APPROVED OR CERTIFIED

PERSONAL PROTECTIVE DEVICES AND

INDUSTRIAL HAZARD MEASURING INSTRUMENTS

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
Morgantown, West Virginia 26505
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16. Abstract (Limit: 200 words): This publication listed coal mine dust personal sampler units, gas detector tube units, and respiratory protective devices certified by NIOSH as of February 28, 1974. The report discussed the purpose of respiratory protective equipment, sampler units, specifications of the sampler units including weight, construction, exhaust, switch, battery, pulsation, beltclips, recharging connection, flow rate indicator, flow rate range, flow rate consistency, and the duration of operation. The conducting of various tests of the equipment was described along with certain applications. Types of protective devices described include self contained breathing apparatus; supplied air respirators; dust, fume, and mist respirators; and chemical cartridge respirators. Names and addresses of manufacturers of approved respiratory protective devices were included.

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(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272(4-77)
(Formerly NTIS-35)
Department of Commerce

PREFACE

The NIOSH Testing and Certification Laboratory was established, at 944 Chestnut Ridge Road, Morgantown, West Virginia 26505, to insure that devices and instruments used for control and evaluation of occupational hazards meet minimum performance requirements necessary to protect worker's health and safety. This NIOSH Laboratory, in cooperation with other Branches of the NIOSH Division of Laboratories and Criteria Development, at 1014 Broadway, Cincinnati, Ohio 45202, have the following responsibilities: (1) Development and promulgation of certification tests and requirements for personal protective devices and industrial hazard measuring instruments, (2) testing and certification of these products, (3) preparation of lists of certified products, (4) surveys of manufacturer's plants to check their quality inspection programs, (5) periodic testing of certified devices and instruments procured on the open market, and (6) development of authoritative information on selection, use, and maintenance of certified products. In general, testing and quality inspection are performed at Morgantown, while long term research into new tests and requirements and on selection, use, and maintenance of certified products are directed from Cincinnati.

Use of personal protective devices and industrial hazard measuring instruments is required in regulations published by Federal agencies, such as the Occupational Safety and Health Administration, Mining Enforcement and Safety Administration, and the Atomic Energy Commission. Use of NIOSH certified products is required when they are availabe, and personnel of these agencies use the NIOSH product certification lists, in this publication and its supplements, to verify NIOSH acceptance during inspection of industries under

their jurisdiction. Purchasers of these products should also refer to these lists to assure their conformance to applicable health and safety regulations.

This publication includes lists of coal mine dust personal sampler units, gas detector tube units, and respiratory protective devices certified by the National Institute for Occupational Safety and Health, as of February 28, 1974. Future certifications of these and other safety and industrial hygiene products will be listed in regular supplements to this publication.

Use of the terms "approved and certified" throughout this publication reflects applicable regulations. Those regulations issued under authority of the Federal Coal Mine Health and Safety Act of 1969, refer to "approval " of devices in accordance with the wording of that act. All NIOSH regulations issued under authority of the Occupational Safety and Health Act of 1970 refer to "certification" of devices and instruments.

Coal Mine Dust Personal Sampler Units

The U.S. Departments of Interior and Health, Education and Welfare have issued joint regulations for approval of coal mine dust personal sampler units. These regulations appeared in the Federal Register on March 11, 1970 (35 FR 4326) and were incorporated in Federal Regulations as Title 30 CFR Part 74 under authority of the Federal Coal Mine Health and Safety Act of 1969.

Several coal mine dust personal sampler units were approved by the DHEW Bureau of Occupational Safety and Health (which subsequently became the National Institute for Occupational Safety and Health) at Cincinnati. The first series of NIOSH (or BOSH) approvals appear below in this section as items 1 through 6. These six approvals were scheduled to expire on December 15, 1973. Before that date, units bearing these approvals were to be modified or replaced by new or revised coal mine dust personal sampler units equipped with pulsation dampeners, designed to provide more regular air flow and approved in accordance with amendments to Part 74, issued on December 15, 1972 (37 FR 26712) and December 22, 1972 (37 FR 28294). Pulsation dampener kits were made available by the manufacturers of the units for their modification by the user.

The December 15, 1973 expiration date was subsequently extended to June 15, 1974, to provide sufficient time for modification or replacement of units in use in coal mines.

The following coal mine dust personal sampler units were approved by the National Institute for Occupational Safety and Health (or Bureau of Occupational Safety and Health), as of February 28, 1974:

1. MSA® Model G. Approval 1A-101, issued to Mine Safety Appliances Co., March 24, 1970.

2. Bendix 39010 Micronair Unico. Approval 1A-102, issued to Bendix Corp., May 5, 1970.

3. Bendix 39101 Micronair Unico (for use with cap lamp battery). Approval 1A-103, issued to Bendix Corp., August 4, 1970.

4. MSA® Model G (for use with cap lamp battery). Approval 1A-104, issued to Mine Safety Appliances Co., December 7, 1970.

5. Bendix C-110. Approval 1A-105, issued to Bendix Corp, _____.

6. Willson Modified Casella. Approval 1A-107, issued to Willson Products Div., ESB Inc., September 1, 1972.

7. Bendix Micronair Unico. Approval TC-74-012, issued to Bendix Corp., July 5, 1973.

8. NIOSH. Approval TC-74-013, issued to National Institute for Occupational Safety and Health, July 25, 1973 (for use by NIOSH personnel only).

9. Willson Model BC. Approval TC-74-014, issued to Willson Products Div., ESB Inc., July 18, 1973.

10. MSA® Model G. Approval TC-74-015, issued to Mine Safety Appliances, Co., August 8, 1973.

NAMES AND ADDRESSES OF MANUFACTURERS OF APPROVED COAL MINE DUST PERSONAL SAMPLER UNITS

Bendix Corporation, 1400 Taylor Avenue, Baltimore, MD 21204.

Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh, PA 15208.

Willson Products Div., ESB Inc., P.O. Box 622, Reading, PA 19603.

PART 74—COAL MINE DUST PERSONAL SAMPLER UNITS

Sec.

AUTHORITY: The provisions of this Part 74 issued under sec. 508, 83 Stat. 803, 30 U.S.C. 957.

SOURCE: The provisions of this Part 74 appear at 35 F.R. 4326, Mar. 11, 1970, unless otherwise noted.

§ 74.1 Purpose.

The regulations in this part set forth the requirements for approval of coal mine dust personal sampler units designed to determine the concentrations of respirable dust in coal mine atmospheres; procedures for applying for such approval; test procedures; and labeling.

§ 74.2 Sampler unit.

A coal mine dust personal sampler unit shall consist of (a) a pump unit, (b) a sampling head assembly, and (c) if rechargeable batteries are used in the pump unit, a battery charger.

§ 74.3 Specifications of sampler unit.

(a) *Pump unit*—(1) *Dimensions.* The overall dimensions of the pump unit, hose connections and valve or switch covers shall not exceed 8 inches in height, 6 inches in width and 4 inches in thickness.

(2) *Weight.* The pump unit shall not weigh more than 4 pounds.

(3) *Construction.* The case and all components of the pump unit shall be of sufficiently durable construction to endure the wear of use in a coal mine and shall be tight fitting, so as to minimize the amount of dust entering the pump case.

(4) *Exhaust.* The pump shall exhaust into the pump case, maintaining a slight positive pressure which will reduce the entry of dust into the pump case.

(5) *Switch.* The pump unit shall be equipped with an on-off switch or equivalent device on the outside of the pump case. This switch shall be protected against accidental operation during use and protected to keep dust from entering the mechanisms.

(6) *Flow rate adjustment.* Except as provided in the last sentence of this subparagraph, the pump unit shall be equipped with a suitable means of flow rate adjustment accessible from outside the case. To prevent accidental adjustment, the flow rate adjuster shall be recessed in the pump case and shall require the use of an adjusting tool. If the pump is capable of maintaining the flow rate consistency required in this part without adjustment, an external flow rate adjuster is not required.

(7) *Battery.* The power supply for the pump shall be a suitable battery located in the pump case or in a separate case which attaches to the pump case by a permissible electrical connection.

(8) *Pulsation.* (i) The irregularity in flow rate due to pulsation shall have a fundamental frequency of not less than 20 Hz.

* (ii) On and after **July 1, 1974** the quantity of respirable dust collected with a sampler unit shall be within ±5 percent of that collected with a sampling head assembly operated with nonpulsating flow.

NOTE: The test procedures for evaluating sampler units with respect to this specification will be provided on request by the National Institute for Occupational Safety and Health, 1014 Broadway, Cincinnati, Ohio 45202.

(iii) Certificates of approval issued for sampler units which fail to comply with the specification set forth in subdivision (ii) of this subparagraph when such specification becomes effective, shall be revoked.

(9) *Belt clips.* The pump unit shall be provided with a belt clip which will hold the pump securely on a coal miner's belt.

(10) *Recharging connection.* A suitable connection shall be provided so that the battery may be recharged without removing the battery from the pump case or from the battery case if a separate battery case is used.

(11) *Flow rate indicator.* A visual indicator of flow rate (e.g., a flowmeter) shall be provided either as an integral part of the pump unit or of the sampling head assembly. The flowrate indicator shall be calibrated within ±5 percent at 2, 1.8, and 1.6 liters per minute to indicate the rate of air passing through the accompanying sampling head assembly.

(12) *Flow rate range.* The pump shall be capable of operating in or over a range of from 1.5 to 2.5 liters per minute and shall be adjustable over this range.

(13) *Flow rate consistency.* The flow shall remain within ±0.1 liters per minute over an 8-hour period when the pump is operated at 2 liters per minute with a standard sampling head assem-

*As amended on January 29, 1974, Federal Register, Vol. 39, No. 20, page 3677

bly. Not more than two readjustments of the flow rate to 2 liters per minute shall be required to maintain this accuracy.

(14) *Duration of operation.* The pump shall be capable of operating for not less than 8 hours at a flow rate of 2 liters per minute against a resistance of 4 inches of water measured at the inlet of the pump.

(b) *Sampling head assembly.* The sampling head assembly shall consist of a cyclone and a filter assembly as follows:

(1) *Cyclone.* The cyclone shall consist of a cyclone body with removable grit cap and a vortex finder and shall be constructed of nylon or a material equivalent in performance. The dimensions of the components, with the exception of the grit cap, shall be identical to those of a Dorr-Oliver 10 mm. cyclone body, part No. 28541/4A or 01B11476-01 and vortex finder, part No. 28541/4B.

(2) *Filter assembly.* The filter assembly shall meet the following requirements:

(i) *Filter.* The filter shall be a membrane filter type with a nominal pore size not over 5 microns. It shall be nonhydroscopic and shall not dissolve or decompose when emersed in ethyl or isopropyl alcohol. The strength and surface characteristics of the filter shall be such that dust deposited on its surface may be removed by ultrasonic methods without tearing the filter. The filter resistance shall not be more than 2 inches of water at an airflow rate of 2 liters per minute.

(ii) *Capsule.* The capsule enclosing the filter shall not permit sample air to leak around the filter. The capsule shall be made of nonhydroscopic material. Its weight, including the enclosed filter, shall not exceed 5 grams and it shall be preweighed by the manufacturer with a precision of ±0.1 milligrams. Impact to the capsule shall not dislodge any dust from the capsule, which might then be lost to the weight measurement.

(iii) *Cassette.* The cassette shall enclose the capsule so as to prevent contamination. The cassette must be easily removable without causing a loss or gain of capsule weight. Appropriate covers shall be provided to prevent contaminants from entering, or dust from leaving, the capsule when it is not in use.

(3) *Arrangement of components.* The connections between the cyclone vortex finder and the capsule and between the capsule and the ¼-inch (inside diameter) hose mentioned in subparagraph (5) of this paragraph shall be mechanically firm and shall not leak at a rate of more than 0.1 liters per hour under a vacuum of 4 inches of water.

(4) *Clamping of components.* The clamping and positioning of the cyclone body, vortex finder, and cassette shall be rigid, remain in alignment, be firmly in contact and airtight. The cyclone-cassette assembly shall be attached firmly to a backing plate or other means of holding the sampling head in position. The cyclone shall be held in position so that the inlet opening of the cyclone is pointing perpendicular to, and away from, the backing plate.

(5) *Hose.* A 3-foot long, ¼-inch (inside diameter) hose shall be provided to form an airtight connection between the inlet of the sampler pump and the outlet of the filter assembly. A device, capable of sliding along the hose and attaching to the miner's outer garment shall be provided.

(c) *Battery charger*—(1) *Power supply.* The battery charger shall be operated from a 117 volt, 60 Hz power line.

(2) *Connection.* The battery charger shall be provided with a cord and polarized connector so that it may be connected to the charge socket on the pump or battery case.

(3) *Protection.* The battery charger shall be fused, shall have a grounded power plug, and shall not be susceptible to damage by being operated without a battery on charge.

(4) *Charge rates.* The battery charger shall be capable of operating at either a 16-hour or a 64-hour charge rate. The battery charger shall be capable of fully charging the battery in the pump unit in the stated times and shall not overcharge a discharged battery in 16 hours when operating at the 16-hour charge rate or in 88 hours when operating at the 64-hour charge rate.

[35 FR 4326, Mar. 11, 1970, as amended at 37 FR 26712, Dec. 15, 1972; 37 FR 28294, Dec. 22, 1972]

§ 74.4 Tests of coal mine dust personal sampler units.

(a) The National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare, shall conduct tests to determine whether a coal mine dust personal sampler unit which is submitted for approval under these regulations meets the requirements set forth in § 74.3.

(b) The Bureau of Mines, Department of the Interior, will conduct tests, pursuant to § 18.68 of this chapter, to determine whether the pump unit of a coal mine dust personal sampler unit submitted for approval under these regulations is intrinsically safe.

[35 FR 4326, Mar. 11, 1970, as amended at 37 FR 26712, Dec. 15, 1972]

§ 74.5 Conduct of tests; demonstrations.

Prior to the issuance of a certificate of approval, only personnel of the Bureau of Mines and National Institute for Occupational Safety and Health, representatives of the applicant, and such other persons as may be mutually agreed upon may observe the tests conducted. The Bureau of Mines and the National Institute for Occupational Safety and Health shall hold as confidential, and shall not disclose, principles of patentable features prior to certification, nor shall the Bureau or Institute disclose any details of the applicant's drawings or specifications or other related material. After the issuance of a certificate of approval, the Bureau of Mines or the National Institute for Occupational Safety and Health may conduct such public demonstrations and tests of the approved coal mine dust personal sampler unit as the Bureau or Institute deems appropriate. The conduct of all investigations, tests, and demonstrations shall be under the sole direction of the National Institute for Occupational Safety and Health and the Bureau of Mines and any other persons shall be present only as observers.

[35 FR 4326, Mar. 11, 1970, as amended at 37 FR 26712, Dec. 15, 1972]

§ 74.6 Applications.

(a) Testing of a coal mine dust personal sampler unit will be undertaken by the National Institute for Occupational Safety and Health, and testing of the pump unit of such a sampler unit will be undertaken by the Bureau of Mines, only pursuant to a written application in duplicate, each copy accompanied by complete scale drawings, specifications and description of materials. An application to the Bureau of Mines must be accompanied by a check, bank draft, or money order in the amount of $105, payable to the U.S. Bureau of Mines, to cover the fee specified in § 18.7 of this chapter. The applications, together with the drawings and specifications and any other related documents shall be sent to National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare, Box 4256, 944 Chestnut Ridge Road, Morgantown, WV 26505, and the Bureau of Mines, Department of the Interior, 4800 Forbes Avenue, Pittsburgh, Pa. 15213.

(b) Ten complete coal mine dust personal sampler units must be sent to the National Institute for Occupational Safety and Health in connection with an application. One pump unit must be sent to the Bureau of Mines in connection with an application.

(c) Drawings and specifications shall be adequate in number and fully detailed to identify the design of the coal mine dust personal sampler unit or pump unit thereof and to disclose the dimensions and materials of all component parts.

(d) An application shall describe the way in which each lot of components will be sampled and tested to maintain their quality prior to assembly of each sampler unit. In order to ensure that the quality of the coal dust personal sampler unit will be maintained in production through adequate quality control procedures, the National Institute for Occupational Safety and Health and the Bureau of Mines reserve the right to have their qualified personnel inspect each applicant's control-test equipment procedures, and records and to interview the employees who conduct the control tests. Two copies of the results of any tests made by the applicant on the coal mine dust personal sampler unit or the pump unit thereof shall accompany an application.

[35 FR 4326, Mar. 11, 1970, as amended at 37 FR 26712, Dec. 15, 1972]

§ 74.7 Certificate of approval.

(a) Upon completion of the testing of a coal mine dust personal sampler unit or the pump unit thereof, the National Institute for Occupational Safety and Health or the Bureau of Mines, as appropriate, shall issue to the applicant either a certificate of approval or a written notice of disapproval, as the case may require. The National Institute for Occupational Safety and Health shall not issue a certificate of approval for a coal mine dust personal sampler unit unless the Bureau of Mines has issued a certificate of approval for the pump unit thereof. No informal notification of approval will be issued. If a certificate of approval is issued, no test data or detailed results of tests will accompany such approval. If a notice of disapproval is issued, it will be accompanied by details of the defects, resulting in disapproval, with a view to possible correction.

(b) A certificate of approval will be accompanied by a list of the drawings and specifications, covering the details of design and construction of the coal mine dust personal sampler unit or the pump unit thereof upon which the certificate of approval is based. The applicant shall keep exact duplicates of the drawings and specifications submitted to the National Institute for Occupational Safety and Health and to the Bureau of Mines relating to the sampler unit or

pump unit thereof which has received a certificate of approval. The approved drawings and specifications shall be adhered to exactly in the production of the certified sampler unit, including the pump unit thereof, for commercial purposes. In addition, the applicant shall observe such procedures for, and keep such records of, the control of component parts as either the Bureau or Institute may in writing require as a condition of certification.

[35 FR 4326, Mar. 11, 1970, as amended at 37 FR 26712, Dec. 15, 1972]

§ 74.8 Approval labels.

(a) Certificates of approval will be accompanied by photographs of designs for the approval labels to be affixed to each coal mine dust personal sampler unit.

(b) The labels showing approval by the National Institute for Occupational Safety and Health and by the Bureau of Mines shall contain such information as the Bureau or Institute may require and shall be reproduced legibly on the outside of a sampler unit as directed by the appropriate bureau.

(c) The applicant shall submit full-scale designs or reproductions of approval labels and a sketch or description of the position of the labels on each unit.

(d) Use of the approval labels obligates the applicant to whom the certificates of approval were issued to maintain the quality of the complete coal mine dust personal sampler unit and to guarantee that the complete sampler unit is manufactured or assembled according to the drawings and specifications upon which the certificates of approval were based. Use of the approval labels is authorized only on sampler units which conform strictly with the drawings and specifications upon which the certificates of approval were based.

[35 FR 4326, Mar. 11, 1970, as amended at 37 FR 26712, Dec. 15, 1972]

§ 74.9 Material required for record.

(a) As part of the permanent record of the investigation, the National Institute for Occupational Safety and Health will retain a complete coal mine dust personal sampler unit, and the Bureau of Mines will retain a pump unit, that has been tested and certified. Material not required for record purposes will be returned to the applicant at his request and at his expense on written shipping instructions to the Bureau or Institute.

(b) As soon as a coal mine dust personal sampler unit is commercially available, the applicant shall deliver a complete unit free of charge to the National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare, Box 4256, 944 Chestnut Ridge Road, Morgantown, WV 26505.

[35 FR 4326, Mar. 11, 1970, as amended at 37 FR 26712, Dec. 15, 1972]

§ 74.10 Changes after certification.

(a) If the applicant desires to change any feature of a certified coal mine dust personal sampler unit, he shall first obtain the approval of the National Institute for Occupational Safety and Health pursuant to the following procedures:

(1) Application shall be made as for an original certificate of approval, requesting that the existing certification be extended to encompass the proposed change. The application shall be accompanied by drawings, specifications and related material, as in the case of an original application.

(2) The application and accompanying material will be examined by the National Institute for Occupational Safety and Health to determine whether testing of the modified sampler unit or components will be required. Testing will be necessary if there is a possibility that the modification may affect the performance of the sampler unit adversely. The National Institute for Occupational Safety and Health will inform the applicant whether such testing is required.

(3) If the proposed modification meets the pertinent requirements of these regulations, a formal extension of certification will be issued, accompanied by a list of new and revised drawings and specifications to be added to those already on file as the basis for the extension of certification.

(b) If a change is proposed in a pump unit of a certified coal dust personal sampler unit, the approval of the Bureau of Mines with respect to intrinsic safety shall be obtained in accordance with the procedures set forth in paragraph (a) of this section.

[35 FR 4326, Mar. 11, 1970, as amended at 37 FR 26712, Dec. 15, 1972]

§ 74.11 Withdrawal of certification.

Any certificate of approval issued under the regulations in this part may be revoked for cause by the Institute or the Bureau which issued the certificate.

[37 FR 26712, Dec. 15, 1972]

Gas Detector Tube Units

The U.S. Department of Health, Education and Welfare has issued regulations for certification of gas detector tube units. These regulations appeared in the Federal Register on May 8, 1973 (38 FR 11458) and were incorporated in Federal Regulations as Title 42 CFR Part 84 under authority of the Occupational Safety and Health Act of 1970.

The performance requirements for gas detector tube units were developed by the NIOSH Division of Laboratories and Criteria Development (1014 Broadway, Cincinnat, Ohio 45202) with the cooperation and assistance of members of the American Industrial Hygiene Association - American Conference of Governmental Industrial Hygienists Joint Direct Reading Gas Detecting Systems Committee.

Gas dectector tube units are tested for NIOSH certification by the Institute's Testing and Certification Laboratory.

Certified gas detector tube units listed in this section consist of an aspirating pump which draws a fixed volume and rate of air through a tube containing a chemically impregnated packing which indicates the concentration of a contaminant in the air by means of a chemically produced color change.

NIOSH, as of February 28, 1974, has tested gas detector tube units for carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, hydrogen sulfide, and carbon dioxide. Units for ammonia are undergoing tests as of February 28, 1974. Applications for testing units for chlorine, trichloroethylene, carbon tetrachloride, perchloroethylene and benzene will be accepted February through June, 1974, respectfully.

The following gas detector tube units were approved by the National Institute for Occupational Safety and Health, as of February 28, 1974:

Gas Detector Tube Units Certified By NIOSH

As of February 28, 1974

A. MSA® Model 83499 Universal Sampling Pump has been certified for use with:

1. CO - Model 91229 gas detector tube - TC-84-015 October 12, 1973.

B. Gastec Model 400 Aspirating Pump (Bendix PN 2417535) has been certified for use with:

1. CO - Model 1La gas detector tube - TC-84-014 September 6, 1973.
2. NO_2 - Model 9L gas detector tube - TC-84-018 January 15, 1974.
3. SO_2 - Model 5La gas detector tube - TC-84-017 February 11, 1974.
4. H_2S - Model 4LL gas detector tube - TC-84-020 February 13, 1974.
5. CO_2 - Model 2L gas detector tube - TC-84-021 February 25, 1974.

C. Dräger Bellows Pump Model 31 has been certified for use with:

1. CO - Model 5/c gas detector tube - TC-84-012 August 31, 1973.
   - Model 10/b gas detector tube - TC-84-013 August 31, 1974.
2. NO_2 - Model 0,5/c gas detector tube - TC-84-016 October 31, 1974.

D. Kitagawa Model 400 Aspirating Pump has been certified for use with:

1. CO - Model 106s gas detector tube - TC-84-019 January 30, 1974.

NAMES AND ADDRESSES OF MANUFACTURERS OR U.S. DISTRIBUTORS OF CERTIFIED GAS AND VAPOR DETECTOR TUBE SYSTEMS

Bacharach Instrument Co., 625 Alpha Drive, Pittsburgh, PA 15238.

Bendix Corp., 1400 Taylor Avenue, Baltimore, MD 21204 (Kitagawa distributor).

Matheson Gas Products, 932 Paterson Plank Road, East Rutherford, NJ 07073 (Gastec distributor).

Mine Safety Appliances Co., 201 North Braddock, Pittsburgh, PA 15208.

National Mine Service Co., 3000 Koppers Bldg., Pittsburgh, PA 15219 (Dräger distributor).

PART 84—CERTIFICATION OF GAS DETECTOR TUBE UNITS

Subpart A—General Provisions

Subpart B—Construction and Performance Requirements

Subpart C—Quality Control

AUTHORITY.—The provisions of this part 84 issued under sec. 8(g), 84 Stat. 1600; 29 U.S.C. 657(g).

SOURCE: 38 FR 11459, May 8, 1973, unless otherwise noted.

Subpart A—General Provisions

§ 84.1 Purpose.

The regulations in this part set forth the requirements and fees for the certification of gas detector tube units and components thereof, which are used to determine the concentrations of toxic gases in employee working environments.

§ 84.2 Definitions.

Any term defined in the Occupational Safety and Health Act of 1970 and not defined below shall have the meaning given it in the Act. As used in this part:

(a) "Act" means the Occupational Safety and Health Act of 1970 (29 U.S.C. 651 et seq.).

(b) "Institute" means the National Institute for Occupational Safety and Health established under the Act.

(c) "Applicant" means an individual, partnership, company, corporation, association, or other organization that designs, manufactures, assembles, or markets a gas detector tube unit or component and seeks a certificate therefor.

(d) "Gas detector tube" means a tube containing a chemically impregnated packing which indicates the concentration of a contaminant in the air by means of a chemically produced color change.

(e) "Tube unit" means a device for measuring or signaling the presence of one or more gaseous contaminants in the atmosphere of a working environment which consists of (1) a gas detector tube and (2) an aspirating pump and which may also include (3) an oxidation tube or pyrolyzer or any other component which changes the nature of the contaminant so that it may be measured by the tube, or (4) any other device such as an automatic stroke counter which enhances the convenience or usability of the tube unit.

(f) "Component" means any gas detector tube, aspirating pump, or device which changes the nature of the contaminant so that it may be measured by the tube, and is designed to operate as a constituent of the tube unit in such a way that the entire unit meets the requirements of this part.

(g) "Independent tube reader" means a person measuring the length of stain or comparing the color or stain in a tube unit in accordance with the instructions furnished by the applicant who (1) is not aided by another person in reading the tube, (2) has no knowledge of other reader results, and (3) has no prior knowledge of the actual contaminant concentration other than from tube unit readings.

(h) "Test standard" means the contaminant concentration in air which is adopted by the Institute for each contaminant for the purpose of defining the concentration range to be measured by the tube.

(i) "MIL–STD" means a specific military standards document approved by the U.S. Department of Defense.

(j) "Batch" means a quantity of material as defined in MIL–STD–105D and MIL–STD–414.

[38 FR 11459, May 8, 1973, as amended at 38 FR 14940, June 7, 1973]

§ 84.3 Applications; tube units; components.

* (a) From time to time, the Institute will publish a notice in the FEDERAL REGISTER specifying the dates during which applications will be accepted for the testing and possible certification of tube units and components thereof which are intended to measure specific gases. This notice shall also list the test standard adopted by the Institute for each specific gas. Information concerning the test standards for specific gases is available at the address given in paragraph (b) below.

