

NFPA 1976

Standard on Protective Ensemble for Proximity Fire Fighting

2000 Edition



National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 1976

Standard on

Protective Ensemble for Proximity Fire Fighting

2000 Edition

This edition of NFPA 1976, *Standard on Protective Ensemble for Proximity Fire Fighting*, was prepared by the Technical Committee on Specialized Fire-Fighting Applications Protective Clothing and Equipment, released by the Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment, and acted on by the National Fire Protection Association, Inc., at its November Meeting held November 14–17, 1999, in New Orleans, LA. It was issued by the Standards Council on January 14, 2000, with an effective date of February 11, 2000, and supersedes all previous editions.

This edition of NFPA 1976 was approved as an American National Standard on February 11, 2000.

Origin and Development of NFPA 1976

This document was the first from the Technical Committee on Fire Service Protective Clothing and Equipment to address speciality protective clothing for fire-fighting operations other than structural fire fighting.

It is intended to provide thermal protection from high levels of radiant heat as well as thermal protection from conductive and convective heat present during proximity fire-fighting operations such as those involving bulk flammable liquids, bulk flammable gases, bulk flammable material, and during aircraft rescue and fire fighting.

The Subcommittee on Proximity Protective Clothing began their work in 1987 and passed their work on to the Technical Committee in January 1991. The first edition was presented to the Association at the 1992 Annual Meeting in New Orleans, LA and became effective on August 14, 1992.

Since the first edition, the entire project for fire service protective clothing and equipment was recognized in January 1995 by the Standards Council. The new project has a Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment and seven technical committees operating within the Project. The former standing Subcommittee on Proximity Protective Clothing was established as the new Technical Committee on Specialized Fire-Fighting Applications Protective Clothing and Equipment and has responsibility for NFPA 1976.

This second edition, with the new title of *Standard on Protective Ensemble for Proximity Fire Fighting*, represents a complete revision to the first edition and addresses the protection as an ensemble rather than separate items. This edition establishes requirements for all ensemble elements, including helmets, garments, shrouds, gloves, and footwear. This second edition was presented to the Association membership at the 1999 Fall Meeting in New Orleans, LA on November 17, 1999, and was issued by the Standards Council with an effective date of February 11, 2000.

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

Committee Scope: This Committee shall have primary responsibility for documents on 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 protective clothing and protective equipment, except respiratory protective equipment, that provides hand, foot, torso, limb, head, and interface protection for fire fighters or other emergency services responders during incidents that include, but are not limited to, bulk flammable gas fires, bulk flammable liquid fires, flammable metal fires, nuclear fuel fires, exotic fuel fires, that present an unusual or extraordinary danger to personnel and involve highly specialized fire-fighting operations. These operations include the activities of rescue, fire suppression, and property conservation during fires producing very high levels of conductive, convective, or radiant heat or any combination thereof.

Additionally, this committee shall have primary responsibility for documents on the selection, care, and maintenance of specialized fire-fighting applications, protective clothing and protective equipment by fire and emergency services organizations and personnel.

Contents

Chapter 1 Administration	1976- 5	6-12 Conductive and Compressive Heat Resistance Test (CCHR)	1976-38
1-1 Scope	1976- 5	6-13 Thermal Protective Performance (TPP) Test	1976-39
1-2 Purpose	1976- 5	6-14 Thread Melting Test	1976-43
1-3 Definitions	1976- 5	6-15 Tear Resistance Test	1976-43
1-4 Units	1976- 8	6-16 Burst Strength Test	1976-43
Chapter 2 Certification	1976- 9	6-17 Seam Breaking Strength Test	1976-44
2-1 General	1976- 9	6-18 Top Impact Resistance Test (Force)	1976-44
2-2 Certification Organization	1976- 9	6-19 Impact Resistance Test (Acceleration)	1976-46
2-3 Inspection and Testing	1976- 9	6-20 Faceshield Component Resistance Test	1976-48
2-4 Recertification	1976-11	6-21 Impact and Compression Tests	1976-49
2-5 Manufacturer's Quality Assurance Program	1976-12	6-22 Physical Penetration Resistance Test	1976-49
2-6 ISO Registration for Manufacturers	1976-12	6-23 Puncture Resistance, Test One	1976-49
Chapter 3 Labeling and Information	1976-12	6-24 Puncture Resistance, Test Two	1976-50
3-1 Product Label Requirements	1976-12	6-25 Cut Resistance Test	1976-50
3-2 User Information	1976-13	6-26 Abrasion Resistance Test	1976-50
Chapter 4 Design Requirements	1976-13	6-27 Cleaning Shrinkage Resistance Test	1976-50
4-1 Proximity Protective Garment Design Requirements	1976-13	6-28 Water Penetration Test	1976-51
4-2 Protective Helmet Design Requirements ..	1976-14	6-29 Liquid Penetration Resistance Test	1976-52
4-3 Protective Glove Design Requirements ...	1976-15	6-30 Viral Penetration Resistance Test	1976-52
4-4 Proximity Protective Footwear Design Requirements	1976-17	6-31 Wet Flex	1976-53
4-5 Protective Wristlet Interface Component Design Requirements	1976-18	6-32 Adhesion After Wet Flex-Tape Method ...	1976-54
4-6 Accessory Design Requirements	1976-18	6-33 Flex at Low Temperature	1976-54
Chapter 5 Performance Requirements	1976-18	6-34 Resistance to High-Temperature Blocking	1976-55
5-1 Proximity Protective Garment Performance Requirements	1976-18	6-35 Corrosion Resistance Test	1976-55
5-2 Proximity Protective Helmet Performance Requirements	1976-19	6-36 Electrical Insulation Test One	1976-55
5-3 Proximity Protective Glove Performance Requirements	1976-20	6-37 Electrical Insulation Test Two	1976-56
5-4 Protective Footwear Performance Requirements	1976-21	6-38 Overall Liquid Integrity Test One	1976-56
5-5 Protective Wristlet Interface Component Performance Requirements	1976-22	6-39 Overall Liquid Integrity Test Two	1976-57
Chapter 6 Test Methods	1976-23	6-40 Retention System Test	1976-57
6-1 Sample Preparation Procedures	1976-23	6-41 Suspension System Retention Test	1976-58
6-2 Flame Resistance, Test One	1976-24	6-42 Liner Retention Test	1976-58
6-3 Flame Resistance, Test Two	1976-25	6-43 Glove Hand Function Tests	1976-59
6-4 Flame Resistance, Test Three	1976-26	6-44 Grip Test	1976-60
6-5 Flame Resistance, Test Four	1976-27	6-45 Ladder Shank Bend Resistance Test	1976-60
6-6 Heat and Thermal Shrinkage Resistance Test	1976-28	6-46 Slip Resistance Test	1976-61
6-7 Conductive Heat Resistance, Test One ...	1976-31	6-47 Label Durability and Legibility Test One ..	1976-61
6-8 Conductive Heat Resistance, Test Two ...	1976-32	6-48 Label Durability and Legibility Test Two ..	1976-62
6-9 Radiant Heat Resistance, Test One	1976-32	6-49 Shell Retention Test	1976-62
6-10 Radiant Reflective, Test Two	1976-32	6-50 Luminous (Visible) Transmittance Test ...	1976-62
6-11 Radiant Heat Transmittance, Test Three ..	1976-37	6-51 Helmet Shroud Opening Size Retention Test	1976-63
		6-52 Whole Garment Liquid Penetration Test ..	1976-63
		6-53 Eyelet and Stud Post Attachment Test ...	1976-65
		Chapter 7 Referenced Publications	1976-65
		Appendix A Explanatory Material	1976-66
		Appendix B Referenced Publications	1976-71
		Index	1976-72

NFPA 1976**Standard on****Protective Ensemble for Proximity
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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Appendix A.

Information on referenced publications can be found in Chapter 7 and Appendix B.

Chapter 1 Administration**1-1* Scope.**

1-1.1 This standard shall specify the minimum design, performance, and certification requirements and the test methods for proximity protective ensembles, including protective coats, protective trousers, protective coveralls, helmets, gloves, footwear, and interface components.

1-1.2 This standard shall apply to the design, manufacturing, and certification of new proximity protective ensembles or new individual elements of the proximity protective ensemble. This standard shall not apply to proximity fire-fighting protective clothing and equipment manufactured to comply with previous editions of NFPA 1976, *Standard on Protective Clothing for Proximity Fire Fighting*.

1-1.3 This standard shall not apply to protective clothing or ensembles for structural or wildland fire-fighting operations, for entry specialized fire-fighting operations, or for hazardous materials emergency operations. This standard shall not apply to protection from radiological agents, protection from all biological agents, or protection from all hazardous chemicals.

1-1.4 This standard shall not apply to the use of proximity fire-fighting protective clothing and equipment, since these requirements are specified in NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

1-1.5 Certification of the proximity fire-fighting protective ensemble, or individual elements of the protective ensemble, to the requirements of this standard shall not preclude certification to additional appropriate standards where the protective ensemble or elements of the protective ensemble meet all applicable requirements of each standard.

1-1.6 The requirements of this standard shall not apply to accessories that might be attached to any element of the proximity fire-fighting protective ensemble unless specifically addressed herein.

1-1.7 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 a minimum level of protection against adverse environmental conditions during proximity fire-fighting incidents that release high levels of radiant heat as well as convective and conductive heat.

1-2.2* Controlled laboratory tests used to determine compliance with the performance requirements of this standard shall not be deemed as establishing performance levels for all situations to which proximity fire-fighting personnel can be exposed.

1-2.3 This standard is not intended to be used as a detailed manufacturing or purchase specification but shall be permitted to be referenced in purchase specifications as minimum requirements.

1-3 Definitions.

1-3.1* Accessories. Those items that are attached to a proximity protective ensemble element but designed in such a manner to be removable from the proximity protective ensemble element and that are not necessary to meet the requirements of this standard.

1-3.2 Aircraft Rescue and Fire Fighting. The fire-fighting actions, performed both inside and outside of aircraft, that are taken to rescue persons and to control or extinguish fire involving or adjacent to aircraft on the ground.

1-3.3* Approved. Acceptable to the authority having jurisdiction.

1-3.4 Arch. A footwear term; the bottom curve of the foot, from the heel to the ball.

1-3.5* Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

1-3.6 Barrier Material. A single-layer fabric or a laminated or coated, multilayer material considered as a single-layer fabric that limits transfer from the face of the layer to the other side.

1-3.7 Basic Plane. The anatomical plane that includes the superior rim of the external auditory meatus, the upper edge of the external openings of the ear, and the inferior margin of the orbit, which is the lowest point of the floor of the eye socket.

1-3.8 Basic Weight. The weight of the helmet, including all components specified in 4-2.2.

1-3.9 Biological Agents. Biological materials that could be capable of causing a disease or long-term damage to the human body.

