

NFPA® 1951

Standard on Protective Ensembles for Technical Rescue Incidents

2013 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA® 1951

Standard on

Protective Ensembles for Technical Rescue Incidents

2013 Edition

This edition of NFPA 1951, *Standard on Protective Ensembles for Technical Rescue Incidents*, was prepared by the Technical Committee on Special Operations Protective Clothing and Equipment, released by the Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment, and acted on by NFPA at its June Association Technical Meeting held June 11–14, 2012, in Las Vegas, NV. It was issued by the Standards Council on August 9, 2012, with an effective date of August 29, 2012, and supersedes all previous editions.

This edition of NFPA 1951 was approved as an American National Standard on August 29, 2012.

Origin and Development of NFPA 1951

The Technical Committee on Special Operations Protective Clothing and Equipment began work on the first edition of NFPA 1951, *Standard on Protective Ensembles for USAR Operations*, in 1997 to answer the need for personal protective equipment for fire and emergency services personnel operating at technical rescue incidents involving building or structural collapse, vehicle/person extrication, confined space entry, trench/cave-in rescue, rope rescue, and similar incidents. Technical rescue incidents in urban and other nonwilderness locations are complex incidents requiring specially trained personnel and special equipment.

The Technical Committee developed NFPA 1951 with the goal of establishing personal protection requirements for protective ensembles to reduce the safety risks and health risks associated with exposure of personnel to the hazards of technical rescue during search, rescue, extrication, treatment, recovery, site stabilization, and other mitigation operations at or involving urban search and rescue (USAR) incidents.

The majority of performance criteria in this standard were based on the September 1993 U.S. Fire Administration Study “Protective Clothing and Equipment Needs of Emergency Responders for Urban Search and Rescue Missions” (FA-136, Federal Emergency Management Agency), September 1993. That report documented the protective clothing and equipment needs for emergency responders engaged in technical rescue activities. Input was obtained from an emergency responder user requirements committee and resulted in proposed criteria based on a needs and risk analysis. The U.S. Fire Administration report contains survey results and test data for a number of materials.

The jurisdiction of this Technical Committee does not include the respiratory protection that is necessary for these operations; the appropriate respiratory protection needs to be addressed by emergency responder organizations.

With the second edition of NFPA 1951, the title was changed to *Standard on Protective Ensembles for Technical Rescue Incidents*, to clarify that the standard applies to all emergency services organizations that perform technical rescue incident operations, not just to USAR teams of state or federal governments. The second edition embraced the broader audience of emergency responders for whom these types of protective ensembles are developed to provide protection from the expected hazards common to such operations.

The second edition specified requirements for three different types of technical rescue ensembles:

- (1) A *utility* ensemble, which provides protection from physical hazards, a basic flame resistance for the ensemble and the elements of the ensemble, and a high level of “breathability” of the ensemble to reduce heat stress for the wearers
- (2) A *rescue and recovery* ensemble, which provides the physical protection of the utility ensemble and a blood-borne-pathogen barrier to protect wearers from body fluid infection from injured or deceased victims

- (3) A *CBRN* ensemble, which in addition to all the protections of the rescue and recovery ensemble, provides limited protection from chemicals, biological agents, and radiological particulates during incidents involving chemical warfare agents or weapons of mass destruction

It is left to emergency services organizations to select the appropriate ensembles for the protection of their emergency responders based on the expected and anticipated technical rescue incidents to which the organizations will or could respond.

The 2013 (third) edition of NFPA 1951 includes a number of editorial changes, new definitions, and updated washing and drying procedures for whole garments, gloves, glove pouches, and CBRN materials. New sections on helmet positioning, glove test areas, and pouch construction have also been included. The man-in-simulant test (MIST) in Chapter 8 has been completely revised, and a new torque test for protective gloves has been added to the end of Chapter 8.

In Memoriam, 11 September 2001

We pay tribute to the 343 members of FDNY who gave their lives to save civilian victims on 11 September 2001, at the World Trade Center. They are true American heroes in death, but they were also American heroes in life. We will keep them in our memory and in our hearts. They are the embodiment of courage, bravery, and dedication. May they rest in peace.



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

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Committee Scope: This Committee shall have primary responsibility for documents on special operations protective clothing and protective equipment, except respiratory equipment, that provides hand, foot, torso, limb, head, and interface protection for fire fighters and other emergency services responders during incidents involving special operations functions including, but not limited to, structural collapse, trench rescue, confined space entry, urban search and rescue, high angle/mountain rescue, vehicular extraction, swift water or flooding rescue, contaminated water diving, and air operations.

This Committee shall also have primary responsibility for documents on station/work uniform garments that are not of themselves primary protective garments but can be combined with a primary protective garment to serve dual or multiple functions.

Additionally, this Committee shall have primary responsibility for documents on the selection, care, and maintenance of special operations protective clothing and equipment by fire and emergency services organizations and personnel.



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

Chapter 1 Administration**1.1* Scope.**

1.1.1 This standard shall specify the minimum design, performance, testing, and certification requirements for utility technical rescue, rescue and recovery technical rescue, and chemicals, biological agents, and radiological particulate [also known as chemical, biological, radiological, and nuclear (CBRN)] technical rescue protective ensembles for use by emergency services personnel during technical rescue incidents.

1.1.2 This standard shall also specify the minimum requirements for the various elements of the utility technical rescue ensembles and the rescue and recovery technical rescue protective ensembles, including garments, helmets, gloves, footwear, interface, and eye and face protection devices.

1.1.3* This standard shall also specify the minimum requirements for the respiratory protection for the CBRN technical rescue protective ensembles.

1.1.4 This standard shall not specify requirements for respiratory protection equipment for utility technical rescue or res-

cue and recovery technical rescue protective ensembles; those requirements are specified by NIOSH in 42 CFR 84 and by OSHA in 29 CFR 1910.134.

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

1.1.6* This standard shall not specify requirements for any visibility markings.

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

1.1.8 This standard shall not establish criteria for protection for any fire-fighting operations or hazardous materials emergencies.

1.1.9* This standard shall not specify requirements for accessories that could be attached to any ensemble or ensemble element but are not required for the ensemble or element to meet the requirements of this standard.

1.1.10 Certification of technical rescue protective ensembles or ensemble elements to the requirements of this standard shall not preclude certification to additional applicable standards where the protective ensemble or ensemble elements meet all the applicable requirements of the other standards.

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

1.1.12 This standard shall not be construed as addressing all 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 protective ensembles or elements 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.

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

1.2* Purpose.

1.2.1* The purpose of this standard shall be to establish minimum levels of protection for emergency services personnel assigned to or involved in search, rescue, treatment, decontamination, recovery, site stabilization, and similar operations at technical rescue incidents.

1.2.2 To achieve that purpose, this standard shall establish requirements for three different ensembles and their associated ensemble elements designed to provide protection to emergency response personnel during technical rescue incidents.

1.2.2.1* Utility technical rescue protective ensembles and ensemble element requirements shall establish limited protection for operational settings where exposure to physical and thermal hazards are expected.

1.2.2.2* Rescue and recovery technical rescue protective ensembles and ensemble element requirements shall establish limited protection for operational settings where exposure to physical, thermal, liquid, and body fluid-borne pathogen hazards are expected.

1.2.2.3* CBRN technical rescue protective ensemble and ensemble element requirements shall establish limited protection in operational settings where exposure to physical, thermal, liquid, and body fluid-borne pathogen hazards and CBRN agents in vapor, liquid-splash, and particulate forms are expected during terrorism incident operations.

1.2.3* 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 personnel can be exposed.

1.2.4 This standard is not intended to be utilized 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, manufacturing, testing, and certification of new utility technical rescue, rescue and recovery technical rescue, and CBRN technical rescue protective ensembles and new ensemble elements.

1.3.2 This edition of NFPA 1951 shall not apply to urban search and rescue (USAR) protective ensembles and ensemble elements manufactured and certified to previous editions of this standard.

1.3.3 This standard shall not apply to utility technical rescue, rescue and recovery technical rescue, and CBRN technical rescue protective ensembles and ensemble elements manufactured to the requirements of any other organization's standards.

1.3.4 This standard shall not apply to protective ensembles or protective ensemble elements for personnel assigned to or involved in search, rescue, recovery, or site stabilization operations that require the functional capabilities for water or wilderness incidents.

1.3.5* The requirements of this standard shall not apply to accessories that could be attached to any element of technical rescue ensembles.

1.3.6* This standard shall not apply to protection for any fire-fighting operations or hazardous materials emergencies.

1.3.7 This standard shall not apply to protection from ionizing radiation, protection from all chemical warfare agents, protection from all biological agents, protection from all weapons of mass destruction, or protection from all toxic industrial chemicals.

1.3.8 This standard shall not apply to the use of utility technical rescue, rescue and recovery technical rescue, and CBRN technical rescue protective ensembles and ensemble elements.

1.3.9* The requirements of this standard shall not apply to any accessories that could be attached to the product but that are not necessary for the product to meet the requirements of this standard.

1.4* Units.

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

1.4.2 Equivalent values in parentheses shall not be considered as the requirement, because 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 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2013 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2007 edition.

2.3 Other Publications.

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

AATCC 42, *Water Resistance: Impact Penetration Test*, 2000.

AATCC 61, *Colorfastness to Laundering, Home and Commercial: Accelerated*, 2010.

AATCC 135, *Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics*, 2004.

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

ANSI Z87.1, *Occupational and Educational Personal Eye and Face Protection Devices*, 2010.

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

ASTM B 117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*, 2003.

ASTM B 152, *Specification for Copper Sheet, Strip, Plate, and Rolled Bar*, 2000.

ASTM D 471, *Standard Test Method for Rubber Property — Effect of Liquids*, 1998.

ASTM D 747, *Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam*, 2002.

ASTM D 1683, *Standard Test Method for Failure in Sewn Seams of Woven Fabrics*, 2004.

ASTM D 2582, *Standard Test Method for Puncture Propagation Tear Resistance of Plastic Film and Thin Sheeting*, 2003.

ASTM D 3787, *Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics — Ball Burst Testing Method*.

ASTM D 3884, *Standard Test Method for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)*, 2001.

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ASTM F 1342, *Standard Test Method for Protective Clothing Material Resistance to Puncture*, 2005.

ASTM F 1359, *Standard Test Method for Liquid Penetration Resistance of Protective Clothing or Protective Ensembles Under a Shower Spray While on a Mannequin*, 1999.

ASTM F 1671, *Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage as a Test System*, 2003.

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ASTM F 2413, *Performance Requirements for Protective (Safety) Toe Cap Footwear*, 2011.

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



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NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2008 edition.

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. A document, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and which 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 *Manual of Style for NFPA Technical Committee Documents*.

3.3 General Definitions.

3.3.1 Arch. The bottom curve of the foot, from the heel to the ball.

3.3.2 Barrier Layer. The component of the ensemble that is intended to provide protection from hazardous liquids.

3.3.3 Biological Agents. Biological materials that are capable of causing acute disease or long-term damage to the human body.

3.3.4 Biological Terrorism Agents. Liquid or particulate agents that can consist of biologically derived toxins or pathogens to inflict lethal or incapacitating casualties.

3.3.5 Body Fluid–Borne Pathogen. An infectious bacterium or virus carried in human, animal, or clinical body fluids, organs, or tissue.

3.3.6 Body Fluids. Fluids that are produced by the body, including, but not limited to, blood, semen, mucus, feces, urine, vaginal secretions, breast milk, amniotic fluid, cerebrospinal fluid, synovial fluid, and pericardial fluid.

3.3.7 Brim. A part of the shell of the helmet extending around the entire circumference of the helmet.

3.3.8 Cargo Pockets. Pockets located on the protective garment exterior.

3.3.9 CBRN. An abbreviation for chemicals, biological agents, and radiological particulate hazards. (See also 3.3.18, *CBRN Terrorism Agents*.)

3.3.10* CBRN Barrier Layer. The component of the ensemble that provides protection against CBRN terrorism agents.

3.3.11 CBRN Technical Rescue Protective Ensemble. Multiple elements of compliant protective clothing and protective equipment designed and configured as an ensemble to provide limited protection in operational settings where exposure to physical, thermal, liquid, and body fluid–borne pathogen hazards, and CBRN agents in vapor, liquid-splash, and particulate forms are expected.

3.3.12 CBRN Technical Rescue Protective Ensemble Elements.

The parts that comprise the CBRN technical rescue protective ensemble, that include coats, trousers, coveralls, helmets, hoods, gloves, footwear, respirator, and interface components.

3.3.13 CBRN Technical Rescue Protective Footwear Element.

The element of the certified CBRN technical rescue protective ensemble element that provides protection to the foot, ankle, and leg.

3.3.14 CBRN Technical Rescue Protective Garment Element.

The coat, trouser, or coverall of the certified CBRN technical rescue protective ensemble that provides protection to the upper and lower torso, arms, and legs.

3.3.15 CBRN Technical Rescue Protective Glove Element. The element of the certified CBRN technical rescue protective ensemble that provides protection to the hand and wrist.

3.3.16 CBRN Technical Rescue Protective Helmet Element.

The element of the certified CBRN technical rescue protective ensemble that provides protection to the head.

3.3.17 CBRN Technical Rescue Protective Hood Element. An interface element of the certified CBRN technical rescue protective ensemble that provides protection to the coat/helmet/respirator facepiece area.

3.3.18* CBRN Terrorism Agents. Chemicals, biological agents, radiological particulates (also known as “chemical, biological, radiological, nuclear”) that could be released as an act of terrorism. (See also 3.3.21, *Chemical Terrorism Agents*; 3.3.4, *Biological Terrorism Agents*; and 3.3.88, *Radiological Particulate Terrorism Agents*.)

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

3.3.20 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.

3.3.21 Chemical Terrorism Agents. Liquid, solid, gaseous, and vapor chemical warfare agents and toxic industrial chemicals used to inflict lethal or incapacitating casualties, generally on a civilian population as a result of a terrorist attack.

