NFPA®

1984

Standard on Respirators for Wildland Fire-Fighting and Wildland Urban Interface Operations

2022

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Respirators for Wildland Fire-Fighting and Wildland Urban Interface Operations

2022 Edition

This edition of NFPA 1984, *Standard on Respirators for Wildland Fire-Fighting and Wildland Urban Interface Operations*, was prepared by the Technical Committee on Respiratory Protection Equipment and released by the Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. It was issued by the Standards Council on March 18, 2021, with an effective date of April 8, 2021, and supersedes all previous editions.

This edition of NFPA 1984 was approved as an American National Standard on April 8, 2021.

Origin and Development of NFPA 1984

In October 2006, the NFPA Standards Council received a request that NFPA develop a new respiratory standard for fire fighters in wildland fire operations. The following month, the Standards Council voted to publish a notice of receipt of the request soliciting opinions on the need to address the subject matter, information on resources available on the topic, those interested in participating if approved, and other organizations actively involved in the subject.

At its October 2007 meeting, the Standards Council voted to proceed with the request to develop a new document on respiratory standards for wildland fire fighting. The council asked the Technical Correlating Committee (TCC) on Fire and Emergency Services Protective Clothing and Equipment to clarify whether this document would be assigned to an existing technical committee (TC) under the project or if a new TC was being contemplated. In addition, the council directed the TCC to submit a new or revised TC scope, and that a start-up roster for any new TC be submitted.

At its March 2009 meeting, the TCC on Fire and Emergency Services Protective Clothing and Equipment reported to the council that the TCC had assigned the development of the new document to the TC on Respiratory Protection Equipment. The council directed the TCC to review the membership on the TC and make any recommendations necessary to ensure that the TC had the appropriate wildland fire-fighting expertise to develop the document. The council subsequently determined that the TC on Respiratory Protection Equipment had the necessary expertise to develop the document and instructed the TC to proceed with the development of a draft, ballot the TC and TCC, and make a request to the council to enter an appropriate revision cycle.

The draft of NFPA 1984, *Standard on Respirators for Wildland Fire-Fighting and Wildland Urban Interface Operations*, was published in the Report on Proposals (ROP) and released for public review and comment on December 8, 2009. Following the public review period, which closed on March 5, 2010, the Report on Comments (ROC) was processed in the Spring of 2010. The TCC on Fire and Emergency Services Protective Clothing and Equipment processed the proposed NFPA 1984 at its meeting in June 2010 and approved the document to go forward.

The 2016 edition of NFPA 1984 incorporated TIA-11-1, issued by the Standards Council on March 1, 2011. This TIA addresses NIOSH certification of wildland fire fighter respirators in accordance with 42 CFR 84. This edition also featured two new tests for breathing resistance and air-purifying respirators' (APR) air purification component capacity.

The 2022 edition of NFPA 1984 includes respiratory protection equipment (RPE) considerations for when large numbers of wildland and urban interface fire fighters are exposed to a variety of respiratory hazards. Also considered are increasing medical and health concerns for fire fighters exposed to products of combustion in wildland and urban interface fire-fighting conditions.

This addition not only expands the range of protected members (with the addition of urban interface fire fighters), it offers, through advances in technology, agency or user group options for a layered filtering approach for protection as part of individual respiratory protection programs.

Typical use scenarios based on anticipated inhalation on hazard exposures are the following:

(1) Class 1 is for conditions in camp and away from fire combustion activities.
(2) Class 2 is for conditions in operational wildland fire fighter personnel activities.
(3) Class 3 is for conditions in wildland urban interface fire activities, where manmade materials are likely to be encountered.

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This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

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

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

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

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

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Standard on

Respirators for Wildland Fire-Fighting and Wildland Urban Interface Operations

2022 Edition

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

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced 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 design, performance, testing, and certification requirements for respirators to provide protection from inhalation hazards for personnel conducting wildland fire-fighting and/or wildland urban interface operations.

1.1.2 This standard shall specify only respirator requirements for use in non-IDLH (immediately dangerous to life and health) wildland environments during wildland fire-fighting and/or wildland urban interface operations.

1.1.3 This standard shall not specify requirements for any accessories or enhancements built into, attached to, or sold with the certified wildland fire-fighting or wildland urban interface operations respirator by the respirator manufacturer for later attachment, and that shall be tested with those accessories and enhancements installed or attached as specified in 4.3.11 and 4.3.11.1.

1.1.4 This standard shall not specify requirements for any wildland fire-fighting protective clothing and protective equipment other than that identified in 1.1.1 through 1.1.3.

1.1.5 This standard shall not specify requirements for respirators for any other fire-fighting operations other than those identified in 1.1.1 and 1.1.2, any technical rescue operation, any hazardous materials emergencies, or any CBRN incident operations.

1.1.6 Certification of respirators for wildland fire-fighting and wildland urban interface operations to the requirements of this standard shall not preclude certification to additional appropriate standards where the respirator meets all the applicable requirements of each standard.

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

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

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

1.2 Purpose.

1.2.1 The purpose of this standard shall be to establish minimum levels of respiratory protection for personnel assigned to or involved in wildland fire-fighting or wildland urban interface operations incidents.

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 situations to which wildland fire-fighting or wildland urban interface operations personnel might be exposed.

1.2.3 This standard is not intended as a detailed manufacturing or purchase specification, but shall be permitted to be referenced in purchase specifications as minimum requirements.

1.3 Application.

1.3.1 This standard shall apply to the design, manufacture, testing, and certification of new wildland fire-fighting or wildland urban interface operations respirators.

1.3.2 This standard shall apply to respirators used during wildland fire-fighting or wildland urban interface operations incidents.

1.3.3 This standard shall apply only to respirator requirements for use in non-IDLH (immediately dangerous to life and health) wildland and urban interface environments during wildland fire-fighting or wildland urban interface operations.

1.3.4 This standard shall apply to any accessories or enhancements that are built into, attached to, or sold with the certified

wildland fire-fighting and wildland urban interface operations respirator by the respirator manufacturer for later attachment and that shall be tested with those accessories and enhancements installed or attached to the respirator, as specified in 4.3.11and 4.3.11.1.

1.3.5 This standard shall not apply to any wildland fire-fighting or wildland urban interface operations respirators manufactured to the requirements of any other organization's standards, nor shall this standard apply to any other type of respirator.

1.3.6 This standard shall not apply to the use of any wildland fire-fighting or wildland urban interface operations respirators, as such use requirements for fire services organizations are specified in NFPA 1500.

1.3.7 This standard shall not apply to any other protective clothing and protective equipment for wildland fire-fighting or wildland urban interface operations.

1.3.8 This standard shall not apply to protective clothing, equipment, or respirators for any other fire-fighting operations, any technical rescue operations, any hazardous materials emergencies, or any CBRN incident operations.

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 as these values are approximate.

Chapter 2 Referenced Publications

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

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

NFPA 1500™, *Standard on Fire Department Occupational Safety, Health, and Wellness Program*, 2021 edition.

NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting and Urban Interface Fire Fighting*, 2022 edition.

2.3 Other Publications.

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

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

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*, 2019.

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

ASTM D2859, *Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials*, 2016.

2.3.3 ISO Publications. International Organization for Standardization, Central Secretariat, BIBC II, 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*, 2017.

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

ISO/IEC 17021-1, *Conformity assessment — Requirements for bodies providing audit and certification of management systems — Part 1: Requirements*, 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.

2.3.4 NIOSH/NPPTL Publications. National Institute for Occupational Safety and Health, National Personal Protective Technology Laboratory, P.O. Box 18070, 626 Cochrans Mill Road, Pittsburgh, PA 15236-0070.

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

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

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

Title 29, Code of Federal Regulations, Part 1910.134(29 CFR 1910.134), "Respiratory Protection."

Title 42, Code of Federal Regulations, Part 84(42 CFR 84), "Approval of Respiratory Protective Devices, Tests for Permissibility."

2.3.6 Other Publications.

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

2.4 References for Extracts in Mandatory Sections. (Reserved)

Chapter 3 Definitions

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

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction. An organization, office, or individual responsible for enforcing the requirements of a

code or standard, or for approving equipment, materials, an installation, or a procedure.

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

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

3.2.5 Shall. Indicates a mandatory requirement.

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

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase "standards development process" or "standards development activities," the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Accessory. An item or items, or enhancements that could be built into, or attached to, or sold with a certified product by the product manufacturer for later attachment.

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

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

3.3.4 Capacity. The service life under test conditions for an air-purifying component.

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

3.3.6 Certification/Certified. A system whereby a certification organization determines that a manufacturer has demonstrated the ability to produce a product that complies with the requirements of this standard, authorizes the manufacturer to use a label on listed products that comply with the requirements of this standard, and establishes a follow-up program conducted by the certification organization as a check on the methods the manufacturer uses to determine continued compliance of labeled and listed products with the requirements of this standard. *(See also 3.3.17, NIOSH-Certified.)*

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

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

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

3.3.10 Facepiece. A tight-fitting respiratory inlet covering: a half facepiece covers the wearer's nose and mouth; a full facepiece covers the wearer's nose, mouth, and eyes.

3.3.11 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.

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

3.3.13 Immediately Dangerous to Life or Health (IDLH). A condition that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death, to cause permanent adverse health effects (immediate or delayed), or to prevent escape from an environment such as confined space.

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

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

3.3.16 Model. The collective term used to identify a group of individual items of the same basic design and components from a single manufacturer produced by the same manufacturing and quality assurance procedures that are covered by the same certification.

3.3.17 NIOSH-Certified. Tested and certified by the National Institute for Occupational Safety and Health (NIOSH), National Personal Protective Equipment Laboratory (NPPTL), in accordance with the requirements of 42 CFR 84.

3.3.18 PAPR. See 3.3.22, Powered Air-Purifying Respirator (PAPR).

3.3.19 Particulate Matter. Finely divided solid or liquid matter (particles).

3.3.20 Particulate Respirator. Respirators that filter airborne particles out of the ambient air passing through filtration media.

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

3.3.22 Powered Air-Purifying Respirator (PAPR). An air-purifying respirator that uses a powered blower to force the ambient air through one or more air-purifying components to the respiratory inlet covering.

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

3.3.24 Respirator. The complete assembly including the respiratory inlet covering, air purification components, electronics, batteries, harness, cables, and hoses where applicable; designed to protect the wearer from inhalation of atmospheres containing harmful gases, vapors, or particulate matter.

