

NFPA®

1851

**Standard on
Selection, Care, and
Maintenance of Protective
Ensembles for Structural
Fire Fighting and Proximity
Fire Fighting**

2020



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NFPA® 1851

Standard on

Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting

2020 Edition

This edition of NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, was prepared by the Technical Committee on Structural and Proximity Fire Fighting Protective Clothing and Equipment, released by the Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment, and acted on by NFPA at its June Association Technical Meeting held June 17–20, 2019, in San Antonio, TX. It was issued by the Standards Council on August 5, 2019, with an effective date of August 25, 2019, and supersedes all previous editions.

This document has been amended by one or more Tentative Interim Amendments (TIAs) and/or Errata. See “Codes & Standards” at www.nfpa.org for more information.

This edition of NFPA 1851 was approved as an American National Standard on August 25, 2019.

Origin and Development of NFPA 1851

The first edition of NFPA 1851, published in 2001, was titled *Standard on the Selection, Care, and Maintenance of Structural Fire Fighting Protective Ensembles*. The standard was developed to be a companion document for NFPA 1971, then titled *Standard on Protective Ensembles for Structural Fire Fighting*, which has been in effect since 1975 and specifies product design, performance, testing, and certification.

NFPA 1851 is written for the organizations that evaluate the risks their emergency responders face and their particular needs for protective clothing, that develop purchase specifications, and that purchase structural fire-fighting protective ensembles and ensemble elements. It is also written for end users of structural fire-fighting protective ensembles and ensemble elements to be able to inspect, maintain, and care for the protective ensembles and ensemble elements they use during structural fire-fighting operations.

The overall protection and safety of fire-fighting personnel depend not only on adequate protective clothing but equally on the organization’s policies, training, and administration of the correct use of the proper protective ensembles and ensemble elements in fire-fighting situations. To satisfy the portion of the organization’s overall protective clothing and equipment program that addresses structural fire-fighting protective ensembles and ensemble elements, this document provides criteria for the selection, care, and maintenance of protective ensembles and ensemble elements.

In this standard, the requirements for several areas are written to begin with the person who actually uses the protective ensemble or ensemble element being constantly aware of its condition and need for cleaning, repair, or more in-depth inspection. Users can perform the simple actions to improve the condition of the protective ensemble or ensemble element. The more involved actions of advanced inspection, evaluation, cleaning, decontamination, and repair are handled by the organization’s designated staff trained and authorized to perform such duties. In other areas, the requirements are written for the organization to perform the administrative functions of the structural fire-fighting protective ensemble program and to perform periodic actions to evaluate the program to ensure it is achieving its goals and that the quality of the protective ensembles and ensemble elements provides optimum safety to fire fighters.

The 2008 edition of NFPA 1851 was a complete revision of the first edition. Because NFPA 1976, *Standard on Protective Ensemble for Proximity Fire Fighting*, was incorporated into the 2007 edition of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, under

the Technical Committee on Structural and Proximity Fire Fighting Protective Clothing and Equipment, this edition of NFPA 1851 was expanded to include both structural fire-fighting ensembles and proximity fire-fighting ensembles.

The 2008 edition followed the new standards format according to the *Manual of Style for NFPA Technical Committee Documents*.

New requirements in Chapter 11 for organizations and ISPs and for verification of the ISPs by independent, third-party certification organizations set the criteria for organizations and ISPs to perform the tasks of inspection, cleaning, and repairing of protective ensembles and ensemble elements. New requirements for testing methods for trained personnel in the organization as well as the ISPs set the criteria to determine functionality and protection afforded by ensembles and ensemble elements.

Chapter 10 was revised, requiring retirement of structural fire-fighting ensembles and ensemble elements and proximity fire-fighting ensembles and ensemble elements not later than 10 years from the date the ensembles or ensemble elements were manufactured. The radiant reflective outer shell of proximity fire-fighting ensembles and ensemble elements were required to be replaced a maximum of 5 years from the date the ensembles or ensemble elements were manufactured. More frequent replacement of fire-fighting ensembles and ensemble elements was required to better ensure that fire fighters had state-of-the-art protection from fire-fighting environments. The significant changes that technology underwent within two editions of this standard (approximately 10 years), in addition to the normal “wear and tear” of fire-fighting and additional emergency incident responses, training, and other factors, dictated that protective ensembles and ensemble elements be replaced. Fire departments that responded to a higher-than average number of emergency incidents or that had frequent or extensive “working fire” operations were encouraged to plan for replacement of ensembles or ensemble elements on a more frequent cycle.