* In accordance with § 84.3(a) of the regulations, notice is hereby given that the National Institute for Occupational Safety and Health will accept applications for certification of gas detector tube units pursuant to the following schedule:

Gas	Dates for submittal	Test standard
1. Ammonia (NH_3)	Jan. 1–31, 1974	50.0 ppm.
2. Chlorine (Cl_2)	Feb. 1–28, 1974	1.0 ppm.
3. Trichloroethylene (C_2HCl_3)	Mar. 1–31, 1974	100.0 ppm.

(b) No testing of a tube unit or components thereof will be undertaken by the Institute except pursuant to a written application filed in accordance with the requirements of this subpart. The application and all related materials and correspondence concerning it shall be sent to the National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare, Testing and Certification Laboratory, Appalachian Center for Occupational Safety and Health, 944 Chestnut Ridge Road, Morgantown, W. Va., 26505, and shall be accompanied by a check, bank draft, or money order in the amount specified in § 84.12, payable to the National Institute for Occupational Safety and Health.

(c) Tube units or compatible components thereof submitted for certification shall be made from those materials specified in the application, on regular production tooling, using only those operations which are a part of regular production processing.

(d) The applicant shall describe the way in which each lot or batch of components will be sampled and tested to maintain their quality in the manufacturing and distribution process pursuant to Subparts B and C of this part.

(e) The applicant shall furnish to the Institute without charge the tube units required for testing. The Institute may require such number of units and components as it deems necessary for adequately testing such units.

(f) The applicant shall submit full-scale designs or reproductions of proposed labels specifying storage instructions, batch number, and expiration date, and a sketch or description of the position of the proposed labels on each tube unit or component thereof. The proposed position of the certification seals issued by the Institute shall also be shown.

(g) The applicant shall submit a statement based upon tests prescribed in Subpart B of this part that the tube unit or the component thereof meets the requirements of this part.

(h) For a tube unit, the applicant shall also include:

(1) Drawings, specifications, and descriptions adequate in detail to identify the design, dimensions, and materials of the detector tube, aspirating pump, and other components.

(2) A description of the test methods and a copy of the test results upon which the statement set forth in paragraph (g) of this section is based.

(i) For components of tube units the applicant shall also include:

(1) Drawings, specifications, and descriptions adequate in detail to identify the design, dimensions, and materials of the component part and its function in the tube unit.

(2) A description of the test methods and test results upon which the statement set forth in paragraph (g) of this section is based.

(3) A statement identifying the tube unit or units with which the particular component is compatible.

§ 84.4 Issuance of certificates.

(a) Upon completion of its inspection and testing of a tube unit or any component thereof, the Institute will issue to the applicant either a certificate or a written notice that the tube unit or component fails to comply with the applicable requirements of this part. In the latter situation, details of the reasons the unit or component failed to comply will be included in the notice.

(b) Components will be certified for use only for the specific tube unit or units identified in the certificates issued for such components.

§ 84.5 Certification seals.

(a) Certification seals shall be imprinted or affixed by the applicant to tube units certified by the Institute pursuant to this part, or to certified components thereof, in the manner set forth by the Institute in the certificate.

(b) Use of the certification seal obligates the applicant to:

1. Manufacture and assemble the tube unit or manufacture the component thereof according to the drawings and specifications upon which the certificate is based.

2. Maintain the quality of the tube unit or the component thereof in accordance with subparts B and C of this part.

(c) Any failure by the applicant to comply with the conditions for use of the certification seal may result in a withdrawal of such certification or other action to require compliance with such conditions.

(d) Certification seals shall not be imprinted or affixed to types of tube units or components for which a certificate has not been issued by the Institute.

§ 84.6 Required information.

(a) Each component or set of components to be marketed shall include instructions stating the additional components with which it has been certified for use as a tube unit.

(b) Each aspirating pump to be marketed shall be accompanied by instruc-

tions which shall enable the user to verify by a simple field test the capability for accurate flow rate sampling and the absence of leakage. The applicant shall also provide instructions for making simple corrective adjustments to the pump and for replacing minor parts.

(c) Each box of certified tubes to be marketed shall be labeled with the following information:

(1) Manufacturer's batch number.

(2) The date until which the applicant will maintain samples of the tubes from the batch and guarantee that the tubes meet the requirements of this part, if stored from time of manufacture according to his instructions. This date shall be designated as the expiration date of the tubes.

(3) Storage instructions.

(d) Each box of certified tubes to be marketed shall be accompanied by descriptive literature setting forth the following:

(1) Instructions for obtaining contaminant concentration values from tube readings.

(2) The temperature, pressure, and humidity at which the tube has been calibrated; methods for quantitatively correcting tube readings necessitated by use of the tubes at conditions of temperature, pressure, and humidity other than those at which the tube was calibrated.

(3) Instructions for the use of the tubes and pumps.

(4) Limitations of the tube unit in obtaining accurate concentration measurements including a list of known interfering gases or vapors and the amount of each which may be tolerated without affecting the measurement of toxic gas concentrations over the working range of the tube.

(5) Basic chemical reactions involved in the operation of the tube, including the chemical composition of the reagent with which the contaminant reacts and the end products formed, provided that, where the manufacturer has demonstrated to the Institute that any such information is a trade secret, such information need not be set forth.

(e) For length-of-stain type detector tubes only, each box of certified tubes to be marketed shall be accompanied by a calibration chart or curve showing those concentrations of each gas that the tube measures which correspond to various lengths of stained reagent and the volume of the air sampled. The calibration shall be based upon the method described in § 84.23.

(f) For color-intensity type detector tubes only, each box of certified tubes to be marketed shall be accompanied by a color chart showing those concentrations of each gas that the tube measures which correspond to various color changes of the indicating reagent section of the detector tube and to the volume of the air sampled. The calibration shall be based upon the method described in § 84.23.

(g) Each aspirating pump, pyrolyzer, or other component not packaged inside a box of detector tubes must be identified by a serial number or other means of identification so that the date and batch of manufacture may be ascertained.

(h) The applicant shall furnish an assurance that upon request of the user of the tube unit, the applicant will furnish the following:

(1) The calibration methods employed as required by § 84.23 (d) and (e).

(2) The effects (including reactions) on the operation and accuracy of the gas detector tube unit caused by specific environmental conditions described by the user, if the effects are known by the applicant.

§ 84.7 Conduct of tests.

(a) The Institute shall conduct such tests as it deems appropriate to determine whether a tube unit or the components thereof, submitted for certification under these regulations, meet the requirements set forth in subparts B and C of this part.

(b) After the testing of a tube unit or component thereof, pursuant to application filed under this part, the application and matters relating to the tube unit or component, including all tests results, shall be public records and available for public inspection. However, any such information which is designated by the applicant as a trade secret will be held confidential, provided that the applicant demonstrates to the Institute, upon request, that the information is a trade secret.

§ 84.8 Changes after certification.

Prior to changing any feature of a certified tube unit or of a compatible component thereof, the applicant shall obtain approval of the Institute in accordance with the following procedures:

(a) Application may be made at any time as for an original certificate as specified by § 84.3. The application shall request that the existing certification be extended to encompass the proposed change.

(b) The application and accompanying material will be examined by the Institute to determine whether testing of the modified tube unit or components will be required. The Institute will in-

form the applicant whether such testing is required and, if so, when the modified units may be submitted for testing.

(c) If the proposed modification meets the pertinent requirements of these regulations, a revised certificate will be issued. If a notice is sent that the tube unit or component fails to comply with the applicable requirements of this part, details of the reasons the unit or component failed to comply will accompany the notice.

§ 84.9 Material required for record.

(a) One certified tube unit or certified component thereof may be retained without cost by the Institute as a record of the performance investigation.

(b) Material not required for the record shall be returned to the applicant at his request and at his expense upon written shipping instruction to the Institute.

§ 84.10 Withdrawal of certification.

(a) The Institute may, after affording the certificate holder reasonable notice in writing and an opportunity to present his views or evidence, withdraw, for cause, any certificate which the Institute has issued under the provisions of this part.

(1) The views and evidence of the holder of the certificate shall be presented in writing unless the Director of the Institute determines that an oral presentation is desirable.

(2) Such views and evidence shall be confined to matters relevant to whether cause exists for the withdrawal of the certificate.

(b) Effective upon receipt by the applicant of the Institute's written notice of intent to withdraw certification, the applicant shall cease to manufacture, market, or distribute for sale tube units or components bearing the certification seal for those units or components for which notice of intent to withdraw certification has been given.

§ 84.11 Incorporation by reference.

In accordance with 5 U.S.C. 552(a)(1), MIL–STD–105D "Sampling Procedures and Tables for Inspection by Attributes" (April 29, 1963) and MIL–STED–414 "Sampling Procedures and Tables for Inspection by Variables for Percent Defective" (June 11, 1957) to which reference is made in subpart C of this part are hereby incorporated by reference and made a part hereof. These documents are available for inspection at the National Institute for Occupational Safety and Health, 5600 Fishers Lane, Rockville, Md., at the Institute's Testing and Certification Laboratory, Morgantown, W. Va., and at the Public Health Service Information Centers as listed in 45 CFR 5.31. Copies of either document may be purchased from the Government Printing Office.

§ 84.12 Fees.

(a) Except as provided in paragraph (d) of this section, the following fees shall be charged by the Institute for the examination, inspection, and testing of complete tube units submitted for certification:

(1) Tube unit incorporating aspirating pump	$400
(2) Tube unit incorporating aspirating pump and oxidation tube and/or pyrolyzer	450

(b) Except as provided in paragraph (d) of this section, the following fees shall be charged by the Institute for the examination, inspection, and testing of tube unit components submitted for certification:

(1) Gas detector tube	$350
(2) Other components, the testing of which does not require a complete test of the entire tube unit	50

(c) The fees stated in paragraph (a) and (b) of this section are based on estimated man hours of testing required by the Institute staff. If actual expenditure of personnel time is less than the estimated amount, the testing fee will be prorated and the balance returned to the applicant.

(d) An application for examination, inspection, and testing of complete tube units which are not listed in paragraph (a) of this section, or for examination, inspection, and testing of components which are not listed in paragraph (b) of this section, shall be accompanied by the following deposits:

(1) Complete tube unit	$400
(2) Individual component	50

(e) The fees charged for the examination, inspection, and testing of unlisted complete tube units, or components submitted for certification shall be at the rate of $50 per day for each man-day required to be expended by the Institute;

(f) If the amount assessed by the Institute pursuant to paragraph (e) of this section is greater or less than the amount of deposit submitted in accordance with paragraph (d) of this section, the Institute shall request an additional fee, or refund the overpayment, as appropriate, prior to the issuance of any certification or notice that the tube unit or component fails to comply.

Subpart B—Construction and Performance Requirements

§ 84.20 General.

(a) The Institute will test the tube units and components thereof for which applications are submitted in accordance with this part.

(b) All tube units and components accepted by the Institute for examination, inspection, and testing shall be designed on sound engineering and scientific principles, constructed of suitable materials, and evidence good workmanship.

(c) Replacement parts shall be designed and constructed to permit easy installation and to maintain the effectiveness of the tube unit.

(d) The component parts of each tube unit shall be:

(1) Designed, constructed, and fitted to minimize the chance of hazard to the user;

(2) Assembled in a manner which permits easy access (i) for inspection and repair of functional parts and (ii) to parts which require periodic cleaning.

(e) The accuracy of gas detector tube units shall be such that measurements made by these units, when used in accordance with the applicant's instructions, produce measurements of contaminant concentrations within ±25 percent of the actual value at concentrations of 1, 2, and 5 times the test standard of the contaminant of interest, and within ±35 percent of the actual value at one-half the test standard.

(f) Gas detector tubes shall continue to meet the performance standards of this part from the date of manufacture until the expiration date, if the tubes are stored according to the applicant's instructions during the elapsed time.

§ 84.21 Length-of-stain type detector tubes.

(a) In addition to requirements stated in § 84.20, length-of-stain type detector tubes shall either:

(1) Produce a minimum length of stain such that the calibration point on the calibration chart or curve for a concentration equal to the test standard for the gas to be detected shall correspond to a stain length of 15 mm or greater; or

(2) At a concentration equal to the test standard for the gas to be detected, produce a stain with such a clear and sharp end point that the following requirement is met:

$$\frac{\sigma}{\bar{X}} \leq 0.10$$

where:

σ=the standard deviation of the tube readings obtained from three or more independent tube readers when reading an individual stained tube.

$\bar{X}$=mean value of the tube readings.

The applicant shall demonstrate to the satisfaction of the Institute by means of data and test results that the tubes meet the above requirement. Such tests must be reproducible by the Institute.

(b) Channeling of airflow through the detector tube shall be minimized so that the maximum variation of stain length around the circumference of the tube at the interface between stained and unstained reagent shall be such that:

$$\frac{\Delta L}{M} \leq 0.20$$

where:

$\Delta L = L_2 - L_1$

L_2=The concentration value indicated by the length of stain at the side of the tube where the stain is farthest extended along the tube's longitudinal axis.

L_1=The concentration value indicated by the length of stain at the side of the tube where the stain is least extended along the tube's longitudinal axis.

M=The median value between L_1 and L_2.

(c) Gas detector tubes shall be assembled so that the packing which interfaces with the indicator reagent at the stained end of the tube is at a right angle to the longitudinal axis of the tube and shall be such that the distance along the tube's longitudinal axis from the point at which the packing is farthest extended toward the reagent to the point at which the packing is least extended toward the reagent shall not exceed 2 mm.

§ 84.22 Color-intensity type detector tubes.

In addition to requirements stated in § 84.20, color-intensity type detector tubes shall meet either of the following requirements:

(a) A sufficient number of color charts and sampling volume combinations shall be provided to:

(1) Cover the range from 0.5 to 1.5 times the test standard in increments not greater than 0.25 times the test standard.

(2) Cover the range from 1.5 to 3 times the test standard in increments not greater than 0.5 times the test standard.

(3) Cover the range from 3 to 5 times the test standard in increments not greater than the test standard.

A color comparison chart and corresponding sampling volume shall be provided for each of the discrete increments indicated above; or

(b) A sufficient number of color charts and sampling volume combinations shall be provided so that the following requirement is met when readings are obtained by interpolation between color comparison charts:

$$\frac{\sigma}{\bar{X}} \leq 0.10$$

where:

σ=the standard deviation of the tube readings obtained from three or more independent tube readers when reading an individual stained tube.

$\bar{X}$=mean value of the tube readings.

The applicant shall demonstrate to the satisfaction of the Institute by means of data and test results that the tubes meet the above requirement. Such tests must be reproducible by the Institute.

§ 84.23 Calibration.

(a) Gas detector tubes from each batch of tubes of the applicant shall be tested by the applicant for accuracy of contaminant concentration measurement by using the tubes to sample known concentration of contaminants.

(b) All applicant-supplied correction factors for temperature, relative humidity, pressure, and other pertinent variables shall be applied to the tube readings before evaluating such readings for accuracy.

(c) Routine calibration of each batch of tubes by the applicant shall be conducted at ambient room temperature in the range of 65–85° F. (18.3–29.5° C.). Relative humidities shall be adjusted approximately to 50 percent, except for cases in which the presence of a substantial amount of water vapor would result in unstable contaminant concentrations, interfere with concentration monitoring systems, or otherwise cause a disturbance of test conditions. In such cases, a lower relative humidity may be used.

(d) The applicant shall perform tube calibration tests on gas detector tubes from each batch of its tubes at concentrations of 0.5, 1, 2, and 5 times the test standard for the specific gas or vapor to be detected.

(e) Calibration concentrations shall be generated using one of the following methods:

(1) A dynamic contaminant generation system, as by a gas saturating method (employing the vapor pressure of the substance), permeation tube devices, or other instruments or devices which generate gases at a steady, measurable rate.

(2) An analyzed gas mixture from a pressurized cylinder.

(3) A static concentration system as one prepared by injecting a known mass of a liquid contaminant into a sealed container of known volume and allowing time for evaporation and the equilibration of adsorption and desorption on container walls.

(4) Any other method approved by the Institute.

(f) Independent chemical or physical analysis shall be used by the applicant to verify the test concentration of the gas generated pursuant to paragraph (e) of this section, except in the case when no independent method of acceptable accuracy has been developed.

(g) The applicant shall test gas detector tubes in the presence of interfering gases to verify the applicant's stated interference levels and to determine what additional gases might also interfere with detector tube readings and to what degree such interferences might occur.

§ 84.24 Aspirating pumps.

(a) Aspirating pumps for drawing the air to be sampled with detector tubes shall be free from leakage which can result in erroneously low tube readings, and shall be calibrated by the applicant to sample at whatever flow rate is deemed appropriate by the applicant in order to assure accurate measurements.

(b) After the pump has been evacuated, leakage per minute shall not be more than 3 percent of the pump's volume capacity in a single stroke when the pump inlet is plugged.

(c) Flow control devices, if used, shall regulate the flow rate to within ±10 percent of the rate stated by the applicant for each flow rate control device.

(d) Pumps shall be calibrated by the applicant to insure that they are capable of sampling accurately the stated volume at the stated flow rate. Subsequent to a check of proper flow rate and volume, the pump shall be capable of drawing 100 full-capacity strokes of air without deviating more than ±10 percent from the calibration flow rate.

(e) The pump shall be capable of drawing the volume stated by the applicant to within ±5 percent of said volume. A properly maintained pump shall be able to continue to draw this volume throughout its normal working lifetime.

(f) The performance of the discharge check valve system shall be such that when 10 consecutive pump strokes are taken, the total volume of air drawn into the pump through its inlet minus the total volume discharged through the pump inlet shall be within 5 percent of 10 times the pump's volume capacity for a single stroke.

Subpart C—Quality Control

§ 84.30 Filing quality control plans.

Quality control plans shall be filed by the applicant as a part of each application submitted pursuant to § 84.3.

§ 84.31 Contents of quality control plan.

(a) Each quality control plan shall contain provisions for the management of quality, including: (1) Requirements for the production of quality data and the use of quality control records; (2) control of engineering drawings, documentations, and changes; (3) control and calibration of measuring and test equipment; (4) control of purchased material to include incoming inspection; (5) batch identification, control of processes, manufacturing, fabrication, and assembly work conducted in the applicant's plant; (6) audit of final inspection of the completed product; and, (7) the organizational structure necessary to carry out these provisions.

(b) Each final inspection quality control plan shall include a procedure for the selection of a sample of detector tubes, pumps, and accessory equipment for testing in accordance with MIL–STD–105D "Sampling Procedures and Tables for Inspection by Attributes," or MIL–STD–414, "Sampling Procedures and Tables for Inspection by Variables for Percent Defective," or from a combination of such sampling procedures, or equivalent plan approved by the Institute.

(c) The sampling plan shall include a list of the characteristics to be measured, inspected, or tested by the applicant. These characteristics shall be classified according to the potential effect of each defect and grouped into the following classes:

(1) *Special.* Tube reading accuracy.

(2) *Critical.* A defect which will make the product completely inoperative or render it unusable for its intended purpose.

(3) *Major.* A defect other than critical, that is likely to result in failure, or to reduce materially the usability of the detector tube system in its intended purpose.

(4) *Minor.* A defect that is not likely to reduce materially the usability of the detector tube system for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the detector tube system.

(d) For each characteristic required to be tested or inspected, the test method to be used by the applicant for quality control inspection shall be described in detail.

(e) For those characteristics for which an alternate inspection level has been requested pursuant to paragraph (h) of this section, the alternate level proposed and supporting evidence for its selection shall be given.

(f) Each item manufactured shall be 100 percent inspected for defects in all critical characteristics except where tests are destructive, and all defective items shall be rejected.

(g) The acceptable quality level (AQL) for each special, critical, major or minor defect, so classified by the applicant shall be as follows:

(1) Special—6.5 percent.
(2) Critical—0 percent (where tests are nondestructive). 1.0 percent (where tests are destructive).
(3) Major—2.5 percent.
(4) Minor—4.0 percent.

(h) Inspection level II as described in MIL–STD–414 shall be used for special characteristics and destructive tests for critical characteristics except when the applicant's request for an alternate inspection level has been approved by the Institute. Inspection level II as described in MIL–STD–105, or inspection level IV as described in MIL–STD–414 shall be used for major and minor characteristics except when the applicant's request for an alternate inspection level has been approved by the Institute. The request for an alternate inspection level shall include sufficient evidence that smaller sample sizes are necessary and larger sampling risks can be tolerated.

§ 84.32 Approval of plan.

(a) Each quality control plan submitted in accordance with this subpart shall be reviewed by the Institute to determine its effectiveness in maintaining compliance with the construction and performance requirements set forth in subpart B of this part.

(b) In the event the quality control plan submitted by the applicant will not, in the opinion of the Institute, ensure adequate quality control, the Institute shall, as necessary, require the applicant to modify the procedures and testing requirements of the plan prior to approval of the plan and issuance of any certificate.

(c) Approved quality control plans shall constitute a part of and be incorporated into any certificate issued by the Institute, and compliance with such plans by the applicant shall be a condition of certification.

§ 84.33 Quality control records.

(a) The applicant shall maintain quality control inspection records sufficient to carry out the procedures required in MIL–STD–105D or MIL–STD–414.

(b) The Institute reserves the right, at reasonable times, to have its qualified representatives inspect, without prior notice, the applicant's quality control test methods, systems, equipment, and records, and to interview any employee or agent of the applicant who conducts quality control tests.

Incorporation by reference provision approved by the Director of the Federal Register March 5, 1973.

Approval or certificaton of personal protective devices and industrial hazard measuring instruments, performed today by the National Institute for Occupational Safety and Health, is based on regulations developed for respiratory protective devices by the U.S. Department of the Interior, Bureau of Mines. From 1919 to 1973, the Bureau performed tests and issued approvals on respirators for coal mine use, from its Pittsburgh, PA laboratories. On March 25, 1972, in accordance with the Federal Coal Mine Health and Safety Act of 1969, the Bureau and NIOSH issued joint regulations for respirator approval in the Federal Register (37 FR 6244). These regulations were amended on March 15, 1973, (38 FR 11458) when the Bureau officially transferred testing of these devices to the NIOSH Testing and Certification Laboratory at Morgantown, West Virginia. Regulations for respirator approval are incorporated in Federal Regulations as Title 30 CFR Part 11. Approvals under these regulations are issued jointly by the Bureau and the Institute.

Respirators included in lists appearing in this publication were all issued under the most recent regulations, described as Part 11. Respirator approvals issued by the Bureau under older regulations are scheduled to expire at a future date. After that date, users should purchase only new devices approved under Part 11 and manufactured under strict quality control requirements, although they may continue to use older respirators for reasonable times that will be established by the Bureau and NIOSH to permit orderly replacement with new devices. Announcement of the expiration date for older respirator approvals and the terminal use dates for older respirators now in use, will be made by publication in the Federal Register.

The following respiratory protective devices have been approved by the U.S. Department of the Interior, Bureau of Mines and the U.S. Department of Health, Education, and Welfare, National Institute for Occupational Safety and Health, as of February 28, 1974:

Self-Contained Breathing Apparatus

1. BioMarine part numbers 45-801 and 45-701 (with part numbers 45-200 sorbent canister), forty-five-minute compressed-oxygen self-contained breathing apparatus. Approval TC-13F-27, issued to BioMarine Industries, Inc., September 7, 1973.

2. Lear Siegler part number 202000, five-minute compressed-air self-contained breathing apparatus for escape only. Approval TC-13F-28 issued to Lear Siegler, Inc., October 4, 1973.

3. MSA® part numbers 457153, 457154, 95066 and 96363, one-half-hour compressed-air demand-type self-contained breathing apparatus. Approval TC-13F-29 issued to Mine Safety Appliances Co., November 2, 1973.

4. MSA® part numbers 95069 and 96338, one-half-hour compressed-air pressure-demand-type self-contained breathing apparatus. Approval TC-13F-30, issued to Mine Safety Appliances Co., November 2, 1973.

5. Lockheed part number 5537517-501, one-hour oxygen-generating self-contained breathing apparatus for escape only. Approval TC-13F-31, issued to Lockheed Missiles and Space Co., November 5, 1973. This approval applies to units with serial numbers 0000102 through 0000201, inclusive.

6. Siebe Gorman part number 013831.04 (with part number 029697.01 sorbent canister) three-hour liquid-oxygen breathing apparatus. Approval TC-13F-32, issued to Siebe Gorman Ltd., November 23, 1973.

7. Survivair part numbers 9081-14 and 9881-14 combination five-minute compressed-air demand-type self-contained breathing apparatus for escape only and type C demand-type supplied-air respirator. Approval TC-13F-33, issued to Survivair, Div., U.S. Divers Co., February 11, 1974.

8. Survivair part numbers 9081-12 and 9881-12 combination five-minute compressed-air demand-type self-contained breathing apparatus for escape only and type C demand-type supplied air respirator. Approval TC-13F-34, issued to Survivair Div., U.S. Divers Co., February 11, 1974.

9. Survivair part numbers 9065-03 and 9865-03 fifteen-minute compressed-air demand-type self-contained breathing apparatus for escape only. Approval TC-13F-35, issued to Survivair Div., U.S. Divers Co., February 11, 1974.

10. Survivair part numbers 9069-02, 9069-11, 9869-02, and 9869-11 five-minute compressed-air demand-type self-contained breathing apparatus for escape only. Approval TC-13F-36, issued to Survivair Div., U.S. Divers Co., February 11, 1974.

Supplied-Air Respirators

1. Cesco Safety Products PI-800-series supplied-air respirators (types C or CE continuous-flow). Approval TC-19C-64, issued to Parmalee Industries, Inc., September 26, 1973.

2. United States Safety Service PI-800-series supplied-air respirators (types C or CE continuous-flow). Approval TC-19C-64, issued to Parmalee Industries, Inc., September 26, 1973.

3. Survivair part numbers 9011-12 and 9811-12 supplied-air respirators (type C demand-type). Approval TC-19C-65, issued to Survivair Div., U.S. Divers Co., February 11, 1974.

4. Survivair part numbers 9011-14 and 9811-14 supplied-air respirators (type C demand-type). Approval TC-19C-66, issued to Survivair Div., U.S. Divers Co., February 11, 1974.

5. Survivair part numbers 9011-13 and 9811-13 supplied-air respirators (type C demand-type). Approval TC-19C-67, issued to Survivair Div., U.S. Divers Co., February 11, 1974.

6. Survivair part numbers 9011-15 and 9811-15 supplied-air respirators (type C demand-type). Approval TC-19C-68, issued to Survivair Div., U.S. Divers Co., February 11, 1974.

Dust, Fume, and Mist Respirators

1. 3M model number 8710 single-use respirator for respiratory protection against pneumoconiosis and fibrosis-producing dusts. Approval TC-21C-132, issued to 3M Company, May 24, 1972.

2. MSA® part number 459440 respirator (with part number 459595(10) or 459693(100) filters) for respiratory protection against dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-21C-133, issued to Mine Safety Appliances Co., October 4, 1972.

3. MSA® part number 459438 respirator (with part number 459594 filters) for respiratory protection against dusts, fumes, and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, radon daughters attached to the above dusts, fumes, and mists, and asbestos-containing dusts and mists. Approval TC-21C-134, issued to Mine Safety Appliances, Co., October 27, 1972.

