

NFPA® 1987

Standard on Combination Unit Respirator Systems for Tactical and Technical Operations

2023 Edition



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NFPA® 1987

Standard on

Combination Unit Respirator Systems for Tactical and Technical Operations

2023 Edition

This edition of NFPA 1987, *Standard on Combination Unit Respirator Systems for Tactical and Technical Operations*, was prepared by the Technical Committee on Tactical and Technical Operations Respiratory Protection Equipment and released by the Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. It was issued by the Standards Council on April 4, 2022, with an effective date of April 24, 2022.

This edition of NFPA 1987 was approved as an American National Standard on April 24, 2022.

Origin and Development of NFPA 1987

In August 2015, the Standards Council responded to a new project request submitted by Brian Clifford of the Federal Bureau of Investigation. The request related to the use of respiratory protection equipment for emergency operations that incorporated a combination of respiratory protective methods in one system. This system, at a minimum, would contain the capabilities of a self-contained breathing apparatus (SCBA) and at least one other respiratory protective method [air-purifying respirator (APR) or powered air-purifying respirator (PAPR)]. After review, the Standards Council determined there was a well-established technical need and a demonstrated demand for a standard addressing design, use, testing, and certification of combined unit respirators (CUR) not covered by any existing standards.

The Standards Council assigned this new project to the Technical Committee on Tactical and Technical Operations Respiratory Protection Equipment, because it already had the expertise and diversity to fulfill the request. The technical committee met for the first time to discuss this new standard in July 2016, at NFPA headquarters in Quincy, MA. The Standards Council approved the draft of NFPA 1987 to enter revision cycle in August 2019, as a Fall 2021 document.

This edition of the standard specifies the minimum requirements for the certification (Chapter 4), design (Chapter 6), performance (Chapter 7), and testing (Chapter 8) of new combination unit respirators (CUR) and for replacement parts, components, and accessories for such respirators.

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Committee Scope: This Committee shall have primary responsibility for documents on respiratory protection equipment and selection, care, and maintenance of respiratory protection equipment for non-firefighting emergency services operations including, but not limited to, tactical law enforcement, confined space, and hazardous materials operations, during incidents involving hazardous or oxygen-deficient atmospheres. This Committee does not cover respiratory protection equipment for firefighting operations addressed by the Technical Committee on Respiratory Protection Equipment.

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NFPA 1987

Standard on

**Combination Unit Respirator Systems for
Tactical and Technical Operations**

2023 Edition

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

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 combination unit respirator (CUR) systems and for the replacement parts, components, and accessories for such respirators.

1.1.2 Reserved.

1.1.3 This standard shall not specify requirements for respiratory protection equipment that is used for firefighting operations.

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

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

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

1.1.7 Safety.

1.1.7.1 This standard shall not be construed as addressing all of the safety concerns associated with the use of CURs.

1.1.7.2 It shall be the responsibility of the persons and organizations that use CURs to establish safety and health practices and to determine the applicability of regulatory limitations prior to use.

1.1.7.3 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.

1.1.7.4 It shall be the responsibility of the persons and organizations that use this standard to conduct testing of CURs to establish safety and health practices and to determine the applicability of regulatory limitations prior to using this standard for any designing, manufacturing, or testing.

1.1.8 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 CUR performance for respiratory protection for emergency services personnel in non-firefighting operations and in atmospheres that are categorized as follows:

- (1) Entry into and escape from immediately dangerous to life or health (IDLH) atmospheres when in open-circuit SCBA mode
- (2) Entry into non-IDLH and escape from IDLH and non-IDLH atmospheres when in APR mode or PAPR mode

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 Use.

1.2.3.1 This standard shall not be interpreted or used as a detailed manufacturing or purchase specification.

1.2.3.2 This standard shall be permitted to be referenced in purchase specifications as minimum requirements.

1.2.3.3* This standard shall not address all performance or functional properties of CUR that can be of importance when references as part of purchase specifications.

1.3 Application.**1.3.1 Emergency Services Organizations.**

1.3.1.1 This standard shall apply to all CURs used by emergency services organizations for respiratory protection of its personnel during rescue, hazardous materials, and terrorist incident responses, and similar operations where products of combustion, oxygen deficiency, particulates, toxic products, or other IDLH atmospheres exist or could exist at the incident scene.

1.3.1.2* If the CUR is equipped with a universal emergency breathing safety system (UEBSS), the UEBSS performance requirements set forth in this standard shall apply only to CURs

used by emergency services organizations for respiratory protection of its personnel during the applications listed in 1.3.1.1.

1.3.2 This standard shall apply to the design, manufacturing, and certification of new CURs.

1.3.3 This standard shall apply to accessories attached to a CUR that are certified by NIOSH for use with that specific CUR.

1.3.4 Reserved.

1.3.5 This standard shall not apply to closed-circuit self-contained breathing apparatus (SCBA).

1.3.6 This standard shall not apply to accessories that can be attached to CURs but which are not certified by NIOSH for use with that specific CUR.

1.3.7* Except for the cautions and limitations specified in Chapter 5, this standard shall not apply to the use of CURs.

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 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.

NFPA 1994, *Standard on Protective Ensembles for First Responders to Hazardous Materials Emergencies and CBRN Terrorism Incidents*, 2018 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. American National Standards Institute, Inc. (operations) 25 West 43rd Street, 4th Floor, New York, NY 10036; (headquarters) 1899 L Street, NW, 11th Floor, Washington, DC 20036.

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

ANSI/ISEA Z87.1, *American National Standard Occupational and Educational Personal Eye and Face Protection Devices*, 2015

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

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*, 2018.

ASTM D395, *Standard Test Method for Rubber Property—Compression Set*, 2018.

ASTM D412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension*, 2016.

ASTM D572, *Standard Test Method for Rubber—Deterioration by Heat and Oxygen*, 2004, reapproved 2015.

ASTM D573, *Standard Test Method for Rubber—Deterioration in Air Oven*, 2004, reapproved 2015.

ASTM D624, *Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers*, 2000, reapproved 2012.

ASTM D746, *Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact*, 2014.

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

ASTM D2240, *Standard Test Method for Rubber Property—Durometer Hardness*, 2015e1.

ASTM D2632, *Standard Test Method for Rubber Property—Resilience by Vertical Rebound*, 2015.

ASTM D3182, *Standard Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets*, 2016.

2.3.3 CGA Publications. Compressed Gas Association, 8484 Westpark Drive, Suite 220, McLean, VA 22102.

CGA G-7.1, *Commodity Specification for Air*, 2018.

CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*, 2019.

2.3.4 DoD Publications. Department of Defense, Naval Publications and Forms Center (NPFC), 5801 Tabor Avenue, Philadelphia, PA 19120.

MIL-STD-282, *Test Method Standard—Filter Units, Protective Clothing, Gas-Mask Components and Related Products: Performance Test Methods*, 2015.

2.3.5 EBU Publications. European Broadcasting Union, L'Ancienne-Route 17A, Postal Box 45 Grand-Saconnex, Geneva, Switzerland.

EBU Technical Recommendation R68, *Alignment level in digital audio production equipment and in digital audio recorders*, 2000.

2.3.6 EN Publications (CEN). European Committee for Standardization Central Secretariat, Rue de la Science 23, B-1040 Brussels, Belgium.

EN 136, *Respiratory protective devices. Full face masks. Requirements, testing, marking*, 1998.

EN 137, *Respiratory protective devices. Self-contained open-circuit compressed air breathing apparatus with full face mask. Requirements, testing, marking*, 2006.

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

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

2.3.8 ISO Publications. International Organization for Standardization, Chemin de Blandonnet 8, 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 16900-1, *Respiratory protective devices — Methods of test and test equipment — Part 1: Determination of inward leakage*, 2019.

ISO/IEC 17000, *Conformity assessment — Vocabulary and general principles*, 2004.

ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*, 2017.

ISO/IEC 17021, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*, 2015.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, 2017.

ISO/IEC 17065, *Conformity assessment — Requirements for bodies certifying products, processes and services*, 2012.

2.3.9 NIOSH/NPPTL Publications. National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, 1600 Clifton Road, Room 4505, MS E-20, Atlanta, GA 30329-4027.

NIOSH Standard Test Procedure TEB-APR-STP-0003, *Determination of Exhalation Resistance Test, Air-Purifying Respirators Standard Testing Procedure (STP)*, March 15, 2019.

NIOSH Standard Test Procedure TEB-APR-STP-0004, *Determination of Exhalation Valve Leakage Test, Air-Purifying Respirators Standard Testing Procedure (STP)*, March 22, 2019.

NIOSH Standard Test Procedure TEB-APR-STP-0007, *Determination of Inhalation Resistance Test, Air-Purifying Respirators Standard Testing Procedures (STP)*, March 8, 2019.

NIOSH Standard Test Procedure RCT-APR-STP-0012, *Determination of Air Flow for Powered Air-Purifying Respirators Standard Testing Procedure (STP)*, June 6, 2005.

NIOSH Standard Test Procedure RCT-APR-STP-0014, *Determination of Leakage of Drinking Tube and Accessories for Respirator Facepieces Standard Test Procedure (STP)*, June 6, 2005.

NIOSH Standard Test Procedure RCT-APR-STP-0025, *Determination of Silica Dust Loading Test for Powered Air-Purifying Respirator Filters Standard Testing Procedure (STP)*, June 14, 2005.

NIOSH Standard Test Procedure TEB-APR-STP-0051, *Determination of Particulate Filter Efficiency Level for P100 Series Filters Against Liquid Particulates for Non-Powered, Air-Purifying Respirators Standard Test Procedure (STP)*, April 2, 2016.