1-3.10* Bitragion Coronal Arc. The arc between the right and left trignon as measured over the top of the head in a plane perpendicular to the midsagittal plane.

1-3.11* Bitragion Inion Arc. The arc between trignon as measured over the inion; for test purposes, the bitragion inion arc is identified as Datum plane 10 in Figures 6-18.4.1(a) through (c).

1-3.12 Body Fluids. Fluids 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.

1-3.13 Brim. That part of the helmet shell extending around the entire circumference of the helmet.

1-3.14 Brim Line. The horizontal plane intersecting the point of the front opening of the helmet at the midsagittal plane.

1-3.15 Cargo Pockets. Pockets located on the proximity protective garment exterior.

1-3.16 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 require-

ments 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 compliance with the requirements of this standard.

1-3.17 Certification Organization. An independent, third-party organization that determines product compliance with the requirements of this standard with a labeling/listing/follow-up program.

1-3.18 Char. The formation of a brittle residue when material is exposed to thermal energy.

1-3.19 Chin Strap. A helmet term for the adjustable strap, fitting under the chin, to help secure the helmet to the head.

1-3.20 Coat. See definition 1-3.86, *Proximity Protective Coat*.

1-3.21 Collar. The portion of a coat or coverall that encircles the neck.

1-3.22 Collar Lining. That part of collar fabric composite that is next to the skin when the collar is closed in the raised position.

1-3.23 Compliance/Compliant. Meeting or exceeding all applicable requirements of this standard.

1-3.24 Component. Any material, part, or subassembly used in the construction of the protective ensemble or any element of the protective ensemble. (See also definition 1-3.62, *Interface Components*.)

1-3.25 Composite. The layer or combination of layers of the protective ensemble or any element of the proximity protective ensemble that provides the required protection.

1-3.26 Coronal Plane. The anatomical plane perpendicular for both the basic and midsagittal planes and containing the midpoint of a line connecting the superior rims of the right and left auditory meatuses.

1-3.27 Coverall. See definition 1-3.87, *Proximity Protective Coverall*.

1-3.28 Crown. The portion of the helmet that covers the head above the reference plane.

1-3.29 Crown Straps. The part of the helmet suspension that passes over the head.

1-3.30 Dielectric Test Plane. The plane that runs from the intersection of the helmet test line and midsagittal plane in the front of the headform diagonally through the headform to the intersection of the reference plane and midsagittal plane in the rear of the headform.

1-3.31 Drip. To run or fall in drops or blobs.

1-3.32 Elements. The parts or items that comprise the protective ensemble. The protective ensemble elements are coats, trousers, coveralls, helmets, gloves, footwear, and interface components.

1-3.33 Energy Absorbing System. The material, suspension system, or combination thereof incorporated into the design of the helmet to attenuate impact energy.

1-3.34 Ensemble. See definition 1-3.82, *Protective Ensemble*.

1-3.35* Entry Fire Fighting. Extraordinarily specialized fire-fighting operations that can include the activities of rescue, fire suppression, and property conservation at incidents involving fires producing extreme levels of radiant, conductive, and convective heat. (See also definitions 1-3.84, *Proximity Fire Fighting*, and 1-3.114, *Structural Fire Fighting*.)

1-3.36 Eye/Face Positioning Index. The vertical distance, as specified by the helmet manufacturer, from the top lateral midpoint of the faceshield components to the basic plane of

the Alderson 50th percentile adult male headform where the faceshield component is positioned on the headform.

1-3.37 Faceshield. A helmet component not intended as primary eye protection, but to help protect a portion of the wearer's face in addition to the eyes.

1-3.38 Flame Resistance. The property of a material whereby the application of a flaming or nonflaming source of ignition and the subsequent removal of the ignition source results in the termination of combustion. Flame resistance can be an inherent property of the material, or it can be imparted by specific treatment.

1-3.39 Follow-up Program. The sampling, inspection, tests, or other measures conducted by the certification organization on a periodic basis to determine the continued compliance of products listed that are being produced by the manufacturer to the requirements of this standard.

1-3.40 Footwear. See definition 1-3.89, *Proximity Protective Footwear*.

1-3.41 Functional. The ability of an element or component of an element to continue to be used for its intended purpose.

1-3.42 Garment(s). See definition 1-3.90, *Proximity Protective Garment*.

1-3.43 Gauntlet. A glove term for the circular, flared, or otherwise expanded part of the glove that extends beyond the opening of the glove body. (See also definition 1-3.46, *Glove Wristlet*.)

1-3.44 Glove, Body. The part of the glove that extends from the tip of the fingers to 25 mm (1 in.) beyond the wrist crease.

1-3.45 Glove, Liner. The innermost component of the glove body composite that comes into contact with the wearer's skin.

1-3.46 Glove, Wristlet. The circular, close-fitting part of the glove, usually made of knitted material, that extends beyond the opening of the glove body. (See also definitions 1-3.43, *Gauntlet*, and 1-3.128, *Wristlet*.)

1-3.47 Gloves. See definition 1-3.91, *Proximity Protective Glove*.

1-3.48 Hardware. Nonfabric components of the proximity protective ensemble including, but not limited to, those made of metal or plastic.

1-3.49 Hazardous Chemicals. Any solid, liquid, gas, or mixture thereof that can potentially cause harm to the human body through respiration, ingestion, skin absorption, injection, or contact.

1-3.50 Hazardous Materials Emergencies. Incidents involving the release or potential release of hazardous chemicals into the environment that can cause loss of life, personnel injury, or damage to property and the environment.

1-3.51 Headband. The portion of the helmet suspension that encircles the head.

1-3.52 Headform. A device that simulates the configuration of the human head.

1-3.53 Helmet. See definition 1-3.92, *Proximity Protective Helmet*.

1-3.54 Helmet Outer Cover. A removable helmet component that offers radiant reflective protection to the exterior of the helmet shell.

1-3.55 Helmet Positioning Index. The vertical distance, as specified by the helmet manufacturer, from the lowest point of the brow at the lateral midpoint of the helmet to the basic plane of the ISO Size J headform when the helmet is firmly positioned on the headform.

1-3.56 Helmet Shroud. A component of the helmet element of the proximity protective ensemble designed to provide radiant reflective heat protection for the head and neck area.

1-3.57 Hood. See definition 1-3.93, *Proximity Protective Hood*.

1-3.58 Horizontal Center Plane. The plane that passes through the helmet and whose intersection with the helmet surface is equidistant from the top of the helmet at all points.

1-3.59 Inherent Flame Resistance. As applied to textiles, flame resistance that is derived from an essential characteristic of the fiber or polymer from which the textile is made.

1-3.60 Insole. The inner part of the footwear upon which the foot rests and that conforms to the bottom of the foot.

1-3.61 Interface Area. An area of the body where the proximity protective garments, helmet, gloves, footwear, or SCBA facepiece meet (i.e., the protective coat-helmet-SCBA facepiece area, the protective coat-protective trouser area, the protective coat-glove area, and the protective trouser-footwear area).

1-3.62 Interface Components. Elements of the proximity protective ensemble that are designed to provide limited protection to interface areas.

1-3.63 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. (See also definition 1-3.81, *Product Label*.)

1-3.64 Ladder Shank. Reinforcement to the shank area of footwear designed to provide additional support to the instep when standing on a ladder rung.

1-3.65 Liquid Borne Pathogen. An infectious bacteria or virus carried in human, animal, or clinical body fluids, organs, or tissues.

1-3.66* 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.

1-3.67 Lower Torso. The area of body below the waist including the legs but excluding the ankles and feet.

1-3.68 Major A Seams. See definition 1-3.103, *Seams (Major A)*.

1-3.69 Major B Seams. See definition 1-3.104, *Seams (Major B)*.

1-3.70 Manufacturer. The entity that assumes the liability and provides the warranty for the compliant product.

1-3.71 Melt. A response to heat by a material, resulting in evidence of flowing or dripping.

1-3.72 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.

1-3.73 Minor Seams. See definition 1-3.105, *Seams (Minor)*.

1-3.74 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 manufac-

turing and quality assurance procedures that are covered by the same certification.

1-3.75 Model Weight. The basic weight of the helmet plus accessories for the specific model identified.

1-3.76 Moisture Barrier. The portion of the composite designed to prevent the transfer of liquids.

1-3.77 Nape Device. A device located below the bitrignon inion arc used to aid in helmet retention.

1-3.78 Outer Cover. See definition 1-3.54, *Helmet Outer Cover*.

1-3.79 Outer Shell. The outermost layer of the composite with the exception of trim, hardware, reinforcing material, and wristlet material.

1-3.80 Product. The compliant proximity protective ensemble or the compliant elements of the proximity protective ensemble.

1-3.81 Product Label. A label or marking affixed to each compliant element of a proximity protective ensemble by the manufacturer. Such labels contain compliance statements, certification statements, general information, care, maintenance, or similar data. The product label is not the certification organization's label, symbol, or identifying mark; however, the certification organization's label, symbol, or identifying mark can be attached to or be part of the product label. (See also definition 1-3.63, *Labeled*.)

1-3.82 Protective Ensemble. A term that is synonymous with the term *proximity protective ensemble*. See definition 1-3.88, *proximity protective ensemble*.

1-3.83 Protective Wristlet. See definition 1-3.128, *Wristlet*.

1-3.84* Proximity Fire Fighting. Specialized fire-fighting operations that can include the activities of rescue, fire suppression, and property conservation at incidents involving fires producing high levels of radiant heat as well as conductive and convective heat. (See also definitions 1-3.35, *Entry Fire Fighting*, and 1-3.114, *Structural Fire Fighting*.)

1-3.85 Proximity Protective Clothing. See definition 1-3.88, *Proximity Protective Ensemble*.

1-3.86 Proximity Protective Coat. A proximity protective garment; an element of the proximity protective ensemble designed to provide minimum protection to upper torso and arms, excluding the hands and head.

1-3.87 Proximity Protective Coverall. A proximity protective garment; an element of the protective ensemble configured as a single-piece garment and designed to provide minimum protection to the torso, arms, and legs, excluding the head, hands, and feet.

1-3.88 Proximity Protective Ensemble. Multiple elements of clothing and equipment (coats, trousers, coveralls, helmets, gloves, footwear, and interface components) designed to provide a degree of protection for fire fighters from adverse exposures to the inherent risks of proximity fire-fighting operations and certain other emergency operations where high levels of radiant heat, as well as convective and conductive heat, are a hazard.

1-3.89* Proximity Protective Footwear. An element of the proximity protective ensemble designed to provide minimum protection to the foot, ankle, and lower leg.

1-3.90 Proximity Protective Garment. The coat, trouser, or coverall elements of the proximity protective ensemble designed to provide minimum protection to the upper and lower torso, arms, and legs, excluding the head, hands, and feet.

1-3.91 Proximity Protective Glove. An element of the proximity protective ensemble designed to provide minimum protection to the fingers, thumb, hand, and wrist.

