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NFPA 1981 Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters 1987 Edition

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

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NATIONAL FIRE PROTECTION ASSOCIATION

NFPA 1981

Standard on

Open-Circuit Self-Contained

Breathing Apparatus for Fire Fighters

1987 Edition

This edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, was prepared by the Technical Committee on Protective Equipment for Fire Fighters, and acted on by the National Fire Protection Association, Inc. at its Annual Meeting held May 18-21, 1987 in Cincinnati, Ohio. It was issued by the Standards Council on June 10, 1987, with an effective date of June 30, 1987, and supersedes all previous editions.

The 1987 edition of this standard has been approved by the American National Standards Institute.

Origin and Development of NFPA 1981

The first NFPA document to address fire fighter respiratory protection was NFPA 19B, *Standard on Respiratory Protective Equipment for Fire Fighters*. NFPA 19B was adopted on May 18, 1971 at the Association's Annual Meeting in San Francisco, California. It was developed by the Sectional Committee on Protective Equipment for Fire Fighters of the Technical Committee on Fire Department Equipment. After 1975, the Sectional Committee was removed from the Technical Committee on Fire Department Equipment and made its own technical committee. The main thrust of NFPA 19B was to prohibit filter-type canister masks for fire fighters and permit only self-contained breathing apparatus. NFPA 19B was officially withdrawn by the Association on May 19, 1981 at the Annual Meeting in Dallas, Texas.

NFPA 1981, *Standard on Self-Contained Breathing Apparatus for Fire Fighters*, was adopted at the same meeting to replace NFPA 19B. That first edition of NFPA 1981 essentially specified NIOSH/MSHA approved SCBA with a minimum rated service life of 30 minutes. Open-circuit SCBA was required to be positive pressure.

The Technical Committee on Protective Equipment for Fire Fighters undertook a complete revision of NFPA 1981 to state performance requirements and appropriate testing procedures designed to simulate various environmental conditions that fire fighters' SCBA can be exposed to during use and storage. These requirements are in addition to the basic NIOSH/MSHA certification requirements and now NFPA 1981 only applies to open-circuit SCBA. A similar document will be developed for closed-circuit SCBA.

This second edition of NFPA 1981 was completed in March, 1986 and adopted by the Association at the 1987 Annual Meeting in Cincinnati, Ohio.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

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NFPA 1981

Standard on

Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters

1987 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Information on referenced publications can be found in Chapter 5 and Appendix B.

Chapter 1 Administration

1-1 Scope.

1-1.1* This standard sets forth minimum requirements for the design, performance, and testing of open-circuit self-contained breathing apparatus (SCBA) used in fire fighting, rescue, and other hazardous duties. This standard does not apply to closed-circuit self-contained breathing apparatus.

1-1.2 This standard is not intended to serve as a detailed manufacturing or purchase specification, but may be referenced in purchase specifications as minimum acceptable requirements.

1-1.3* Environmental and physical tests are used to determine compliance with the performance requirements of this standard. These tests shall not be deemed as establishing SCBA performance levels for all situations to which fire fighting personnel may be exposed.

1-2 Purpose.

1-2.1* The purpose of this standard is to provide minimum performance requirements for open-circuit SCBA utilized by fire fighters.

1-3 Definitions.

Anechoic Chamber. A test room in which some or all surfaces are lined with sound-absorbing material to reduce reflections of sound to a specified minimum over a range of frequencies.

Closed-Circuit SCBA. A recirculation-type SCBA in which the exhaled gas is rebreathed by the wearer after the carbon dioxide has been removed from the exhalation and the oxygen content within the system has been restored from sources such as compressed breathing gas, chemical oxygen, and liquid oxygen.

Compressed Breathing Gas.* A mixture of oxygen or air stored in a compressed state and supplied to the user in gaseous form. Compressed breathing gas shall meet at least the requirements of the specification for Type I, Grade D breathing air, and liquid air shall meet at least the requirements for Type II, Grade B breathing air as described in ANSI Z86.1, *Commodity Specification for Air*.

End-of-Service-Time Indicator. A warning device on a SCBA that warns the user that the end of the service time of the SCBA is approaching.

Fabric Component. Any single or combination of pliable, natural, or synthetic material(s) made by weaving, felting, forming, or knitting that is used to secure the backplate assembly to the SCBA wearer including but not limited to shoulder, waist, and chest straps.

Facepiece. The component of a respirator that covers the wearer's nose, mouth, and eyes. It is designed to make a gastight or particle-tight fit with the face and includes the headbands, exhalation valves, and other necessary components required to connect it to a respirable gas source.

Gas. An aeriform fluid that is in a gaseous state at standard temperature and pressure.

Identical SCBA. SCBA that are produced to the same engineering and manufacturing specifications.

May. This term is used to state a permissive use, or an alternative method to a specified requirements.

NIOSH/MSHA Approved. Tested and certified jointly by the National Institute for Occupational Safety and Health (NIOSH) of the U.S. Department of Health and Human Services and the Mine Safety and Health Administration (MSHA) of the U.S. Department of Labor in accordance with the requirements of Title 30, Code of Federal Regulations (CFR), Part 11, Subpart H. Approval by the Bureau of Mines of the U.S. Department of Interior shall not fall under the definition of approved. For the approval to remain in effect, the SCBA must be used and maintained in the approved condition.

Open-Circuit SCBA. An SCBA in which exhalation is vented to the atmosphere and not rebreathed. There are two types of open-circuit SCBA:

(a) *Demand Type (Negative Pressure).* An SCBA in which the pressure inside the facepiece, in relation to the immediate environment, is negative during any part of the inhalation or exhalation cycle when tested in accordance with 30 CFR Part 11, Subpart H by NIOSH and using NIOSH test equipment.

(b) *Pressure Demand Type (Positive Pressure).* An SCBA in which the pressure inside the facepiece, in relation to the immediate environment, is positive during both inhalation and exhalation when tested in accordance with 30 CFR, Part 11 Subpart H by NIOSH and using NIOSH test equipment.

Random Noise. An oscillation whose instantaneous magnitude is not specified for any give instant of time.

Random Noise Generator. An electrical device used as a source of high-level, broad-band, random electrical

noise that can be converted to acoustic noise by means of a loudspeaker.

Rated Time Service. The period of time, stated on the SCBA's NIOSH/MSHA approval label, that the SCBA supplied air to the breathing machine when tested to 30 CFR Part 11.

Resistance. Opposition to the flow of gas, as through an orifice or valve.

SCBA. See self-contained breathing apparatus.

Self-Contained Breathing Apparatus (SCBA). A respirator worn by the user that supplies a respirable atmosphere, that is either carried in or generated by the apparatus, and is independent of the ambient environment.

Shall. Indicates a mandatory requirement.

Should. This term, as used in Appendix A, indicates a recommendation or that which is advised but not required.

White Noise. Random noise that has a constant energy per unit bandwidth at every frequency in the range of interest.

Chapter 2 General Requirements

2-1 Compliance.

2-1.1 SCBA labeled as being compliant with this standard shall meet or exceed all requirements of this standard.

2-1.2 To comply with the performance requirements of Chapter 3 of this standard, samples of the manufacturer's current production SCBA that are to be labeled as being compliant with NFPA 1981 shall be tested as specified in 2-1.2.1, 2-1.2.2, and 2-1.2.3.

2-1.2.1 SCBA shall be initially tested and shall meet the performance requirements of three separate test series as defined in 3-1.1, and the flame resistance test specified in Section 3-5, heat resistance test specified in Section 3-6, and thread heat resistance test specified in Section 3-7, all of this standard. After completion of these tests for a specific model SCBA or its variant, only those tests on other similar SCBA models or variants shall be required where, in the determination of the manufacturer, the SCBA's test results can be affected by any components that are different from those on the original SCBA tested.