NIOSH Standard Test Procedure RCT-APR-STP-0060, *Determination of End-of-Service-Life Indicator (ESLI) Drop Test, Air-Purifying Respirators Standard Testing Procedure (STP)*, August 24, 2005.

NIOSH Standard Test Procedure RCT-APR-STP-0064, *Determination of Facepiece Carbon-Dioxide and Oxygen Concentration Levels of Tight Fitting Powered Air-Purifying Respirators with the Blower Unit Off or Non-Powered Respirators Standard Testing Procedure (STP)*, September 12, 2005.

NIOSH Standard Test Procedure RCT-APR-STP-0065, *Determination of Airflow Resistance in Breath-Responsive, Powered Air-Purifying Respirators Standard Testing Procedures (STP)*, September 12, 2005.

NIOSH Standard Test Procedure RCT-ASR-STP-0100, *Determination of Strength of Hoses and Couplings, Type C, and CE Supplied-Air Respirators Standard Testing Procedure (STP)*, June 3, 2005.

NIOSH Standard Test Procedure RCT-ASR-STP-0101, *Determination of Tightness of Hoses and Couplings, Type C and CE, Supplied-Air Respirators Standard Testing Procedure (STP)*, June 3, 2005.

NIOSH Standard Test Procedure RCT-ASR-STP-0105A, *Determination of Airflow - Demand and Pressure Demand, Type C and CE, Supplied-Air Respirators Standard Testing Procedure (STP)*, September 27, 2005.

NIOSH Standard Test Procedure RCT-ASR-STP-0121, *Determination of Rated Service Time- Open-Circuit, Demand and Pressure-Demand, Self-Contained Breathing Apparatus Standard Testing Procedure (STP)*, June 5, 2018.

NIOSH Standard Test Procedure RCT-ASR-STP-0126, *Determination of By-Pass Valve Flow Test - Open-Circuit, Demand and Pressure Demand, Self-Contained Breathing Apparatus Standard Testing Procedure (STP)*, May 15, 2019.

NIOSH Standard Test Procedure RCT-ASRS-STP-0128, *Determination of Accuracy of Gauge, Self-Contained Breathing Apparatus Standard Testing Procedure (STP)*, September 20, 2005.

NIOSH Standard Test Procedure RCT-ASR-STP-0140, *Man Tests Self-Contained Breathing Apparatus Standard Testing Procedure (STP)*, September 21, 2005.

NIOSH Standard Test Procedure RCT-ASR-STP-0146, *Determination of Diaphragm Over-Pressurization – Open Circuit, Self-Contained Breathing Apparatus with Belt Mounted Regulators and Breathing Tubes Standard Testing Procedure (STP)*, September 12, 2005.

NIOSH Standard Test Procedure TEB-CBRN-ASR-STP-0147, *Determination of Mode Transfer Test of Combination, Open-Circuit, Self-Contained Breathing Apparatus and Supplied-Air Respirators Standard Testing Procedure (STP)*, September 12, 2005.

NIOSH Standard Test Procedure TEB-CBRN-ASR-STP-0219, *Determination of Open-Circuit, Self-Contained Breathing Apparatus (SCBA) Emergency Breathing Safety Systems (EBSS) Functionality During Low-Temperature Operation Standard Testing Procedure (STP)*, January 30, 2014.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0301, *Determination of CBRN Organic Vapor (Cyclohexane) Service Life Test, Air-Purifying Respirators, Standard Test Procedure (STP)*, June 29, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0302, *Determination of CBRN Acid Gases (Cyanogen Chloride) Service Life Test, Air-Purifying Respirators, Standard Test Procedure (STP)*, December 12, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0303, *Determination of CBRN Acid Gases (Hydrogen Cyanide) Service Life Test, Air-Purifying Respirators Standard Test Procedure (STP)*, December 12, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0304, *Determination of CBRN Acid Gases (Phosgene) Service Life Test, Air-Purifying Respirators Standard Test Procedure (STP)*, December 12, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0305, *Determination of CBRN Acid Gases (Hydrogen Sulfide) Service-Life Test, Air-Purifying Respirators Standard Test Procedure (STP)*, December 13, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0306, *Determination of CBRN Acid Gases (Sulfur Dioxide) Service Life Test, Air-Purifying Respirators Standard Test Procedure (STP)*, December 13, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0307, *Determination of CBRN Base Gases (Ammonia) Service-Life Test, Air-Purifying Respirators Standard Test Procedure (STP)*, December 21, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0308, *Determination of CBRN Nitrogen Oxide Gases (Nitrogen Dioxide) Service Life Test, Air-Purifying Respirators Standard Test Procedure (STP)*, December 13, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0309, *Determination of CBRN Hydride Gases (Phosphine) Service Life Test, Air-Purifying Respirators Standard Test Procedure*, December 13, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0310, *Determination of CBRN Formaldehyde Service Life Test, Air-Purifying Respirators Standard Test Procedure (STP)*, December 13, 2005.

NIOSH Standard Conditioning Procedure CET-APRS-STP-CBRN-0311, *Durability Conditioning Process for Environmental, Transportation and Rough Handling Use Conditions on Chemical, Biological, Radiological, and Nuclear (CBRN) Respiratory Protective Devices (RPD) Standard Conditioning Procedure (SCP)*, December 8, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0314, *Determination of Lens Fogging on Full-Facepiece Chemical Biological Radiological and Nuclear (CBRN) Air-Purifying Respirators Standard Test Procedure (STP)*, December 22, 2005.

NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0316, *Determination of Haze and Luminous Transmittance Properties and Abrasion Resistance Properties of the Primary Lens System Material for Full Facepiece Respiratory Protective Devices (RPD) Standard Test Procedure (STP)*, October 24, 2005.

NIOSH Standard Test Procedure CVB-CBRN-CUR-STP-0066, *Determination of Determination of End-of-Service-Life Indicator (ESLI) Standard Testing Procedure (STP)*, September 12, 2005.

NIOSH Standard Test Procedure CVB-CBRN-CUR-STP-0800, *Determination of Laboratory Respirator Protection Level (LRPL) Values for Combination Unit Respirators (CURs) Standard Testing Procedure (STP)*, January 24, 2019.

NIOSH Standard Test Procedure CVB-CBRN-CUR-STP-0801, *Determination of Combination Unit Respirators (CURs) Performance During Dynamic Testing Against Chemical Agent Distilled Sulfur Mustard (HD) Vapor and Liquid, Standard Test Procedure (STP)*, January 24, 2019.

NIOSH Standard Test Procedure CVB-CBRN-CUR-STP-0802, *Determination of Combination Unit Respirators (CURs) Performance*

During Dynamic Testing Against the Chemical Agent Sarin (GB) Vapor, Standard Testing Procedure, January 24, 2019.

NIOSH Standard Test Procedure CVB-CBRN-CUR-STP-0819, *Determination of Combination Unit Respirators (CURs) Functionality, Including Mode Switching, During Low-Temperature Operation, Standard Test Procedure*, January 24, 2019.

NIOSH Standard Test Procedure CVB-CBRN-CUR-STP-0848, *Determination of Remote Gauge Leak Flow Test for Combination Unit Respirators (CURs), Standard Testing Procedure (STP)*, January 24, 2019.

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

ANSI/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.

ANSI/UL 121201, *Non-incendive Electric Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*, 2017.

2.3.11 US Government Publications. US Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 42, Code of Federal Regulations, Part 84, "Approval of Respiratory Protective Devices," 1 October 1995.

2.3.12 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2014.

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 phrases “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. Any item that could be attached to a certified product but that is not necessary for the certified product to meet the requirements of this standard.

3.3.2 Accreditation. Third-party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks, including sampling and testing, inspection, certification, and registration.

3.3.3 Air Purification Component. The air purification element of air-purifying respirators (APRs) and powered air-purifying respirators (PAPRs) that removes gases, vapors, and solid or liquid aerosols from the inspired air.

3.3.4 Air-Purifying Respirator (APR). A respirator that removes specific air contaminants by passing ambient air through one or more air purification components.

3.3.5 Atmosphere-Supplying Respirator. A respirator that supplies the user with breathing air from a source independent of the ambient atmosphere and includes a self-contained breathing apparatus (SCBA) or a supplied air respirator (SAR), or both. [See also 3.3.61, *Self-Contained Breathing Apparatus (SCBA)*.]

3.3.6 Audit. Systematic, independent, documented process for obtaining records, statements of fact, or other relevant information and assessing them objectively to determine the extent to which specified requirements are fulfilled.

3.3.7 Breathing Air. See 3.3.19, Compressed Breathing Air.

3.3.8 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.

3.3.9 Breathing Air/Gas Container. See 3.3.8, Breathing Air Cylinder.

3.3.10 Certification. 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.

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

3.3.12 Certified. The resultant condition of a product having undergone certification in accordance with the requirements of this standard.

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

3.3.14 Closed-Circuit SCBA. A recirculation-type SCBA in which the wearer rebreathes exhaled gas 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.

3.3.15 Combination Unit Respirator. A respirator that employs technology of two or more different types of respiratory protective devices, comprising at least an open-circuit SCBA, and which provides the wearer a method of mode selection in an operational environment.

3.3.16 Compliance. The condition of meeting or exceeding all applicable requirements of this standard.

3.3.17 Compliant. Meeting or exceeding all applicable requirements of this standard.

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

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

3.3.20 CUR. See 3.3.15, Combination Unit Respirator.

3.3.21 Cylinder. See 3.3.8, Breathing Air Cylinder.

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

3.3.23 End-of-Service-Life Indicator (ESLI). An indicator, often a color change, that the contaminant will no longer be able to be removed by the air purification element and that the air-purification element should be replaced.