1-3.92 Proximity Protective Helmet. An element of the proximity protective ensemble designed to provide minimum protection to the head.

1-3.93 Proximity Protective Hood. The interface component element of the proximity protective ensemble designed to provide limited protection to the coat–helmet–SCBA facepiece interface area. (See also definition 1-3.62, *Interface Components*.)

1-3.94 Proximity Protective Trouser. A proximity protective garment; an element of the proximity protective ensemble that is designed to provide minimum protection to the lower torso and legs, excluding the ankles and feet.

1-3.95 Puncture-Resistant Device. The reinforcement to the bottom of footwear located between the sole with heel and the insole that is designed to provide puncture resistance.

1-3.96 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.

1-3.97 Recall System. The action taken by which a manufacturer identifies an element, provides notice to the users, withdraws an element from the marketplace and distribution sites, and the element is returned to the manufacturer or other acceptable location for corrective action.

1-3.98 Reference Plane. The plane that is 102.5 mm down from the top of the head and parallel to the basic plane on an ISO size J headform.

1-3.99 Retention System. The complete assembly by which the helmet is retained in position on the head.

1-3.100 Sample. Proximity protective ensemble elements taken from a manufacturer's current production lot. (See also definition 1-3.112, *Specimen*.)

1-3.101 Seam. Any permanent attachment of two or more materials in a line formed by joining the separate material pieces.

1-3.102 Seam Assembly. The structure obtained when fabrics are joined by means of a seam.

1-3.103 Seams (Major A). Outer shell layer seam assemblies where rupture could reduce the protection of the garment by exposing the inner layers such as the moisture barrier, the thermal barrier, the wearer's station/work uniform, other clothing, or skin.

1-3.104 Seams (Major B). Moisture barrier or thermal barrier 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.

1-3.105 Seams (Minor). Remaining seam assemblies that are not classified as Major A or Major B seams.

1-3.106 Separate. A material response evidenced by splitting or delaminating.

1-3.107 Shall. Indicates a mandatory requirement.

1-3.108 Shank. Reinforcement to the area of protective footwear designed to provide additional support to the instep.

1-3.109 Shell. The outermost layer of the proximity protective ensemble element composite. (See also definition 1-3.79, *Outer Shell*.)

1-3.110 Should. Indicates a recommendation or that which is advised but not required.

1-3.111 Shroud. See definition 1-3.56, *Helmet Shroud*.

1-3.112 Specimen. The item that undergoes testing; in some cases, the specimen is also the sample.

1-3.113 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 shall be located in an appendix, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

1-3.114 Structural Fire Fighting. The activities of rescue, fire suppression, and property conservation in buildings, enclosed structures, vehicles, marine vessels, or like properties that are involved in a fire or emergency situation.

1-3.115 Suspension. The energy attenuating system made up of the helmet headband and crown strap.

1-3.116 Sweatband. That part of a helmet headband, either integral or attached, that comes in contact with the wearer's forehead.

1-3.117 Textile Fabric. A planar structure consisting of yarns or fibers.

1-3.118 Thermal Barrier. The portion of proximity protective ensemble element composites that is designed to provide thermal protection.

1-3.119 Toecap. The reinforcement to the toe area of footwear designed to protect the toes from impact and compression.

1-3.120 Top. The intersection between the midsagittal plane and the coronal plane extended to the helmet surface.

1-3.121 Top Line. The top edge of footwear that includes the tongue, gusset, quarter, collar, and shaft.

1-3.122 Trouser. See definition 1-3.94, *Proximity Protective Trouser*.

1-3.123 Upper. The part of footwear [as shown in Figure A-1-3(c)] including, but not limited to, the toe, vamp, quarter, shaft, collar, and throat; but not including the sole with heel, puncture-resistant device, and insole.

1-3.124 Upper Torso. The area of body above the waist and extending to the shoulder, including the arms and wrists but excluding the hands.

1-3.125 Wear Surface. The bottom of the footwear sole, including the heel.

1-3.126 Wildland Fire Fighting. The activities of fire suppression and property conservation in vegetation that are not within structures but that are involved in a fire situation.

1-3.127 Winter Liner. An optional component layer for a garment designed to provide added insulation against cold.

1-3.128 Wristlet. An interface component element of the proximity protective ensemble that is the circular, close-fitting extension of the coat sleeve, usually made of knitted material, designed to provide limited protection to the protective coat-glove interface area. (See also definitions 1-3.43, *Gauntlet*; 1-3.46, *Glove Wristlet*; and 1-3.62, *Interface Components*.)

1-4 Units.

1-4.1 In this standard, values for measurement are followed by an equivalent in parentheses, but only the first stated value shall be regarded as the requirement.

1-4.2 Equivalent values in parentheses shall not be considered as the requirement, as these values might be approximate.

Chapter 2 Certification

2-1 General.

2-1.1 All individual elements of the proximity protective ensemble that are labeled as being compliant with this standard shall meet or exceed all applicable requirements specified in this standard and shall be certified. Manufacturers shall not claim compliance with a portion(s) or segment(s) of the requirements of this standard and shall not use the name or identification of this standard, NFPA 1976, in any statements about their respective products unless the product is certified to this standard.

2-1.2 All certification shall be performed by a certification organization that meets at least the requirements specified in Section 2-2 and that is accredited for personal protective equipment in accordance with ANSI Z34.1, *American National Standard for Third-Party Certification Programs for Products, Processes, and Services*.

2-1.3 All individual compliant elements of the proximity protective ensemble shall be labeled and listed. All individual compliant elements of the proximity protective ensemble shall also have a product label. The product label shall meet the applicable requirements for the specific element specified in 3-1.1 and 3-2.1.

2-1.4* The certification organization's label, symbol, or identifying mark shall be attached to the product label or shall be part of the product label.

2-1.5 The certification organization shall not certify any proximity protective ensembles or individual elements of the proximity protective ensemble to the 1992 edition of NFPA 1976 on or after 1 September 2000.

2-1.6 The certification organization shall not permit any manufacturer to label any proximity protective ensembles or individual elements of the proximity protective ensemble as compliant with the 1992 edition of this standard on or after 1 September 2000.

2-1.7 The certification organization shall require manufacturers to remove all certification labels and product labels indicating compliance with the 1992 edition of NFPA 1976 from all proximity protective ensembles or individual elements of the proximity protective ensemble that are under the control of the manufacturer on 1 September 2000. The certification organization shall verify this action is taken.

2-2 Certification Organization.

2-2.1* The certification organization shall not be owned or controlled by manufacturers or vendors of the product being certified. The certification organization shall be primarily engaged in certification work and shall not have a monetary interest in the product's ultimate profitability.

2-2.2 The certification organization shall refuse to certify products to this standard that do not comply with all applicable requirements of this standard.

2-2.3* 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. There shall be no conditional, temporary, or partial certifications. Manufacturers shall not be authorized to use any label or reference to the certification

organization on products that are not manufactured in compliance with all applicable requirements of this standard.

2-2.4* The certification organization shall have laboratory facilities and equipment available for conducting proper tests, a program for calibration of all instruments shall be in place and operating, and procedures shall be in use to ensure proper control of all testing. Good practice shall be followed regarding the use of laboratory manuals, form data sheets, documented calibration and calibration routines, performance verification, proficiency testing, and staff qualification and training programs.

2-2.5 The certification organization shall require the manufacturer to establish and maintain a program of production inspection and testing that at least meets the requirements specified in Section 2-5 or Section 2-6. 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.

2-2.6 The certification organization and the manufacturer shall evaluate any changes affecting the form, fit, or function of the certified product to determine the product's continued compliance to this standard.

2-2.7* The certification organization shall have a follow-up inspection program of the manufacturing facilities of the certified product, with at least two random and unannounced visits per 12-month period. As part of the follow-up inspection program, the certification organization shall select sample product at random from the manufacturer's production line, from the manufacturer's in-house stock, or from the open market. The certification organization shall have a statistically validated process for determining the critical inspections and tests to be conducted through this follow-up program to verify the continued compliance of the product or component.

2-2.8 The certification organization shall have a program for investigating field reports alleging malperformance or failure of listed products.

2-2.9* The certification organization shall require the manufacturer to have a product recall system as part of the manufacturer's quality assurance program.

2-2.10 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.

2-2.11 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.

2-3 Inspection and Testing.

2-3.1 For both certification and recertification of ensembles, ensemble elements, and components, the certification organization shall conduct both inspection and testing as specified in this section.

2-3.2 All inspections, evaluations, conditioning, and testing for certification or for recertification shall be conducted by the certification organization or by a facility accredited by the certification organization for inspections, evaluations, conditioning, and testing in accordance with all requirements pertaining to testing laboratories in ISO Guide 25, *General requirements for the competence of calibration and testing laboratories*.

2-3.3 All inspections, evaluations, conditioning, or testing conducted by a product manufacturer shall not be used in the certification or recertification process unless the facility for inspections, evaluations, conditioning, or testing has been accredited by the certification organization in accordance with all requirements pertaining to testing laboratories in ISO Guide 25, *General requirements for the competence of calibration and testing laboratories*.

2-3.4 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. Information about sampling levels shall be provided to the purchaser upon request.

2-3.4.1 For certification of helmets, a test series shall consist of 14 helmets. A minimum of three test series shall be required for certification. Each helmet shall be subjected to the environmental conditioning and test or tests specified in Tables 2-3.4.1(a) and (b).

2-3.4.2 The order of testing shall be from left to right in Tables 2-3.4.1(a) and (b). Where there is more than one environmental condition for a specific test, the order of environmental conditioning for that test shall be from top to bottom in Tables 2-3.4.1(a) and (b).

2-3.4.3 For certification of interface components, the required testing and conditioning of the shroud and wristlet, materials, and components shall be specified as shown in Table 2-3.4.3.

2-3.5 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 specific protective ensemble element in Sections 3-1 and 3-2.

2-3.6 Inspection by the certification organization shall include a review of any graphic representations used on product labels, as permitted by 3-1.5, to ensure that the symbols are consistent with the worded statements, readily understood, and clearly communicate the intended message.

2-3.7 Inspection by the certification organization shall include a review of the user information required by Section 3-2 to ensure that the information has been developed and is available.

2-3.8 Inspection by the certification organization for determining compliance with the design requirements specified in Chapter 4 shall be performed on whole or complete products. The certification organization shall report on the compliance of each element to each design requirement specified in Chapter 4 for that element.