2-1.2.2 SCBA shall be annually tested within twelve months from previous test and shall meet the performance requirements of one test series as defined in 3-1.1, and the flame resistance test specified in Section 3-5, heat resistance test specified in Section 3-6, and thread heat resistance test specified in Section 3-7, all of this standard. This requirement may be waived every fifth year when the testing required in 2-1.2.3 is conducted. After completion of these tests for a specific model SCBA or its variant, only those tests on other similar SCBA models or variants shall be required where, in the determination of the manufacturer, the SCBA's test results can be affected by any components that are different from those on the original SCBA tested.

2-1.2.3 SCBA shall be tested and shall meet the performance requirements of three separate test series as defined in 3-1.1, and the flame resistance test specified in Section 3-5, heat resistance test specified in Section 3-6, and thread heat resistance test specified in Section 3-7, all of this standard, every fifth year from the date of the initial tests performed in 2-1.2.1. After completion of these tests for a specific model SCBA or its variant, only those tests on other similar SCBA models or variants shall be required where, in the determination of the manufacturer, the SCBA's test results can be affected by any components that are different from those on the original SCBA tested.

2-1.3 Any modifications made to the SCBA by the manufacturer after conducting the tests specified in 2-1.2 of this section shall require the retesting and meeting of the performance requirements of all those individual tests that the manufacturer determines may be affected by such changes. This retesting shall be conducted before labeling the modified SCBA as being compliant with NFPA 1981.

2-2 Labeling.

2-2.1 Only SCBA that meet all the requirements of this standard and are so represented by the manufacturer shall be labeled according to the provisions of 2-2.2 of this section.

2-2.2 In addition to NIOSH/MSHA approval label, each SCBA shall be labeled with the following information:

(a) The following statement:

"This SCBA meets all requirements of NFPA 1981, Standard on Open-Circuit Self-Contained Breathing Apparatus, 1987 Edition."

(b) The identification of the major components of the SCBA that are required to meet this standard.

2-2.3 The major components listed by the manufacturer in 2-2.2 of this section shall be labeled with the lot number or serial number, or the year and the month of manufacture.

2-2.4 Manufacturers of SCBA shall provide, upon request, a written statement that the SCBA manufactured and labeled as being compliant with this standard does meet or exceed all requirements of this standard.

2-3 Basic Design.

2-3.1 SCBA shall be certified by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) as positive pressure SCBA.

2-3.1.1* In accordance with NIOSH/MSHA certification, the maximum weight of the SCBA shall not exceed 35 pounds.

2-3.2* SCBA shall have a NIOSH/MSHA rated service time of 30 minutes or more.

2-3.3 SCBA that is certified by NIOSH/MSHA as positive pressure but capable of supplying air to the user in a negative pressure, demand-type mode shall not meet the requirements of this standard.

2-3.4 The SCBA shall not be one that was approved under Bureau of Mines schedules, regardless of any grandfather provisions to the contrary that have been adopted or that may in the future be adopted by U.S. or foreign governmental agencies.

2-4 Manufacturer's Instructions.

2-4.1 The SCBA manufacturer shall provide, with each SCBA, instructions and information for maintenance, cleaning, disinfecting, storage, and inspection.

2-4.2 The SCBA manufacturer shall provide, with each SCBA, specific instructions regarding the use, operation, and limitations of the SCBA, and training materials.

Chapter 3 Performance Requirements

3-1 Test Series.

3-1.1 Three identical SCBA selected from the manufacturer's production SCBA and that are to be labeled compliant with this standard shall be subjected to the tests specified in Table 3-1.1, "Test Series." The first SCBA shall be subjected to the tests listed in Category A, the second SCBA shall be subjected to the tests listed in Category B, and the third SCBA shall be subjected to the tests listed in Category C as shown in Table 3-1.1. This grouping of test requirements shall be defined as a single test series.

Table 3-1.1 Test Series

Category A (SCBA #1)	Category B (SCBA #2)	Category C (SCBA #3)
Airflow Section 3-2	Airflow Section 3-2	Airflow Section 3-2
Lens Abrasion Section 3-10	Accelerated corrosion Section 3-8	Vibration and Shock Section 3-4
Communication Section 3-11		
Thermal Section 3-3		
Particulate Section 3-9		

3-1.2 No adjustment, repair, or replacement of parts is permitted to any SCBA being tested in accordance with this standard. Breathing-gas containers may be filled as required. All tests in Category A shall be conducted in the order specified and are designed as cumulative damage tests.

3-2 Airflow Performance.

3-2.1* When tested in accordance with the Airflow Performance Test specified in Section 4-1 of this standard, the SCBA facepiece pressure shall not be less than 0.00 inches of water column nor greater than 3.50 inches of water column above ambient pressure from the time the test begins until the time the test is concluded.

3-3 Thermal Resistance Performance.

3-3.1 SCBA shall be tested in accordance with the Thermal Resistance Tests specified in Section 4-2 of this standard.

3-3.1.1 Where conditioned in accordance with the cold thermal test specified in 4-2.4 of this standard, the SCBA shall meet the performance requirement of Section 3-2 of this chapter.

3-3.1.2 When conditioned in accordance with the hot thermal test specified in 4-2.5 of this standard, the SCBA shall meet the performance requirements of Section 3-2 of this chapter.

3-3.1.3 When conditioned in accordance with the hot to cold thermal test specified in 4-2.6 of this standard, the SCBA shall meet the performance requirement of Section 3-2 of this chapter.

3-3.1.4 When conditioned in accordance with cold to hot thermal test specified in 4-2.7 of this standard, the SCBA shall meet the performance requirement of Section 3-2 of this chapter.

3-4 Vibration and Shock Resistance Performance.

3-4.1 When conditioned in accordance with the Vibration and Shock Resistance Test specified in Section 4-3 of this standard, the SCBA shall meet the performance requirements of Section 3-2 of this chapter.

3-5 Flame Resistance Performance.

3-5.1 When tested to the Flame Resistance Test specified in Section 4-4 of this standard, the test specimens shall have an average char length of not more than 4.0 inches (101.6 mm), an average afterflame of not more than 2.0 seconds, and shall not melt or drip when tested in accordance with Method 5903, Flame Resistance of Cloth; Vertical, of Federal Test Method Standard No. 191, *Textile Test Methods*.

3-6 Heat Resistance Peformance.

3-6.1 When tested to the Heat Resistance Test specified in Section 4-5 of this standard, the test specimens shall not melt, separate, or ignite.

3-7 Thread Heat Resistance Performance.

3-7.1 When tested in accordance with the Thread Heat Resistance Test specified in Section 4-6 of this standard, the thread shall not melt or ignite.

3-8 Accelerated Corrosion Resistance Performance.

3-8.1 When conditioned in accordance with the Accelerated Corrosion Resistance Test specified in Section 4-7 of this standard, corrosion shall not prohibit the

proper use and function per the manufacturer's instructions of any control or operating feature of the SCBA. In addition, the SCBA shall meet the performance requirements of Section 3-2 of this chapter.

3-9 Particulate Resistance Performance.

3-9.1 When conditioned in accordance with the Particulate Resistance Test specified in Section 4-8 of this standard, the SCBA shall meet the performance requirements of Section 3-2 of this chapter.

3-10 Facepiece Lens Abrasion Resistance Performance.

3-10.1 When tested in accordance with the Facepiece Lens Abrasion Resistance Test specified in Section 4-9 of this standard, the lens shall not exhibit either:

(a) Any scratch greater than 0.063 in. (1.60 mm) long and wider than 0.008 in. (0.20 mm) in a 0.984-in. (25-mm) circle located on the center of the stroked area of the lens.