4. MSA® part number 459439 respirator (with part number 459593 filters) for respiratory protection against dusts, fumes, and mists having a time-weighted average less than 0.05 mg/M^3 and radionuclides. Approval TC-21C-135, issued to Mine Safety Appliances, Co., October 27, 1972.

5. 3M part numbers W5002, W5003, W5005, and W5201 powered air purifying respirators (with W2031 filter and W2009 back pack harness or W2008 machine mounting) for respiratory protection against dusts, fumes, and mists having a time-weighted average less than 0.05 mg/M^3 or 2 mppcf.

Approval TC-21C-136, issued to 3M Company, June 20, 1973.

6. 3M part number W5006 powered air-purifying respirator (with W2031 filter and W2009 back pack harness or W2008 machine mounting) for respiratory protection during abrasive blasting. Approval TC-21C-137, issued to 3M Company, June 20, 1973.

7. MSA® part number 96000 or 457344 respirator (with part number 96077 filters) for respiratory protection against dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf. Approval TC-21C-138, issued to Mine Safety Appliances Co., October 25, 1973.

8. Willson 560 respirator (500-series respirator with R60 filter) for respiratory protection against dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2mppcf, and asbestos-containing dusts and mists. Approval TC-21C-139, issued to Willson Products Div., ESB Inc., January 24, 1974.

9. Willson 1210 respirator (1200-series respirator with R10 filters) for respiratory protection against dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-21C-140, issued to Willson Products Div., ESB Inc., January 23, 1974.

10. Willson 1211 respirator (1200-series respirator with R11 filters) for respiratory protection against dusts, fumes, and mists having a time-weighted average not less than 0.05 mg/M^3, dusts and mists having a time-weighted average not less than 2 mppcf, and asbestos-containing dusts and mists. Approval TC-21C-141, issued to Willson Products Div., ESB Inc., January 22, 1974.

Chemical-Cartridge Respirators

1. MSA® part number 459433 respirator (with part number 459315 cartridges) for respiratory protection against not more than 1,000 ppm organic vapors, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-40, issued to Mine Safety Appliances Co., October 13, 1972. (For dusts and mists, add part numbers 459595(10) or 459693(100) filters and 459027 covers to the above.)

2. MSA® part number 459434 respirator (with part number 459316 cartridges) for respiratory protection against not more than 10 ppm chlorine, 50 ppm sulfur dioxide, or 50 ppm hydrogen chloride, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-41, issued to Mine Safety Appliances Co., October 13, 1972. (For dusts and mists, add part numbers 459595(10) or 459693(100) filters and 459027 covers to the above.)

3. MSA® part number 459436 respirator (with part number 459318 cartridges) for respiratory protection against not more than 300 ppm ammonia or 100 ppm methylamine, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-43, issued to Mine Safety Appliances Co., October 31, 1972 (For dusts and mists, add part numbers 459595(10) or 459693(100) filters and 459027 covers to the above.)

4. MSA® part number 459435 respirator (with part numbers 459317 cartridges) for respiratory protection against not more than 1,000 ppm organic vapors, 10 ppm chlorine, 50 ppm hydrogen chloride, or 50 ppm sulfur dioxide, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-47, issued to Mine Safety Appliances Co., October 31, 1972. (For dusts and mists, add part numbers 459545(10) or 459693(100) filters and 459027 covers to the above.)

5. MSA® part number 459453 respirator (with part number 459452 cartridges) for respiratory protection against not more than 10 ppm chlorine, 50 ppm hydrogen chloride, or 50 ppm sulfur dioxide, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-42, issued to Mine Safety Appliances Co., January 2, 1973. (For dusts and mists, add part number 73654 filters and part number 11147 retainers to the above.)

6. MSA® part number 85558 respirator (with part number 42876 cartridges) for respiratory protection against not more than 300 ppm ammonia or 100 ppm methylamine, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-44, issued to Mine Safety Appliances Co., January 2, 1973. (For dusts and mists, add part number 73654 filters and part number 11147 retainers to the above.)

7. MSA® part number 85557 respirator (with part number 10340 cartridges) for respiratory protection against not more than 1,000 ppm organic vapors, 10 ppm chlorine, 50 ppm hydrogen chloride, or 50 ppm sulfur dioxide, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-46, issued to Mine Safety Appliances Co., January 2, 1973. (For dusts and mists, add part number 73654 filters and part number 11147 retainers to the above.)

8. MSA® part number 459520 respirator (with part number 459519 cartridges) for respiratory protection against pesticides. Approval TC-23C-45, issued to Mine Safety Appliances Co., March 6, 1973.

9. MSA® part number 85556 respirator (with part number 44135 cartridges) for respiratory protection against not more than 1,000 ppm organic vapors, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-48, issued to Mine Safety Appliances Co., June 14, 1973. (For dusts and mists, add part number 73654 filters and part number 11147 retainers to the above.)

10. Welsh Manufacturing Co. part number 7501 respirator (with part number 7500-1 cartridges) for respiratory protection against not more than 1,000 ppm organic vapors. Approval TC-23C-49, issued to Welsh Manufacturing Co., October 10, 1973.

11. Willson 1221 respirator (1200-series respirator with R21 chemical cartridges) for respiratory protection against not more than 1,000 ppm organic vapors. Approval TC-23C-50, issued to Willson Products Div., ESB Inc., January 31, 1974.

12. Willson 122110 respirator (1200-series respirator, with R21 chemical cartridges, R10 filters, and R682 filter retainers) for respiratory protection agains not more than 1,000 ppm organic vapors, dusts and mists having a time-weighted average not less than 0.05 mg/M^3 or 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-51, issued to Willson Products Div., ESB Inc., January 31, 1974.

13. Willson 122113 respirator (1200-series respirator with R21 chemical cartridges and R13 filters) for respiratory protection against not more than 1,000 ppm organic vapors, dusts, fumes, and mists having a time-weighted average not less than 0.05 mg/M^3, dusts and mists having a time-weighted average not less than 2 mppcf, and asbestos-containing dusts and mists. Approval TC-23C-52, issued to Willson Products Div., ESB Inc., February 1, 1974.

14. Willson 122114 respirator (1200-series respirator with R21 chemical cartridges, R14 filters, and R683 filter retainers) for respiratory protection against (1) mists of paints, lacquers, and enamels, (2) not more than 1,000 ppm organic vapors, or (3) any combination thereof. Approval TC-23C-53, issued to Willson Products Div., ESB Inc., Feburary 1, 1974.

15. Willson AGRI-TOX-2 respirator (1200-series respirator with R21 chemical cartridges, R15 filters, and R683 filter retainers) for respiratory protection against pesticides. Approval TC-23C-54, issued to Willson Products Div., ESB Inc., January 30, 1974.

Names and Addresses of Manufacturers of Approved Respiratory Protective Devices

BioMarine Industries, Inc., 303 W. Lancaster Ave., Devon, PA 19333.

Lear Siegler, Inc., 714 North Brookhurst St., Anaheim, CA 92803.

Lockheed Missiles & Space Co., 1111 Lockheed Way, Sunnyvale, CA 94088.

Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh, PA 15208.

Parmalee Industries, Inc. P.O. Box 1237, Kansas City, MO 64141.

Siebe Gorman, Ltd., Chessington Surrey, England.

Survivair, Division of U.S. Divers Co., 3323 W. Warner Ave.,
Santa Ana, CA 92702

3M Company, 3M Center, St. Paul, MN 55101.

Welsh Manufacturing Co., 9 Magnolia Street, Providence, RI 02909

Willson Products Div., ESB Inc., P.O. Box 622, Reading, PA 19603.

Chapter I—Bureau of Mines

SUBCHAPTER B—RESPIRATORY PROTECTIVE APPARATUS; TESTS FOR PERMISSIBILITY; FEES

PART 11—RESPIRATORY PROTECTIVE DEVICES; TESTS FOR PERMISSIBILITY; FEES

Subpart A—General Provisions

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Subpart F—Classification of Approved Respirators; Scope of Approval; Atmospheric Hazards; Service Time

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Sec.

Subpart H—Self-Contained Breathing Apparatus

AUTHORITY: Secs. 202(h), 204, and 508, 83 Stat. 763, 764 and 803; 30 U.S.C. 842(h), 844 and 957; secs. 2, 3, and 5, 36 Stat. 370, as amended 37 Stat. 681; 30 U.S.C. 3, 5, and 7; sec. 8(g), 84 Stat. 1600; 29 U.S.C. 657(g).

SOURCE: 37 FR 6244, Mar. 25, 1972, unless otherwise noted.

Subpart A—General Provisions

§ 11.1 Purpose.

The purpose of the regulations contained in this Part 11 is: (a) To establish procedures and prescribe requirements which must be met in filing applications for joint approval by the Bureau of Mines and the National Institute for Occupational Safety and Health of respirators or changes or modifications of approved respirators; (b) to establish a schedule of fees to be charged each applicant for the inspections, examinations, and testing conducted by the Institute under the provisions of this part; (c) to provide for the issuance of certificates of approval or modifications of certificates of approval for respirators which have met the applicable construction, performance, and respiratory protection requirements set forth in this part; and (d) to specify minimum requirements and to prescribe methods to be employed by the Institute and by the applicant in conducting inspections, examinations, and tests to determine the effectiveness of respirators used during entry into or escape from hazardous atmospheres.

[37 FR 6246, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.2 Approved respirators.

(a) Until March 30, 1974, respirators or combinations of respirators shall be considered to be approved for use during entry into hazardous atmospheres, escape from hazardous mine atmospheres, or both, where such respirators or combinations of respirators are: (1) The same in all respects as those respirators which have been approved after meeting the minimum requirements for performance and respiratory protection set forth in this Part 11; or (2) fabricated, assembled, or built under any approval, or any modification thereof, issued by the U.S. Bureau of Mines, Department of the Interior, in accordance with the schedules set forth below; and

(3) maintained in an approved condition:

(i) Self-contained Breathing Apparatus, Bureau of Mines Schedules 13, March 5, 1919; 13A, January 21, 1930; 13B, August 12, 1935; 13C, July 9, 1946; 13D, September 22, 1956; and 13E, July 19, 1968.

(ii) Gas Masks, Bureau of Mines Schedule 14F, April 23, 1955.

(iii) Supplied-air Respirators, Bureau of Mines Schedule 19B, April 19, 1955.

(iv) Filter-type Dust, Fume, and Mist Respirators, Bureau of Mines Schedule 21B, January 19, 1965.

(v) Nonemergency Gas Respirators, Bureau of Mines Schedule 23B, August 4, 1959.

(b) After March 30, 1974, respirators or combinations of respirators shall be considered to be approved for use during entry into hazardous atmospheres, escape from hazardous mine atmospheres, or both, only where such respirators or combinations of such respirators are: (1) The same in all respects as those respirators which have been approved after meeting the minimum requirements for performance and respiratory protection prescribed in this Part 11; and (2) maintained in an approved condition.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.2-1 Selection, fit, use, and maintenance of approved respirators.

In order to insure the maximum amount of respiratory protection, approved respirators shall be selected, fitted, used, and maintained in accordance with the provisions of the American National Standard Practices for Respiratory Protection, Z88.2, obtainable from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

§ 11.3 Definitions.

As used in this part—

(a) "Air Contamination Level" means the standards of contaminant levels prescribed by the Secretary of Labor in accordance with the provisions of the Occupational Safety and Health Act of 1970 (Public Law 91-596; 84 Stat. 1590).

(b) "Applicant" means an individual, partnership, company, corporation, association, or other organization that designs, manufactures, assembles, or controls the assembly of a respirator and who seeks to obtain a certificate of approval for such respirator.

(c) "Approval" means a certificate or formal document issued by the Bureau and the Institute stating that an individual respirator or combination of respirators has met the minimum requirements of this Part 11, and that the applicant is authorized to use and attach an approval label to any respirator, respirator container, or instruction card for any respirator manufactured or assembled in conformance with the plans and specifications upon which the approval was based, as evidence of such approval.

(d) "Approved" means conforming to the minimum requirements of this Part 11.

(e) "Auxiliary equipment" means a self-contained breathing apparatus, the use of which is limited in underground mine rescue and recovery operations to situations where the wearer has ready access to fresh air and at least one crew equipped with approved self-contained breathing apparatus of 2 hours or longer rating, is in reserve at a fresh-air base.

(f) "Bureau" means the U.S. Bureau of Mines, Department of the Interior.

(g) "Compressed breathing gas" means oxygen or air stored in a compressed state and supplied to the wearer in gaseous form.

(h) "Concentration limits for radionuclides" means the concentration limits set forth in Appendix B, Table 1, Column I of Title 10 CFR Part 20 by the Atomic Energy Commission.

(i) "dBA" means sound pressure levels in decibels, as measured with the A-weighted network of a standard sound level meter using slow response.

(j) "DOP" means a homogenous liquid aerosol, having a particle diameter of 0.3 micrometer, which is generated by vaporization and condensation of dioctyl phthalate.

(k) "Dust" means a solid mechanically produced particle with a size ranging from submicroscopic to macroscopic.

(l) Respirators "for entry into and escape from" means respiratory devices providing protection during entry into and escape from hazardous atmospheres.

(m) Respirators "for escape only" means respiratory devices providing protection only during escape from hazardous atmospheres.

(n) A "facepiece" or "mouthpiece" is a respirator component designed to provide a gas-tight or dust-tight fit with the face and may include headbands, valves, and connections for canisters, cartridges, filters, or respirable gas source.

(o) "Final inspection" means that activity carried out on a product after all manufacturing and assembly operations are completed to insure completeness and adherence to performance or other specifications, including satisfactory appearance.

(p) "Fume" means a solid condensation particle, generally less than 1 micrometer in diameter.

(q) "Gas" means an aeriform fluid which is in a gaseous state at ordinary temperature and pressure.

(r) "Hazardous atmosphere" means: (1) Any atmosphere containing a toxic or disease producing gas, vapor, dust, fume, mist, or pesticide, either immediately or not immediately dangerous to life or health; or (2) any oxygen-deficient atmosphere.

(s) A "hood" or "helmet" is a respirator component which covers the wearer's head and neck, or head, neck, and shoulders, and is supplied with incoming respirable air for the wearer to breathe. It may include a headharness and connection for a breathing tube.

(t) "Immediately dangerous to life or health" means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health.

(u) "Incoming inspection" means the activity of receiving, examining, and accepting only those materials and parts whose quality conforms to specification requirements.

(v) "In-process inspection" means the control of products at the source of production and at each step of the manufacturing process, so that departures from specifications can be corrected before defective components or materials are assembled into the finished product.

(w) "Institute" means the National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare.

(x) "Liquefied breathing gas" means oxygen or air stored in liquid form and supplied to the wearer in a gaseous form.

(y) "Mist" means a liquid condensation particle with a size ranging from submicroscopic to macroscopic.

(z) "Not immediately dangerous to life or health" means any hazardous atmosphere which may produce physical discomfort immediately, chronic poisoning after repeated exposure, or acute adverse physiological symptoms after prolonged exposure.

(aa) "Oxygen deficient atmosphere" means an atmosphere which contains an oxygen partial pressure of less than 148 millimeters of mercury (19.5 percent by volume at sea level).

(bb) "Pesticide" means (1) any substance or mixture of substances (including solvents and impurities) intended to prevent, destroy, repel, or mitigate any insect, rodent, nematode, fungus, weed, or other form of plant or animal life or virus, and (2) any substance or mixture of substances (including solvents and impurities) intended for use as a plant regulator, defoliant, or desiccant, as defined in the Federal Insecticide, Fungicide, and Rodenticide Act of 1947, as amended (7 U.S.C. 135–135k), excluding fumigants which are applied as gases or vapors or in a solid or liquid form as pellets or poured liquids for subsequent release as gases or vapors.

(cc) "Powered air-purifying respirator" means a device equipped with a facepiece, hood, or helmet, breathing tube, canister, cartridge, filter, canister with filter, or cartridge with filter, and a blower.

(dd) "Radionuclide" means an atom identified by the constitution of its nucleus (specified by the number of protons Z, number of neutrons N, and energy, or, alternatively, by the atomic number Z, mass number $A=(N+Z)$, and atomic mass) which exists for a measurable time; decays or disintegrates spontaneously, emits radiation, and results in the formation of new nuclides.

(ee) "Respirable dust" means a dust particle aerodynamically capable of reaching the terminal airways of the lung.

(ff) "Respirator" means any device designed to provide the wearer with respiratory protection against inhalation of a hazardous atmosphere.

(gg) "Smoke" means the products of incomplete combustion of organic substances in the form of solid and liquid particles and gaseous products in air, usually of sufficient concentration to perceptibility obscure vision.

(hh) "Testing and Certification Laboratory" means the Testing and Certification Laboratory, National Institute for Occupational Safety and Health, 944 Chestnut Ridge Road, Morgantown, W V 26505.

(ii) "Vapor" means the gaseous state of a substance that is solid or liquid at ordinary temperature and pressure.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.4 Incorporation by reference.

In accordance with 5 U.S.C. 552(a)(1), the technical publications to which reference is made in this Part 11, and which have been prepared by organizations other than the Bureau or the Institute, are hereby incorporated by reference and made a part hereof. The incorporated technical publications are available for examination at Approval and

Testing, Health and Safety Technical Support Center, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, PA 15213, and at the Testing and Certification Laboratory. In addition, copies of the American National Standards Institute Standard Z88.2–1969, "Practices for Respiratory Protection," are available for examination in every Coal Mine Health and Safety District and Subdistrict Office.

[38 FR 6993, Mar. 15, 1973]

Subpart B—Application for Approval

§ 11.10 Application procedures.

(a) Inspection, examination, and testing leading to the approval of the types of respirators classified in Subpart F of this part shall be undertaken by the Institute only pursuant to written applications which meet the minimum requirements set forth in this Subpart B.

(b) Applications shall be submitted to the Testing and Certification Laboratory, and shall be accompanied by a check, bank draft, or money order in the amount specified in Subpart C of this part payable to the order of the National Institute for Occupational Safety and Health.

(c) Except as provided in § 11.64 and in paragraph (e) of this section, the examination, inspection, and testing of all respirators shall be conducted by the Testing and Certification Laboratory.

(d) Applicants, manufacturers, or their representatives may visit or communicate with the Testing and Certification Laboratory in order to discuss the requirements for approval of any respirator or the proposed designs thereof. No charge shall be made for such consultation and no written report shall be issued to applicants, manufacturers, or their representatives by the Institute as a result of such consultation.

(e) Inspection, examination, and testing of electrical components of respirators that are required to be permissible shall be tested in accordance with Part 18 of this chapter, and such components shall be submitted to Approval and Testing, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, PA 15213.

[38 FR 6993, Mar. 15, 1973]

§ 11.11 Contents of application.

(a) Each application for approval shall contain a complete written description of the respirator for which approval is requested together with drawings and specifications (and lists thereof) showing full details of construction of the respirator and of the materials used. Drawings and specifications (and lists thereof) shall be submitted in triplicate.

(b) Drawings shall be titled, numbered, and dated; any revision dates shall be shown on the drawings, and the purpose of each revision being sought shall be shown on the drawing or described on an attachment to the drawing to which it applies.

(c) Each application for approval shall contain a proposed plan for quality control which meets the minimum requirements set forth in Subpart E of this part.

(d) Each application shall contain a statement that the respirator has been pretested by the applicant as prescribed in § 11.64, and shall include the results of such tests.

(e) Each application for approval shall contain a statement that the respirator and component parts submitted for approval are either (1) prototypes, or (2) made on regular production tooling, with no operation included which will not be incorporated in regular production processing.

§ 11.12 Delivery of respirators and components by applicant; requirements.

(a) Each applicant shall, when an application is filed pursuant to § 11.10, be advised by the Institute of the total number of respirators and component parts required for testing.

(b) The applicant shall deliver, at his own expense, the number of completely assembled respirators and component parts required for testing, to Testing and Certification Laboratory.

(c) Respirators and component parts submitted for approval must be made from materials specified in the application.

(d) One completely assembled respirator approved under the provisions of this part may be retained by the Institute as a laboratory exhibit, the remaining respirators may be returned to the applicant at his own expense, upon written request within 30 days after notice of approval. If no such request is made, the respirators will be disposed of by the Institute in such manner as it deems appropriate.

(e) Where a respirator fails to meet the requirements for approval set forth in this part, all respirators and components delivered in accordance with this section may be returned to the applicant at his own expense, upon written request within 30 days after notice of disapproval. If no such request is made, the respirators will be disposed of by the Institute in such manner as it deems appropriate.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

Subpart C—Fees

§ 11.20 Examination, inspection and testing of complete respirator assemblies; fees.

Except as provided in § 11.22, the following fees shall be charged by the Institute for the examination, inspection and testing of complete respirator assemblies:

(a) Self-contained breathing apparatus—	
(1) Entry and escape, 1 hour or more	$3,500
(2) Entry and escape, less than 1 hour	2,750
(3) Escape only	2,000
(b) Gas masks, including pesticide gas masks—	
(1) Single hazard	1,100
(2) Type N	4,100
(c) Supplied-air respirators	750
(d) Dust, fume and mist respirators—	
(1) Single particulate hazard having an Air Contamination Level more than 0.05 mg./m.³ or 2 million particles per cubic foot	500
(2) Combination particulate hazards having an Air Contamination Level more than 0.05 mg./m.³ or 2 million particles per cubic foot	750
(3) Particulate hazards having an Air Contamination Level less than 0.05 mg./m.³ or 2 million particles per cubic foot, radon daughters	1,250
(4) All dusts, fumes and mists	2,000
(e) Chemical cartridge respirators	1,150
(f) Paint spray respirators	1,600
(g) Pesticide respirators	1,600

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.21 Examination, inspection and testing of respirator components or subassemblies; fees.

Except as provided in § 11.22, the following fees shall be charged by the Institute for the examination, inspection and testing of the individual respirator components or subassemblies:

(a) Facepieces	$450
(b) Canisters	900
(c) Cartridges	600
(d) Filters	650
(e) Hoses	250
(f) Blowers	250
(g) Harnesses	100

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.22 Unlisted fees; additional fees; payment by applicant prior to approval.

(a) Applications for the examination, inspection and testing of complete respirator assemblies which are not listed in § 11.20, or for the examination, inspection, and testing of respirator components or subassemblies which are not listed in § 11.21, shall be accompanied by the following deposits:

(1) Complete respirator assembly	$1,500
(2) Each individual component or subassembly	500

The Bureau and the Institute reserve the right to conduct any examination, inspection or test they deem necessary to determine the quality and effectiveness of any listed or unlisted respirator assembly or respirator component or subassembly, and to assess the cost of such examinations, inspections, or tests against the applicant prior to the issuance of any approval for such assembly, component, or subassembly.

(c) The fees charged for the examination, inspection, and testing of unlisted respirator assemblies, unlisted individual respirator components or subassemblies, and for the additional examination, inspection, and testing of listed respirator assemblies and components or subassemblies shall be at the rate of $100 per day for each man-day required to be expended by the Institute.

(d) Upon completion of all examinations, inspections, and tests of unlisted respirator assemblies or components, or following the completion of any additional examination, inspections, or tests of listed assemblies, or components or subassemblies, including retesting subsequent to disapproval, the Institute shall advise the applicant in writing of the total cost assessed and the additional amount, if any, which must be paid to the Institute as a condition of approval.

(e) In the event the amount assessed by the Institute for unlisted assemblies, or components or subassemblies is less than the amount of the deposit submitted in accordance with paragraph (a) of this section, the Institute shall refund the overpayment upon the issuance of any approval or notice of disapproval.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

Subpart D—Approval and Disapproval

§ 11.30 Certificates of approval; scope of approval.

(a) The Bureau and the Institute shall issue certificates of approval pursuant to the provisions of this subpart only for individual, completely assembled respirators which have been examined, inspected, and tested, and which meet the minimum requirements

set forth in Subparts H through M of this part, as applicable.

(b) The Bureau and the Institute will not issue certificates of approval for any respirator component or for any respirator subassembly.

(c) The Bureau and the Institute shall not issue an informal notification of approval. However, if the application for approval, submitted in accordance with § 11.11, states that the submitted respirator and component parts are only prototypes, the Institute will examine, inspect, and test such respirator and component parts in accordance with the provisions of this Part 11. If, upon completion of such examinations, inspections and tests, it is found that the prototype meets the minimum requirements set forth in this part, the Bureau and the Institute may inform the applicant, in writing, of the results of the examinations, inspections, and tests, and may require him to resubmit respirators and component parts made on regular production tooling, with no operations included which will not be incorporated in regular production processing, for further examination, inspection, and testing, prior to issuance of the certificate of approval.

(d) Applicants required to resubmit respirators and component parts made on regular production tooling, with no operation included which will not be incorporated in regular production processing, shall be charged fees in accordance with Subpart C of this part.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6994, Mar. 15, 1973]

§ 11.31 Certificates of approval; contents.

(a) The certificate of approval shall contain a classification and a description of the respirator or combination of respirators for which it is issued, as provided in this part.

(b) The certificate of approval shall specifically set forth any restrictions or limitations on the respirator's use in hazardous atmospheres.

(c) Each certificate of approval shall be accompanied by the drawings and specifications (and lists thereof) submitted by the applicant in accordance with § 11.11. These drawings and specifications shall be incorporated by reference in the certificate of approval, and shall be maintained by the applicant. The drawings and specifications listed in each certificate of approval shall set forth in detail the design and construction requirements which shall be met by the applicant during commercial production of the respirator.

(d) Each certificate of approval shall be accompanied by a reproduction of the approval label design to be employed by the applicant with each approved respirator, as provided in § 11.33.

(e) No test data or specific laboratory findings will accompany any certificate of approval, however, the Bureau or the Institute will release pertinent test data and specific findings upon written request by the applicant, or as required by statute or regulation.

(f) Each certificate of approval shall also contain the approved quality control plan as specified in § 11.42.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6994, Mar. 15, 1973]

§ 11.32 Notice of disapproval.

(a) If, upon the completion of the examinations, inspections, and tests required to be conducted in accordance with the provisions of this part, it is found that the respirator does not meet the minimum requirements set forth in this part, the Bureau and the Institute shall issue a written notice of disapproval to the applicant.

(b) Each notice of disapproval shall be accompanied by all pertinent data or findings with respect to the defects of the respirator for which approval was sought with a view to the possible correction of any such defects.

(c) The Bureau and the Institute shall not disclose, except to the applicant or as required by statute or regulation, any data, findings, or other information with respect to any respirator for which a notice of disappoval is issued.

§ 11.33 Approval labels and markings; approval of contents; use.

(a) Full-scale reproductions of approval labels and markings, and a sketch or description of the method of application and position on the harness, container, canister, cartridge, filter, or other component, together with instructions for the use and maintenance of the respirator shall be submitted to the Bureau and the Institute for approval.

(b) Approval labels shall bear the seals of the U.S. Bureau of Mines and the Department of Health, Education, and Welfare, the applicant's name and address, an approval number assigned by the Institute, and, where appropriate, restrictions or limitations placed upon the use of the respirator by the Bureau and the Institute. The approval number assigned by the Institute shall be designated by the prefix TC and a serial number.