Table 2-3.4.1(a) Protective Helmet Test Matrix

Test	Helmet & FS Flame Resistance	Heat Resistance	Retention	Electrical Resistance	Shell Retention	Faceshield Luminous Transmittance	Faceshield Radiant Reflective Test	Faceshield Impact	Top Impact	Label	Impact Acceleration	Penetration	Radiant Transmittance Heat Test	Hardware Corrosion
Section	6-3	6-6	6-40 6-41	6-36	6-49	6-50	6-10	6-20	6-18	6-48	6-19	6-22	6-11	6-35
Environmental Conditioning														
Room Temperature (See 6-1.3)	1	2	1	4	13	6	15	3	3	2	5	3	15	
Wet (See 6-1.7)								4	4	4	6	4		
Radiant (See 6-1.6)									7	7	8	14		
Low Temperature (See 6-1.4)								9	9	9	10	9		
Convective Heat (See 6-1.5)								13	11			12		
Salt Spray (See 6-30)														3,4,9

Table 2-3.4.1(b) Protective Helmet Covers and Shroud Test Matrix

Test	Helmet Covers & Shroud Radiant Reflective Test	Helmet Covers & Shroud Wet Flex Test	Helmet Covers & Shroud Flex at Low Temp	Helmet Covers & Shrouds High Temp Blocking Test	Shroud TPP	Helmet Cover Tear Resistance	Helmet Shroud Tear Resistance	Helmet Covers & Shroud Flame Resistance	Helmet Covers & Shroud Heat Resistance	Thread Melting Test
Section	6-10	6-31	6-33	6-34	6-13	6-15	6-15	6-2	6-6	6-14
Environmental Conditioning										
Room Temperature (See 6-1.3)	X	X	X	X	X	X		X	X	X
Washing & Drying (See 6-1.2)							X	X	X	

Table 2-3.4.3 Protective Shroud and Wristlet Test Matrix

Test	Flame Resistance	Heat/Thermal Shrinkage Resistance	Heat Resistance	Radiant Reflexive	TPP	Thread Melting	Burst Strength	Seam Strength	Cleaning Shrinkage
Section	6-2	6-6	6-6	6-10	6-13	6-14	6-16	6-17	6-27
Test Material or Component									
Shroud material or composite	X	X	X		X		X		X
Shroud seams								X	
Shroud thread						X			
Wristlet material or composite	X	X	X		X		X		X
Wristlet seams								X	
Wristlet thread						X			
Environmental Condition									
Washing/drying (See 6-1.2)	X	X	X		X				X
Room temperature (See 6-1.3)	X	X	X		X	X	X	X	X

2-3.9 Testing conducted by the certification organization in accordance with the testing requirements of Chapter 6, for determining product compliance with the applicable performance requirements specified in Chapter 5, shall be performed on element samples or element sample specimens that are representative of materials and components used in the actual construction of protective ensemble element products. The certification organization also shall be permitted to use sample materials cut or taken from a representative product.

2-3.10 Where certification testing includes an element with an accessory or accessories, each accessory shall be certified as complying with Section 4-6.

2-3.11 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.

2-3.12 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. The certification organization shall not allow test specimens that have been conditioned and tested for one test method to be reconditioned and tested for another test method unless specifically permitted in the test method.

2-3.13 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.

2-4 Recertification.

2-4.1 All individual elements of the protective ensemble that are labeled as being compliant with this standard shall undergo recertification on an annual basis. The recertification shall include the following:

- (1) Inspection and evaluation to all design requirements and testing to all performance 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 with the following protocol:
 - a. Where a test method incorporates testing both before and after laundering preconditioning specified in 6-1.2 and the test generates quantitative results, recertification testing shall be limited to the conditioning that yielded in 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 laundering preconditioning specified in 6-1.2 and the test generates nonquantitative results (e.g., pass/fail for melt/drip), recertification shall be limited to a single conditioning procedure in any given year. Subsequent annual recertification 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 of these 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.

2-4.1.1 Any change that affects the element's performance under the design or performance requirements of this standard shall constitute a different model.

2-4.1.2 For the purpose of this standard, models shall include each unique pattern, style, or design of the individual element.

2-4.2 Samples of manufacturer models and components for recertification shall be acquired as part of the follow-up program, in accordance with 2-2.7, and shall be permitted to be used toward annual recertification.

2-4.3 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.

2-5 Manufacturer's Quality Assurance Program.

2-5.1 The manufacturer shall provide and maintain a quality assurance program that includes a documented inspection and product recall system. The manufacturer shall have an inspection system to substantiate conformance to this standard.

2-5.2 The manufacturer shall maintain written inspection and testing instructions. The instructions shall prescribe inspection and testing of materials, work in process, and completed articles. Criteria for acceptance and rejection of materials, processes, and final product shall be part of the instructions.

2-5.3 The manufacturer shall maintain records of all pass/fail tests. Pass/fail records shall indicate the disposition of a failed material or product.

2-5.4 The manufacturer's inspection system shall provide for procedures that ensure the latest applicable drawings, specifications, and instructions are used for fabrication, inspection, and testing.

2-5.5 As part of the quality assurance program, the manufacturer shall maintain a calibration program of all instruments used to ensure proper control of testing. The calibration program shall document the date of calibration and performance verification.

2-5.6 The manufacturer shall maintain a system for identifying the appropriate inspection status of component materials, work in process, and finished goods.

2-5.7 The manufacturer shall establish and maintain a system for controlling nonconforming material, including procedures for the identification, segregation, and disposition of rejected material. All nonconforming materials or products shall be identified to prevent their use, shipment, and intermingling with conforming materials or products.

2-5.8 The manufacturer's quality assurance program shall be audited by the third-party certification organization to determine that the program is sufficient to ensure continued product compliance with this standard.

2-6 ISO Registration for Manufacturers.

2-6.1 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 2-2.9.

2-6.2 The manufacturer shall be registered to ISO 9001, *Quality Systems — Model for Quality Assurance in Design, Development, Production, Installation, and Servicing*.

2-6.3 The ISO registration requirements shall have an effective date of 1 March 2002.

2-6.4 Until 1 March 2002 or until the date the manufacturer becomes ISO registered, whichever date occurs first, the manufacturer shall comply with Section 2-5.

Chapter 3 Labeling and Information

3-1 Product Label Requirements.

3-1.1* Each element of the protective ensemble shall have at least one product label permanently and conspicuously located inside each element when the element is properly assembled with all layers and components in place.

3-1.2 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 comprising the product label shall be located adjacent to each other.

3-1.3* 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.

3-1.4 All worded portions of the required product label shall be printed at least in English.

3-1.5 Symbols and other pictorial graphic representations shall be permitted to be used to supplement worded statements on the product label(s).

3-1.6 The following compliance statement shall be printed legibly on the product label. The appropriate term for the element type (garment, helmet, glove, footwear) shall be inserted in the compliance statement text where indicated. All letters shall be at least 2.5 mm ($\frac{3}{32}$ in.) in height.

“THIS (insert appropriate element term here) MEETS THE (insert appropriate element term here) REQUIREMENTS OF NFPA 1976, STANDARD ON PROTECTIVE ENSEMBLE FOR PROXIMITY FIRE FIGHTING, 2000 EDITION. DO NOT REMOVE THIS LABEL”

3-1.7 The following information shall also be printed legibly on the product label with all letters at least 1.5 mm ($\frac{1}{16}$ in.) in height:

- (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) Principle material(s) of construction
- (9) Cleaning precautions

3-1.8 Where other protective item(s) or detachable components must be used with proximity protective ensemble elements in order for an element to be compliant with this standard, at least the following statement and information shall also be printed legibly on the product label. All letters shall be at least 2.5 mm ($\frac{3}{32}$ in.) high. The appropriate term for the element type (garment, helmet, glove, footwear) shall be inserted in the statement text where indicated. Following this statement, the additional protective items or detachable components shall be listed by type, identification, and how properly assembled.

“FOR COMPLIANCE WITH THE (insert appropriate element term here) REQUIREMENTS OF NFPA 1976, THE FOLLOWING PROTECTIVE ITEMS MUST BE WORN IN CONJUNCTION WITH THIS (insert appropriate element term here):”

(List additional items or detachable components here.)

3-1.9 For helmets only, the helmet manufacturer shall place a unique manufacturer's part number, the symbol of the certification organization, and the words “NFPA 1976, 2000 Edition” permanently on each replaceable performance-critical part of the goggle lens or faceshield.

3-2 User Information.

3-2.1* The manufacturer shall provide at least the user information that is specified in 3-2.4 with each element.

3-2.2 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.

3-2.3* 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 manufacturer shall provide notice that the user information is to be removed *only* by the end user.

3-2.4* The manufacturer shall provide at least the following instructions and information with each element:

- (1) Pre-use information
 - 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
 - a. Sizing/adjustment
 - b. Recommended storage practices
- (3) Inspection frequency and details
- (4) Don/doff
 - a. Donning and doffing procedures
 - b. Sizing and adjustment procedures
 - c. Interface issues
- (5) Proper use consistent with NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and 29 CFR 1910.132, General Requirements of Subpart I, *Personal Protective Equipment*
- (6) Maintenance and cleaning
 - a. Cleaning instructions and precautions with a statement advising users not to use an element that is 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 criteria and considerations

3-2.5 For gloves only, the manufacturer shall make a chart illustrating the hand dimension ranges specified in 4-3.7.3 available on request to prospective purchasers.

3-2.6* For footwear only, the manufacturer shall establish and provide, upon request, a size conversion chart for each model or style footwear element based on toe length, arch length, and foot width as measured on a Brannock Scientific Foot Measuring Device.

Chapter 4 Design Requirements

4-1* Proximity Protective Garment Design Requirements.

4-1.1 A sample garment shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 2-3.

4-1.2* Garments shall consist of a composite of an outer shell, moisture barrier, and thermal barrier. This composite shall be permitted to be configured as a single layer or multiple layers.

4-1.3* Garments shall have a means of securing the moisture barrier and thermal barrier to the outer shell.

4-1.4 Moisture barriers and thermal barriers, or materials meeting the performance requirements of these components, shall extend, as a minimum, to the neckline seam of the coat, to the waistline seam of the trouser, and to within 75 mm (3 in.) of the bottom outer shell hems of proximity protective garments. In coats, the moisture barriers and thermal barriers, or materials meeting the performance requirements of these components, shall also extend to within 25 mm (1 in.) of the sleeve end of the outer shell and be permitted to retract a maximum of 50 mm (2 in.) from the sleeve end of the outer shell, and in trousers, shall also extend to within 75 mm (3 in.) of the bottom outer shell hems. The liner system shall be attached at or adjacent to the end of the coat sleeves or the end of the trouser legs. Any mechanism used to attach the liner system at or adjacent to the end of the coat sleeves and the end of the trouser legs shall not be greater than 25 mm (1 in.) between the attachment points, and shall not be expandable. Moisture barriers and thermal barriers, or materials meeting the performance requirements of these components, shall be configured in a manner to provide overlap at all closures.

4-1.5 Proximity protective garments and their closure systems, including the coat front and trouser flies, shall be constructed in a manner that provides continuous moisture and thermal protection. Such closure systems shall be secured with positive locking fasteners including, but not limited to, hooks and dees or zippers. Nonpositive fasteners, such as snaps or hook and pile tape, shall not be used as positive locking fasteners but shall be permitted to be used as supplementary garment closure devices.