(b) More than two scratches having a length greater than 0.008 in. (0.20 mm) or a width greater than 0.008 in. (0.20 mm) in the same 0.984-in. (25-mm) circle located in the center of the stroke area.

3-11 Communications Performance.

3-11.1 When tested in accordance with the Communications Test specified in Section 4-10 of this standard, the average score achieved when tested with the SCBA shall not be less than 72 percent of the average score achieved when tested without the SCBA.

Chapter 4 Test Methods

4-1 Airflow Performance Test.

4-1.1* The facepiece of the SCBA being tested shall be secured to a Sierra Model No. 803608-01 or Scott Aviation Model No. 803608-02 test headform or equivalent. The facepiece shall be secured to the headform to assure that an initial pressure of 1.0 ± 0.1 in. water column below ambient shall not decrease by more than 0.2 in. water column in 5 seconds.

4-1.2 The remaining components of the SCBA shall be mounted in accordance with Figure 4-1.2 to simulate its typical wearing position on a fire fighter as specified by the manufacturer.

4-1.3 A pressure probe shall be attached to the test headform to monitor facepiece pressure. The pressure probe shall be a ¼-in. O.D. with 0.062-in. wall thickness metal tube having one open end and one closed end. The closed end shall have 4 equally spaced holes, each 0.062 ± 0.005 in. and positioned 0.250 ± 0.02 in. back from the end of the pressure probe.

4-1.4 The closed end of the pressure probe shall extend through the test headform exiting out the center of the left eye. The pressure probe shall extend 0.50 + 0.06 - 0.0 in. outward from the surface of the center of the left eye.

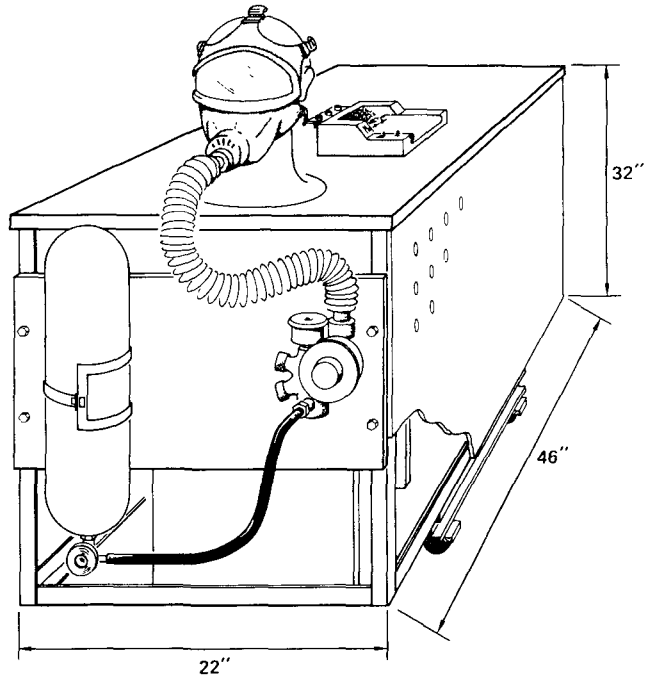


Figure 4-1.2 Typical Apparatus Configuration for Airflow Performance Test

4-1.5 The open end of the pressure probe shall extend a maximum of 18 in. and a minimum of one in. outward from the back surface of the test headform.

4-1.6 A maximum of a four (4) foot length of nominal 3/16-in. I.D. flexible smoothbore tubing with a nominal 1/16-in. wall thickness may be connected from the open end of the pressure probe to the inlet of the pressure transducer.

4-1.7* A differential pressure transducer having the following characteristics shall be used:

Range: 8.9 inches of water differential

Linearity: ± 0.5% Full Scale best straight line

Hysteresis: 0.5% pressure excursion

Overpressure: To 200% of range in either direction with less than 0.5% zero shift

Line Pressure Effect: Less than 1% Full Scale zero shift/1000 psig

Output: ± 2.5 volts dc for ± Full Scale

Output Impedance: 100 ohms, maximum

Output Ripple: 10 millivolts peak to peak

Frequency Response: Flat + 5%, 0 to 1000 Hz

Regulation: Full scale output shall not change more than + 0.1% for input voltage change from 22 to 35 Vdc

Temperature: Operating: -65° - 250°F
Compensated: 0° - 160°F

Temperature Effects: Within 2% Full Scale/100°F, Error band

4-1.8* The differential pressure transducer shall be appropriately connected to a strip chart recorder having the following characteristics:

(a) a chart width of 250 mm

(b) a pen speed of at least 750 mm/second (⅓ second FS)

(c) an accuracy of ± 0.25% FS

(d) an input voltage range of 1 volt full scale

(e) a span set at 25 mm of chart per in. water column.

4-1.9 The test headform shall be equipped with a stainless steel breathing tube having a 0.90-in. I.D. with 0.024-in. wall thickness. The metal breathing tube shall be located on the centerline of the mouth and be flush with the test headform.

4-1.10 The metal breathing tube shall extend outward from either the back or the base surface of the test headform a minimum of 8 in. and a maximum of 18 in.

4-1.11 If flexible smoothbore tubing is used from the metal breathing tube to the inlet connection of the breathing machine, it shall have a maximum length of 4 ft and a ¾-in. I.D. with nominal ⅛-in. wall thickness.

4-1.12* A Model 327-6 Breathing Machine as shown in Figures 4-1.12(a), (b), and (c) shall be used. The breathing machine shall be set to the following characteristics:

MINUTE VOLUME (liters min)	RESPIRATORY FREQUENCY (breaths/min)	TIDAL VOLUME (liters)
103 ± 3	30 ± 1	3.4 nominal

4-1.13 The test conditions of ambient temperature and barometric pressure shall be 72°F ± 5°F (22°C ± 3°C), 50% relative humidity ± 25%, (725 mm Hg + 50 - 70 mm Hg). The dew point of air charged into the SCBA breathing gas containers shall not be higher than -65°F (-54°C) at the outlet port of the charge line. The air shall meet or exceed the requirements of the specification for Type 1, Grade D breathing air as specified in ANSI Z86.1, *Commodity Specification for Air*.

4-1.14* The test set-up for conducting the airflow performance test shall be calibrated at least once each day before conducting tests, and shall be verified at least once each day after testing. The calibration procedure utilized for the differential pressure transducer shall consist of confirming at least three different pressures between zero and 5 in. water gauge. The pressure shall be measured using an incline manometer or equivalent measuring device with a scale measuring in increments of ± 0.02 in. of water column or less.

4-1.15 The SCBA being tested shall utilize a fully charged breathing gas container. The airflow performance test shall begin after five complete strokes of the breathing machine and continue to operate through 30 complete strokes of the breathing machine after actuation of the end-of-service life indicator.

4-1.16 The facepiece pressure shall be read from the strip chart recorder to determine pass/fail.

4-2 Thermal Resistance Tests.

4-2.1 The thermal resistance tests specified in this section may be conducted in any sequence. After performing each test, the SCBA shall be placed in an ambient environment of 72°F ± 5°F (22°C ± 3°C) with a relative humidity of 50% ± 25% for a minimum 12-hour dwell period.

4-2.2 The SCBA shall be placed in an appropriate environmental chamber and positioned to simulate the normal wearing position of the SCBA on a fire fighter as specified by the manufacturer. A test headform as specified in 4-1.1 of this chapter shall be equipped with a thermocouple or other temperature-sensing element to monitor SCBA test chamber temperature. The thermocouple or other temperature-sensing element used shall be attached to the test headform in a manner in which it will be directy exposed to the chamber atmosphere. The test headform shall be connected to the breathing machine in accordance with Section 3-2 of this standard. The breathing machine may be located either inside or outside the environmental chamber.