3.3.22 Coat. See 3.3.14, CBRN Technical Rescue Protective Garment Element; 3.3.94, Rescue and Recovery Technical Rescue Protective Garment Element; and 3.3.128, Utility Technical Rescue Protective Garment Element.

3.3.23 Collar. The portion of a coat or coverall that encircles the neck.

3.3.24 Collar Lining. That part of collar fabric composite that is next to the skin when the collar is closed in the raised position.

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

3.3.26 Component(s). Any material, part, or subassembly used in the construction of the compliant product.

3.3.27 Composite. The layer or layers of materials or components.

3.3.28 Coverall. See 3.3.14, CBRN Technical Rescue Protective Garment Element; 3.3.94, Rescue and Recovery Technical Rescue Protective Garment Element; and 3.3.128, Utility Technical Rescue Protective Garment Element.

3.3.29 Decontamination. The act of removing contaminants from protective clothing and equipment by a physical, chemical, or combined process. [1851, 2008]

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

3.3.31 Element(s). See 3.3.33, Ensemble Elements.

3.3.32 Energy Absorbing System. Materials or systems used to attenuate impact energy.

3.3.33 Ensemble Elements. The certified parts of an ensemble that provide protection to the upper and lower torso, arms, legs, head, hands, and feet.

3.3.34* Flame Resistance. The property of a material whereby combustion is prevented, terminated, or inhibited following the application of a flaming or nonflaming source of ignition, with or without subsequent removal of the ignition source.

3.3.35 Flammable or Explosive Atmospheres. Atmospheres containing solids, liquids, vapors, or gases at concentrations that will burn or explode if ignited.

3.3.36 Flash Fire. A fire that rapidly spreads through a diffuse fuel, such as a dust, gas, or the vapors of an ignitable liquid, without the production of damaging pressure.

3.3.37 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.

3.3.38 Footwear. See 3.3.93, Rescue and Recovery Technical Rescue Protective Footwear Element; 3.3.13, CBRN Technical Rescue Protective Footwear Element; and 3.3.123, Utility Technical Rescue Protective Footwear Element.

3.3.39 Footwear Upper. The portion of the protective footwear element or item that includes, but is not limited to, the toe, vamp, quarter, shaft, collar, and throat, but not including the sole with heel, puncture-resistant device, and insole.

3.3.40 Garment. See 3.3.14, CBRN Technical Rescue Utility Protective Garment Element; 3.3.94, Rescue and Recovery Technical Rescue Protective Garment Element; and 3.3.128, Utility Technical Rescue Protective Garment Element.

3.3.41 Garment Closure. The garment component designed and configured to allow the wearer to don (put on) and doff (take off) the garment.

3.3.42 Garment Closure Assembly. The combination of the garment closure and the seam attaching the garment closure to the garment, including any protective flap or cover.

3.3.43 Garment Material. The primary protective material(s) used in the construction of garments.

3.3.44 Gauntlet. An interface component of the protective glove element that provides limited protection to the coat/glove interface area.

3.3.45 Glove. See 3.3.15, CBRN Technical Rescue Protective Glove Element; 3.3.95, Rescue and Recovery Technical Rescue Protective Glove Element; and 3.3.129, Utility Technical Rescue Protective Glove Element.

3.3.46 Glove Body. The part of the glove that extends from the tip of the fingers to 25 mm (1 in.) beyond the wrist crease.

3.3.47 Glove Gauntlet. See 3.3.44, Gauntlet.

3.3.48 Glove Liner. The innermost component of the glove body composite that comes in contact with the wearer's skin.

3.3.49 Goggles. The component that provides protection to the wearer's eyes and a portion of the wearer's face.

3.3.50* Gusset. The part of the protective footwear that is a relatively flexible material joining the footwear upper (quarter) and the tongue, which is intended to provide expansion of the footwear front to enable donning of the footwear while maintaining continuous moisture integrity of the footwear.

3.3.51 Hardware. Nonfabric components of the protective clothing or equipment, including, but not limited to, those made of metal or plastic.

3.3.52 Headband. The portion of the helmet suspension that encircles the head.

3.3.53 Headform. A device that simulates the configuration of the human head.

3.3.54 Helmet. See 3.3.16, CBRN Technical Rescue Protective Helmet Element; 3.3.97, Rescue and Recovery Technical Rescue Protective Helmet Element; and 3.3.131, Utility Technical Rescue Protective Helmet Element.

3.3.55 Helmet Positioning Index. The distance, as specified by the manufacturer, from the lowest point of the brow opening at the lateral midpoint of the helmet to the basic plane of



the headform when the helmet is firmly positioned on the headform.

3.3.56 Hood. See 3.3.17, CBRN Technical Rescue Protective Hood Element.

3.3.57 Insole. The inner component of the footwear upon which the foot rests.

3.3.58 Interface Area. An area of the body where the protective garments, helmet, gloves, footwear, or SCBA facepiece meet. Interface areas include, but are not limited to, the coat/helmet/SCBA facepiece area, the coat/trouser area, the coat/glove area, and the trouser/footwear area.

3.3.59* Interface Component(s). Any material, part, or subassembly used in the construction of the compliant product that provides limited protection to interface areas.

3.3.60 Ladder Shank. See 3.3.103, Shank.

3.3.61 Liquid-Borne Pathogen. An infectious bacteria or virus carried in human, animal, or clinical body fluids, organs, or tissues.

3.3.62 Major A Seam. See 3.3.100.1.

3.3.63 Major B Seam. See 3.3.100.2.

3.3.64 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.

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

3.3.66 Midsagittal Plane. The anatomical plane perpendicular to the basic plane and containing the midpoint of the line connecting the notches of the right and left inferior orbital ridges and the midpoint of the line connecting the superior rims of the right and left auditory meatus.

3.3.67 Minor Seam. See 3.3.100.3.

3.3.68 Model. The collective term used to identify a group of individual elements 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.

3.3.69 Nape Device. A component used to aid in helmet retention.

3.3.70 Operations.

3.3.70.1 Search Operations. Any land-based operations involving the search for victims or body recovery.

3.3.70.2 Technical Rescue Incidents. Those activities directed at locating endangered persons, removing endangered persons from danger, treating the injured at an emergency incident, and providing transport to an appropriate health care facility.

3.3.71 Outer Glove. A secondary glove worn over the glove ensemble element for the purpose of providing CBRN protection.

3.3.72 Outer Shell. The outermost component of an element or item not including trim, hardware, reinforcing material, pockets, wristlet material, accessories, fittings, or suspension systems.

3.3.73 Package. The wrapping or enclosure directly containing the technical rescue ensembles or element.

3.3.74 Product. The compliant protective ensemble or the compliant elements and the compliant interface elements of the protective ensemble.

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

3.3.76 Protective Clothing. See 3.3.11, CBRN Technical Rescue Protective Ensemble; 3.3.91, Rescue and Recovery Technical Rescue Protective Ensemble; and 3.3.125, Utility Technical Rescue Protective Ensemble.

3.3.77 Protective Coat. See 3.3.12, CBRN Technical Rescue Protective Ensemble Elements; 3.3.92, Rescue and Recovery Technical Rescue Protective Ensemble Elements; and 3.3.126, Utility Technical Rescue Protective Ensemble Elements.

3.3.78 Protective Coverall. See 3.3.12, CBRN Technical Rescue Protective Ensemble Elements; 3.3.92, Rescue and Recovery Technical Rescue Protective Ensemble Elements; and 3.3.126, Utility Technical Rescue Protective Ensemble Elements.

3.3.79 Protective Ensemble. See 3.3.11, CBRN Technical Rescue Protective Ensemble; 3.3.91, Rescue and Recovery Technical Rescue Protective Ensemble; and 3.3.125, Utility Technical Rescue Protective Ensemble.

3.3.80 Protective Footwear. See 3.3.13, CBRN Technical Rescue Protective Footwear Element; 3.3.93, Rescue and Recovery Technical Rescue Protective Footwear Element; and 3.3.127, Utility Technical Rescue Protective Footwear Element.

3.3.81 Protective Garment. See 3.3.14, CBRN Technical Rescue Protective Garment Element; 3.3.94, Rescue and Recovery Technical Rescue Protective Garment Element; and 3.3.128, Utility Technical Rescue Protective Garment Element.

3.3.82 Protective Glove. See 3.3.15, CBRN Technical Rescue Protective Glove Element; 3.3.95, Rescue and Recovery Technical Rescue Protective Glove Element; and 3.3.129, Utility Technical Rescue Protective Glove Element.

3.3.83 Protective Goggle. See 3.3.130, Utility Technical Rescue Protective Goggle Element.

3.3.84 Protective Helmet. See 3.3.16, CBRN Technical Rescue Protective Helmet Element; 3.3.97, Rescue and Recovery Technical Rescue Protective Helmet Element; and 3.3.131, Utility Technical Rescue Protective Helmet Element.

3.3.85 Protective Trouser. See 3.3.14, CBRN Technical Rescue Protective Garment Element; 3.3.94, Rescue and Recovery Technical Rescue Protective Garment Element; and 3.3.128, Utility Technical Rescue Protective Garment Element.

3.3.86 Puncture-Resistant Device. A reinforcement to the bottom of protective footwear that is designed to provide puncture resistance.

3.3.87 Radiological Agents. Radiation associated with X-rays, alpha, beta, and gamma emissions from radioactive isotopes, or other materials in excess of normal background radiation levels.

3.3.88* Radiological Particulate Terrorism Agents. Particles that emit ionizing radiation in excess of normal background levels, used to inflict lethal or incapacitating casualties, generally on a civilian population as a result of a terrorist attack.

3.3.89 Recovery. An operation involving the retrieval of either (1) the remains of a deceased victim or (2) property, but in no case a living person.

3.3.90 Rescue. Those operations directed at locating and removing endangered persons and treating the injured at an emergency incident.

3.3.91* Rescue and Recovery Technical Rescue Protective Ensemble. Multiple elements of compliant protective clothing and protective equipment designed and configured as an ensemble to provide limited protection in operational settings where exposure to physical, thermal, liquid, and body fluid-borne pathogen hazards is expected.

3.3.92 Rescue and Recovery Technical Rescue Protective Ensemble Elements. The parts that comprise the rescue and recovery technical rescue protective ensemble, that include coats, trousers, coveralls, helmets, gloves, footwear, and interface components.

3.3.93 Rescue and Recovery Technical Rescue Protective Footwear Element. The certified element of the rescue and recovery technical rescue protective ensemble that provides protection to the foot, ankle, and lower leg.

3.3.94 Rescue and Recovery Technical Rescue Protective Garment Element. The coat, trouser, or coverall certified element of the rescue and recovery technical rescue protective ensemble that provides protection to the upper and lower torso, arms, and legs.

3.3.95 Rescue and Recovery Technical Rescue Protective Glove Element. The certified element of the rescue and recovery technical rescue protective ensemble that provides protection to the hand and wrist.

3.3.96 Rescue and Recovery Technical Rescue Protective Goggle Element. The certified element of the rescue and recovery technical rescue protective ensemble that provides partial protection to the face and eyes.

3.3.97 Rescue and Recovery Technical Rescue Protective Helmet Element. The certified element of the rescue and recovery technical rescue protective ensemble that provides protection to the head.

3.3.98 Retention System. The complete assembly by which the helmet is retained in position on the head.

3.3.99 Sample. The ensemble, element, item, component, or composite that is conditioned for testing. (*See also 3.3.106, Specimen.*)

3.3.100 Seam. Any permanent attachment of two or more materials, in a line formed by joining the separate material pieces.

3.3.100.1 Major A Seam. Outermost layer seam assemblies where rupture could reduce the protection of the garment by exposing the garment's inner layers.

3.3.100.2 Major B Seam. Inner layer seam assemblies where rupture could reduce the protection of the garment by exposing the next layer of the garment, the wearer's station/work uniform, other clothing, or skin.

3.3.100.3 Minor Seam. Remaining seam assemblies that are not classified as Major A or Major B seams.

3.3.101 Search. Land-based efforts to find victims or recover bodies.

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

3.3.103 Shank. The component of footwear that provides additional support to the instep.

3.3.104 Shell. See 3.3.72, Outer Shell.

3.3.105 Site Stabilization. Those activities directed at mitigating the dangerous elements of an emergency situation.

3.3.106 Specimen. The conditioned element, item, component, or composite that is tested; specimens are taken from samples. (*See also 3.3.99, Sample.*)

3.3.107 Strap.

3.3.107.1 Chin Strap. An adjustable strap for the helmet that fits under the chin to help secure the helmet to the head.

3.3.107.2 Crown Straps. The part of the helmet suspension that passes over the head.

3.3.108 Suspension. The energy attenuating system of the helmet that is made up of the headband and crown strap.

3.3.109 Sweatband. That part of a helmet headband, either integral or attached, that comes in contact with the wearer's forehead.

3.3.110 Technical Rescue Incidents. Complex rescue incidents requiring specially trained personnel and special equipment to complete the mission.

3.3.111 Technical Rescue Protective Ensembles. See 3.3.11, CBRN Technical Rescue Protective Ensemble; 3.3.91, Rescue and Recovery Technical Rescue Protective Ensemble; and 3.3.125, Utility Technical Rescue Protective Ensemble.

3.3.112 Technical Rescue Protective Footwear. See 3.3.13, CBRN Technical Rescue Protective Footwear Elements; 3.3.93, Rescue and Recovery Technical Rescue Protective Footwear Element; and 3.3.127, Utility Technical Rescue Protective Footwear Element.

3.3.113 Technical Rescue Protective Garments. See 3.3.128, Utility Technical Rescue Protective Garment Element; 3.3.94, Rescue and Recovery Technical Rescue Protective Garment Element; and 3.3.14, CBRN Technical Rescue Protective Garment Element.

3.3.114 Technical Rescue Protective Gloves. See 3.3.15, CBRN Technical Rescue Protective Glove Element; 3.3.95, Rescue and Recovery Technical Rescue Protective Glove Element; and 3.3.129, Utility Technical Rescue Protective Glove Element.