3.3.25 Sample. The equipment, equipment component, ensemble, element, item, composite, or component that is conditioned for testing. *(See also 3.3.28, Specimen.)*

3.3.26 Separate. A material response evidenced by splitting or delaminating.

3.3.27* Service Life. The length of time required for an air purification component to reach a specific effluent concentration.

3.3.28 Specimen. The conditioned equipment, equipment component, ensemble, element, item, composite, or component that is tested. Specimens are taken from samples. *(See also 3.3.25, Sample.)*

3.3.29 Wildland Fire. Accidental or planned outdoor fires burning vegetation such as woodlands, forests, grasslands, brush, and prairies.

3.3.30 Wildland Fire Fighting. The activities of fire suppression and property conservation in woodlands, forests, grasslands, brush, prairies, and other such vegetation, or any combination of vegetation, that is involved in a fire situation but is not within buildings or structures.

3.3.31 Wildland Fire-Fighting and Wildland Urban Interface Operations Respirator. A respirator that has been certified by NIOSH under 42 CFR 84, and certified as compliant with NFPA 1984.

3.3.32 Wildland Urban Interface Operations. The activities of fire suppression and property conservation in areas where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Chapter 4 Certification

4.1 General.

4.1.1 The process of certification for wildland fire-fighting or wildland urban interface operations respirators as being compliant with NFPA 1984 shall meet the requirements of Section 4.1 through Section 4.8.

4.1.2* Prior to certification of wildland fire-fighting or wildland urban interface operations respirators to this standard, respirators shall be certified by NIOSH as an air-purifying respirator, or as a powered air-purifying respirator.

4.1.3 All respirators for wildland fire-fighting or wildland urban interface operations that are labeled as being compliant with this standard shall meet or exceed all applicable requirements specified in this standard and shall be certified.

4.1.4 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 in accordance with ISO/IEC 17065, *Conformity assessment — Requirements for bodies certifying products, processes, and services*. The accreditation shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.1.5 Manufacturers shall not claim compliance with portions or segments of the requirements of this standard and shall not use the NFPA name or the name or identification of this standard, NFPA 1984, in any statements about their respective wildland fire-fighting or wildland urban interface operations respirators unless the respirator is certified as compliant to this standard.

4.1.6 All compliant wildland fire-fighting or wildland urban interface operations respirators shall be labeled.

4.1.7 All compliant wildland fire-fighting or wildland urban interface operations respirators shall be listed by the certification organization. This listing shall uniquely identify the certified product by style, model number, part number, or similar specific identification.

4.1.8 All compliant wildland fire-fighting or wildland urban interface operations respirators shall also have a product label that meets the requirements specified in Section 5.1.

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

4.2 Certification Program.

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

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

4.2.3 The certification organization shall be accredited for personal protective equipment in accordance with ISO/IEC 17065, *Conformity assessment — Requirements for bodies certifying products, processes, and services*. The accreditation shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

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

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

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

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

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

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

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

4.2.7 The certification organization shall require the manufacturer to establish and maintain a quality assurance program that meets the requirements of Section 4.5.

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 this standard.

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

4.2.9.1 As part of the follow-up inspection program, the certification organization shall select sample compliant product at random from the manufacturer's production line, from the manufacturer's in-house stock, or from the open market.

4.2.9.2 Sample product shall be inspected and tested by the certification organization to verify the product's continued compliance.

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

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

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

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

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

4.3 Inspection and Testing.

4.3.1 For both initial certification and recertification of wildland fire-fighting or wildland urban interface operations respirators, the certification organization shall conduct both inspection and testing as specified in this section.

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

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

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

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

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

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

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

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

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

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

4.3.5 Inspection and evaluation by the certification organization shall include a review of all product labels to ensure that all required label attachments, compliance statements, certifi-

cation statements, and other product information are at least as specified for the product in Section 5.1.

4.3.6 Inspection and evaluation 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 by 5.1.5, to ensure that the symbols are clearly explained in the product's user information package.

4.3.7 Inspection and evaluation 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 wildland fire-fighting or wildland urban interface operations respirators.

4.3.9 All wildland fire-fighting or wildland urban interface operations respirators shall be initially tested for certification and shall meet the performance requirements specified in Chapter 7 of at least three separate test series of Categories A, B, C, and D as specified in Table 4.3.9.

4.3.9.1 All tests within Categories A and B shall be conducted in the order specified and are designed as cumulative damage tests.

4.3.9.2 Wildland fire-fighting or wildland urban interface operations respirator components shall be initially tested for certification and shall meet the performance requirements of at least three separate test series of Category D as specified in Table 4.3.9.

4.3.10 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.

4.3.10.1 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 as the actual final product or product component.

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

4.3.11 Where wildland fire-fighting or wildland urban interface operations respirators are provided with any accessories or enhancements, those accessories or enhancements shall be certified by NIOSH in accordance with 42 CFR 84 for that specific respirator, and the respirator with accessories or enhancements installed shall be tested to and shall pass all of the performance requirements specified in Chapter 7.

4.3.11.1 Where there are any accessories, enhancements, or both that are built into, or attachable to, or detachable from the wildland fire-fighting or wildland urban interface operations respirator, the certification organization shall evaluate and inspect the respirator as specified in Chapter 6, and shall test the respirator as specified in Chapter 8, and the respirator shall meet the performance requirements specified in Chapter 7 with those accessories and enhancements installed or attached to ensure the performance and functions of the respirator.

4.3.12 After completion of these tests for a specific model wildland fire-fighting or wildland urban interface operations respirator or its variant, only those tests on other similar respirator models or variants shall be required where, in the determination of the certification organization, the respirator's test results can be affected by any components or NIOSH-certified accessories that are different from those on the original respirator tested.

4.3.13 Any modifications made to a wildland fire-fighting or wildland urban interface operations respirator that is certified by NIOSH in accordance with 42 CFR 84, and also certified as compliant with this standard; or any modifications to any NIOSH-certified accessories or enhancements by the respirator manufacturer after certification, shall require evaluation by NIOSH.

4.3.14 In addition to the requirements of 4.3.13, the respirator shall be retested to determine the respirator remains compliant with performance requirements selected from Chapter 7 that the certification organization determines could be affected by such changes. This retesting shall be conducted before the modified respirator, respirator accessories, or respirator enhancements are certified as being compliant with this standard.

4.3.15 Every fifth year from the date of the initial certification, a minimum of three identical wildland fire-fighting or wildland urban interface operations respirators that are certified as compliant with this standard shall be tested and shall meet the performance requirements of at least three separate test series of Categories A, B, C, and D as specified in Table 4.3.9.

4.3.15.1 All tests within Categories A and B shall be conducted in the order specified and are designed as cumulative damage tests.

4.3.15.2 Wildland fire-fighting or wildland urban interface operations respirator components that are certified as compliant with this standard shall be tested and shall meet the performance requirements of at least three separate test series of Category D, as specified in Table 4.3.9.

Table 4.3.9 Test Series

Test Series Order	Category A Respirator #1	Category B Respirator #2	Category C Respirator #3	Category D Component Test
1	Communication *(Section 8.6)*	Storage Integrity *(Section 8.3)*	Accelerated Corrosion *(Section 8.7)*	Lens Abrasion *(Section 8.4)*
2	Heat Resistance *(Section 8.1)*	Donning Performance *(Section 8.5)*		
3		Flammability *(Section 8.2)*		

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

4.4 Annual Verification of Product Compliance.

4.4.1 All wildland fire-fighting and wildland urban interface operations respirator models that are certified and 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 as required by this standard on all manufacturer models and components.

4.4.3 Recertification shall include testing to all performance requirements as required by this standard on all manufacturer models and components.

4.4.3.1 Where a test method incorporates testing both before and after a preconditioning and the test generates quantitative results, recertification testing shall be limited to the conditioning that yielded the worst-case test result during the initial certification for the model or component.

4.4.3.2 Where a test method incorporates testing both before and after a preconditioning and the test generates nonquantitative results, recertification testing shall be limited to a single conditioning procedure in any given year. Subsequent annual recertifications shall cycle through the remaining conditioning procedures to ensure that all required conditionings are included over time.

4.4.3.3 Where a test method requires testing on three specimens, a minimum of one specimen shall be tested for annual recertification.

4.4.3.4 Where a test method requires testing of five or more specimens, a minimum of two specimens shall be tested for annual recertification.

4.4.4 Samples of manufacturer models and components for recertification acquired from the manufacturer or component supplier during random and unannounced visits as part of the follow-up inspection program in accordance with 4.2.9 shall be permitted to be used toward annual recertification.

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

4.4.6 Every fifth year from the date of the initial certification, the requirements specified in Section 4.4 shall be waived when the testing required by 4.3.15 is conducted.

4.5 Manufacturers' Quality Assurance Program.

4.5.1 The manufacturer shall provide and operate a quality assurance program that meets the requirements of this section and that includes a product recall system as specified in 4.2.7.1 and Section 4.8.

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 production remains in compliance.

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

4.5.3.1 Registration to the requirements of ISO 9001, *Quality management systems — Requirements,* shall be conducted by a registrar that is accredited for personal protective equipment in accordance with ISO/IEC 17021-1, *Conformity assessment — Requirements for bodies providing audit and certification of management systems — Part 1: Requirements.*

4.5.3.2 The scope of the ISO registration shall include at least the design and manufacturing systems management for the personal protective equipment being certified.

4.5.3.3 The registrar shall affix the accreditation mark on the ISO registration certificate.

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

4.5.5 Where the manufacturer uses subcontractors in the construction or assembly of the compliant product, the locations and names of all subcontractor facilities shall be documented and the documentation shall be provided to the manufacturer's ISO registrar and the certification organization.

4.6 Hazards Involving Compliant Product.

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

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

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

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

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

4.6.6 The investigation shall include, but not be limited to, the extent and scope of the problem as it might apply to other compliant product or compliant product components manu-

factured by other manufacturers or certified by other certification organizations.

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

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

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

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

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

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

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

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

4.7* Manufacturers' Investigation of Complaints and Returns.

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

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

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

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

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

Chapter 5 Labeling and Information

5.1 Product Label Requirements.

5.1.1 Each wildland fire-fighting or wildland urban interface operations respirator and each wildland fire-fighting respirator protective package shall have a product label permanently and conspicuously attached.

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

5.1.3 The certification organization's label, symbol, or identifying mark shall be attached to the product label or be part of the product label. All letters and numerals shall be at least 2.5 mm (3⁄32 in.) in height. The label, symbol, or identifying mark shall be at least 6 mm (¼ in.) in height and shall be placed in a conspicuous location.

