

NFPA®

1981

**Standard on
Open-Circuit Self-Contained
Breathing Apparatus (SCBA)
for Emergency Services**

2019



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NFPA® 1981

Standard on

Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services

2019 Edition

This edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, was prepared by the Technical Committee on Respiratory Protection Equipment and released by the Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. It was acted on by NFPA at its June Association Technical Meeting held June 11-14, 2018, in Las Vegas, NV. It was issued by the Standards Council on August 14, 2018, with an effective date of September 3, 2018, and supersedes all previous editions.

This edition of NFPA 1981 was approved as an American National Standard on September 3, 2018.

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 17, 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 (SCBA). NFPA 19B was officially withdrawn by the Association on May 19, 1981, at the Annual Meeting in Dallas, Texas.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 National Institute for Occupational Safety and Health (NIOSH) and Mine Safety and Health Administration (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 to which fire fighters' SCBA can be exposed during use and storage. These requirements are in addition to the basic NIOSH/MSHA certification requirements, and now NFPA 1981 applies to open-circuit SCBA.

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

After the second edition, the name of the Technical Committee was changed to Fire Service Protective Clothing and Equipment, and a standing Subcommittee on Self-Contained Breathing Apparatus was established.

The third edition, in 1992, incorporated new requirements for third-party certification and quality control, as well as a new total heat and flame test for the entire apparatus. Other test methods covering facepiece lens abrasion and communications were revised.

The third edition was completed in December 1991 and presented to the Association at the 1992 Annual Meeting in New Orleans, Louisiana.

In January 1995, the Standards Council reorganized the entire project for fire service protective clothing and equipment. The new project was given a Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment and seven technical committees operating

within the project. The former standing Subcommittee on Self-Contained Breathing Apparatus was changed to the new Technical Committee on Respiratory Protection and Personal Alarm Equipment.

The fourth edition, presented to the Association membership at the 1997 Annual Meeting in Los Angeles, California, incorporated new requirements for surrogate cylinders to replace the actual breathing gas cylinders during the vibration testing to ensure a higher level of safety during this rigorous test. A new requirement for redundant end-of-service-time indicators (EOSTI) was added to provide a better level of safety in case of failure of one EOSTI.

The fifth edition of NFPA 1981 was presented to the NFPA membership at the 2002 Annual Meeting in Minneapolis, Minnesota, on May 19, 2002. That edition incorporated new requirements for heads-up displays (HUD) that provide visual information and warnings to SCBA wearers of the status of the SCBA's air supply and, where the HUD is powered by a power source, the power source status. Those new requirements were in response to fire service requests for the provision of user-friendly information for SCBA wearers so they can better understand their environment and limitations.

Also in response to strong fire service input to the committee, new requirements were specified for a single universal air connection located in a specific position on all new SCBA certified as compliant with the 2002 edition of NFPA 1981, and existing SCBA that could be upgraded and certified as compliant with the 2002 edition of NFPA 1981. The RIC UAC [RIC stands for rapid intervention company or crew (sometimes called RIT for rapid intervention team, or FAST company or crew); UAC stands for universal air connection] permits the breathing air cylinder of an SCBA user to be replenished from an independent rescue breathing air supply source when the SCBA user is trapped or unable to be removed from a hazardous atmosphere. The RIC UAC does not take breathing air from an SCBA worn by a member of the rescue operation but replenishes the victim's breathing air cylinder from a source of rescue breathing air, such as a rescue breathing air cylinder or a high-pressure breathing air supply line. The RIC UAC is not a buddy breathing device—it does not permit the sharing of a single SCBA breathing air source between two persons. NIOSH does not permit or certify any buddy breathing system that allows two users to share a single breathing air source. Because NFPA 1981 requires NIOSH certification as a prerequisite to become certified as compliant with NFPA 1981, NFPA cannot permit buddy breathing systems, which would be in violation of NIOSH regulations.

The committee continued to review and revise text for improved clarity and specificity, improved accuracy in testing and test result reporting, and added criteria to better evaluate and test the EOSTI.

In 2002, NFPA revised the format for its codes and standards, resulting in chapter, section, and paragraph numbers not matching or corresponding to those of previous editions.

The 2007 edition of NFPA 1981, the sixth edition, represented a complete revision and retitling of the standard as NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*.

While the committee made several significant changes to the standard, a major change in the 2007 edition was the mandatory requirement for all emergency services SCBA to also be NIOSH certified as CBRN SCBA in accordance with the NIOSH *Statement of Standard for NIOSH CBRN SCBA Testing*. This requirement provided respiratory protection from CBRN terrorism agents (specified chemicals, biological agents, and radiological particulates) that could be released as a result of a terrorism attack.

Although major metropolitan areas are more likely targets of a terrorist event, emergency responders from small communities could be called on to respond to urban areas where the emergency services have become overwhelmed by a terrorist incident. Terrorists themselves might reside in small communities while they await the opportunity to strike, and if they have chemical, biological, or nuclear material in their possession, the possibility of exposure is even greater for those small, rural areas. Terrorist attacks aside, CBRN-certified SCBA offer greater protection for emergency services personnel at minimal cost.

CBRN certification offers verification of enhanced protection for emergency responders that is not otherwise available. Without CBRN protection evaluation, SCBA components are not tested for permeation, penetration, corrosion resistance, or other detrimental effects from exposure to toxic industrial chemicals during hazardous materials incidents and hazardous chemical warfare atmospheres. NIOSH benchmark testing of non-CBRN-hardened SCBA against CBRN agents demonstrated that chemical warfare agents (CWA) could cause catastrophic failures within minutes of exposure.

NIOSH's selection of the test challenge agents for CBRN protection was based on a comprehensive review of available technical data and consultations with other government agencies (e.g., Department of Defense, Department of Justice, and Department of Energy). Various chemical data lists were analyzed, including lists from the Environmental Protection Agency; the Agency for Toxic Substances and Disease Registry; NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents*; the U.S. Army Center for Health Promotion and Preventative Medicine Technical Guide 244; and other, classified sources. That analysis identified a total of 151 toxic industrial chemicals (TICs) and CWA as potential candidates for challenge agents. The candidate agents were evaluated for permeation (molecularly diffusing through material) and penetration (seeping through interfacing components) characteristics as part of a review of their physical properties.

This evaluation concluded that sarin and sulfur mustard could be selected as the two representative agents for the penetration/permeation test for the complete listing of 151 CWA and TICs due to their physical properties and molecular

structure. NIOSH is unaware of any data that indicate that CBRN-certified SCBA provide less protection against TICs than their industrial counterparts.

The evaluation for CBRN protection provides verification and assurance that the component and material combinations in the approved SCBA configurations provided high resistance to permeation and penetration of hazardous atmospheres of TICs and materials into the breathing air. This is of importance to all responders subject to extreme exposures to any hazardous industrial chemicals and materials.

In addition to the new CBRN requirement, the following significant requirements were added to increase the safety to the users of emergency services SCBA and to better assure the proper functioning of the SCBA:

- (1) New breathing air cylinder retention requirement within the mounted position
- (2) Mechanical voice diaphragm performance requirement increased to 80 percent minimum score at 1.5 m (4.9 ft) distance
- (3) New voice communications system with at least an 85 percent score at 3 m (10 ft) distance
- (4) New independent pressure gauge that would not be affected by failure of the head's-up display
- (5) New water immersion requirements for electronic devices that are part of the SCBA that must function properly and remain watertight after six exposures to 177°C (350°F) for 15 minutes and water submersion to 1.5 m (4.9 ft)
- (6) New low power capacity requirements for electronic devices to assure that such devices will continue to function properly for at least 2 hours following activation of the low power source signal

The 2013 edition of NFPA 1981, the seventh edition, represented a complete revision of the standard. Among the many changes included in this edition is a new section on emergency breathing safety systems (EBSS) in response to correspondence that the Technical Committee on Respiratory Protection Equipment received from NIOSH that indicated NIOSH's intention to modify its existing policy on buddy breathers. For the complete text of this letter, please see the NFPA 1981 F12 *Report on Comments* (ROC), 1981-1, LOG #21.

Also in this edition were new definitions for terms related to speech intelligibility, including speech transmission index, sound pressure level, mouth reference point, and microphone measurement point.

The technical committee also modified the performance requirements for the nonelectronic communications performance test and the supplementary voice communications system performance test. Several new tests were added, including an emergency breathing safety system cold temperature performance test, a lens radiant heat test, and a lens convective heat and flame resistance test.

The 2019 edition of NFPA 1981, the eighth, includes editorial corrections, paragraph numbering changes, and reference document updates. A definition of universal emergency breathing safety systems (UEBSS) is added, and Table 4.3.9, Test Series, is updated to include UEBSS. Also, the standard now requires pressure demand certification by NIOSH and a nonelectronic transmission system at a minimum for voice communications.