3.3.115 Technical Rescue Protective Goggles. See 3.3.96, Rescue and Recovery Technical Rescue Protective Goggle Element, and 3.3.130, Utility Technical Rescue Protective Goggle Element.

3.3.116 Technical Rescue Protective Helmets. See 3.3.16, CBRN Technical Rescue Protective Helmet Element; 3.3.97, Rescue and Recovery Technical Rescue Protective Helmet Element; and 3.3.131, Utility Technical Rescue Protective Helmet Element.

3.3.117 Textile Fabric. A planar structure consisting of yarns or fibers.

3.3.118 Toecap. A reinforcement to the toe area of footwear designed to protect the toes from impact and compression.

3.3.119* Tongue. The part of the protective footwear that is provided for protective footwear with a closure that extends from the vamp to the top line of the footwear between sides of the footwear upper and is exposed to the exterior environment when the footwear is correctly donned.

3.3.120 Top Line. The top edge of the protective footwear that includes the tongue, gusset, quarter, collar, and shaft.

3.3.121 Torso.

3.3.121.1 Lower Torso. The area of the body trunk below the waist, excluding the legs, ankles and feet.

3.3.121.2 Upper Torso. The area of body trunk above the waist and extending to the shoulder, excluding the arms, wrists, and hands.

3.3.122 Toxic Industrial Chemicals. Highly toxic solid, liquid, or gaseous chemicals that have been identified as mass casualty threats that could be used to inflict casualties, generally on a civilian population during a terrorist attack.

3.3.123 Treatment. The provision of medical first aid at the incident.

3.3.124 Trouser. See 3.3.14, CBRN Technical Rescue Protective Garment Element; 3.3.94, Rescue and Recovery Technical Protective Garment Element; and 3.3.128, Utility Technical Rescue Protective Garment Element.

3.3.125 Utility Technical Rescue Protective Ensemble. Multiple elements of protective clothing and protective equipment designed and configured as an ensemble to provide limited protection in operational settings where exposure to physical and thermal hazards are expected.

3.3.126 Utility Technical Rescue Protective Ensemble Elements.

The parts that comprise the utility technical rescue protective ensemble, that include coats, trousers, coveralls, helmets, gloves, footwear, and interface components.

3.3.127 Utility Technical Rescue Protective Footwear Element. A certified element of the utility technical rescue protective ensemble that provides protection to the foot, ankle, and lower leg that is certified to the utility protection requirements.

3.3.128 Utility Technical Rescue Protective Garment Element.

The coat, trouser, or coverall of the certified element of the utility technical rescue protective ensemble that provides protection to the upper and lower torso, arms, and legs.

3.3.129 Utility Technical Rescue Protective Glove Element.

The certified element of the utility technical rescue protective ensemble that provides protection to the hand and wrist.

3.3.130 Utility Technical Rescue Protective Goggle Element.

The certified element of the utility technical rescue protective ensemble that provides partial protection to the face and eyes.

3.3.131 Utility Technical Rescue Protective Helmet Element.

The certified element of the utility technical rescue protective ensemble that provides protection to the head.

3.3.132 Wear Surface. The bottom of the footwear sole, including the heel.

3.3.133 Wristlet. The interface component of the protective element or item that provides limited protection to the coat/glove interface area.

Chapter 4 Certification

4.1 General.

4.1.1 The process of certification for protective ensembles and ensemble elements as being compliant with NFPA 1951 shall meet the requirements of Section 4.1, General; Section 4.2, Certification Program; Section 4.3, Inspection and Testing; Section 4.4, Annual Verification of Product Compliance; Section 4.5, Manufacturers' Quality Assurance Program; Section 4.6, Hazards Involving Compliant Product; Section 4.7, Manufacturers' Investigation of Complaints and Returns; and Section 4.8, Manufacturers' Safety Alert and Product Recall Systems.

4.1.2 All compliant protective ensembles and ensemble elements that are labeled as being compliant with this standard shall meet or exceed all applicable requirements specified in this standard and shall be certified.

4.1.2.1 The certification organization shall only permit the certification of complete CBRN protective ensembles that include protective garments, protective helmets, protective gloves, protective footwear, and interface components.

4.1.2.2 The certification organization shall further require that the CBRN protective ensemble manufacturer specify the respiratory protection for the ensemble.

4.1.3 All certification shall be performed by a certification organization that meets at least the requirements specified in Section 4.2, Certification Program, and that is accredited for personal protective equipment in accordance with ISO 65, *General requirements for bodies operating product certification systems*. The accreditation shall be issued by an accreditation body operating in accordance with ISO 17011, *General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.1.4* 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 1951, in any statements about their respective product(s) unless the product(s) is certified as compliant to this standard.

4.1.5 All compliant protective ensembles and ensemble elements shall be labeled.

4.1.6 All compliant protective ensembles and ensemble elements shall be listed by the certification organization. The listing shall uniquely identify the certified product, for example, by style, model number, or part number.

4.1.7 All compliant protective ensembles and ensemble elements shall also have a product label that meets the requirements specified in Section 5.1, Product Label Requirements.

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

4.1.9 The certification organization shall not issue any new certifications to the 2007 edition of this standard on or after the NFPA effective date for the 2013 edition, which is August 29, 2012.

4.1.10 The certification organization shall not permit any manufacturer to continue to label any protective ensembles or ensemble elements that are certified as compliant with the

2007 edition of this standard on or after August 29, 2012 plus 12 months.

4.1.11 The certification organization shall require manufacturers to remove all certification labels and product labels indicating compliance with the 2007 edition of this standard from all protective ensembles and ensemble elements that are under the control of the manufacturer on August 29, 2012 plus 12 months, and the certification organization shall verify that this action is taken.

4.2 Certification Program.

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

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

4.2.3 The certification organization shall be accredited for personal protective equipment in accordance with ISO 65, *General requirements for bodies operating product certification systems*. The accreditation shall be issued by an accreditation body operating in accordance with ISO 17011, *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, Manufacturer's Quality Assurance Program.

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

4.2.7.2 The certification organization shall audit the manufacturer's quality assurance program to ensure that the quality

assurance program provides continued product compliance with this standard.

4.2.8 The certification organization and the manufacturer shall evaluate any changes affecting the form, fit, or function of the compliant product to determine its continued certification to 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 The sample product shall be evaluated by the certification organization to verify the product's continued compliance in order to assure that the materials, components, and manufacturing quality assurance systems are consistent with the materials, components, and manufacturing quality assurance that were inspected and tested by the certification organization during certification and recertification.

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

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

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

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

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

4.3 Inspection and Testing.

4.3.1 For both initial certification and recertification of protective ensembles and ensemble elements, 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 17025, *General requirements for the competence of calibration and testing laboratories*.

4.3.2.1 The certification organization's testing laboratory's scope of accreditation to ISO 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 17011, *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 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 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 17011, *General requirements for accreditation bodies accrediting conformity assessment bodies*.

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

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

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

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

4.3.6 Inspection by the certification organization shall include an evaluation of any symbols and pictorial 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 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 by the certification organization for determining compliance with the design requirements specified in Chapter 6 shall be performed on whole or complete products.

4.3.9 Testing to determine product compliance with the performance requirements specified in Chapter 7 shall be conducted by the certification organization in accordance with the specified testing requirements of Chapter 8.

4.3.9.1 Testing shall be performed on specimens representative of materials and components used in the actual construction of the protective ensemble and ensemble element.

4.3.9.2 The certification organization also shall be permitted to use sample materials cut from a representative product.

4.3.10 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.

4.3.11 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.

4.3.12 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.

4.3.13 The certification organization shall not allow test specimens that have been conditioned and tested for one method to be reconditioned and tested for another test method unless specifically permitted in the test method.

4.3.14 The certification organization shall test ensemble elements with the specific ensemble(s) with which they are to be certified.

4.3.15 Any change in the design, construction, or material of a compliant product shall necessitate new inspection and testing to verify compliance to all applicable requirements of this standard that the certification organization determines can be affected by such change. This recertification shall be conducted before labeling the modified product as being compliant with this standard.

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 individual elements of the protective ensemble that are labeled as being compliant with this standard shall undergo recertification on an annual basis. This recertification shall include the following:

- (1) Inspection and evaluation to all design requirements as required by this standard on all manufacturer models and components
- (2) Testing to all performance requirements as required by this standard on all manufacturer models and components within the following protocol:
 - (a) When a test method incorporates testing both before and after the laundering precondition specified in 8.1.3 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.
 - (b) Where a test method incorporates testing both before and after the laundering precondition specified in 8.1.3 and the test generates nonquantitative results, recertifications 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.

- (c) Where a test method requires the testing on three specimens, a minimum of one specimen shall be tested for annual recertification.
- (d) Where a test method requires the testing of five or more specimens, a minimum of two specimens shall be tested for annual recertification.

4.4.2 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.

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

4.5* Manufacturers' Quality Assurance Program.

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

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

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

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

4.5.3.2 Where the registrar specified in 4.5.3.1 is currently accredited for personal protective equipment in accordance with the 1996 edition of ISO Guide 62, *General requirements for bodies operating assessment and certification/registration of quality systems*, that accreditation shall be permitted until 14 September 2008.

4.5.3.3 Not later than 14 September 2008, registrars specified in 4.5.3.1 shall be accredited for personal protective equipment in accordance with the 2006 edition of ISO/IEC 17021, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*.

4.5.3.4 Any new accreditations for registrars specified in 4.5.3.1 for personal protective equipment shall only be in accordance with the 2006 edition of ISO/IEC 17021, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*.

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

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 validity of the report shall be investigated.

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

4.6.7 The certification organization shall also investigate reports of a hazard where a 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 shall require the manufacturer of the compliant product, or the manufacturer of the compliant product component if applicable, to assist the certification organization in the investigation and to conduct its own investigation as specified in Section 4.7, Manufacturers' Investigation of Complaints and Returns.

4.6.9 Where the facts indicating a need for corrective action are conclusive and the certification organization's appeal procedures referenced in 4.2.11 have been followed, the certification organization 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 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 shall take one or more of the following corrective actions:

- (1) Notification of parties authorized and responsible for issuing a safety alert when, in the opinion of the certification organization, such a notification is necessary to inform the users
- (2) Notification of parties authorized and responsible for issuing a product recall when, in the opinion of the certification organization, such a recall is necessary to protect the users
- (3) Removal of the mark of certification 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 shall notify relevant governmental and regulatory agencies and issue a notice to the user community about the hazard

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

4.6.13* Where a change to an NFPA standard(s) is felt to be necessary, the certification organization shall also provide a copy of the report and corrective actions indicated to the NFPA, and shall also submit either a public proposal for a proposed change to the next revision of the applicable standard, or a proposed temporary interim amendment (TIA) to the current edition of the applicable standard.

4.7 Manufacturers' Investigation of Complaints and Returns.

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

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

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

4.8 Manufacturers' Safety Alert and Product Recall Systems.

4.8.1 Manufacturers shall establish a written safety alert system and a written product recall system that describes the procedures to be used in the event that it decides, or is directed by the certification organization, to either issue a safety alert or to conduct a product recall.

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

- (1) The establishment of a coordinator and responsibilities by the manufacturer for the handling of safety alerts and product recalls

- (2) A method of notifying all dealers, distributors, purchasers, users, and the NFPA about the safety alert or product recall that can be initiated within a one 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 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 a product that is recalled and for documenting the effectiveness of the product recall
- (5) A plan for either repairing, replacing, or compensating purchasers for returned product

Chapter 5 Labeling and Information

5.1 Product Label Requirements.

5.1.1* Each element of the protective ensemble shall have a product label or labels permanently and conspicuously located inside each element when the element is properly assembled with all layers and components in place.

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 label pieces that make up the product label shall be located adjacent to each other.

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

5.1.4 All worded portions of the required product label shall be printed at least in English.

5.1.5 Symbols and other pictorial graphic representations shall be permitted to be used to supplement worded statements on the product label(s) where the symbols and pictorial graphic representations are clearly explained in the product's user information package.

5.1.6 The statement specified in 5.1.6.3 or 5.1.6.4 for the specific element being certified shall be printed legibly on the product label. The appropriate term for the element (garment, helmet, glove, footwear, goggles, interface) shall be inserted in this compliance statement text where indicated. All letters shall be at least 2.5 mm ($\frac{3}{32}$ in.) in height.

5.1.6.1 The line that reads "CBRN PROTECTIVE ENSEMBLE FOR TECHNICAL RESCUE INCIDENTS" specified in 5.1.6.4 shall be in letters at least 10 mm ($\frac{3}{8}$ in.) in height.

5.1.6.2 Where the requirements for the utility protective ensemble helmet and footwear elements and for the rescue and recovery protective ensemble helmet and footwear elements are identical for both types of ensembles, the product label text for both "utility and rescue and recovery ensemble elements," as detailed in 5.1.6.3, shall be permitted to be selected.

5.1.6.3 For utility protective ensemble elements and for rescue and recovery protective ensemble elements, the following statement shall be printed as specified in 5.1.6:

“THIS [insert “UTILITY,” or “RESCUE AND RECOVERY,” or both “UTILITY AND RESCUE AND RECOVERY” here] PROTECTIVE ENSEMBLE [insert appropriate element term here] ELEMENT MEETS THE REQUIREMENTS OF NFPA 1951, STANDARD ON PROTECTIVE ENSEMBLES FOR TECHNICAL RESCUE INCIDENTS, 2013 EDITION. DO NOT REMOVE THIS LABEL.”