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

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

5.1.6 The wildland fire-fighting or wildland urban interface operations respirator product label shall bear the following compliance statement and all letters and numbers shall be at least 2.5 mm (3⁄32 in.) in height:

CERTIFIED COMPLIANT WITH NFPA 1984, CLASS [insert 1, 2, or 3 here], 2022 ED.

5.1.6.1 The appropriate numeral for the class of respirator (1, 2, or 3) shall be inserted where indicated in 5.1.6.

5.1.7 The wildland fire-fighting or wildland urban interface operations respirator protective package product label shall bear the following compliance statement and all letters and numbers shall be at least 6 mm (¼ in.) in height:

THIS RESPIRATOR MEETS THE REQUIREMENTS OF NFPA 1984, CLASS [insert 1, 2, or 3 here], STANDARD ON RESPIRATORS FOR WILDLAND FIRE-FIGHTING AND WILDLAND URBAN INTERFACE OPERATIONS, 2022 EDITION.

DO NOT REMOVE THIS LABEL!

5.1.7.1 The appropriate numeral for the class of respirator (1, 2, or 3) shall be inserted where indicated in 5.1.7.

5.1.8 Wildland fire-fighting or wildland urban interface operations respirators that are certified with replaceable air purification component(s) shall have a product label affixed to each air purification component and shall also have a product label affixed to each air purification component protective package. The product label shall bear the following compliance statement and all letters and numbers shall be at least 2.5 mm (3⁄32 in.) in height:

CERTIFIED COMPLIANT WITH NFPA 1984, CLASS [insert 1, 2, or 3 here] 2022 ED.

5.1.8.1 The appropriate numeral for the class of respirator (1, 2, or 3) shall be inserted where indicated in 5.1.8.

5.1.8.2 For respirators certified with carbon monoxide filtration, the following label shall be used:

CERTIFIED COMPLIANT WITH NFPA 1984, CLASS [insert 1, 2, or 3 here], INCLUDING CARBON MONOXIDE PROTECTION, 2022 ED.

5.1.9 Where applicable, the expiration date of air purification component(s) shall be printed on the outside surface of the air purification component, and shall also be printed on the air purification component protective package. The expiration date shall be in the YYYY/MM form. The expiration date shall be visible when the air purification component is attached to the respirator inlet covering for normal use.

5.1.10 Where a wildland fire-fighting or wildland urban interface operations respirator utilizes, as a component of the respirator, a rechargeable power source with an expiration date, the power source expiration date shall be printed on the outside surface of the power source. The expiration date shall be in the YYYY/MM form.

5.1.11 Where a wildland fire-fighting or wildland urban interface operations respirator utilizes a power source as a component of the certified respirator, the estimated power source service life, in the fully charged condition, shall be printed on the respirator. The printing shall be visible when the respirator is assembled in the as-certified configuration.

5.2 User Information.

5.2.1 The wildland fire-fighting or wildland urban interface operations respirator manufacturer shall provide with each respirator at least the training material and user instructions specified within this section. The respirator manufacturer shall provide with each replaceable air purification component at least the user instructions specified within this section.

5.2.2 Upon request at the time of purchase, the wildland fire-fighting or wildland urban interface operations respirator manufacturer shall provide to the purchaser an information sheet that documents at least the following:

(1) Date of manufacture
(2) Model number
(3) Serial number
(4) Lot number, if applicable
(5) Shelf life

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

(1) Safety considerations
(2) Limitations of use
(3) Replacement of air purification components, if applicable
(4) Service time recommendations for air purification components, power sources, and any other applicable components
(5) Air purification component service life if the respirator does not have an end-of-service-life indicator
(6) Marking recommendations and restrictions
(7) Warranty information
(8) Recommended storage practices
(9) Carrying on belt or wildland fire-fighting load-carrying equipment
(10) Mounting on/in vehicles or fire apparatus

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

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

(1) Removal from packaging
(2) Donning and doffing procedures, including fit check procedures if applicable
(3) Adjustment procedures
(4) Interface issues

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

(1) Pre-use checks

(2) For fire departments or fire department–based emergency services, proper use consistent with NFPA 1500
(3) Replacement of air purification components, if applicable
(4) Emergency procedures to be followed in the event of damage, malfunction, or failure of the respirator

5.2.7 Where the wildland fire-fighting or wildland urban interface operations respirator is designed for multiple use, information or training materials regarding periodic maintenance and cleaning shall be provided at least on the following topics:

(1) Cleaning instructions and precautions
(2) Disinfecting procedures
(3) Maintenance frequency and details
(4) Methods of repair, where applicable

5.2.8 Complete instructions shall be provided by the wildland fire-fighting or wildland urban interface operations respirator manufacturer for reporting to the manufacturer, to the certification authority, and to NIOSH/NPPTL all returned equipment or complaints of damage, malfunction, or failure of the respirator that could present a hazard to the user.

5.2.9 Information or training materials regarding retirement shall be provided at least on replacement and retirement considerations.

5.2.10 The respirator manufacturer shall provide the manufacturer's specified component service life, where applicable, in the maintenance information provided to the users.

Chapter 6 Design Requirements

6.1 Requirements for All Wildland Fire-Fighting Respirators.

6.1.1 All wildland fire-fighting and wildland urban interface operations respirators shall have at least 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 Prior to certification of wildland fire-fighting or wildland urban interface operations respirators to the requirements of this standard, all respirators shall first be certified by NIOSH in accordance with 42 CFR 84.

6.1.3 All wildland fire-fighting and wildland urban interface operations respirators shall have a minimum assigned protection factor of 10 in accordance with 29 CFR 1910.134.

6.1.4 Wildland fire-fighting and wildland urban interface operations respirators shall be designed to accommodate protective eyewear.

6.1.4.1 Where the respiratory inlet covering is configured as a full facepiece, the full facepiece shall accommodate corrective eyewear that is certified by NIOSH as a respirator accessory.

6.1.4.2* Where the respiratory inlet covering is not configured as a full facepiece, the respirator shall be designed to accommodate protective eyewear, including, but not limited to, corrective eyewear, safety glasses, and gas-tight goggles.

6.1.5 Where wildland fire-fighting or wildland urban interface operations respirators incorporate a helmet as a component of the respirator, the helmet shall meet the wildland fire-fighting helmet requirements specified in NFPA 1977.

6.1.6 All wildland fire-fighting and wildland urban interface operations respirator hardware, all non-fabric components of metal or plastic, all brackets, all snaps or other fasteners, and all NIOSH-certified accessories if any, shall be free of rough spots, burrs, and sharp edges.

6.1.7 All wildland fire-fighting and wildland urban interface operations respirators shall be designed to be carried on a belt, in a pocket, or on wildland fire-fighting load-carrying equipment.

Chapter 7 Performance Requirements

7.1 Requirements for All Wildland Fire-Fighting Respirators.

7.1.1 All wildland fire-fighting and wildland urban interface operations respirators shall be tested for resistance to heat as specified in Section 8.1 and no part of the respirator shall ignite, melt, drip, or separate.

7.1.2 All Class 1, Class 2, or Class 3 wildland fire-fighting or wildland urban interface operations respirator materials that are externally exposed when the respirator is worn, in accordance with the respirator manufacturer's instructions, shall be tested as specified in Section 8.2 and shall not sustain flame after removal of the heat source.

7.1.2.1 All Class 1 wildland fire-fighting fabric-based respirator materials that are externally exposed when the respirator is worn, in accordance with the respirator manufacturer's instructions, shall be tested as specified in Section 8.2.

7.1.3 All wildland fire-fighting and wildland urban interface operations respirators shall be tested for storage integrity as specified in Section 8.4 and all test subjects shall pass a quantitative fit test with all three test samples.

7.1.4 All wildland fire-fighting and wildland urban interface operations respirator lenses shall be tested for abrasion resistance as specified in Section 8.5 and shall not exhibit a delta haze value greater than 14 percent.

7.1.5 All wildland fire-fighting and wildland urban interface operations respirators shall be tested for donning performance as specified in Section 8.6 and the donning time shall not exceed 2.0 minutes.

7.1.6 All wildland fire-fighting and wildland urban interface operations respirators shall be tested for communication performance as specified in Section 8.7 and shall have a value of 80 percent or greater.

7.1.7 All wildland fire-fighting and wildland urban interface operations respirators shall be tested for corrosion resistance as specified in Section 8.8 and shall have metals that are inherently resistant to corrosion show no more than light surface-type corrosion or oxidation, shall have ferrous metals show no corrosion of the base metal, and shall have the use and function of controls and operating features of the respirator remain functional.

7.1.8 All wildland fire-fighting and wildland urban interface operations respirators with a tight-fitting facepiece shall be tested for breathing resistance as specified in Section 8.9, and, when tested at 150 lpm, the inhalation resistance shall not exceed 80 mm water column and the exhalation resistance shall not exceed 25 mm water column.

7.2* Respirator Classifications. Respirators shall be classified as specified in Table 7.2 and shall meet the specified performance requirements.

Table 7.2 Respirator Classes

Class	Performance Requirements	Optional Performance Requirements	Description
Class 1	7.1.1, 7.1.2 or 7.1.2.1, 7.1.3, 7.1.4, 7.1.5, 7.1.6, 7.1.7	Carbon monoxide 7.2.3	Particulate respirator
Class 2	Class 1 and 7.1.8, 7.2.1, 7.2.3	Carbon monoxide 7.2.3	APR or PAPR
Class 3	Class 2 and additional gases and vapors	Carbon monoxide 7.2.3	APR or PAPR

7.2.1 Requirements for Air-Purifying Respirators (APR). Air-purifying respirator (APR) air purification components shall be tested for gas and vapor capacity as specified in the applicable test methods in Section 8.10, and the breakthrough concentration for each test representative agent shall not exceed the applicable values for penetration specified in Table 8.10.4(a) and Table 8.10.4(b).

7.2.2 Requirements for Powered Air-Purifying Respirators (PAPR). Powered air-purifying respirator (PAPR) air purification components shall be tested for gas and vapor capacity as specified in the applicable test methods in Section 8.11, and the breakthrough concentration for each test representative agent shall not exceed the applicable values specified for penetration in Table 8.11.4.

7.2.3* Carbon Monoxide Protection Performance Requirements. Where the respirator offers protection against carbon monoxide, it shall be tested as specified in the applicable test methods in Section 8.9 or 8.10, and the breakthrough concentration for carbon monoxide shall not exceed the applicable values specified in Table 8.10.4(a) or Table 8.11.4.