3.3.24 End-of-Service-Time Indicator (EOSTI). A warning device on an SCBA that warns the user that the end of the breathing air supply is approaching.

3.3.25 EOSTI. See 3.3.24, End-of-Service-Time Indicator (EOSTI).

3.3.26 ESLI. See 3.3.23, End-of-Service-Life Indicator (ESLI).

3.3.27 Fabric Component. Natural or synthetic material, or combination of materials, that is pliable and made by weaving, felting, forming, or knitting.

3.3.28 Facepiece. The component of a CUR that covers the wearer's nose, mouth, and eyes.

3.3.29 Failure Modes and Effects Analysis (FMEA). A risk assessment technique for systemically identifying potential failures in a system or a process.

3.3.30 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.

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

3.3.32 HATS. See 3.3.34, Head and Torso Simulator (HATS).

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

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

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

3.3.36 HUD. See 3.3.35, Heads-Up Display (HUD).

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

3.3.38 IDLH. See 3.3.39, Immediately Dangerous to Life or Health (IDLH).

3.3.39 Immediately Dangerous to Life or Health (IDLH). An atmosphere that poses a threat of exposure to airborne contaminants where that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.

3.3.40 Inspection. Examination of a product design, product, process, or installation and determination of its conformity with specific requirements or, based on professional judgment, with general requirements.

3.3.41 Manufacturer. The entity to whom the certification is issued that directs and controls any of the following: compliant product design, compliant product manufacturing, or compliant product quality assurance; also, the entity that assumes liability for the compliant product or provides the end user warranty for a compliant product.

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

3.3.43 Microphone Measurement Point (MMP). A point 1.5 m (59 in.) in front of and on the axis of the lip position of a typical human mouth, or an artificial mouth, and 1.5 m (59 in.) above the floor.

3.3.44 MMP. See 3.3.43, Microphone Measurement Point (MMP).

3.3.45 Mode of Operation. A respiratory mode described by the type of respiratory protective device that typically employs that technology, such as APR, PAPR, or SCBA.

3.3.46 Mouth Reference Point (MRP). A point 50 mm (1.9 in.) in front of and on the axis of the lip position of a typical human mouth or of an artificial mouth.

3.3.47 MRP. See 3.3.46, Mouth Reference Point (MRP).

3.3.48 Negative Pressure (Demand) Mode. A CUR mode of operation in which the pressure inside the facepiece, in relation to the pressure surrounding the outside of the facepiece, is negative during inhalation.

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

3.3.50 PAPR. See 3.3.52, Powered Air-Purifying Respirator (PAPR).

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

3.3.52 Powered Air-Purifying Respirator (PAPR). An air-purifying respirator that uses a powered blower to force the ambient air through one or more air purification components to the facepiece.

3.3.53 PPE. Personal protective equipment.

3.3.54 Pressure Demand 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.

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

3.3.56 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 emergency services personnel.

3.3.57 Rated Service Time. The period of time, stated on a certification label, that the SCBA supplied air to the breathing machine when tested to 42 CFR 84.

3.3.58 RIC. Rapid intervention crew/company.

3.3.59 Sample. (1) Product, component, or accessory randomly selected from the manufacturer's production line, the manufacturer's inventory, or the open market. (2) Product, component, or accessory that is conditioned for testing. (See also 3.3.65, *Specimen*.)

3.3.60 SCBA. See 3.3.61, Self-Contained Breathing Apparatus (SCBA).

3.3.61* Self-Contained Breathing Apparatus (SCBA). An atmosphere-supplying respirator the breathing air source of which is designed to be carried by the user.

3.3.62 Service Life. The period for which a compliant product should be useful before retirement.

3.3.63 Service Time. See 3.3.57, Rated Service Time.

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

3.3.65 Specimen. The conditioned product, component, or accessory that is tested from a sample thereof. (*See also 3.3.59, Sample*).

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

3.3.67 SPL. See 3.3.64, Sound Pressure Level (SPL).

3.3.68 STI. See 3.3.66, Speech Transmission Index (STI).

3.3.69 Switchover Element(s). A means within the CUR for selecting a mode of operation—SCBA, APR, or PAPR—that isolates one operational mode from any other.

3.3.70 Synthetic Breathing Air. Manufactured breathing air produced by blending nitrogen and oxygen. (*See also 3.3.19, Compressed Breathing Air*).

3.3.71 Testing. Determination of one or more characteristics of an object of conformity assessment, according to a procedure, which typically applies to materials, products, or processes.

3.3.72 UAC. See 3.3.73, Universal Air Connection (UAC).

3.3.73 Universal Air Connection (UAC). The male fitting affixed to the CUR and the female fitting affixed to the filling hose that allow emergency replenishment of breathing air to a CUR breathing air cylinder. [*See also 3.3.56, Rapid Intervention Crew/Company Universal Air Connection (RIC)*].

3.3.74 Universal Emergency Breathing Safety System (UEBSS). A device on a CUR that allows users to share their available air supply in an emergency situation.

3.3.75 Variant. A grouping of subassemblies having common functional or design characteristics, the assembly of multiple variants of which results in a CUR model configuration.

Chapter 4 Certification

4.1 General.

4.1.1 The process for certification of CUR as being compliant with NFPA 1987 shall meet the requirements of Sections 4.1 through 4.8.

4.1.2 All CUR that are labeled as being compliant with this standard shall comply with both of the following:

- (1) Meet or exceed all applicable requirements specified in this standard
- (2) Be certified

4.1.3 All certification shall be performed by a certification organization that meets at least the requirements specified in Section 4.2 and that is accredited for personal protective equipment (PPE) in accordance with ISO/IEC 17065.

4.1.4 Manufacturers shall not either claim compliance with a portion(s) or segment(s) of the requirements of this standard or use the name or identification of this standard, NFPA 1987, in any statements about their respective product(s) unless the product(s) is certified as compliant with this standard.

4.1.5 Listings.

4.1.5.1 All compliant CUR shall be listed by the certification organization.

4.1.5.2 All listings shall uniquely identify the certified product by, at a minimum, style or model number.

4.1.6 All compliant CUR shall have a product label that meets the requirements specified in Chapter 5.

4.1.7 The certification organization's label, symbol, or identifying mark shall be one of the following:

- (1) Attached to the product label
- (2) Part of the product label
- (3) Immediately adjacent to the product label.

4.1.8 Reserved.

4.1.9 Reserved.

4.1.10 Reserved.

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 Interests.

4.2.2.1 The certification organization shall be primarily engaged in certification work.

4.2.2.2 The certification organization shall not have a monetary interest in the product's ultimate profitability.

4.2.3 Certification Organizations.

4.2.3.1 All certification organizations shall be accredited for PPE in accordance with ISO/IEC 17065.

4.2.3.2 The accreditation referenced in 4.2.3.1 shall be issued by an accreditation body operating in accordance with ISO/IEC 17011.

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 reference to the certification organization or any label that references this standard 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 tests to determine product compliance.

4.2.6.1 The certification organization laboratory facilities shall have both of the following:

- (1) Programs in place and functioning for calibration of all instruments
- (2) Procedures in use to ensure 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.

4.2.7.1 The certification organization shall require the manufacturer to have a product recall system as specified in Section 4.8 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 20XX edition of NFPA 1987.

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

4.2.9.2 Sample product shall be evaluated by the certification organization to verify the product's continued compliance 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 for which 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, that address report(s) of situation(s) in which a compliant product is subsequently found to be hazardous.

4.2.11 Appeals.

4.2.11.1 The certification organization's operating procedures shall provide a mechanism for the manufacturer to appeal decisions.

4.2.11.2 The procedures shall include the presentation of information from both sides of a controversy to a designated appeals panel.

4.2.12 Name and Label.

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

4.2.12.2 The name and label shall be registered and legally defended.

4.3* Inspections and Testing.

4.3.1 For both certification and recertification of CUR, 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 nongovernmental certification or recertification shall be conducted by a certification organization's testing laboratory that is accredited in accordance with the requirements of ISO/IEC 17025.

4.3.2.1 The nongovernmental certification organization's testing laboratory's scope of accreditation to ISO/IEC 17025 shall encompass testing of PPE.

4.3.2.2 The accreditation of a nongovernmental certification organization's testing laboratory shall be issued by an accreditation body operating in accordance with ISO/IEC 17011.

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.

4.3.3.2 The manufacturer's testing laboratory's scope of accreditation to ISO/IEC 17025 shall encompass testing of PPE.

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.

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 reliability at a 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 specified for the CUR as in Section 5.1.

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 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 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 CUR and CUR components shall be subjected to the tests specified in Table 4.3.9(a) through Table 4.3.9(d) for each series.

4.3.10 Certification and Performance.

4.3.10.1 CUR shall be initially tested for certification.

4.3.10.2 CUR shall meet the performance requirements of three separate test series as specified in the categories of Table 4.3.9(a), Table 4.3.9(b), Table 4.3.9(c), or Table 4.3.9(d), and categories as specified in Table 4.3.9(a), Table 4.3.9(b), Table 4.3.9(c), or Table 4.3.9(d).

4.3.10.3 Categories as specified in Table 4.3.9(a), Table 4.3.9(b), Table 4.3.9(c), or Table 4.3.9(d), which are designed as cumulative damage tests, shall be conducted in the order specified.

4.3.11 Certification and Performance for CUR Lens Components.

4.3.11.1 CUR lens components shall be initially tested for certification.

4.3.11.2 CUR lens components shall meet the performance requirements of one test series of Category G, as specified in Table 4.3.9(a).