5.1.6.4 For CBRN protective ensembles, the following statement shall be printed as specified in 5.1.6:

**“CBRN PROTECTIVE ENSEMBLE FOR TECHNICAL RESCUE INCIDENTS
THIS ENSEMBLE IS NOT INTENDED AS PART OF A HAZARDOUS MATERIALS PROTECTIVE ENSEMBLE.
THIS CBRN PROTECTIVE ENSEMBLE [insert appropriate element term here] ELEMENT MEETS THE CBRN [insert appropriate element term here] REQUIREMENTS OF NFPA 1951, STANDARD ON PROTECTIVE ENSEMBLES FOR TECHNICAL RESCUE INCIDENTS, 2013 EDITION, WHEN WORN TOGETHER WITH THE OTHER SPECIFIED ELEMENTS AND INTERFACE COMPONENTS OF THE CBRN ENSEMBLE. DO NOT REMOVE THIS LABEL.”**

5.1.7 The following information shall also be printed legibly on the product label, and all letters shall be at least 1.6 mm ($\frac{1}{16}$ in.) high:

- (1) Manufacturer’s name, identification, or designation
- (2) Manufacturer’s address
- (3) Country of manufacture
- (4) Manufacturer’s element identification number, lot number, or serial number
- (5) Month and year of manufacture (not coded)
- (6) Model name, number, or design
- (7) Size or size range
- (8)*Principal material(s) of construction.
 - (a) For gloves, at least the outer layer, barrier layer, thermal lining layer, where applicable, and wristlet shall be listed. Generic names of materials shall be used. The type of leather shall be listed. Additional materials that are used throughout the majority of the glove body shall also be listed on the label.
 - (b) For footwear, at least the outer layer, barrier layer, and thermal lining layer, where applicable, shall be listed. Generic names of materials shall be used. Additional materials that are used throughout the majority of the boot shall also be listed on the boot label.
 - (c) For garments, at least the identification of the fiber or material type of the outer shell, moisture barrier, and thermal barrier, where applicable, shall be listed.
 - (d) For helmets, at least the general terminology for the shell material shall be used.
- (9) Cleaning precautions, if applicable

5.1.8 Supplementary Product Labels.

5.1.8.1 For garments only, where the outer shell and moisture barrier are separable, each separable layer shall also have a label containing the information required in 5.1.7(4) through 5.1.7(8).

5.1.8.2 Supplementary product labels shall also meet the requirements of 5.1.4 and 5.1.5.

5.1.9 Specific Requirements for CBRN Protective Ensemble for Technical Rescue Incidents Garment Elements.

5.1.9.1 Where the principal material of construction used in a garment is a component that is listed, the component name under which it is listed shall be used.

5.1.9.2 This listed component shall be on the product label by manufacturer name and model number after the following statement:

**FOR COMPLIANCE WITH THE CBRN PROTECTIVE ENSEMBLE FOR TECHNICAL RESCUE INCIDENTS REQUIREMENTS OF NFPA 1951, THE FOLLOWING COMPONENT MUST BE WORN IN CONJUNCTION WITH THIS GARMENT:
[list component here]**

5.1.9.3 All letters shall be at least 2.5 mm ($\frac{3}{32}$ in.) in height.

5.1.10 Specific Requirements for Technical Rescue Incidents Protective Goggles.

5.1.10.1 For goggles only, the product label shall be permitted to be placed on the package.

5.1.10.2 The package containing the smallest number of goggle elements from which the user withdraws product for use shall have a package product label.

5.1.10.3 The package product label shall be permanently and conspicuously located on the outside of the package or printed on the package.

5.1.10.4 The label shall not be removed, obscured, or otherwise mutilated by the opening of the package when the package is opened as intended.

5.1.10.5 Where goggles have a package label, the certification organization’s label, symbol, or identifying mark and at least the following statement shall be legibly printed as the product label on each pair of goggles. All letters and numbers shall be at least 3 mm ($\frac{1}{8}$ in.) high.

“MEETS NFPA 1951, 2013 EDITION”

5.2 User Information.

5.2.1 The manufacturer shall provide user information, including, but not limited to, warnings, information, and instructions with each element.

5.2.2 The manufacturer shall attach the required user information or packaging containing the user information to the element in such a manner that it is not possible to use the element without being aware of the availability of the information.

5.2.3 The required user information or packaging containing the user information shall be attached to the element so that a deliberate action is necessary to remove it. The element manufacturer shall provide notice that the user information is to be removed only by the end user.

5.2.4* The element manufacturer shall provide at least the following instructions and information with each element:

- (1) Pre-use information, including the following:
 - (a) Safety considerations
 - (b) Limitations of use
 - (c) Marking recommendations and restrictions

- (d) A statement that most performance properties of the element cannot be tested by the user in the field
- (e) Warranty information
- (2) Preparation for use, including the following:
 - (a) Sizing/adjustment
 - (b) Recommended storage practices
- (3) Inspection, including inspection frequency and details
- (4) Don/doff, including the following:
 - (a) Donning and doffing procedures
 - (b) Sizing and adjustment procedures
 - (c) Interface issues
- (5) Use, including proper use consistent with 29 CFR 1910.132
- (6) Maintenance and cleaning, including the following:
 - (a) Cleaning instructions and precautions with a statement advising users not to use garments that are not thoroughly cleaned and dried
 - (b) Inspection details
 - (c) Maintenance criteria and methods of repair where applicable
 - (d) Decontamination procedures for both chemical and biological contamination
- (7) Retirement and disposal, including criteria and considerations

5.2.5 For compliant CBRN protective ensembles for technical rescue incidents, the manufacturer shall provide the following additional instruction and information with the ensemble:

- (1) A statement that only the ensemble and the specific elements with which the ensemble has been certified must be worn together to ensure that the CBRN protection is provided
- (2) A list of the specific elements and interface components that must be worn as part of the CBRN protective ensemble for technical rescue incidents, including each type of CBRN self-contained breathing apparatus (SCBA), CBRN air-purifying respirator (APR), or CBRN powered air-purifying respirator (PAPR) with which the ensemble has been certified
- (3) Specific limitations associated with the use of the ensemble for a response involving CBRN hazards, including, but not limited to, a statement that protection against radiological and nuclear hazards is limited to particulates only
- (4) Specific care and maintenance provisions associated with properly maintaining the unique performance properties of the ensemble, its elements, or interface components
- (5) A statement that if the ensemble is used in an emergency involving CBRN hazards, the ensemble be retired from use and not be further used
- (6) When the requirements for CBRN protection necessitate a specific action to engage interface areas, manufacturer's details explaining those procedures.

Chapter 6 Design Requirements

6.1 Utility Protective Ensemble for Technical Rescue Incidents Design Requirements.

6.1.1 Utility Protective Ensemble Garment Elements.

6.1.1.1 Garments shall have at least the applicable design requirements specified in this section where inspected by the

certification organization as specified in Section 4.3, Inspection Testing.

6.1.1.2 Garments shall be permitted to be single-layer or multiple-layer garments.

6.1.1.3 All garment collars shall remain upright after extension into a vertical position. The collar shall have a collar at least 50 mm (2 in.) in height at any point when measured from the top of the collar down and shall have a closure system. The collar and closure system shall consist of materials that meet all applicable requirements as specified in this section.

6.1.1.4 Garments shall not have turn-up cuffs. Sleeve cuffs shall have a closure system that can be adjusted to provide a snug and secure fit around the wrist when a technical rescue glove is worn.

6.1.1.5 Top-entry pockets shall have cover flaps with a closure system.

6.1.1.6 Pass-through openings of coveralls shall have a closure system that can be easily secured and easily opened by the wearer.

6.1.1.7 Sewing thread utilized in the construction of garments shall be made of an inherently flame-resistant fiber.

6.1.1.8 All garment hardware finish shall be free of rough spots, burrs, and sharp edges.

6.1.1.9 All snaps shall be Style 2 and shall comply with the design and construction requirements of MIL-F-10884G, *Fastener, Snap*.

6.1.1.10 Zippers shall meet the physical performance requirements of A-A-55634, *Commercial Item Description, Zippers (Fasteners, Slide Interlocking)*.

6.1.1.11 Expandable pockets, where provided, shall have a means to drain water and shall have a means of being fastened in the closed position. This shall not apply to patch pockets that lie flat on the garment.

6.1.1.12 All upper torso garments shall have closure systems at the neckline.

6.1.1.13 One-piece coverall torso closure systems shall be continuous from the top of the crotch area to the top of the garment at the neck.

6.1.1.14 Metallic closure systems shall not come in direct contact with the body.

6.1.1.15 Metal components of the garments shall not come in direct contact with the body.

6.1.1.16* Garment Sizing.

6.1.1.16.1 Upper torso garment chest circumferences shall be provided in circumferences from 760 mm to 1270 mm (30 in. to 50 in.) in 50 mm (2 in.) increments or cut to order.

6.1.1.16.2 Upper torso garment sleeve lengths shall be provided in lengths from 760 mm to 915 mm (30 in. to 36 in.) in 25 mm (1 in.) increments or cut to order.

6.1.1.16.3 Lower torso garment waist circumferences shall be provided in circumferences from 660 mm to 1270 mm (26 in. to 50 in.) in 50 mm (2 in.) increments or cut to order.

6.1.1.16.4 Lower torso garment inseam lengths shall be provided in lengths from 660 mm to 890 mm (26 in. to 35 in.) in 25 mm (1 in.) increments or cut to order.

6.1.1.16.5 Men's and women's sizing shall be accomplished by the use of individual patterns for men's and women's garments.

6.1.2 Utility Protective Ensemble Helmet Elements.

6.1.2.1 Helmets shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 4.3, Inspection and Testing.

6.1.2.2 Helmets shall consist of material or materials meeting the performance requirements of 7.1.2.

6.1.2.3 Suspension shall contain a nape device and shall be removable and replaceable.

6.1.2.3.1 Helmet suspension shall be adjustable in at least 3 mm ($\frac{1}{8}$ in.) hat size increments, and the size range that can be accommodated shall be marked on the product label.

6.1.2.3.2 With the suspension adjusted to the maximum designated size, there shall be sufficient clearance between the shell and the headband to provide ventilation.

6.1.2.4 A sweatband shall be provided that shall cover at least the forehead portion of the headband. Sweatbands shall be removable and replaceable or shall be integral with the headband.

6.1.2.5 Crown straps shall be provided and, when assembled, shall form a cradle for supporting the helmet on the wearer's head. The crown straps shall be designed so that the distance between the top of the head and the underside of the shell cannot be adjusted to less clearance than the manufacturer's requirements for that specific helmet.

6.1.2.6 Chin straps shall be provided and shall be attached to the helmet shell. Chin straps shall not be less than 13 mm ($\frac{1}{2}$ in.) in width.

6.1.2.7 Sewing thread utilized in the construction of helmets shall be made of an inherently flame-resistant fiber.

6.1.2.8 Product labels and any other identification labels or markers used on helmet shells shall be affixed without holes being made through the shell and without the use of any metal parts or metallic labels.

6.1.3 Utility Protective Ensemble Glove Elements.

6.1.3.1 Gloves shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 4.3, Inspection and Testing.

6.1.3.2 Gloves shall consist of a material or materials meeting the performance requirements of 7.1.3. The composite shall be permitted to be configured as a single layer or multiple layers. If the glove is made up of multiple layers, all layers of the glove shall be individually graded per size.

6.1.3.3 The glove shall consist of a glove body and a glove interface component.

6.1.3.3.1 The glove shall extend circumferentially from the tip of the fingers to beyond the wrist crease.

6.1.3.3.2 The portion of the glove that extends from the tip of the fingers to the wrist crease shall be considered to be the glove body and shall meet the glove body requirements as specified in 7.1.3 or 7.3.4.

6.1.3.3.3 The portion of the glove that extends from the wrist crease up to the end of the entire glove shall be considered to be the glove interface component and shall meet the glove interface component requirements as specified in 7.1.3 or 7.3.4. The glove interface component shall allow the glove to fit closely around the wearer's wrist.

6.1.3.3.4 The weight shall be allowed to hang freely in the air of 60 seconds prior to any measurements.

6.1.3.3.5* Two points shall be marked on the back side of the glove, and the location of the points shall be determined by measuring down the distances shown in Table 6.1.3.3.5 from the finger crotch of digit two and from the finger crotch of digit three. The distances are shown according to glove size.

Table 6.1.3.3.5 Glove Sizes and Corresponding Palm Length

Glove Size	Palm Length	
	cm	in.
XS	9.46–10.04	3.72–3.95
S	10.04–10.68	3.95–4.20
M	10.68–11.21	4.20–4.42
L	11.21–11.73	4.42–4.62
XL	11.73–12.23	4.62–4.81
XXL	12.23–12.71	4.81–5.0

6.1.3.3.6 A straight line shall be drawn on the back side of the glove using the two points. This line shall be drawn around the side edges of the glove.

6.1.3.3.7 The glove shall be removed from the measurement board. A line shall be drawn on the palm side of the glove by connecting the lines from the side edges of the glove.

6.1.3.3.8 The resulting straight line around the circumference of the glove shall be the location of the wrist crease.

6.1.3.4 Sewing thread utilized in the construction of gloves shall be made of an inherently flame-resistant fiber.

6.1.3.5* In order to label or otherwise represent a glove as compliant with the requirements of this standard, the manufacturer shall provide gloves in not fewer than five separate and distinct sizes.

6.1.3.6 Glove Sizing.

6.1.3.6.1 Gloves shall be available in all sizes from XS to XXL.

6.1.3.6.2 Gloves shall be available in at least two finger lengths for all sizes in 6.1.3.6.1.

6.1.4 Utility Protective Ensemble Footwear Elements.

6.1.4.1 Footwear shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 4.3, Inspection and Testing.

6.1.4.2 The footwear shall consist of a composite meeting the performance requirements of 7.1.4. The composite shall be permitted to be configured as a continuous or joined single layer or continuous or joined multiple layers. If the footwear is made up of multiple layers, all layers of the footwear shall be individually graded per size.



6.1.4.3 Footwear shall consist of a sole with heel, an upper with lining, an insole with puncture-resistant device, a ladder shank, and a toecap permanently attached.

6.1.4.4 Footwear height shall be a minimum of 200 mm (8 in.).

6.1.4.4.1 The footwear height shall be determined by measuring inside the footwear from the center of the insole at the heel up to a perpendicular reference line extending across the footwear at the lowest point of the topline, excluding the tongue and gusset.