Breathing rate can now be reported by the data logging software. Updated figures for the EBSS male and female fittings are provided, and requirements for EBSS location marking specify that it be readily visible and contrasting. A new strength of connection between the facepiece and second stage regulator performance requirement and associated test has been added.

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Committee Scope: This Committee shall have primary responsibility for documents on the design, performance, testing, and certification of protective clothing and protective equipment manufactured for fire and emergency services organizations and personnel, to protect against exposures encountered during emergency incident operations. This Committee shall also have the primary responsibility for documents on the selection, care, and maintenance of such protective clothing and protective equipment by fire and emergency services organizations and personnel.

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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.

Committee Scope: This Committee shall have primary responsibility for documents on respiratory equipment, including breathing air, for fire and emergency services personnel during incidents involving hazardous or oxygen deficient atmospheres. This Committee shall also have primary responsibility for documents on the selection, care, and maintenance of respiratory protection equipment and systems by fire and emergency services organizations and personnel.

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NFPA 1981

Standard on

Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services

2019 Edition

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

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex C. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration**1.1 Scope.**

1.1.1* This standard shall specify the minimum requirements for the design, performance, testing, and certification of new compressed breathing air open-circuit self-contained breathing apparatus (SCBA) and compressed breathing air combination open-circuit self-contained breathing apparatus and supplied air respirators (SCBA/SARs) and for the replacement parts, components, and accessories for these respirators.

1.1.2 This edition of the standard shall also specify the minimum requirements for the design, performance and testing of replacement parts, components, and add-on accessories for SCBA and combination SCBA/SARs certified as compliant to earlier editions of this standard.

1.1.3 This standard shall not specify requirements for other types of SCBA.

1.1.4* This standard shall not specify requirements for any accessories that could be attached to the certified product that are not certified by the National Institute for Occupational Safety and Health (NIOSH).

1.1.5 This standard shall not establish criteria for SCBA for water or underwater operations.

1.1.6 This standard shall not establish criteria for protection from ionizing radiation.

1.1.7 This standard shall not be construed as addressing all of the safety concerns associated with the use of compliant SCBA and combination SCBA/SARs. It shall be the responsibility of the persons and organizations that use compliant SCBA and combination SCBA/SARs to establish safety and health practices and to determine the applicability of regulatory limitations prior to use.

1.1.8 This standard shall not be construed as addressing all of the safety concerns, if any, associated with the use of this standard by testing facilities. It shall be the responsibility of the persons and organizations that use this standard to conduct testing of SCBA and combination SCBA/SARs to establish safety and health practices and to determine the applicability of regulatory limitations prior to using this standard for any designing, manufacturing, and testing.

1.1.9 Nothing herein shall restrict any jurisdiction or manufacturer from exceeding these minimum requirements.

1.2 Purpose.

1.2.1 The purpose of this standard shall be to establish minimum levels of protection for emergency services personnel from atmospheres that are categorized as immediately dangerous to life and health (IDLH) atmospheres.

1.2.2* Controlled laboratory tests used to determine compliance with the performance requirements of this standard shall not be deemed as establishing performance levels for all respiratory protective situations and IDLH atmospheres to which personnel can be exposed.

1.2.3* This standard shall not be interpreted or used as a detailed manufacturing or purchase specification but shall be permitted to be referenced in purchase specifications as minimum requirements.

1.3 Application.

1.3.1 This standard shall apply to all open-circuit SCBA and combination SCBA/SARs used by emergency services organizations for respiratory protection of its personnel during fire-fighting, rescue, hazardous materials, terrorist incident, and similar operations where products of combustion, oxygen deficiency, particulates, toxic products, or other IDLH atmospheres exist or could exist at the incident scene.

1.3.1.1* If the SCBA is equipped with an EBSS, the EBSS performance requirements set forth in this standard shall apply only to open-circuit SCBA and combination SCBA/SARs used by the fire service for respiratory protection of its personnel during the applications listed in 1.3.1.

1.3.2 This edition of the standard shall apply to the design, manufacturing, and certification of new open-circuit SCBA and combination SCBA/SARs and shall apply to replacement parts, components, and add-on accessories for such respirators certified as compliant to earlier editions of this standard.

1.3.3 This standard shall apply to accessories attached to the SCBA that are certified by NIOSH for use with that specific SCBA or combination SCBA/SARs.

1.3.4 This standard shall not apply to open-circuit SCBA and combination SCBA/SARs manufactured according to previous editions of this standard; however, organizations shall be permitted to have open-circuit SCBA and combination SCBA/SARs that are certified as compliant with previous editions of this standard and modified to become compliant with this edition of NFPA 1981.

1.3.5 This standard shall not apply to closed-circuit SCBA.

1.3.6 This standard shall not apply to accessories that can be attached to an open-circuit SCBA and combination SCBA/SARs but are not certified by NIOSH for use with that specific SCBA or combination SCBA/SARs.

1.3.7 This standard shall not apply to the use of SCBA and combination SCBA/SARs; those requirements are specified in NFPA 1500.

1.4 Units.

1.4.1 In this standard, values for measurement are followed by an equivalent in parentheses, but only the first stated value shall be regarded as the requirement.

1.4.2 Equivalent values in parentheses shall not be considered as the requirement because those values might be approximate.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2018 edition.

NFPA 1852, *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)*, 2019 edition.

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2018 edition.

NFPA 1989, *Standard on Breathing Air Quality for Emergency Services Respiratory Protection*, 2019 edition.

2.3 Other Publications.

2.3.1 AATCC Publications. American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

AATCC 135, *Dimensional Changes of Fabrics After Home Laundering*, 2014.

2.3.2 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th floor, New York, NY 10036.

ANSI/ASA S3.2, *American National Standard Method for Measuring the Intelligibility of Speech over Communication Systems*, 2009, reaffirmed 2014.

2.3.3 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P. O. Box C700, West Conshohocken, PA 19428-2959.

ASTM B16/B16M, *Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines*, 2010, reapproved 2015.

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*, 2011.

ASTM D1003, *Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics*, 2013.

ASTM D6413/D6413M, *Standard Test Method for Flame Resistance of Textiles (Vertical Test)*, 2015.

ASTM E162, *Standard Test Method for Surface Flammability of Materials Using Radiant Heat Energy Source*, 2015.

2.3.4 CENELEC Publications. CENELEC, European Committee for Electrotechnical Standardization, CEN-CENELEC Management Centre, Avenue Marnix 17, B-1000, Brussels, Belgium.

BS EN 136, *Respiratory protective devices — Full face masks — Requirements, testing, marking*, 1998, Corrigendum, 2004.

2.3.5 EBU Publications. EBU (European Broadcasting Union) Department of Technology & Innovation, L'Ancienne-Route 17A, Postal Box 45, 1218 Le Grand-Saconnex, Geneva, Switzerland.

EBU R 068, *Alignment level in digital audio production equipment and in digital audio recorders*, 2000.

2.3.6 IEC Publications. International Electrotechnical Commission, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland.

IEC 60268-16, *Sound System Equipment — Part 16: Objective Rating of Speech Intelligibility by Speech Transmission Index*, 2011.

2.3.7 ISO Publications. International Organization for Standardization, ISO Central Secretariat, BIBC II, 8, Chemin de Blandonnet, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO Guide 27, *Guidelines for corrective action to be taken by a certification body in the event of misuse of its mark of conformity*, 1983.

ISO 9001, *Quality management systems — Requirements*, 2015.

ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*, 2004.

ISO/IEC 17021, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*, 2011.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, 2005, Technical Corrigendum, 2006.

ISO/IEC 17065, *Conformity Assessment — Requirements for Bodies Certifying Products, Processes and Services*, 2012.

2.3.8 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1 Hazardous (Classified) Locations*, Sixth edition, 2002.

2.3.9 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington DC, 20401-0001.

Statement of Standard for NIOSH CBRN SCBA Testing, 2002.

Title 42, Code of Federal Regulations, Part 84, “Respiratory Protective Devices, Tests for Permissibility.”

2.3.10 Other Publications.

Merriam-Webster’s Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections. (Reserved)

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster’s Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable

for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Accessory. An item, or items, that could be attached to a certified product, but are not necessary for the certified product to meet the requirements of the standard.

3.3.2 Atmosphere-Supplying Respirator. A respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere and includes self-contained breathing apparatus (SCBA) and supplied air respirators (SAR). [See also 3.3.10, *Combination SCBA/SAR*; 3.3.46, *Self-Contained Breathing Apparatus (SCBA)*; and 3.3.51, *Supplied Air Respirator (SAR)*.]