4.3.11.3 CUR component testing in Category G shall be conducted on test specimens as specified in the respective test method.

4.3.12 After certification, compliant CUR and components of compliant CUR shall meet both of the following:

- (1) Be tested annually within 12 months of previous tests
- (2) Performance requirements of one test series as specified in the categories of Table 4.3.9(a), excluding Categories A, B and C; and Table 4.3.9(b), excluding Category A.

4.3.13 A minimum of five identical CUR that are to be certified to this standard shall be selected from the manufacturer's production.

4.3.14 The CURs shall be subjected to the tests listed sequentially in Table 4.3.9(a), Table 4.3.9(b), Table 4.3.9(c), or Table 4.3.9(d).

4.3.15 Components.

4.3.15.1 Components from CUR that are to be certified to this standard shall be subjected to the tests specified in Category G of Table 4.3.9(a).

4.3.15.2 CUR component testing in Category G shall be conducted on test specimens as specified in each respective test method.

4.3.16 The requirement specified in 4.3.12 shall be waived every fifth year when the testing required by 4.3.17 is conducted.

4.3.17 Compliant CUR shall meet the testing and performance requirements of three separate test series as specified in the categories of Table 4.3.9(a), Table 4.3.9(b), Table 4.3.9(c), or Table 4.3.9(d) every fifth year from the date of the initial certification testing specified in 4.3.10.

4.3.18 CUR Lens Component Testing and Performance.

4.3.18.1 CUR lens components shall meet the testing and performance requirements of one test series of Category G, as specified in Table 4.3.9(a), every fifth year from the date of the initial certification testing specified in 4.3.10.

Table 4.3.9(a) Series Tests

Category A (CUR #1)	Category B (CUR #2)	Category C (CUR #3)	Category D (CUR #4)	Category E (CUR #5)	Category F (CUR #6)	Category G (CUR #7)
Chemical Agent Permeation and Penetration Resistance Against Distilled Sulfur Mustard (HD), see 8.1.1	Chemical Agent Permeation and Penetration Resistance Against Sarin (GB), see 8.1.1	Field of View Performance, see 8.1.3	Nonelectronic Communications Performance, see 8.1.6	Carbon Dioxide (CO ₂) Content Performance, see 8.1.9	Flame Resistance Performance, see 8.1.8	Rigid Facepiece Lens Abrasion Resistance Performance, see 8.1.4
		LRPL, see 8.1.2	Supplementary Voice Communications System Performance, see 8.1.7			Flexible Facepiece Lens Abrasion Resistance Performance, see 8.1.5
			Low-Power Capacity, see 8.1.11			
			Immersion Leakage Performance, see 8.1.10			

Table 4.3.9(b) Series Tests

Category A (CUR #1)	Category B (CUR #2)	Category C (CUR #3)	Category D (CUR #4)	Category E (CUR #5)
	CUR Airflow Performance, see 8.2.11	CUR Airflow Performance, see 8.2.11	CUR Airflow Performance, see 8.2.11	CUR Gauge Accuracy Performance, see 8.2.9
Exhalation Valve Leakage Performance, see 8.2.1	Environmental Temperature Performance, see 8.2.12	Corrosion Resistance Performance, see 8.2.14	Vibration Resistance Performance, see 8.2.13	CUR Remote Gauge Leakage Flow Performance, see 8.2.10
Service Time Performance, see 8.2.2	Universal Emergency Breathing Safety System (UEBSS) Cold Temperature Performance, see 8.2.20	Universal Emergency Breathing Safety System (UEBSS) Cold Temperature Performance, see 8.2.20		EOSTI Alarm Recognition, see 8.2.16
Integrity of Coupling Performance, see 8.2.5	Particulate Resistance Performance, see 8.2.15	Breathing Air Pressure Vessel Performance, see 8.2.19		CUR HUD Performance, see 8.2.17
CUR Standby Air Supply Airflow Performance, see 8.2.6				RIC UAC Performance, see 8.2.18
Connection to a Remote Air Source Performance, see 8.2.7				
CUR Air Flow Capabilities in Event of Second Stage Regulator Failure Performance, see 8.2.8				
Low-Temperature Man Test Performance, see 8.2.3				
Physical Exertion Man Test A Performance, see 8.2.4				
Physical Exertion Man Test B Performance, see 8.2.4				

4.3.18.2 CUR component testing in Category G shall be conducted on test specimens as specified in each respective test method.

4.3.19 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.

4.3.19.1 The certification organization shall accept from the manufacturer for evaluation and testing for certification only product or product components that are the same in every respect to the actual final product or product component.

4.3.19.2 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.

Table 4.3.9(c) Series Tests

Category A (CUR #1)
PAPR Airflow Performance, see 8.3.1
Facepiece Carbon Dioxide and Oxygen Concentration Levels Performance with the PAPR Blower Off, see 8.3.4
Airflow Resistance Performance in Breathing-Responsive, Powered Air-Purifying Respirators (if equipped), see 8.3.2
PAPR Silica Dust Loading Performance, see 8.3.3

4.3.20 Adjustments or Repair or Replacement Parts.

4.3.20.1 No adjustment or repair or replacement of parts shall be permitted to any CUR being tested in accordance with this standard, except as provided in 4.3.20.2.

Table 4.3.9(d) Series Tests

Category A (CUR #1)	Category B (CUR #2)	Category C (CUR #3)
Breathing Resistance Performance, see 8.4.1 and 8.4.2	Canister Challenge and Breakthrough Concentrations Performance, see 8.4.4 to 8.4.5.10	Particulate/ Aerosol Canister Performance, see 8.4.4 and 8.4.6
Hydration Leakage Performance (if equipped), see 8.4.3		
End-of-Service-Life Indicator Drop Performance (if equipped), see 8.4.8		
End-of-Service-Life Indicator Performance for Canisters (if equipped), see 8.4.9		
Low-Temperature/Fogging Performance, see 8.4.7		

4.3.20.2 Breathing air pressure vessels shall be permitted to be filled as required.

4.3.21 Accessories.

4.3.21.1 Where CUR are provided with an attached accessory or accessories, the CUR with accessories installed shall be tested to all of the performance requirements specified in Chapter 7.

4.3.21.2 Accessories shall not cause degradation of the performance of the CUR.

4.3.21.3 The accessories themselves shall not be required to pass the performance testing unless specifically specified herein.

4.3.22 After completion of testing for a specific model CUR or its variant, only those tests on other similar CUR models or variants shall be required where, in the determination of the certification organization, the CUR's test results can be affected by any components or certified accessories that are different from those on the original CUR tested.

4.3.23 Modifications.

4.3.23.1 Any modifications made to a CUR or to any certified accessories provided for a CUR by the CUR manufacturer after certification shall require retesting and the meeting of the performance requirements of all those individual tests that the certification organization determines could be affected by such changes.

4.3.23.2 The retesting as stated in 4.3.23.1 shall be conducted before the modified CUR is certified as being compliant with this standard.

4.3.24 Data.

4.3.24.1 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.

4.3.24.2 The manufacturer shall provide such data, upon request, to the purchaser or authority having jurisdiction.

4.4 Recertification.

4.4.1 All CUR 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 4.3.12 on all manufacturer models and components.

4.4.3 Data.

4.4.3.1 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.

4.4.3.2 The manufacturer shall provide such data, upon request, to the purchaser or authority having jurisdiction.

4.4.4 Follow-Up Inspection.

4.4.4.1 It is permissible for product to be manufactured for the follow-up inspection program to ensure correct configuration is available at the request of the certification organization.

4.4.4.2 Samples shall be selected at random from a product completed on the manufacturer's production line.

4.5 Manufacturers' Quality Assurance Programs.

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.

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.

4.5.3.1 Registration to the requirements of ISO 9001 shall be conducted by a registrar that is accredited for PPE.

4.5.3.2 Registrars specified in 4.5.3.1 shall be accredited for PPE in accordance with ISO/IEC 17021.

4.5.4* Any entity that does not manufacture or assemble the compliant product but meets the definition of manufacturer as specified in 3.3.41 and therefore is considered to be the manufacturer 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, both of the following shall apply:

- (1) Locations and names of all subcontractor facilities shall be documented.
- (2) Documentation shall be provided to the manufacturer's ISO registrar and the certification organization.

4.6 Hazards Involving Compliant Product.

4.6.1 Procedures.

4.6.1.1 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.

4.6.1.2* The procedures as stated in 4.6.1.1 shall comply with the provisions of ISO Guide 27 and as modified herein.

4.6.2* Where a report of a hazard involved with a compliant product is received by the certification organization, both of the following shall apply:

- (1) The certification organization shall contact NIOSH National Personal Protective Technology Laboratory (NIOSH/NPPTL)
- (2) 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 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 this 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 this 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.

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 where the manufacturer has gone out of business or 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 that organization or individual of the corrective action indicated or that no corrective action is indicated.

4.7 Manufacturers' Investigations of Complaints and Returns.

4.7.1 Manufacturers shall provide corrective action in accordance with ISO 9001 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 its 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 describe the procedures to be used in the event that they decide or are 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 National Fire Protection Association

(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 conduct a product recall or after the manufacturer has been directed by the certification organization or NIOSH/NPPTL to issue a safety alert or conduct a product recall

- (3) Techniques for communicating 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 other certification labels, each CUR shall have a CUR system product label permanently attached to the CUR system.

5.1.2 Multiple Labels.

5.1.2.1 Multiple label pieces shall be permitted in order to carry all statements and information required to be on the CUR systems product label.