6.1.4.4.2 Removable insole inserts shall not be removed prior to measurement.

6.1.4.4.3 Moisture protection shall be continuous circumferentially to within 50 mm (2 in.) of the footwear topline at all locations with the exception of the area inside of and within 13 mm (0.5 in.) around pull-up holes that fully penetrate the footwear from the outside to the inside. The height of moisture protection at all locations of the boot shall be no less than 203 mm (8 in.) when measured as described in 6.1.4.4.1 and 6.2.4.4.1.

6.1.4.4.4 Thermal and physical protection shall be continuous circumferentially to within 50 mm (2 in.) of the footwear topline at all locations with the exception of the tongue, gusset, and the area inside of and within 13 mm (0.5 in.) around pull-up holes that fully penetrate the footwear from the outside to the inside. The height of thermal and physical protection at all locations of the boot with the exception of the tongue and gusset shall be no less than 203 mm (8 in.) when measured as described in 6.1.4.4.1 and 6.2.4.4.1.

6.1.4.5 The puncture-resistant device shall cover the maximum area of the insole.

6.1.4.6 Footwear shall have a toecap that extends not less than 50 mm (2 in.) from the front edge of the footwear.

6.1.4.7 Sewing thread utilized in the construction of footwear shall be made of an inherently flame-resistant fiber.

6.1.4.8 Metal parts shall not penetrate from the outside into the lining or insole at any point unless the metal parts are covered.

6.1.4.9 No metal parts, including but not limited to nails or screws, shall be present or utilized in the construction or attachment of the sole with heel to the puncture-resistant device, insole, or upper.

6.1.4.10 Where stud hooks are used, there shall be a minimum of four metal stud hooks on each side of the eyerow.

6.1.4.11 Eyelets, where used, shall be constructed of coated steel, solid brass, brass-coated nickel, or nickel.

6.1.4.12 Footwear shall incorporate a metatarsal impact guard positioned partially over the protective toecap and extended to cover the metatarsal bone area. The metatarsal protection shall be an integral and permanent part of the footwear.

6.1.4.12.1 Footwear shall meet the performance requirements as specified in ASTM F 2413, *Performance Requirements for Protective (Safety) Toe Cap Footwear*, for impact, compression, metatarsal, and puncture-resistant footwear, with the exception that flex resistance to cracking shall not be evaluated.

6.1.4.13 Footwear Sizing.

6.1.4.13.1 Footwear shall be available in all of the following sizes:

- (1) Mens: 6–15, including half sizes, and a minimum of three widths
- (2) Womens: 5–10, including half sizes, and a minimum of three widths

6.1.4.13.2 Manufacturers shall be required to establish and provide, upon request, a size conversion chart for each model or style of protective footwear based on toe length, arch length, and foot width as measured on the Brannock Scientific Foot-Measuring Device.

6.1.4.13.3 Full and half sizes in each of the three required widths shall be accomplished by individual and unique lasts to provide proper fit.

6.1.5 Utility Protective Ensemble Goggle Elements.

6.1.5.1 Goggle elements shall meet the respective requirements for goggles and be marked “Z87+” in accordance with ANSI Z87.1, *Occupational and Educational Personal Eye and Face Protection Devices*.

6.1.5.2 Goggle elements shall be rated as “Z87+” in accordance with ANSI Z87.1, *Occupational and Educational Personal Eye and Face Protection Devices*.

6.1.5.3 Goggle elements shall be permitted to be attached to the helmet.

6.2 Rescue and Recovery Protective Ensemble for Technical Rescue Incidents Design Requirements.

6.2.1 Rescue and Recovery Protective Ensemble Garment Elements.

6.2.1.1 Garments shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 4.3, Inspection Testing.

6.2.1.2 Garments shall be permitted to be single-layer or multiple-layer garments.

6.2.1.3 All garment collars shall remain upright after extension into a vertical position. The coat shall have a collar at least 50 mm (2 in.) in height at any point when measured from the top of the collar down and shall have a closure system. The collar and closure system shall consist of materials that meet all applicable requirements as specified in this section.

6.2.1.4 Garments shall not have turn-up cuffs. Sleeve cuffs shall have a closure system that can be adjusted to provide a snug and secure fit around the wrist when a technical rescue glove is worn.

6.2.1.5 Rescue and recovery protective ensemble garments shall have a means for securing the liquid barrier to the outer shell.

6.2.1.6 Top-entry pockets shall have cover flaps with a closure system.

6.2.1.7 Pass-through openings of coveralls shall have a closure system that can be easily secured and easily opened by the wearer.

6.2.1.8 Sewing thread utilized in the construction of garments shall be made of an inherently flame-resistant fiber.

6.2.1.9 All garment hardware finish shall be free of rough spots, burrs, and sharp edges.

6.2.1.10 All snaps shall be Style 2 and shall comply with the design and construction requirements of MIL-F-10884G, *Fastener, Snap*.

6.2.1.11 Fastener tape shall meet the requirements of A-A-55126, *Commercial Item Description, Fastener Tapes, Hook and Pile, Synthetic*.

6.2.1.12 Zippers shall meet the physical performance requirements of A-A-55634, *Commercial Item Description, Zippers (Fasteners, Slide Interlocking)*.

6.2.1.13 Cargo pockets, where provided, shall have a means to drain water and shall have a means of being fastened in the closed position.

6.2.1.14 All upper torso garments shall have closure systems at the neckline.

6.2.1.15 One-piece coverall torso closure systems shall be continuous from the top of the crotch area to the top of the garment at the neck.

6.2.1.16 Metallic closure systems shall not come in direct contact with the body.

6.2.1.17 Metal components of the garments shall not come in direct contact with the body.

6.2.1.18* Garment Sizing.

6.2.1.18.1 Upper torso garment chest circumferences shall be provided in circumferences from 760 mm to 1270 mm (30 in. to 50 in.) in 50 mm (2 in.) increments or cut to order.

6.2.1.18.2 Upper torso garment sleeve lengths shall be provided in lengths from 760 mm to 915 mm (30 in. to 36 in.) in 25 mm (1 in.) increments or cut to order.

6.2.1.18.3 Lower torso garment waist circumferences shall be provided in circumferences from 660 mm to 1270 mm (26 in. to 50 in.) in 50 mm (2 in.) increments or cut to order.

6.2.1.18.4 Lower torso garment inseam lengths shall be provided in lengths from 660 mm to 890 mm (26 in. to 35 in.) in 25 mm (1 in.) increments or cut to order.

6.2.1.18.5 Men's and women's sizing shall be accomplished by the use of individual patterns for men's and women's garments.

6.2.2 Rescue and Recovery Protective Ensemble Helmet Elements.

6.2.2.1 Helmets shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 4.3, Inspection and Testing.

6.2.2.2 Helmets shall consist of material or materials meeting the performance requirements of 7.2.2.

6.2.2.3 Suspension shall contain a nape device and shall be removable and replaceable.

6.2.2.3.1 Helmet suspension shall be adjustable in at least 3 mm (1/8 in.) hat size increments, and the size range that can be accommodated shall be marked on the product label.

6.2.2.3.2 With the suspension adjusted to the maximum designated size, there shall be sufficient clearance between the shell and the headband to provide ventilation.

6.2.2.4 A sweatband shall be provided that shall cover at least the forehead portion of the headband. Sweatbands shall be removable and replaceable or shall be integral with the headband.

6.2.2.5 Crown straps shall be provided and, when assembled, shall form a cradle for supporting the helmet on the wearer's head. The crown straps shall be designed so that the distance between the top of the head and the underside of the shell cannot be adjusted to less clearance than the manufacturer's requirements for that specific helmet.

6.2.2.6 Chin straps shall be provided and shall be attached to the helmet shell. Chin straps shall not be less than 13 mm (1/2 in.) in width.

6.2.2.7 Sewing thread utilized in the construction of helmets shall be made of an inherently flame-resistant fiber.

6.2.2.8 Product labels and any other identification labels or markers used on helmet shells shall be affixed without holes being made through the shell and without the use of any metal parts or metallic labels.

6.2.3 Rescue and Recovery Protective Ensemble Glove Elements.

6.2.3.1 Gloves shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 4.3, Inspection and Testing.

6.2.3.2 Gloves shall consist of a material or materials meeting the performance requirements of 7.2.3. The composite shall be permitted to be configured as a single layer or multiple layers. If the glove is made up of multiple layers, all layers of the glove shall be individually graded per size.

6.2.3.3 The glove shall consist of a glove body and a glove interface component.

6.2.3.3.1 The glove shall extend circumferentially from the tip of the fingers to beyond the wrist crease.

6.2.3.3.2 The portion of the glove that extends from the tip of the fingers to the wrist crease shall be considered to be the glove body and shall meet the glove body requirements as specified in 7.2.3 or 7.3.4.

6.2.3.3.3 The portion of the glove that extends from the wrist crease up to the end of the entire glove shall be considered to be the glove interface component and shall meet the glove interface component requirements as specified in 7.2.3 or 7.3.4. The glove interface component shall allow the glove to fit closely around the wearer's wrist.

6.2.3.3.4 The weight shall be allowed to hang freely in the air of 60 seconds prior to any measurements.

6.2.3.3.5* Two points shall be marked on the back side of the glove, and the location of the points shall be determined by measuring down the distances shown in Table 6.1.3.3.5 from the finger crotch of digit two and from the finger crotch of digit three. The distances are shown according to glove size.

6.2.3.3.6 A straight line shall be drawn on the back side of the glove using the two points. This line shall be drawn around the side edges of the glove.

6.2.3.3.7 The glove shall be removed from the measurement board. A line shall be drawn on the palm side of the glove by connecting the lines from the side edges of the glove.

6.2.3.3.8 The resulting straight line around the circumference of the glove shall be the location of the wrist crease.

6.2.3.4 Sewing thread utilized in the construction of gloves shall be made of an inherently flame-resistant fiber.

6.2.3.5* In order to label or otherwise represent a glove as compliant with the requirements of this standard, the manufacturer shall provide gloves in not fewer than five separate and distinct sizes.

6.2.3.6 Glove Sizes.

6.2.3.6.1 Gloves shall be available in all sizes from XS to XXL.

6.2.3.6.2 Gloves shall be available in at least two finger lengths for all sizes in 6.2.3.6.1.

6.2.4 Rescue and Recovery Protective Ensemble Footwear Elements.

6.2.4.1 Footwear shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 4.3, Inspection and Testing.

6.2.4.2 The footwear shall consist of a composite meeting the performance requirements of 7.2.4. The composite shall be permitted to be configured as a continuous or joined single layer or continuous or joined multiple layers. If the footwear is made up of multiple layers, all layers of the footwear shall be individually graded per size.

6.2.4.3 Footwear shall consist of a sole with heel, an upper with lining, an insole with puncture-resistant device, a ladder shank, and a toecap permanently attached.

6.2.4.4 Footwear height shall be a minimum of 200 mm (8 in.).

6.2.4.4.1 The footwear height shall be determined by measuring inside the footwear from the center of the insole at the heel up to a perpendicular reference line extending across the width of the footwear at the lowest point of the topline, excluding the tongue and gusset.

6.2.4.4.2 Removable insole inserts shall not be removed prior to measurement.

6.2.4.4.3 Moisture protection shall be continuous circumferentially to within 50 mm (2 in.) of the footwear topline at all locations with the exception of the area inside of and within 13 mm (0.5 in.) around pull-up holes that fully penetrate the footwear from the outside to the inside. The height of moisture protection at all locations of the boot shall be no less than 203 mm (8 in.) when measured as described in 6.2.4.4.1.

6.2.4.4.4 Thermal and physical protection shall be continuous circumferentially to within 50 mm (2 in.) of the footwear topline at all locations with the exception of the tongue, gusset, and the area inside of and within 13 mm (0.5 in.) around pull-up holes that fully penetrate the footwear from the outside to the inside. The height of thermal and physical protection at all locations of the boot with the exception of the tongue and gusset shall be no less than 203 mm (8 in.) when measured as described in 6.1.4.4.1 and 6.2.4.4.1.

6.2.4.5 The puncture-resistant device shall cover the maximum area of the insole.

6.2.4.6 Footwear shall have a toecap that extends not less than 50 mm (2 in.) from the front edge of the footwear.

6.2.4.7 Sewing thread utilized in the construction of footwear shall be made of an inherently flame-resistant fiber.

6.2.4.8 Metal parts shall not penetrate from the outside into the lining or insole at any point, unless the metal parts are covered.

6.2.4.9 No metal parts, including but not limited to nails or screws, shall be present or utilized in the construction or attachment of the sole with heel to the puncture-resistant device, insole, or upper.

6.2.4.10 Where stud hooks are used, there shall be a minimum of four metal stud hooks on each side of the eyerow.

6.2.4.11 Eyelets, where used, shall be constructed of coated steel, solid brass, brass-coated nickel, or nickel.

6.2.4.12 Footwear shall incorporate a metatarsal impact guard positioned partially over the protective toecap and extended to cover the metatarsal bone area. The metatarsal protection shall be an integral and permanent part of the footwear.

6.2.4.13 Footwear shall meet the performance requirements as specified in ASTM F 2413, *Performance Requirements for Protective (Safety) Toe Cap Footwear*, for impact, compression, metatarsal, and puncture-resistant footwear, with the exception that flex resistance to cracking shall not be evaluated.

6.2.4.14 Footwear Sizing.

6.2.4.14.1 Footwear shall be available in all of the following sizes:

- (1) Mens: 6–15, including half sizes, and a minimum of three widths
- (2) Womens: 5–10, including half sizes, and a minimum of three widths

6.2.4.14.2 Manufacturers shall be required to establish and provide, upon request, a size conversion chart for each model or style of protective footwear based on toe length, arch length, and foot width as measured on the Brannock Scientific Foot-Measuring Device.

6.2.4.14.3 Full and half sizes in each of the three required widths shall be accomplished by individual and unique lasts to provide proper fit.