(c) The Bureau and the Institute shall, where necessary, notify the applicant

when additional labels, markings, or instructions will be required.

(d) Approval labels and markings shall only be used by the applicant to whom they were issued.

(e) Legible reproductions or abbreviated forms of the label approved by the Bureau and the Institute for use on each respirator shall be attached to or printed at the following locations:

Respirator type	Label type	Location
Self-contained breathing apparatus.	Entire	Harness assembly and canister (where applicable).
Gas mask	Entire	Mask container and canister.
Supplied-air respirator.	Entire	Respirator container or instruction card.
Dust, fume, and mist respirator.	Entire	Respirator container and filter container.
	Abbreviated.	Filters.
Chemical-cartridge respirator, including paint spray respirator.	Entire	Respirator container, cartridge container, and filter containers (where applicable).
	Abbreviated.	Cartridges and filters and filter containers.
Pesticide respirator.	Entire	Respirator container, and cartridge and filter containers.
	Abbreviated.	Cartridges and filters.

(f) The use of any Bureau and Institute approval label obligates the applicant to whom it is issued to maintain or cause to be maintained the approved quality control sampling schedule and the acceptable quality level for each characteristic tested, and to assure that it is manufactured according to the drawings and specifications upon which the certificate of approval is based.

(g) Each respirator, respirator component, and respirator container shall, as required by the Bureau and the Institute to assure quality control and proper use of the respirator, be labeled distinctly to show the name of the applicant, and the name and letters or numbers by which the respirator or respirator component is designated for trade purposes, and the lot number, serial number, or approximate date of manufacture.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6994, Mar. 15, 1973]

§ 11.34 Revocation of certificates of approval.

The Bureau and the Institute reserve the right to jointly revoke, for cause, any certificate of approval issued pursuant to the provisions of this part. Such causes include, but are not limited to, misuse of approval labels and markings, misleading advertising, and failure to maintain or cause to be maintained the quality control requirements of the certificate of approval.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6994, Mar. 15, 1973]

§ 11.35 Changes or modification of approved respirators; issuance of modification of certificate of approval.

(a) Each applicant may, if he desires to change any feature of an approved respirator, request a modification of the original certificate of approval issued by the Bureau and the Institute for such respirator by filing an application for such modification in accordance with the provisions of this section.

(b) Applications shall be submitted as for an original certificate of approval, with a request for a modification of the existing certificate to cover any proposed change.

(c) The application shall be accompanied by appropriate drawings and specifications, and by a proposed quality control plan which meets the requirements of Subpart E of this part.

(d) The application for modification, together with the accompanying material, shall be examined by the Institute to determine whether testing will be required.

(e) The Institute shall inform the applicant of the fee required for any additional testing and the applicant will be charged for the actual cost of any examination, inspection, or test required, and such fees shall be submitted in accordance with the provisions of Subpart C of this part.

(f) If the proposed change or modification meets the requirements of this part, a formal certificate of modification will be issued, accompanied, where necessary, by a list of new and revised drawings and specifications covering the change(s) and reproductions of revised approval labels.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.36 Delivery of changed or modified approved respirator.

An approved respirator for which a formal certificate of modification has been issued shall be delivered, with proper markings and containers, by the applicant to the Testing and Certification Laboratory, as soon as it is commercially produced.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

Subpart E—Quality Control

§ 11.40 Quality control plans, filing requirements.

As a part of each application for approval or modification of approval submitted pursuant to this part, each applicant shall file with the Bureau and the Institute a proposed quality control plan which shall be designed to assure the quality of respiratory protection provided by the respirator for which approval is sought.

§ 11.41 Quality control plans; contents.

(a) Each quality control plan shall contain provisions for the management of quality, including: (1) Requirements for the production of quality data and the use of quality control records; (2) control of engineering drawings, documentations, and changes; (3) control and calibration of measuring and test equipment; (4) control of purchased material to include incoming inspection; (5) lot identification, control of processes, manufacturing, fabrication, and assembly work conducted in the applicant's plant; (6) audit of final inspection of the completed product; and, (7) the organizational structure necessary to carry out these provisions.

(b) Each provision for incoming and final inspection in the quality control plan shall include a procedure for the selection of a sample of respirators and the components thereof for testing, in accordance with procedures set forth in Military Standard MIL–STD–105D, "Sampling Procedures and Tables for Inspection by Attributes," or Military Standard MIL–STD–414, "Sampling Procedures and Tables for Inspection by Variables for Percent Defective," or an approved equivalent sampling procedure, or an approved combination of sampling procedures. Incoming bulk raw material inspection or verification of specification, and in-process inspection shall be sufficient to ensure control of product quality through the manufacturing cycle.

(c) The sampling procedure shall include a list of the characteristics to be tested by the applicant or his agent.

(d) The characteristics listed in accordance with paragraph (c) of this section shall be classified according to the potential effect of such defect and grouped into the following classes:

(1) *Critical.* A defect that judgment and experience indicate is likely to result in a condition immediately hazardous to life or health for individuals using or depending upon the respirator;

(2) *Major A.* A defect, other than critical, that is likely to result in failure to the degree that the respirator does not provide any respiratory protection, or a defect that reduces protection and is not detectable by the user;

(3) *Major B.* A defect, other than Major A or critical, that is likely to result in reduced respiratory protection, and is detectable by the user; and

(4) *Minor.* A defect that is not likely to materially reduce the usability of the respirator for its intended purpose, or a defect that is a departure from established standards and has little bearing on the effective use or operation of the respirator.

(e) The quality control inspection test method to be used by the applicant or his agent for each characteristic required to be tested shall be described in detail.

(f) Each item manufactured shall be 100 percent inspected for defects in all critical characteristics and all defective items shall be rejected.

(g) The Acceptable Quality Level (AQL) for each major or minor defect so classified by the applicant shall be:

(1) *Major A.* 1.0 percent;

(2) *Major B.* 2.5 percent; and

(3) *Minor.* 4.0 percent.

(h) Except as provided in paragraph (i) of this section, inspection level II as described in MIL–STD–105D, or inspection level IV as described in MIL–STD–414, shall be used for major and minor characteristics and 100 percent inspection for critical characteristics.

(i) Subject to the approval of the Bureau and the Institute, where the quality control plan provisions for raw material, processes, manufacturing, and fabrication inspection are adequate to insure control of finished article quality, destructive testing of finished articles may be conducted at a lower level of inspection than that specified in paragraph (h) of this section.

§ 11.42 Proposed quality control plans; approval by the Bureau and the Institute.

(a) Each proposed quality control plan submitted in accordance with this subpart shall be reviewed by the Bureau and the Institute to determine its effectiveness in insuring the quality of respiratory protection provided by the respirator for which an approval is sought.

(b) If the Bureau and the Institute determine that the proposed quality control plan submitted by the applicant will not insure adequate quality control, the Bureau and the Institute shall require the applicant to modify the procedures and testing requirements of the plan prior to approval of the plan and issuance of any

certificate of approval.

(c) Approved quality control plans shall constitute a part of and be incorporated into any certificate of approval issued by the Bureau and the Institute, and compliance with such plans by the applicant shall be a condition of approval.

§ 11.43 Quality control records; review by the Bureau and the Institute; revocation of approval.

(a) The applicant shall keep quality control inspection records sufficient to carry out the procedures required in MIL–STD–105D or MIL–STD–414, or an approved equivalent sampling procedure.

(b) The Bureau and the Institute reserve the right to have their representatives inspect the applicant's quality control test methods, equipment, and records, and to interview any employee or agent of the applicant in regard to quality control test methods, equipment, and records.

(c) The Bureau and the Institute reserve the right to jointly revoke, for cause, any certificate of approval where it is found that the applicant's quality control test methods, equipment, or records do not insure effective quality control over the respirator for which the approval was issued.

Subpart F—Classification of Approved Respirators; Scope of Approval; Atmospheric Hazards; Service Time

§ 11.50 Types of respirators to be approved; scope of approval.

Approvals shall be issued for the types of respirators which have been classified pursuant to this Subpart F, have been inspected, examined and tested by the Institute, in accordance with the provisions of Subparts G through M of this part, and have been found to provide respiratory protection for fixed periods of time against the hazards specified in such approval.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.51 Entry and escape, or escape only; classification.

Respirators described in Subparts H through M of this part shall be classified for use as follows:

(a) *Entry and escape.* Respirators designed and approved for use during entry into a hazardous atmosphere, and for escape from a hazardous atmosphere; or,

(b) *Escape only.* Respirators designed and approved for use only during escape from a hazardous atmosphere.

§ 11.52 Respiratory hazards; classification.

Respirators described in Subparts H through M of this part shall be classified as approved for use against any or all of the following respiratory hazards:

(a) Oxygen deficiency;

(b) Gases and vapors;

(c) Particles, including dusts, fumes and mists; and

(d) Pesticides.

§ 11.53 Service time; classification.

(a) Respirators described in Subparts H through M of this part shall be classified, where applicable, as approved for use during the following prescribed service times:

(1) Four hours;
(2) Three hours;
(3) Two hours;
(4) One hour;
(5) Forty-five minutes;
(6) Thirty minutes;
(7) Fifteen minutes;
(8) Ten minutes;
(9) Five minutes;
(10) Three minutes.

(b) Other service times may be prescribed by the Institute.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

Subpart G—General Construction and Performance Requirements

§ 11.60 Construction and performance requirements; general.

(a) The Bureau and the Institute shall issue approvals for the types of respirators described in Subparts H through M of this part which have met the minimum requirements set forth for such respirators in this Part 11.

(b) In addition to the types of respirators specified in Subparts H through M, the Bureau and the Institute shall issue approvals for other respiratory protective devices not specifically described in this Part 11 subject to such additional requirements as may be imposed in accordance with § 11.63(c).

§ 11.61 General construction requirements.

(a) Respirators will not be accepted by the Institute for examination, inspection and testing unless they are designed on sound engineering and scientific principles, constructed of suitable materials and evidence good workmanship.

(b) Respirator components which come into contact with the wearer's skin shall be made of nonirritating materials.

(c) Components replaced during or after use shall be constructed of mate-

rials which will not be damaged by normal handling.

(d) Mouthpieces, hoods, helmets, and facepieces, except those employed in single-use respirators, shall be constructed of materials which will withstand repeated disinfection as recommended by the applicant in his instructions for use of the device.

(e) The components of each respirator approved by the Bureau and the Institute for use where permissibility is required shall meet the requirements for permissibility and intrinsic safety set forth in Part 18, Subchapter D of this chapter (Bureau of Mines Schedule 2G).

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.62 Component parts; minimum requirements.

(a) The component parts of each respirator shall be:

(1) Designed, constructed, and fitted to insure against creation of any hazard to the wearer;

(2) Assembled to permit easy access for inspection and repair of functional parts; and

(3) Assembled to permit easy access to parts which require periodic cleaning and disinfecting.

(b) Replacement parts shall be designed and constructed to permit easy installation and to maintain the effectiveness of the respirator.

§ 11.63 Test requirements; general.

(a) Each respirator and respirator component shall when tested by the applicant and by the Institute, meet the applicable requirements set forth in Subparts H through M of this part.

(b) Where a combination respirator is assembled from two or more types of respirators, as described in this part, each of the individual respirator types which have been combined shall, as applicable, meet the minimum requirements for such respirators set forth in Subparts H through M of this part, and such combination respirators, except as specified in § 11.70(b)(2), will be classified by the type of respirator in the combination which provides the least protection to the user.

(c) In addition to the minimum requirements set forth in Subparts H through M of this part, the Bureau and the Institute reserve the right to require, as a further condition of approval, any additional requirements deemed necessary to establish the quality, effectiveness, and safety of any respirator used as protection against hazardous atmospheres.

(d) Where it is determined after receipt of an application that additional requirements will be required for approval, the Institute will notify the applicant in writing of these additional requirements, and necessary examinations, inspections, or tests, stating generally the reasons for such requirements, examinations, inspections, or tests.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.64 Pretesting by applicant; approval of test methods.

(a) Prior to making or filing any application for approval or modification of approval, the applicant shall conduct, or cause to be conducted, examinations, inspections, and tests of respirator performance which are equal to or exceed the severity of those prescribed in this part.

(b) With the application, the applicant shall provide a statement to the Institute showing the types and results of the examinations, inspections, and tests required under paragraph (a) of this section and state that the respirator meets the minimum requirements of Subparts H through M of this part, as applicable. Complete examination, inspection, and test data shall be retained on file by the applicant and be submitted, upon request, to the Institute.

(c) The Institute may, upon written request by the applicant, provide drawings and descriptions of its test equipment and otherwise assist the applicant in establishing a test laboratory or securing the services of a testing agency.

(d) No approval will be issued until the Institute has validated the applicant's test results.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.65 Conduct of examinations, inspections, and tests by the Bureau and the Institute; assistance by applicant; observers; recorded data; public demonstrations.

(a) All examinations, inspections, and tests conducted pursuant to Subparts H through M of this part will be under the sole direction and control of the Bureau and the Institute.

(b) The Bureau and the Institute may, as a condition of approval, require the assistance of the applicant or agents of the applicant during the assembly, disassembly, or preparation of any respirator or respirator component prior to testing or in the operation of such equipment during testing.

(c) Only Bureau and Institute person-

nel, persons assisting the Bureau pursuant to paragraph (b) of this section, and such other persons as are requested by the Bureau, the Institute, or the applicant to be observers, shall be present during any examination, inspection, or test conducted prior to the issuance of an approval by the Bureau and the Institute for the equipment under consideration.

(d) The Bureau and the Institute shall hold as confidential any analyses, drawings, specifications, or materials submitted by the applicant and shall not disclose any principles or patentable features of such equipment, except as required by statute or regulation.

(e) As a condition of each approval issued for any respirator, the Bureau and the Institute reserve the right, following the issuance of such approval, to conduct such public tests and demonstrations of the approved respiratory equipment as is deemed appropriate.

§ 11.66 Withdrawal of applications; refund of fees.

(a) Any applicant may, upon a written request submitted to the Bureau or the Institute, withdraw any application for approval of any respirator.

(b) Upon receipt of a written request for the withdrawal of an application, the Institute shall determine the total man-days expended and the amount due for services already performed during the course of any examinations, inspections, or tests conducted pursuant to such application. The total amount due shall be determined in accordance with the provisions of § 11.22 and assessed against the fees submitted by the applicant. If the total amount assessed is less than the fees submitted, the Institute shall refund the balance together with a statement of the charges made for services rendered.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

Subpart H—Self-Contained Breathing Apparatus

§ 11.70 Self-contained breathing apparatus; description.

(a) Self-contained breathing apparatus, including all completely assembled, portable, self-contained devices designed for use as respiratory protection during entry into and escape from or escape only from hazardous atmospheres, are described as follows:

(1) *Closed-circuit apparatus.* An apparatus of the type in which the exhalation is rebreathed by the wearer after the carbon dioxide has been effectively removed and a suitable oxygen concentration restored from sources composed of:

(i) Compressed oxygen; or

(ii) Chemical oxygen; or

(iii) Liquid-oxygen.

(2) *Open-circuit apparatus.* An apparatus of the following types from which exhalation is vented to the atmosphere and not rebreathed:

(i) *Demand-type apparatus.* An apparatus in which the pressure inside the facepiece in relation to the immediate environment is positive during exhalation and negative during inhalation.

(ii) *Pressure-demand-type apparatus.* An apparatus in which the pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.

(b) The following respirators may be classified as designed and approved for use during emergency entry into a hazardous atmosphere: A combination respirator which includes a self-contained breathing apparatus and a Type "C" or Type "CE" supplied air respirator, where (1) the self-contained breathing apparatus is classified for 3-, 5-, or 10-minute service time and the air line supply is used during entry, or (2) the self-contained breathing apparatus is classified for 15 minutes or longer service time and not more than 20 percent of the rated capacity of the air supply is used during entry.

(c) Self-contained breathing apparatus classified for less than 1 hour service time will not be approved for use during underground mine rescue and recovery operations except as auxiliary equipment.

(d) Self-contained breathing apparatus classified for less than 30 minutes' service time will not be approved for use as auxiliary equipment during underground mine rescue and recovery operations.

§ 11.71 Self-contained breathing apparatus; required components.

(a) Each self-contained breathing apparatus described in § 11.70 shall, where its design requires, contain the following component parts:

(1) Facepiece or mouthpiece, and noseclip;

(2) Respirable breathing gas container;

(3) Supply of respirable breathing gas;

(4) Gas pressure or liquid level gages;

(5) Timer;

(6) Remaining service life indicator or warning device;

(7) Hand-operated valves;

(8) Breathing bag;

(9) Safety relief valve or safety relief system; and

(10) Harness.

(b) The components of each self-contained breathing apparatus shall meet the minimum construction requirements set forth in Subpart G of this part.

§ 11.72 Breathing tubes; minimum requirements.

(a) Flexible breathing tubes used in conjunction with breathing apparatus shall be designed and constructed to prevent:

(1) Restriction of free head movement;

(2) Disturbance of the fit of facepieces and mouthpieces;

(3) Interference with the wearer's activities; and,

(4) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 11.73 Harnesses; installation and construction; minimum requirements.

(a) Each apparatus shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the apparatus in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of apparatus parts, and, where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 11.74 Apparatus containers; minimum requirements.

(a) Apparatus may be equipped with a substantial, durable container bearing markings which show the applicant's name, the type and commercial designation of the respirator it contains, and all appropriate approval labels.

(b) Containers supplied by the applicant for carrying or storing self-contained breathing apparatus will be inspected, examined, and tested as components of the respirator for which approval is sought.

(c) Containers for self-contained breathing apparatus shall be designed and constructed to permit easy removal of the apparatus.

§ 11.75 Half-mask facepieces, full facepieces, mouthpieces; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes, either (1) by providing more than one facepiece size, or (2) by providing one facepiece size which will fit varying facial shapes and sizes.

(b) Full facepieces shall provide for the optional use of corrective spectacles or lenses which shall not reduce the respiratory protective qualities of the apparatus.

(c) Apparatus with mouthpieces shall be equipped with noseclips which are securely attached to the mouthpiece or apparatus and provide an airtight seal.

(d) Facepieces shall be designed to prevent eyepiece, spectacle, and lens fogging.

§ 11.76 Facepieces; eyepieces; minimum requirements.

(a) Facepieces shall be designed and constructed to provide adequate vision which is not distorted by the eyepiece.

(b) All eyepieces shall be designed and constructed to meet the impact and penetration requirements specified in Federal Specification, Mask, Air Line, and Respirator, Air Filtering, Industrial, GGG–M–125d, October 11, 1955. This Federal Specification is available from the Government Printing Office or the General Services Administration.

§ 11.77 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be provided where necessary and protected against damage and distortion.

(b) Exhalation valves shall be:

(1) Protected against external influence, and

(2) Designed and constructed to prevent inward leakage of contaminated air.

§ 11.78 Head harnesses; minimum requirements.

(a) Facepieces shall be equipped with adjustable and replaceable head harnesses designed and constructed to provide adequate tension during suspension and an even distribution of pressure over the entire area in contact with the face.

(b) Mouthpieces shall be equipped, where applicable, with adjustable and replaceable harnesses designed and constructed to hold the mouthpiece in place.

§ 11.79 Breathing gas; minimum requirements.

(a) Breathing gas used to supply apparatus shall be respirable and contain no less than 19.5 (dry atmosphere) volume percent of oxygen.

(b) Oxygen, including liquid oxygen, shall meet the minimum requirements for medical or breathing oxygen set forth in the U.S. Pharmacopeia.

(c) Compressed, gaseous breathing air shall meet the applicable minimum grade requirements for Type I gaseous

air set forth in the Compressed Gas Association Commodity Specification for Air, G-7.1 (Grade D or higher quality).

(d) Compressed, liquefied breathing air shall meet the applicable minimum grade requirements for Type II liquid air set forth in the Compressed Gas Association Commodity Specification for Air, G-7.1 (Grade B or higher quality).

§ 11.79-1 Interchangeability of oxygen and air prohibited.

Approvals shall not be issued by the Bureau and the Institute for any apparatus, combination of respirator assemblies, or any apparatus or respirator component which is designed or constructed to permit the interchangeable use of oxygen and air.

§ 11.80 Compressed breathing gas and liquified breathing gas containers; minimum requirements.

(a) Compressed breathing gas and liquefied breathing gas containers shall meet the minimum requirements of the Department of Transportation for Interstate shipment of such containers when fully charged.

(b) Such containers shall be permanently and legibly marked to identify their contents, e.g., compressed breathing air, compressed breathing oxygen, liquefied breathing air, or liquefied breathing oxygen.

(c) Containers normally removed from apparatus for refilling shall be equipped with a dial indicating gage which shows the pressure in the container.

(d) Compressed breathing gas contained valves or a separate charging system or adapter provided with each apparatus shall be equipped with outlet threads specified for the service by the American National Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections, B57.1 (1965), obtainable from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

§ 11.81 Gas pressure gages; minimum requirements.

(a) Gas pressure gages employed on compressed breathing gas containers shall be calibrated in pounds per square inch.

(b) Liquid-level gages shall be calibrated in fractions of total container capacity, or in units of liquid volume.

(c) Gas pressure gages other than those specified in paragraphs (a) and (b) of this section shall be calibrated in:

(1) Pounds per square inch, or

(2) In fractions of total container capacity, or

(3) Both in pounds per square inch inch and fractions of total container capacity.

(d) (1) Dial-indicating gages shall be reliable to within ±5 percent of full scale when tested both up and down the scale at each of 5 equal intervals.

(2) The full scale graduation of dial-indicating gages shall not exceed 150 percent of the maximum rated cylinder pressures specified for the container in applicable Department of Transportation specifications or permits.

(e) (1) Stem-type gages shall be readable by sight and by touch and shall have a stem travel distance of not less than one-fourth inch between each graduation.

(2) A minimum of five graduations shall be engraved on the stem of each gage and these graduations shall include readings for empty, one-quarter, one-half, three-quarters, and full.

(3) Stem gage readings shall not vary from true readings by more than one-sixteenth inch per inch of stem travel.

(f) The loss of gas through a broken gage or severed gage connection shall not exceed 70 liters per minute when the cylinder pressure is 6,900 kN/m.^{2} (1,000 pounds per square inch gage) or when the liquid level is at one-half.

(g) Where gages are connected to the apparatus through a gage line, the gage and line shall be capable of being isolated from the apparatus except where the failure of the gage or line would not impair the performance or service life of the apparatus.

(h) Oxygen pressure gages shall have the words, "Oxygen" and "Use No Oil," marked prominently on the gage.

(i) (1) Apparatus using compressed breathing gas, except apparatus classified for escape only, shall be equipped with gages visible to the wearer which indicate the remaining gas content in the container.

(2) Apparatus using liquefied breathing gas, except apparatus classified for escape only, shall be equipped with gages visible to the wearer which indicate the remaining liquid content in the container; however, where the liquid content cannot be rapidly vented, and the service time of the device begins immediately after filling, a timer shall be provided in place of a visible gage.

§ 11.82 Timers; elapsed time indicators; remaining service life indicator; minimum requirements.

(a) Elapsed time indicators shall be

provided for apparatus with a chemical oxygen source, except:

(1) Apparatus used for escape only; or,

(2) Liquefied breathing gas apparatus equipped with gages visible to the wearer which indicate the remaining liquid content in the container.

(b) The timer or other indicator shall be accurately calibrated in minutes of remaining service life.

(c) Timers shall be readable by sight and by touch during use by the wearer.

(d) Timers shall be equipped with automatically preset alarms which will warn the wearer for a period of 7 seconds or more after the preset time has elapsed.

(e) Remaining service-life indicators or warning devices shall be provided in addition to a pressure gage on compressed gas self-contained breathing apparatus, except apparatus used for escape only, and shall operate automatically without preadjustment by the wearer.

(f) Each remaining service-life indicator or warning device shall give an alarm when the remaining service life of the apparatus is reduced within a range of 20 to 25 percent of its rated service time.

§ 11.83 Hand-operated valves; minimum requirements.

(a) Hand-operated valves shall be designed and constructed to prevent removal of the stem from the valve body during normal usage to insure against a sudden release of the full pressure of the container when the valve is opened.

(b) Valves shall be designed or positioned to prevent accidental opening and closing, and damage from external forces.

(c) Valves operated during use of the apparatus shall be installed in locations where they can be readily adjusted by the wearer.

(d) Main-line valves, designed and constructed to conserve gas in the event of a regulator or demand valve failure, shall be provided in addition to gas container valves, except when such failure will not affect performance.

(e) Hand-operated bypass systems designed and constructed to permit the wearer to breathe and to conserve his gas supply in the event of a regulator or demand valve failure, shall be provided where necessary.

(f) Valves installed on apparatus shall be clearly distinguishable from one another by sight and touch.

(g) The bypass system valve control shall be colored red.

(h) A main-line or bypass valve or system will not be required on apparatus for escape only.

(i) Safety relief valves or systems, designed and constructed to release excess pressure in the breathing circuit, shall be provided on closed-circuit apparatus, and shall meet the following requirements:

(1) The relief valve or system shall operate automatically when the pressure in the breathing circuit on the inhalation side of the breathing bag reaches 13 mm. (one-half inch) water-column height of pressure above the minimum pressure required to fill the breathing bag, within the breathing resistance requirements for the apparatus.

(2) The relief valve or system shall be designed to prevent external atmospheres from entering the breathing circuit.

(3) The relief valve or system shall be designed to permit manual overriding for test purposes and in the event of a failure in the valve or system.

§ 11.84 Breathing bags; minimum requirements.

(a) Breathing bags shall have sufficient volume to prevent gas waste during exhalation and to provide an adequate reserve for inhalation.

(b) Breathing bags shall be constructed of materials which are flexible and resistant to gasoline vapors.

(c) Breathing bags shall be installed in a location which will protect them from damage or collapse by external forces, except on apparatus classified for escape only.

§ 11.85 Self-contained breathing apparatus; performance requirements; general.

Self-contained breathing apparatus and the individual components of each such device shall as applicable meet the requirements specified in §§ 11.85–1 through 11.85–19.

§ 11.85–1 Component parts exposed to oxygen pressures; minimum requirements.

Each applicant shall certify that the materials employed in the construction of component parts exposed to oxygen pressures above atmospheric pressure are safe and compatible for their intended use.

§ 11.85–2 Compressed gas filters; minimum requirements.

All self-contained breathing apparatus

using compressed gas shall have a filter downstream of the gas source to effectively remove particles from the gas stream.

§ 11.85–3 Breathing bag test.

(a) Breathing bags will be tested in an air atmosphere saturated with gasoline vapor at room temperature (24°–30° C./75°–85° F.) for a continuous period of twice the rated time of the apparatus (except for apparatus for escape only where the test period shall be the rated time of the apparatus).

(b) The bag will be operated during this test by a breathing machine with 24 respirations per minute and a minute-volume of 40 liters.

(c) A breathing machine cam with a work rate of 622 kg.-m./min. will be used.[1]

(d) The air within the bag(s) shall not contain more than 100 parts per million of gasoline vapor at the end of the test.

§ 11.85–4 Weight requirement.