5.1.2.2 All pieces of the CUR system product label shall be located adjacent to each other.

5.1.3 The certification organization's label, symbol, or identifying mark shall conform to all of the following:

- (1) Be attached to other certification labels and the CUR system product label, or be part of the product labels
- (2) Be placed in a conspicuous location
- (3) Have letters at least 2.5 mm ($\frac{3}{32}$ in.) in height
- (4) Have all labels, symbols, or identifying marks at least 6 mm ($\frac{15}{64}$ 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 Product Label.

5.1.6.1 The CUR product label shall bear the following printed compliance statement:

WHEN ASSEMBLED WITH ALL REQUIRED COMPONENTS, THIS COMBINATION UNIT RESPIRATOR MEETS THE REQUIREMENTS OF NFPA 1987, STANDARD ON COMBINATION UNIT RESPIRATOR SYSTEMS FOR TACTICAL AND TECHNICAL OPERATIONS, 20XX EDITION.

DO NOT USE FOR FIREFIGHTING

DO NOT REMOVE THIS LABEL

5.1.6.2 All letters and numbers shall be at least 2 mm (0.07 in.) in height.

5.1.7 Where applicable, each APR, PAPR, and SCBA assembly shall be marked with the lot number, the serial number, or year and month of manufacture.

5.2 User Information.

5.2.1 The CUR system manufacturer shall provide with each CUR system at least the information and training materials specified within this section.

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

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

5.2.3 Information regarding CURs and their modes of operation shall be provided.

5.2.4 Information or training materials regarding preuse shall be provided at least on the following areas:

- (1) Safety considerations
- (2) Limitations of use
- (3) Charging breathing air pressure vessels
- (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 emergency apparatus

5.2.5 Cautions and Limitations.

5.2.5.1* Specific statements regarding limitations of use shall be provided under the title of "Operational Mode Information" as follows:

- (1) A statement that it is the user's responsibility to monitor and understand any atmospheric hazard.
- (2) A statement that APR or PAPR modes of operation are prohibited for entry into an IDLH or unknown atmosphere.
- (3) A statement that the remote air source coupling is not to be used in CBRN exposures or for post-incident decontamination after CBRN incidents.
- (4) A statement that the remote air source coupling is not to be used as a UEBSS.
- (5) A statement of the minimum temperature for use of CUR relative to the manufacturer-specified low temperature indicated in 7.2.3.2.

5.2.5.2 CUR Manufacturer.

5.2.5.2.1 The CUR manufacturer shall provide cautions and limitations regarding the CUR's use.

5.2.5.2.2 At a minimum, the CUR manufacturer shall include the appropriate NIOSH CBRN-specific cautions and limitations for each of the operational modes supported by the CUR as defined in the following application procedures:

- (1) The "Standard Application Procedure for the Approval of Powered Air-Purifying Respirators and Chemical, Biological, Radiological, and Nuclear-Powered Air-Purifying Respirators" under 42 CFR Part 84
- (2) The "Standard Application Procedure for the Approval of Air-Purifying Respirators and Chemical, Biological, Radio-

logical, and Nuclear Air-Purifying Respirators” under 42 CFR Part 84

- (3) The “Standard Application Procedure for the Approval of Self-Contained Breathing Apparatus and Chemical, Biological, Radiological, and Nuclear Self-Contained Breathing Apparatus” under 42 CFR Part 84

5.2.5.3 The CUR manufacturer shall also include the following:

- (1) A statement that it is the user's responsibility to monitor and understand any atmospheric hazard.
- (2) A statement that APR or PAPR modes of operation are prohibited for entry into an IDLH or unknown atmosphere.
- (3) A statement of limitations for the use of CUR for cold temperature operations relative to manufacturer-specified low temperature indicated in 7.2.3.2 and any specific care and maintenance procedures relative to use in such conditions.

5.2.6 Inspection and Inspection Training Materials. Information or training materials regarding periodic inspections shall be provided at least as stated in 5.2.6.1 through 5.2.6.2.

5.2.6.1 Inspection Frequency.

5.2.6.1.1 Where a CUR is assigned to an individual user for a duty period, the inspection shall be performed by the individual user at the beginning of each duty period.

5.2.6.1.2 Where additional CURs are available for use on response vehicles but not assigned to individual users, the inspection shall be performed on such additional CURs at least once each duty period.

5.2.6.1.3 Where CURs are not assigned to an individual user for a duty period, the inspection shall be performed at least once a week for all CURs that are available for use.

5.2.6.1.4 In all cases, the interval between the inspections shall not exceed 1 week.

5.2.6.2 Inspection.

5.2.6.2.1 All of the following CUR components shall be present:

- (1) Facepiece
- (2) Backframe or harness assembly
- (3) Pressure vessel
- (4) Hose
- (5) End-of-service-time indicator(s) (EOSTI)
- (6) Regulators
- (7) PAPR components, if applicable
- (8) APR components, if applicable
- (9) Accessories

5.2.6.2.2 Facepiece inspection shall include the following:

- (1) Material checked for deterioration, dirt, cracks, tears, holes, pliability, and tackiness
- (2) Head-harness buckles, strap, and webbing checked for breaks, loss of elasticity, or wear
- (3) Lens checked for holes, cracks, scratches, heat-damaged areas, and a seal with the facepiece material
- (4) Exhalation valve, where present, checked for valve seat
- (5) Springs and covers checked for operation and cleanliness

- (6) Regulator connection(s) checked for operation and damage
- (7) Nonelectronic communications system and supplementary voice communications system, where present, checked for damage
- (8) Gaskets and seals, where present, checked for good condition
- (9) All hardware, checked for condition of threads, couplings, and adapters
- (10) HUD installation and operation, where present

5.2.6.2.3 Carrier, harness, and webbing subassembly (if included) inspection shall include the following:

- (1) Harness straps and carrier assembly checked for cuts, tears, abrasion, indications of heat damage, and indications of chemical-related damage
- (2) All buckles, fasteners, and adjustments checked for operation
- (3) Pressure vessel retention system checked for damage and operation
- (4) Pressure vessel checked for secure attachment to the carrier assembly
- (5) Harness straps checked for full extension

5.2.6.2.4 Breathing air pressure vessel assembly inspection shall include the following:

- (1) Hydrostatic test date on the pressure vessel checked to be current
- (2) Gauge checked for damage
- (3) Pressure vessel body checked for cracks, dents, weakened areas, indications of heat damage, and indications of chemical damage (*See Annex C*)
- (4) Composite portion of the pressure vessel checked for cuts, gouges, loose composite materials, and the absence of resin (*See Annex C*)
- (5) Pressure vessel valve outlet sealing surface and threads checked for damage
- (6) Valve hand wheel checked for damage, alignment, serviceability, and secure attachment
- (7) Burst disc outlet area checked for debris
- (8) Pressure vessel checked for full charge

5.2.6.2.5 Hose inspection shall include the following:

- (1) Hose checked for cuts, abrasions, bubbling, cracks, heat damage, and chemical damage
- (2) External fittings checked for visual signs of damage
- (3) Hose checked for tight connections

5.2.6.2.6 PAPR assembly (if included) inspection shall include the following:

- (1) Examine all hardware to ensure condition of threads, couplings, and adapters—ensure there is no visual damage or cracks
- (2) No loose objects or rattling inside the PAPR assembly
- (3) Ensure all gaskets and seals are present and in good condition, replace if necessary
- (4) Ensure that the unit turns on/off
- (5) When on, ensure the correct airflow is provided

5.2.6.2.7 EOSTI inspection shall include the following:

- (1) EOSTI alarm and mounting hardware checked for damage, secure attachment, dirt, and debris
- (2) EOSTI checked for activation in accordance with the manufacturer's instructions

5.2.6.2.8 Regulator Inspection.

5.2.6.2.8.1 Regulator inspection shall include the following:

- (1) Regulator controls, where present, checked for damage and function
- (2) Pressure relief devices checked visually for damage
- (3) Housing and components checked for damage
- (4) Regulator checked for any unusual sounds such as whistling, chattering, clicking, or rattling during operation
- (5) Regulator and bypass checked for function when each is operated

5.2.6.2.8.2 Where regulator and bypass inspection is checked for function by donning the facepiece and contamination between users is a possibility, the regulator, facepiece, or both shall be cleaned and disinfected.

5.2.6.2.9 Pressure indicator inspection shall include the following:

- (1) Pressure indicator checked for damage
- (2) Where the CUR has a pressure vessel pressure gauge as well as a remote gauge, both checked to read within 10 percent of each other

5.2.6.2.10 Where CUR has an integrated PASS, the CUR integrated-PASS inspection shall include the following:

- (1) Wear and damage assessment
- (2) Covers/compartments checked for secure attachment
- (3) All operating modes checked for proper function
- (4) Low-battery warning signal

5.2.6.2.11 Other Required Components.

5.2.6.2.11.1 Where CUR has other required components, including rapid intervention crew/company universal air connection (RIC UAC), heads-up display (HUD), electronic communications enhancement, and any other required components not otherwise addressed herein, such components shall be inspected.

5.2.6.2.11.2 Inspection of other required components shall include at least inspection for signs of complete assembly of the component, wear, damage, secure attachment, adequate power source, and proper operation and functionality.

5.2.6.2.12 System Pressure.

5.2.6.2.12.1 The CUR shall hold system pressure in accordance with the manufacturer's specifications, after the pressure vessel valve is closed.