6.2.5 Rescue and Recovery Protective Ensemble Goggle Elements.

6.2.5.1 Goggle elements shall meet the respective requirements for goggles and be marked “Z87+” in accordance with ANSI Z87.1, *Occupational and Educational Personal Eye and Face Protection Devices*.

6.2.5.2 Goggle elements shall be permitted to be attached to the helmet.

6.3 CBRN Protective Ensemble for Technical Rescue Incidents Design Requirements.

6.3.1 CBRN Protective Ensembles.

6.3.1.1 Ensembles shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 4.3, Inspection and Testing.

6.3.1.2 Ensembles, including the respirator, shall be designed to protect the wearer’s upper and lower torso, head, arms, legs, hands, and feet.

6.3.1.3 Ensemble elements shall include protective garments, protective helmet, protective gloves, protective footwear, interface components, and a protective hood, where the protective hood is not already part of the protective garment.

6.3.1.4 The manufacturer shall specify each respirator that is part of the CBRN protective ensemble. All respirators specified by the ensemble manufacturer for inclusion in the ensemble shall be any of the following:

- (1) Certified to NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, and certified as CBRN SCBA compliant with the *Statement of Standard for NIOSH CBRN SCBA Testing*, by the National Institute for Occupational Safety and Health (NIOSH)
- (2) Certified as CBRN APR compliant with the *Statement of Standard for NIOSH CBRN SCBA Testing*, by NIOSH
- (3) Certified as CBRN PAPR compliant with the *Statement of Standard for NIOSH CBRN PAPR Testing*, by NIOSH

6.3.1.5 Ensembles shall be designed to accommodate the respirator(s) as specified in 6.3.1.4 by the manufacturer for the specific ensemble.

6.3.1.6* The interface of and integration of the selected respirator with the protective ensemble shall not invalidate the NIOSH certification of the respective respirator.

6.3.2 CBRN Protective Ensemble Garment Elements.

6.3.2.1 CBRN protective ensemble garment elements shall meet the design requirements specified in 6.2.1.

6.3.2.2 Supplemental garments that are provided to meet the performance requirements of this standard but are not intended to be worn continuously with the wearing of the garment element shall not be permitted.

6.3.2.3 Garments shall be permitted to include integrated booties to protect the wearer's feet in conjunction with outer footwear.

6.3.2.4 Where garments incorporate booties, the booties shall be designed as an extension of the garment leg and shall cover the entire foot and ankle.

6.3.3 CBRN Protective Ensemble Helmet Elements.

6.3.3.1 Where the CBRN barrier layer is provided in a protective hood and provides an interface with the respirator specified by the ensemble manufacturer, the helmet shall not be required to incorporate a CBRN barrier layer.

6.3.3.2 Where the helmet is not required to demonstrate compliance with the CBRN protection requirements, the manufacturer shall not specify a helmet as part of the CBRN protective ensemble.

6.3.3.3 Supplemental helmets that are provided to meet the performance requirements of this standard but are not intended to be worn continuously with the wearing of the helmet shall not be permitted.

6.3.4 CBRN Protective Ensemble Glove Elements.

6.3.4.1 CBRN technical rescue gloves shall meet the design requirements specified in 6.2.3.

6.3.4.2 Supplemental gloves that are provided to meet the performance requirements of this standard but are not intended to be worn continuously with the wearing of the glove element shall not be permitted.

6.3.4.3 Where outer gloves are worn to provide a CBRN barrier layer, the manufacturer shall provide gloves in not fewer than five separate and distinct sizes.

6.3.4.4 If an interface component connects the glove to the coat sleeve in a manner providing continuous thermal protection and demonstrates liquid integrity, then gloves shall not be required to meet the requirements in 6.2.3.3.

6.3.5 CBRN Protective Ensemble Footwear Elements.

6.3.5.1 CBRN technical rescue footwear shall meet the design requirements in 6.2.4.

6.3.5.2 Where booties are used as part of the ensemble, the manufacturer shall specify types of outer footwear that provide the physical and other performance requirements for footwear as specified in 7.3.2.4, as applicable.

6.3.5.3 Where booties are used as part of the ensemble, the outer footwear shall not be required to have a liner in the upper.

6.3.5.4 Supplemental footwear that is provided to meet the performance requirements of this standard but is not intended to be worn continuously with the wearing of the footwear element shall not be permitted.

6.3.6 CBRN Protective Ensemble Hood Interface Elements. Where a hood interface element is provided for CBRN protection, hood interface elements shall meet the design criteria for structural fire-fighting protective hood requirements in Section 6.14 of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*.

Chapter 7 Performance Requirements

7.1* Utility Protective Ensemble for Technical Rescue Incidents Performance Requirements.

7.1.1 Utility Protective Ensemble Garment Elements.

7.1.1.1 Garment composites shall be tested for total heat loss as specified in Section 8.6, Total Heat Loss Test, and shall have a total heat loss equal to or greater than 650 W/m².

7.1.1.2 Textile fabrics and linings used for garments shall be tested for tear resistance as specified in Section 8.7, Tear Resistance Test, and shall have a tear resistance of not less than 30 N (6.75 lbf).

7.1.1.3 Outer shell fabric shall be tested for breaking strength as specified in Section 8.8, Breaking Strength Test, and shall have a breaking strength of not less than 400 N (90 lbf).

7.1.1.4 Garment outer shell fabrics shall be tested for abrasion resistance as specified in Section 8.9, Abrasion Resistance Test 1, and shall have an ending breaking strength of not less than 230 N (50 lbf).

7.1.1.5 Garment outer shell fabrics and liners shall be individually tested for cleaning shrinkage resistance as specified in Section 8.10, Cleaning Shrinkage Resistance Test, and shall not shrink more than 5 percent in either direction.

7.1.1.6 All garment seam assemblies shall be tested for seam strength as specified in Section 8.12, Seam Breaking Strength Test, and shall demonstrate a seam strength equal to or greater than that stipulated for the respective seam type.

7.1.1.6.1 Garment seam assemblies shall demonstrate a seam strength equal to or greater than 315 N (70 lbf) force for Major A seams and 180 N (40 lbf) for Major B seams.

7.1.1.6.2 All combination woven and knit or stretch knit seam assemblies shall meet the requirements specified in 7.1.1.6.1.

7.1.1.6.3 Seam strength shall be considered acceptable where the fabric strength is less than the required seam strength specified in 7.1.1.6.1, provided the fabric fails without seam failure below the applicable forces specified in 7.1.1.6.1.

7.1.1.7* Textile fabrics, linings, collar linings, lettering, and other materials used in garment construction, including but not limited to padding, reinforcement, interfacing, binding, and hanger loops but excluding emblems, labels, and patches, shall be individually tested for flame resistance as specified in Section 8.4, Flame Resistance Test 1, and shall not have a char length of more than 100 mm (4 in.), shall not have an after-flame of more than 2 seconds, and shall not melt or drip.

7.1.1.7.1 Zippers shall meet the performance requirements specified in 7.1.1.7 only where located on the exterior of the garment or located where they will directly contact the wearer's body.

7.1.1.7.2 Elastic and hook and pile fasteners shall meet the performance requirements specified in 7.1.1.7 only where located where they will directly contact the wearer's body.

7.1.1.7.3 Small specimens such as hanger loops and emblems or patches that are not large enough to meet the sample size requirements in 8.4.2.1 shall be tested for resistance to flame as specified in 8.4.11 and shall not have an afterflame of more than 2 seconds and shall not melt or drip.

7.1.1.8 Textile fabrics and linings utilized in garments shall be individually tested for thermal shrinkage resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not shrink more than 10 percent in any direction.

7.1.1.9 Textile fabrics, linings, hardware, and other materials used in garment construction, including but not limited to padding, reinforcements, wristlets, collars, labels, hanger hooks, buttons, and fasteners but excluding hook and pile fasteners not in direct contact with the skin, shall be individually tested for heat resistance in their original form as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not melt, drip, separate, or ignite; garment outer shells shall not char; and hardware items and closures shall remain functional.

7.1.1.9.1 Garment closures, including but not limited to zippers and hook and pile fasteners, shall meet the performance requirements specified in 7.1.1.9 only where they are located on the exterior of the garment or located where they will directly contact the wearer's body.

7.1.1.10 Sewing thread utilized in the construction of garments shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.1.1.11 All metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation;

shall have ferrous metals show no corrosion of the base metal; and shall have hardware items remain functional.

7.1.1.12 Garment composites shall be tested for thermal protective performance as specified in Section 8.2, Thermal Protective Performance Test, and shall have an average thermal protective performance (TPP) of 10 or greater.

7.1.1.13 Garment outer shell fabric shall be tested for water absorption resistance as specified in Section 8.13, Water Absorption Resistance Test, and shall have a percent water absorption of 15 percent or less.

7.1.1.14 Garment product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.1.1.15 Fastener tape shall be tested for breaking strength as specified in Section 8.46, Fastener Tape Strength Tests, in A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*, and shall meet or exceed the minimum breaking strength requirements as set forth in that specification established in Table 1 of A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*.

7.1.1.16 Fastener tape shall be tested for shear strength as specified in Section 8.46, Fastener Tape Strength Tests, in A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*, and shall meet or exceed the minimum shear strength requirements as set forth in the specification established in Table 1 of A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*.

7.1.1.17 Fastener tape shall be tested for peel strength as specified in Section 8.46, Fastener Tape Strength Tests, in A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*, and shall meet or exceed the minimum peel strength requirements as set forth in the specification established in Table 1 of A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*.

7.1.2 Utility Protective Ensemble Helmet Elements.

7.1.2.1 Helmets shall be tested for flame resistance as specified in Section 8.18, Flame Resistance Test 2, Procedure A, and shall not have afterflame with a duration greater than 5 seconds.

7.1.2.2 Any antiglare material, where used, shall be tested for flame resistance as specified in Section 8.18, Flame Resistance Test 2, Procedure B, and shall not have afterflame with a duration greater than 5 seconds.

7.1.2.3 Helmets shall be tested for heat resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not have any distortion of the shell extend more than 30 mm (1³/₁₆ in.) below the original position of the helmet, and hardware shall remain functional.

7.1.2.4 Helmets shall be tested for top impact resistance as specified by Section 8.19, Top Impact Resistance Test (Force), and shall not transmit an average force of more than 3785 N (850 lbf). No individual specimen shall transmit a force of more than 4450 N (1000 lbf).

7.1.2.5 Helmets shall be tested for physical penetration resistance as specified in Section 8.20, Physical Penetration Resistance Test, and shall exhibit no electrical or physical contact between the penetration striker and the headform.

7.1.2.6 Helmets shall be tested for electrical insulation as specified in Section 8.21, Electrical Insulation Test 1, and shall not have electrical leakage current exceeding 3 milliamperes.

7.1.2.7 Helmets shall be tested for suspension system separation as specified in Section 8.22, Suspension System Retention Test, and shall not have the minimum force required to separate any individual attachment point of the suspension assembly from the helmet shell be less than 22 N (5 lbf).

7.1.2.8 Helmets shall be tested for retention system and chin strap efficiency as specified in Section 8.23, Retention System Test, and the retention system shall not break or show any slip or stretch greater than 38 mm (1½ in.).

7.1.2.9 All metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation; shall have ferrous metals show no corrosion of the base metal; and shall have hardware items remain functional.

7.1.2.10 Sewing thread utilized in the construction of helmets shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.1.2.11 Helmet product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.1.3 Utility Protective Ensemble Glove Elements.

7.1.3.1 Glove body composites shall be tested in areas A, C, D, E, G, and H as shown in Figure 8.1.13.1, if different, for resistance to cut as specified in Section 8.26, Cut Resistance Test, and shall have a distance of blade travel not less than 20 mm (0.8 in.).

7.1.3.2 Glove body composites shall be tested in areas A, C, and D, if different, for puncture resistance as specified in Section 8.27, Puncture Resistance Test 1, and shall not puncture under an average applied force of 22 N (5 lbf).

7.1.3.3 Glove body composites shall be tested in areas A, C, D, E, G, and H, if different, for abrasion resistance as specified in Section 8.11, Abrasion Resistance Test 2, and shall show no wear-through.

7.1.3.4 Gloves shall be tested for hand function as specified in Section 8.28, Glove Hand Function Test, and shall not have an average percent of barehanded control exceeding 170 percent.

7.1.3.5 Gloves shall be tested for grip as specified in Section 8.29, Grip Test, and shall not have a drop of more than 30 percent from the peak pull force value.

7.1.3.6 Gloves shall be tested for ease of donning as specified in Section 8.30, Glove Donning Test, and shall not have a baseline donning time exceed 10 seconds nor a final donning time exceed the baseline donning time plus 20 seconds, shall have no detachment of the inner liner, shall have no detachment of the moisture barrier, and shall allow full insertion of all digits.

7.1.3.7 Glove body composites, including but not limited to trim, labels, and external tags, but excluding hardware and hook and pile fasteners that do not directly contact the wearer's body, shall be individually tested for flame resistance as specified in Section 8.24, Flame Resistance Test 3; shall have an average char length of not more than 100 mm (4 in.); shall have an average afterflame of not more than 2 seconds; and shall not melt or drip.

7.1.3.8 Gloves shall be tested for heat resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not separate, melt, ignite, or drip. Hook and pile fasteners on gloves shall be excluded from these requirements because these items are placed such that they will not directly contact the wearer's body.

7.1.3.9 All glove metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation; shall have ferrous metals show no corrosion of the base metal; and shall have hardware items remain functional.

7.1.3.10 Glove body composites shall be tested in areas A, C, and D, if different, for conductive heat resistance as specified in Section 8.25, Conductive Heat Resistance Test, shall not have a second-degree burn time of less than 7 seconds, and shall not have the pain time be less than 4 seconds.

7.1.3.11 Glove knit wristlet material shall be tested for material strength as specified in Section 8.39, Burst Strength Test, and shall have a burst strength of not less than 180 N (40.7 lbf).