Chapter 8 Test Methods

8.1 Heat Resistance Test.

8.1.1 Application. This test method shall apply to all wildland fire-fighting and wildland urban interface operations respirators.

8.1.2 Samples.

8.1.2.1 Samples shall be complete wildland fire-fighting and wildland urban interface operations respirators.

8.1.2.2 Samples shall be conditioned for a minimum of 4 hours at an ambient temperature of 22°C, ±3°C (72°F, ±5°F), and relative humidity of 50 percent, ±25 percent.

8.1.3 Specimens.

8.1.3.1 Specimens for conditioning shall be complete wildland fire-fighting and wildland urban interface operations respirators.

8.1.3.2 At least three specimens shall be tested.

8.1.4 Apparatus.

8.1.4.1 Specimens for testing shall be securely mounted on a room-temperature nonconductive test headform specified in Figure 8.1.4.1 in the "as-worn" position.

8.1.4.2 The test oven shall be a horizontal-flow circulating air oven with minimum internal dimensions of 460 mm × 460 mm × 460 mm (18 in. × 18 in. × 18 in.).

8.1.4.3 The thermocouple or other temperature-sensing component used shall be mounted within the chamber in a manner in which it will be exposed directly to the chamber atmosphere.

8.1.4.4 The oven shall be heated and stabilized to a temperature of 177°C, +5°/–0°C (350°F, +10°/–0°F) for a minimum of 30 minutes.

8.1.5 Procedure.

8.1.5.1 Specimen respirators mounted on the headform shall be placed in the center of the oven and shall face into the air flow.

8.1.5.2 Specimens shall be exposed to 177°C, +5°/–0°C (350°F, +10°/–0°F) for 5 minutes, +15 seconds/–0 seconds.

8.1.5.3 Immediately after the specified exposure, specimens shall be removed and examined for evidence of ignition, melting, dripping, or separation.

8.1.6 Report. Observations of ignition, melting, dripping, or separation shall be recorded and reported for each specimen.

8.1.7 Interpretation.

8.1.7.1 Any evidence of ignition, melting, dripping, or separation of any specimen shall constitute failure of the specimen.

8.1.7.2 One or more specimens failing this test shall constitute failing performance of the test series.

8.2 Flammability Test.

8.2.1 Application. This test method shall apply to all wildland fire-fighting and wildland urban interface operations respirators.

8.2.2 Samples.

8.2.2.1 Samples shall be complete wildland fire-fighting and wildland urban interface operations respirators.

8.2.2.2 Samples shall be conditioned for a minimum of 4 hours at an ambient temperature of 22°C, ±3°C (72°F, ±5°F), and relative humidity of 50 percent, ±25 percent.

8.2.3 Specimens.

8.2.3.1 Specimens for conditioning shall be complete respirators.

8.2.3.2 At least three specimens shall be tested.

8.2.4 Apparatus.

8.2.4.1 A 1 mm diameter resistance heating alloy wire as specified in Figure 8.2.4.1 shall be used.

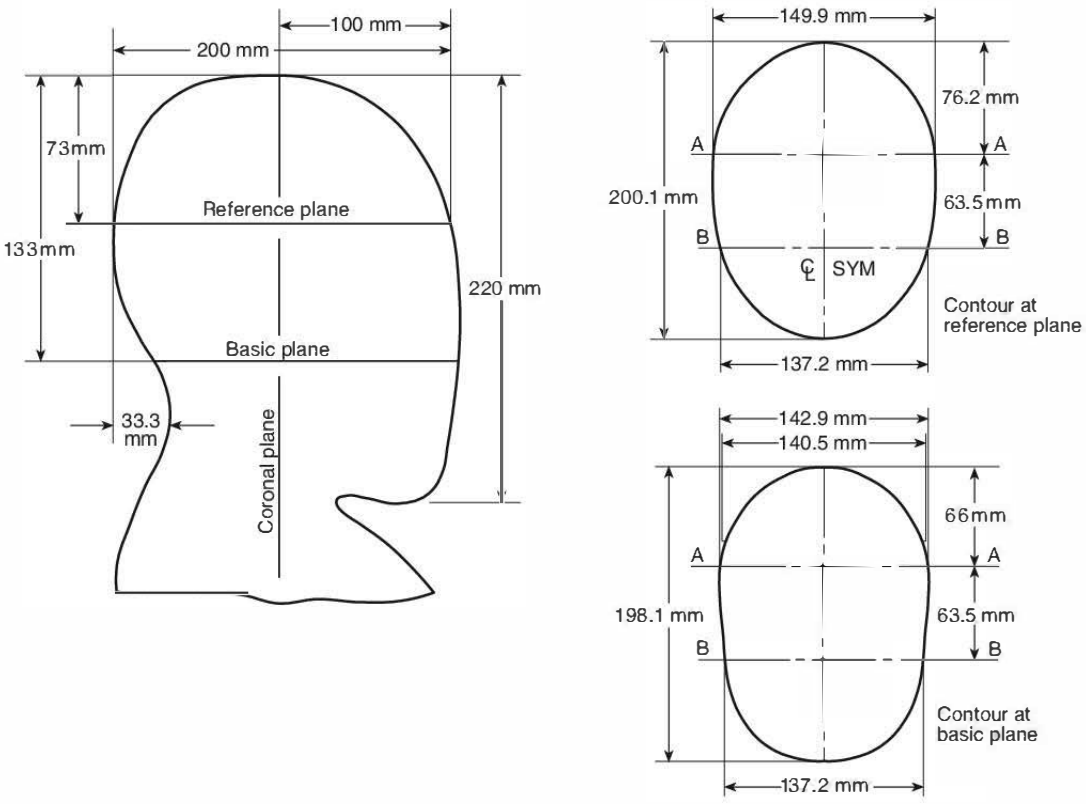

FIGURE 8.1.4.1 Nonconductive Test Headform.

8.2.4.2 The resistance heating alloy wire shall be connected to a power supply. A wire temperature of 550°C, +50°/–0°C (1022°F, +90°F/–0°F) shall be maintained.

8.2.4.3 Specimens for testing shall be securely mounted on a room-temperature headform as shown in Figure 8.1.4.1 in the "as-worn" position.

8.2.5 Procedure.

8.2.5.1 The heated wire shall be placed on each externally exposed respirator material for 3 seconds, +1/–0 seconds.

8.2.5.2 Each externally exposed respirator material shall be tested in three different locations.

8.2.6 Report. Observations of flame after removal of the heat source shall be recorded and reported for each specimen.

8.2.7 Interpretation.

8.2.7.1 Any evidence of flame after removal of the heat source of any specimen shall constitute failure of the specimen.

8.2.7.2 One or more specimens failing this test shall constitute failing performance of the test series.

8.3 Class 1 Flammability Test.

8.3.1 Application. This test method shall apply to fabric-based respirator materials.

8.3.2 Samples. A minimum of eight specimens shall be tested.

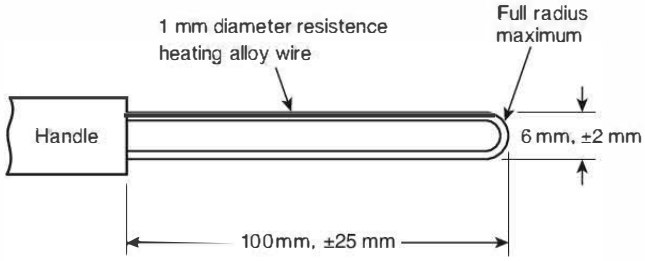

FIGURE 8.2.4.1 Wire Configuration.

8.3.3 Specimen Preparation. Eight specimens shall be prepared as specified in ASTM D2859, *Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.*

8.3.4 Apparatus. The apparatus shall be constructed as specified in ASTM D2859, *Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.*

8.3.5 Procedure. Specimens shall be tested as specified in ASTM D2859, *Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.*

8.3.6 Report. The results of the Class 1 Flammability Test shall be recorded and reported for each test specimen.

8.3.7 Interpretation. Pass or fail performance shall be based on any observed afterflame after removal of the heat source, as specified in 7.1.2.

8.4 Storage Integrity Test.

8.4.1 Application. This test method shall apply to all non-powered wildland fire-fighting and wildland urban interface operations respirators.

8.4.2 Samples.

8.4.2.1 Samples shall be complete wildland fire-fighting and wildland urban interface operations respirators.

8.4.2.2 Where the respirator manufacturer's user instructions require the respirator to be stored in a protective storage device when the respirator is not in use, the storage device shall be included as part of the sample.

8.4.2.3 Samples shall be conditioned for a minimum of 4 hours at an ambient temperature of 22°C, ±3°C (72°F, ±5°F), and relative humidity of 50 percent, ±25 percent.

8.4.3 Specimens.

8.4.3.1 Specimens shall be complete respirators. Where 8.4.2.2 applies, the protective storage devices shall be part of the specimen.

8.4.3.2 At least three specimens shall be tested.

8.4.4 Procedure.

8.4.4.1* Prior to testing, the test subject shall undergo and pass a quantitative fit test procedure with the test specimen. The fit test procedures shall be as specified in Appendix A of 29 CFR 1910.134.

8.4.4.2 Where the respirator manufacturer's user instructions require the respirator to be stored in a protective storage device when the respirator is not in use, the respirator shall be placed in the storage device at the conclusion of the fit test.

8.4.4.3 Specimens shall be subjected to a static compressive load of 100 kg (220 lb) for 1 minute, +10 seconds/–0 seconds, in three mutually perpendicular planes. The load shall be applied using a flat plate of sufficient area to cover the specimen. Where 8.4.4.2 applies, the load shall be applied using a flat plate of sufficient area to cover the surface of the specimen storage device.

8.4.4.4 Specimens shall be oriented in each of three mutually perpendicular planes and shall then be dropped three times from a height of 2 m (6.5 ft) onto a concrete surface.

8.4.4.5 Following the three drops, the fit testing shall be performed as specified in 8.4.4.1 using the same test subject and fit test procedure.

8.4.4.6 Where 8.4.4.2 applies, following the three drops, the specimens shall be removed from the storage devices and the fit testing shall be performed as specified in 8.4.4.1 using the same test subject and fit test procedure.

8.4.5 Report. Fit test results shall be recorded and reported.

8.4.6 Interpretation.

8.4.6.1 Fit test results shall be used to determine pass or fail performance.

8.4.6.2 One or more test subjects failing the fit test in 8.4.4.5 of any specimen shall constitute failure of the specimen.