5.2.6.2.12.2 Following the pressure check, the system pressure shall be released.

5.2.7 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) Ensemble interface issues

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

- (1) Pre-use checks
- (2) Recharging breathing air pressure vessels
- (3) Emergency procedures to be followed in the event of damage, malfunction, or failure of the breathing apparatus

- (4) Emergency procedures to be followed in the event of an out-of-air situation

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

5.2.9.1 The external surfaces of the CUR shall be cleaned and disinfected according to the manufacturer's instructions using only those agents indicated by the manufacturer.

5.2.9.2 Facepiece Cleaning.

5.2.9.2.1 The facepiece shall be thoroughly cleaned after each use and disinfected as needed.

5.2.9.2.2 Facepiece cleaning and disinfecting shall be performed using only those agents indicated by the manufacturer.

5.2.9.2.3 The exhalation valve shall be cleaned and flushed.

5.2.9.2.4 Facepiece Drying.

5.2.9.2.4.1 The facepiece shall be dried.

5.2.9.2.4.2 Facepiece drying shall not be done in direct sunlight or in high heat.

5.2.9.2.5 The exhalation valve shall be cycled to ensure proper operation.

5.2.9.3 Where the internal components have been exposed to bodily fluids, exhaled breath, dirt, or debris, the second-stage regulator shall be thoroughly cleaned and disinfected according to the manufacturer's instructions.

5.2.9.4 CUR Strap and Harness Cleaning and Drying.

5.2.9.4.1* CUR straps and harness assemblies shall be cleaned and disinfected when required, according to the manufacturer's instructions.

5.2.9.4.2 Under no circumstances shall a chlorine bleach ever be used to clean straps and harness assemblies made from aramid fibers.

5.2.9.4.3 The straps and harness assemblies shall be dried.

5.2.9.4.4 Drying of straps and harness assemblies shall not be done in direct sunlight or in high heat.

5.2.9.5 CUR pressure vessel valve assemblies shall be cleaned and disinfected using only those agents indicated by the manufacturer.

5.2.9.5.1 The valve shall be free of debris.

5.2.9.5.2 Disc Outlet.

5.2.9.5.2.1 The burst disc outlet shall be inspected for debris.

5.2.9.5.2.2 If debris is present, the pressure vessel shall be removed from service.

5.2.9.6* Water or cleaning materials shall be prevented from entering the connection between the pressure vessel valve and the mating CUR inlet connector.

5.2.9.7 Pneumatic component cleaning and disinfecting shall be performed using only those agents indicated by the manufacturer.

5.2.9.7.1 All pneumatic components shall be thoroughly dried after cleaning.

5.2.9.7.2 Drying of pneumatic components shall not be done in direct sunlight or in high heat.

5.2.9.8 All other CUR components shall be thoroughly air dried prior to storage in a compartment that does not allow for air circulation.

5.2.9.9 PAPR Assembly.

5.2.9.9.1 The PAPR assembly, if included, shall have its components or subassemblies wiped or rinsed with water or cleaning solution, in accordance with the manufacturer's instructions.

5.2.9.9.2 Unless specifically designed to be submerged, the blower assembly shall not be submerged.

5.2.9.9.3 The breathing tube connection, canister mounts, and any other sealing interface shall be cleansed of contaminants that could prevent an airtight seal.

5.2.9.10 Required inspections shall be performed after cleaning.

5.2.10 Information or training materials regarding periodic user maintenance shall be provided at least on the following areas:

- (1) Information or training materials regarding low-power-source signals and power source replacement, where applicable
- (2) 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 could present a hazard to the user

5.2.11 Information or training materials regarding user repair shall be provided where stated in 5.2.11.1 through 5.2.11.6.

5.2.11.1 Where user repair can be accomplished and replacement items or remedial action are immediately available, the CUR shall be permitted to be restored and returned to in-service status.

5.2.11.2 Where user repair cannot be accomplished or where replacement items or remedial action are not immediately available, the CUR shall be tagged out-of-service and removed from the response vehicle or standby location until the user repair can be completed.

5.2.11.3 Organization Personnel.

5.2.11.3.1 The organization's personnel shall follow the organization's SOPs and the manufacturer's written instructions for allowable user repairs.

5.2.11.3.2 The organization's personnel shall be trained on the specific repair procedures before performing them.

5.2.11.4 Users shall not do either of the following:

- (1) Perform work beyond the limits of the organization's SOPs and their training
- (2) Exceed what is allowed by the manufacturer's written instructions

5.2.11.5 All repairs shall be done with the proper tools, parts, and equipment as specified by the manufacturer.

5.2.11.6 After repairs are made, the user shall conduct the required inspection as specified in 5.2.6.2 to verify proper function of the CUR.

5.2.12 Information or training materials regarding retirement shall be provided at least on replacement/retirement considerations, where applicable, for each APR, PAPR, and SCBA assembly.

5.2.13 Component Service Life.

5.2.13.1 The CUR manufacturer shall provide the manufacturer's specified component service life for composite breathing air pressure vessels and for all elastomeric components of the CUR.

5.2.13.2 The information required in 5.2.13.1 shall be included at least in the maintenance information provided to the users.

5.2.14 Contamination and Decontamination.

5.2.14.1 Tags.

5.2.14.1.1 Where a CUR is suspected of being contaminated, it shall be tagged out-of-service and segregated from other equipment and personnel.

5.2.14.1.2 Tags shall include details of the incident, including known and suspected contaminants.

5.2.14.2 The CUR manufacturer shall be contacted to determine if any additional special procedures can be used to decontaminate the CUR.

5.2.14.3 In all cases, decontamination shall be conducted in accordance with the CUR manufacturer's instructions.

5.2.14.4 Where it is determined that the CUR is contaminated beyond the ability to decontaminate it and return it to service, the CUR shall be disposed of.

5.2.15 Storage.

5.2.15.1 CUR shall be stored in their original carrying or storage cases or in a wall or apparatus bracket/rack designed for quick removal and for protection of the CUR.

5.2.15.2 Brackets/racks shall protect the CUR.

5.2.15.3 Brackets/racks shall be adjusted so they do not cause physical damage to pressure vessels, hoses, regulators, or straps.

5.2.15.4 Where appropriate, brackets for securing CUR in vehicles used for transportation of emergency services personnel shall meet the requirements of 14.1.10 of NFPA 1901.

5.2.15.5 CUR shall be stored with the pressure vessel valves closed.

5.2.15.6 CUR valves or controls shall be positioned according to manufacturer's specifications.

5.2.15.7 The facepieces of all CUR shall be positioned to avoid distortion of parts during storage.

5.2.15.8 All harness straps shall be adjusted to their maximum length during storage.

5.2.15.9 In all instances, the CUR shall be stored in a manner to control and minimize exposure to shock, vibration, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and environmental elements.

5.2.15.10 All in-service CUR pressure vessels shall be stored fully charged.

5.2.15.11 Pressure vessels shall be filled when the pressure falls to 90 percent of the manufacturer's specified pressure level.

5.2.15.12 A positive pressure shall be maintained in depleted CUR pressure vessels by keeping the valve closed until they are filled to keep external contamination and condensation out of the pressure vessel.

5.2.15.13 Compressed breathing air stored in CUR breathing air pressure vessels shall be replaced at least annually.

5.2.15.14 CUR pressure vessels shall be stored in a manner that prevents damage to the valve and pressure vessel.

Chapter 6 Design Requirements

6.1 CUR System Requirements.

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

6.1.2 The CUR shall be approved as a system.

6.1.2.1 CUR modes shall not be certified individually under this certification.

6.1.2.2 The system shall consist of at least two different modes of operation.

6.1.2.2.1 One operating mode shall be an open-circuit SCBA.

6.1.2.2.2 One operating mode(s) shall be a PAPR, an APR, or both.

6.1.3 CUR shall be certified to meet system CBRN performance requirements in accordance with this document.

6.1.4 The CUR shall be designed to allow the user to switch between modes, either automatically or manually.

6.1.4.1 The switchover element(s) shall isolate one mode from the other allowing only one mode to be operational at any time.

6.1.4.2 There shall be an indication as to which mode the CUR is operating in throughout its use.

6.1.4.2.1 When the CUR is activated, the system shall provide an indication to the user which mode of operation it is in.

6.1.4.2.2 When the CUR is switched from one mode of operation to another, there shall be a distinct indication of the new mode of operation.

6.1.5 All CUR connectors that are designed to be disconnected during use shall be self-sealing when disconnected.

6.1.6 The components of each CUR shall meet the minimum construction requirements of 6.1.6.1 through 6.1.6.8.

6.1.6.1 Components shall conform to all of the following:

- (1) Designed on sound engineering and scientific principles
- (2) Constructed of suitable materials
- (3) Show evidence of good workmanship

6.1.6.2 Components that come into contact with the wearer's skin shall be made of nonirritating materials.

6.1.6.3 Components replaced during or after use shall be constructed of materials which will not be damaged by normal handling.

6.1.6.4 Facepieces shall be constructed of materials that shall withstand repeated disinfection as recommended by the manufacturer's instructions for use of the device.

6.1.6.5 Components shall be designed, constructed, and fitted to ensure against creation of any hazard to the wearer.

6.1.6.6 Components shall be assembled to permit easy access for inspection and repair of functional parts.

6.1.6.7 Components shall be assembled to permit easy access to parts that require periodic cleaning and disinfecting.

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

6.1.7 Breathing hoses and other components used in conjunction with CUR shall be designed and constructed to prevent the following:

- (1) Restriction of free head movement
- (2) Disturbance of the fit of facepieces
- (3) Interference with the wearer's activities
- (4) Shutoff of airflow due to kinking, or from chin or arm pressure

6.1.8 CUR facepieces shall be equipped with adjustable and replaceable head harnesses designed and constructed to provide tension during suspension and an even distribution of pressure over the entire area in contact with the face.