4-2.3 The dwell period between thermal tests shall be used for refilling the breathing gas container and visually inspecting the SCBA for any gross damage that could cause unsafe test conditions.

4-2.4 The SCBA shall be cold soaked at -25°F ± 2°F (-32°C ± 1°C) for a minimum of 12 hours. The SCBA shall be tested in accordance with Section 3-2 of this standard at an ambient of -25°F ± 10°F (-32°C ± 5°C).

4-2.5 The SCBA shall be hot soaked at 160°F ± 2°F (71°C ± 1°C) for a minimum of 12 hours. The SCBA shall then be tested in accordance with Section 3-2 of this standard at an ambient of 160°F ± 10°F (71°C ± 5°C).

4-2.6 The SCBA shall be hot soaked at 160°F ± 2°F (71°C ± 1°C) for a minimun of 12 hours. The SCBA shall then be transferred to a chamber with an air temperature of -25°F ± 2°F (-32°C ± 1°C). The SCBA shall then be tested in accordance with Section 3-2 of this standard at a chamber air temperature of -25°F ± 10°F (-32°C ± 5°C). The airflow performance test shall commence within 3 minutes after removal from hot soak.

4-2.7 The SCBA shall be cold soaked at -25°F ± 2°F (-32°C ± 1°C) for a minimum of 12 hours. The SCBA shall then be transferred to a chamber with an air temperature of 160°F ± 2°F (71°C ± 1°C). The SCBA shall then be tested in accordance with Section 3-2 of this standard at a chamber air temperature of 160°F ± 10°F (71°C ± 1°C). The airflow performance test shall commence within 3 minutes after removal from cold soak.

4-3 Vibration and Shock Resistance Tests.

4-3.1 The following tests shall be conducted in the order specified. After being subjected to the tests, the SCBA shall be tested in accordance with Section 3-2 of this standard.

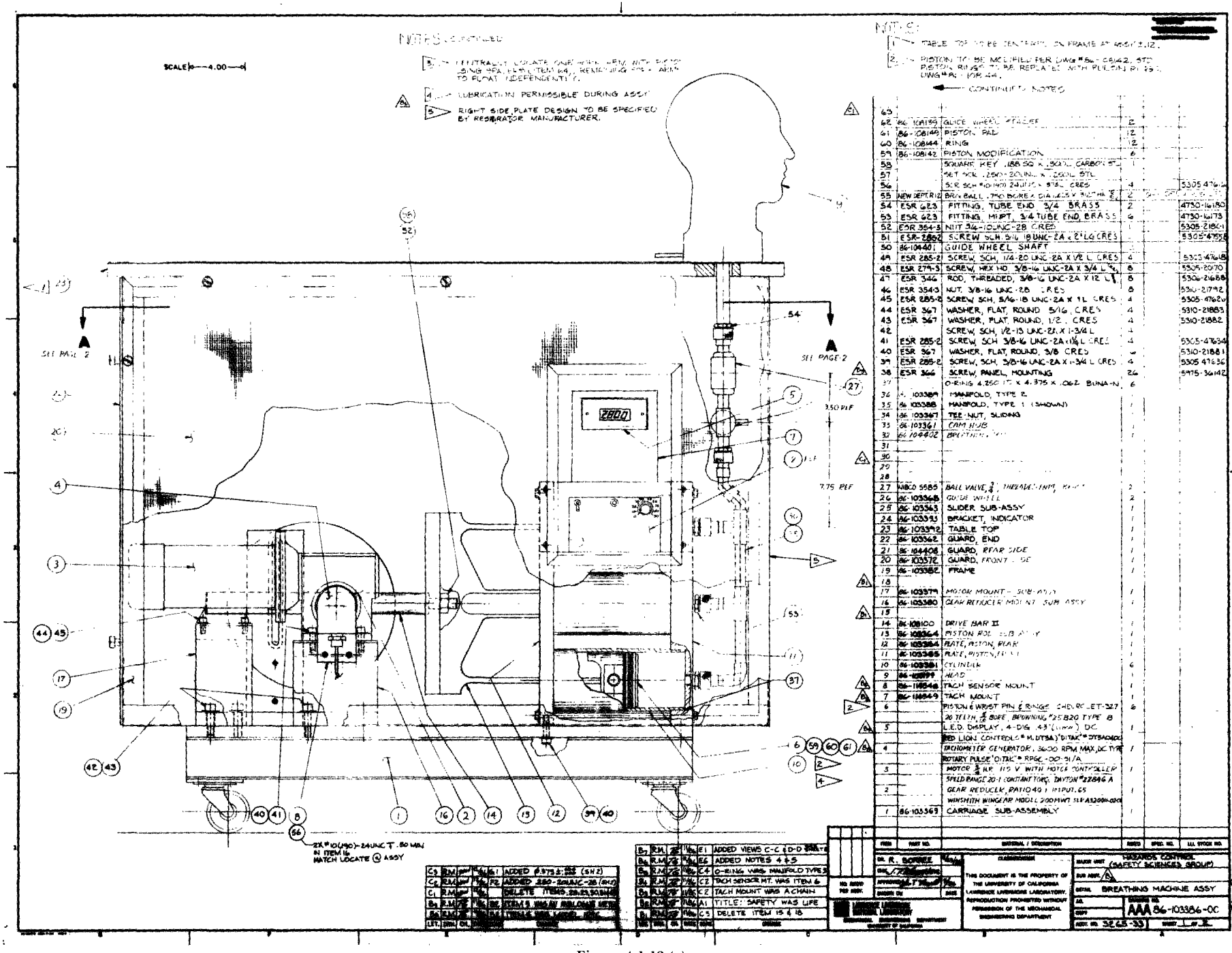


Figure 4-1.12 (a)