8.4.6.3 Where 8.4.4.2 applies, one or more test subjects failing the fit test in 8.4.4.6 shall constitute failure of the specimen.

8.4.6.4 One or more specimens failing either of these tests shall constitute failing performance of the test series.

8.5 Lens Abrasion Test.

8.5.1 Application. This test method shall apply to all wildland fire-fighting and wildland urban interface operations respirators that contain a lens as a component of the respiratory inlet covering.

8.5.2 Samples.

8.5.2.1 Samples shall be complete wildland fire-fighting and wildland urban interface operations respirator lenses.

8.5.2.2 Samples shall be conditioned for a minimum of 4 hours at an ambient temperature of 22°C, ±3°C (72°F, ±5°F), and relative humidity of 50 percent, ±25 percent.

8.5.3 Specimens.

8.5.3.1 Seven specimens shall be chosen from the four respirator lenses.

8.5.3.2 Four specimens shall be taken from the left viewing area of the lenses, and three specimens shall be taken from the right viewing area of the lenses.

8.5.3.3 One of the four specimens taken from the left viewing area shall be the "set-up" specimen.

8.5.3.4 The left test specimens shall conform to all the following criteria:

(1) Each specimen shall be a square measuring 50 mm × 50 mm (2 in. × 2 in.).
(2) Two edges of the square section shall be parallel within ±2 degrees of the axis of the cylinder or cone in the center of the specimen.
(3) At least 38 mm (1½ in.) of the 50 mm × 50 mm (2 in. × 2 in.) square shall be taken from the left side of the center line of the lens.
(4) The 50 mm × 50 mm (2 in. × 2 in.) square shall be cut at approximately eye level.

8.5.3.5 The right test specimens shall conform to all the following criteria:

(1) Each specimen shall be a square measuring 50 mm × 50 mm (2 in. × 2 in.).
(2) Two edges of the square section shall be parallel within ±2 degrees of the axis of the cylinder or cone in the center of the specimen.
(3) At least 38 mm (1½ in.) of the 50 mm × 50 mm (2 in. × 2 in.) square shall be taken from the right side of the center line of the lens.
(4) The 50 mm × 50 mm (2 in. × 2 in.) square shall be cut at approximately eye level.

8.5.3.6 Each of the specimens shall be cleaned in the following manner:

(1) Specimens shall be rinsed with clean tap water.
(2) Specimens shall be washed with a solution of nonionic/low-phosphate detergent and water using a clean, soft gauze pad.
(3) Specimens shall be rinsed with de-ionized water.
(4) Specimens shall be blown dry with clean compressed air or nitrogen.

8.5.4 Apparatus. The test apparatus shall be constructed in accordance with Figure 8.5.4(a) and Figure 8.5.4(b).

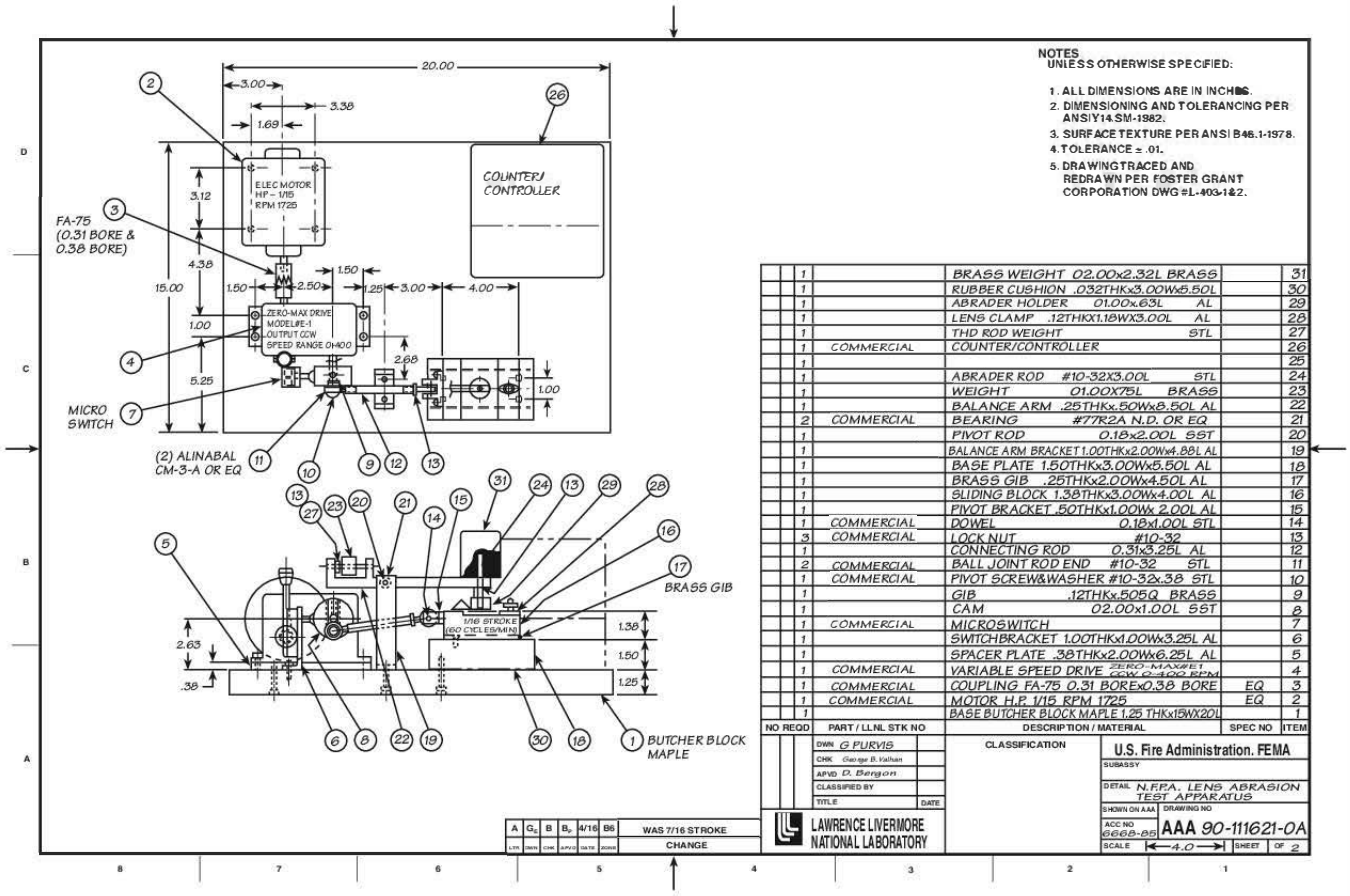

FIGURE 8.5.4(a) Lens Abrasion Tester.

8.5.5 Procedure.

8.5.5.1 The haze of the specimen shall be measured using a haze meter in accordance with ASTM D1003, *Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics*, and recorded with the following additions:

(1) The haze shall be measured in the middle of the specimen, ±1.6 mm (±1/16 in.).
(2) The specimen shall be repositioned to achieve the maximum haze value within the area defined in 8.5.5.1(1).
(3) The haze meter shall have a specified aperture of 22.4 mm (7/8 in.).
(4) The haze meter shall have a visual display showing 0.1 percent resolution.
(5) The haze meter shall be calibrated before and after each day's use following procedures specified in ASTM D1003, *Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.*

8.5.5.2 The set-up specimen shall be placed cover side up in the test apparatus specimen holder.

8.5.5.3 The specimen holder shall be configured with a flat surface under the lens or with an inner radius support.

8.5.5.4 The pad holder shall consist of a cylinder 10 mm (3/8 in.) high and 25 mm (1 in.) in diameter with a radius of curvature equal to the radius of curvature of the outside of the lens in the viewing area, ±0.25 diopter. This cylinder shall be rigidly affixed to the stroking arm by a #10-32 UNF threaded rod.

8.5.5.5 The pad shall be a Blue Streak M306M wool felt polishing pad or equivalent, 24 mm (15/16 in.) in diameter.

8.5.5.6 The abrasive disc shall be made from 3M Part Number 7415, Wood Finishing Pad, or equivalent.

8.5.5.6.1 A disc 24 mm (15/16 in.) in diameter shall be cut from the abrasive sheet.

8.5.5.6.2 The marked side of the disc shall be placed against the pad and the orientation shall be maintained for each abrasive disc throughout the testing.

8.5.5.7 The pad holder, pad, and abrasive disc shall be installed on the stroking arm. The stroking arm shall be leveled to ±3 degrees by adjusting the threaded pin, and the pin shall be secured to prevent rotation of the pad holder. The axis of curvature of the pad holder shall be coincident with the axis of curvature of the lens.