6.1.9 Where inhalation or exhalation valves are provided on CUR facepieces, they shall be protected against damage and distortion.

6.1.9.1 Exhalation valves shall be protected against external influence and designed and constructed to prevent inward leakage of contaminated air.

6.1.9.2 Inhalation valves shall be designed and constructed to prevent excessive exhaled air from adversely affecting the air purifying component(s).

6.2 CUR/Open-Circuit SCBA Mode Design Requirements.

6.2.1 CUR shall be permitted to supply air to the user in a negativepressure (demand) mode only when operating in the air purifying or powered air purifying device modes.

6.2.2 A heads-up display (HUD) shall not be the sole device used to meet the requirements of 6.2.26.6.

6.2.3 The pressure gauge provided as part of the CUR manufacturer's breathing air pressure vessel and valve assembly shall be able to be read by a person other than the wearer of the CUR when the CUR is worn in accordance with the CUR manufacturer's instructions and with the breathing air pressure vessel securely retained in the CUR backframe or carrier.

6.2.3.1 The pressure gauge shall be permitted to be covered.

6.2.3.1.1 If covered, the pressure gauge shall have tool-free access in accordance with 6.2.3.

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

6.2.5 Testing.

6.2.5.1 Combination unit respirators (CUR) shall be tested for listing to ANSI/ISA-12.12.01, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*.

6.2.5.2 CURs shall meet the design (i.e., construction) requirements for at least Class I, Division 2, Groups C and D and Class II, Division 2, Groups F and G hazardous locations, and with a temperature class of T3 through T6 inclusive.

6.2.6 Nonincendive Equipment. The CUR shall be suitable for use in Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; and Class III, Divisions 1 and 2 hazardous (classified) locations as demonstrated by being certified as nonincendive equipment in accordance with ANSI/UL 121201, *Non-Incendive Electric Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous(Classified) Locations*.

6.2.6.1 Intrinsically Safe Systems. The CUR shall be permitted to be certified for use in Class I, Division 1, Groups C and D; Class II, Division 1, Groups E, F, and G; and Class III, Divisions 1 and 2 hazardous (i.e., classified) locations as demonstrated by being certified as an intrinsically safe system in accordance with ANSI/UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations*.

6.2.7 All hardware, brackets, and snaps or other fasteners of CUR or any certified accessories shall be free of rough spots, burrs, and sharp edges.

6.2.8 All CUR shall have a voice communications capability that shall consist of a nonelectronic transmission system.

6.2.8.1 If the CUR incorporates an optional electronic supplementary voice communications system, the supplementary voice communications system design shall incorporate an indication that the system has been activated.

6.2.8.2 The optional supplementary voice communications system's power source shall, at a minimum, provide upon activation an alert signal indicating low power capacity.

6.2.8.3 The optional supplementary voice communications system shall be designed to be switched on and off manually without the performance of the CUR being affected.

6.2.8.4 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 CUR.

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

6.2.9.1 All CUR shall be equipped with a minimum of one EOSTI.

6.2.9.2 The EOSTI(s) shall be activated with no additional procedures than those required to activate the CUR breathing system.

6.2.9.3 Where the CUR is equipped with non-HUD EOSTI, the alarm signal shall remain active at least until the pressure vessel drops below 20 bar (290 psi).

6.2.9.4 Each EOSTI shall consist of at least the following:

- (1) Sensing mechanism
- (2) Signaling device

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

6.2.9.4.2 The EOSTI(s) signaling devices shall provide notification to the CUR user of the activation of the EOSTI by stimulating one or more human senses.

6.2.9.4.3 Signaling Device.

6.2.9.4.3.1 The EOSTI(s) shall be permitted to have more than one signaling device.

6.2.9.4.3.2 Each signaling device shall be permitted to stimulate more than one human sense.

6.2.9.4.4 A failure mode and effects analysis shall be provided to the certification organization for the EOSTI(s).

6.2.9.4.4.1 The failure mode and effects analysis shall identify each potential failure mode for each component necessary for the EOSTI(s) to function.

6.2.9.4.4.2 For the failure mode and effects analysis, power sources other than the air from the CUR breathing air pressure vessel shall be considered as part of the EOSTI(s).

6.2.9.4.5 The EOSTI alarm shall activate at a minimum of 27 $\pm$ 2 percent of full pressure vessel pressure.

6.2.10 Optional HUD Design Requirements.

6.2.10.1 The CUR shall be permitted to be equipped with at least one HUD.

6.2.10.2 If the CUR is equipped with a HUD, the HUD shall be activated with no additional procedures other than those required to activate the CUR breathing system.

6.2.10.3 HUD User Control.

6.2.10.3.1 The HUD shall be permitted to be capable of being user controlled following activation.

6.2.10.3.2 User control function(s) shall include, but not be limited to, deactivation of the HUD visual pressure gauge display function.

6.2.10.4 If the HUD is used as the EOSTI, the EOSTI indication shall not be capable of being disabled.

6.2.10.5 The activation/deactivation of the HUD shall be performed external to the facepiece.

6.2.10.6 The user shall be able to operate the HUD without having to use special tools.

6.2.10.7 Each time the CUR breathing system is activated with the breathing air pressure vessel pressure of 20 bar (290 psi) or greater, the HUD shall provide a visual indication of activation.

6.2.10.8 Where the HUD is provided with an external wiring disconnect, the wiring connector shall require two distinct actions for disconnection.

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

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

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

6.2.11 Visual Alert Signals (when in the Active Mode).

6.2.11.1 The HUD shall display visual alert signals for breathing air pressure vessel content specified in 6.2.11.4.

6.2.11.2 In addition to the mandatory visual alert signals specified in 6.2.11.4, additional visual alert signals to indicate when other status or conditions have occurred shall be permitted.

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

6.2.11.4 Visual Alert Signal.

6.2.11.4.1 The HUD shall display a visual alert signal for breathing air pressure vessel content when the breathing air in the CUR pressure vessel has been reduced to 50 percent of rated service content.

6.2.11.4.2 The visual alert signal stated in 6.2.11.4.1 shall visibly flash at a frequency of not less than one per second for a minimum of 20 consecutive seconds.

6.2.12 Visual Informational Displays (when in the Active Mode).

6.2.12.1 The HUD shall display visual informational signals for at least breathing air pressure vessel content as specified in 6.2.12.5.

6.2.12.2 In addition to the mandatory visual informational signal specified in 6.2.12.5, additional visual informational signals to indicate when other status or conditions have occurred shall be permitted.

6.2.12.3 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 sec.

6.2.12.4 Where the visual display is not constantly visible or is not visible for at least 10 consecutive seconds every 60 sec, the HUD shall be provided with a manual activation of the display.

6.2.12.5 The HUD shall display a visual informational signal for breathing air pressure vessel content at 100 percent, 75 percent, 50 percent, and 25 percent of the pressure vessel's total rated service content.

6.2.12.5.1 The range of pressures under the EOSTI set point shall be visually obvious.

6.2.12.5.2 Where an analog gauge is used, the pressure range below the EOSTI set point shall have a red background.

6.2.12.5.3 Where an electronic mode is used, the display of pressure below the EOSTI set point shall flash at a frequency of not less than one per second for the remaining duration of the pressure vessel.

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

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

6.2.13.1 The CUR shall be permitted to be equipped with an RIC UAC male fitting to allow replenishment of breathing air to the CUR breathing air pressure vessel.

6.2.13.2 If the CUR is equipped with an RIC UAC, both of the following shall apply:

- (1) The RIC UAC male fitting shall meet the requirements specified in 6.2.14.
- (2) An RIC UAC male fitting shall be located on each CUR in a permanently fixed position.

6.2.13.3 The distance between the leading edge of the Compressed Gas Association (CGA) fitting at the outlet of the CUR pressure vessel valve and the leading edge of the RIC UAC male fitting shall be a maximum of 100 mm (4 in.).

6.2.13.4 If the CUR is equipped with an RIC UAC, a separate self-resetting relief valve shall be installed on the CUR to protect the CUR against overpressurization.

6.2.14 RIC UAC Male Fitting.

6.2.14.1 The RIC UAC male fitting shall be designed as specified in Figure 6.2.14.1.

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

6.2.14.3 The RIC UAC male fitting shall not interfere with any other operation of the CUR.

6.2.14.4 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.

6.2.15 RIC UAC Female Fitting.

6.2.15.1 The RIC UAC female fitting shall be designed as specified in Figure 6.2.15.1.

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

6.2.15.3 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.

6.2.16 RIC UAC Filling Hose Assembly.

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

6.2.16.2 The RIC UAC filling hose assembly shall be, at a minimum, a high-pressure, 310 bar (4,500 psi) assembly designed to replenish breathing air to a CUR breathing air pressure vessel.

6.2.16.3 The filling hose shall have an RIC UAC female fitting that meets the requirements specified in 6.2.15 attached to the delivery end.

6.2.17 RIC UAC Coupling.

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

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

6.2.17.3 The RIC UAC coupling shall have an operating pressure of at least 310 bar (4,500 psi).

6.2.18 Power Source Design Requirements for PAPR and SCBA Operating Modes.

6.2.18.1 Where the CUR is equipped with a power source for electronics, it shall be either a single dedicated source for one device or a common power source for multiple devices.

6.2.18.2 Where all electronic devices that are part of the CUR share a common power source, at least one low power source alert signal shall be provided.

6.2.18.3 Where multiple but not all electronic devices that are part of the CUR share a common power source, a low power source alert signal shall be located on each of those electronic devices supplied by the common power source and positioned on each of those electronic devices where it will be detected upon device activation with the electronic device mounted in its permanent position on the CUR.