7.1.3.12 Sewing thread utilized in the construction of gloves shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.1.3.13 Glove product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.1.3.14 Glove body composites shall be tested for thermal protective performance as specified in Section 8.2, Thermal Protective Performance Test, and shall have an average TPP of 10 or greater.

7.1.3.15 Glove interface component composites shall be individually tested for flame resistance as specified in Section 8.24, Flame Resistance Test 3, and shall have an average char length of not more than 100 mm (4 in.), shall have an average afterflame of not more than 2 seconds, and shall not melt or drip.

7.1.3.16 Gloves shall be tested for grip function as specified in Section 8.45, Torque Test, and shall have an average percent of barehanded control not less than 80 percent.

7.1.4 Utility Protective Ensemble Footwear Elements.

7.1.4.1 Footwear uppers shall be tested for abrasion resistance as specified in Section 8.11, Abrasion Resistance Test 2, and shall show no wear-through.

7.1.4.2 Footwear uppers shall be tested for cut resistance as specified in Section 8.26, Cut Resistance Test, and shall have a distance of blade travel not less than 20 mm (0.8 in.).

7.1.4.3 Footwear uppers shall be tested for puncture resistance as specified in Section 8.27, Puncture Resistance Test 1, and shall not puncture under an applied force of 45 N (10 lbf).

7.1.4.4 Footwear ladder shanks shall be tested for resistance to bending as specified in Section 8.33, Ladder Shank Bend Resistance Test, and shall not deflect more than 6 mm (¼ in.).

7.1.4.5 Footwear soles and heels shall be tested for abrasion resistance as specified in Section 8.34, Abrasion Resistance

Test 3, and the relative volume loss shall not be greater than 200 mm³ (0.01 in.³).

7.1.4.6 Footwear shall be tested for slip resistance as specified in Section 8.35, Slip Resistance Test, and shall have a coefficient of friction of 0.45 or greater.

7.1.4.7 Footwear shall be tested for electrical conduction as specified in Section 8.36, Electrical Insulation Test 2, and shall not have any electrical leakage exceed 3 milliamperes.

7.1.4.8 Eyelets and stud hooks shall be tested for detachment strength as specified in Section 8.37, Eyelet and Stud Post Attachment Test, and shall have a minimum detachment strength of 300 N (66 lbf).

7.1.4.9 All metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation; shall have ferrous metals show no corrosion of the base metal; and shall have hardware items remain functional.

7.1.4.10 Footwear shall be individually tested for flame resistance as specified in Section 8.32, Flame Resistance Test 4, shall not have an afterflame of more than 5 seconds, shall not melt or drip, and shall not exhibit any burn-through.

7.1.4.11 Footwear shall be tested for heat resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and, other than the laces, shall not have any part of the footwear melt, shall have no delamination or separation of any part of the footwear, shall have all hardware remain functional, and shall show no water penetration.

7.1.4.12 Footwear uppers shall be tested for thermal protective performance as specified in Section 8.2, Thermal Protective Performance Test, and shall not have an average TPP of less than 10.

7.1.4.13 Footwear uppers shall be tested for conductive heat resistance as specified in Section 8.25, Conductive Heat Resistance Test, shall not have a second-degree burn time of less than 7 seconds, and shall not have the pain time be less than 4 seconds.

7.1.4.14 Footwear upper material composite, upper seams, and vamp seams shall be tested for liquid penetration resistance as specified in Section 8.16, Liquid Penetration Resistance Test, and shall show no chemical penetration.

7.1.4.15 Footwear upper material composite, upper seams, and vamp seams shall be tested for biopenetration resistance as specified in Section 8.17, Viral Penetration Resistance Test, and shall show no viral penetration.

7.1.4.16 Sewing thread utilized in the construction of footwear shall be made of an inherently flame-resistant fiber, shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.1.4.17 Footwear product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.1.4.18 Footwear shall meet the performance requirements as specified in ASTM F 2413, *Performance Requirements for Protective (Safety) Toe Cap Footwear*, for impact, compression, metatar-

sal, and puncture-resistant footwear, with the exception that flex resistance to cracking shall not be evaluated.

7.1.5 Utility Protective Ensemble Goggle Elements.

7.1.5.1 Goggle elements shall be tested for flame resistance as specified in Section 8.18, Flame Resistance Test 2, and shall not show any visible afterflame 5 seconds after removal of the test flame.

7.1.5.2 Goggle elements shall be tested for heat resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not melt, drip, or ignite.

7.2* Rescue and Recovery Protective Ensemble for Technical Rescue Incidents Performance Requirements.

7.2.1 Rescue and Recovery Protective Ensemble Garment Elements.

7.2.1.1 Garment composites shall be tested for total heat loss as specified in Section 8.6, Total Heat Loss Test, and shall have a total heat loss equal to or greater than 450 W/m².

7.2.1.2 Textile fabrics and linings used for garments shall be tested for tear resistance as specified in Section 8.7, Tear Resistance Test, and shall have a tear resistance of not less than 30 N (6.75 lbf).

7.2.1.3 Outer shell fabrics shall be tested for breaking strength as specified in Section 8.8, Breaking Strength Test, and shall have a breaking strength of not less than 400 N (90 lbf).

7.2.1.4 Garment outer shell fabrics shall be tested for abrasion resistance as specified in Section 8.9, Abrasion Resistance Test 1, and shall have an ending breaking strength of not less than 230 N (50 lbf).

7.2.1.5 Garment outer shell fabrics, liquid barrier, and liners shall be individually tested for cleaning shrinkage resistance as specified in Section 8.10, Cleaning Shrinkage Resistance Test, and shall not shrink more than 5 percent in either direction.

7.2.1.6 All garment seam assemblies shall be tested for seam strength as specified in Section 8.12, Seam Breaking Strength Test, and shall demonstrate a seam strength equal to or greater than that stipulated for the respective seam type.

7.2.1.6.1 Garment seam assemblies shall demonstrate a seam strength equal to or greater than 315 N (70 lbf) for Major A seams and 180 N (40 lbf) for Major B seams.

7.2.1.6.2 All combination woven and knit or stretch knit seam assemblies shall meet the requirements as specified in 7.2.1.6.1.

7.2.1.6.3 Seam strength shall be considered acceptable where the fabric strength is less than the required seam strength specified in 7.2.1.6.1, provided the fabric fails without seam failure below the applicable forces specified in 7.2.1.6.1.

7.2.1.7* Textile fabrics, linings, collar linings, lettering, and other materials used in garment construction, including but not limited to padding, reinforcement, interfacing, binding, and hanger loops but excluding emblems, labels, and patches, shall be individually tested for flame resistance as specified in Section 8.4, Flame Resistance Test 1, and shall not have a char length of more than 100 mm (4 in.), shall not have an afterflame of more than 2 seconds, and shall not melt or drip.

7.2.1.7.1 Zippers and seam-sealing materials shall meet the performance requirements specified in 7.2.1.7 only where lo-

cated on the exterior of the garment or located where they will directly contact the wearer's body.

7.2.1.7.2 Elastic and hook and pile fasteners shall meet the performance requirements specified in 7.2.1.7 only where located where they will directly contact the wearer's body.

7.2.1.7.3 Small specimens such as hanger loops and emblems or patches that are not large enough to meet the sample size requirements in 8.4.2.1 shall be tested for resistance to flame as specified in 8.4.11 test format and shall not have an after-flame of more than 2 seconds, and shall not melt or drip.

7.2.1.8 Textile fabrics and linings utilized in garments shall be individually tested for thermal shrinkage resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not shrink more than 10.0 percent in any direction.

7.2.1.9 Textile fabrics, linings, hardware, and other materials used in garment construction, including but not limited to padding, reinforcements, wristlets, collars, labels, hanger hooks, buttons, and fasteners but excluding hook and pile fasteners not in direct contact with the skin, shall be individually tested for heat resistance in their original form as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not melt, drip, separate, or ignite; garment outer shells shall not char; and hardware items and closures shall remain functional.

7.2.1.9.1 Garment closures, including but not limited to zippers and hook and pile fasteners, shall meet the performance requirements specified in 7.2.1.9 only where they are located on the exterior of the garment or located where they will directly contact the wearer's body.

7.2.1.9.2 Liquid barrier seams shall be individually tested for resistance to heat as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not drip or ignite.

7.2.1.10 Sewing thread utilized in the construction of garments shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.2.1.11 All metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation; shall have ferrous metals show no corrosion of the base metal; and shall have hardware items remain functional.

7.2.1.12 Garment composites shall be tested for thermal protective performance as specified in Section 8.2, Thermal Protective Performance Test, and shall have an average TPP of 10 or greater.

7.2.1.13 Garment outer shell fabrics shall be tested for water absorption resistance as specified in Section 8.13, Water Absorption Resistance Test, and shall have a percent water absorption of 15 percent or less.

7.2.1.14 Garment composites and seams shall be tested for liquid penetration resistance as specified in Section 8.16, Liquid Penetration Resistance Test, and shall show no liquid penetration.

7.2.1.15 Garment composites and seams shall be tested for bio-penetration resistance as specified in Section 8.17, Viral Penetration Resistance Test, and shall show no viral penetration.

7.2.1.16 Garments shall be tested for liquid penetration resistance as specified in Section 8.3, Overall Liquid Integrity Test 1, and shall not allow liquid penetration.

7.2.1.17 Garment product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.2.1.18 Fastener tape shall be tested for breaking strength as specified in Section 8.46, Fastener Tape Strength Tests, in A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*, and shall meet or exceed the minimum breaking strength requirements as set forth in that specification established in Table 1 of A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*.

7.2.1.19 Fastener tape shall be tested for shear strength as specified in Section 8.46, Fastener Tape Strength Tests, in A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*, and shall meet or exceed the minimum shear strength requirements as set forth in the specification established in Table 1 of A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*.

7.2.1.20 Fastener tape shall be tested for peel strength as specified in Section 8.46, Fastener Tape Strength Tests, in A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*, and shall meet or exceed the minimum peel strength requirements as set forth in the specification established in Table 1 of A-A-55126B, *CID Fastener Tapes, Hook and Loop, Synthetic*.

7.2.2 Rescue and Recovery Protective Ensemble Helmet Elements.

7.2.2.1 Helmets shall be tested for flame resistance as specified in Section 8.18, Flame Resistance Test 2, Procedure A, and shall not have afterflame with a duration greater than 5 seconds.

7.2.2.2 Any antiglare material, where used, shall be tested for flame resistance as specified in Section 8.18, Flame Resistance Test 2, Procedure B, and shall not have afterflame with a duration greater than 5 seconds.

7.2.2.3 Helmets shall be tested for heat resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not have any distortion of the shell extend more than 30 mm (1 $\frac{3}{16}$ in.) below the original position of the helmet, and shall have hardware remain functional.

7.2.2.4 Helmets shall be tested for top impact resistance as specified by Section 8.19, Top Impact Resistance Test (Force), and shall not transmit an average force of more than 3785 N (850 lbf). No individual specimen shall transmit a force of more than 4450 N (1000 lbf).

7.2.2.5 Helmets shall be tested for physical penetration resistance as specified in Section 8.20, Physical Penetration Resistance Test, and shall exhibit no electrical or physical contact between the penetration striker and the headform.

7.2.2.6 Helmets shall be tested for electrical insulation as specified in Section 8.21, Electrical Insulation Test 1, and shall not have electrical leakage current exceeding 3 milliamperes.

7.2.2.7 Helmets shall be tested for suspension system separation as specified in Section 8.22, Suspension System Retention Test, and shall not have the minimum force required to separate any individual attachment point of the suspension assembly from the helmet shell be less than 22 N (5 lbf).

7.2.2.8 Helmets shall be tested for retention system and chin strap efficiency as specified in Section 8.23, Retention System

Test, and the retention system shall not break or show any slip or stretch greater than 38 mm (1½ in.).

7.2.2.9 All metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation; shall have ferrous metals show no corrosion of the base metal; and shall have hardware items remain functional.

7.2.2.10 Sewing thread utilized in the construction of helmets shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.2.2.11 Helmet product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.2.3 Rescue and Recovery Protective Ensemble Glove Elements.

7.2.3.1 Glove body composites shall be tested in areas A, C, D, E, G, and H, if different, for resistance to cut as specified in Section 8.26, Cut Resistance Test, and shall have a distance of blade travel not less than 20 mm (0.8 in.).

7.2.3.2 Glove body composites shall be tested in areas A, C, and D, if different, for puncture resistance as specified in Section 8.27, Puncture Resistance Test 1, and shall not puncture under an average applied force of 22 N (5 lbf).

7.2.3.3 Glove body composites shall be tested in areas A, C, D, E, G, and H, if different, for abrasion resistance as specified in Section 8.11, Abrasion Resistance Test 2, and shall show no wear-through.

7.2.3.4 Gloves shall be tested for hand function as specified in Section 8.28, Glove Hand Function Test, and shall not have an average percent of barehand control exceeding 170 percent.

7.2.3.5 Gloves shall be tested for grip as specified in Section 8.29, Grip Test, and shall not have a drop of more than 30 percent from the peak pull force value.

7.2.3.6 Gloves shall be tested for ease of donning as specified in Section 8.30, Glove Donning Test; shall not have a baseline donning time exceed 10 seconds, nor a final donning time exceed the baseline donning time plus 20 seconds; shall have no detachment of the inner liner; shall have no detachment of the moisture barrier; and shall allow full insertion of all digits.

7.2.3.7 Glove body composites, including but not limited to trim, labels, and external tags, but excluding hardware and hook and pile fasteners that do not directly contact the wearer's body, shall be individually tested for flame resistance as specified in Section 8.24, Flame Resistance Test 3, shall have an average char length of not more than 100 mm (4 in.); shall have an average afterflame of not more than 2 seconds; and shall not melt or drip.

7.2.3.8 Glove interface component composites shall be individually tested for flame resistance as specified in Section 8.24, Flame Resistance Test 3, shall have an average char length of not more than 100 mm (4 in.); shall have an average afterflame of not more than 2 seconds; and shall not melt or drip.