The 2014 edition of NFPA 1851 was another complete revision and featured many editorial changes as well as new definitions for *manufacturer trained organization*, *verified organization*, and *verified independent service provider (ISP)*. A new table was added to Chapter 4 that specified the responsibilities for garment inspection, cleaning, and repair. Inspection for delamination and label integrity and legibility was added to Chapter 6. Changes were made to the cleaning and decontamination procedures in Chapter 7, and requirements in Chapter 8 for the repair of ensembles and ensemble elements were revised. There were also several changes to Chapter 11 that affected verification of organizations and ISPs, and two new tables were added that addressed advanced inspection and advanced cleaning evaluations.

The 2020 edition has seen major changes to the cleaning requirements in Chapter 4 and Chapter 7 and further changes to supporting definitions. In Chapter 4, the table of responsibilities for garment element inspection, cleaning, and repair has been redone to reflect six different groups that could potentially have one of those responsibilities with accompanying clarifications concerning how that responsibility is accomplished. In Chapter 7, each major heading has been rewritten in light of new technologies and information gleaned from research and testing. Two new decision trees have been added for handling, disposition, and cleaning of ensembles and ensemble elements to assist in determining the appropriate cleaning procedure(s). These changes have also led to a definition and associated annex material for the term *preliminary exposure reduction* to replace *on-scene preliminary cleaning*.

For the 2020 edition, the technical committee has strengthened the annex material associated with the Chapter 10 retirement requirements by expanding on existing language and explaining the work that was done that led to the development of retirement criteria in the standard. The technical committee has also added a paragraph concerning carcinogens and performance testing.

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Committee Scope: This committee shall have primary responsibility for documents on protective ensembles, except respiratory protection, that provides head, limb, hand, foot, torso, and interface protection for fire fighters and other emergency services responders during incidents involving structural fire fighting operations or proximity fire fighting operations.

Structural fire fighting operations include the activities of rescue, fire suppression, and property conservation during incidents involving fires in buildings, enclosed structures, vehicles, marine vessels, or like properties.

Proximity fire fighting operations include the activities of rescue, fire suppression, and property conservation during incidents involving commercial and military aircraft fires, bulk flammable gas fires, bulk flammable and combustible liquids fires, combustible metal fires, exotic fuel fires, and other such fires that produce very high levels of radiant heat as well as convective and conductive heat.

Additionally, this committee shall have primary responsibility for documents on the selection, care, and maintenance of structural and proximity fire fighting protective ensembles by fire and emergency services organizations and personnel.

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Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting

2020 Edition

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

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

Chapter 1 Administration

1.1 Scope.

- Δ 1.1.1 This standard shall specify the minimum selection, care, and maintenance requirements for structural fire fighting protective ensembles and the individual ensemble elements that include garments, helmets, gloves, footwear, and interface components that are compliant with NFPA 1971.
- Δ 1.1.2 This standard shall also specify the minimum selection, care, and maintenance requirements for proximity fire fighting protective ensembles and the individual ensemble elements that include garments, helmets, gloves, footwear, and interface components that are compliant with NFPA 1971.
- Δ 1.1.3 This standard shall also specify requirements for both structural fire fighting and proximity fire fighting protective ensembles, ensemble elements, clothing, and equipment certified as compliant with previous editions of NFPA 1971.

1.1.4 This standard shall also specify the minimum selection, care, and maintenance requirements for structural fire fighting protective ensembles with optional liquid and particulate contaminant protection and for proximity fire fighting protective ensembles with optional liquid and particulate contaminant protection.

1.1.5 This standard shall not specify requirements for other organizational programs such as appropriate use of structural fire fighting or proximity fire fighting protective ensembles for training, for operations, or for infection control, because these programs are under the jurisdiction of other NFPA standards.

- Δ 1.1.6 This standard shall not apply to protective ensembles or protective clothing that are compliant with NFPA 1951, NFPA 1977, NFPA 1991, NFPA 1992, NFPA 1994, and NFPA 1999.

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

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

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

1.2 Purpose.

1.2.1 The purpose of this standard shall be to establish a program for structural fire fighting protective ensembles and ensemble elements and for proximity fire fighting protective ensembles and ensemble elements to reduce the safety risks and potential health risks associated with poorly maintained, contaminated, or damaged protective ensembles and ensemble elements.

1.2.2 The purpose of this standard shall also be to establish basic criteria for selection, inspection, cleaning, decontamination, repair, storage, and retirement of structural fire fighting protective ensembles or ensemble elements and proximity fire fighting protective ensembles or ensemble elements.