4-1.6 Snaps shall be Style 2 and shall comply with the design and construction requirements of MIL-F-10884G *Fastener, Snap*. The construction of the snap shall be permitted to vary from the drawings with regard to the attachment means and use of logos on the caps.

4-1.7 Aramid hook and pile fastener tapes shall not be permitted.

4-1.8 Zippers shall meet the physical performance requirements of A-A.55634, *Commercial Item Description, Zippers (Fasteners, Slide, Interlocking)*. Coat and coverall front closures zippers, trouser fly zippers, and sleeve and leg zippers shall be size 9 or larger when measured in accordance with A-A.55634, *Commercial Item Description, Zippers (Fasteners, Slide, Interlocking)*.

4-1.9 Hooks and dees shall be nonferrous. Hooks shall be inward facing and shall have at least three attachment points. Dees shall have at least two attachment points.

4-1.10 All garment hardware finish shall be free of rough spots, burrs, or sharp edges.

4-1.11* Cargo pockets, where provided, shall have a means to drain water and shall have a means of fastening in the closed position.

4-1.12 Proximity protective garments shall not have materials that do not meet the radiant reflective requirements specified in 5-1.1 affixed to the outer shell radiant reflective surfaces of the garments unless such materials are covered in 4-1.13.

4-1.13 Reinforcing materials that do not meet the radiant reflective requirements specified in 5-1.1 shall be permitted to be affixed only to the garment outer shell radiant reflect surfaces as reinforcement of the sleeve cuffs and trouser leg cuffs when the following requirements are met:

- (1) The reinforcing materials above shall meet the flame resistant requirements specified in 5-1.8.
- (2) The reinforcing materials above shall meet the heat resistance requirements specified in 5-1.10.
- (3) Reinforcement areas shall not cover the radiant reflective surfaces of the garment by more than 25 mm (1 in.) when measured from the edge of the cuff back along the sleeve or leg.

4-1.14 Additional Design Requirements for Protective Coats.

4-1.14.1 Coats shall provide protection as specified to the upper torso, neck, arms, and wrists, excluding the hands and head.

4-1.14.2* Each coat sleeve shall have a protective wristlet permanently attached to the coat sleeve in a manner that will not permit a gap in the thermal protection and that meets the requirements specified in Sections 4-5 and 5-5.

4-1.14.3 Coats shall have a composite collar at least 100 mm (4 in.) in height at any point and shall have a closure system. The collar and closure system shall consist of an outer shell, moisture barrier, thermal barrier, and collar lining, or of materials that meet all applicable performance requirements as specified in Section 5-1. The collar lining material shall not be reflective material.

4-1.14.4 Coat hardware shall not penetrate through the outer shell, moisture barrier, and thermal barrier to contact the wearer's body when the coat is worn with the closures fastened, unless the hardware is completely covered by external closure flaps.

4-1.14.5* In order to label a protective coat or coverall as compliant with this standard, the manufacturer shall provide, as a minimum, men's and women's chest sizes in increments not greater than 50 mm (2 in.) and sleeve lengths in increments not greater than 25 mm (1 in.) in the ranges specified in Table 4-1.14.5.

4-1.14.6 Men's and women's sizing shall be accomplished by men's and women's individual patterning.

4-1.15 Additional Design Requirements for Protective Trousers.

4-1.15.1* Trousers shall provide protection as specified to the lower torso and legs, excluding the ankles and feet.

4-1.15.2 Trouser hardware shall not penetrate through the outer shell, moisture barrier, and thermal barrier to come into contact with the wearer's body when the trouser is worn with the closure fastened, unless the hardware is located on or above the trouser waistline or hardware is completely covered by external closure flaps.

4-1.15.3 In order to label a protective trouser or coverall as compliant with this standard, the manufacturer shall provide, as a minimum, men's and women's waist sizes in increments not greater than 50 mm (2 in.) and inseam lengths in increments not greater than 50 mm (2 in.) in the ranges specified in Table 4-1.14.5.

4-1.15.4 Men's and women's sizing shall be accomplished by men's and women's individual patterning.

4-1.16 Additional Design Requirements for Protective Coveralls.

4-1.16.1 That portion of the coverall that corresponds to the coat shall meet all requirements of 4-1.14.

4-1.16.2 That portion of the coverall that corresponds to the trouser shall meet all requirements of 4-1.15.

4-2 Protective Helmet Design Requirements.

4-2.1 A sample helmet shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 2-3.

4-2.2 Helmets for proximity fire fighting shall consist of at least the following assembled components: a shell, an energy absorbing system, a retention system, a shroud, and a faceshield.

4-2.2.1 The helmet shall be permitted to have an outer cover to provide the radiant reflective protection for the exterior of the helmet shell, including the upper surface of the brim, and the brim edge.

4-2.2.2 The helmet outer cover shall be permitted to be removable.

4-2.3 There shall be no openings penetrating the shell other than those provided by the manufacturer for mounting energy-absorbing systems, retention systems, and accessories.

4-2.4 The retention system shall include a chin strap and a nape device. The chin strap shall have a minimum width of 20 mm ($\frac{3}{4}$ in.).

4-2.5 The faceshield shall be attached to the helmet. The faceshield, when deployed in accordance with its helmet eye/face positioning indexes on an Alderson 50th percentile male headform shown in Figure 6-20.4.1.1 shall provide at least the following field of vision when measured from the center of the eye:

- (1) A dihedral angle of at least 85 degrees
- (2) An upper dihedral angle of at least 10 degrees
- (3) A lower dihedral angle 40 degrees

4-2.6 The helmet with faceshield component(s) stowed shall provide peripheral vision clearance of at least 94 degrees to each side when measured from the center of the eye with the helmet positioned according to its helmet positioning index on the Alderson 50th percentile male headform specified in Figure 6-20.4.1.1.

Table 4-1.14.5 Available Coat/Trouser Size Ranges

	Mens		Womens		Increments	
	mm	in.	mm	in.	mm	in.
Chest	865-1525	34-60	710-1270	28-50	50	2
Sleeve	820-965	32-38	710-865	28-34	25	1
Waist	760-1525	30-60	710-1270	28-50	50	2
Inseam	660-915	26-36	610-865	24-34	50	2

4-2.7 The helmet shroud component shall be attached to the helmet and shall be designed to cover and provide continuous radiant reflective protection for the head, face, and neck areas that do not receive primary protection from the helmet, faceshield, or the self-contained breathing apparatus (SCBA) facepiece.

4-2.7.1 The shroud component shall be permitted to be a part of a helmet outer cover, where provided.

4-2.7.2 Specimens of shrouds shall be measured to determine the areas of coverage. The helmet with shroud shall be donned properly in the position in which it is intended to be worn on an ISO size J reference headform. In this position, the shroud shall provide a minimum coverage on each side measured downward from the reference plane at the coronal plane of 230 mm ($9\frac{1}{8}$ in.), shall provide a minimum coverage in the back measured downward from the reference plane at the rear mid-sagittal plane of 330 mm (13 in.), and shall provide a minimum coverage in the front measured downward from the reference plane at the front midsagittal plane, including the gap of material where the face opening is located, of 295 mm ($11\frac{5}{8}$ in.).

4-2.7.3 The shroud shall be designed with a face opening. Other than where the shroud face opening is designed to interface with a specific SCBA facepiece or where the shroud face opening is designed to be adjustable, the shroud face opening shall measure 140 mm, $+0/-25$ mm ($5\frac{5}{8}$ in., $+0/-1$ in.) in any direction when the shroud is laid out in a relaxed condition on a flat surface, smoothed out, and with the face opening facing up.

4-2.7.4 Where the shroud face opening is designed to interface with a specific SCBA facepiece, the shroud face opening shall overlap the outer edge of the specific SCBA facepiece-to-face seal perimeter by not less than 13 mm ($\frac{1}{2}$ in.).

4-2.7.5 Where the shroud face opening is provided with manual adjustment, the shroud face opening shall be adjustable to achieve a face opening of 140 mm ($5\frac{5}{8}$ in.).

4-2.7.6 The helmet shroud, when deployed, shall provide peripheral vision clearance of at least 85 degrees to each side of the midsagittal plane, an angle of at least 7 degrees above the reference plane, and an angle of at least 40 degrees under the basic plane when seated according to its helmet positioning index on the reference headform illustrated in Figure 6-20.4.1.1.

4-2.7.7 Shrouds shall not overlap or obscure vision areas as defined in 4-2.5 and 4-2.6.

4-2.8 The helmet, and helmet outer cover where provided, shall be permitted to have fluorescent and retroreflective trim on the helmet exterior and on the helmet outer cover.

4-2.9 Identification markings or material including, but not limited to, trim, lettering, patches, name or number stencils, emblems, and paint shall be permitted only on the helmet outer cover, provided such materials are located above the corresponding helmet test line. The corresponding helmet with the outer cover and markings attached shall meet the requirements specified in 5-2.23.

4-2.10 Where helmets are provided with an SCBA facepiece that is attached or integrated with the helmet, the helmet, with

the SCBA facepiece installed, shall meet all applicable design and performance requirements of this standard.

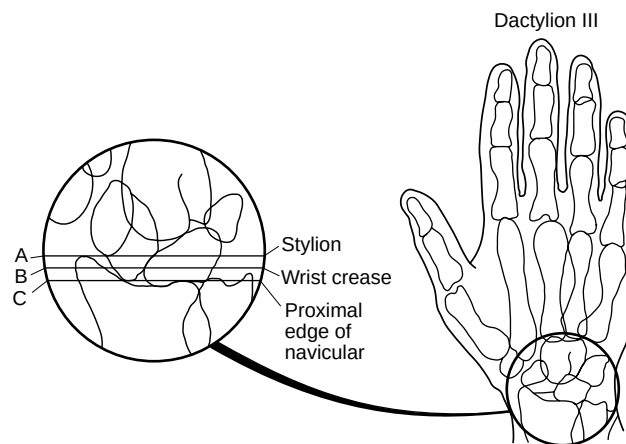
4-3 Protective Glove Design Requirements.

4-3.1 A sample glove shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 2-3.

4-3.2 The sample glove shall consist of a composite meeting the performance requirements of Section 5-3. This composite shall be permitted to be configured as a continuous or joined single layer or as continuous or joined multiple layers.

4-3.3 The sample glove body shall extend circumferentially not less than 50 mm (2 in.) beyond the wrist crease where measured from the tip of the middle finger. The location of the wrist crease shall be determined as shown in Figure 4-3.3.

FIGURE 4-3.3 Anatomical landmarks at base of hand.



4-3.4 Sample gloves shall be permitted to be provided with either a gauntlet or a glove wristlet. Where gloves are provided with a gauntlet or a glove wristlet, the sample glove body and the gauntlet or glove wristlet shall extend circumferentially at least 75 mm (3 in.) beyond the wrist crease. Where gloves are not provided with a gauntlet or a glove wristlet, the sample glove body shall extend circumferentially at least 75 mm (3 in.) beyond the wrist crease, an increase of 25 mm (1 in.) to the requirement specified in 4-3.3.