8.5.5.8 The stroking arm shall be counterbalanced with the pad holder, pad, and abrasive disc in place.

8.5.5.9 The set-up specimen shall be replaced with one of the six specimens to be tested.

8.5.5.10 The 1000 g, ±5 g (2.2 lb, ±0.18 lb) test weight shall be installed on the pin above the test specimen.

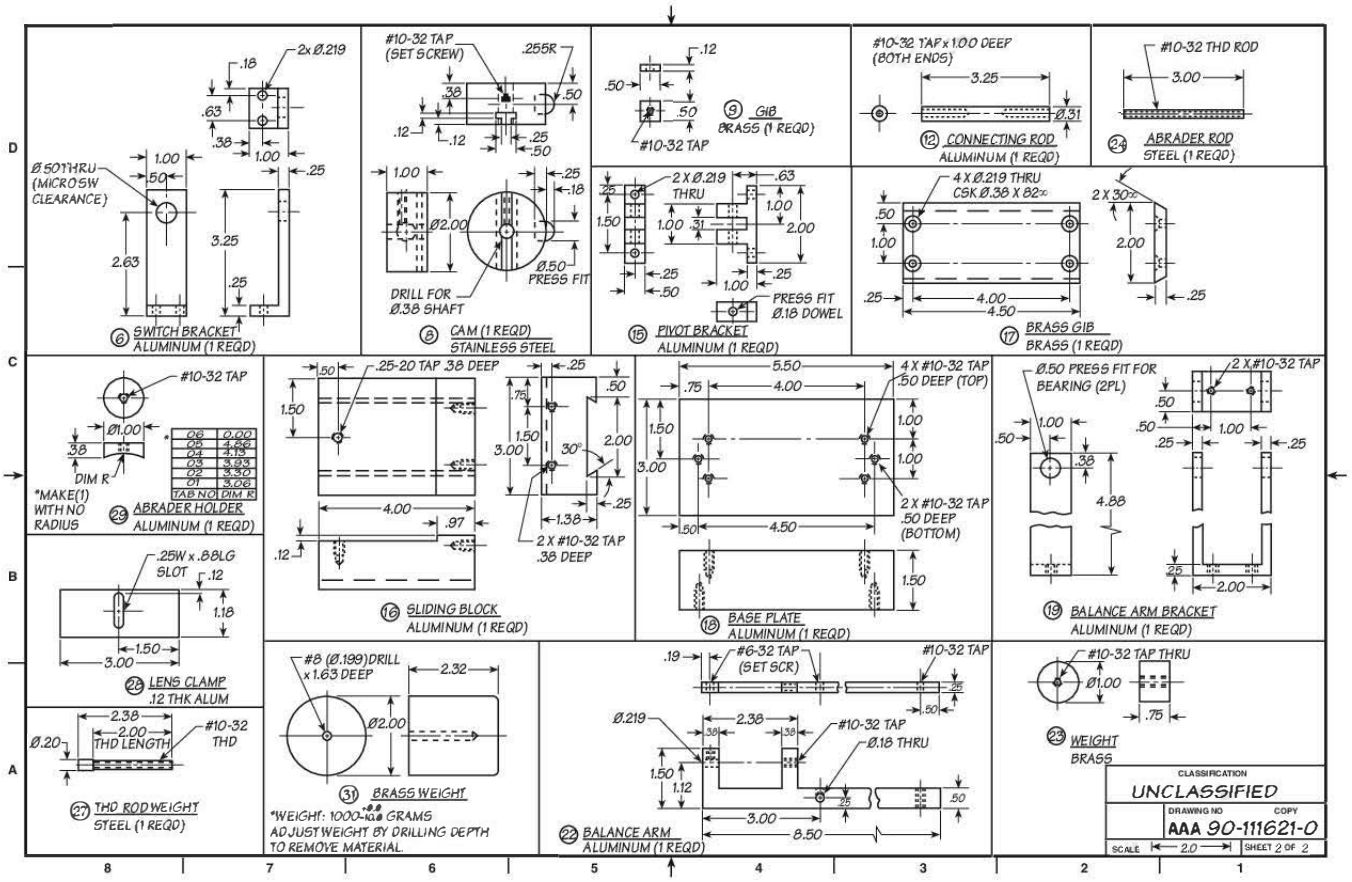

FIGURE 8.5.4(b) Lens Abrasion Tester (details).

8.5.5.11 The test shall be run for 200 cycles, ±1 cycle. One cycle shall consist of a complete revolution of the eccentric wheel.

8.5.5.12 The length of stroke shall be 14.5 mm (9/16 in.), producing a pattern 38 mm (1½ in.) long. The frequency of the stroke shall be 60 cycles, ±1 cycle, per minute. The center of the stroke shall be within ±2 mm (±1/16 in.) of the center of the specimen.

8.5.5.13 The specimen shall be removed and cleaned following the procedure specified in 8.5.3.6.

8.5.5.14 The abrasive disc shall be discarded.

8.5.5.15 The haze of the specimen shall be measured following the procedure specified in 8.5.5.1.

8.5.5.16 The delta haze shall be calculated by subtracting the initial haze from the final haze.

8.5.5.17 The testing steps specified in 8.5.3.6 through 8.5.5.16 shall be repeated five times, using a new specimen and abrasive disc each time.

8.5.6 Report. The six delta haze values shall be recorded, and the values shall be averaged, recorded, and reported.

8.5.7 Interpretation.

8.5.7.1 The average delta haze shall be used to determine pass or fail performance.

8.5.7.2 Failure of the average value of one or more specimens shall constitute failing performance.

8.6 Donning Performance Test.

8.6.1 Application. This test method shall apply to all wildland fire-fighting and wildland urban interface operations respirators with or without protective storage devices.

8.6.2 Samples.

8.6.2.1 Samples shall be complete wildland fire-fighting and wildland urban interface operations respirators.

8.6.2.2 Samples shall be conditioned for a minimum of 4 hours at an ambient temperature of 22°C, ±3°C (72°F, ±5°F), and relative humidity of 50 percent, ±25 percent.

8.6.3 Specimens.

8.6.3.1 Specimens shall be complete respirators.

8.6.3.2 At least three specimens shall be tested.

8.6.4 Procedure.

8.6.4.1 Prior to testing, the test subject shall be trained to remove the respirator from the protective storage device, if applicable; assemble any respirator components if applicable; don the respirator and perform a user seal check, if applicable; in accordance with the respirator manufacturer's instructions.

8.6.4.2 PAPRs shall be tested with the blower turned off.

8.6.4.3 For respirators with a protective storage device, the test subject shall remove the respirator from the protective storage device before donning the respirator.

8.6.4.4 The test subject shall don the respirator in accordance with the manufacturer's instructions.

8.6.4.5 For respirators with a tight-fitting respirator inlet covering, the test subject shall perform a user seal check, as described in the manufacturer's instructions for use, to confirm that the respirator is adequately sealed to the test subject's face.

8.6.5 Report. The total time required to remove the respirator from the protective storage device, if applicable; assemble any respirator components, if applicable; don the respirator; and perform a user seal check, if applicable; shall be recorded and reported.

8.6.6 Interpretation.

8.6.6.1 The total time required to remove the respirator from the protective storage device, if applicable; assemble any respirator components, if applicable; don the respirator; and perform a user seal check, if applicable; shall be used to determine pass or fail performance.

8.6.6.2 One or more specimens failing this test shall constitute failing performance.

8.7 Communication Test.

8.7.1 Application. This test method shall apply to all wildland fire-fighting and wildland urban interface operations respirators.

8.7.2 Samples.

8.7.2.1 Samples shall be complete wildland fire-fighting and wildland urban interface operations respirators.

8.7.2.2 Samples shall be conditioned for a minimum of 4 hours at an ambient temperature of 22°C, ±3°C (72°F, ±5°F), and relative humidity of 50 percent, ±25 percent.

8.7.3 Specimens.

8.7.3.1 Specimens shall be complete respirators.

8.7.3.2 At least three specimens shall be tested.

8.7.4 Apparatus.

8.7.4.1 Testing shall be conducted in a chamber that absorbs a minimum of 90 percent of all sound from 500 Hz to 5000 Hz.

8.7.4.2 Five listening subjects and five talkers consisting of four males and one female shall be available for testing. The alternative of electronic recording of five talkers for testing automation and repeatability shall be permitted.

8.7.4.3 The subjects participating as listeners shall have "audiometrically normal" hearing as defined in Section 5.3 of ANSI/ASA S3.2, *Method for Measuring the Intelligibility of Speech over Communication Systems*, in the range of 500 Hz to 3000 Hz and shall not be permitted to use any device that would enhance their ability to hear.

8.7.4.4 Talkers and listeners shall be selected and trained according to Section 7 of ANSI/ASA S3.2, *Method for Measuring the Intelligibility of Speech over Communication Systems*.

8.7.4.5 The five talkers shall not have facial hair, any unusual facial characteristics, or any other condition that could cause interference with the seal of the facepiece.

8.7.4.6 The talkers shall perform and pass a qualitative facepiece-to-face fit check in accordance with the respirator manufacturer's instructions.

8.7.4.7 Where the talker is qualified to wear several sizes of respirators, the talker shall choose the respirator that is most comfortable.

8.7.4.8 The five talkers shall be trained in the donning and usage of the respirator per manufacturer's instructions.

8.7.4.9 The five talkers shall have no obvious speech defect or strong regional accent.

8.7.4.10 The distance between the talker and the listener(s) shall be 1.5 m, +305/−0 mm (5 ft, +1/−0 ft), and they shall be facing each other.

8.7.4.11 The test chamber shall be filled with broadband "pink" noise with a tolerance of 6 dB per octave band from 400 Hz to 4000 Hz.

8.7.4.12 The forward axis of the loudspeaker shall be oriented away from the listener group.

8.7.4.13 The distance between the loudspeaker and the listeners shall be as great as possible so as to create a quasi-uniform sound field over the listening group.

8.7.4.14 More than one loudspeaker shall be permitted to be used to achieve the desired sound field.

8.7.4.15 The gain of the power amplifier used to generate the pink noise shall be adjusted to achieve an A-weighted sound level of 70 dB, ±2 dB, at each listener's head position, without listeners present.

8.7.5 Procedure.

8.7.5.1 PAPRs shall be tested with the blower turned on.

8.7.5.2 The method for measuring word intelligibility shall be as specified in ANSI/ASA S3.2, *Method for Measuring the Intelligibility of Speech over Communication Systems*, with the modified apparatus specified in 8.7.4.

8.7.5.3 The test material shall be the reading of one complete list of modified rhyme words as contained in Table 2 of ANSI/ASA S3.2, *Method for Measuring the Intelligibility of Speech over Communication Systems*.

8.7.5.3.1 The words shall be spoken singularly in the following carrier sentence: "Would you circle [list word] now?"

8.7.5.3.2 The rate shall be approximately one test word every 6 seconds.

8.7.5.3.3 The talkers shall be trained to talk at 75 dBA to 85 dBA without a respirator, measured at the listener's ear, and shall not place any unusual stress on any word.

8.7.5.3.4 Training shall include the use of background noise as defined in 8.7.4.11 through 8.7.4.15.

8.7.5.3.5 After the respirator is donned, the talkers shall not vary their voice level from that used without the respirator.

8.7.5.3.6 The listeners shall circle each word as they hear it.

8.7.5.4 The talkers shall conduct two tests in the chamber having an ambient noise field as specified in 8.7.4.11 through 8.7.4.15. One word list shall be used for the condition of "no respirator," and a different word list for the condition of "with the respirator worn and operated per the respirator manufacturer's instructions."

8.7.5.5 Talkers' speech shall be monitored during the tests to determine if the talkers conform to the word list specified for that test.

8.7.5.6 Each listener's response form shall be scored as to the number of correct responses out of the 50 words recited.

8.7.5.6.1 Listeners' scores shall be based on the words actually spoken by the talkers.

8.7.5.6.2 Listeners' scores shall not be reduced because of speaking mistakes of the talkers.

8.7.5.6.3 All of the listeners' scores without the respirator used by the talker shall be averaged, and all of the listeners' scores with the respirator used by the talker shall be averaged.

8.7.5.6.4 The average score of the five listeners for the talker using the respirator shall be divided by the average score of the five listeners for the talker without using the respirator, and the result shall be called the "score value." This procedure shall be performed for each of the five talkers.