7.2.3.9 Gloves shall be tested for heat resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test,

and shall not separate, melt, ignite, or drip. Hook and pile fasteners on gloves shall be excluded from these requirements because these items are placed such that they will not directly contact the wearer's body.

7.2.3.10 All glove metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation; shall have ferrous metals show no corrosion of the base metal; and shall have hardware remain functional.

7.2.3.11 Glove body composites shall be tested in areas A, C, and D, if different, for conductive heat resistance as specified in Section 8.25, Conductive Heat Resistance Test, and shall not have a second-degree burn time of less than 7 seconds, and shall not have the pain time be less than 4 seconds.

7.2.3.12 Glove materials and seams shall be tested for liquid penetration resistance as specified in Section 8.16, Liquid Penetration Resistance Test, and shall show no liquid penetration.

7.2.3.13 Glove materials and seams shall be tested for biopenetration resistance as specified in Section 8.17, Viral Penetration Resistance Test, and shall show no viral penetration.

7.2.3.14 Gloves shall be tested for overall watertight integrity as specified in Section 8.31, Overall Liquid Integrity Test 2, and shall show no water penetration.

7.2.3.15 Glove knit wristlet material shall be tested for material strength as specified in Section 8.39, Burst Strength Test, and shall have a burst strength of not less than 180 N (40.7 lbf).

7.2.3.16 Sewing thread utilized in the construction of gloves shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.2.3.17 Glove product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.2.3.18 Glove body composites shall be tested for thermal protective performance as specified in Section 8.2, Thermal Protective Performance Test, and shall have an average TPP of 10 or greater.

7.2.3.19 Gloves shall be tested for grip function as specified in Section 8.45, Torque Test, and shall have an average percent of bare-hand control not less than 80 percent.

7.2.4 Rescue and Recovery Protective Ensemble Footwear Elements.

7.2.4.1 Footwear uppers shall be tested for abrasion resistance as specified in Section 8.11, Abrasion Resistance Test 2, and shall show no wear-through.

7.2.4.2 Footwear uppers shall be tested for cut resistance as specified in Section 8.26, Cut Resistance Test, and shall have a distance of blade travel not less than 20 mm (0.8 in.).

7.2.4.3 Footwear uppers shall be tested for puncture resistance as specified in Section 8.27, Puncture Resistance Test 1, and shall not puncture under an applied force of 45 N (10 lbf).

7.2.4.4 Footwear ladder shanks shall be tested for resistance to bending as specified in Section 8.33, Ladder Shank Bend Resistance Test, and shall not deflect more than 6 mm (¼ in.).

7.2.4.5 Footwear soles and heels shall be tested for abrasion resistance as specified in Section 8.34, Abrasion Resistance Test 3, and the relative volume loss shall not be greater than 200 mm³ (0.01 in.³).

7.2.4.6 Footwear shall be tested for slip resistance as specified in Section 8.35, Slip Resistance Test, and shall have a coefficient of friction of 0.45 or greater.

7.2.4.7 Footwear shall be tested for electrical conduction as specified in Section 8.36, Electrical Insulation Test 2, and shall not have any electrical leakage exceed 3 milliamperes.

7.2.4.8 Eyelets and stud hooks shall be tested for detachment strength as specified in Section 8.37, Eyelet and Stud Post Attachment Test, and shall have a minimum detachment strength of 300 N (66 lbf).

7.2.4.9 All metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation; shall have ferrous metals show no corrosion of the base metal; and shall have hardware items remain functional.

7.2.4.10 Footwear shall be individually tested for flame resistance as specified in Section 8.32, Flame Resistance Test 4, shall not have an afterflame of more than 5 seconds, shall not melt or drip, and shall not exhibit any burn-through.

7.2.4.11 Footwear shall be tested for heat resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and, other than the laces, shall not have any part of the footwear melt, shall have no delamination or separation of any part of the footwear, shall have all hardware remain functional, and shall show no water penetration.

7.2.4.12 Footwear uppers shall be tested for thermal protective performance as specified in Section 8.2, Thermal Protective Performance Test, and shall not have an average TPP of less than 10.

7.2.4.13 Footwear uppers shall be tested for conductive heat resistance as specified in Section 8.25, Conductive Heat Resistance Test, shall not have a second-degree burn time of less than 7 seconds, and shall not have the pain time be less than 4 seconds.

7.2.4.14 Footwear upper material composites, upper seams, and vamp seams shall be tested for liquid penetration resistance as specified in Section 8.16, Liquid Penetration Resistance Test, and shall show no chemical penetration.

7.2.4.15 Footwear upper material composites, upper seams, and vamp seams shall be tested for biopenetration resistance as specified in Section 8.17, Viral Penetration Resistance Test, and shall show no viral penetration.

7.2.4.16 Sewing thread utilized in the construction of footwear shall be made of an inherently flame-resistant fiber, shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.2.4.17 Footwear product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.2.4.18 Footwear shall meet the performance requirements as specified in ASTM F 2413, *Performance Requirements for Protective (Safety) Toe Cap Footwear*, for impact, compression, metatarsal, and puncture-resistant footwear with the exception that flex resistance to cracking shall not be evaluated.

7.2.5 Rescue and Recovery Protective Ensemble Goggle Elements.

7.2.5.1 Goggle elements shall be tested for flame resistance as specified in Section 8.18, Flame Resistance Test 2, and shall not show any visible afterflame 5 seconds after removal of the test flame.

7.2.5.2 Goggle elements shall be tested for heat resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not melt, drip, or ignite.

7.3* CBRN Protective Ensemble for Technical Rescue Incidents Performance Requirements.

7.3.1 CBRN Protective Ensembles.

7.3.1.1* The entire ensemble shall be tested for overall inward leakage as specified in Section 8.40, Man-In-Simulant Test, and shall have an average local physiological protective dosage factor ($PPDF_i$) value at each PAD location for the four ensembles tested of no less than 120.0 and an average systemic physiological protective dosage factor ($PPDF_{sys}$) value for each of the four tested ensembles of no less than 76.

7.3.1.2 The entire ensemble shall be tested as specified in Section 8.3, Overall Liquid Integrity Test 1, and shall show no liquid penetration.

7.3.1.3 Each ensemble element's CBRN barrier layer and the barrier layer seams shall be tested for permeation resistance as specified in Section 8.41, Chemical Permeation Resistance Test, and shall meet the following performance criteria:

- (1) For permeation testing of the liquid chemical warfare agent sulfur mustard, distilled [HD, or bis (2-chloroethyl) sulfide, CAS 505-60-2], the average cumulative permeation in 1 hour shall not exceed 4.0 µg/cm².
- (2) For permeation testing of the liquid chemical warfare agent Soman [GD, or O-Pinacolyl methylphosphonofluoridate, CAS 96-64-0], the average cumulative permeation in 1 hour shall not exceed 1.25 µg/cm².
- (3) For permeation testing of the liquid toxic industrial chemical dimethyl sulfate (DMS, sulfuric acid dimethyl ester, CAS 77-78-1), the average cumulative permeation in 1 hour shall not exceed 6.0 µg/cm².
- (4) For permeation testing of the chemical gas acrolein (allyl aldehyde, CAS 107-02-8), the average cumulative permeation in 1 hour shall not exceed 6.0 µg/cm².
- (5) For permeation testing of the chemical gas acrylonitrile (VCN, cyanoethylene, CAS 107-13-1), the average cumulative permeation in 1 hour shall not exceed 6.0 µg/cm².
- (6) For permeation testing of the chemical gas ammonia (NH₃, CAS 7664-41-7), the average cumulative permeation in 1 hour shall not exceed 6.0 µg/cm².
- (7) For permeation testing of the chemical gas chlorine (Cl₂, CAS 7782-50-5), the average cumulative permeation in one hour shall not exceed 6.0 µg/cm².

7.3.2 CBRN Protective Ensemble Garment Elements.

7.3.2.1 Garment composites shall be tested for total heat loss as specified in Section 8.6, Total Heat Loss Test, and shall have a total heat loss equal to or greater than 250 W/m².



7.3.2.2 Textile fabrics and linings used for garments shall be tested for tear resistance as specified in Section 8.7, Tear Resistance Test, and shall have a tear resistance of not less than 30 N (6.75 lbf).

7.3.2.3 Outer shell fabrics shall be tested for breaking strength as specified in Section 8.8, Breaking Strength Test, and shall have a breaking strength of not less than 400 N (90 lbf).

7.3.2.4 Garment outer shell fabrics shall be tested for abrasion resistance as specified in Section 8.9, Abrasion Resistance Test 1, and shall have an ending breaking strength of not less than 230 N (50 lbf).

7.3.2.5 Garment outer shell fabrics, liquid barrier, and liners shall be individually tested for cleaning shrinkage resistance as specified in Section 8.10, Cleaning Shrinkage Resistance Test, and shall not shrink more than 5 percent in either direction.

7.3.2.6 All garment seam assemblies shall be tested for seam strength as specified in Section 8.12, Seam Breaking Strength Test, and shall demonstrate a seam strength equal to or greater than that stipulated for the respective seam type.

7.3.2.6.1 Garment seam assemblies shall demonstrate a seam strength equal to or greater than 315 N (70 lbf) for Major A seams and 180 N (40 lbf) for Major B seams.

7.3.2.6.2 All combination woven and knit or stretch knit seam assemblies shall meet the requirements as specified in 7.3.2.6.1.

7.3.2.6.3 Seam strength shall be considered acceptable where the fabric strength is less than the required seam strength specified in 7.3.2.6.1, provided the fabric fails without seam failure below the applicable forces specified in 7.3.2.6.1.

7.3.2.7* Textile fabrics, linings, collar linings, lettering, and other materials used in garment construction, including but not limited to padding, reinforcement, interfacing, binding, and hanger loops but excluding emblems, labels, and patches, shall be individually tested for flame resistance as specified in Section 8.4, Flame Resistance Test 1, and shall not have a char length of more than 100 mm (4 in.), shall not have an after-flame of more than 2 seconds, and shall not melt or drip.

7.3.2.7.1 Zippers and seam-sealing materials shall meet the performance requirements specified in 7.3.2.7 only where located on the exterior of the garment or located where they will directly contact the wearer's body.

7.3.2.7.2 Elastic and hook and pile fasteners shall meet the performance requirements specified in 7.3.2.7 only where located where they will directly contact the wearer's body.

7.3.2.7.3 Small specimens such as hanger loops and emblems or patches that are not large enough to meet the sample size requirements in 8.4.2.1 shall be tested for resistance to flame as specified in 8.4.11 and shall not have an afterflame of more than 2 seconds, and shall not melt or drip.

7.3.2.8 Textile fabrics and linings utilized in garments shall be individually tested for thermal shrinkage resistance as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not shrink more than 10 percent in any direction.

7.3.2.9 Textile fabrics, linings, hardware, and other materials used in garment construction, including but not limited to padding,

reinforcements, wristlets, collars, labels, hanger hooks, buttons, and fasteners but excluding hook and pile fasteners not in direct contact with the skin, shall be individually tested for heat resistance in their original form as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not melt, drip, separate, or ignite; garment outer shells shall not char; and hardware items and closures shall remain functional.

7.3.2.9.1 Garment closures, including but not limited to zippers and hook and pile fasteners, shall meet the performance requirements specified in 7.3.2.9 only where they are located on the exterior of the garment or located where they will directly contact the wearer's body.

7.3.2.9.2 Liquid barrier seams shall be individually tested for resistance to heat as specified in Section 8.5, Heat and Thermal Shrinkage Resistance Test, and shall not drip or ignite.

7.3.2.10 Sewing thread utilized in the construction of garments shall be tested for heat resistance as specified in Section 8.14, Thread Heat Resistance Test, and shall not melt.

7.3.2.11 All metal hardware and hardware that includes metal parts shall be tested for corrosion resistance as specified in Section 8.15, Corrosion Resistance Test, and shall have metals that are inherently resistant to corrosion, including but not limited to stainless steel, brass, copper, aluminum, and zinc, show no more than light surface-type corrosion or oxidation; shall have ferrous metals show no corrosion of the base metal; and shall have hardware items remain functional.

7.3.2.12 Garment composites shall be tested for thermal protective performance as specified in Section 8.2, Thermal Protective Performance Test, and shall have an average TPP of 10 or greater.

7.3.2.13 Garment outer shell fabrics shall be tested for water absorption resistance as specified in Section 8.13, Water Absorption Resistance Test, and shall have a percent water absorption of 15 percent or less.

7.3.2.14 Garment composites and seams shall be tested for liquid penetration resistance as specified in Section 8.16, Liquid Penetration Resistance Test, and shall show no chemical penetration.

7.3.2.15 Garment composites and seams shall be tested for bio-penetration resistance as specified in Section 8.17, Viral Penetration Resistance Test, and shall show no viral penetration.

7.3.2.16 Garment product labels shall be tested for legibility as specified in Section 8.38, Label Durability and Legibility Test, and shall not be torn, shall remain in place, and shall be legible to the unaided eye.

7.3.2.17 Where the garment CBRN barrier layer and the CBRN barrier layer seams are also the moisture barrier and the moisture barrier seams for the garment, the garment CBRN barrier layer and CBRN barrier layer seams shall meet all the performance requirements for the moisture barrier and the moisture barrier seams in 7.3.2.5, 7.3.2.6, 7.3.2.7, 7.3.2.8, 7.3.2.9, 7.3.2.14, and 7.3.2.15.

7.3.2.18 Where the garment CBRN barrier layer and the CBRN barrier layer seams are also the external layer of the garment, the garment CBRN outer layer and CBRN outer layer seams shall meet all the performance requirements for the barrier layer and barrier layer seams in 7.3.2.3, 7.3.2.4, 7.3.2.5, 7.3.2.6, 7.3.2.7, 7.3.2.8, 7.3.2.9, and 7.3.2.18.