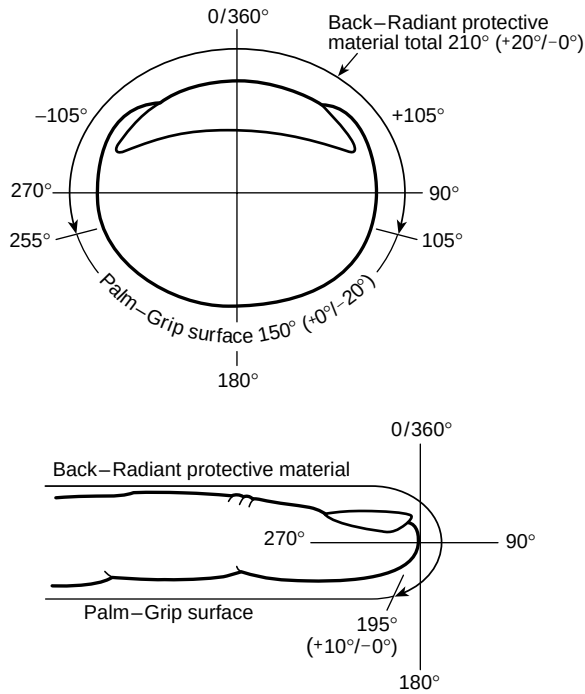
4-3.5 The protective glove shall not be permitted to have any hardware.

4-3.6 The outer shell of the back of the glove body including the back of the digits shall be a radiant reflective material.

4-3.6.1 The fingers, thumb, and the back shall have radiant reflective protection of 210 degrees, $+20^\circ/-0^\circ$. The radiant reflective material shall provide coverage from 0 degrees to 105 degrees, $+10^\circ/-0^\circ$ and then from 255 degrees, $+10^\circ/-0^\circ$ to 360 degrees as specified in Figure 4-3.6.1.

4-3.6.2 The radiant reflective material shall provide coverage for the finger/thumb tip of at least 195 degrees, $+10^\circ/-0^\circ$ as specified in Figure 4-3.6.1. The portion of the finger, thumb, and palm surfaces that are not covered by the radiant reflective protection shall be the gripping surface of the glove.

FIGURE 4-3.6.1 Glove radiant reflective protection areas.

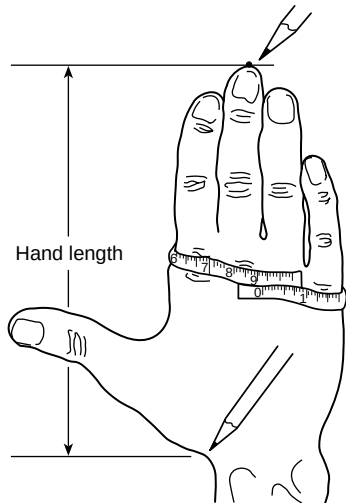


4-3.7 Glove Sizing.

4-3.7.1 Hand dimensions for selection of proper glove size shall consist of measuring the following two dimensions, as shown in Figure 4-3.7.1:

- (1) Hand circumference
- (2) Length of the hand

FIGURE 4-3.7.1 Method of measuring hand dimensions for selection of proper glove.



4-3.7.1.1 Hand circumference shall be measured by placing a measuring tape on a table or other flat surface with the numerals facing downward. The subject shall place the right hand, palm down and fingers together, in the middle of the tape so that the tape can pass straight across the metacarpal knuckles. The circumference shall be measured to the nearest 3 mm ($\frac{1}{8}$ in.), as shown in Figure 4-3.7.1.

4-3.7.1.2 Finger circumference shall be measured at the proximal interphalangeal joint (first knuckle). Finger length shall be measured from the tip of the finger to the base of the finger crease on the palm side.

4-3.7.1.3 Hand length shall be measured by placing the subject's hand, palm down, on a piece of paper with the fingers together and the hand and arm in a straight line. The thumb shall be fully abducted, extended away from the palm as far as possible. The paper shall be marked at the tip of the third, or middle, finger. A pencil mark shall be placed in the notch at the base of the thumb where the thumb joins the wrist. The straight line distance between the two points shall be measured to the nearest 3 mm ($\frac{1}{8}$ in.), as shown in Figure 4-3.7.1.

4-3.7.2 To label or otherwise represent a glove as compliant with the requirements of this standard, the manufacturer shall provide gloves in not less than five separate and distinct sizes. The manufacturer shall provide gloves that at least fit the hand dimension ranges specified in 4-3.7.3.

4-3.7.3* The glove size indicated on the label shall be determined by the hand dimensions given in Tables 4-3.7.3(a) through (e).

Table 4-3.7.3(a) Sizing for Extra Small (XS) Glove

	mm		in.	
Range for hand length	16.25-17.25		6.40-6.79	
Range for hand circumference	16.25-20.25		6.40-7.97	
	Mid-Size Value		Range to Be Accommodated	
	mm	in.	mm	in.
Digit 1 circumference	62	2.43	56-67	2.20-2.65
Digit 2 circumference	61	2.39	55-66	2.17-2.61
Digit 3 circumference	61	2.39	55-66	2.18-2.61
Digit 4 circumference	57	2.24	51-63	2.02-2.46
Digit 5 circumference	50	1.97	45-55	1.76-2.17
Digit 1 length	49	1.94	44-55	1.72-2.17
Digit 2 length	64	2.54	58-71	2.26-2.80
Digit 3 length	73	2.87	67-79	2.64-3.10
Digit 4 length	68	2.67	61-74	2.41-2.92
Digit 5 length	51	2.00	45-57	1.78-2.23
Hand circumference	183	7.19	16.34-201	6.43-7.94
Hand length	168	6.59	163-172	6.41-6.78

Table 4-3.7.3(b) Sizing for Small (S) Glove

	mm		in.	
Range for hand length	173–183		6.79–7.19	
Range for hand circumference	173–213		6.79–8.37	
	Mid-Size Value		Range to Be Accommodated	
	mm	in.	mm	in.
Digit 1 circumference	64	2.52	58–70	2.29–2.74
Digit 2 circumference	63	2.48	57–69	2.26–2.70
Digit 3 circumference	63	2.48	58–69	2.27–2.70
Digit 4 circumference	59	2.33	54–65	2.11–2.56
Digit 5 circumference	52	2.06	47–57	1.85–2.26
Digit 1 length	53	2.09	47–59	1.87–2.32
Digit 2 length	69	2.71	62–76	2.44–2.98
Digit 3 length	77	3.04	71–83	2.81–3.27
Digit 4 length	72	2.83	66–70	2.58–3.08
Digit 5 length	54	2.14	49–60	1.92–2.37
Hand circumference	193	7.58	173–212	6.83–8.33
Hand length	178	6.99	173–182	6.80–7.18

Table 4-3.7.3(c) Sizing for Medium (M) Glove

	mm		in.	
Range for hand length	183–193		7.19–7.58	
Range for hand circumference	183–223		7.19–8.76	
	Mid-Size Value		Range to Be Accommodated	
	mm	in.	mm	in.
Digit 1 circumference	70	2.76	64–77	2.50–3.01
Digit 2 circumference	68	2.69	63–73	2.48–2.88
Digit 3 circumference	68	2.69	63–74	2.46–2.91
Digit 4 circumference	63	2.50	58–69	2.28–2.72
Digit 5 circumference	56	2.22	51–62	2.00–2.43
Digit 1 length	56	2.22	50–63	1.97–2.46
Digit 2 length	71	2.80	65–77	2.56–3.04
Digit 3 length	81	3.18	76–86	2.97–3.38
Digit 4 length	76	3.00	71–81	2.81–3.18
Digit 5 length	58	2.28	52–64	2.03–2.52
Hand circumference	203	7.97	183–222	7.22–8.72
Hand length	188	7.38	183–192	7.19–7.57

4.4 Proximity Protective Footwear Design Requirements.

4.4.1 Sample footwear shall have at least the applicable design requirements specified in this section where inspected by the certification organization as specified in Section 2-3.

4.4.2 Footwear shall consist of a sole with heel, upper with lining, and insole with a puncture-resistant device, ladder shank, and an impact- and compression-resistant toe cap permanently attached.

4.4.3 Footwear height shall be a minimum of 305 mm (12 in.). The height shall be determined by measuring inside the boot from the center of the insole at the heel up to a perpendicular reference line extending across the width of the boot at the lowest point of the top line. Removable insole inserts shall be removed prior to measurement.

Table 4-3.7.3(d) Sizing for Large (L) Glove

	mm		in.	
Range for hand length	19.25–20.25		7.58–7.97	
Range for hand circumference	19.25–23.25		7.58–9.15	
	Mid-Size Value		Range to Be Accommodated	
	mm	in.	mm	in.
Digit 1 circumference	73	2.86	66–79	2.61–3.11
Digit 2 circumference	70	2.77	65–75	2.57–2.97
Digit 3 circumference	71	2.80	65–77	2.57–3.02
Digit 4 circumference	66	2.60	60–72	2.38–2.82
Digit 5 circumference	59	2.30	53–64	2.09–2.52
Digit 1 length	59	2.31	52–65	2.06–2.56
Digit 2 length	75	2.95	69–81	2.71–3.19
Digit 3 length	85	3.36	80–91	3.16–3.57
Digit 4 length	80	3.16	76–85	2.98–3.35
Digit 5 length	61	2.41	55–68	2.17–2.66
Hand circumference	212	8.37	193–232	7.61–9.12
Hand length	198	7.78	193–202	7.59–7.96

Table 4-3.7.3(e) Sizing for Extra-Large (XL) Glove

	mm		in.	
Range for hand length	203–213		7.97–8.37	
Range for hand circumference	203–243		7.97–9.55	
	Mid-Size Value		Range to Be Accommodated	
	mm	in.	mm	in.
Digit 1 circumference	75	2.96	69–82	2.70–3.21
Digit 2 circumference	73	2.85	67–78	2.65–3.06
Digit 3 circumference	74	2.90	68–79	2.67–3.12
Digit 4 circumference	69	2.70	63–74	2.48–2.92
Digit 5 circumference	61	2.39	55–66	2.17–2.60
Digit 1 length	61	2.41	55–68	2.16–2.66
Digit 2 length	79	3.09	73–85	2.86–3.33
Digit 3 length	90	3.55	85–95	3.35–3.76
Digit 4 length	84	3.32	80–89	3.14–3.51
Digit 5 length	65	2.55	59–71	2.30–2.80
Hand circumference	223	8.76	203–242	8.01–9.51
Hand length	208	8.17	203–212	7.98–8.36

4.4.4 The footwear heel breast shall not be less than 13 mm ($\frac{1}{2}$ in.) nor more than 25 mm (1 in.). The heel breasting angle shall not be less than 90 degrees nor more than 135 degrees. The edges shall not be less than, or extend more than, 13 mm ($\frac{1}{2}$ in.) laterally from the upper at any point. The width of the footwear heel shall be equal to or greater than the width of the sole, excluding any calendar roll if present, at the intersection of the heel breast and the sole bottom.