1.3 Application.

- Δ 1.3.1 This standard shall apply to structural fire fighting and proximity fire fighting ensembles and ensemble elements certified as compliant with NFPA 1971.
- Δ 1.3.2 This standard shall also apply to structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements certified as compliant with the previous editions of NFPA 1971.

1.3.2.1 This standard shall also apply to structural fire fighting protective ensembles with optional liquid and particulate contaminant protection and to proximity fire fighting protective ensembles with optional liquid and particulate contaminant protection.

tive ensembles with optional liquid and particulate contaminant protection.

1.3.3 This standard shall not apply to other organizational programs such as appropriate use of structural fire fighting or proximity fire fighting protective ensembles for training, operations, or infection control, because these programs are under the jurisdiction of other NFPA standards.

1.3.4 This standard shall not apply to respiratory protective equipment other than where such equipment interfaces with structural fire fighting protective ensembles or proximity fire fighting protective ensembles with the optional liquid and particulate contaminant protection.

1.3.5 The requirements of this standard shall not apply to accessories attached to any element of the structural fire fighting protective ensemble unless specifically addressed herein.

1.4 Units.

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

1.4.2 Equivalent values in parentheses shall not be considered as the requirement because these values are approximate.

Chapter 2 Referenced Publications

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

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

NFPA 600, *Standard on Facility Fire Brigades*, 2015 edition.

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

NFPA 1951, *Standard on Protective Ensembles for Technical Rescue Incidents*, 2013 edition.

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

NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting*, 2016 edition.

NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies and CBRN Terrorism Incidents*, 2016 edition.

NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies*, 2018 edition.

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

NFPA 1999, *Standard on Protective Clothing and Ensembles for Emergency Medical Operations*, 2018 edition.

2.3 Other Publications.

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

AATCC 135, *Dimensional Changes of Fabrics after Home Laundering*, 2004.

AATCC 198, *Horizontal Wicking of Textiles*, 2013.

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

ASTM D2261, *Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine)*, 2013, reapproved 2017e1.

ASTM D5034, *Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)*, 2017.

ASTM E2274, *Standard Test Method for Evaluation of Laundry Sanitizers and Disinfectants*, 2016.

ASTM E2406, *Standard Test Method for Evaluation of Laundry Sanitizers and Disinfectants for Use in High Efficiency Washing Operations*, 2016.

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

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

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

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

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

Title 29, Code of Federal Regulations, Part 1910.1030, "Bloodborne Pathogens."

▲ 2.3.5 Other Publications.

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

● 2.4 References for Extracts in Mandatory Sections. (Reserved)

Chapter 3 Definitions

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

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

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

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

compliance with appropriate standards or performance in a specified manner.

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

3.2.5 Shall. Indicates a mandatory requirement.

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

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

3.3 General Definitions.

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

3.3.2 Advanced Cleaning. See 3.3.12.1, Advanced Cleaning.

3.3.3 Biological Terrorism Agents. Liquid or particulate agents that can consist of a biologically derived toxin or pathogen to inflict lethal or incapacitating casualties.

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

3.3.5* Carcinogen/Carcinogenic. A cancer-causing substance that is identified in one of several published lists, including, but not limited to, those prepared by the U.S. National Toxicology Program, the International Agency for Research on Cancer (IARC), the National Institute for Occupational Safety and Health (NIOSH), and the American Conference of Governmental Industrial Hygienists (ACGIH).

3.3.6 Care. Cleaning and storage of protective clothing and equipment.

3.3.7 CBRN. An abbreviation for chemicals, biological agents, and radiological particulate hazards. (See also 3.3.8, *CBRN Terrorism Agents*.)

3.3.8* CBRN Terrorism Agents. Chemicals, biological agents, and radiological particulates that could be released as the result of a terrorist attack. (See also 3.3.3, *Biological Terrorism Agents*; 3.3.11, *Chemical Terrorism Agents*; 3.3.81, *Radiological Particulate Terrorism Agents*; and 3.3.109, *Toxic Industrial Chemicals*.)

3.3.9 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 a specific standard(s), authorizes the manufacturer to use a label on listed products that comply with the requirements of that standard(s), and establishes a follow-up program conducted by the certification organization as a check on the methods the manufacturer uses to determine continued compliance of labeled and listed products with the requirements of that standard(s).

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

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

3.3.12* Cleaning. The act of removing soiling and contamination from ensembles and ensemble elements by mechanical, chemical, thermal, or combined processes.

3.3.12.1* Advanced Cleaning. The act of removing both soiling and contamination generally associated with products of combustion.

3.3.12.2* Specialized Cleaning. The act of removing hazardous materials, soiling associated with body fluids, or other forms of contamination.