8.7.5.7 The average of the score values obtained in 8.7.5.6.3 and 8.7.5.6.4 shall be calculated.

8.7.5.7.1 Where the average of the score values is ≥80 percent, this average score value shall be used to determine pass or fail.

8.7.5.7.2 Where the average of the score values is <80 percent, the sample standard deviation (*s.d.*) of the score values shall be calculated in the following manner:

[8.7.5.7.2]

$$s.d. = \sqrt{\frac{\sum x^2 - \left(\frac{\sum x}{N}\right)^2}{N-1}}$$

where:
s.d. = sample standard deviation
x = score values
N = sample size (5)

8.7.5.7.3 Where the calculated sample standard deviation of the test score values is ≥10.0, the test shall be invalidated and the procedures of 8.7.5.3 through 8.7.5.7.2 shall be repeated.

8.7.5.7.4 Where the calculated sample standard deviation of the test score values is <10.0, a test statistic, *T*-value, shall be calculated to determine if the average of the score values obtained is equivalent to 80 percent. The *T*-value shall be calculated in the following manner:

[8.7.5.7.4]

$$T = \frac{(\mu - \overline{X})\sqrt{N}}{s.d.}$$

where:
T = *T*-value
μ = 72 percent
$\overline{X}$ = average of the score values
N = sample size (5)
s.d. = sample standard deviation

8.7.5.7.5 For *T*-values ≤2.13, the score value shall be considered 80 percent and shall be used to determine pass or fail.

8.7.5.7.6 For *T*-values >2.13, the score value shall be as calculated in 8.7.5.7, and this calculated score value shall be used to determine pass or fail performance.

8.7.6 Report. The average of the score values obtained shall be calculated, recorded, and reported.

8.7.7 Interpretation.

8.7.7.1 The average of the score values shall be used to determine pass or fail performance.

8.7.7.2 One or more specimens failing this test shall constitute failing performance.

8.8 Accelerated Corrosion Test.

8.8.1 Application.

8.8.1.1 This test method shall apply to all reusable wildland fire-fighting and wildland urban interface operations respirators.

8.8.1.2 This test method shall not apply to single-use, disposable wildland fire-fighting and wildland urban interface operations respirators.

8.8.2 Samples.

8.8.2.1 Samples shall be complete wildland fire-fighting and wildland urban interface operations respirators.

8.8.2.2 Samples shall be conditioned for a minimum of 4 hours at an ambient temperature of 22°C, ±3°C (72°F, ±5°F), and relative humidity of 50 percent, ±25 percent.

8.8.3 Specimens.

8.8.3.1 Specimens shall be complete respirators.

8.8.3.2 At least three specimens shall be tested.

8.8.3.3 Specimens shall be tested within 5 minutes after removal from conditioning.

8.8.4 Procedure.

8.8.4.1 Specimens shall be tested in accordance with ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*. Salt spray shall be 5 percent saline solution, and the test exposure shall be for 48 hours, +30/–0 minutes. The chamber shall be stabilized at a temperature of 35°C, ±3°C (95°F, ±5°F).

8.8.4.2 Specimens shall be placed in the chamber in the typical operating position as used by first responders, as specified by the manufacturer.

8.8.4.3 At the conclusion of the salt spray period, specimens shall be stored in an environment of 22°C, ±3°C (72°F, ±5°F) and relative humidity of 50 percent, ±5 percent for a minimum of 48 hours.

8.8.4.4 Following the salt spray exposure, specimens shall be evaluated within 30 seconds of removal from the chamber.

8.8.5 Report.

8.8.5.1 Metals inherently resistant to corrosion shall be evaluated for corrosion and any specimens showing more than light surface-type corrosion shall be reported and recorded.

8.8.5.2 Ferrous metals shall be evaluated for corrosion and any corrosion of the base metals shall be reported and recorded.

8.8.5.3 Hardware shall be evaluated for use and function of controls and operating features and any reduction of function of controls and operating features shall be reported and recorded.

8.8.6 Interpretation. One or more specimens failing this test shall constitute failing performance.

8.9 Breathing Resistance Test.

8.9.1 Application. This test method shall apply to all wildland fire-fighting and wildland urban interface operations respirators with a tight-fitting facepiece.

8.9.2 Samples.

8.9.2.1 Samples shall be complete wildland fire-fighting and wildland urban interface operations respirators.

8.9.2.2 Samples shall be conditioned as specified in the applicable NIOSH test procedure.

8.9.3 Specimens.

8.9.3.1 Specimens shall be complete respirators.

8.9.3.2 At least three specimens shall be tested.

8.9.4 Procedure.

8.9.4.1 Testing shall be performed as specified in the applicable NIOSH test procedures, TEB-APR-STP-0003, *Determination of Exhalation Resistance Test, Air-Purifying Respirators Standard Testing Procedure (STP)*, and TEB-APR-STP-0007, *Determination of Inhalation Resistance Test, Air-Purifying Respirators Standard Testing Procedure (STP)*, with the flow and resistance required in 7.1.8.

8.9.4.2 PAPRs shall be tested with the blower turned off.

8.9.5 Report. Inhalation and exhalation resistance shall be recorded and reported for each test specimen.

8.9.6 Interpretation.

8.9.6.1 Inhalation and exhalation resistance shall be used to determine pass or fail performance.

8.9.6.2 One or more specimens failing this test shall constitute failing performance.

8.10 APR Air Purification Component Capacity Test.

8.10.1 Application. This test method shall apply to all nonpowered wildland fire-fighting and wildland urban interface operations respirators.

8.10.2 Samples.

8.10.2.1 Samples shall be air-purifying components of wildland fire-fighting and wildland urban interface operations respirators, or complete disposable wildland fire-fighting and wildland urban interface operations respirators.

8.10.2.2 Samples shall be conditioned as specified in the applicable NIOSH test procedure.

8.10.3 Specimens.

8.10.3.1 Specimens shall be the air purification component or components of wildland fire-fighting and wildland urban interface operations respirators, or complete disposable respirators.

8.10.3.2 At least three specimens of each air purification component shall be tested.

8.10.4 Procedure. Testing shall be performed as specified in the applicable NIOSH test procedure. *[See Table 8.10.4(a) and Table 8.10.4(b).]*

8.10.5 Report. Breakthrough concentration shall be recorded and reported for each test specimen.

8.10.6 Interpretation.

8.10.6.1 Breakthrough concentration shall be used to determine pass or fail performance.

8.10.6.2 One or more specimens failing this test shall constitute failing performance.

8.11 PAPR Air Purification Component Capacity Test.

8.11.1 Application. This test method shall apply to all powered air-purifying wildland fire-fighting and wildland urban interface operations respirators.

8.11.2 Samples.

8.11.2.1 Samples shall be air-purifying components of wildland fire-fighting and wildland urban interface operations respirators.

8.11.2.2 Samples shall be conditioned as specified in the applicable NIOSH test procedure.

8.11.3 Specimens.

8.11.3.1 Specimens shall be the air purification component or components of wildland fire-fighting and wildland urban interface operations respirators.

8.11.3.2 At least three specimens of each air purification component shall be tested.

8.11.4 Procedure. Testing shall be performed as specified in the applicable NIOSH test procedure for wildland fire-fighting and wildland urban interface operations respirators. *(See Table 8.11.4.)*

8.11.5 Report. Breakthrough concentration shall be recorded and reported for each test specimen.

8.11.6 Interpretation.

8.11.6.1 Breakthrough concentration shall be used to determine pass or fail performance.

8.11.6.2 One or more specimens failing this test shall constitute failing performance.

Table 8.10.4(a) APR Air Purification Component Capacity Test Requirements

Protection	Test Temp. (°C)	Test RH (%)	Gas/ Vapor	Challenge Concentration (ppm)	FlowRate[a] (lpm)	Penetration (ppm)	Minimum Service Time (min)
Carbon monoxide[b]	25	92	CO	200	64	25 ppm averaged over a rolling 5-min time frame	480
Carbon monoxide intermittent use[b]	25	92	CO	200	64	25 ppm averaged over a rolling 5-min time frame	240, storage for 20 hours, 240
Carbon monoxide[b]	25	92	CO	1200	64	200 ppm averaged over a rolling 5-min time frame & 768 mL cumulative	480
Carbon monoxide inspiration temperature[b]	25	92	CO	1200	40 cyclic at 24 rpm	200 ppm averaged over a rolling 5-min time frame & 60 mL cumulative[c]	60
Organic vapors	25	80	C_6H_{12}	300	64	10	20
Organic vapors	25	25	C_6H_{12}	300	64	10	20
Sulfur dioxide	25	80	SO_2	50	64	5	30
Sulfur dioxide	25	25	SO_2	50	64	5	30
Nitrogen dioxide	25	80	NO_2	25	64	1 ppm NO_2 or 25 ppm NO	30
Nitrogen dioxide	25	25	NO_2	25	64	1 ppm NO_2 or 25 ppm NO	30
Formaldehyde	25	80	HCHO	50	64	1	30
Formaldehyde	25	25	HCHO	50	64	1	30
Acrolein	25	80	C_3H_4O	10	64	0.1	20
Acrolein	25	25	C_3H_4O	10	64	0.1	20
Hydrogen fluoride[d]	25	80	HF	70	115/170	3	20
Hydrogen fluoride[d]	25	25	HF	70	115/170	3	20
Hydrogen cyanide[d]	25	80	HCN	1000	115/170	5	20
Hydrogen cyanide[d]	25	25	HCN	1000	115/170	5	20

Notes:

[a]Constant flow unless otherwise specified.

[b]The inspired air temperature, measured at the facepiece, to be less than or equal to 50°C (wet bulb) if the relative humidity is equal or greater than 50 percent. The inspired air temperature to be less than or equal to 55°C (dry bulb) if the inspired air relative humidity is less than 50 percent.

[c]Optional performance metric for carbon monoxide filtration component.

[d]Class 3 gases and vapors.