3.3.3 Breathing Air. See 3.3.13, *Compressed Breathing Air*.

3.3.4 Breathing Air Cylinder. The pressure vessel or vessels that are an integral part of the SCBA and that contain the breathing gas supply; can be configured as a single cylinder or other pressure vessel, or as multiple cylinders or pressure vessels.

3.3.5 Breathing Air/Gas Container. See 3.3.4, *Breathing Air Cylinder*.

3.3.6 Certification Organization. An independent third-party organization that determines product compliance with the requirements of this standard with a labeling/listing/follow-up program.

3.3.7 Certification/Certified. A system whereby a certification organization determines that a manufacturer has demonstrated the ability to produce a product that complies with the requirements of this standard, authorizes the manufacturer to use a label on listed products that comply with the requirements of this standard, and establishes a follow-up program conducted by the certification organization as a check on the methods the manufacturer uses to determine continued compliance of labeled and listed products with the requirements of this standard. (See also 3.3.33, *NIOSH Certified*.)

3.3.8 Char. The formation of a brittle residue when material is exposed to thermal energy.

3.3.9 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 gas and the oxygen content within the system has been restored from sources such as compressed breathing air, chemical oxygen, liquid oxygen, or compressed gaseous oxygen.

3.3.10* Combination SCBA/SAR. An atmosphere-supplying respirator that supplies a respirable atmosphere to the user from a combination of two breathing air sources that both are independent of the ambient environment. [See also 3.3.2, *Atmosphere-Supplying Respirator*; 3.3.46, *Self-Contained Breathing Apparatus (SCBA)*; and 3.3.51, *Supplied Air Respirator (SAR)*.]

3.3.11 Compliance/Compliant. Meeting or exceeding all applicable requirements of this standard.

3.3.12* Component. Any material, part, or subassembly used in the construction of the compliant product.

3.3.13* Compressed Breathing Air. A respirable gas mixture derived from either normal atmospheric air or from manufactured synthetic air, stored in a compressed state in storage cylinders and respirator breathing air cylinders, and supplied to the user in a gaseous form.

3.3.14 Cylinder. See 3.3.4, Breathing Air Cylinder.

3.3.15 Demand SCBA. See 3.3.32, Negative Pressure SCBA.

3.3.16 Drip. To run or fall in drops or blobs.

3.3.17 EBSS. Abbreviation for emergency breathing safety system.

3.3.17.1 UEBSS. Abbreviation for Universal Emergency Breathing Safety System.

3.3.18 Emergency Breathing Safety System (EBSS). A device on an SCBA that allows users to share their available air supply in an emergency situation.

3.3.19 End-of-Service-Time Indicator (EOSTI). A warning device on an SCBA that alerts the user that the reserve air supply is being utilized.

3.3.20 Fabric Component. Any single or combination of natural or synthetic material(s) that are pliable and that are made by weaving, felting, forming, or knitting.

3.3.21 Facepiece. The component of an SCBA that covers the wearer's nose, mouth, and eyes.

3.3.22 Follow-up Program. The sampling, inspections, tests, or other measures conducted by the certification organization on a periodic basis to determine the continued compliance of labeled and listed products that are being produced by the manufacturer to the requirements of this standard.

3.3.23 Gas. Matter in a gaseous state at standard temperature and pressure.

3.3.24 Haze. Light that is scattered as a result of passing through a transparent object.

3.3.25 Head and Torso Simulator (HATS). A mannequin with built-in ear and mouth simulators that provides a realistic reproduction of the acoustic properties of an average adult human head and torso.

3.3.26 Heads-Up Display (HUD). Visual display of information and system condition status visible to the wearer.

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

3.3.28 Manufacturer. The entity that directs and controls any of the following: compliant product design, compliant product manufacturing, or compliant product quality assurance; or the entity that assumes the liability for the compliant product or provides the warranty for the compliant product.

3.3.29 Melt. A response to heat by a material resulting in evidence of flowing or dripping.

3.3.30 Microphone Measurement Point (MMP). A point 1.5 m in front of and on the axis of the lip position of typical human mouth (or artificial mouth) and 1.5 m above the floor.

3.3.31 Mouth Reference Point (MRP). A point 50 mm in front of and on the axis of the lip position of a typical human mouth (or artificial mouth).

3.3.32 Negative Pressure SCBA. An SCBA in which the pressure inside the facepiece, in relation to the pressure surrounding the outside of the facepiece, is negative during any part of the inhalation or exhalation cycle when tested by NIOSH in accordance with 42 CFR 84.

3.3.33* NIOSH Certified. Tested and certified by the National Institute for Occupational Safety and Health (NIOSH) of the U.S. Department of Health and Human Services in accordance with the requirements of 42 CFR 84, Subpart H.

3.3.34 Open-Circuit SCBA. An SCBA in which exhalation is vented to the atmosphere and not rebreathed.

3.3.35 Pink Noise. Noise that contains constant energy per octave band.

3.3.36 Positive Pressure SCBA. An SCBA in which the pressure inside the facepiece, in relation to the pressure surrounding the outside of the facepiece, is positive during both inhalation and exhalation when tested by NIOSH in accordance with 42 CFR 84, Subpart H.

3.3.37 Pressure Demand SCBA. See 3.3.36, Positive Pressure SCBA.

3.3.38* Product Label. A marking provided by the manufacturer for each compliant product containing compliant statements, certification statements, manufacturer and model information, or similar data.

3.3.39 Rapid Intervention Crew/Company Universal Air Connection (RIC UAC). A system that allows emergency replenishment of breathing air to the SCBA of disabled or entrapped fire or emergency services personnel.

3.3.40 Rated Service Time. The period of time, stated on the SCBA's NIOSH certification label, that the SCBA supplied air to the breathing machine when tested to 42 CFR 84, Subpart H.

3.3.41 Reserve Air Supply. The period of time available for emergency egress, self-rescue, or assisted rescue.

3.3.42 RIC. Abbreviation for rapid intervention crew/company.

3.3.43 SAR. Abbreviation for supplied air respirator. [See 3.3.51, *Supplied Air Respirator (SAR)*.]

3.3.44 SCBA. Abbreviation for self-contained breathing apparatus. [See 3.3.46, *Self-Contained Breathing Apparatus (SCBA)*.]

3.3.45 SCBA/SAR. Abbreviation for combination open-circuit SCBA and supplied air respirator. [See 3.3.10, *Combination SCBA/SAR*; 3.3.46, *Self-Contained Breathing Apparatus (SCBA)*; and 3.3.51, *Supplied Air Respirator (SAR)*.]

3.3.46* Self-Contained Breathing Apparatus (SCBA). An atmosphere-supplying respirator that supplies a respirable air atmosphere to the user from a breathing air source that is inde-

pendent of the ambient environment and designed to be carried by the user.

3.3.47 Service Life. The period for which compliant product may be useful before retirement.

3.3.48 Service Time. See 3.3.40, Rated Service Time.

3.3.49 Sound Pressure Level (SPL). The local pressure deviation from the ambient (average, or equilibrium) atmospheric pressure caused by a sound wave.

3.3.50 Speech Transmission Index (STI). A measure of intelligibility of speech quality on a scale of intelligibility, whose values vary from 0 (completely unintelligible) to 1 (perfect intelligibility).

3.3.51* Supplied Air Respirator (SAR). An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user; also known as an *airline respirator*. [See also 3.3.2, *Atmosphere-Supplying Respirator*; 3.3.10, *Combination SCBA/SAR*; and 3.3.46, *Self-Contained Breathing Apparatus (SCBA)*.]

3.3.52 Synthetic Breathing Air. A manufactured breathing air that is produced by blending nitrogen and oxygen. (See also 3.3.13, *Compressed Breathing Air*.)

3.3.53 UAC. Abbreviation for universal air connection.

3.3.54 Universal Air Connection (UAC). The male fitting, affixed to the SCBA, and the female fitting, affixed to the filling hose, to provide emergency replenishment of breathing air to an SCBA breathing air cylinder. Also known as Rapid Intervention Crew/Company Universal Air Connection.

3.3.55 UEBSS. See 3.3.17.1.

Chapter 4 Certification

4.1 General.

4.1.1 The process for certification of SCBA as being compliant with NFPA 1981 shall meet the requirements of Section 4.1, General; Section 4.2, Certification Program; Section 4.3 Inspections and Testing; Section 4.4, Recertification; Section 4.5, Manufacturers' Quality Assurance Program; Section 4.6, Hazards Involving Compliant Product; Section 4.7, Manufacturers' Investigation of Complaints and Returns; and Section 4.8, Manufacturers' Safety Alert and Product Recall Systems.