N 3.3.13* Cleaning Facility. An entity, location, or site engaged in the cleaning of ensemble elements that includes an element manufacturer verified in cleaning, a verified cleaner, a verified organization, or a verified ISP.

3.3.14 Coat. See 3.3.94, Structural Fire Fighting Protective Coat, and 3.3.71, Proximity Fire Fighting Protective Coat.

Δ 3.3.15* Contamination. The accumulation of products of combustion and other hazardous materials on or in an ensemble element that includes carcinogenic, toxic, corrosive, or allergy-causing chemicals, body fluids, infectious microorganisms, or CBRN terrorism agents.

3.3.16 Coverall. See 3.3.95, Structural Fire Fighting Protective Coverall, and 3.3.72, Proximity Fire Fighting Protective Coverall.

3.3.17 Craze. The appearance of fine cracks in the surface of a helmet shell or other smooth surface of an ensemble element.

3.3.18 Cross-Contamination. The transfer of contamination from one item to another or to the environment.

3.3.19 Crown. The portion of the helmet that covers the head above the reference plane.

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

Δ 3.3.21* Decontamination. The act of removing contamination from or neutralizing contamination in protective clothing and equipment. (See also 3.3.12, *Cleaning*.)

3.3.22* Disinfectant. A type of antimicrobial agent that destroys or irreversibly inactivates fungi and bacteria, but not necessarily their spores, on inanimate surfaces and objects.

3.3.23* Drag Rescue Device. A component integrated within the protective coat element to aid in the rescue of an incapacitated fire fighter.

3.3.24 DRD. See 3.3.23, Drag Rescue Device.

3.3.25 Ear Covers. An interface component of the protective helmet element that provides limited protection to the helmet/coat interface area.

3.3.26 Elasticity. The ability of a material to return to its original form after being stretched.

3.3.27 Elements. See 3.3.32, Ensemble Elements.

3.3.28 Embrittlement. The hardening of a material that makes it susceptible to easy fracture.

3.3.29* Emergency Medical Operations. Delivery of emergency patient care, including patient transportation, provided prior to arrival at a hospital or other health care facility.

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

3.3.31 Ensemble. See 3.3.96, Structural Fire Fighting Protective Ensemble, and 3.3.73, Proximity Fire Fighting Protective Ensemble.

3.3.32* Ensemble Elements. The compliant products that provide protection to the upper and lower torso, arms, legs, head, hands, and feet.

3.3.33 Faceshield. The component of the helmet that provides limited protection to a portion of the wearer's face. Not primary eye protection.

3.3.34 Field Evaluation. The nonlaboratory assessment of an ensemble, ensemble element, or item.

3.3.35 Fit. The quality, state, and manner in which clothing and equipment, when worn, relate to the human body.

3.3.36* Flame Resistance (Protective Clothing and Equipment). The property of a material whereby combustion is prevented, terminated, or inhibited following the application of a flaming or nonflaming source of ignition, with or without subsequent removal of the ignition source. (See also 3.3.51, *Inherent Flame Resistance*.)

3.3.37 Footwear. See 3.3.98, Structural Fire Fighting Protective Footwear, and 3.3.75, Proximity Fire Fighting Protective Footwear.

3.3.38 Functional. The ability of an ensemble element or component of an ensemble element to continue to be utilized for its intended purpose.

3.3.39 Garment. See 3.3.99, Structural Fire Fighting Protective Garments, and 3.3.76, Proximity Fire Fighting Protective Garments.

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

3.3.41 Glove. See 3.3.100, Structural Fire Fighting Protective Glove, and 3.3.77, Proximity Fire Fighting Protective Glove.

3.3.42 Glove Wristlet. See 3.3.119, Wristlet.

3.3.43* Goggles. Ensemble element or component that provides limited protection to the wearer's eyes. Goggles might or might not provide primary protection.

3.3.44* Gross Decontamination. A term used in the hazardous materials response industry to indicate the partial removal of exterior contamination from protective clothing, usually by rinsing with water, sometimes with detergent, to allow for the safe exit of the responder from the protective clothing in the contamination reduction zone of an emergency incident. (See 3.3.66, *Preliminary Exposure Reduction*.)

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

3.3.46* Hazardous Materials. Substances (solid, liquid, or gas) that when released are capable of creating harm to people, the environment, and property.

3.3.47 Hazardous Materials Emergencies. Incidents involving the release or potential release of hazardous materials.

3.3.48 Helmet. See 3.3.101, Structural Fire Fighting Protective Helmet, and 3.3.78, Proximity Fire Fighting Protective Helmet.

3.3.49 Hood. See 3.3.103, Structural Fire Fighting Protective Particulate-Blocking Hood, and 3.3.102, Structural Fire Fighting Protective Hood.