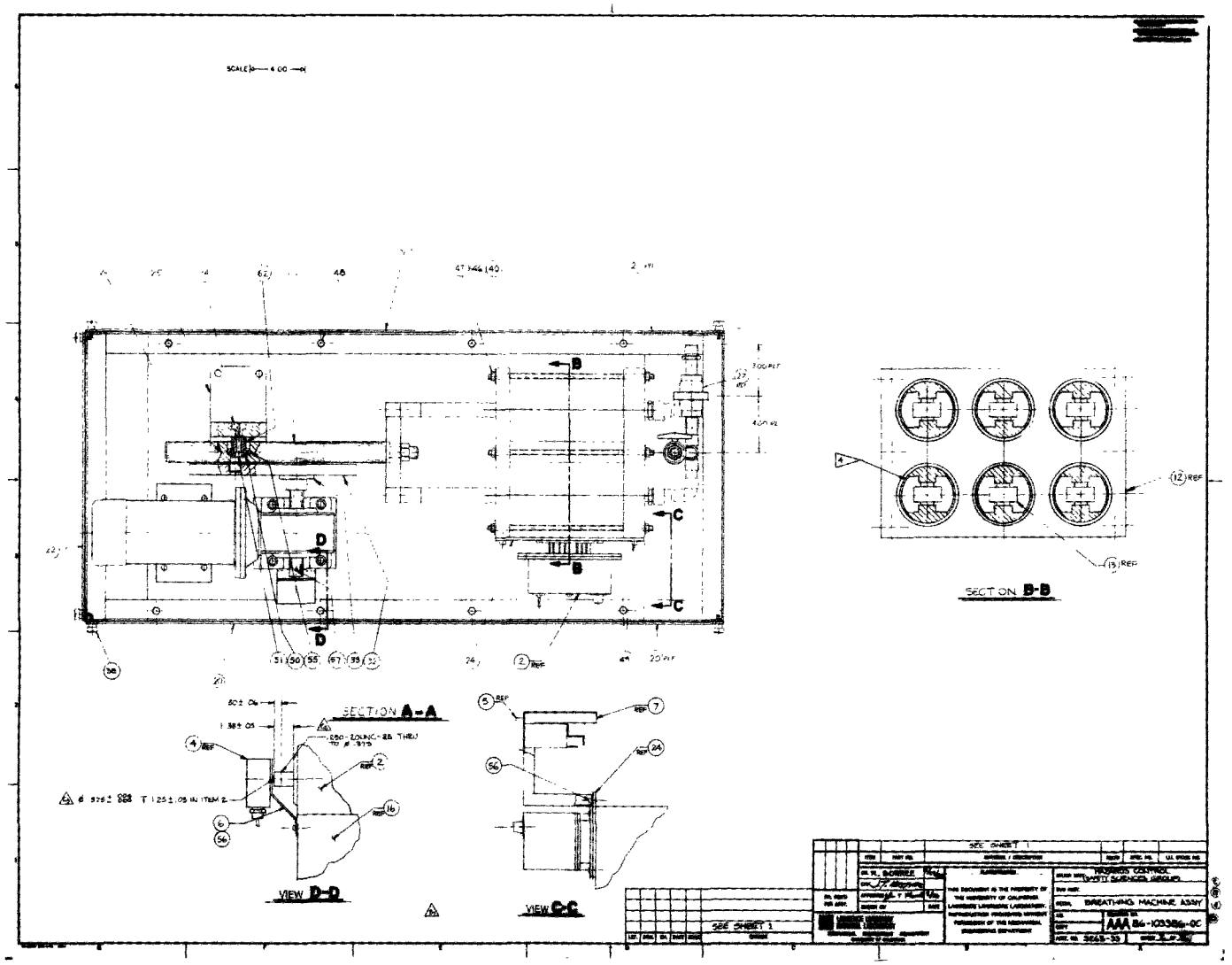


Figure 4-1.12(b)

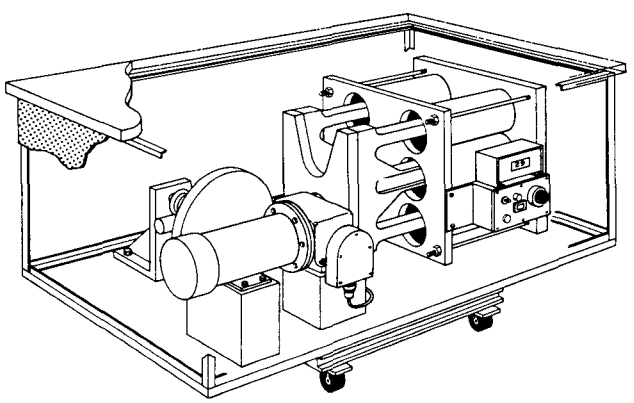


Figure 4-1.12(c) Model 327-6 Breathing Machine

4-3.2* The complete SCBA shall be tested in accordance with Method 514.3, Vibration, of MIL-STD-810D, *Environmental Test Methods*. The test shall be set up according to I-3.2.1c. The test procedure used shall be Section II-3.1, Procedure II, using the frequency curves 514.3-1, 514.3-2, and 514.3-3. The SCBA shall be secured using a suitable rigid mounting bracket and the SCBA shall be tested on each axis for three hours. The total duration shall be 9 hours; 3 hours for each frequency curve.

4-3.3 The complete SCBA less facepiece and less those components that attach directly to the facepiece per the manufacturer's instructions for use shall be tested in accordance with Method 514.3, Vibration, of MIL-STD-810D, *Environmental Test Methods*, using Procedure II. The test shall be set up according to I-3.2.3c. The duration of the test shall be 3 hours. A vibration box with a one-inch circular motion shall be constructed in accordance with diagram 514.3-24 of Method 514.3, Vibration, of MIL-STD-810D, *Environmental Test Methods*.

4-3.4 The SCBA facepiece with those components not tested in 4-3.3 attached per the manufacturer's instructions for use shall be tested in accordance with Method 514.3, Vibration, Section II-3.2 of MIL-STD-810D, *Environmental Test Methods*, using Procedure II. The test shall be set up according to I-3.2.3c. The duration of the test shall be 3 hours. A vibration box with a one-inch circular motion shall be constructed in accordance with diagram 514.3-24 of Method 514.3, Vibration, of MIL-STD-810D, *Environmental Test Methods*.

4-4 Flame Resistance Tests.

4-4.1 Five specimens of each different fabric component of the SCBA shall be tested in accordance with Method 5903, Flame Resistance of Cloth; Vertical, of Federal Test Method Standard 191A, *Textile Test Methods*.

4-4.2 Test specimens shall be a minimum of 12 inches long and shall be tested in the width specified by the prescribed test method. If the fabric component(s) is (are) not available in the specified width, the width of the test specimen shall be the widest width as used on the SCBA, but shall be a minimum of 12 in. long.

4-4.3 The five test specimens shall first be conditioned by five cycles of washing and drying in accordance with the procedures in Section 5 of AATCC 135, 1, III, B prior to flame resistance testing.

4-4.4 The char lengths and afterflame shall be recorded and each shall be averaged to determine pass/fail. Melting and dripping shall be observed and recorded to determine pass/fail.

4-5 Heat Resistance Tests.

4-5.1 Five specimens of each different fabric component shall be tested in a forced circulating air oven capable of achieving and maintaining an air stream temperature of 500°F + 10° -0°F (260°C + 4° -0°C).

4-5.2 Test specimens shall be 15 × 15 inches ± 0.5 inches (381 × 381 mm, ± 13 mm) and shall be cut from a standard production run of the fabric component(s) used in the SCBA. If the fabric is not available in a 15-inch (381-mm) width, the width of the test specimen shall be the widest width as used on the SCBA, but shall be a minimum of 15 in. (381 mm) long.

4-5.3 The five test specimens shall first be conditioned by five cycles of washing and drying in accordance with the procedures in Section 5 of AATCC 135, 1, III, B prior to heat resistance testing.

4-5.4 The test specimen shall be suspended by a metal hook(s) at the top and centered in the oven so that the entire specimen is not less than 2 inches from any oven surface or another test specimen. Oven airflow shall be parallel to the plane of the material.

4-5.5 Specimens shall be exposed to the circulating airflow for 5 minutes + 15 - 0 seconds. Oven recovery time after the door is closed shall not exceed one minute. Specimen exposure time shall begin when the oven has recovered to an air temperature of 500°F + 10°F - 0°F (260°C + 4° - 0°C).

4-5.6 The fabric shall be observed for melting or ignition to determine pass/fail.

4-6 Thread Heat Resistance Test.

4-6.1 All thread utilized shall be tested in accordance with Method 1534, Melting Point of Synthetic Fibers, of Federal Test Method Standard 191A, *Textile Test Methods*, to a temperature of 500°F + 10° - 0°F (260°C + 4° - 0°C).

4-6.2 Thread shall be observed for melting or ignition to determine pass/fail.

4-7 Accelerated Corrosion Resistance Test.

4-7.1 An SCBA with a fully charged cylinder and having the cylinder valve closed shall be tested in accordance with Method 509.2. Salt Fog, Section II, of MIL-STD-810D, *Environmental Test Methods*.

4-7.2 The SCBA shall be attached to a mannequin to simulate its typical wearing position on a fire fighter as specified by the manufacturer. The mannequin shall then be placed in a test chamber. The test chamber temperature shall be adjusted to 95°F ± 3°F (35°C ± 2°C). The SCBA shall be placed in the chamber for 2 hours prior to the introduction of the salt solution.

4-7.3 The SCBA shall be exposed to a 5 ± 1% salt fog for a period of 48 hours.

4-7.4 The SCBA shall be stored in an environment of 72°F ± 5°F (22°C ± 3°C) with 50% relative humidity for a minimum of 48 hours.