(a) The completely assembled and fully charged apparatus shall not weigh more than 16 kg. (35 pounds); however, where the weight decreases by more than 25 percent of its initial charge weight during its rated service life, the maximum allowable weight of a completely assembled and fully charged apparatus shall be 18 kg. (40 pounds).

(b) Where an apparatus employs equipment which contributes materially to the wearer's comfort, e.g., a cooling system, the completely assembled and fully charged apparatus shall not weigh more than 18 kg. (40 pounds) regardless of the decrease in weight during use.

[1] Silverman, L., G. Lee, T. Plotkin, L. Amory, and A. R. Yancey, Fundamental Factors in Design of Protective Equipment, O.S.R.D. Report No. 5732, issued Apr. 1, 1945. The dimensions of the breathing machine cam are available from the Bureau upon request.

§ 11.85–5 Breathing resistance test; inhalation.

(a) Resistance to inhalation airflow will be measured in the facepiece or mouthpiece while the apparatus is operated by a breathing machine as described in § 11.85–3.

(b) The inhalation resistance of open-circuit apparatus shall not exceed 32 mm. (1.25 inch) water-column height (at a flow rate of 120 liters per minute).

(c) The inhalation resistance of closed-circuit apparatus shall not exceed the difference between exhalation resistance (§ 11.85–6(e)) and 10 cm. (4 inches) water-column height.

§ 11.85–6 Breathing resistance test; exhalation.

(a) Resistance to exhalation airflow will be measured in the facepiece or mouthpiece of open-circuit apparatus with air flowing at a continuous rate of 85 liters per minute.

(b) The exhalation resistance of demand apparatus shall not exceed 25 mm. (1 inch) water-column height.

(c) The exhalation resistance of pressure-demand apparatus shall not exceed the static pressure in the facepiece by more than 51 mm. (2 inches) water-column height.

(d) The static pressure (at zero flow) in the facepiece shall not exceed 38 mm. (1.5 inches) water-column height.

(e) Resistance to exhalation airflow will be measured in the facepiece or mouthpiece of closed-circuit apparatus with a breathing machine as described in § 11.85–3, and the exhalation resistance shall not exceed 51 mm. (2 inches) water-column height.

§ 11.85–7 Exhalation valve leakage test.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. (1 inch) water-column height while in a normal operating position.

(b) Leakage between the valve and the valve seat shall not exceed 30 milliliters per minute.

§ 11.85–8 Gas flow test; open-circuit apparatus.

(a) A static-flow test will be performed on all open-circuit apparatus.

(b) The flow from the apparatus shall be greater than 200 liters per minute when the pressure in the facepiece of demand-apparatus is lowered by 51 mm. (2 inches) water-column height when full container pressure is applied.

(c) Where pressure demand apparatus are tested, the flow will be measured at zero gage pressure in he facepiece.

(d) Where apparatus with compressed-breathing-gas containers are tested, the flow test shall also be made with 3,450 kN/m.[2] (500 p.s.i.g.) container pressure applied.

§ 11.85–9 Gas flow test; closed-circuit apparatus.

(a) Where oxygen is supplied by a constant-flow device only, the rate of flow shall be at least 3 liters per minute

for the entire rated service time of the apparatus.

(b) Where constant flow is used in conjunction with demand flow, the constant flow shall be greater than 1.5 liters per minute for the entire rated service time.

(c) All demand-flow devices shall provide at least 30 liters of oxygen per minute when in the fully open position.

§ 11.85–10 Service time test; open-circuit apparatus.

(a) Service time will be measured with a breathing machine as described in § 11.85–3.

(b) The open-circuit apparatus will be classified according to the length of time it supplies air or oxygen to the breathing machine.

(c) The service time obtained on this test will be used to classify the open-circuit apparatus in accordance with § 11.53.

§ 11.85–11 Service time test; closed-circuit apparatus.

(a) The closed-circuit apparatus will be classified according to the length of time it supplies adequate breathing gas to the wearer during man test No. 4 described in Table 4.

(b) The service time obtained on man test No. 4 will be used to classify the closed-circuit apparatus in accordance with § 11.53.

§ 11.85–12 Test for carbon dioxide in inspired gas; open- and closed-circuit apparatus; maximum allowable limits.

(a) Open-circuit apparatus:

(1) The concentration of carbon dioxide in inspired gas in open-circuit apparatus will be measured at the mouth while the apparatus mounted on a dummy head is operated by a breathing machine.[2]

(2) The breathing rate will be 14.5 respirations per minute with a minute-volume of 10.5 liters.

(3) A sedentary breathing machine cam will be used.

(4) The apparatus will be tested at a temperature of 27° ± 2° C. (80° ± 5° F.).

(5) A concentration of 5 percent carbon dioxide in air will be exhaled into the facepiece.

(b) Closed-circuit apparatus:

(1) The concentration of carbon dioxide in inspired gas in closed-circuit apparatus will be measured at the mouth while the parts of the apparatus contributing to dead-air space are mounted on a dummy head and operated by the breathing machine as in paragraphs (a) (1) through (5) of this section.

(c) During the testing required by paragraphs (a) and (b) of this section, the concentration of carbon dioxide in inspired gas at the mouth will be continuously recorded, and the maximum average concentration during the inhalation portion of the breathing cycle shall not exceed the following limits:

Where the service time is:	*Maximum allowable average concentration of carbon dioxide in inspired air, percent by volume*
Not more than 30 minutes	2.5
1 hour	2.0
2 hours	1.5
3 hours	1.0
4 hours	1.0

(d) In addition to the tests requirements for closed-circuit apparatus set forth in paragraph (b) of this section, gas samples will be taken during the course of the man tests described in Tables 1, 2, 3, and 4. These gas samples will be taken from the closed-circuit apparatus at a point downstream of the carbon dioxide sorbent, and they shall not contain more than 0.5 percent carbon dioxide at any time.

[2] Kloos, E. J., and J. Lamonica, A Machine-Test Method for Measuring Carbon Dioxide in the Inspired Air of Self-Contained Breathing Apparatus. Bureau of Mines Report of Investigations 6865, 1966, 11 pp.

§ 11.85–13 Tests during low temperature operation.

(a) The applicant shall specify the minimum temperature for safe operation and two persons will perform the tests described in paragraphs (c) and (d) of this section, wearing the apparatus according to applicant's directions. At the specified temperature, the apparatus shall meet all the requirements described in paragraph (e) of this section.

(b) The apparatus will be precooled at the specified minimum temperature for 4 hours.

(c) The apparatus will be worn in the low temperature chamber for 30 minutes, or for the service time of the apparatus, whichever is less.

(d) During the test period, alternate 1-minute periods of exercise and rest will be required with the exercise periods consisting of stepping onto and off a box 21.5 cm. (8½ inches) high at a rate of 30 cycles per minute.

(e) (1) The apparatus shall function satisfactorily at the specified minimum temperature on duplicate tests.

(2) The wearer shall have sufficient unobscured vision to perform the work.

(3) The wearer shall not experience undue discomfort because of airflow restriction or other physical or chemical changes in the operation of the apparatus.

(f) Auxiliary low-temperature parts which are commercially available to the user may be used on the apparatus to meet the requirements described in paragraph (e) of this section.

§ 11.85–14 Man tests; testing conditions; general requirements.

(a) The man tests described in Tables 1, 2, 3, and 4 represent the workload performed in the mining, mineral, or allied industries by a person wearing the apparatus tested.

(b) The apparatus tested will be worn by Institute personnel trained in the use of self-contained breathing apparatus, and the wearer will, before participating in these tests, pass a physical examination conducted by a qualified physician.

(c) All man tests will be conducted by the Institute.

(d) The apparatus will be examined before each man test to ensure that it is in proper working order.

(e) Breathing resistance will be measured within the facepiece or mouthpiece and the wearer's pulse and respiration rate will be recorded during each 2 minute sample period prescribed in tests 1, 2, 3, and 4.

(f) Man tests 1, 2, 3, 4, 5, and 6 will be conducted in duplicate.

(g) If man tests are not completed through no fault of the apparatus, the test will be repeated.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.85–15 Man tests 1, 2, 3, and 4; requirements.

(a) Man tests 1, 2, 3, and 4, set forth in Tables 1, 2, 3, and 4 respectively, prescribe the duration and sequence of specific activities. These tests will be conducted to:

(1) Familiarize the wearer with the apparatus during use;

(2) Provide for a gradual increase in activity;

(3) Evaluate the apparatus under different types of work and physical orientation; and

(4) Provide information on the operating and breathing characteristics of the apparatus during actual use.

§ 11.85–16 Man test 5; requirements.

(a) Test 5 will be conducted to determine the maximum length of time the apparatus will supply the respiratory needs of the wearer while he is sitting at rest.

(b) The wearer will manipulate the devices controlling the supply of breathing gas to the advantage of the apparatus.

(c) Samples of inspiration from within the apparatus facepiece or mouthpiece shall be taken once every 15 minutes, and shall meet the minimum requirement for oxygen specified in § 11.79(a) of this part, and the maximum allowable average concentration of carbon dioxide specified in § 11.85–12(c).

(d) One sample of inspiration will be taken in the case of 3-, 5-, and 10-minute apparatus.

§ 11.85–17 Man test 6; requirements.

(a) Man test 6 will be conducted with respect to liquefied breathing gas apparatus only.

(b) This test will be conducted to evaluate operation of the apparatus in other than vertical positions.

(c) The wearer will lie face downward for one-fourth the service life of the apparatus with a full charge of liquefied breathing gas, and then a one-quarter full charge of liquefied breathing gas.

(d) The test will be repeated with the wearer lying on each side and on his back.

(e) The oxygen content of the gas supplied to the wearer by the apparatus will be continuously measured.

§ 11.85–18 Man tests; performance requirements.

(a) The apparatus shall satisfy the respiratory requirements of the wearer for the classified service time.

(b) Fogging of the eyepiece shall not obscure the wearer's vision, and the wearer shall not experience undue discomfort because of fit or other characteristics of the apparatus.

(c) When the ambient temperature during testing is 24° ± 6° C. (75° ± 10° F.), the maximum temperature of inspired air recorded during man tests shall not exceed the following, after correction for deviation from 24° C. (75° F.):

Where service life of apparatus is—	Where percent relative humidity of inspired air is—	Maximum permissible temperature of inspired air shall not exceed—	
		° F.	° C.
¼ hour or less	0–100	135	57
½ hour to ¾ hour	0–50	125	52
	50–100	[1] 110	[1] 43
1 to 2 hours	0–50	115	46
	50–100	[1] 105	[1] 41
3 hours	0–50	110	43
	50–100	[1] 100	[1] 38
4 hours	0–50	105	41
	50–100	[1] 95	[1] 35

[1] Where percent relative humidity is 50–100 and apparatus is designed for escape only, these maximum permissible temperatures will be increased by 5° C. (10° F.).

§ 11.85–19 Gas tightness test; minimum requirements.

(a) Each apparatus will be tested for tightness by persons wearing it in an atmosphere of 1,000 p.p.m. isoamyl acetate.

(b) Six persons will each wear the apparatus in the test concentrations specified in paragraph (a) of this section for 2 minutes and none shall detect the odor or taste of the test vapor.

TABLE 1.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 1, IN MINUTES

(30 CFR Part 11, Subpart H, § 11.85, et seq.)

Activity	Service time—							
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2, 3, and 4 hours
Sampling and readings				2	2	2	2	Perform 1 hour test 2, 3, or 4 times respectively.
Walks at 4.8 km. (3 miles) per hour	3	5	3	4	8	12	18	
Sampling and readings			2	2	2	2	2	
Walks at 4.8 km. (3 miles) per hour			3	5	8	12	18	
Sampling and readings			2	2	2	2	2	
Walks at 4.8 km. (3 miles) per hour					6	13	16	
Sampling and readings					2	2	2	

TABLE 2.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 2, IN MINUTES

(30 CFR Part 11, Subpart H, § 11.85, et seq.)

Activity	Service Time—							
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2, 3 and 4 hours [1]
Sampling and readings				2	2	2	2	2.
Walks at 4.8 km. (3 miles) per hour			1	1	3	4	6	10.
Carries 23 kg. (50 pound) weight over overcast.			1 time in 2 minutes.	1 time in 2 minutes.	2 times in 4 minutes.	3 times in 6 minutes.	4 times in 8 minutes.	5 times in 10 minutes.
Walks at 4.8 km. (3 miles) per hour				1	3	3	3	5.
Climbs vertical treadmill [2] (or equivalent).	1	1	1	1	1	1	1	1.
Walks at 4.8 km. (3 miles) per hour		1	1			2	3	5.
Climbs vertical treadmill (or equivalent)		1				1	1	1.
Sampling and readings					2	2	2	2.
Walks at 4.8 km. (3 miles) per hour				2	2	3	5	11.
Climbs vertical treadmill (or equivalent)				1	1	1	1	1.
Carries 23 kg. (50 pound) weight over overcast.				1 time in 2 minutes.	3 times in 6 minutes.	4 times in 8 minutes.	5 times in 10 minutes.	5 times in 10 minutes.
Sampling and readings			2			2	2	2.
Walks at 4.8 km. (3 miles) per hour				1	3	3	3	
Climbs vertical treadmill (or equivalent)			1		1	1	1	Then repeat above activities once.
Walks at 4.8 km. (3 miles) per hour			2			2	3	
Climbs vertical treadmill (or equivalent)						1	1	
Carries 20 kg. (45 pound) weight and walks at 4.8 km. (3 miles) per hour.	1						2	
Walks at 4.8 km. (3 miles) per hour	1	2				1	4	
Sampling and readings				2	2	2	2	

[1] Total test time for Test 2 for 2-hour, 3-hour, and 4-hour apparatus is 2 hours.

[2] Treadmill shall be inclined 15° from vertical and operated at a speed of 1 foot per second.

TABLE 3.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 3, IN MINUTES
(30 CFR Part 11, Subpart H, § 11.85, et seq.)

Activity	Service time—							
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2, 3 and 4 hours [1]
Sampling and readings				2	2	2	2	Perform test No. 3 for 1 hr. apparatus; then perform test No. 1 for 1 hour apparatus.
Walks at 4.8 km. (3 miles) per hour			1	1	2	2	3	
Runs at 9.7 km. (6 miles) per hour	1	1	1	1	1	1	1	
Pulls 20 kg. (45 pound) weight to 5 feet		15 times in 1 minute.		30 times in 2 minutes.	30 times in 2 minutes.	30 times in 2 minutes.	60 times in 6 minutes.	
Lies on side	½	1	1	2	3	4	5	
Lies on back	½	1	1	2	2	3	3	
Crawls on hands and knees	1	1	1	2	2	2	2	
Sampling and readings			2		2	2	2	
Runs at 9.7 km. (6 miles) per hour				1	1	1	1	
Walks at 4.8 km. (3 miles) per hour					2	8	10	
Pulls 20 kg. (45 pound) weight to 5 feet			30 times in 2 minutes.		60 times in 6 minutes.	60 times in 6 minutes.	60 times in 6 minutes.	
Sampling and readings				2		2	2	
Walks at 4.8 km. (3 miles) per hour			1		3	4	10	
Lies on side						2	4	
Lies on back						2	1	
Sampling and readings					2	2	2	

[1] Total test time for Test 3 for 2-hour, 3-hour, and 4-hour apparatus is 2 hours.

TABLE 4.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 4, IN MINUTES

(30 CFR Part 11, Subpart H, § 11.85, et seq.)

Activity	Service time—									
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2 hours	3 hours	4 hours
Sampling and readings				2	2	2	2	Perform test No. 1 for 30-minute apparatus; then perform test No. 4 for 1-hour apparatus; then perform test No. 1 for 30-minute apparatus.	Perform test No. 1 for 1-hour apparatus; then perform test No. 4 for 1-hour apparatus; then perform test No. 1 for 1-hour apparatus.	Perform test No. 1 for 1-hour apparatus; then perform test No. 4 for 1-hour apparatus; then perform test No. 1 for 1-hour apparatus twice (i.e., two one-hour tests).
Walks at 4.8 km. (3 miles) per hour				1	2	2	2			
Climbs vertical treadmill [1] (or equivalent).	1	1	1	1	1	1	1			
Walks at 4.8 km. (3 miles) per hour	1	1	1	1	2	2	2			
Pulls 20 kg. (45 pound) weight to 5 feet.		30 times in 2 minutes.	30 times in 2 minutes.	30 times in 2 minutes.	60 times in 5 minutes.	60 times in 5 minutes.	60 times in 5 minutes.			
Walks at 4.8 km. (3 miles) per hour		1		1	1	2	3			
Carries 23 kg. (50 pound) weight over overcast.				1 time in 1 minute.	1 time in 1 minute.	2 times in 3 minutes.	4 times in 8 minutes.			
Sampling and readings			2		2	2	2			
Walks at 4.8 km. (3 miles) per hour				1	3	3	4			
Runs at 9.7 km. (6 miles) per hour		1	1	1	1	1	1			
Carries 23 kg. (50 pound) weight over overcast.			1 time in 1 minute.	1 time in 1 minute.	2 times in 3 minutes.	4 times in 6 minutes.	6 times in 9 minutes.			
Pulls 20 kg. (45 pound) weight to 5 feet.	15 times in 1 minute.			15 times in 1 minute.	60 times in 5 minutes.	30 times in 2 minutes.	36 times in 3 minutes.			
Sampling and readings				2	2	2	2			
Walks at 4.8 km. (3 miles) per hour	1		1			2	6			
Pulls 20 kg. (45 pound) weight to 5 feet.						60 times in 5 minutes.	60 times in 5 minutes.			
Carries 20 kg. (45 pound) weight and walks at 4.8 km. (3 miles) per hour.						3	3			
Sampling and readings						2	2			

[1] Treadmill shall be inclined 15° from vertical and operated at a speed of 30 cm. (1 foot) per second.

Subpart I—Gas Masks

§ 11.90 Gas masks; description.

(a) Gas masks including all completely assembled air purifying masks which are designed for use as respiratory protection during entry into and escape or escape only from hazardous atmospheres containing adequate oxygen to support life are described as follows:

(1) *Front-mounted or back-mounted gas mask.* A gas mask which consists of a full facepiece, a breathing tube, a canister at the front or back, a canister harness, and associated connections.

(2) *Type "N" front-mounted or back-mounted gas mask.* A gas mask specifically designed to protect against acid gases, ammonia, carbon monoxide, organic vapors, and particulate contaminants which consists of a full facepiece, breathing tube, a canister at the front or back, a canister harness, and associated connections.

(3) *Chin-style gas mask.* A gas mask which consists of a full facepiece, a canister which is usually attached to the facepiece, and associated connections.

(4) *Escape gas mask.* A gas mask designed for use during escape only from hazardous atmospheres which consists of a half-mask facepiece or mouthpiece, a canister, and associated connections.

(b) Gas masks shall be further described according to the specific gases or vapors against which they are designed to provide respiratory protection, as follows:

	Maximum use concentration, percent by volume
Type of front-mounted or back-mounted gas mask:	
Acid gas [3, 4]	[5] 2
Ammonia [3]	3
Carbon monoxide [3]	2
Organic vapors [3, 4]	[5] 2
Type of chin-style gas mask:	
Acid gas [3, 4]	[5] 0.5
Ammonia	.5
Organic vapors [3, 4]	[5] .5

	Maximum use concentration, parts per million
Type of escape gas mask:	
Acid gas [3, 4, 6]	[5] 1,000
Ammonia, [6]	5,000
Carbon monoxide	10,000
Organic vapors [3, 4, 6]	[5] 5,000

[3] Approval may be for acid gases or organic vapors as a class or for specific acid gases, ammonia, or organic vapors. Approval may also be granted for combinations of acid gases, organic vapors, and other gases and vapors.

[4] Not for use against acid gases or organic vapors with poor warning properties or which generate high heats of reaction with sorbent materials in the canister.

[5] Suggested maximum use concentrations are lower than these for some acid gases and organic vapors.

[6] Eye protection may be required in certain concentrations of acid gases, ammonia, and organic vapors.

(c) Gas masks for respiratory protection against gases and vapors other than those specified in paragraph (b) of this section, may be approved upon submittal of an application in writing for approval to the Testing and Certification Laboratory listing the gas or vapor and suggested maximum use concentration for the specific type of gas mask. The Institute and the Bureau will consider the application and accept or reject it on the basis of effect on the wearer's health and safety and any field experience in use of gas masks for such exposures. If the application is accepted, the Institute will test such masks in accordance with the requirements of this subpart.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6994, Mar. 15, 1973]

§ 11.91 Gas masks; required components.

(a) Each gas mask described in § 11.90 shall, where its design requires, contain the following component parts:

(1) Facepiece or mouthpiece and noseclip;

(2) Canister or cartridge;

(3) Canister harness;

(4) External check valve; and

(5) Breathing tube.

(b) The components of each gas mask shall meet the minimum construction requirements set forth in Subpart G of this part.

§ 11.92 Canisters and cartridges in parallel; resistance requirements.

Where two or more canisters or cartridges are used in parallel, their resistance to airflow shall be essentially equal.

§ 11.93 Canisters and cartridges; color and markings; requirements.

The color and markings of all canisters and cartridges or labels shall conform with the requirements of the American National Standard for Identification of Gas Mask Canisters, K13.1, obtainable from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

§ 11.94 Filters used with canisters and cartridges; location; replacement.

(a) Particulate matter filters used in conjunction with a canister or cartridge shall be located on the inlet side of the canister or cartridge.

(b) Filters shall be incorporated in or firmly attached to the canister or cartridge and each filter assembly shall,

where applicable, be designed to permit its easy removal from and replacement in the canister or cartridge.

§ 11.95 Breathing tubes; minimum requirements.

(a) Flexible breathing tubes used in conjunction with gas masks shall be designed and constructed to prevent:

(1) Restriction of free head movement;

(2) Disturbance of the fit of facepieces or mouthpieces;

(3) Interference with the wearer's activities; and,

(4) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 11.96 Harnesses; installation and construction; minimum requirements.

(a) Each gas mask shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the gas mask in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of gas mask parts, and where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 11.97 Gas mask containers; minimum requirements.

(a) Gas masks shall be equipped with a substantial, durable container bearing markings which show the applicant's name, the type and commercial designation of mask it contains and all appropriate approval labels.

(b) Containers for gas masks shall be designed and constructed to permit easy removal of the mask.

§ 11.98 Half-mask facepieces, full facepieces and mouthpieces; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either: (1) By providing more than one facepiece size, or (2) by providing one facepiece size which will fit varying facial shapes and sizes.

(b) Full facepieces shall provide for optional use of corrective spectacles or lenses, which shall not reduce the respiratory protective qualities of the gas mask.

(c) Half-mask facepieces shall not interfere with the fit of common industrial safety spectacles, as determined by the Institute's facepiece tests in § 11.102–3.

(d) Gas masks with mouthpieces shall be equipped with noseclips which are securely attached to the mouthpiece or gas mask and provide an airtight seal.

(e) Facepieces shall be designed to prevent eyepiece fogging.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.99 Facepieces; eyepieces; minimum requirements.

(a) Full facepieces shall be designed and constructed to provide adequate vision which is not distorted by the eyepiece.

(b) All eyepieces shall be designed and constructed to meet the impact and penetration requirements specified in Federal Specification, Mask, Air Line: and Respirator, Air Filtering, Industrial, GGG–M–125d, October 11, 1965.

§ 11.100 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be provided where necessary and protected against damage and distortion.

(b) Inhalation valves shall be designed and constructed to prevent excessive exhaled air from adversely affecting cartridges, canisters, and filters.

(c) Exhalation valves shall be protected against external influence, and designed and constructed to prevent inward leakage of contaminated air.

§ 11.101 Head harnesses; minimum requirements.

(a) Facepieces shall be equipped with adjustable and replaceable head harnesses, designed and constructed to provide adequate tension during use and an even distribution of pressure over the entire area in contact with the face.

(b) Mouthpieces shall be equipped, where applicable, with adjustable and replaceable harnesses designed and constructed to hold the mouthpiece in place.

§ 11.102 Gas masks; performance requirements; general.

Gas masks and the individual components of each such device shall, as appropriate, meet the requirements for performance and protection specified in the tests described in §§ 11.102–1 through 11.102–5.

§ 11.102–1 Breathing resistance test; minimum requirements.

(a) Resistance to airflow will be measured in the facepiece or mouthpiece of a gas mask mounted on a breathing machine both before and after each test conducted in accordance with §§ 11.102–3, 11.102–4, and 11.102–5, with air flow-

ing at a continuous rate of 85 liters per minute.

(b) The maximum allowable resistance requirements for gas masks are as follows:

MAXIMUM RESISTANCE
(mm. water-column height)

Type of gas mask	Inhalation		Exhalation
	Initial	Final[1]	
Front-mounted or back-mounted (without particulate filter)	60	75	20
Front-mounted or back-mounted (with approved particulate filter)	70	85	20
Chin-style (without particulate filter)	40	55	20
Chin-style (with approved particulate filter)	65	80	20
Escape (without particulate filter)	60	75	20
Escape (with approved particulate filter)	70	85	20

[1] Measured at end of the service life specified in Tables 5, 6, and 7.

§ 11.102–2 Exhalation valve leakage test.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

§ 11.102–3 Facepiece tests; minimum requirements.

(a) The complete gas mask will be fitted to the faces of persons having varying facial shapes and sizes.

(b) Where the applicant specifies a facepiece size or sizes for the gas mask, together with the approximate measurements of faces they are designed to fit, the Institute will insure that test subjects suit such facial measurements.

(c) Any gas mask parts which must be removed to perform the facepiece or mouthpiece fit test shall be replaceable without special tools and without disturbing the facepiece or mouthpiece fit.

(d) The facepiece or mouthpiece fit test, using positive or negative pressure recommended by the applicant and described in his instructions will be used before each test specified in paragraph (e) of this section, and in § 11.102–4.

(e) (1) Each wearer will enter a chamber containing 100 p.p.m. isoamyl acetate vapor for a half-mask facepiece and 1,000 p.p.m. isoamyl acetate vapor for a full facepiece or mouthpiece.

(2) The facepiece or mouthpiece may be adjusted, if necessary, in the test chamber before starting the tests.

(3) Each wearer will remain in the chamber for 8 minutes while performing the following activities:

(i) Two minutes, nodding and turning head;

(ii) Two minutes, calisthenic arm movements;

(iii) Two minutes, running in place, and

(iv) Two minutes, pumping with a tire pump into a 28 liter (1 cubic foot) container.

(4) Each wearer shall not detect the odor of isoamyl acetate during the test.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.102–4 Dust, fume, mist, and smoke tests; canisters containing filters; minimum requirements.

(a) Gas mask canisters containing filters for protection against dusts, fumes, mists, and smokes in combination with gases, vapors, or gases and vapors, will be tested as prescribed in § 11.140.

(b) Gas mask canisters designed for protection against smokes will be tested in an atmospheric concentration of 100 micrograms of dioctyl phthalate per liter of air at continuous flow rates of (1) 32 liters per minute, and (2) 85 liters per minute for a period of 5 to 10 seconds, and the DOP leakage through the canister shall not exceed 0.03 percent of the test concentration.

§ 11.102–5 Canister bench tests; minimum requirements.