4.1.2 Prior to certification of SCBA to the requirements of this standard, SCBA shall be NIOSH certified.

4.1.2.1 SCBA shall have NIOSH certification as positive pressure.

4.1.2.2* SCBA shall have a NIOSH-certified rated service time of at least 30 minutes.

4.1.2.3 SCBA that are NIOSH certified as positive pressure but capable of supplying air to the user in a negative pressure demand-type mode shall NOT be certified to this standard.

4.1.3 SCBA and accessories that are certified as compliant with NFPA 1981 shall also be certified by NIOSH as compliant with the *Statement of Standard for NIOSH CBRN SCBA Testing*.

4.1.4 All SCBA that are labeled as being compliant with this standard shall meet or exceed all applicable requirements

specified in this standard and shall be certified. This certification shall be in addition to, and shall not be construed to be the same as, the NIOSH certification as specifically defined in 3.3.33.

4.1.5 All certification shall be performed by a certification organization that meets at least the requirements specified in Section 4.2, Certification Program, and that is accredited for personal protective equipment in accordance with ISO/IEC Guide 65, *General requirements for bodies operating product certification systems*.

4.1.6 Manufacturers shall not claim compliance with a portion(s) or segment(s) of the requirements of this standard and shall not use the name or identification of this standard, NFPA 1981, in any statements about their respective product(s) unless the product(s) is certified as compliant to this standard.

4.1.7 All compliant SCBA shall be listed by the certification organization. The listing shall uniquely identify the certified product by, at a minimum, style, model number, or part number.

4.1.8 All compliant SCBA shall also have a product label that meets the requirements specified in Chapter 5.

4.1.9 The certification organization's label, symbol, or identifying mark shall be attached to the product label, shall be part of the product label, or shall be immediately adjacent to the product label.

4.1.10 The certification organization shall not issue any new certifications for any SCBA to the 2013 edition of this standard on or after the NFPA effective date for the 2018 edition, which is September 3, 2018.

4.1.11 The certification organization shall not permit any manufacturer to label any SCBA as compliant with the 2013 edition of this standard on September 3, 2019, except when replacement labels or replacement components that bear the certification organization's label are required.

4.1.12 The certification organization shall require manufacturers to remove all certification labels and product labels indicating compliance with the 2013 edition of this standard from all SCBA that are under the control of the manufacturer on September 3, 2019. The certification organization shall verify that this action is taken.

4.2 Certification Program.

4.2.1* The certification organization shall not be owned or controlled by manufacturers or vendors of the product being certified.

4.2.2 The certification organization shall be primarily engaged in certification work and shall not have a monetary interest in the product's ultimate profitability.

4.2.3 The certification organization shall be accredited for personal protective equipment in accordance with ISO/IEC Guide 65, *General requirements for bodies operating product certification systems*. The accreditation shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.2.4 The certification organization shall refuse to certify products to this standard that do not comply with all applicable requirements of this standard.

4.2.5* The contractual provisions between the certification organization and the manufacturer shall specify that certification is contingent on compliance with all applicable requirements of this standard.

4.2.5.1 The certification organization shall not offer or confer any conditional, temporary, or partial certifications.

4.2.5.2 Manufacturers shall not be authorized to use any label or reference to the certification organization on products that are not compliant with all applicable requirements of this standard.

4.2.6* The certification organization shall have laboratory facilities and equipment available for conducting proper tests to determine product compliance.

4.2.6.1 The certification organization laboratory facilities shall have a program in place and functioning for calibration of all instruments, and procedures shall be in use to ensure proper control of all testing.

4.2.6.2 The certification organization laboratory facilities shall follow good practice regarding the use of laboratory manuals, form data sheets, documented calibration and calibration routines, performance verification, proficiency testing, and staff qualification and training programs.

4.2.7 The certification organization shall require the manufacturer to establish and maintain a quality assurance program that meets the requirements of Section 4.5, Manufacturers' Quality Assurance Program.

4.2.7.1 The certification organization shall require the manufacturer to have a product recall system specified in Section 4.8, Manufacturers' Safety Alert and Product Recall Systems, as part of the manufacturer's quality assurance program.

4.2.7.2 The certification organization shall audit the manufacturer's quality assurance program to ensure that the quality assurance program provides continued product compliance with this standard.

4.2.8 The certification organization and the manufacturer shall evaluate any changes affecting the form, fit, or function of the compliant product to determine its continued certification to the 2018 edition of NFPA 1981.

4.2.8.1 The certification organization and the manufacturer shall evaluate replacement parts, components, and add-on accessories to determine any changes affecting the form, fit, or function for SCBA certified to the 2007 edition or the 2013 edition of NFPA 1981 in order for those certifications to accept replacement parts, components, and add-on accessories tested and certified as compliant to the 2018 edition of this standard.

4.2.8.2 Replacement parts, components, and add-on accessories for SCBAs certified to the 2007 edition or the 2013 edition of NFPA 1981 shall be approved by NIOSH in accordance with 42 CFR 84, "Respiratory Protective Devices, Tests for Permissibility."

4.2.9* The certification organization shall have a follow-up inspection program of the manufacturing facilities of the compliant product, with at least two random and unannounced visits per 12-month period to verify the product's continued compliance.

4.2.9.1 As part of the follow-up inspection program, the certification organization shall select sample product at random

from the manufacturer's production line, from the manufacturer's in-house stock, or from the open market.

4.2.9.2 Sample product shall be evaluated by the certification organization to verify the product's continued compliance in order to ensure that the materials, components, and manufacturing quality assurance systems are consistent with the materials, components, and manufacturing quality assurance that were inspected and tested by the certification organization during initial certification and recertification.

4.2.9.3 The certification organization shall be permitted to conduct specific testing to verify the product's continued compliance.

4.2.9.4 For products, components, and materials where prior testing, judgment, and experience of the certification organization have shown results to be in jeopardy of not complying with this standard, the certification organization shall conduct more frequent testing of sample product, components, and materials acquired in accordance with 4.2.9.1 against the applicable requirements of this standard.

4.2.10 The certification organization shall have in place a series of procedures, as specified in Section 4.6, Hazards Involving Compliant Product, that address report(s) of situation(s) in which a compliant product is subsequently found to be hazardous.

4.2.11 The certification organization's operating procedures shall provide a mechanism for the manufacturer to appeal decisions. The procedures shall include the presentation of information from both sides of a controversy to a designated appeals panel.

4.2.12 The certification organization shall be in a position to use legal means to protect the integrity of its name and label. The name and label shall be registered and legally defended.

4.3* Inspections and Testing.

4.3.1 For both certification and recertification of SCBA, the certification organization shall conduct both the inspection and the testing specified in this section.

4.3.2 All inspections, evaluations, conditioning, and testing for certification or for recertification shall be conducted by a certification organization's testing laboratory that is accredited in accordance with the requirements of ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*.

4.3.2.1 The certification organization's testing laboratory's scope of accreditation to ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, shall encompass testing of personal protective equipment.

4.3.2.2 The accreditation of a certification organization's testing laboratory shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.3.3 A certification organization shall be permitted to utilize conditioning and testing results conducted by a product or component manufacturer for certification or recertification provided the manufacturer's testing laboratory meets the requirements specified in 4.3.3.1 through 4.3.3.5.

4.3.3.1 The manufacturer's testing laboratory shall be accredited in accordance with the requirements of ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*.

4.3.3.2 The manufacturer's testing laboratory's scope of accreditation to ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, shall encompass testing of personal protective equipment.

4.3.3.3 The accreditation of a manufacturer's testing laboratory shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.3.3.4 The certification organization shall approve the manufacturer's testing laboratory.

4.3.3.5 The certification organization shall determine the level of supervision and witnessing of the conditioning and testing for certification or recertification conducted at the manufacturer's testing laboratory.

4.3.4 Sampling levels for testing and inspection shall be established by the certification organization and the manufacturer to ensure a reasonable and acceptable reliability at a reasonable and acceptable confidence level that products certified to this standard are compliant, unless such sampling levels are specified herein.

4.3.5 Inspection by the certification organization shall include a review of all product labels to ensure that all required label attachments, compliance statements, certification statements, and other product information are at least as specified for the SCBA in Section 5.1, Product Label Requirements.

4.3.6 Inspection by the certification organization shall include an evaluation of any symbols and pictorial graphic representations used on product labels or in user information, as permitted in 5.1.5, to ensure that the symbols are clearly explained in the product's user information package.

4.3.7 Inspection by the certification organization shall include a review of the user information required by Section 5.2, User Information, to ensure that the information has been developed and is available.

4.3.8 Inspection and evaluation by the certification organization for determining compliance with the design requirements specified in Chapter 6 shall be performed on whole or complete products.