4-7.5 The SCBA shall then be tested in accordance with Section 3-2 of this standard to determine pass/fail. All controls or operating features of the SCBA shall be operated per the SCBA manufacturer's instructions to determine pass/fail.

4-8 Particulate Resistance Test.

4-8.1 A fully charged SCBA shall be subjected to Method 510.2, Sand and Dust, Section II-3, of MIL-STD-810D, *Environmental Test Methods*.

4-8.2 The facepiece of the SCBA being tested shall be secured to a test headform as specified in 4-1.1 of this chapter.

4-8.3 The test headform shall be joined to a mannequin with the remaining components of the SCBA attached to the mannequin to simulate its typical wearing position on a fire fighter as specified by the manufacturer.

4-8.4 The test headform shall be connected as specified in Section 3-2 of this standard to a Model 327-6 Breathing Machine or other respiration simulator capable of producing a nominal minute volume of 40 liters with a minimum tidal volume of 1.6 liters per breath at a minimum respiration of 10 breaths per minute.

4-8.5 The mannequin, including the test headform, shall be mounted upright and turned about its vertical axis 180° midway through the test. The test duration shall be one hour and the breathing machine shall be operating throughout the entire test. The test may be interrupted to change the SCBA breathing gas container.

4-8.6 The test conditions as outlined per Method 510.2, Sand and Dust, of MIL-STD-810D, *Environmental Test Methods*, Section I-3d, shall be:

(a) *Air velocity:* Refer to subparagraph 1-3.2c (1).

(b) *Temperature:* 72°F ± 5°F (22°C ± 3°C)

(c) *Test item configuration and orientation:* mannequin upright and rotated 180° midway through the test.

(d) *Dust composition:* Refer to Section I-3.2d (1).

(e) *Dust concentration:* Refer to Section I-3.2e (1).

(f) *Test duration:* 1 hour.

4-8.7 After the completion of the above test, the SCBA shall be removed from the test compartment; it shall be lightly shaken or brushed free of dust, and then shall be tested in accordance with Section 3-2 of this standard to determine pass/fail.

4-9 Facepiece Lens Abrasion Resistance Test

4-9.1 The test apparatus shall be constructed in accordance with Figure 4-9.1.

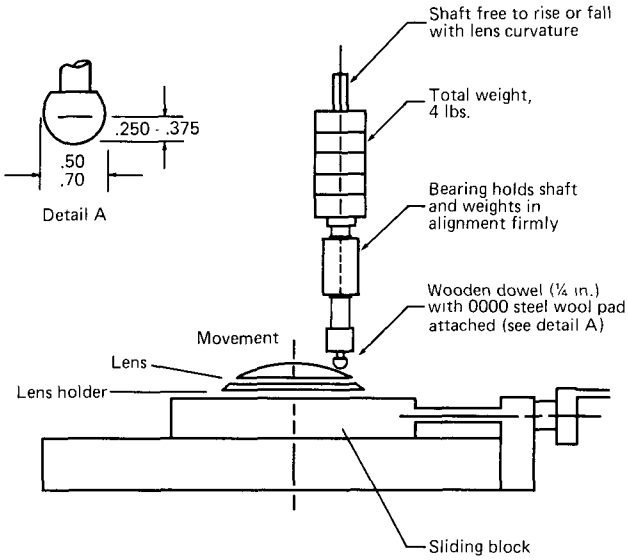


Figure 4-9.1 Dowel Tester for Lens Abrader

4-9.2 The facepiece shall be mounted with the lens exterior side up in the test apparatus shown in Figure 4-9.1. The rubbing surface shall be a 0.25-inch (6.35-mm) diameter dowel covered with 0000 steel wool. A 4-lb (1.7-kg) vertical weight shall be applied to the steel wool. The lens shall be abraded with three one inch (25 mm) strokes. A stroke shall be determined as starting at the appropriate level of the user's eye, 0.50 inch (13 mm) from the center of the lens, passing through the center of the lens and beyond for 0.50 inch (13 mm), and returning to the starting point.

4-9.3 Upon completion of the test, the facepiece lens shall be inspected for the pass/fail criteria detailed in 3-10.1 of this standard when tested in accordance with ASTM F532-81, *Standard Methods for Measuring the Width in Optical Surfaces Using Nomarski Differential Microscopy*, using a magnification of 50X.

4-10 Communication Test.

4-10.1 The method for measuring word intelligibility shall be as specified in ANSI S3.2, *Method for Measurement of Monosyllabic Word Intelligibility*.

4-10.2 Testing shall be conducted in an anechoic chamber that absorbs a minimum of 95 percent of all sound from 500 to 6000 hz.

4-10.3 A minimum of five listening subjects shall be used for testing. The subjects participating as listeners shall meet the auditory acuity criteria as described in paragraph 2.3 of ANSI S3.2, *Method for Measurement of Monosyllabic Word Intelligibility*.

4-10.4 The subject participating as the talker shall have no obvious speech defect or strong regional accent. Distance between the talker and the listener(s) shall be 5 feet + 1 - 0 feet, and they shall be facing each other.

4-10.5 The test material shall be the reading of one complete list of phonetically balanced words as contained in ANSI S3.2, *Method for Measurement of Monosyllabic Word Intelligibility*. The words shall be spoken singularly in the following carrier sentence: "Write the word (list word) now." The talker shall be trained to speak at the same volume, placing no unnatural stress on any word. The listeners shall write each word as they hear it.

4-10.6 The talker shall conduct two test in an anechoic chamber having an ambient noise field as specified in 4-10.7 of this section using two different word lists under the following conditions:

(a) no SCBA

(b) with SCBA worn and operated per the manufacturer's instructions.

4-10.7 The test chamber shall have a uniform, diffuse ambient noise field produced by a white noise generator connected to acoustical speakers. The output frequency range of the white noise generator shall be a minimum of 500 to 6000 Hz ± 1 dB and the minimum frequency response of the acoustical speakers shall be 500 to 6000 Hz ± 6 dB. The white noise sound pressure level shall be adjusted to an average 60 ± 2 dBA as measured at each of the listener's ears.

4-10.8 Each listener's written word list shall be scored as to the number of correct words out of the 50 words recited. An average score shall then be calculated from the test group's results to determine pass/fail.

Chapter 5 Referenced Publications

5-1 The following documents or portions thereof are referenced within this document and shall be considered part of the requirements of this document. The edition indicated for each reference shall be the current edition as of the date of the NFPA issuance of this document.

5-1.1* AATCC Publication.

AATCC 135, 1, III, B; *Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics*, 1978.

5-1.2* ANSI Publications.

ANSI S3.2, *Method for Measurement of Monosyllabic Word Intelligibility*, 1982.

ANSI Z86.1, *Commodity Specification for Air*, 1986.

5-1.3* ASTM Publication.

ASTM F532-81, *Standard Methods for Measuring the Width in Optical Surfaces Using Nomarski Differential Microscopy*, 1981.

5-1.4* GSA Publication.

Federal Test Method Standard 191, *Textile Test Methods*, 1983.

5-1.5* Navy Publication.

MIL-STD-810D, *Environmental Test Methods*, 19 July 1983.

5-1.6* Superintendent of Documents Publication.

30 CFR, Part 11; *Respiratory Protective Devices, Tests for Permissibility*.

Appendix A

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

A-1-1.1 The use of self-contained breathing apparatus (SCBA) by fire fighters is always assumed to be in atmospheres immediately dangerous to life or health (IDLH). There is no way to predetermine hazardous conditions, concentrations of toxic materials, or percentages of oxygen in air in a fire environment, during overhaul (salvage) operations, or under other emergency conditions involving spills or releases of hazardous materials. Thus, SCBA are required at all times during any fire fighting, hazardous materials, or overhaul operations.