Table 8.10.4(b) APR Air Purification Component High Flow Test Requirements

Protection	Test Temp. (°C)	Test RH (%)	Gas/ Vapor	Challenge Concentration (ppm)	FlowRate (lpm)	Penetration (ppm)	Minimum Service Time (min)
Organic vapors	25	80	C_6H_{12}	300	110	10	5
Organic vapors	25	25	C_6H_{12}	300	110	10	5
Sulfur dioxide	25	80	SO_2	50	110	5	5
Sulfur dioxide	25	25	SO_2	50	110	5	5
Nitrogen dioxide	25	80	NO_2	25	110	1 ppm NO_2 or 25 ppm NO	5
Nitrogen dioxide	25	25	NO_2	25	110	1 ppm NO_2 or 25 ppm NO	5
Formaldehyde	25	80	HCHO	50	110	1	5
Formaldehyde	25	25	HCHO	50	110	1	5
Acrolein	25	80	C_3H_4O	10	110	0.1	5
Acrolein	25	25	C_3H_4O	10	110	0.1	5

Table 8.11.4 PAPR Air Purification Component Capacity Test Requirements for Wildland Fire-Fighting and Wildland Urban Interface Operations Respirators

Protection	Test Temp. (°C)	Test RH (%)	Gas / Vapor	Challenge Concentration (ppm)	Flow rate[a] (lpm)	Penetration (ppm)	Minimum Service Time (min)
Carbon monoxide[b]	25	92	CO	200	115 / 170	25 ppm averaged over a rolling 5-min time frame	480
Carbon monoxide Intermittent use[b]	25	92	CO	200	115 / 170	25 ppm averaged over a rolling 5-min time frame	240, storage for 20 hours, 240
Carbon monoxide[b]	25	92	CO	1200	115 / 170	200 ppm averaged over a rolling 5-min time frame & 1380 / 2040 mL cumulative	480
Carbon monoxide inspiration temperature[b]	25	92	CO	1200	40 cyclic at 24 rpm	200 ppm averaged over a rolling 5-min time frame & 60 mL cumulative[c]	60
Organic vapors	25	80	C_6H_{12}	300	115 / 170	10	20
Organic vapors	25	25	C_6H_{12}	300	115 / 170	10	20
Sulfur dioxide	25	80	SO_2	50	115 / 170	200	30
Sulfur dioxide	25	25	SO_2	50	115 / 170	200	30
Nitrogen dioxide	25	80	NO_2	25	115 / 170	1 ppm NO_2 or 25 ppm NO	30
Nitrogen dioxide	25	25	NO_2	25	115 / 170	1 ppm NO_2 or 25 ppm NO	30
Formaldehyde	25	80	HCHO	50	115 / 170	1	30
Formaldehyde	25	25	HCHO	50	115 / 170	1	30
Acrolein	25	80	C_3H_4O	10	115 / 170	0.1	20
Acrolein	25	25	C_3H_4O	10	115 / 170	0.1	20
Hydrogen fluoride[d]	25	80	HF	70	115 / 170	3	20
Hydrogen fluoride[d]	25	25	HF	70	115 / 170	3	20
Hydrogen cyanide[d]	25	80	HCN	1000	115 / 170	5	20
Hydrogen cyanide[d]	25	25	HCN	1000	115 / 170	5	20

Notes:

[a]Constant flow unless otherwise specified.

[b]The inspired air temperature, measured at the facepiece, to be less than or equal to 50°C (wet bulb) if the relative humidity is greater than 50 percent. The inspired air temperature to be less than or equal to 55°C (dry bulb) if the inspired air relative humidity is less than 50 percent.

[c]Optional performance metric for carbon monoxide filtration component.

[d]Class 3 gases and vapors.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.4 Metric units are used throughout with U.S. approximate equivalents provided in parentheses.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction. The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insur-

ance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.23 Product Label. The product label is not the certification organization's label, symbol, or identifying mark; however, the certification organization's label, symbol, or identifying mark can be attached to it or be part of the product label.

A.3.3.27 Service Life. Service life is determined by the type of substance being removed, the concentration of the substance, the ambient temperature, the specific component being tested (cartridge or canister), the flow rate resistance, and the selected breakthrough value.

A.4.1.2 In addition to the breathing resistance and gas and vapor performance requirements specified in 7.1.8 through 7.2.2, NIOSH testing includes the following:

(1) *Facepiece carbon dioxide concentration:* Verification that the respiratory inlet covering carbon dioxide concentration does not exceed 1.0 percent.
(2) *Particulate filter efficiency:* Minimum NIOSH-certified R95 particulate filter efficiency level. A filter medium that removes at least 95 percent of an aerosol of dioctylphthalate (DOP) having a mass median aerodynamic diameter of 0.3 μm, at a maximum challenge loading of 200 mg are R95 filters.
(3) *Powered air-purifying respirator power supply life:* Verification that the power source provides at least 8 hours of continuous use without recharging or replacement.

A.4.1.9 The NFPA, from time to time, has received complaints that certain items of fire and emergency services protective clothing or protective equipment could be carrying labels falsely identifying them as compliant with an NFPA standard. The requirement for placing the certification organization's mark on or next to the product label is to help ensure that the purchaser can readily determine compliance of the respective product through independent third-party certification.

A.4.2.1 The certification organization should have sufficient breadth of interest and activity so that the loss or award of a specific business contract would not be a determining factor in the financial well-being of the agency.

A.4.2.5 The contractual provisions covering a certification program should contain clauses advising the manufacturer that if requirements change, the product should be brought into compliance with the new requirements by a stated effective date through a compliance review program involving all currently listed products.

Without the clauses, certifiers would not be able to move quickly to protect their name, marks, or reputation. A product safety certification program would be deficient without these contractual provisions and the administrative means to back them up.

A.4.2.6 Investigative procedures are important parts of an effective and meaningful product safety certification program. A preliminary review should be carried out on products submitted to the agency before any major testing is undertaken.

A.4.2.7.1 For further information and guidance on recall programs, see 21 CFR 7, Subpart C.

A.4.2.9 Such inspections should include, in most instances, witnessing of production tests. With certain products, the certification organization inspectors should select samples from the production line and submit them to the main laboratory for countercheck testing. With other products, it can be desirable to purchase samples in the open market for test purposes.

A.4.6.1 ISO/IEC Guide 27 is a component of accreditation of certification organizations specified in 4.1.4 and 4.2.3 of this standard. Those paragraphs contain mandatory reference to ISO/IEC 17065, *Conformity assessment — Requirements for bodies certifying products, processes, and services,* in which ISO/IEC Guide 27 is referenced.

A.4.6.2 By definition, a hazard might involve a condition that can be imminently dangerous to the end user. With this thought in mind, the investigation should be started immediately and completed in as timely a manner as is appropriate considering the particulars of the hazard being investigated.

A.4.6.11 The determination of the appropriate corrective action for the certification organization to initiate should take into consideration the severity of the product hazard and its potential consequences to the safety and health of end users. The scope of testing and evaluation should consider, among other things, testing to the requirements of the standard to which the product was listed as compliant; the age, type of use, and conditions to which the compliant product has been exposed; care and maintenance that has been provided; the use of expertise on technical matters outside the certification organization's area of competence; and product hazards caused by circumstances not anticipated by the requirements of the applicable standard. As a guideline for choosing between a safety alert and a product recall, the following product hazard characteristics are provided. These characteristics are based on 42 CFR 84, Subpart E, §84.41:

Critical: A product hazard that judgment and experience indicate is likely to result in a condition immediately hazardous to life or health (IHLH) for individuals using or depending on the compliant product.

If an IHLH condition occurs, the user will sustain, or will be *likely* to sustain, an injury of a severity that could result in loss of life, or resultant significant bodily injury or loss of bodily function, either immediately or at some point in the future.

Major A: A product hazard, other than *Critical,* that is likely to result in failure to the degree that the compliant product does not provide any protection or reduces protection, and is not detectable to the user.

The term "reduces protection" means the failure of specific protective design(s) or feature(s) that results in degradation of protection in advance of reasonable life expectancy to the point that continued use of the product is *likely* to cause physical harm to the user, or where continued degradation could lead to IHLH conditions.

Major B: A product hazard, other than *Critical* or *Major A*, that is likely to result in reduced protection, and is detectable to the user.

The term "reduces protection" means the failure of specific protective design(s) or feature(s) that results in degradation of protection in advance of reasonable life expectancy to the point that continued use of the product is *likely* to cause physical harm to the user, or where continued degradation could lead to IHLH conditions.

Minor: A product hazard, other than *Critical*, *Major A*, or *Major B*, that is not likely to materially reduce the usability of the compliant product for its intended purpose, or a product hazard that is a departure from the established applicable standard and has little bearing on the effective use or operation of the compliant product for its intended purpose.

Where the facts are conclusive, based on characteristics of the hazard classified as indicated above, the certification organization should consider initiating the following corrective actions with the authorized and responsible parties:

(1) *Critical product hazard characteristics:* product recall
(2) *Major A product hazard characteristics:* product recall or safety alert, depending on the nature of the specific product hazard
(3) *Major B product hazard characteristics:* safety alert or no action, depending on the nature of the specific product hazard
(4) *Minor product hazard characteristic:* no action

A.4.6.13 Reports, proposals, and proposed TIAs should be addressed to the technical committee that is responsible for the applicable standard and be sent in care of Standards Administration, NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471.

A.4.7 ISO 9000, *Quality management systems — Fundamentals and vocabulary*, defines quality terms and concepts. It gives an overview of the content and use of the ISO 9000 series. ISO 9001, *Quality management systems — Requirements*, is used to register the manufacturer's quality system processes. It prescribes quality system requirements for design, development, production, installation, and servicing.

A.6.1.4.2 Protective eyewear is not required to be provided with the respirator.

A.7.2 Typical use scenarios based on anticipated inhalation on hazard exposure follow: Class 1 is anticipated for exposure conditions found in camp and away from fire combustion activities; Class 2 is anticipated for exposure conditions found in operational wildland firefighter line personnel activities; and Class 3 is anticipated for exposure conditions found in wildland urban interface fire activities, where man-made materials are likely to be encountered.

A.7.2.3 If the NFPA 1984 respirator does not contain carbon monoxide protection, other techniques should be used to mitigate carbon monoxide exposure, for example, CO monitoring or avoidance of CO exposure areas.

A.8.4.4.1 A fit test is a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

Annex B Informational References

B.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

B.1.1 NFPA Publications. (Reserved)

B.1.2 Other Publications.

B.1.2.1 ISO Publications. International Organization for Standardization, Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO/IEC 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 9000, *Quality management systems — Fundamentals and vocabulary*, 2015.

ISO 9001, *Quality management systems— Requirements*, 2017.

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

B.1.2.2 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street NW, Washington, DC 20401-0001.

Title 21, Code of Federal Regulations, Part 7, "Enforcement Policy."

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

B.2 Informational References. (Reserved)

B.3 References for Extracts in Informational Sections. (Reserved)

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