4.3.9 SCBA and SCBA components shall be subjected to the tests specified in Table 4.3.9 for each series.

4.3.10 SCBA shall be initially tested for certification and shall meet the performance requirements of three separate test series of Categories A, B, C, D, E, and F, as specified in Table 4.3.9. All tests within Categories A, B, C, D, E, and F shall be conducted in the order specified and are designed as cumulative damage tests.

4.3.11 SCBA fabric, thread, and lens components shall be initially tested for certification and shall meet the performance requirements of one test series of Category G, as specified in Table 4.3.9. SCBA component testing in Category G shall be conducted on test specimens as specified in each respective test method.

4.3.12 SCBA shall be initially tested for certification and shall meet the performance requirements of one test series for Category H, as specified in Table 4.3.9 for each EOSTI identified by the product manufacturer. Additional SCBA shall be permitted to be used, where necessary, to conduct all of the Category H tests.

4.3.13 After certification, compliant SCBA and components of compliant SCBA shall be tested annually within 12 months of previous tests and shall meet the performance requirements of one test series of Categories A, B, C, D, E, F, G, and H, as specified in Table 4.3.9.

4.3.14 A minimum of seven identical SCBA that are to be certified to this standard shall be selected from the manufacturer's production.

4.3.15 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, the third SCBA shall be subjected to the tests in Category C, the fourth SCBA shall be subjected to the tests in Category D, the fifth SCBA shall be subjected to the tests in Category E, the sixth SCBA shall be subjected to the tests in Category F, and the seventh SCBA, at a minimum, shall be subjected to the tests in Category H, as shown in Table 4.3.9. Additional SCBA shall be permitted to be used, where necessary, to conduct all of the Category H tests.

4.3.16 Components from SCBA that are to be certified to this standard shall be subjected to the tests specified in Category G of Table 4.3.9. SCBA component testing in Category F shall be conducted on test specimens as specified in each respective test method.

4.3.17 The requirement specified in 4.3.13 shall be waived every fifth year when the testing required by 4.3.18 is conducted.

4.3.18 Compliant SCBA shall be tested and shall meet the performance requirements of three separate test series of Categories A, B, C, D, E, and F, as specified in Table 4.3.9, every fifth year from the date of the initial certification testing specified in 4.3.10.

4.3.19 SCBA fabric, thread, and lens components shall be tested and shall meet the performance requirements of one test series of Category G, as specified in Table 4.3.9, every fifth year from the date of the initial certification testing specified in 4.3.11. SCBA component testing in Category G shall be conducted on test specimens as specified in each respective test method.

4.3.20 Compliant SCBA shall be tested and shall meet the performance requirements of one test series for Category H, as specified in Table 4.3.9, for each EOSTI identified by the product manufacturer, every fifth year from the date of the initial certification testing specified in 4.3.12. Additional SCBA shall be permitted to be used, where necessary, to conduct all of the Category H tests.

4.3.21 The certification organization shall not allow any modifications, pretreatment, conditioning, or other such special processes of the product or any product component prior to the product's submission for evaluation and testing by the certification organization.

4.3.21.1 The certification organization shall accept from the manufacturer for evaluation and testing for certification only

Table 4.3.9 Test Series

Test Order	Category A (SCBA #1)	Category B (SCBA #2)	Category C (SCBA #3)	Category D (SCBA #4)	Category E (SCBA #5)	Category F (SCBA #6)	Category G (Component Tests)	Category H (Additional SCBA as required)
1	Airflow (Section 8.1)	Airflow (Section 8.1)	Airflow (Section 8.1)	Airflow (Section 8.1)	HUD visibility performance (Sections 8.17 through 8.19)	Low power capacity test (Section 8.26)	Fabric flame tests (Section 8.4)	EOSTI independent activation (Section 8.13)
2	Facepiece carbon dioxide content (Section 8.12)	Breathing air cylinder and valve assembly retention test (Section 8.22)	Vibration resistance (Section 8.3)	Heat and flame resistance (Section 8.11)	HUD low power source visual alert signal test (Section 8.16)	Heat and immersion leakage tests (Section 8.24)	Fabric heat tests (Section 8.5)	EOSTI recognition performance (Section 8.14)
3	Nonelectronic communications test (Section 8.10)	Cylinder connections and accessibility test (Section 8.23)	—	—	Wiring connection strength (Section 8.15)	—	Thread heat test (Section 8.6)	Elevated temperature heat and flame resistance test (Section 8.29)
4	Supplementary voice communications system performance test (Section 8.25)	RIC UAC cylinder refill breathing performance (Section 8.20)	—	—	Lens radiant heat (Section 8.28)	—	Facepiece lens abrasion resistance (Section 8.9)	—
5	Environmental temperature (Section 8.2)	RIC UAC system fill rate performance (Section 8.21)	—	—	—	—	—	—
6	EBSS cold temp. performance test* (Section 8.27)	EBSS cold temp. performance test* (Section 8.27)	—	—	—	—	—	—
7	Particulate test (Section 8.8)	Accelerated corrosion test (Section 8.7)	—	—	—	—	—	—
8		Strength of connection test (Section 8.30)						

*To be tested together.

product or product components that are the same in every respect to the actual final product or product component.

4.3.21.2 The certification organization shall not allow the substitution, repair, or modification, other than as specifically permitted herein, of any product or any product component during testing.

4.3.22 No adjustment, repair, or replacement of parts shall be permitted to any SCBA being tested in accordance with this standard; however, breathing air cylinders shall be permitted to be filled as required.

4.3.23 Where SCBA are provided with an accessory or accessories that are certified by NIOSH in accordance with 42 CFR 84 for that specific SCBA, the SCBA with accessories installed shall be tested to all of the performance requirements specified in Chapter 7, and the accessories shall not cause degradation of the performance of the SCBA. The accessories themselves shall

not be required to pass the performance testing unless specifically specified herein.

4.3.24 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 certification organization, the SCBA's test results can be affected by any components or NIOSH-certified accessories that are different from those on the original SCBA tested.

4.3.25 Any modifications made to an SCBA or to any NIOSH-certified accessories provided for an SCBA by the SCBA manufacturer after certification shall require the retesting and meeting of the performance requirements of all those individual tests that the certification organization determines could be affected by such changes. This retesting shall be conducted before the modified SCBA is certified as being compliant with this standard.

4.3.26 The manufacturer shall maintain all design and performance inspection and test data from the certification organization used in the certification of the manufacturer's compliant product. The manufacturer shall provide such data, upon request, to the purchaser or authority having jurisdiction.

4.4 Recertification.

4.4.1 All SCBA models that are labeled as being compliant with this standard shall undergo recertification on an annual basis.

4.4.2 Recertification shall include inspection and evaluation to all design requirements and testing to all performance requirements as required by 4.3.8 and 4.3.13 on all manufacturer models and components.

4.4.3 The manufacturer shall maintain all design and performance inspection and test data from the certification organization used in the recertification of manufacturer models and components and shall provide such data, upon request, to the purchaser or authority having jurisdiction.

4.5 Manufacturers' Quality Assurance Program

4.5.1 The manufacturer shall provide and operate a quality assurance program that meets the requirements of this section and that includes a product recall system as specified in 4.2.7.1 and Section 4.8, Manufacturers' Safety Alert and Product Recall Systems.

4.5.2 The operation of the quality assurance program shall evaluate and test compliant product production to the requirements of this standard to ensure that production remains in compliance.

4.5.3 The manufacturer shall be registered to ISO 9001, *Quality management systems — Requirements*.

4.5.3.1 Registration to the requirements of ISO 9001, *Quality management systems — Requirements*, shall be conducted by a registrar that is accredited for personal protective equipment.

4.5.3.2 Where the registrar specified in 4.5.3.1 is currently accredited for personal protective equipment in accordance with ISO/IEC Guide 17065, *Conformity assessment — Requirements for bodies certifying products, processes and services*, that accreditation shall be permitted until 14 September 2008.

4.5.3.3 Not later than 14 September 2008, registrars specified in 4.5.3.1 shall be accredited for personal protective equipment in accordance with ISO/IEC 17021, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*.

4.5.3.4 Any new accreditations for registrars specified in 4.5.3.1 for personal protective equipment shall only be in accordance with ISO/IEC 17021, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*.

4.5.4* Any entity that meets the definition of *manufacturer* specified in Section 3.3, General Definitions, and therefore is considered to be the "manufacturer" but that does not manufacture or assemble the compliant product shall meet the requirements specified in Section 4.5.

4.5.5* Where the manufacturer uses subcontractors in the construction or assembly of the compliant product, the locations and names of all subcontractor facilities shall be docu-

mented, and the documentation shall be provided to the manufacturer's ISO registrar and the certification organization.