A-1-1.3 Although SCBA that meet this standard have been tested to more stringent requirements than required for NIOSH/MSHA approval, there is no inherent guarantee against SCBA failure or fire fighter injury. Even the best-designed SCBA cannot compensate for either abuse or the lack of a respirator training and maintenance program. The severity of these tests should not encourage or condone abuse of SCBA in the field.

The enviromental tests utilized in this standard alone might not simulate actual field conditions, but are devised to put extreme loads on SCBA in an accurate and reproducible manner by testing laboratories. However, the selection of the environmental tests was based on summary values derived from studies of conditions that relate to field use.

A-1-2.1 The performance tests being added to the standard are:

1. *Airflow Performance Test.* This test increases the current NIOSH breathing machine requirement of 40 liters per minute to 100 liters per minute. The 100 liters per minute volume was derived from a review of several studies indicating that a ventilation rate of 100 standard liters per minute encompasses the 98th percentile of all fire fighters studied.

2. *Thermal Resistance Tests.* This series of tests exposes the breathing apparatus to various temperature extremes and temperature cycles that breathing apparatus might be exposed to during actual fire fighting operations.

3. *Particulate Resistance Test.* This test exposes the breathing apparatus to a specified concentration of particulates to provide a reasonable level of assurance that the apparatus is designed to properly function when exposed to the dust conditions commonly present during fire fighting operations.

4. *Facepiece Lens Abrasion Resistance Test.* This test is designed to provide a reasonable level of assurance that the facepiece lens of the breathing apparatus is not easily scratched during fire fighting operations that could result in reduced visibility for the fire fighter.

5. *Communications Test.* This test is designed to assure that the facepiece of the breathing apparatus does not significantly reduce a fire fighter's normal voice communication.

6. *Accelerated Corrosion Resistance Test.* This test is to provide a reasonable level of assurance that the breathing apparatus is designed to resist corrosion that may form and interfere with the apparatus performance and function.

7. *Vibration and Shock Resistance Test.* This test is designed to provide a reasonable level of assurance that when the breathing apparatus is exposed to vibration, such as being carried on a rig that often travels over rough road surfaces, the apparatus will perform and function properly.

8. *Fabric Components Test.* Flame, heat, and thread tests are added to provide a reasonable level of assurance that the fabric components of a harness assembly used to hold the backplate to the wearer's body will remain intact during fire fighting operations.

A-1-3 Compressed Breathing Gas. There are requirements in many standards and regulations covering the quality of air to be used in SCBA, and it is not the function of this Committee to reference all the established requirements. However, we do believe it is most important to remind the user that the quality of the air in the cylinder is of great concern, and that it should have a dew point compatible with the ambinet temperature to be encountered.

A-2-3.1.1 Since additional weight can reduce the fire fighter's ability to carry out assigned tasks, weight reduction is a prime concern of the Committee. The Committee recommends that SCBAs of rated 30-minute duration, the predominant SCBA used by the fire service, should be limited to a maximum weight of 25 lbs. Purchasers are advised to specifically address weight in their purchase specifications regardless of the rated service time.

A-2-3.2 SCBA approved by NIOSH/MSHA include a rated service time based on specific tests conducted by NIOSH. The SCBA is tested using a specified breathing machine with a breathing rate of 40 liters per minute. NIOSH uses this 40 liter per minute rate because it represents a moderate work rate that an average user can sustain for a period of time. To attain a rated service time of 30 minutes, during this 40 liter per minute test, the typical SCBA cylinder must contain 1200 liters or more of compressed breathable air. A 45-cu ft cylinder has a capacity of 1273.5 liters based on 28.3 liters per cubic foot. Because actual work performed by a fire fighter is often more strenuous than the work rate of 40 liters per minute, fire fighters will often not attain an acutal service time of 30 minutes. During extreme exertion, for example, actual service time can be reduced by 50 percent or more.

To assure proper utilization of equipment in actual situations, after training and instruction, it is recommended that users gain confidence by actually using the SCBA in a series of tasks representing or approximating the physical demands likely to be encountered.

In addition to the degree of user exertion, other factors that may affect the sevice time of the SCBA include:

(a) The physical condition of the user. (*See also ANSI Z88.6.*)

(b) Emotional conditions, such as fear or excitement, that may increase the user's breathing rate.

(c) The degree of training or experience the user has had with such equipment.

(d) Whether or not the cylinder is fully charged at the beginning of use.

(e) The facepiece fit.

(f) Use in a pressurized tunnel or caisson. At two atmospheres (15 psig), the duration will be one-half the duration obtained at one atmosphere; at three atmospheres, the duration will be one-third the duration obtained at one atmosphere.

(g) The condition of the SCBA.

A-3-2.1 The current NIOSH certification test method, 30 CFR, Part 11, uses a minute volume of 40 liters per minute, while NFPA 1981 requires an airflow test based on a minute volume of 100 liters per minute of airflow. A ventilation rate of 100 standard liters per minute encompasses the 98th percentile of all fire fighters studied. The ability of the SCBA to supply the 100 liters per minute of breathing air is measured in this airflow performance test by monitoring the pressure within the facepiece.

Specific response times for both the pressure transducer and recorder are specified in this standard. It is important to note that if other types of recording devices, measuring equipment, and testing methods are used, pressure fluctuations might appear in the facepiece as short (millisecond) negative pressure spikes. The significance of these spikes to the actual protection afforded the user by the SCBA is not fully understood at this time. Additional studies are needed to determine the significance, if any, of these spikes. Because these negative spikes might affect the actual protection offered by the SCBA, it is recommended that a facepiece fitting program be established. Quantitative fitting tests are recognized to be the best method for determining the facepiece-to-face seal and should be performed by the fire service wherever SCBA are used. For departments that wish to perform quantitative fit testing, a suggested procedure for conducting such tests may be found in ANSI Z88.2, *Practices for Respiratory Protection.*

A-4-1.1 The headform, Models 803608-1 and 803608-2, can be obtained from Scott Aviation, 225 Erie St., Lancaster, NY 14086. Drawings can be obtained from NFPA for Model 803608-1 or 803608-2.

A-4-1.7 A Model P24 differential pressure transducer with a range of ± 8.9 in. of water differential is recommended and available from Validyne Engineering Corporation, 8626 Wilbur Avenue, Northbridge, CA 91324.

A-4-1.8 A Model #1241 B00 one-pen recorder is recommended and available from Soltec Corporation, 11684 Pendleton Street, Sun Valley, CA 91352.

A-4-1.12 Complete engineering drawings to construct the Model 327-6 Breathing Machine can be obtained from NFPA.

The respiratory frequency is determined by dividing the minute volume by the tidal volume for each Model 327-6 Breathing Machine manufactured.

A-4-1.14 Calibration Procedure for NFPA Model 327-6 Breathing Machine.

CALIBRATION PROCEDURE FOR NFPA MODEL 327-6 BREATHING MACHINE

I. Set Up Equipment.

1. Remove plug fitting and open valve at side port of the breathing machine (BM), then close the valve to the test headform.

2. Connect a nonreturn 2-way valve to the side port. (*See Figure 1.*)

3. Make sure all gas has been expelled from a gas collection bag by rolling the bag up. Connect the bag to the dead-ended gas collection port of a 3-way valve. (*See Figure 2.*) A recommended gas collection bag is a 120-liter meterological bag (Catalog No. 022631) or a 150-liter Douglas bag (Catalog No. 022622) available from Warren C. Collins, Inc., 220 Wood Road, Braintree, MA 02184. Equivalent or similar collection bags may be substituted. Collins also supplies a 3-way valve (T-shape stopcock — Catalog No. 021043).