(a) (1) Bench tests, except for carbon monoxide tests, will be made on an apparatus that allows the test atmosphere at 50±5 percent relative humidity and room temperature (25°±2.5° C.) to enter the canister continuously at concentrations and rates of flow specified in Tables 5, 6, and 7.

(2) Three canisters will be removed from containers and tested as received from the applicant.

(3) Two canisters, other than those described in paragraph (a)(2) of this section, will be equilibrated at room temperature by passing 25 percent relative humidity air through them at 64 liters per minute for 6 hours.

(4) Two canisters, other than those described in paragraphs (a) (2) and (3) of this section, will be equilibrated at room temperature by passing 85 percent relative humidity air through them at 64 liters per minute for 6 hours.

(5) The equilibrated canisters will be resealed, kept in an upright position at room temperature, and tested within 18 hours.

(b) Front-mounted and back-mounted gas mask canisters will be tested and shall meet the minimum requirements set forth in Table 5.

(c) (1) Front-mounted and back-mounted canisters designated as Type N canisters shall have a window or other indicator to warn the gas mask wearer when the canister will no longer satisfactorily remove carbon monoxide from the inhaled air.

(2) Other types of front- and back-mounted canisters may also be equipped with a window or other indicator to warn of imminent leakage of other gases or vapors.

(3) The window indicator canisters will be tested as regular canisters, but shall show a satisfactory indicator change or other warning before the allowable canister penetration has occurred.

(d) Chin-style gas mask canisters shall meet the minimum requirements set forth in Table 6.

(e) Escape gas mask canisters shall meet the minimum requirements set forth in Table 7.

TABLE 5.—CANISTER BENCH TESTS AND REQUIREMENTS FOR FRONT AND BACK-MOUNTED GAS MASK CANISTERS

(30 CFR Part 11, Subpart I, § 11.102-5)

Canister type	Test condition	Test atmosphere			Number of tests	Maximum allowable penetration, p.p.m.	Minimum service life, minutes [1]
		Gas or vapor	Concentration, p.p.m.	Flow rate, l.p.m.			
Acid gas	As received	SO_2	20,000	64	3	5	12
		Cl_2	20,000	64	3	5	12
		NO_2	20,000	64	3	5	12
	Equilibrated	SO_2	20,000	32	4	5	12
		Cl_2	20,000	32	4	5	12
		NO_2	20,000	32	4	5	12
Organic vapors	As received	CCl_4	20,000	64	3	5	12
	Equilibrated	CCl_4	20,000	32	4	5	12
Ammonia	As received	NH_3	30,000	64	3	50	12
	Equilibrated	NH_3	30,000	32	4	50	12
Carbon monoxide	As received	CO	20,000	[2] 64	2	[3]	60
		CO	5,000	[4] 32	3	[3]	60
		CO	3,000	[2] 32	3	[3]	60
Type N	As received	SO_2	20,000	64	3	5	6
		Cl_2	20,000	64	3	5	6
		NO_2	20,000	64	3	5	6
		CCl_4	20,000	64	3	5	6
		NH_3	30,000	64	3	50	6
		CO	20,000	[2] 64	2	[3]	60
		CO	5,000	[4] 32	3	[3]	60
		CO	3,000	[2] 32	3	[3]	60
	Equilibrated	SO_2	20,000	32	4	5	6
		Cl_2	20,000	32	4	5	6
		NO_2	20,000	32	4	5	6
		CCl_4	20,000	32	4	5	6
		NH_3	30,000	32	4	50	6

[1] Minimum life will be determined at the indicated penetration.
[2] Relative humidity of test atmosphere will be 95±3 percent; temperature of test atmosphere will be 25±2.5° C.
[3] Maximum allowable CO penetration will be 385 cc. during the minimum life. The penetration shall not exceed 500 p.p.m. during this time.
[4] Relative humidity of test atmosphere will be 95±3 percent; temperature of test atmosphere entering the test fixture will be 0+2.5° C.—0° C.

TABLE 6.—CANISTER BENCH TESTS AND REQUIREMENTS FOR CHIN-STYLE GAS MASK CANISTERS

(30 CFR Part 11, Subpart I, § 11.102-5)

Canister type	Test condition	Test atmosphere			Number of tests	Maximum allowable penetration, p.p.m.	Minimum service life, minutes [1]
		Gas or vapor	Concentration, p.p.m.	Flow rate, l.p.m.			
Acid gas	As received	SO_2	5,000	64	3	5	12
		Cl_2	5,000	64	3	5	12
		NO_2	5,000	64	3	5	12
	Equilibrated	SO_2	5,000	32	4	5	12
		Cl_2	5,000	32	4	5	12
		NO_2	5,000	32	4	5	12
Organic vapors	As received	CCl_4	5,000	64	3	5	12
	Equilibrated	CCl_4	5,000	32	4	5	12
Ammonia	As received	NH_3	5,000	64	3	50	12
	Equilibrated	NH_3	5,000	32	4	50	12

[1] Minimum life will be determined at the indicated penetration.

TABLE 7.—CANISTER BENCH TESTS AND REQUIREMENTS FOR ESCAPE GAS MASK CANISTERS

(30 CFR Part 11, Subpart I, § 11.102-5)

Canister type	Test condition	Test atmosphere: Gas or vapor	Test atmosphere: Concentration, p.p.m.	Test atmosphere: Flow rate, l.p.m.	Number of tests	Maximum allowable penetration, p.p.m.	Minimum service life, minutes [1]
Acid gas	As received	SO_2	5,000	64	3	5	12
		Cl_2	5,000	64	3	5	12
		NO_2	5,000	64	3	5	12
	Equilibrated	SO_2	5,000	32	4	5	12
		Cl_2	5,000	32	4	5	12
		NO_2	5,000	32	4	5	12
Organic vapors	As received	CCl_4	5,000	64	3	5	12
	Equilibrated	CCl_4	5,000	32	4	5	12
Ammonia	As received	NH_3	5,000	64	3	50	12
	Equilibrated	NH_3	5,000	32	4	50	12
Carbon monoxide	As received	CO	10,000	[2] 32	2	[3]	[4] 60
		CO	5,000	[5] 32	3	[3]	60
		CO	3,000	[2] 32	3	[3]	60

[1] Minimum life will be determined at the indicated penetration.
[2] Relative humidity of test atmosphere will be 95±3 percent; temperature of test atmosphere will be 25±2.5° C.
[3] Maximum allowable CO penetration will be 385 cc. during the minimum life. The penetration shall not exceed 500 p.p.m. during this time.
[4] If effluent temperature exceeds 100° C. during this test, the escape gas mask shall be equipped with an effective heat exchanger.
[5] Relative humidity of test atmosphere will be 95±3 percent; temperature of test atmosphere entering the test fixture will be 0+2.5° C.−0° C.

Subpart J—Supplied-Air Respirators

§ 11.110 Supplied-air respirators; description.

(a) Supplied-air respirators, including all completely assembled respirators designed for use as respiratory protection during entry into and escape from hazardous atmospheres are described as follows:

(1) *Type "A" supplied-air respirators.* A hose mask respirator, for entry into and escape from hazardous atmospheres, which consists of a motor-driven or hand-operated blower that permits the free entrance of air when the blower is not operating, a strong large-diameter hose having a low resistance to airflow, a harness to which the hose and the lifeline are attached and a tight-fitting facepiece.

(2) *Type "AE" supplied-air respirators.* A Type "A" supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, woven wire, sheet metal, or other suitable material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the external surface of such window(s) for cleaning.

(3) *Type "B" supplied-air respirators.* A hose mask respirator, for entry into and escape from atmospheres not immediately dangerous to life or health, which consists of a strong large-diameter hose with low resistance to airflow through which the user draws inspired air by means of his lungs alone, a harness to which the hose is attached, and a tight-fitting facepiece.

(4) *Type "BE" supplied-air respirators.* A type "B" supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, woven wire, sheet metal, or other suitable material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the external surface of such window(s) for cleaning.

(5) *Type "C" supplied-air respirators.* An airline respirator, for entry into and escape from atmospheres not immediately dangerous to life or health, which consists of a source of respirable breathing air, a hose, a detachable coupling, a control valve, orifice, a demand valve or pressure demand valve, an arrangement for attaching the hose to the wearer, and a facepiece, hood, or helmet.

(6) *Type "CE" supplied-air respirators.* A type "C" supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, woven wire, sheet metal, or other suit-

able material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the external surface of such window(s) for cleaning.

§ 11.111 Supplied-air respirators; required components.

(a) Each supplied-air respirator described in § 11.110 shall, where its design requires, contain the following component parts:

(1) Facepiece, hood, or helmet;

(2) Air supply valve, orifice, or demand or pressure-demand regulator;

(3) Hand operated or motor driven air blower;

(4) Air supply hose;

(5) Detachable couplings;

(6) Flexible breathing tube; and

(7) Respirator harness.

(b) The component parts of each supplied-air respirator shall meet the minimum construction requirements set forth in Subpart G of this part.

§ 11.112 Breathing tubes; minimum requirements.

(a) Flexible breathing tubes used in conjunction with supplied-air respirators shall be designed and constructed to prevent:

(1) Restriction of free head movement;

(2) Disturbance of the fit of facepieces, mouthpieces, hoods, or helmets;

(3) Interference with the wearer's activities; and

(4) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 11.113 Harnesses; installation and construction; minimum requirements.

(a) Each supplied-air respirator shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the respirator in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of respirator parts, and where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 11.114 Respirator containers; minimum requirements.

Supplied-air respirators shall be equipped with a substantial, durable container bearing markings which show the applicant's name, the type and commercial designation of the respirator it contains, and all appropriate approval labels.

§ 11.115 Half-mask facepieces, full facepieces, hoods, and helmets; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either (1) by providing more than one facepiece size, or (2) by providing one facepiece size which will fit varying facial shapes and sizes.

(b) Full facepieces shall provide for optional use of corrective spectacles or lenses, which shall not reduce the respiratory protective qualities of the respirator.

(c) Hoods and helmets shall be designed and constructed to fit persons with various head sizes, provide for the optional use of corrective spectacles or lenses, and insure against any restriction of movement by the wearer.

(d) Facepieces, hoods, and helmets shall be designed to prevent eyepiece fogging.

§ 11.116 Facepieces, hoods, and helmets; eyepieces; minimum requirements.

(a) Facepieces, hoods, and helmets shall be designed and constructed to provide adequate vision which is not distorted by the eyepiece.

(b) All eyepieces except those on Types B, BE, C, and CE supplied-air respirators shall be designed and constructed to meet the impact and penetration requirements specified in Federal Specification, Mask, Air Line, and Respirator, Air Filtering, Industrial GGG-M-125d, October 11, 1965.

(c) (1) The eyepieces of AE, BE, and CE type supplied-air respirators shall be shielded by plastic, glass, woven wire, sheet metal, or other suitable material which does not interfere with the vision of the wearer.

(2) Shields shall be mounted and attached to the facepiece to provide easy access to the external surface of the eyepiece for cleaning.

§ 11.117 Inhalation and exhalation valves; check valves; minimum requirements.

(a) Inhalation and exhalation valves shall be provided where necessary and protected against distortion.

(b) Exhalation valves shall be:

(1) Protected against damage and external influence; and

(2) Designed and constructed to prevent inward leakage of contaminated air.

(c) Check valves designed and constructed to allow airflow toward the facepiece only shall be provided in the connections to the facepiece or in the hose fitting near the facepiece of all Type A,

AE, B, and BE supplied-air respirators.

§ 11.118 Head harnesses; minimum requirements.

Facepieces shall be equipped with adjustable and replaceable head harnesses which are designed and constructed to provide adequate tension during use, and an even distribution of pressure over the entire area in contact with the face.

§ 11.119 Head and neck protection; supplied-air respirators; minimum requirements.

Type AE, BE, and CE supplied-air respirators shall be designed and constructed to provide protection against impact and abrasion from rebounding abrasive materials to the wearer's head and neck.

§ 11.120 Air velocity and noise levels; hoods and helmets; minimum requirements.

Noise levels generated by the respirator will be measured inside the hood or helmet at maximum airflow obtainable within pressure and hose length requirements and shall not exceed 80 dBA.

§ 11.121 Breathing gas; minimum requirements.

(a) Breathing gas used to supply supplied-air respirators shall be respirable breathing air and contain no less than 19.5 volume-percent of oxygen.

(b) Compressed, gaseous breathing air shall meet the applicable minimum grade requirements for Type I gaseous air set forth in the Compressed Gas Association Commodity Specification for Air, G–7.1 (Grade D or higher quality).

(c) Compressed, liquefied breathing air shall meet the applicable minimum grade requirements for Type II liquid air set forth in the Compressed Gas Association Commodity Specification for Air, G–7.1 (Grade B or higher quality).

§ 11.122 Air supply source; hand-operated or motor driven air blowers; Type A supplied-air respirators; minimum requirements.

(a) Blowers shall be designed and constructed to deliver an adequate amount of air to the wearer with either direction of rotation, unless constructed to permit rotation in one direction only, and to permit the free entrance of air to the hose when the blower is not operated.

(b) No multiple systems, whereby more than one user is supplied by one blower, will be approved, unless each hose line is connected directly to a manifold at the blower.

§ 11.123 Terminal fittings or chambers; Type B supplied-air respirators; minimum requirements.

(a) Blowers or connections to air supplies providing positive pressures shall not be approved for use on Type B supplied-air respirators.

(b) Terminal fittings or chambers employed in Type B supplied-air respirators, shall be:

(1) Installed in the inlet of the hose;

(2) Designed and constructed to provide for the drawing of air through corrosion resistant material arranged so as to be capable of removing material larger than 0.149 mm. in diameter (149 micrometers, 100-mesh, U.S. Standard sieve).

(3) Installed to provide a means for fastening or anchoring the fitting or chamber in a fixed position in a zone of respirable air.

§ 11.124 Supplied-air respirators; performance requirements; general.

Supplied-air respirators and the individual components of each such device shall, as appropriate, meet the requirements for performance and protection specified in the tests described in §§ 11.124–1 through 11.124–24.

§ 11.124–1 Hand-operated blower test; minimum requirements.

(a) Hand-operated blowers shall be tested by attaching them to a mechanical drive and operating them 6 to 8 hours daily for a period of 100 hours at a speed necessary to deliver 50 liters of air per minute through each completely assembled respirator. Each respirator shall be equipped with the maximum length of hose with which the device is to be approved and the hose shall be connected to each blower or manifold outlet designed for hose connections.

(b) The crank speed of the hand-operated blower shall not exceed 50 revolutions per minute in order to deliver the required 50 liters of air per minute to each facepiece.

(c) The power required to deliver 50 liters of air per minute to each wearer through the maximum length of hose shall not exceed one-fiftieth horsepower, and the torque shall not exceed a force of 2.3 kg. (5 pounds) on a 20 cm. (8-inch) crank, as defined in § 11.124–3.

(d) The blower shall operate throughout the period without failure or indication of excessive wear of bearings or other working parts.

§ 11.124–2 Motor-operated blower test; minimum requirements.

(a) Motor-operated blowers shall be tested by operating them at their specified running speed 6 to 8 hours daily for a period of 100 hours when assembled with the kind and maximum length of hose for which the device is to be approved and when connected to each blower or manifold outlet designed for hose connections

(b) The connection between the motor and the blower shall be so constructed that the motor may be disengaged from the blower when the blower is operated by hand.

(c) The blower shall operate throughout the period without failure or indication of excessive wear of bearings or other working parts.

(d) Where a blower, which is ordinarily motor driven, is operated by hand, the power required to deliver 50 liters of air per minute to each wearer through the maximum length of hose shall not exceed one-fiftieth horsepower, and the torque shall not exceed a force of 2.3 kg. (5 pounds) on a 20 cm. (8-inch) crank, as defined in § 11.124–3.

(e) Where the respirator is assembled with the facepiece and 15 m. (50 feet) of the hose for which it is to be approved, and when connected to one outlet with all other outlets closed and operated at a speed not exceeding 50 revolutions of the crank per minute, the amount of air delivered into the respiratory-inlet covering shall not exceed 150 liters per minute.

§ 11.124–3 Method of measuring the power and torque required to operate blowers.

As shown in Figure 1, the blower crank is replaced by a wooden drum, *a* (13 cm. (5 inches) in diameter is convenient). This drum is wound with about 12 m. (40 feet) of No. 2 picture cord, *b*. A weight, *c*, of sufficient mass to rotate the blower at the desired speed is suspended from this wire cord. A mark is made on the cord about 3 to 4.5 m. (10 to 15 feet) from the weight, *c*. Another mark is placed at a measured distance (6–9 m./20–30 feet is convenient) from the first. These are used to facilitate timing. To determine the torque or horsepower required to operate the blower, the drum is started in rotation manually at or slightly above the speed at which the power measurement is to be made. The blower is then permitted to assume constant speed, and then as the first mark on the wire leaves the drum, a stopwatch is started. The watch is stopped when the second mark leaves the drum. From these data the foot-pounds per minute and the torque may be calculated.

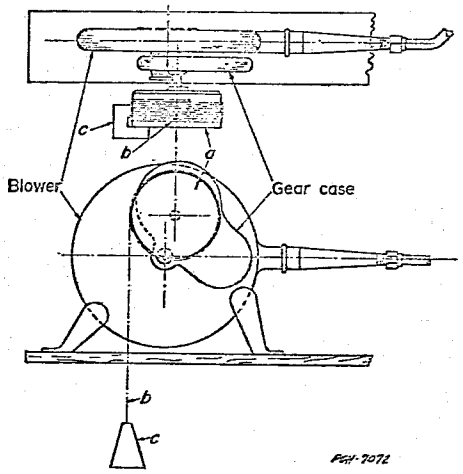

Figure 1.—Apparatus for measuring power required to operate blower. (30 CFR Part 11, Subpart J, § 11.124–3)

§ 11.124–4 Type B supplied-air respirator; minimum requirements.

No Type B supplied-air respirator shall be approved for use with a blower or with connection to an air supply device at positive pressures.

§ 11.124–5 Type C supplied-air respirator, continuous flow class; minimum requirements.

(a) Respirators tested under this section shall be approved only when they supply respirable air at the pressures and quantities required.

(b) The pressure at the inlet of the hose connection shall not exceed 863 kN/m². (125 pounds per square inch gage).

(c) Where the pressure at any point in the supply system exceeds 863 kN/m.² (125 pounds per square inch gage), the respirator shall be equipped with a pressure-release mechanism that will prevent the pressure at the hose connection from exceeding 863 kN/m.² (125 pounds per square inch gage) under any conditions.

§ 11.124–6 Type C supplied-air respirator, demand and pressure demand class; minimum requirements.

(a) Respirators tested under this section shall be approved only when used to supply respirable air at the pressures and quantities required.

(b) The manufacturer shall specify the range of air pressure at the point of attachment of the air-supply hose to the air-supply system, and the range of hose length for the respirator. For example,

he might specify that the respirator be used with compressed air at pressures ranging from 280–550 kN/m.² (40 to 80 pounds per square inch) with from 6 to 76 m. (15 to 250 feet) of air-supply hose.

(c) The specified air pressure at the point of attachment of the hose to the air-supply system shall not exceed 863 kN/m.² (125 pounds per square inch gage).

(d) (1) Where the pressure in the air-supply system exceeds 863 kN/m.² (125 pounds per square inch gage), the respirator shall be equipped with a pressure-release mechanism that will prevent the pressure at the point of attachment of the hose to the air-supply system from exceeding 863 kN/m.² (125 pounds per square inch gage).

(2) The pressure-release mechanism shall be set to operate at a pressure not more than 20 percent above the manufacturer's highest specified pressure. For example, if the highest specified pressure is 863 kN/m.² (125 pounds per square inch), the pressure-release mechanism would be set to operate at a maximum of 1,035 kN/m.² (150 pounds per square inch).

§ 11.124–7 Air-supply line tests; minimum requirements.

Air supply lines employed on Type A, Type B, and Type C supplied-air respirators shall meet the minimum test requirements set forth in Table 8.

§ 11.124–8 Harness test; minimum requirements.

(a) (1) Shoulder straps employed on Type A supplied-air respirators shall be tested for strength of material, joints, and seams and must separately withstand a pull of 113 kg. (250 pounds) for 30 minutes without failure.

(2) Belts, rings, and attachments for life lines must withstand a pull of 136 kg. (300 pounds) for 30 minutes without failure.

(3) The hose shall be firmly attached to the harness so as to withstand a pull of 113 kg. (250 pounds) for 30 minutes without separating, and the hose attachments shall be arranged so that the pull or drag of the hose behind an advancing wearer does not disarrange the harness or exert pull upon the facepiece.

(4) The arrangement and suitability of all harness accessories and fittings will be considered.

(b) (1) The harness employed on Type B supplied-air respirators shall not be uncomfortable, disturbing, or interfere with the movements of the wearer.

(2) The harness shall be easily adjustable to various sizes.

(3) The hose shall be attached to the harness in a manner that will withstand a pull of 45 kg. (100 pounds) for 30 minutes without separating or showing signs of failure.

(4) The design of the harness and attachment of the line shall permit dragging the maximum length of hose considered for approval over a concrete floor without disarranging the harness or exerting a pull on the facepiece.

(5) The arrangement and suitability of all harness accessories and fittings will be considered.

(c) The harness employed on Type C respirators shall be similar to that required on the Type B respirator, or, it may consist of a simple arrangement for attaching the hose to a part of the wearer's clothing in a practical manner that prevents a pull equivalent to dragging the maximum length of the hose over a concrete floor from exerting pull upon the respiratory-inlet covering.

(d) Where supplied-air respirators have a rigid or partly rigid head covering, a suitable harness shall be required to assist in holding this covering in place.

§ 11.124–9 Breathing tube test; minimum requirements.

(a) (1) Type A and Type B supplied-air respirators shall employ one or two flexible breathing tubes of the nonkinking type which extend from the facepiece to a connecting hose coupling attached to the belt or harness.

(2) The breathing tubes employed shall permit free head movement, insure against closing off by kinking or by chin or arm pressure, and they shall not create a pull that will loosen the facepiece or disturb the wearer.

(b) Breathing tubes employed on Type C supplied-air respirators of the continuous flow class shall meet the minimum requirements set forth in paragraph (a) of this section, however, an extension of the connecting hose may be employed in lieu of the breathing tubes required.

(c) (1) A flexible, nonkinking type breathing tube shall: (i) Be employed on Type C supplied-air respirators of the demand and pressure-demand class; and (ii) extend from the facepiece to the demand or pressure-demand valve, except where the valve is attached directly to the facepiece.

(2) The breathing tube shall permit free head movement, insure against closing off by kinking or by chin or arm pressure, and shall not create a pull that will loosen the facepiece or disturb the wearer.

TABLE 8.—AIR-SUPPLY-LINE REQUIREMENTS AND TESTS

(30 CFR Part 11, Subpart J, § 11.124-7)

Specific requirements	Requirements for the air-supply lines of the indicated type of supplied-air respirators		
	Type A	Type B	Type C
Length of hose	Maximum of 91 m. (300 feet), in multiples of 7.6 m. (25 feet).	Maximum of 23 m. (75 feet) in multiples of 7.6 m. (25 feet).	Maximum of 91 m. (300 feet) in multiples of 7.6 m. (25 feet). It will be permissible for the applicant to supply hose of the approved type of shorter length than 7.6 m. (25 feet) provided it meets the requirements of the part.
Air flow	None	None	The air-supply hose with air regulating valve or orifice shall permit a flow of not less than 115 liters (4 cubic feet) per minute to tight-fitting and 170 liters (6 cubic feet) per minute to loose-fitting respiratory-inlet coverings through the maximum length of hose for which approval is granted and at the minimum specified air-supply pressure. The maximum flow shall not exceed 425 liters (15 cubic feet) per minute at the maximum specified air-supply pressure with the minimum length of hose for which approval is granted. The air-supply hose, detachable coupling, and demand valve of the demand class or pressure-demand valve of the pressure-demand class for Type C supplied-air respirators, demand and pressure-demand classes, shall be capable of delivering respirable air at a rate of not less than 115 liters (4 cubic feet) per minute to the respiratory-inlet covering at an inhalation resistance not exceeding 50 millimeters (2 inches) of water-column height measured in the respiratory-inlet covering with any combination of air-supply pressure and length of hose within the applicant's specified range of pressure and hose length. The air-flow rate and resistance to inhalation shall be measured while the demand or pressure-demand valve is actuated 20 times per minute by a source of intermittent suction. The maximum rate of flow to the respiratory-inlet covering shall not exceed 425 liters (15 cubic feet) per minute under the specified operating conditions.
Air-regulating valve.	None	None	If an air-regulating valve is provided, it shall be so designed that it will remain at a specific adjustment, which will not be affected by the ordinary movement of the wearer. The valve must be so constructed that the air supply with the maximum length of hose and at the minimum specified air-supply pressure will not be less than 115 liters (4 cubic feet) of air per minute to tight-fitting and 170 liters (6 cubic feet) of air per minute of loose-fitting respiratory inlet coverings for any adjustment of the valve. If a demand or pressure-demand valve replaces the air-regulating valve, it shall be connected to the air-supply at the maximum air pressure for which approval is sought by means of the minimum length of air-supply hose for which approval is sought. The outlet of the demand or pressure-demand valve shall be connected to a source of intermittent suction so that the demand or pressure-demand valve is actuated approximately 20 times per minute for a total of 100,000 inhalations. To expedite this test, the rate of actuation may be increased if mutually agreeable to the applicant and the Bureau. During this test the valve shall function without failure and without excessive wear of the moving parts. The demand or pressure-demand valve shall not be damaged in any way when subjected at the outlet to a pressure or suction of 25 cm. (10 inches) of water gage for 2 minutes.
Noncollapsibility.	The hose shall not collapse or exhibit permanent deformation when a force of 90 kg. (200 pounds) is applied for 5 minutes between 2 planes 7.6 cm. (3 inches) wide on opposite sides of the hose.	Same as Type A	None.

TABLE 8.—AIR-SUPPLY-LINE REQUIREMENTS AND TESTS—Continued

(30 CFR Part 11, Subpart J, § 11.124-7)

Specific requirements	Requirements for the air-supply lines of the indicated types of supplied-air respirators		
	Type A	Type B	Type C
Nonkinkability.	None	None	A 7.6 m. (25 foot) section of the hose will be placed on a horizontal-plane surface and shaped into a one-loop coil with one end of the hose connected to an airflow meter and the other end of the hose supplied with air at the minumim specified supply pressure. The connection shall be in the plane of the loop. The other end of the hose will be pulled tangentially to the loop and in the plane of the loop until the hose straightens. To meet the requirements of this test the loop shall maintain a uniform near-circular shape and ultimately unfold as a spiral, without any localized deformation that decreases the flow of air to less than 90 percent of the flow when the hose is tested while remaining in a straight line.
Strength of hose and couplings.	Hose and couplings shall not separate or fail when tested with a pull of 113 kg. (250 pounds) for 5 minutes.	Same as Type A	Hose and couplings shall not exhibit any separation or failure when tested with a pull of 45 kg. (100 pounds) for 5 minutes and when tested by subjecting them to an internal air pressure of 2 times the maximum respirator-supply pressure that is specified by the applicant or at 173 kN/m.² (25 pounds per square inch) gage, whichever is higher.
Tightness	No air leakage shall occur when the hose and couplings are joined and the joint(s) are immersed in water and subjected to an internal air pressure of 35 kN/m.² (5 pounds per square inch) gage.	None	Leakage of air exceeding 50 cc. per minute at each coupling shall not be permitted when the hose and couplings are joined and are immersed in water, with air flowing through the respirator under a pressure of 173 kN/m.² (25 pounds per square inch) gage applied to the inlet end of the air-supply hose, or at twice the maximum respirator-supply pressure that is specified by the applicant, whichever is higher.
Permeation of hose by gasoline.	The permeation of the hose by gasoline will be tested by immersing 7.6 m. (25 feet) of hose and one coupling in gasoline, with air flowing through the hose at the rate of 8 liters per minute for 6 hours. The air from the hose shall not contain more than 0.01 percent by volume of gasoline vapor at the end of the test.	Same as for Type A.	Same as for Type A, except the test period shall be 1 hour.
Detachable coupling.	None	None	A hand-operated detachable coupling by which the wearer can readily attach or detach the connecting hose shall be provided at a convenient location. This coupling shall be durable, remain connected under all conditions of normal respirator use, and meet the prescribed tests for strength and tightness of hose and couplings.