4.6 Hazards Involving Compliant Product.

4.6.1* The certification organization shall establish procedures to be followed where situation(s) are reported in which a compliant product is subsequently found to be hazardous. These procedures shall comply with the provisions of ISO Guide 27, *Guidelines for corrective action to be taken by a certification body in the event of misuse of its mark of conformity*, and as modified herein.

4.6.2* Where a report of a hazard involved with a compliant product is received by the certification organization, the certification organization shall contact NIOSH National Personal Protective Technology Laboratory (NPPTL), and the validity of the report shall be investigated following the procedures established by NIOSH/NPPTL.

4.6.3 With respect to a compliant product, a hazard shall be a condition or create a situation that results in exposing life, limb, or property to an imminently dangerous or dangerous condition.

4.6.4 Where a specific hazard is identified, the determination of the appropriate action for the manufacturer to undertake shall take into consideration the severity of the hazard and its consequences to the safety and health of users.

4.6.5 Where it is established that a hazard is involved with a compliant product, the certification organization, in coordination with NIOSH/NPPTL, shall determine the scope of the hazard, including products, model numbers, serial numbers, factory production facilities, production runs, and quantities involved.

4.6.6 The investigation shall include but not be limited to the extent and scope of the problem as it might apply to other compliant product or compliant product components manufactured by other manufacturers or certified by other certification organizations.

4.6.7 The certification organization, in coordination with NIOSH/NPPTL, shall also investigate reports of a hazard where compliant product is gaining widespread use in applications not foreseen when the standard was written, such applications in turn being ones for which the product was not certified, and no specific scope of application has been provided in the standard, and no limiting scope of application was provided by the manufacturer in written material accompanying the compliant product at the point of sale.

4.6.8 The certification organization, in coordination with NIOSH/NPPTL, shall require the manufacturer of the compliant product or the manufacturer of the compliant product component, if applicable, to assist the certification organization and NIOSH/NPPTL in the investigation and to conduct its own investigation as specified in Section 4.7, Manufacturers' Investigation of Complaints and Returns.

4.6.9 Where the facts indicating a need for corrective action are conclusive and the manufacturer has exhausted all appeal rights, the certification organization, in coordination with NIOSH/NPPTL, shall initiate corrective action immediately, provided there is a manufacturer to be held responsible for such action.

4.6.10 Where the facts are conclusive and corrective action is indicated, but there is no manufacturer to be held responsible, such as when the manufacturer is out of business or the manufacturer is bankrupt, the certification organization, in coordination with NIOSH/NPPTL, shall immediately notify relevant governmental and regulatory agencies and issue a notice to the user community about the hazard.

4.6.11* Where the facts are conclusive and corrective action is indicated, the certification organization, in coordination with NIOSH/NPPTL, shall take one or more of the following corrective actions:

- (1) Parties authorized and responsible for issuing a safety alert shall be notified when, in the opinion of the certification organization and NIOSH/NPPTL, such a safety alert is necessary to inform the users.
- (2) Parties authorized and responsible for issuing a product recall shall be notified when, in the opinion of the certification organization and NIOSH/NPPTL, such a recall is necessary to protect the users.
- (3) The mark of certification shall be removed from the product.
- (4) Where a hazardous condition exists and it is not practical to implement 4.6.11(1), 4.6.11(2), or 4.6.11(3), or the responsible parties refuse to take corrective action, the certification organization, in coordination with NIOSH/NPPTL, shall notify relevant governmental and regulatory agencies and issue a notice to the user community about the hazard.

4.6.12 The certification organization, in coordination with NIOSH/NPPTL, shall provide a report to the organization or individual identifying the reported hazardous condition and notify them of the corrective action indicated or that no corrective action is indicated.

4.6.13* Where a change to an NFPA standard(s) is felt necessary, the certification organization, in coordination with NIOSH/NPPTL, shall also provide a copy of the report and indicated corrective actions to the NFPA and shall also submit either a Public Proposal for a proposed change to the next revision of the applicable standard or a proposed Temporary Interim Amendment (TIA) to the current edition of the applicable standard.

4.7 Manufacturers' Investigation of Complaints and Returns.

4.7.1 Manufacturers shall provide corrective action in accordance with ISO 9001, *Quality management systems — Requirements*, for investigating written complaints and returned products.

4.7.2 Manufacturers' records of returns and complaints related to safety issues shall be retained for at least 5 years.

4.7.3 Where the manufacturer discovers, during the review of specific returns or complaints, that a compliant product or compliant product component can constitute a potential safety risk to end users and is possibly subject to a safety alert or product recall, the manufacturer shall immediately contact NIOSH/NPPTL and the certification organization and provide all information about their review to assist NIOSH/NPPTL and the certification organization with their investigation.

4.8 Manufacturers' Safety Alert and Product Recall Systems.

4.8.1 Manufacturers shall establish a written safety alert system and a written product recall system that describes the procedures to be used in the event that it decides or is directed by

the certification organization or NIOSH/NPPTL to either issue a safety alert or conduct a product recall.

4.8.2 The manufacturers' safety alert and product recall systems shall provide the following:

- (1) The establishment of a coordinator and responsibilities by the manufacturer for the handling of safety alerts and product recalls
- (2) A method of notifying all dealers, distributors, purchasers, users, and the NFPA about the safety alert or product recall that can be initiated within a 1-week period following the manufacturer's decision to issue a safety alert or to conduct a product recall or after the manufacturer has been directed by NIOSH/NPPTL or the certification organization to issue a safety alert or conduct a product recall
- (3) Techniques for communicating accurately and understandably the nature of the safety alert or product recall and, in particular, the specific hazard or safety issue found to exist
- (4) Procedures for removing product that is recalled and for documenting the effectiveness of the product recall
- (5) A plan for repairing, replacing, or compensating purchasers for returned product

Chapter 5 Labeling and Information

5.1 Product Label Requirements.

5.1.1 In addition to the NIOSH certification label, each SCBA shall have an SCBA product label, which shall be permanently and conspicuously attached to the SCBA.

5.1.2 Multiple label pieces shall be permitted in order to carry all statements and information required to be on the SCBA product label; however, all label pieces of the product label shall be located adjacent to each other.

5.1.3 The certification organization's label, symbol, or identifying mark shall be attached to both the NIOSH certification label and the SCBA product label or be part of the product labels and shall be placed in a conspicuous location. All letters shall be at least 2.5 mm ($\frac{3}{32}$ in.) in height, and the label, symbol, or identifying mark shall be at least 6 mm ($\frac{1}{4}$ in.) in height.

5.1.4 All worded portions of both required product labels shall be at least in English.

5.1.5 Symbols and other pictorial graphic representations shall be permitted to be used to supplement worded statements on the product label(s).

5.1.6 The SCBA product label shall bear the following compliance statement legibly printed, and all letters and numbers shall be at least 2 mm ($\frac{3}{64}$ in.) in height:

**THIS SCBA MEETS THE REQUIREMENTS OF
NFPA 1981, STANDARD ON OPEN-CIRCUIT
SELF-CONTAINED BREATHING APPARATUS (SCBA)
FOR EMERGENCY SERVICES, 2018 EDITION.
DO NOT REMOVE THIS LABEL**

5.1.7 SCBA components, as listed on the NIOSH certification labels, shall be marked directly on the component with the lot number, the serial number, or the year and month of manufacture.

5.2 User Information.

5.2.1 The SCBA manufacturer shall provide with each SCBA at least the training material and user instructions specified within this section.

5.2.2 Upon request at the time of purchase, the SCBA manufacturer shall provide to the purchaser an information sheet with each SCBA that documents at least the following:

- (1) Manufacturing performance tests conducted at time of manufacture and the results
- (2) Date of manufacture
- (3) Model number
- (4) Serial number
- (5) Lot number, if applicable
- (6) Hydrostatic test dates and results, if applicable

5.2.3 Information or training materials regarding pre-use shall be provided at least on the following areas:

- (1) Safety considerations
- (2) Limitations of use
- (3) Charging breathing air cylinders
- (4) Breathing air quality in accordance with NFPA 1989
- (5) Marking recommendations and restrictions
- (6) Warranty information
- (7) Recommended storage practices
- (8) Mounting on/in vehicles or fire apparatus

5.2.4 Information or training materials regarding periodic inspections shall be provided at least on inspection frequency and details.

5.2.5 Information or training materials regarding donning and doffing shall be provided at least on the following areas:

- (1) Donning and doffing procedures
- (2) Adjustment procedures
- (3) Interface issues

5.2.6 Information or training materials regarding use shall be provided at least on the following areas:

- (1) Pre-use checks
- (2) For fire departments or fire department-based emergency services, proper use consistent with NFPA 1500
- (3) Recharging breathing air cylinders
- (4) Emergency procedures to be followed in the event of damage, malfunction, or failure of the breathing apparatus
- (5) Emergency procedures to be followed in the event of an out-of-air situation
- (6) Instructions for EBSS operation utilizing the following wording: "Immediately after the EBSS connection has been completed, the cylinder valve of the receiving SCBA shall be closed."