4. Connect the common port of the 3-way valve to the exhalation port of the nonreturn 2-way valve. (*See Figure 3.*)

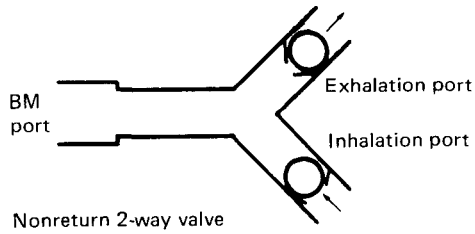
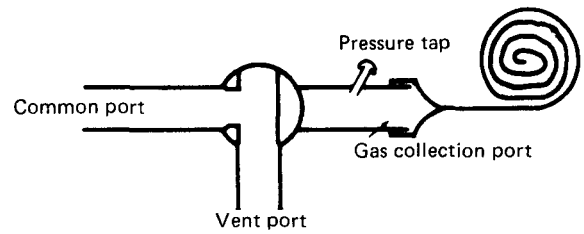
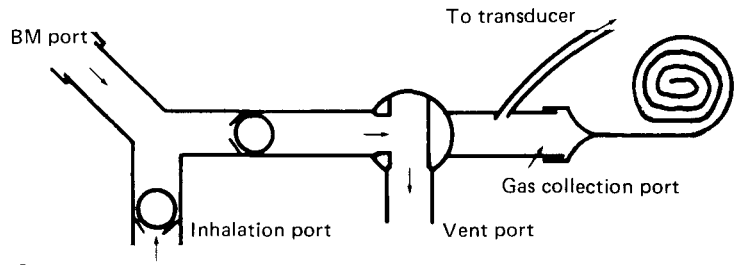


Figure 1



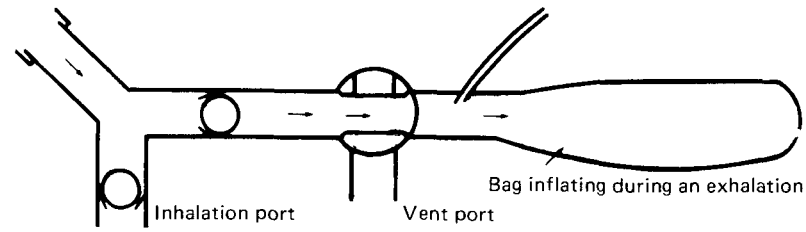
3-way valve with gas collection bag

Figure 2



3-way valve connected to nonreturn 2-way valve

Figure 3



System in gas collecting mode

Figure 4

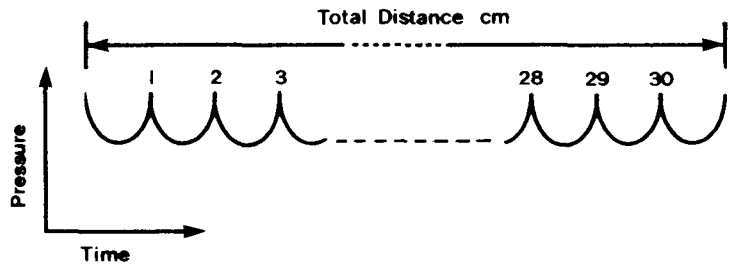


Figure 5

The total distance is the length that the 30 exhalations take on the strip chart recording. Each positive pressure peak indicates an exhalation stroke.

5. Connect the Validyne Transducer DP 24 to a pressure tap on the collection side of the 3-way valve. The transducer output goes to the Soltec Recorder.

II. Collect Gas.

1. With the vent port of the 3-way valve open, start BM and allow BM to "warm up" for at least ten minutes.

2. After the 10-minute "warm up" period, adjust the RPMs to approximately 30 if the machine has not been calibrated within the last few days. If the machine has recently been calibrated, leave it at its preset adjustment.

Calibration Log
for Model 327-6 Breathing Machine

Date	T (°R)	Pb (mm Hg)	V_m	$\left[V_m\left(\frac{492}{T}\right)\left(\frac{Pb}{760}\right)\right] = V_{STPD}$	NE	RPM	TV (liters) $\left[\frac{V_{STPD}}{NE}\right]$	MV (liters) [IV = RPM]	OPR Initials

3. Set the chart speed on the Soltec Recorder to 60 cm/min. and start the recorder.

4. At the start of an inhalation, turn the 3-way valve so that the air exhaled from the BM goes into the collection bag. (*See Figure 4.*)

5. Each exhalation stroke should produce a positive peak on the strip-chart recording, which can be used as a counter. The operator may use a substitute method to count the exhaled tidal volumes (TV) that go into the bag.

6. After 30 to 35 exhalations, turn the 3-way valve at the start of an inhalation so that the gas collection port is closed and the BM vents to atmosphere. Turn off the Soltec Recorder.

III. Measure the Volume (liters) of Gas Collected.

1. The recommended method to measure the volume of gas in the bag is to transfer the air into a Spirometer. Make sure the bag is completely empty by rolling it up.

2. Another method to measure the gas volume in the bag is to slowly empty the bag through a calibrated dry-gas meter. Ensure a correction factor is applied as required.

3. Convert the measured volume (V_m) to Standard Temperature Pressure Dry (STPD),

$$V_{STPD} = V_m \times \frac{492}{T} \times \frac{Pb}{760}$$

where T is the room temperature in degrees Rankin and Pb is the barometric pressure in mmHg.

IV. Calculate Minute Volume.

1. From the positive peaks on the strip chart recording, count the number of exhalations (NE) that were made into the bag or use your own counting method if you are sure it is correct.

2. Measure the total distance (in cm) between the peaks of 30 exhalations, which should be approximately 60 cm at a chart speed of 60 cm/min. (*See Figure 5.*) If the pressure in the gas collection port has not been measured, the operator may use another method to accurately measure the breathing machine's RPMs.

3. Calculate RPM,

$$RPM = \frac{30 \text{ breaths}}{\text{distance} \times \frac{\text{min}}{60 \text{ cm}}}$$

4. Determine the tidal volume (TV),

$$TV = \frac{V_{STPD}}{NE}$$

5. Determine the Minute Volume,

$$MV = TV \times RPM$$

NOTE: A record of TV and RPM should be maintained for each machine. As the seals on the pistons wear, the TV for a given RPM may decrease, an indication that the seals should be replaced.

V. Minute Volume Adjustment.

1. If the MV is between 100 liters and 105 liters, no adjustment is necessary and the BM is ready to perform the NFPA Flow Performance Test at the present RPM setting.

2. If the MV < 100 liters, the RPM must be increased and the MV recalculated.

3. If the MV > 105 liters, the RPM must be decreased and the MV recalculated.

A-4-3.2 A suggested configuration of a typical holding bracket. See Figure 4-1.2 for general configuration.

A-5-1.1 AATCC publications can be obtained from the American Association of Textile Chemists and Colorists, Post Office Box 12215, Research Triangle Park, NC 27709.

A-5-1.2 ANSI publications can be obtained from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

A-5-1.3 ASTM publications can be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

A-5-1.4 GSA publications can be obtained from the General Services Administration, Specifications Activities, Printed Materials Supply Division, Building 197, Naval Weapons Plant, Washington, DC 20407.

A-5-1.5 Navy publications can be obtained from the Navy Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

A-5-1.6 Superintendent of Documents publications can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Appendix B

B-1 The following documents or portions thereof are referenced within this document for informational purposes only and thus should not be considered part of the requirements of this document. The edition indicated for each reference should be the current edition as of the date of the NFPA issuance of this document.

B-1-1.1 Other Publications.

American National Standards Institute, 1430 Broadway, New York, NY 10018.

ANSI Z88.2, *Practices for Respiratory Protection*, 1982

ANSI Z88.6, *Standard for Respiratory Protection — Respirator Use Physical Qualifications for Personnel*, 1984.

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SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

INSTRUCTIONS

Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.