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

4.4.6 Metal parts shall not penetrate from the outside into the lining or insole at any point.

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

44.8 Footwear Sizing.

44.8.1 Protective footwear shall be available in all of the following sizes:

(a) *Men's sizes.* 7–16, including half-sizes and a minimum of three widths

(b) *Women's sizes.* 5–10, including half-sizes and a minimum of three widths.

44.8.2* 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.

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

4.5 Protective Wristlet Interface Component Design Requirements.

4.5.1 A sample wristlet shall have at least the applicable design requirements specified in this section where inspected by the certification organization specified in Section 2-3.

4.5.2 The wristlet shall be designed to cover and provide limited protection to the wrist areas.

4.5.3 The wristlet shall be permanently attached to the protective coat sleeve in a manner that will not permit a gap in the thermal protection.

4.6 Accessory Design Requirements.

4.6.1 Any accessories attached to any element of the proximity protective ensemble shall not interfere with the function of the element or with the function of any of the element's component parts.

4.6.2 Any accessories attached to any element of the proximity protective ensemble shall not degrade the designed protection or performance of the element below the requirements of this standard.

Chapter 5 Performance Requirements

5-1 Proximity Protective Garment Performance Requirements.

5-1.1 The garment outer shell shall be tested for radiant reflective capability as specified in Section 6-10, Radiant Reflective Test II, and shall have a radiant reflective value of not less than 20 seconds.

5-1.2 The garment outer shell shall be tested for resistance to delamination as specified in Section 6-31, Wet Flex, and shall show no signs of cracking on the face or delamination if the base fabric is a laminate.

5-1.3 The garment outer shell shall be tested for adhesion durability as specified in Section 6-32, Adhesion After Wet Flex–Tape Method, and shall show no evidence of separation of the coating or laminate from the base cloth.

5-1.4 The garment outer shell shall be tested for flex durability as specified in Section 6-33, Flex at Low Temperature, and

shall show no evidence of breaking, shattering, or cracking of the coating, laminate, or fabric.

5-1.5 The garment outer shell shall be tested for blocking durability as specified in Section 6-34, Resistance to High-Temperature Blocking, and shall show no blocking.

5-1.6 The garment composite consisting of outer shell, moisture barrier, and thermal barrier shall be tested for thermal insulation as specified in Section 6-13, Thermal Protective Performance (TPP) Test, and shall have an average thermal protective performance (TPP) of not less than 35.0.

5-1.7 The garment composite shall be tested for overall liquid penetration resistance as specified in Section 6-52, Whole Garment Liquid Penetration Test, and shall allow no liquid penetration.

5-1.8 Garment outer shells, moisture barriers, thermal barriers, collar linings, winter liners where provided, and other materials used in garment construction including, but not limited to, padding, reinforcement, interfacing, binding, hanger loops, emblems, and patches shall be individually tested for resistance to flame as specified in Section 6-2, Flame Resistance Test One, and shall not have a char length of more than 100 mm (4 in.) average, shall not have an afterflame of more than 2 seconds average, and shall not melt or drip.

5-1.8.1 Labels shall be tested as specified in 5-1.8 only when placed on the exterior of the garment; zippers and seam sealing materials shall be tested as specified in 5-1.8 only if placed on the exterior of the garment or if they directly contact the wearer's body; and elastic and hook and pile fasteners shall be tested as specified in 5-1.8 only if they directly contact the wearer's body.

5-1.8.2 Small specimens such as hanger loops and emblems (patches), which are not large enough to meet the specimen size requirements in 6-2.2.1, shall be tested for resistance to flame as specified in Section 6-2, Flame Resistance Test One, and shall not be totally consumed, shall not have an afterflame of more than 2 seconds average, and shall not melt or drip.

5-1.9 Garment outer shells, moisture barriers, thermal barriers, winter liners where provided, and collar linings shall be individually tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall not shrink more than 10.0 percent in any direction.

5-1.10 Garment outer shells, moisture barriers, thermal barriers, collar linings, winter liners where provided, lettering, and other materials used in garment construction — including, but not limited to, padding, reinforcement, labels, interfacing, binding, hanger loops, emblems or patches; but excluding elastic and hook and pile fasteners where these items are placed so that they will not directly contact the wearer's body — shall be individually tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall not melt, separate, or ignite.

5-1.11 Garment moisture barrier seams shall be individually tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall not drip or ignite.

5-1.12 Garment outer shells and collar linings shall be individually tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall not char.

5-1.13 Garment hardware, other than hook and pile fasteners where placed so that they will not directly contact the wearer's body, shall be individually tested for resistance to heat as spec-

ified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall not ignite and shall remain functional.

5-1.14 All sewing thread used in the construction of garments shall be made of an inherently flame-resistant fiber and shall be tested for resistance to melting as specified in Section 6-14, Thread Melting Test, and shall not melt below 260°C (500°F).

5-1.15 Garment outer shells and collar linings shall be individually tested for resistance to tearing as specified in Section 6-15, Tear Resistance Test, and shall have a tear strength of not less than 98N (22 lbf).

5-1.16 Garment moisture barriers, thermal barriers, and winter liners, where provided, shall be tested for resistance to tearing as specified in Section 6-15, Tear Resistance Test, and shall have a tear strength of not less than 22 N (5 lbf). Where configured as individual barrier layers, specimens of garment moisture barriers, thermal barriers, and winter liners, where provided, shall be individually tested. Where one or more of these barriers are configured as a single barrier layer by bonding or laminating individual barriers together so that the individual layers do not retain their individuality and are not separable, they shall be tested as a composite.

5-1.17 All garment seam assemblies shall be tested for strength as specified in Section 6-17, Seam Breaking Strength Test.

5-1.17.1 Garment seam assemblies shall demonstrate a sewn seam strength equal to or greater than 675 N (150 lbf) force for Major A seams, 337.5 N (75 lbf) force for Major B seams, and 180 N (40 lbf) force for minor seams when tested using the method specified in 6-17.2.2.1.

5-1.17.2 Seam breaking strength shall be considered acceptable when the fabric strength is less than the required seam strength specified in 5-1.17.1 of this section, providing the fabric fails without failure of the seam below the applicable forces specified in 5-1.17.1.

5-1.17.3 All combination woven and knit or stretch knit seam specimens shall meet the requirements specified in 5-1.17.1.

5-1.18 Garment moisture barriers shall be tested for resistance to water penetration as specified in Section 6-28, Water Penetration Test, and shall have a minimum water penetration resistance of 1.76 kg/cm² (25 psi) when tested as specified in 6-28.4.1.

5-1.19* Garment moisture barrier materials and seams shall be tested for resistance to liquids penetration as specified in Section 6-29, Liquid Penetration Resistance Test, and shall show no penetration of the test liquids for at least 1 hour.

5-1.20 Garment moisture barriers and moisture barrier seams shall be tested for resistance to liquid borne or blood borne pathogens as specified in Section 6-30, Viral Penetration Resistance Test, and shall allow no penetration of the Phi-X-174 bacteriophage for at least 1 hour.

5-1.21 Garment moisture barriers, thermal barriers, winter liners where provided, and collar linings shall be individually tested for resistance to shrinkage as specified in Section 6-27, Cleaning Shrinkage Resistance Test, and shall not shrink more than 5 percent in any direction.

5-1.22 The garment composite from the shoulder areas and the knee areas shall be tested for resistance to heat transfer as

specified in Section 6-12, Conductive and Compressive Heat Resistance Test (CCHR), and shall have a minimum CCHR rating of 13.5 for the shoulder areas and for the knee areas.

5-1.23 All garment metal hardware and all garment hardware that includes metal parts shall be individually tested for resistance to corrosion as specified in Section 6-35, Corrosion Resistance Test. Metals inherently resistant to corrosion including, but not limited to, stainless steel, brass, copper, aluminum, and zinc shall show no more than light surface-type corrosion or oxidation and shall remain functional. Ferrous metals shall show no corrosion of the base metal and shall remain functional.

5-1.24 Labels shall be tested for durability and legibility as specified in Section 6-47, Label Durability and Legibility Test One, and shall remain in place and shall be legible.

5-2 Proximity Protective Helmet Performance Requirements.

5-2.1 Helmet outer covers, where provided, and shrouds shall be tested for radiant reflective capability as specified in Section 6-10, Radiant Reflective Test Two, and shall have a radiant reflective value of not less than 20 seconds.

5-2.2 Helmet outer covers, where provided, and shrouds shall be tested for resistance to delamination as specified in Section 6-31, Wet Flex, and shall show no signs of cracking on the face or delamination if the base fabric is a laminate.

5-2.3 Helmet outer covers, where provided, and shrouds shall be tested for adhesion durability as specified in Section 6-31, Wet Flex, and shall show no evidence of separation of the coating or laminate from the base cloth.

5-2.4 Helmet outer covers, where provided, and shrouds shall be tested for flex durability as specified in Section 6-33, Flex at Low Temperature, and shall show no evidence of breaking, shattering, or cracking of the coating, laminate, or fabric.

5-2.5 Helmet outer covers, where provided, and shrouds shall be tested for blocking durability as specified in Section 6-34, Resistance to High-Temperature Blocking, and shall show no blocking.

5-2.6 The helmet shroud composite consisting of outer shell, moisture barrier, and thermal barrier shall be tested for thermal insulation as specified in Section 6-13, Thermal Protective Performance (TPP) Test, and shall have an average thermal protective performance (TPP) of not less than 35.0.

5-2.7 Helmet shrouds shall be individually tested for resistance to tearing as specified in Section 6-15, Tear Resistance Test, and shall have a tear strength of not less than 98 N (22 lbf).

5-2.8 Helmet outer covers, where provided, shall be tested for resistance to tearing as specified in Section 6-15, Tear Resistance Test, and shall have a tear strength of not less than 22 N (5 lbf).

5-2.9 Helmets shall be tested for resistance to impact as specified in Section 6-18, Top Impact Resistance Test (Force), and shall have no sample transmit a force of more than 3780 N (850 lbf).

5-2.10 Helmets shall be tested for resistance to impact as specified in Section 6-19, Impact Resistance Test (Acceleration), and shall have no sample exceed the maximum acceleration specified in Table 5-2.10 Any acceleration duration above 200 Gn shall not exceed 3 milliseconds; acceleration duration above 150 Gn shall not exceed 6 milliseconds.