5.2.7* Information or training materials regarding periodic maintenance and cleaning shall be provided at least on the following areas:

- (1) Cleaning instructions and precautions
- (2) Disinfecting procedures
- (3) Maintenance frequency and details
- (4) Methods of repair, where applicable
- (5) Low power source signals and power source replacement, where applicable
- (6) Complete instructions for reporting to the manufacturer, certification authority, and NIOSH/NPPTL all returned

equipment or complaints of damage, malfunction, or failure of the breathing apparatus that may present a hazard to the user

5.2.8 Information or training materials regarding retirement in accordance with NFPA 1852 shall be provided.

5.2.9 The SCBA manufacturer shall provide the manufacturer's specified component service life for composite breathing air cylinders and for all elastomeric components of the SCBA. This information shall be included at least in the maintenance information provided to the users.

Chapter 6 Design Requirements

6.1 General Design Requirements.

6.1.1 SCBA shall meet the applicable design requirements specified in this chapter where inspected and evaluated by the certification organization as specified in Section 4.3, Inspections and Testing.

6.1.2 Prior to certification of SCBA to the requirements of this standard, SCBA shall be NIOSH certified in accordance with 42 CFR 84.

6.1.2.1 SCBA shall have NIOSH certification as pressure demand (positive pressure).

6.1.2.2 SCBA shall have a NIOSH-certified rated service time of at least 30 minutes.

6.1.2.3 SCBA that are NIOSH certified as pressure demand but capable of supplying air to the user in a negative pressure demand-type mode shall NOT be certified to this standard.

6.1.3 SCBA that are certified as compliant with NFPA 1981 shall also be certified by NIOSH as compliant with the *Statement of Standard for NIOSH CBRN SCBA Testing*.

6.1.4 SCBA shall consist of all the components necessary for NIOSH certification in accordance with 42 CFR 84, at least two independent end-of-service-time indicators (EOSTI), heads-up display (HUD), voice communications system, and a rapid intervention crew/company universal air connection (RIC UAC).

6.1.5 In addition to the HUD and cylinder-mounted breathing air pressure gauge, all SCBA shall have another independently operating breathing air pressure gauge that shall be capable of being viewed by the wearer when the SCBA is worn in accordance with the SCBA manufacturer's instructions.

6.1.5.1 The design of this independently operating breathing air pressure gauge shall be such that the failure of one breathing air pressure gauge shall not affect the activation and operation of other breathing air pressure gauge.

6.1.5.2 A failure mode and effects analysis shall be provided to the certification organization for each independently operating breathing air pressure gauge.

6.1.5.3 The failure mode and effects analysis shall identify each potential failure mode for each component necessary for the independently operating breathing air pressure gauge to function.

6.1.5.4 The failure mode and effects analysis shall demonstrate that the activation and operation of the independently operating breathing air pressure gauge specified in 6.1.5 is not

affected by any of the potential failure modes, as identified in accordance with 6.1.5.3, of all other breathing air pressure gauges.

6.1.6 The pressure gauge provided as part of the SCBA manufacturer's breathing air cylinder and valve assembly shall be readable by a person other than the wearer of the SCBA when the SCBA is worn in accordance with the SCBA manufacturer's instructions and with the breathing air cylinder securely retained in the SCBA backframe.

6.1.7 All SCBA shall be equipped with a full facepiece that covers, at a minimum, the wearer's eyes, nose, and mouth.

6.1.8 All electric circuits integral to an SCBA or to any SCBA accessories shall be certified to the requirements for Class I, Groups C and D; Class II, Groups E, F, and G, Division 1 hazardous locations specified in UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1 Hazardous (Classified) Locations*.

6.1.9 All hardware, brackets, and snaps or other fasteners of SCBA or any NIOSH-certified accessories shall be free of rough spots, burrs, and sharp edges.

6.1.10 All SCBA shall have a voice communications system that, at a minimum, shall consist of a nonelectronic transmission system.

6.1.10.1 The voice communications system shall be designed to project sound without other persons needing a receiver to hear the voice communications.

6.1.10.2 If the SCBA incorporates an optional electronic Supplementary Voice Communications System, the Supplementary Voice Communications System design shall incorporate an indicator that the system is "on." This indicator shall be permitted to be positioned outside the user's field of vision with the SCBA facepiece properly donned.

6.1.10.3 The optional Supplementary Voice Communications System's power source shall display a visual alert signal indicating low power capacity.

6.1.10.4 The optional Supplementary Voice Communications System shall be designed to be switched off and on manually without the performance of the SCBA being affected.

6.1.10.5 Where the optional Supplementary Voice Communications System is automatically activated, the operation of the on/off control shall override the auto activation of the Supplementary Voice Communications System without affecting the performance of the SCBA.

6.1.10.6 The optional Supplementary Voice Communications System shall be permitted to be equipped with an adjustable volume (gain) control.

6.1.11 If the SCBA incorporates a removable regulator, two distinct actions for disconnection shall be required prior to withdrawal of the regulator from the facepiece.

6.1.11.1 Withdrawal of the regulator shall not be considered one of the two distinct actions.

6.1.11.2 Where a double-release mechanism is utilized, actuation of a single-release mechanism shall not cause disconnection of the regulator.

6.1.12* The SCBA shall incorporate data logging in nonvolatile memory and, at a minimum, the following events and data

points shall be identified and recorded with the data log and shall also have a date and time stamp for each event and data point in the data log:

- (1) Initial activation pressure
- (2) Pressure when the HUD deactivates
- (3) SCBA pressure on the high pressure side of the first stage pressure reducer
- (4) Transmission of visual information signals for breathing air cylinder content specified in 6.3.9.5.1

6.1.12.1 After initial activation, the SCBA shall record pressure as specified in 6.1.12(2) at data logging intervals of no more than 30 seconds.

6.1.12.2 The SCBA data logging shall incorporate a pressure resolution of no more than 0.7 bar (10 psi) increments.

6.1.12.3 The SCBA shall retain a minimum of 36 hours of data collection before data points are overwritten.

6.1.12.4 SCBA data logging shall be permitted to cease when the HUD deactivates.

6.1.12.5 The data logging information shall be downloadable by the emergency services organization.

6.1.12.6 The SCBA wearer's breathing rate in liters per minute (L/min) shall be reported by the data logging software at least every 30 seconds with a minimum of 5 L/min resolution.

6.1.12.7 The SCBA manufacturer shall provide data logging software that shall be capable of creating and exporting a CSV file format that provides, at a minimum, the data points specified in 6.1.12(1) through 6.1.12(4).

6.2 End-of-Service-Time Indicator (EOSTI) Design Requirements.

6.2.1 All SCBA shall be equipped with a minimum of two independent EOSTI.

6.2.2 Each EOSTI shall be activated with no additional procedures than those required to activate the SCBA breathing system.

6.2.3 Each EOSTI shall meet the activation requirements of NIOSH certification as specified in 42 CFR 84.

6.2.4 Each EOSTI shall consist of at least the following:

- (1) A sensing mechanism
- (2) A signaling device

6.2.4.1 At least one of the two required EOSTI shall be independent of any other EOSTI.

6.2.4.2 The EOSTI sensing mechanism shall activate the signaling device(s).

6.2.4.3 The EOSTI signaling devices shall provide notification to the SCBA user of the activation of the EOSTI by stimulating one or more human senses.

6.2.4.4 Each EOSTI shall be permitted to have more than one signaling device, and each signaling device shall be permitted to stimulate more than one human sense.

6.2.4.5 Where one EOSTI signaling device stimulates only one human sense, the other EOSTI shall stimulate at least one different human sense.

6.2.5 The design of EOSTI shall be such that the failure of one EOSTI shall not affect the activation and operation of other EOSTI.

6.2.5.1 A failure mode and effects analysis shall be provided to the certification organization for each EOSTI.

6.2.5.1.1 The failure mode and effects analysis shall identify each potential failure mode for each component necessary for the EOSTI to function.

6.2.5.1.2 The failure mode and effects analysis shall demonstrate that the activation and operation of both EOSTI specified in 6.2.1 are not affected by any of the potential failure modes, as identified in accordance with 6.2.5.1.1, of all other EOSTI.

6.2.5.2 For purposes of the failure mode and effects analysis, power sources other than the air from the SCBA breathing air cylinder shall be considered as part of the EOSTI.