6.2.18.4 Where an electronic device uses a single, dedicated power source, the low power source alert signal shall be located on the electronic device and positioned where it will be detected upon device activation with the electronic device mounted in its permanent position on the CUR.

6.2.18.5 Where a HUD display of low power source alert signal(s) specified in 6.2.18.2 is visual, the low power source alert signal(s) shall be positioned within the user's field of vision with the CUR facepiece donned.

6.2.18.6 Where a power source is used for HUD to comply with the requirements of this standard, HUD shall provide an 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.

6.2.18.6.1 Where the low power source alert signal is visual, it shall be independent from and physically distinguishable from

the breathing air pressure vessel content visual alert signal display.

6.2.18.6.2 When the HUD is in the active mode and uses a low power source visual alert signal, the low power source visual alert signal shall be displayed at all times when the power source condition is below the level specified in 6.2.11.4, except as provided in 6.2.18.6.3.

6.2.18.6.3 Where the HUD is capable of being user controlled, the low power source capacity visual display function shall be permitted to be disabled upon indication of a low power source condition.

6.2.19 Optional Universal Emergency Breathing Safety System (UEBSS) Design Requirements.

6.2.19.1 If a CUR is equipped with a UEBSS, it shall meet the performance requirements of 7.2.20 and 8.2.20.

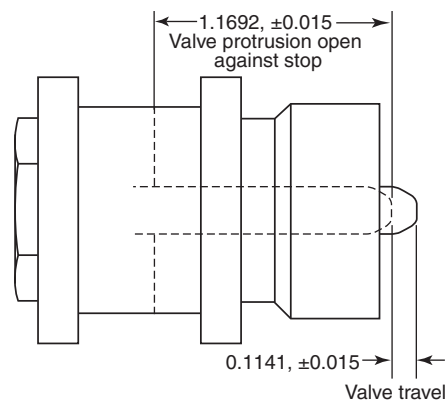


FIGURE 6.2.15.1 RIC UAC Female Fitting (all measurements in inches).

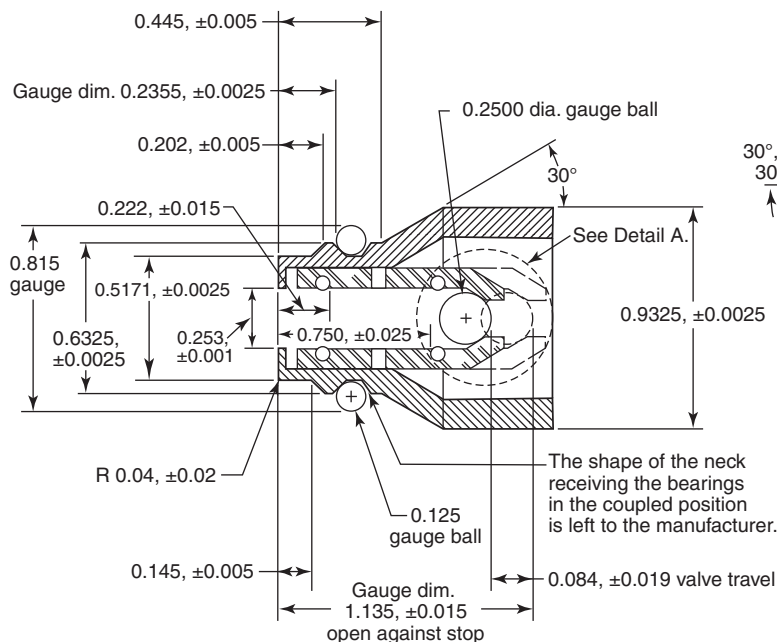
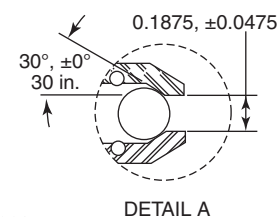


FIGURE 6.2.14.1 RIC UAC Male Fitting (all measurements in inches).



6.2.19.2 Each UEBSS shall operate off the pressure after the first-stage pressure reducer of the CUR.

6.2.19.3 The UEBSS shall have an operating pressure range between 5.5 bar (80 psi) and 10.3 bar (150 psi).

6.2.19.4 The UEBSS shall have bi-directional male and female connections with a check valve feature to prevent inward contaminants.

6.2.19.4.1 The UEBSS male fitting shall be designed as specified in Figure 6.2.19.4.1, or equivalent.

6.2.19.4.2 The UEBSS female fitting shall be designed as specified in Figure 6.2.19.4.1, or equivalent.

6.2.19.5 The UEBSS pressure hose assembly shall be a minimum of 0.51 m (20 in.) long.

6.2.19.6 The UEBSS shall be removable from storage by the wearer using a single hand in a one-directional pull.

6.2.19.7 The UEBSS shall require only one action for connection of the donor's fitting to the receiving CUR's fitting.

6.2.19.8 The UEBSS shall require two distinctive actions to disconnect the fitting between the donor CUR and the receiving CUR.

6.2.19.9 The UEBSS fitting(s) shall be equipped with a dust cap or sealing plug to prevent dust, dirt, and debris from entering the fitting(s).

6.2.19.10 The connection of two UEBSS shall be independent of the facepieces.

6.2.19.11 The UEBSS access location shall be visible to an assisting CUR user.

6.2.19.11.1 The UEBSS access location shall be marked UEBSS.

6.2.19.11.2 The letters referenced in 6.2.19.11.1 shall be at least 25 mm (1 in.) in height.

6.2.20 Optional Remote Air Source Coupling Design Requirements. If a CUR is equipped with an optional remote compressed air source coupling capability, it shall meet the performance requirements of 7.2.5 through 7.2.7 and 8.2.8 through 8.2.10.

6.2.21 Accessories Design Requirements.

6.2.21.1 Items attached to or integrated with a CUR that are not required for the CUR to meet the requirements of this standard shall be considered accessories.

6.2.21.2 All accessories attached to or integrated with a CUR shall be as follows:

- (1) Certified as CUR accessories
- (2) Tested, if appropriate

6.2.21.3 Any accessories attached to a CUR shall not interfere with the function of the CUR or with the function of any of the CUR's component parts.

6.2.21.4 Where a CUR is provided with accessories that are attached to or integrated with the CUR, the CUR, with accessories installed, shall meet all of the design and performance requirements of this standard.

6.2.21.5 In all cases, such accessories shall not degrade the performance of the CUR.

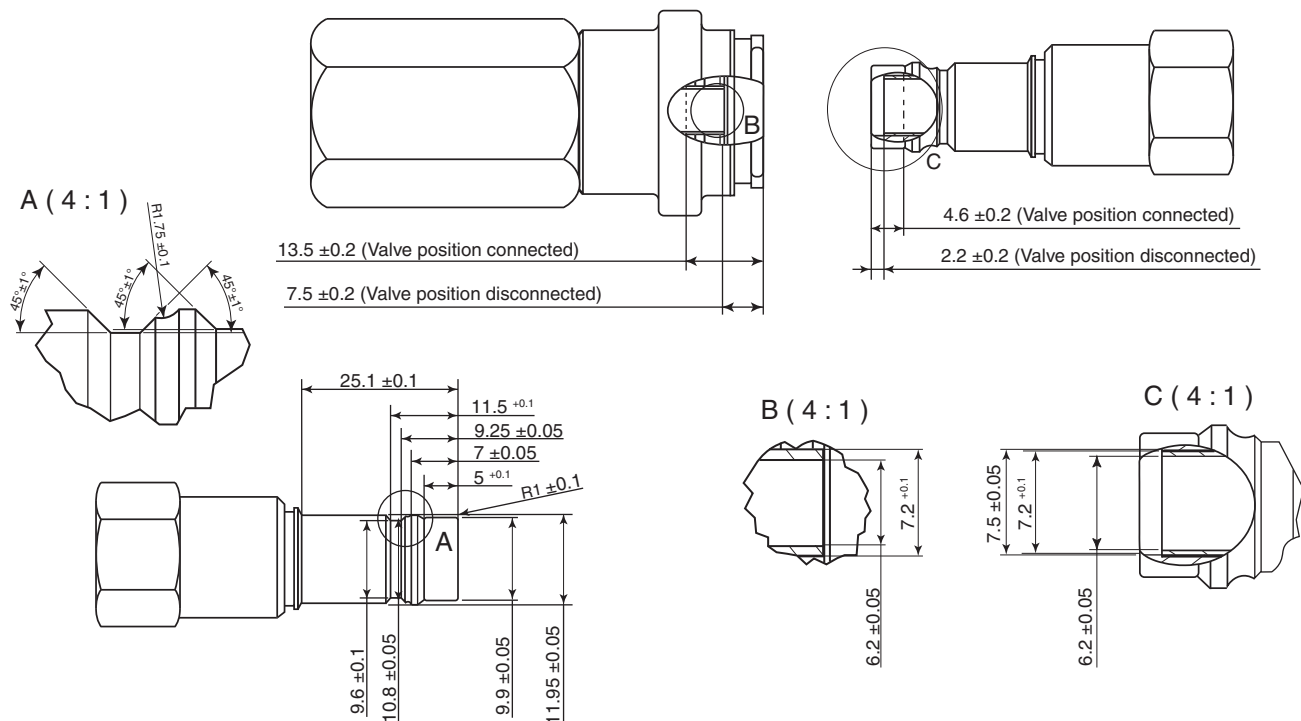


FIGURE 6.2.19.4.1 UEBSS Male and Female Fitting.