Table 5-2.10 Impact Testing

Impact Location	Maximum Acceleration*	m · sec/sec	ft · sec/sec
Top	150 × Gn	1471.5	4830
Front	300 × Gn	2943.0	9660
Sides	300 × Gn	2943.0	9660
Back	300 × Gn	2943.0	9660

*Gn denotes gravitational acceleration, which is defined as 9.81 m per second per second (32.2 ft per second per second).

5-2.11 Helmets shall be tested for resistance to penetration as specified in Section 6-22, Physical Penetration Resistance Test, and shall exhibit no electrical or physical contact between the penetration test striker and the headform.

5-2.12 Helmets shall be tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall meet the following requirements:

- (1) Have no parts of the complete helmet assembly that do not contact the headform before this test come in contact with the headform as a result of this test
- (2) Have no shell distortion in the back extend more than 40 mm (1 5/8 in.) below the original position of the helmet
- (3) Have no distortion of the front and sides of the shell extend more than 30 mm (1 1/4 in.) below the original position of the helmet
- (4) Have no separation, melting, or dripping of the retention system, energy absorption system, or ear covers
- (5) Have a chin strap closure device remain functional
- (6) Have no ignition of any part of the helmet assembly
- (7) Have no ignition or melting of the product labels
- (8) Have no part of the faceshield component that was not below the brim line prior to the test be below the brim line after the test
- (9) Have no part of the faceshield component drip

5-2.13 Helmets shall be tested for resistance to flame as specified in Section 6-3, Flame Resistance Test Two, Procedures A and C, and shall not show any visible afterflame or glow 5 seconds after removal from the test flame in each test.

5-2.14 Helmets shall be tested for resistance to electricity as specified in Section 6-36, Electrical Insulation Test One, Procedures A and B, and shall not have leakage current exceeding 3.0 mA in each test.

5-2.15 Helmets shall be tested for retention ability as specified in Section 6-40, Retention System Test, without any break occurring and without any resulting slip or stretch of more than 20 mm (3/4 in.).

5-2.16 Helmet suspension systems shall be tested for retention ability as specified in Section 6-41, Suspension System Retention Test, and shall not separate from the helmet shell.

5-2.17 Helmets shall be tested for shell retention ability as specified in Section 6-49, Shell Retention Test, and shall not have the helmet shell separate from the helmet suspension and retention systems.

5-2.18 All fabrics used in the construction of helmet shrouds, and helmet outer covers where provided, shall be individually tested for resistance to flame as specified in Section 6-2, Flame Resistance Test One, and shall not have a char length

greater than 100 mm (4 in.), shall not show any visible afterflame 2 seconds after removal from the test flame, and shall not melt or drip.

5-2.19 All materials used in the construction of helmet shrouds and helmet outer covers shall be individually tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, shall not shrink more than 10 percent in any direction, and shall not melt, drip, separate, char, or ignite.

5-2.20 All sewing thread used in the construction of helmets shall be made of inherently flame-resistant fiber and shall be tested for melting resistance as specified in Section 6-14, Thread Melting Test, and shall not melt below 260°C (500°F).

5-2.21 All helmet metal hardware and all helmet hardware that includes metal parts shall be individually tested for resistance to corrosion as specified in Section 6-35, Corrosion Resistance Test. Metals inherently resistant to corrosion including, but not limited to, stainless steel, brass, copper, aluminum, and zinc shall show no more than light surface-type corrosion or oxidation and shall remain functional. Ferrous metals shall show no corrosion of the base metal and shall remain functional.

5-2.22 Labels shall be tested for durability and legibility as specified in Section 6-48, Label Durability and Legibility Test Two, shall remain in place, and shall be legible.

5-2.23 Helmets shall be tested for radiant reflective value as specified in Section 6-11, Radiant Heat Transmittance Test Three, and shall not have a temperature rise of more than 25°C (45°F).

5-2.24 Helmet faceshield components shall be tested for resistance to impact as specified in Section 6-20, Faceshield Component Impact Resistance Test, Tests One and Two, and shall have no contact with an eye of the headform; nor shall any parts of fragments be ejected from the component that could contact the eye of the headform.

5-2.25 Helmet faceshield components shall be tested for flame resistance as specified in Section 6-3, Flame Resistance Test Two, Procedure B, and shall not show any visible afterflame 5 seconds after removal of the test flame.

5-2.26 Helmet faceshield component lenses shall be tested for transmittance of light as specified in Section 6-50, Luminous (Visible) Transmittance Test, and shall transmit not less than 30 percent of the incident visible radiation.

5-2.27 Helmet faceshields shall be tested for radiant reflective capability as specified in Section 6-10, Radiant Reflective Test Two, and shall have a radiant reflective value of not less than 30 seconds.

5-3 Proximity Protective Glove Performance Requirements.

5-3.1 The back of the hand of the glove, including the gauntlet where provided, shall be tested for radiant reflective capability as specified in Section 6-10, Radiant Reflective Test Two, and shall have a radiant reflective value of not less than 20 seconds.

5-3.2 The back of the hand of the glove, including the gauntlet where provided, shall be tested for resistance to delamination as specified in Section 6-31, Wet Flex, and shall show no signs of cracking on the face or delamination if the base fabric is a laminate.

5-3.3 The back of the hand of the glove, including the gauntlet where provided, shall be tested for adhesion durability as specified in Section 6-31, Wet Flex, and shall show no evidence of separation of the coating or laminate from the base cloth.

5-3.4 The back of the hand of the glove, including the gauntlet where provided, shall be tested for flex durability as specified in Section 6-33, Flex at Low Temperature, and shall show no evidence of breaking, shattering, or cracking of the coating, laminate, or fabric.

5-3.5 The back of the hand of the glove, including the gauntlet where provided, shall be tested for blocking durability as specified in Section 6-34, Resistance to High-Temperature Blocking, and shall show no blocking.

5-3.6 The glove body composite shall be tested for thermal insulation as specified in Section 6-13, Thermal Protective Performance (TPP) Test, and shall have an average thermal protective performance rating (TPP) of not less than 35.0.

5-3.7 Where gauntlets or glove wristlets are provided, the glove gauntlet or glove wristlet composite shall be tested for thermal insulation as specified in Section 6-13, Thermal Protective Performance (TPP) Test, and shall have an average TPP rating of not less than 20.0.

5-3.8 Gloves shall be tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall not melt, separate, or ignite; shall not shrink more than 5 percent in length or width; shall be donnable; and shall be flexible.

5-3.9 The innermost separable layer of the glove body composite that is designed to come into contact with the wearer's skin shall be individually tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall not melt, separate, or ignite.

5-3.10 The glove body composite shall be tested for thermal insulation as specified in Section 6-7, Conductive Heat Resistance Test One, and shall have a second-degree burn time of not less than 10 seconds and shall have a pain time of not less than 6 seconds.

5-3.11 The glove body composites shall be tested for resistance to flame as specified in Section 6-4, Flame Resistance Test Three, and shall not have a char length of more than 100 mm (4 in.) average and shall not have an afterflame of more than 2 seconds average after removal of the test flame. The composite shall not melt or drip, and the consumed materials shall not exceed 5 percent of the sample specimen's original weight.

5-3.12 Where gauntlets or glove wristlets are provided, the glove gauntlet or glove wristlet composite shall be tested for resistance to flame as specified in Section 6-2, Flame Resistance Test One, and shall not have a char length of more than 100 mm (4 in.) average, shall not have an afterflame of more than 2 seconds average after removal of the test flame, and shall not melt or drip.

5-3.13 All sewing thread used in the construction of gloves, and wristlets or gauntlets, shall be made of an inherently flame-resistant fiber and shall be tested for melting resistance as specified in Section 6-14, Thread Melting Test, and shall not melt below 260°C (500°F).

5-3.14* The glove body composites and seams shall be tested for resistance to liquid or blood-borne pathogens as specified in Section 6-30, Viral Penetration Resistance Test, and shall allow no penetration of the Phi-X-174 bacteriophage for at least 1 hour.

5-3.15* Glove body composites and seams shall be tested for resistance to liquid penetration as specified in Section 6-29, Liquid Penetration Resistance Test, and shall allow no penetration of test liquids for at least 1 hour.

5-3.16 The glove body composite shall be tested for resistance to cut as specified in Section 6-25, Cut Resistance Test, and shall have a cut distance resistance of more than 25 mm (1 in.).

5-3.17 The glove gauntlet or glove wristlet composite, if different from the glove body composite, shall be tested for resistance to cut as specified in Section 6-25, Cut Resistance Test, and shall have a cut distance resistance of more than 25 mm (1 in.).

5-3.18 The glove body composite shall be tested for resistance to puncture as specified in Section 6-23, Puncture Resistance Test One, and shall not be punctured under an average applied force of 4 kg (8.8 lb).

5-3.19 Glove specimens shall be tested for hand function as specified in Section 6-43, Glove Hand Function Test, and shall have an average percent of barehand control not exceeding 300 percent.

5-3.20 Glove knit wristlet material(s) shall be tested for material strength as specified in Section 6-16, Burst Strength Test, and shall have a burst strength of not less than 225 N (50 lbf).

5-3.21 Glove knit wristlet seams shall be tested for seam strength as specified in Section 6-17, Seam Breaking Strength Test, and shall have a breaking strength of not less than 182 N (41 lbf).

5-3.22 Gloves shall be tested for grip as specified in Section 6-44, Grip Test, and shall have a weight-pulling capacity not less than 80 percent of the bare-hand control value.

5-3.23 Gloves shall be tested for resistance to leakage as specified in Section 6-38, Overall Liquid Integrity Test One, and shall show no leakage.

5-3.24* Gloves shall be tested for ease of donning as specified in Section 6-42, Liner Retention Test, and shall have the final donning time not exceed the baseline donning time plus 20 seconds.

5-3.25 Labels shall be tested for durability and legibility as specified in Section 6-49, Label Durability and Legibility Test One, shall remain in place, and shall be legible.

5-4 Protective Footwear Performance Requirements.

5-4.1 Footwear shall be tested for resistance to heat as specified in Section 6-6, Heat and Thermal Shrinkage Resistance Test, and shall not have any part of the footwear melt, separate, or ignite; shall not shrink more than 5 percent in any dimension; and shall have all components remain functional.

5-4.2 Footwear shall be tested for thermal insulation as specified in Section 6-9, Radiant Heat Resistance Test, and the temperature of the lining surface in contact with the skin shall not exceed 44°C (111°F).

5-4.3 Footwear shall be tested for thermal insulation as specified in Section 6-7, Conductive Heat Resistance Test One, and the temperature of the upper lining surface in contact with skin shall not reach 44°C (111°F) in 10 minutes or less.

5-4.4 Footwear shall be tested for thermal insulation as specified in Section 6-8, Conductive Heat Resistance Test Two, and the temperature of the insole surface in contact with the foot shall not exceed 44°C (111°F).

5-4.5 Footwear, with components in place, shall be tested for resistance to flame as specified in Section 6-5, Flame Resistance Test One.