§ 11.124–10 Airflow resistance test, Type A and Type AE supplied-air respirators; minimum requirements.

(a) Airflow resistance will be determined when the respirator is completely assembled with the respiratory-inlet covering, the air-supply device, and the maximum length of air-supply hose coiled for one-half its length in loops 1.5 to 2.1 m. (5 to 7 feet) in diameter.

(b) The inhalation resistance, drawn at the rate of 85 liters (3 cubic feet) per minute when the blower is not operating or under any practical condition of blower operation shall not exceed the following amounts:

Maximum length of hose for which respirator is approved		Maximum resistance, water column height	
Feet	Meters	Inches	Millimeters
75	23	1.5	38
150	46	2.5	64
250	76	3.5	89
300	91	4.0	102

(c) The exhalation resistance shall not exceed 25 mm. (1 inch) of water-column height at a flow rate of 85 liters (3 cubic feet) per minute when the blower is not operating or under any practical condition of blower operation.

§ 11.124–11 Airflow resistance test; Type B and Type BE supplied-air respirators; minimum requirements.

(a) Airflow resistance shall be determined when the respirator is completely assembled with the respiratory-inlet covering and the hose in the maximum length to be considered for approval, coiled in loops 1.5 to 2.1 m. (5 to 7 feet) in diameter.

(b) Airflow resistance shall not exceed 38 mm. (1.5 inches) of water-column height to air drawn at the flow rate of 85 liters (3 cubic feet) per minute.

(c) The exhalation resistance shall not exceed 25 mm. (1 inch) of water-column height at this flow rate.

§ 11.124–12 Airflow resistance test; Type C supplied-air respirator, continuous flow class and Type CE supplied-air respirator; minimum requirements.

The resistance to air flowing from the respirator shall not exceed 25 mm. (1 inch) of water-column height when the air flow into the respiratory-inlet covering is 115 liters (4 cubic feet) per minute.

§ 11.124–13 Airflow resistance test; Type C supplied-air respirator, demand class; minimum requirements.

(a) Inhalation resistance shall not exceed 50 millimeters (2 inches) of water at an air flow of 115 liters (4 cubic feet) per minute.

(b) The exhalation resistance to a flow of air at a rate of 85 liters (3 cubic feet) per minute shall not exceed 25 millimeters (1 inch) of water.

§ 11.124–14 Airflow resistance test; Type C supplied-air respirator, pressure-demand class; minimum requirements.

(a) The static pressure in the facepiece shall not exceed 38 mm. (1.5 inches) of water-column height.

(b) The pressure in the facepiece shall not fall below atmospheric at inhalation airflows less than 115 liters (4 cubic feet) per minute.

(c) The exhalation resistance to a flow of air at a rate of 85 liters (3 cubic feet) per minute shall not exceed the static pressure in the facepiece by more than 51 mm. (2 inches) of water-column height.

§ 11.124–15 Exhalation valve leakage test.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

§ 11.124–16 Man tests for gases and vapors: supplied-air respirators; general performance requirements.

(a) Wearers will enter a chamber containing a gas or vapor as prescribed in §§ 11.124–17, 11.124–18, 11.124.19, and 11.124–20.

(b) Each wearer will spend 10 minutes in work to provide observations on freedom of the device from leakage. The freedom and comfort allowed the wearer will also be considered.

(c) Time during the test period will be divided as follows:

(1) *Five minutes.* Walking, turning head, dipping chin; and

(2) *Five minutes.* Pumping air with a tire pump into a 28-liter (1 cubic foot) container, or equivalent work.

(d) No odor of the test gas or vapor shall be detected by the wearer in the air breathed during any such test, and the wearer shall not be subjected to any undue discomfort or encumbrance because of the fit, air delivery, or other features of the respirator during the testing period.

§ 11.124–17 Man test for gases and vapors; Type A and Type AE respirators; test requirements.

(a) The completely assembled respirator will be worn in a chamber containing 0.1 ±0.025 percent isoamyl acetate vapor, and the blower, the intake of the hose, and not more than 25 percent of the hose length will be located in isoamyl acetate-free air.

(b) The man in the isoamyl acetate atmosphere will draw his inspired air through the hose, connections, and all parts of the air device by means of his lungs alone (blower not operating).

(c) The 10-minute work test will be repeated with the blower in operation at any practical speed up to 50 revolutions of the crank per minute.

§ 11.124–18 Man test for gases and vapors; Type B and Type BE respirators; test requirements.

(a) The completely assembled respirator will be worn in a chamber containing 0.1±0.025 percent isoamyl acetate vapor, and the intake of the hose, and not more than 25 percent of the hose length will be located in isoamyl acetate-free air.

(b) The man in the isoamyl acetate atmosphere will draw his inspired air through the hose and connections by means of his lungs alone.

§ 11.124–19 Man test for gases and vapors; Type C respirators, continuous-flow class and Type CE supplied-air respirators; test requirements.

(a) The completely assembled respirator will be worn in a chamber containing 0.1±0.025 percent isoamyl acetate vapor, the intake of the hose will be connected to a suitable source of respirable air, and not more than 25 percent of the hose length will be located in isoamyl acetate-free air.

(b) The minimum flow of air required to maintain a positive pressure in the respiratory-inlet covering throughout the entire breathing cycle will be supplied to the wearer, provided however, that airflow shall not be less than 115 liters per minute for tight-fitting and not less than 170 liters per minute for loose-fitting respiratory inlet-coverings.

(c) The test will be repeated with the maximum rate of flow attainable within specified operating pressures.

§ 11.124–20 Man test for gases and vapors; Type C supplied-air respirators, demand and pressure-demand classes; test requirements.

(a) The completely assembled respirator will be worn in a chamber containing 0.1±0.025 percent isoamyl acetate vapor, the intake of the hose will be connected to a suitable source of respirable air, and not more than 25 percent of the hose length will be located in isoamyl acetate free air.

(b) The test will be conducted at the minimum pressure with the maximum hose length and will be repeated at the maximum pressure with the minimum hose length.

§ 11.124–21 Tests for protection during abrasive blasting; Type AE, Type BE, and Type CE supplied-air respirators; general performance requirements.

(a) Tests will be made under conditions of typical abrasive blasting operation.

(b) The tests prescribed in §§ 11.124–22, 11.124–23, and 11.124–24 will be conducted under the following conditions:

(1) A suction-feed abrasive blasting outfit will be used by the wearer;

(2) The diameter of the air jet shall be 5 mm. ($\frac{3}{16}$ inch);

(3) Air pressure will be 276–483 kN/m.^{2} (40–70 pounds per square inch);

(4) The abrasive used will contain a composition of 99+ percent free silica (SiO_2);

(5) The size properties of the abrasive used will be a mixture of 90 percent by weight of essentially No. 1 sandblast sand and 10 percent air-floated fines; and

(6) The No. 1 sand used will meet a size specification of not more than 10 percent on a 20-mesh sieve and not more than 10 percent through a 35-mesh sieve; 99+ percent of the fines will be able to pass through a 270-mesh sieve. All size determinations will be made by standard-mesh sieves.

(c) Tests will be conducted for 30 minutes continuously.

(d) (1) The person wearing the respirator will sandblast the inside surface of a common iron kettle of approximate hemispherical shape (about 76 cm. (30 inches) in diameter, and 113.6 liters (30 gallons) capacity).

(2) The kettle will be placed with the plane of the opening inclined 45° from a vertical position and with the lowest point of the rim at about the height of the person's hips.

(3) The wearer will stand at one position in front of the kettle and lean over until the upper part of the body is inclined to parallel the face of the kettle.

(4) The wearer will blast the entire inner surface of the kettle with the blast at all times directed approximately at right angles to the surface with the nozzle of the gun approximately 15 cm. (6 inches) from the surface, and with his head approximately 46 cm. (18 inches) from the nozzle.

(5) The wearer will move his head forward, backward, and sideways during each blasting operation.

(e) (1) Air will be withdrawn continuously during the test at the rate of 32 liters (1.13 cubic feet) per minute from the respiratory-inlet covering at a point as near as convenient to the wearer's nostrils.

(2) Simultaneously air will be drawn at the same rate from the source of intake air to the respirator.

(f) Respirators tested in accordance with §§ 11.124–22, 11.124–23, and 11.124–24 shall meet the following minimum requirements:

(1) The amount of particulate matter in the air withdrawn from the respiratory-inlet covering shall not exceed the amount of particulate matter supplied to the respirator by more than 0.5 mg. for the 30-minute test period;

(2) The wearer of the respirator in this test shall not experience undue encumbrance and discomfort because of the fit, air delivery, or other features of the respirator; and,

(3) The head and shoulder covering shall adequately protect the wearer from discomfort or injury due to impact or abrasion from the rebounding material during the test.

§ 11.124–22 Test for protection during abrasive blasting; Type AE supplied-air respirator; test requirements.

(a) The respirator will be arranged as prescribed in § 11.124–17(a), and the tests prescribed in § 11.124–21 will be performed.

(b) The wearer will draw his inspired air through the hose, connections, and all parts of the air device by means of his lungs alone (blower not operating).

(c) The test will be repeated with the blower in operation at any practical speed up to 50 revolutions per minute of the crank.

§ 11.124–23 Test for protection during abrasive blasting; Type BE supplied-air respirator; test requirements.

(a) The respirator will be arranged as prescribed in § 11.124–18(a), and the tests prescribing in § 11.124–21 will be performed.

(b) The wearer will draw his inspired air through the hose, connections, and all parts of the air device by means of his lungs alone.

§ 11.124–24 Test for protection during abrasive blasting; Type CE supplied-air respirator; test requirements.

(a) The respirator will be arranged as prescribed in § 11.124–19(a), and the tests prescribed in § 11.124–21 will be performed.

Subpart K—Dust, Fume, and Mist Respirators

§ 11.130 Dust, fume, and mist respirators; description.

Dust, fume, and mist respirators, including all completely assembled respirators designed for use as respiratory protection during entry into and escape from hazardous particulate atmospheres which contain adequate oxygen to support life, are described as follows:

(a) Respirators, either with replaceable or reusable filters, designed as respiratory protection against dusts (1) having an air contamination level not less than 0.05 milligram per cubic meter of air, including but not limited to coal, arsenic, cadmium, chromium, lead, and manganese; or (2) dusts having an air contamination level not less than 2 million particles per cubic foot of air, including but not limited to aluminum, flour, iron ore, and free silica, resulting principally from the disintegration of a solid, e.g., dust clouds produced in mining, quarrying, and tunneling, and in dusts produced during industrial operations, such as grinding, crushing, and the general processing of minerals and other materials.

(b) Respirators, with replaceable filters, designed as respiratory protection against fumes of various metals having an air contamination level not less than 0.05 milligram per cubic meter, including but not limited to aluminum, antimony, arsenic, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury (except mercury vapor), and zinc, which result from the sublimation or condensation of their respective vapors, or from the chemical reaction between their respective vapors and gases.

(c) Respirators, with replaceable filters, designed as respiratory protection against mists of materials having an air contamination level not less than 0.05 milligram per cubic meter or 2 million particles per cubic foot, e.g., mists produced by spray coating with vitreous enamels, chromic acid mist produced during chromium plating, and other mists of materials whose liquid vehicle does not produce harmful gases or vapors.

(d) Respirators, with replaceable filters, designed as respiratory protection against dusts, fumes, and mists having an air contamination level less than 0.05 milligram per cubic meter, including but not limited to lithium hydride and beryllium, and against radionuclides.

(e) Respirators, with replaceable filters, designed as respiratory protection against radon daughters, and radon daughters attached to dusts, fumes, and mists.

(f) Respirators, with replaceable filters, designed as respiratory protection against asbestos-containing dusts and mists.

(g) Respirators, with replaceable filters, designed as protection against various combinations of particulate matter.

(h) Single-use dust respirators designed as respiratory protection against pneumoconiosis- and fibrosis-producing dusts, or dusts and mists, including but not limited to aluminum, asbestos, coal, flour, iron ore, and free silica.

(i) The types of dust, fume, and mist respirators in paragraphs (a) through (g) of this section may also be classified according to their design as follows:

(1) Air-purifying respirators; and

(2) Powered air-purifying respirators.

§ 11.131 Dust, fume and mist respirators; required components.

(a) Each dust, fume, and mis respirator described in § 11.130 shall, where its design requires, contain the following component parts:

(1) Facepiece, mouthpiece with noseclip, hood, or helmet;

(2) Filter unit;
(3) Harness;
(4) Attached blower; and
(5) Breathing tube.

(b) The components of each dust, fume, and mist respirator shall meet the minimum construction requirements set forth in Subpart G of this part.

§ 11.132 Breathing tubes; minimum requirements.

(a) Flexible breathing tubes used in conjunction with respirators shall be designed and constructed to prevent:
(1) Restriction of free head movement;
(2) Disturbance of the fit of facepieces, mouthpieces, hoods, or helmets;
(3) Interference with the wearer's activities; and
(4) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 11.133 Harnesses; installation and construction; minimum requirements.

(a) Each respirator shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the respirator in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of respirator parts, and, where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 11.134 Respirator containers; minimum requirements.

(a) Except as provided in paragraph (b) of this section each respirator shall be equipped with a substantial, durable container bearing markings which show the applicant's name, the type of respirator is contains, and all appropriate approval labels.

(b) Containers for single-use respirators may provide for storage of more than one respirator, however, such containers shall be designed and constructed to prevent contamination of respirators which are not removed, and to prevent damage to respirators during transit.

§ 11.135 Half-mask facepieces, full facepieces, hoods, helmets, and mouthpieces; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either: (1) By providing more than one facepiece size, or (2) by providing one facepiece size which will fit varying facial shapes and sizes.

(b) Full facepieces shall provide for optional use of corrective spectacles or lenses, which shall not reduce the respiratory protective qualities of the respirator.

(c) Hoods and helmets shall be designed and constructed to fit persons with various head sizes, provide for the optional use of corrective spectacles or lenses, and insure against any restriction of movement by the wearer.

(d) Mouthpieces shall be equipped with noseclips which are securely attached to the mouthpiece or respirator and provide an airtight seal.

(e) Facepieces, hoods, and helmets shall be designed to prevent eyepiece fogging.

(f) Half-mask facepieces shall not interfere with the fit of common industrial safety corrective spectacles, as determined by the Institute's facepiece tests in §§ 11.140–1 and 11.140–2.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.136 Facepieces, hoods, and helmets; eyepieces; minimum requirements.

Facepieces, hoods, and helmets shall be designed and constructed to provide adequate vision which is not distorted by the eyepieces.

§ 11.137 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be protected against distortion.

(b) Inhalation valves shall be designed and constructed and provided where necessary to prevent excessive exhaled air from adversely affecting filters, except where filters are specifically designed to resist moisture as prescribed in § 11.140–5.

(c) Exhalation valves shall be: (1) Provided where necessary; (2) protected against damage and external influence; and (3) designed and constructed to prevent inward leakage of contaminated air.

§ 11.138 Head harnesses; minimum requirements.

(a) All facepieces shall be equipped with head harnesses designed and constructed to provide adequate tension during use and an even distribution of pressure over the entire area in contact with the face.

(b) Facepiece head harnesses, except those employed on single-use respirators, shall be adjustable and replaceable.

(c) Mouthpieces shall be equipped, where applicable, with adjustable and replaceable harnesses, designed and constructed to hold the mouthpiece in place.

§ 11.139 Air velocity and noise levels; hoods and helmets; minimum requirements.

Noise levels generated by the respirator will be measured inside the hood or helmet at maximum airflow obtainable and shall not exceed 80 dBA.

§ 11.140 Dust, fume, and mist respirators; performance requirements; general.

Dust, fume, and mist respirators and the individual components of each such device shall, as appropriate, meet the requirements for performance and protection specified in the tests described in §§ 11.140–1 through 11.140–12 and prescribed in Tables 9 and 10.

§ 11.140–1 Isoamyl acetate tightness test: dust, fume, and mist respirators designed for respiratory protection against fumes of various metals having an air contamination level not less than 0.05 milligram per cubic meter; minimum requirements.

(a) The respirator will be modified in such a manner that all of the air that normally would be inhaled through the inhalation port(s) is drawn through an efficient activated charcoal-filled canister, or cartridge(s), without interference with the face-contacting portion of the facepiece.

(b) The modified respirator will be worn by persons for at least 2 minutes each in a test chamber containing 100 parts (by volume) of isoamyl-acetate vapor per million parts of air.

(c) The odor of isoamyl-acetate shall not be detected by the wearers of the modified respirator while in the test atmosphere.

§ 11.140–2 Isoamyl acetate tightness test; respirators designed for respiratory protection against dusts, fumes, and mists having an air contamination level less than 0.05 milligram per cubic meter, or against radionuclides; minimum requirements.

(a) The applicant shall provide a charcoal-filled canister or cartridge of a size and resistance similar to the filter unit with connectors which can be attached to the facepiece in the same manner as the filter unit.

(b) (1) The canister or cartridge will be used in place of the filter unit, and persons will each wear a modified half-mask facepiece for 5 minutes in a test chamber containing 100 parts (by volume) of isoamyl-acetate vapor per million parts of air.

(2) The following work schedule will be performed by each wearer in the test chamber:

(i) Two minutes walking, nodding, and shaking head in normal movements; and

(ii) Three minutes exercising and running in place.

(3) The facepiece shall be capable of adjustment, according to the applicant's instructions, to each wearer's face, and the odor of isoamyl-acetate shall not be detectable by any wearer during the test.

(c) Where the respirator is equipped with a full facepiece, hood, helmet, or mouthpiece, the canister or cartridge will be used in place of the filter unit, and persons will each wear the modified respiratory-inlet covering for 5 minutes in a test chamber containing 1,000 parts (by volume) of isoamyl-acetate vapor per million parts of air, performing the work schedule specified in paragraph (b) (2) of this section.

§ 11.140–3 Air-purifying filter tests; performance requirements; general.

Dust, fume, and mist respirators will be tested in accordance with the schedule set forth in Table 10 to determine their effectiveness as protection against the particulate hazards specified therein.

§ 11.140–4 Silica dust test; single-use or reuseable filters; minimum requirements.

(a) Three respirators with single-use filters will be tested for periods of 90 minutes each at a continuous airflow rate of 32 liters per minute for air-purifying respirators, and for periods of 4 hours each at a flowrate not less than 115 liters per minute to tight-fitting facepieces, and not less than 170 liters per minute to loose-fitting hoods and helmets for powered air-purifying respirators.

(b) The relative humidity in the test chamber will be 20–80 percent, and the room temperature approximately 25° C.

(c) The test suspension in the chamber will not be less than 50 nor more than 60 milligrams of flint (99+ percent free silica) per cubic meter of air.

(d) The flint in suspension will be ground to pass 99+ percent through a 270-mesh sieve.

(e) The particle-size distribution of the test suspension will have a geometric mean of 0.4 to 0.6 micrometer, and the standard geometric deviation will not exceed 2.

(f) The total amount of unretained test suspension in samples taken during testing shall not exceed 1.5 milligrams for an air-purifying respirator, 14.4 milligrams for a powered air-purifying respirator with tight-fitting facepiece, and 21.3 milligrams for a powered air-purifying respirator with loose-fitting hood or helmet.

(g) Three respirators with reusable filters will be tested and shall meet the requirements specified in paragraphs (a) through (f) of this section; each filter shall be tested three times: Once as received; once after cleaning; and once after recleaning. The applicant's instructions shall be followed for each cleaning.

§ 11.140–5 Silica-dust test; single-use dust respirators; minimum requirements.

(a) Three respirators will be tested.

(b) As described in § 11.140–4, airflow will be cycled through the respirator by a breathing machine at the rate of 24 respirations per minute with a minute volume of 40 liters; a breathing machine cam with a work rate of 622 kg.-m.²/minute shall be used.

(c) Air exhaled through the respirator will be 35° ±2° C. (95° ±3° F.) with 94 ±3 percent relative humidity.

(d) Air inhaled through the respirator will be sampled and analyzed for respirator leakage.

(e) The total amount of unretained test suspension, after drying, in samples taken during testing, shall not exceed 1.8 milligrams for any single test.

§ 11.140–6 Lead fume test; minimum requirements.

(a) Three respirators will be tested for a period of 312 minutes each at a continuous airflow rate of 32 liters per minute for air-purifying respirators, and for periods of 4 hours each at a flow rate not less than 115 liters per minute to tight-fitting facepieces, and not less than 170 liters per minute to loose-fitting hoods and helmets for powered air-purifying respirators.

(b) The relative humidity in the test chamber will be 20–80 percent, and the room temperature approximately 25° C.

(c) The test suspension in the test chamber will not be less than 15 nor more than 20 milligrams of freshly generated lead-oxide fume, calculated as lead (Pb), per cubic meter of air.

(d) The fume will be generated by impinging an oxygen-gas flame on molten lead.

(e) Samples of the test suspension will be taken during each test period for analysis.

(f) The total amount of unretained test suspension in the samples taken during testing, which is analyzed and calculated as lead (Pb), shall not exceed 1.5 milligrams of lead for an air-purifying respirator, 4.2 milligrams of lead for a powered air-purifying respirator with tight-fitting facepiece, and 6.2 milligrams of lead for a powered air-purifying respirator with loose-fitting hood or helmet.

§ 11.140–7 Silica mist test; minimum requirements.

(a) Three respirators will be tested for a period of 312 minutes each at a continuous airflow rate of 32 liters per minute for air-purifying respirators, and for periods of 4 hours each at a flow rate not less than 115 liters per minute to tight-fitting facepieces, and not less than 170 liters per minute to loose-fitting hoods and helmets for powered air-purifying respirators.

(b) The room temperature in the test chamber will be approximately 25° C.

(c) The test suspension in the test chamber will not be less than 20 nor more than 25 milligrams of silica mist, weighed as silica dust, per cubic meter of air.

(d) Mist will be produced by spraying an aqueous suspension of flint (99+ percent free silica), and the flint shall be ground to pass 99+ percent through a 270-mesh sieve.

(e) Samples of the test suspension will be taken during each test period for analysis.

(f) The total amount of silica mist unretained in the samples taken during testing, weighed as silica dust, shall not exceed 2.5 milligrams for an air-purifying respirator, 6.9 milligrams for a powered air-purifying respirator with tight-fitting facepiece, and 10.2 milligrams for a powered air-purifying respirator with loose-fitting hood or helmet.

§ 11.140–8 Tests for respirators designed for respiratory protection against more than one type of dispersoid; minimum requirements.

Respirators designed as respiratory protection against more than one particulate hazard (dust, fume, or mist) shall comply with all the requirements of this part, with respect to each of the specific hazards involved.

§ 11.140–9 Airflow resistance tests; all dust, fume, and mist respirators; minimum requirements.

(a) Resistance to airflow will be measured in the facepiece, mouthpiece, hood, or helmet of a dust, fume, or mist respirator mounted on a test fixture with air flowing at a continuous rate of 85 liters per minute, both before and after each test conducted in accordance with §§ 11.140–4 through 11.140–7.

(b) The maximum allowable resistance requirements for dust, fume, and mist respirators are as follows:

MAXIMUM RESISTANCE
(mm. water-column height)

Type of respirator	Initial Inhalation	Final Inhalation	Exhalation
Single-use	12	15	15
Dust, fume, and mist, with single-use filter	30	50	20
Dust, fume, and mist, with reusable filter	20	40	20
Radon daughter	18	[1] 25	15
Asbestos dust and mist	18	25	15

[1] Measured after silica dust test described in § 11.140–4

§ 11.140–10 Exhalation valve leakage test; minimum requirements.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

§ 11.140–11 DOP filter test; respirators designed as respiratory protection against dusts, fumes, and mists having an air contamination level less than 0.05 milligram per cubic meter and against radionuclides; minimum requirements.

(a) All single air-purifying respirator filter units will be tested in an atmosphere concentration of 100 micrograms of DOP per liter of air at continuous flow rates of 32 and 85 liters per minute for a period of 5 to 10 seconds.

(b) Where filters are to be used in pairs, the flow rates will be 16 and 42.5 liters per minute, respectively, through each filter.

(c) The filter will be mounted on a connector in the same manner as used on the respirator, and the total leakage for the connector and filter shall not exceed 0.03 percent of the ambient DOP concentration at either flow rate.

§ 11.140–12 Silica dust loading test; respirators designed as protection against dusts, fumes, and mists having an air contamination level less than 0.05 milligram per cubic meter and against radionuclides; minimum requirements.

Three respirators will be tested in accordance with the provisions of § 11.140–4 and shall meet the minimum requirements of §§ 11.140–4 and 11.140.9.

TABLE 9.—FACEPIECE TEST REQUIREMENTS
(30 CFR Part 11, Subpart K, § 11.140–1, et seq.)

Respirator types	Pressure tightness test [1]	Isoamyl acetate test	
		11.140–1	11.140–2
Dusts: Air Contamination Level not less than 0.05 mg/M³ or 2 mppcf	X		
Fumes: Air Contamination Level not less than 0.05 mg/M³	X	X	
Mists: Air Contamination Level not less than 0.05 mg/M³ or 2 mppcf	X		
Dusts, Fumes, and Mists: Air Contamination Level less than 0.05 mg/M³ or 2 mppcf, and radionuclides	X		X
Radon daughters	X	X	
Asbestos-containing dusts and mists	X		

[1] Test is required only where applicable.

TABLE 10—AIR-PURIFYING AND POWERED AIR-PURIFYING RESPIRATOR FILTER TESTS REQUIRED FOR APPROVAL
(30 CFR Part 11, Subpart K, § 11.140–4, et seq.)

Respirator types	Silica dust tests			Lead fume test	Silica mist test	DOP test
	11.140–4	11.140–5	11.140–12	11.140–6	11.140–7	11.140–11
Dusts: Air Contamination Level not less than 0.05 mg/M³ or 2 mppcf.	X					
Fumes: Air Contamination Level not less than 0.05 mg/M³.				X		
Mists: Air Contamination Level not less than 0.05 mg/M³ or 2 mppcf.					X	
Dusts, Fumes, and Mists: Air Contamination Level less than 0.05 mg/M³ or 2 mppcf, and radionuclides.			X			X
Radon daughters	X[1]			X[3]		
Asbestos-containing dusts and mists	X[1]				X[3]	
Single-use dust and mist respirators		X[3]			X[3]	

[1] For resistance only.
[2] For penetration only.
[3] Test required only where applicable.