6.2.6 The EOSTI alarm shall activate at 35 percent, ± 2 percent of full cylinder pressure.

6.3 Heads-Up Display (HUD) Design Requirements.

6.3.1 All SCBA shall be equipped with at least one heads-up display.

6.3.2 The HUD shall be activated with no additional procedures than those required to activate the SCBA breathing system.

6.3.3 Each time the SCBA breathing system is activated with the breathing air cylinder pressure of 20 bar (290 psi) or greater, the HUD shall provide a visual indication of activation for a minimum of 20 consecutive seconds.

6.3.4 Where HUD is provided with an external wiring disconnect, the wiring disconnect shall be designed to prevent accidental disconnection and shall not be capable of being connected in such a manner as to prevent the pneumatic system and the HUD from operating simultaneously.

6.3.5 HUD shall provide at least visual displays of alert signals and information.

6.3.6 All HUD visual displays shall be visible to the SCBA wearer with the SCBA and facepiece properly donned and regardless of the wearer's head movement.

6.3.7 HUD shall not use color as the only means of differentiating between alert signal displays and informational displays.

6.3.8 Visual Alert Signals.

6.3.8.1 HUD shall display visual alert signals for breathing air cylinder content specified in 6.3.8.5, and for power source condition specified in 6.3.8.6.

6.3.8.2 In addition to the mandatory visual alert signals specified in 6.3.8.5 and 6.3.8.6, additional visual alert signals to indicate when other status or conditions have occurred shall be permitted.

6.3.8.3 All visual alert signals shall be visible for a minimum of 20 consecutive seconds.

6.3.8.4 Each visual alert signal shall be identifiable, by the SCBA wearer, from any other visual alert signals or other informational displays provided on HUD or on the SCBA.

6.3.8.5 HUD shall display a visual alert signal for breathing air cylinder content when the breathing air in the SCBA cylinder has been reduced to 50 percent of rated service content. This visual alert signal shall visibly flash at a frequency of not less than one per second.

6.3.8.6 Where a power source is used for HUD to comply with the requirements of this standard, HUD shall display a visual alert signal for low power source capacity when the remaining power source life will provide a minimum of 2 hours of operation of the HUD at maximum electrical draw.

6.3.8.6.1 The low power source visual alert signal shall be independent from and physically distinguishable from the breathing air cylinder content visual alert signal display.

6.3.8.6.2 The low power source visual alert signal shall be displayed at all times when the power source condition is below the level specified in 6.3.8.6 while the HUD is activated.

6.3.9 Visual Informational Displays.

6.3.9.1 HUD shall display visual informational signals for at least breathing air cylinder content as specified in 6.3.9.5.1.

6.3.9.2 In addition to the mandatory visual informational signal specified in 6.3.9.5.1, additional visual informational signals to indicate when other status or conditions have occurred shall be permitted.

6.3.9.3 All visual displays of information shall be permitted to flash at a frequency of not less than one per second for a minimum of 10 consecutive seconds every 60 seconds.

6.3.9.4 Where the visual display is not constantly visible or is not visible for at least 10 consecutive seconds every 60 seconds, the HUD shall be provided with a manual activation of the display. The manual activation shall cause the display to be visible for at least 5 consecutive seconds for each activation.

6.3.9.5 HUD shall display a visual informational signal for breathing air cylinder content in at least four increments of the cylinder's total rated service content from full to 35 percent.

6.3.9.5.1 HUD visual information signals for breathing air cylinder content shall display at 100 percent, 75 percent, 50 percent, and 35 percent.

6.3.9.5.2 Where an analog visual display is used, the gauge shall visually indicate the reserve air zone with a red background.

6.3.9.5.3 Where an electronic visual display is used, the gauge shall visually indicate that reserve air is being utilized with a flash at a frequency of not less than one per second for the remaining duration of the cylinder.

6.3.9.6 A display only in units of pressure shall not be permitted.

6.4* Rapid Intervention Crew/Company Universal Air Connection (RIC UAC) Design Requirements.

6.4.1 Each SCBA shall be equipped with an RIC UAC male fitting to allow replenishment of breathing air to the SCBA breathing air cylinder.

6.4.2 The RIC UAC male fitting shall meet the requirements specified in 6.4.5, and shall be located on each SCBA in a permanently fixed position.

6.4.3 The distance between the leading edge of the CGA fitting at the outlet of the SCBA cylinder valve and the leading edge of the RIC UAC male fitting shall be a maximum of 100 mm (4 in.).

6.4.4 A separate self-resetting relief valve shall be installed on the SCBA to protect the SCBA against overpressurization.

6.4.5 RIC UAC Male Fitting.

6.4.5.1 The RIC UAC male fitting shall be designed as specified in Figure 6.4.5.1.

6.4.5.2 The RIC UAC male fitting shall be capable of connecting to any RIC UAC female fitting.

6.4.5.3 The RIC UAC male fitting shall not interfere with any other operation of the SCBA.

6.4.5.4 RIC UAC male fittings shall be equipped with a dust cap or sealing plug to prevent dust, dirt, and debris from entering the fitting and to serve as a leakproof seal.

6.4.6 RIC UAC Female Fitting.

6.4.6.1 The RIC UAC female fitting shall be designed as specified in Figure 6.4.6.1.

6.4.6.2 The RIC UAC female fitting shall be capable of connecting to all RIC UAC male fittings.

6.4.6.3 RIC UAC female fittings shall be equipped with a dust cap or sealing plug to prevent dust, dirt, and debris from entering the fitting and to serve as a leakproof seal.

6.4.7 RIC UAC Filling Hose Assembly.

6.4.7.1 Each SCBA manufacturer shall make available an RIC UAC filling hose assembly that consists of a filling hose and a RIC UAC female fitting.

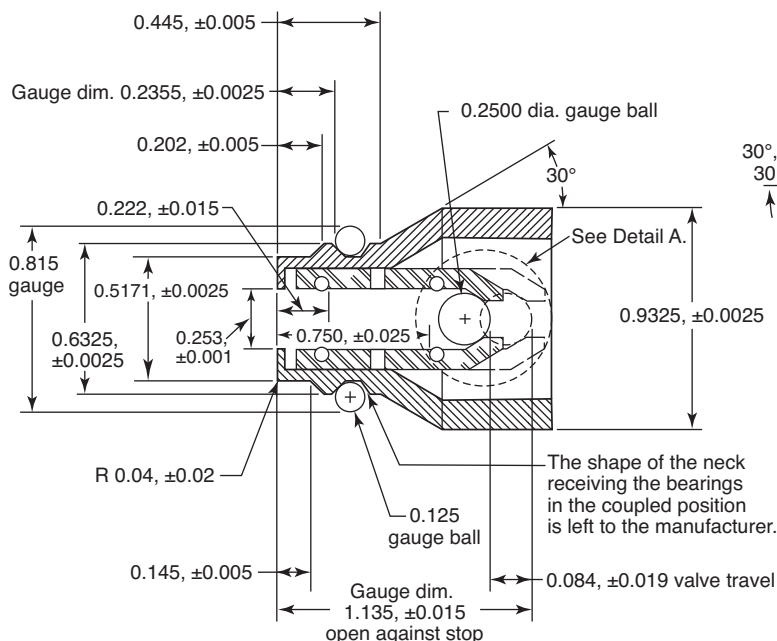


FIGURE 6.4.5.1 RIC UAC Male Fitting (all measurements in inches).

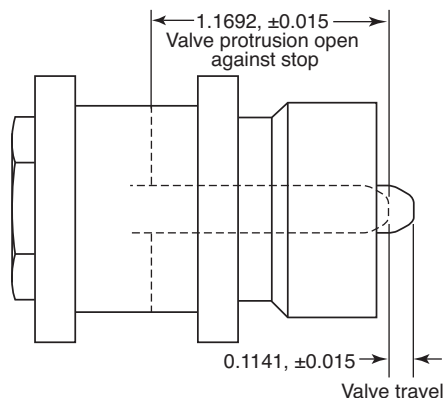


FIGURE 6.4.6.1 RIC UAC Female Fitting (all measurements in inches).

6.4.7.2 The RIC UAC filling hose assembly shall be a high-pressure, 310 bar (4500 psi) assembly designed to replenish breathing air to an SCBA breathing air cylinder.

6.4.7.3 The filling hose shall have an RIC UAC female fitting that meets the requirements specified in 6.4.6, attached to the delivery end.

6.4.8 RIC UAC Coupling.

6.4.8.1 The complete RIC UAC male and female fittings shall constitute the RIC UAC coupling.

6.4.8.2 The RIC UAC coupling shall be capable of connection and disconnection with one hand while subjected to maximum operation pressure.

6.4.8.3 The RIC UAC coupling shall have an operating pressure of at least 310 bar (4500 psi).