Subpart L—Chemical Cartridge Respirators

§ 11.150 Chemical cartridge respirators; description.

Chemical cartridge respirators including all completely assembled respirators which are designed for use as respiratory protection during entry into or escape from atmospheres not immediately dangerous to life and health, are described according to the specific gases or vapors against which they are designed to provide respiratory protection, as follows:

Type of chemical cartridge respirator:	*Maximum use concentration, parts per million*
Ammonia	300
Chlorine	10
Hydrogen chloride	50
Methyl amine	100
Organic vapor[7]	[8] 1,000
Sulfur dioxide	50

[7] Not for use against organic vapors with poor warning properties or those which generate high heats of reaction with sorbent material in the cartridge.

[8] Maximum use concentrations are lower for organic vapors which produce atmospheres immediately hazardous to life or health at concentrations equal to or lower than this concentration.

NOTE: Chemical cartridge respirators for respiratory protection against gases or vapors, which are not specifically listed with their maximum use concentration except pesticides, may be approved if the applicant submits a request for such approval, in writing, to the Institute. The Bureau and the Institute shall consider each such application and accept or reject the application after a review of the effects on the wearer's health and safety and in the light of any field experience in use of chemical cartridge respirators as protection against such hazards.

[37 FR 6242, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.151 Chemical cartridge respirators; required components.

(a) Each chemical cartridge respirator described in § 11.150 shall, where its design requires, contain the following component parts:

(1) Facepiece, mouthpiece, and noseclip, hood, or helmet;

(2) Cartridge;

(3) Cartridge with filter;

(4) Harness;

(5) Breathing tube; and

(6) Attached blower.

(b) The components of each chemical cartridge respirator shall meet the minimum construction requirements set forth in Subpart G of this part.

§ 11.152 Cartridges in parallel; resistance requirements.

Where two or more cartridges are used in parallel, their resistance to airflow shall be essentially equal.

§ 11.153 Cartridges; color and markings; requirements.

The color and markings of all cartridges or labels shall conform with the requirements of the American National Standard for Identification of Gas Mask Canisters, K13.1, obtainable from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

§ 11.154 Filters used with chemical cartridges; location; replacement

(a) Particulate matter filters used in conjunction with a chemical cartridge shall be located on the inlet side of the cartridge.

(b) Filters shall be incorporated in or firmly attached to the cartridge and each filter assembly shall, where applicable, be designed to permit its easy removal from and replacement on the cartridge.

§ 11.155 Breathing tubes; minimum requirements.

(a) Flexible breathing tubes used in conjunction with respirators shall be designed and constructed to prevent:

(1) Restriction of free head movement;

(2) Disturbance of the fit of facepieces, mouthpieces, hoods, or helmets;

(3) Interference with the wearer's activities; and

(4) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 11.156 Harnesses; installation and construction; minimum requirements.

(a) Each respirator shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the respirator in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of respirator parts and, where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 11.157 Respirator containers; minimum requirements.

Respirators shall be equipped with a substantial, durable container bearing markings which show the applicant's name, the type and commercial designation of the respirator it contains and all appropriate approval labels.

§ 11.158 Half-mask facepieces, full facepieces, mouthpieces, hoods, and helmets; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either: (1) By providing more than one facepiece size, or (2) by providing one facepiece size which will fit varying facial shapes and sizes.

(b) Hoods and helmets shall be designed and constructed to fit persons with various head sizes, provide for the optional use of corrective spectacles or lenses, and insure against any restriction of movement by the wearer.

(c) Mouthpieces shall be equipped with noseclips which are securely attached to the mouthpiece or respirator and provide an airtight fit.

(d) Full facepieces shall provide for optional use of corrective spectacles or lenses which shall not reduce the respiratory protective qualities of the respirator.

(e) Facepieces, hoods, and helmets shall be designed to prevent eyepiece fogging.

§ 11.158–1 Facepieces, hoods, and helmets; eyepieces; minimum requirements.

Facepieces, hoods, and helmets shall be designed and constructed to provide adequate vision which is not distorted by the eyepieces.

§ 11.159 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be provided where necessary and protected against distortion.

(b) Inhalation valves shall be designed and constructed to prevent excessive exhaled air from entering cartridges or adversely affecting canisters.

(c) Exhalation valves shall be: (1) Protected against damage and external influence, and (2) designed and constructed to prevent inward leakage of contaminated air.

§ 11.160 Head harnesses; minimum requirements.

(a) Facepieces shall be equipped with adjustable and replaceable head harnesses designed and constructed to provide adequate tension during use and an even distribution of pressure over the entire area in contact with the face.

(b) Mouthpieces shall be equipped where applicable, with an adjustable and replaceable harness designed and constructed to hold the mouthpiece in place.

§ 11.161 Air velocity and noise levels; hoods and helmets; minimum requirements.

Noise levels generated by the respirator will be measured inside the hood or helmet at maximum airflow obtainable and shall not exceed 80 dBA.

§ 11.162 Chemical cartridge respirators; performance requirements; general.

Chemical cartridge respirators and the individual components of each such device shall, as appropriate, meet the minimum requirements for performance and protection specified in the tests described in §§ 11.162–1 through 11.162–8.

§ 11.162–1 Breathing resistance test; minimum requirements.

(a) Resistance to airflow will be measured in the facepiece, mouthpiece, hood, or helmet of a chemical cartridge respirator mounted on a test fixture with air flowing at a continuous rate of 85 liters per minute, both before and after each test conducted in accordance with §§ 11.162–5 through 11.162–8.

(b) The maximum allowable resistance requirements for chemical cartridge respirators are as follows:

MAXIMUM RESISTANCE
(mm. water-column height)

Type of chemical cartridge respirator	Inhalation		Exhalation
	Initial	Final [1]	
For gases, vapors, or gases and vapors	40	45	20
For gases, vapors, or gases and vapors, and dusts, fumes, and mists	50	70	20
For gases, vapors, or gases and vapors, and mists of paints, lacquers, and enamels	50	70	20

[1] Measured at end of service life specified in Table 11.

§ 11.162–2 Exhalation valve leakage test; minimum requirements.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

§ 11.162–3 Facepiece test; minimum requirements.

(a) The complete chemical cartridge respirator will be fitted to the faces of persons having varying facial shapes and sizes.

(b) Where the applicant specifies a facepiece size or sizes for the respirator together with the approximate measurement of faces they are designed to fit, the

Institute will provide test subjects to suit such facial measurements.

(c) Any chemical cartridge respirator part which must be removed to perform the facepiece or mouthpiece fit test shall be replaceable without special tools and without disturbing facepiece or mouthpiece fit.

(d) The facepiece or mouthpiece fit test using the positive or negative pressure recommended by the applicant and described in his instructions will be used before each test.

(e) (1) Each wearer will enter a chamber containing 100 p.p.m. isoamyl acetate vapor for half-mask facepieces, and 1,000 p.p.m. for full facepieces, mouthpieces, hoods, and helmets.

(2) The facepiece or mouthpiece may be adjusted, if necessary, in the test chamber before starting the test.

(3) Each wearer will remain in the chamber for 8 minutes while performing the following activities:

(i) Two minutes, nodding and turning head;

(ii) Two minutes, calisthenic arm movements;

(iii) Two minutes, running in place; and

(iv) Two minutes, pumping with a tire pump into a 28-liter (1 cubic-foot) container.

(4) Each wearer shall not detect the odor of isoamyl-acetate vapor during the test.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.162–4 Lacquer and enamel mist tests; respirators with filters; minimum requirements; general.

(a) Three respirators with cartridges containing or having attached to them, filters for protection against mists of paints, lacquers, and enamels shall be tested in accordance with the provisions of § 11.162–8.

(b) In addition to the test requirements set forth in paragraph (a) of this section, three such respirators will be tested against each aerosol in accordance with the provisions of §§ 11.162–5 and 11.162–6.

§ 11.162–5 Lacquer mist test; minimum requirements.

(a) Temperature in the test chamber will be approximately 25° C.

(b) Continuous airflow through the respirator will be 32 liters per minute for air-purifying respirators, and not less than 115 liters per minute to tight fitting facepieces and 170 liters per minute to loose-fitting hoods and helmets of powered air-purifying respirators.

(c) Airflow through the chamber will be 20–25 air changes per minute.

(d) The atomizer employed will be a No. 64–5 nozzle with setup 3, or equivalent, operating at 69 kN/m². (10 pounds per square inch gage).

(e) The test aerosol will be prepared by atomizing a mixture of one volume of clear cellulose nitrate lacquer and one volume of lacquer thinner.

(f) The lacquer used will conform essentially to Federal Specification TT–L–31, October 7, 1953.

(g) The concentration of cellulose nitrate in the test aerosol will be 95–125 milligrams per cubic meter.

(h) The test aerosol will be drawn to each respirator for a total of 156 minutes for air-purifying respirators and 240 minutes for powered air-purifying respirators.

(i) The total amount of unretained mist in the samples taken during testing, weighed as cellulose nitrate, shall not exceed 5 milligrams for an air-purifying respirator, 28 milligrams for a powered air-purifying respirator with tight-fitting facepiece, and 41 milligrams for a powered air-purifying respirator with loose-fitting hood or helmet.

§ 11.162–6 Enamel mist test; minimum requirements.

(a) Temperature in the test chamber will be approximately 25° C.

(b) Continuous airflow through the respirator will be 32 liters per minute for air-purifying respirators, and not less than 115 liters per minute to tight-fitting facepieces and 170 liters per minute to loose-fitting hoods and helmets of powered air-purifying respirators.

(c) Airflow through the chamber will be 20–25 air changes per minute.

(d) The atomizer employed will be a No. 64 nozzle with setup 1A, or equivalent, operating at 69 kN/m². (10 pounds per square inch gage).

(e) The test aerosol will be prepared by atomizing a mixture of 1 volume of white enamel and 1 volume of turpentine.

(f) The enamel used will conform essentially to Federal Specification TT–E–489b, May 12, 1953 (an enamel having a phthalic alkyd resin vehicle and a titanium dioxide pigment).

(g) The concentration of pigment in the test aerosol, weighed as ash, will be 95–125 milligrams per cubic meter.

(h) The test aerosol will be drawn to each respirator for a total of 156 minutes for air-purifying respirators and 240 minutes for power air-purifying respirators.

(i) The total amount of unretained mist in the samples taken during testing, weighed as ash, shall not exceed 1.5 milligrams for any air-purifying respirator, 8.3 milligrams for a powered air-

purifying respirator with tight-fitting facepiece, and 12.3 milligrams for a powered air-purifying respirator with loose-fitting hood or helmet.

§ 11.162–7 Dust, fume, and mist tests; respirators with filters; minimum requirements; general.

(a) Three respirators with cartridges containing, or having attached to them, filters for protection against dusts, fumes, and mists, except the mists of paints, lacquers, and enamels, will be tested in accordance with the provisions of § 11.162–8.

(b) In addition to the test requirements set forth in paragraph (a) of this section, three such respirators will be tested, as appropriate, in accordance with the provisions of §§ 11.140–1 through 11.140–14, however, the maximum allowable resistance of complete dust, fume, and mist, and gas, vapor, or gas and vapor chemical cartridge respirators shall not exceed the maximum allowable limits set forth in § 11.162–1.

§ 11.162–8 Bench tests; gas and vapor tests; minimum requirements; general.

(a) Bench tests will be made on an apparatus that allows the test atmosphere at 50 ±5 percent relative humidity and room temperature, approximately 25° C., to enter the cartridges continuously at predetermined concentrations and rates of flow, and that has means for determining the test life of the cartridges.

(b) Where two cartridges are used in parallel on a chemical cartridge respirator, the bench test will be performed with the cartridges arranged in parallel, and the test requirements will apply to the combination rather than to the individual cartridges.

(c) Three cartridges or pairs of cartridges will be removed from containers and tested as received from the applicant.

(d) Two cartridges or pairs of cartridges will be equilibrated at room temperature by passing 25 percent relative humidity air through them at the following flow rates (expressed in liters per minute (l.p.m.)) for 6 hours:

Type of cartridge:	*Airflow rate, l.p.m.*
Air purifying	25
Powered air purifying with tight-fitting facepiece	115
Powered air purifying with loose-fitting hood or helmet	170

(e) Two cartridges or pairs of cartridges will be equilibrated by passing 85 percent relative humidity air through them at the flow rates stated in paragraph (d) of this section.

(f) All cartridges will be resealed, kept in an upright position, at room temperatures, and tested within 18 hours.

(g) Cartridges will be tested and shall meet the minimum requirements set forth in Table 11.

TABLE 11.—CARTRIDGE BENCH TESTS AND REQUIREMENTS

(30 CFR Part 11, Subpart L, § 11.162-8)

Cartridge	Test condition	Test atmosphere: Gas or vapor	Test atmosphere: Concentration (p.p.m.)	Flowrate (l.p.m.)	Number of tests	Penetration [1] (p.p.m.)	Minimum life [2] (min.)
Ammonia	As received	NH_3	1000	64	3	50	50
Ammonia	Equilibrated	NH_3	1000	32	4	50	50
Chlorine	As received	Cl_2	500	64	3	5	35
Chlorine	Equilibrated	Cl_2	500	32	4	5	35
Hydrogen chloride	As received	HCl	500	64	3	5	50
Hydrogen chloride	Equilibrated	HCl	500	32	4	5	50
Methyl amine	As received	CH_3NH_2	1000	64	3	10	25
Methyl amine	Equilibrated	CH_3NH_2	1000	32	4	10	25
Organic vapors	As received	CCl_4	1000	64	3	5	50
Organic vapors	Equilibrated	CCl_4	1000	32	4	5	50
Sulfur dioxide	As received	SO_2	500	64	3	5	30
Sulfur dioxide	Equilibrated	SO_2	500	32	4	5	30

[1] Minimum life will be determined at the indicated penetration.

[2] Where a respirator is designed for respiratory protection against more than one type of gas or vapor, as for use in ammonia and in chlorine, the minimum life shall be one-half that shown for each type of gas or vapor. Where a respirator is designed for respiratory protection against more than one gas of a type, as for use in chlorine and sulfur dioxide, the stated minimal life shall apply.

Subpart M—Pesticide Respirators

§ 11.170 Pesticide respirators; description.

Pesticide respirators, including all completely assembled respirators which are designed for use as respiratory protection during entry into and escape from atmospheres which contain pesticide hazards, are described according to their construction as follows:

(a) Front-mounted or back-mounted gas masks;

(b) Chin-style gas mask;

(c) Chemical cartridge;

(d) Air-purifying respirator with attached blower; and,

(e) Other devices, including combination respirators.

§ 11.171 Pesticide respirators; required components.

(a) Each pesticide respirator described in § 11.170 shall, where its design requires, contain the following component parts:

(1) Facepiece, mouthpiece, and noseclip, helmet, or hood;

(2) Canister with filter;

(3) Cartridge with filter;

(4) Harness;

(5) Attached blower; and,

(6) Breathing tube.

(b) The components of each pesticide respirator shall meet the minimum construction requirements set forth in Subpart G of this part.

§ 11.172 Canisters and cartridges in parallel; resistance requirements.

Where two or more canisters or cartridges are used in parallel, their resistance to airflow shall be essentially equal.

§ 11.173 Canisters and cartridges; color and markings; requirements.

The color and markings of all canisters and cartridges or labels shall conform with the requirements of the American National Standard for Identification of Gas Mask Canisters, K13.1.

§ 11.174 Filters used with canisters and cartridges; location; replacement.

(a) Particulate matter filters used in conjunction with a canister or cartridge shall be located on the inlet side of the canister or cartridge.

(b) Filters shall be incorporated into or firmly attached to the canister or cartridge and each filter assembly shall, where applicable, be designed to permit its easy removal from and replacement on the canister or cartridge.

§ 11.175 Breathing tubes; minimum requirements.

(a) Flexible breathing tubes used in conjunction with respirators shall be designed and constructed to prevent:

(1) Restriction of free head movement;

(2) Disturbance of the fit of facepieces, mouthpieces, hoods, or helmets;

(3) Interference with the wearer's activities; and,

(4) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 11.176 Harnesses; installation and construction; minimum requirements.

(a) Each respirator shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the respirator in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of respirator parts, and, where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 11.177 Respirator containers; minimum requirements.

(a) Respirators shall be equipped with a substantial, durable, container bearing markings which show the applicant's name, type, and commercial designation of the respirator it contains, and all appropriate approval labels.

(b) Containers for gas masks shall be designed and constructed to permit easy removal of the mask.

§ 11.178 Half-mask facepieces, full facepieces, hoods and helmets, and mouthpieces; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either: (1) By providing more than one facepiece size, or (2) by providing one facepiece size which will fit varying facial shapes and sizes.

(b) Full facepieces shall provide for optional use of corrective spectacles or lenses, which shall not reduce the respiratory protective quality of the respirator.

(c) Hoods and helmets shall be designed and constructed to fit persons with various head sizes, permit optional use of corrective spectacles without reducing the respiratory protective qualities of the respirator, and insure against any restriction of movement by the wearer.

(d) Pesticide respirators with mouthpieces shall be equipped with noseclips

which are securely attached to the mouthpiece or respirator and provide an airtight seal.

(e) Facepieces, hoods, and helmets shall be designed to prevent eyepiece fogging.

(f) Half-mask facepieces shall not interfere with the fit of common industrial safety corrective spectacles as determined by the facepiece tests in § 11.183–3.

§ 11.179 Facepieces, hoods, and helmets; eyepieces; minimum requirements.

(a) Facepieces, hoods, and helmets shall be designed and constructed to provide adequate vision which is not distorted by the eyepiece.

(b) All eyepieces of gas masks shall be designed and constructed to meet the impact and penetration requirements specified in Federal Specification, Mask, Air line: and Respirator, Air Filtering, Industrial, GGG–M–125d, October 11, 1965.

§ 11.180 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be protected against distortion.

(b) Inhalation valves shall be designed and constructed and provided where necessary to prevent excessive exhaled air from adversely affecting cartridges, canisters, and filters.

(c) Exhalation valves shall be:

(1) Provided where necessary;

(2) Protected against damage and external influence; and,

(3) Designed and constructed to prevent inward leakage of contaminated air.

§ 11.181 Head harnesses; minimum requirements.

(a) Facepieces shall be equipped with adjustable and replaceable head harnesses designed and constructed to provide adequate tension during use and an even distribution of pressure over the entire area in contact with the face.

(b) Mouthpieces shall be equipped, where applicable, with adjustable and replaceable harnesses designed and constructed to hold the mouthpiece in place.

§ 11.182 Air velocity and noise levels; hoods and helmets; minimum requirements.

Noise levels generated by the respirator will be measured inside the hood or helmet at maximum obtainable airflow and shall not exceed 80 dBA.

§ 11.183 Pesticide respirators; performance requirements; general.

Pesticide respirators and the individual components of each such device shall, as appropriate, meet the requirements for performance and protection specified in the tests described in §§ 11.183–1 through 11.183–7.

§ 11.183–1 Breathing resistance test; minimum requirements.

(a) Airflow resistance will be measured in the facepiece, mouthpiece, hood, or helmet of a pesticide respirator mounted on a test fixture with air flowing at a continuous rate of 85 liters per minute, both before and after each test conducted in accordance with §§ 11.183–4 and 11.183–7.

(b) The maximum allowable resistance requirements for pesticide respirators are as follows:

MAXIMUM RESISTANCE
(mm. water-column height)

Type of pesticide respirator	Inhalation		Exhalation
	Initial	Final [1]	
Front- or back-mounted gas mask	70	85	20
Chin-style gas mask	65	80	20
Powered air-purifying	[2] 50	[2] 70	[2] 20
Chemical cartridge	50	70	20

[1] Measured at end of the service life specified in Table 12.

[2] Resistance of filter(s), cartridge(s), and breathing tube(s) only with blower not operating.

§ 11.183–2 Exhalation valve leakage test; minimum requirements.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

§ 11.183–3 Facepiece test; minimum requirements.

(a) The complete pesticide respirator will be fitted to the faces of persons having varying facial shapes and sizes.

(b) Where the applicant specifies a facepiece size or sizes for his respirator together with the approximate measurements of faces they are designed to fit, the Institute will provide test subjects to suit such facial measurements.

(c) Any pesticide respirator part which must be removed to perform the facepiece fit test shall be replaceable without special tools and without disturbing facepiece fit.

(d) The facepiece or mouthpiece fit test using positive or negative pressure recommended by the applicant and described in his instructions will be used during each test.

(e) (1) Each wearer will enter a chamber containing 1,000 p.p.m. isoamyl-

acetate vapor for a respirator equipped with a full facepiece, mouthpiece, hood, or helmet and 100 p.p.m. isoamyl-acetate vapor for a respirator equipped with a half-mask facepiece.

(2) The facepiece, mouthpiece, hood, or helmet may be adjusted, if necessary, in the test chamber before starting the test.

(3) Each wearer will remain in the chamber while performing the following activities:

(i) Two minutes, nodding and turning head;

(ii) Two minutes, calisthenic arm movements;

(iii) Two minutes, running in place; and,

(iv) Two minutes, pumping with a tire pump into a 28-liter (1 cubic foot) container.

(4) Each wearer shall not detect the odor of isoamyl-acetate during the test.

[37 FR 6244, Mar. 25, 1972, as amended at 38 FR 6993, Mar. 15, 1973]

§ 11.183–4 Silica dust test; minimum requirements.

Three completely assembled pesticide respirators will be tested with a mechanical-testing apparatus as follows:

(a) Temperature in the test chamber will be approximately 25° C.

(b) Continuous airflow through the respirator will be 32 liters per minute for front-mounted, back-mounted, and chin-style gas mask pesticide respirators and chemical cartridge pesticide respirators, and not less than 115 (4 cubic feet) liters per minute to tight-fitting facepieces and 170 liters (6 cubic feet) per minute to loose-fitting hoods and helmets of powered air-purifying respirators.

(c) The test aerosol will contain 50–60 milligrams of 99+ percent free silica per cubic meter of air.

(d) The particle size distribution of the test suspension will have a geometric mean diameter of 0.4 to 0.6 micrometer, with a standard geometric deviation less than 2.

(e) Front-mounted, back-mounted, and chin-style gas mask pesticide respirators and chemical cartridge pesticide respirators will be tested for 90 minutes and powered air-purifying respirators will be tested for 4 hours.

§ 11.183–5 Lead fume test; minimum requirements.

Three completely assembled pesticide respirators will be tested with a mechanical-testing apparatus as follows:

(a) Continuous airflow through the respirator will be 32 liters per minute for front-mounted, back-mounted, and chin-style gas mask pesticide respirators and chemical cartridge pesticide respirators and not less than 115 liters (4 cubic feet) per minute, for powered air-purifying respirators with tight-fitting facepieces, and not less than 170 liters (6 cubic feet) per minute for powered air-purifying respirators with loose-fitting hoods and helmets.

(b) The test aerosol will contain 15–20 milligrams of freshly generated lead-oxide fume, calculated as lead, per cubic meter of air.

(c) The fume will be generated by impinging an oxygen-gas flame on molten lead.

(d) Front-mounted, back-mounted, and chin-style gas mask pesticide respirators and chemical cartridge pesticide respirators will be tested for 90 minutes and powered air-purifying pesticide respirators will be tested for 4 hours.

(e) The total amount of unretained test suspension, which is analyzed and calculated as lead, shall not exceed: (1) 0.43 milligram for any 90-minute test; (2) 4.8 milligrams for any 4-hour test made at 115 liters (4 cubic feet) per minute; or (3) 6.2 milligrams for any 4-hour test made at 170 liters (6 cubic feet) per minute.

§ 11.183–6 Dioctyl-phthalate test; minimum requirements.

(a) All canisters submitted for use with front-mounted and back-mounted gas mask pesticide respirators will be tested in an atmospheric concentration of 100 micrograms of dioctyl-phthalate per liter of air at continuous flow rates of 32 and 85 liters per minute for a test period of 5 to 10 seconds.

(b) The DOP leakage through the canister shall not exceed 0.03 percent of the ambient DOP concentration.

§ 11.183–7 Bench tests; minimum requirements.

(a) (1) Bench tests will be made on an apparatus that allows the test atmosphere at 50±5 percent relative humidity and at room temperature (25°±2.5° C.) to enter the canister or cartridge at predetermined concentrations and rates of flow, and that has a means for determining the test life of the canister or cartridge against carbon tetrachloride.

(2) Canisters and cartridges will be tested as they are used on each pesticide respirator, either singly or in pairs.

(3) Three canisters or cartridges or pairs of cartridges will be removed from containers and tested as received from

the applicant.

(4) Two canisters, cartridges, or pairs of cartridges will be equilibrated at room temperature by passing 25 percent relative humidity air through them at the following flow rates (expressed as liters per minute (l.p.m.)) for 6 hours:

Type of canister or cartridge	*Airflow rate, l.p.m.*
Air-purifying canister	64
Air-purifying cartridge	25
Powered air-purifying with tight-fitting facepiece	115
Powered air-purifying with loose-fitting hood or helmet	170

(5) Two canisters, cartridges, or pairs of cartridges will be equilibrated at room temperature by passing 85 percent relative humidity air through them at the flow rates stated in subparagraph (4) of this paragraph for 6 hours.

(6) The equilibrated canisters or cartridges will be resealed, kept in an upright position at room temperature, and tested within 18 hours.

(b) Canisters and cartridges tested in accordance with the provisions of this section shall meet the requirements specified in Table 12.

TABLE 12.—CARBON TETRACHLORIDE BENCH TESTS AND REQUIREMENTS FOR CANISTERS AND CARTRIDGES
(30 CFR Part 11, Subpart M, § 11.183-7)

Type of pesticide respirator	Test concentrations, p.p.m. CCl_4	Flow rate l.p.m.	Number of tests	Minimum life, minutes [1]
Chest-mounted or back-mounted gas mask (as received)	20,000	64	3	12
Chest-mounted or back-mounted gas mask (equilibrated)	20,000	32	4	12
Chin-style gas mask (as received)	5,000	64	3	9
Chin-style gas mask (equilibrated)	5,000	32	4	9
Chemical-cartridge respirator (as received)	1,000	64	3	50
Chemical-cartridge respirator (equilibrated)	1,000	32	4	50
Powered air-purifying respirator (tight-fitting facepiece, as received)	1,000	[2] 115	3	50
Powered air-purifying respirator (tight-fitting facepiece, equilibrated)	1,000	[2] 115	4	5 2
Powered air-purifying respirator (loose-fitting hood or helmet as received)	1,000	[3] 170	3	50
Powered air-purifying respirator (loose-fitting hood or helmet, equilibrated)	1,000	[3] 170	4	25

[1] Minimum life will be determined at 5 p.p.m. leakage.
[2] The flow rate shall be the effective flow rate of the device, but shall be not less than 115 l.p.m.
[3] The flow rate shall be the effective flow rate of the device, but shall be not less than 170 l. p.m.