3.3.50 Independent Service Provider (ISP). An independent third party utilized by an organization to perform advanced cleaning, advanced inspection, and repair services. In order to comply with NFPA 1851, an ISP must be verified. [See also 3.3.115, *Verified Independent Service Provider (ISP)*].

3.3.51 Inherent Flame Resistance. Flame resistance that is derived from the essential characteristics of the fiber or polymer.

3.3.52 Integrity. The ability of an ensemble or ensemble element to remain intact and provide continued minimum performance.

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

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

3.3.55 Liner System. The moisture barrier and thermal barrier components as used in a garment.

3.3.56 Maintenance. The inspection, service, and repair of protective clothing and equipment, including the determination for removal from service.

3.3.57 Major A Seam. See 3.3.84.1, Major A Seam.

3.3.58 Major B Seam. See 3.3.84.2, Major B Seam.

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

3.3.60 Manufacturer-Trained Organization. See 3.3.64.1, **Manufacturer-Trained Organization**.

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

3.3.62 Minor Seam. See 3.3.84.3, **Minor Seam**.

3.3.63 Moisture Barrier. The component of an ensemble element or item that principally prevents the transfer of liquids.

3.3.64* Organization. The entity that provides the direct management and supervision for the emergency services personnel.

3.3.64.1 Manufacturer-Trained Organization. A non-verified organization trained by an element manufacturer of the same element type to conduct any one or a combination of advanced cleaning, advanced inspection, and basic repair on the organization's elements.

Δ **3.3.64.2 Verified Organization.** An organization verified by a third-party certification organization to conduct advanced cleaning, advanced inspection and sanitization, basic repair, and advanced repair on any organization's elements.

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

N **3.3.66* Preliminary Exposure Reduction.** Techniques for reducing soiling and contamination levels on the exterior of the ensemble or ensemble element following incident operations.

N **3.3.67* Products of Combustion.** The end product when fuels, such as hydrocarbons and materials, remain after the process of combustion in a fire.

3.3.68 Protective Clothing. See 3.3.96, **Structural Fire Fighting Protective Ensemble**, and 3.3.73, **Proximity Fire Fighting Protective Ensemble**.

3.3.69 Protective Ensemble. See 3.3.96, **Structural Fire Fighting Protective Ensemble**, and 3.3.73, **Proximity Fire Fighting Protective Ensemble**.

3.3.70 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.

3.3.71 Proximity Fire Fighting Protective Coat. The element of the protective ensemble that provides protection to the upper torso and arms, excluding the hands and head.

3.3.72 Proximity Fire Fighting Protective Coverall. The element of the protective ensemble that provides protection to the torso, arms, and legs, excluding the head, hands, and feet.

3.3.73* Proximity Fire Fighting Protective Ensemble. Multiple elements of compliant protective clothing and equipment that when worn together provide protection from some risks, but not all risks, of emergency incident operations.

3.3.74 Proximity Fire Fighting Protective Ensemble with Optional Liquid and Particulate Contamination Protection. A compliant proximity fire fighting protective ensemble that is

also certified as an entire ensemble to meet the optional requirements for protection from liquid and particulate contaminants.

3.3.75 Proximity Fire Fighting Protective Footwear. The element of the protective ensemble that provides protection to the foot, ankle, and lower leg.

3.3.76 Proximity Fire Fighting Protective Garments. The coat, trouser, and coverall elements of the protective ensemble.

3.3.77 Proximity Fire Fighting Protective Glove. The element of the protective ensemble that provides protection to the hand and wrist.

3.3.78 Proximity Fire Fighting Protective Helmet. The element of the protective ensemble that provides protection to the head.

3.3.79 Proximity Fire Fighting Protective Shroud. The component of the helmet that provides limited protection to the helmet/coat interface area.

3.3.80 Proximity Fire Fighting Protective Trouser. The element of the protective ensemble that provides protection to the lower torso and legs, excluding the ankles and feet.

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

3.3.82 Retirement. The process of permanently removing an ensemble element from emergency operations service in the organization.

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N **3.3.83* Sanitizer.** A type of antimicrobial agent that is used to reduce, but not necessarily eliminate, microorganisms from the inanimate environment to levels considered safe as determined by public health codes or regulations.

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

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

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

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

3.3.85 Selection. The process of determining what protective clothing and equipment (PCE) is necessary for protection of fire and emergency services response personnel from an anticipated specific hazard or other activity, the procurement of the appropriate PCE, and the choice of the proper PCE for a specific hazard or activity at an emergency incident.

3.3.86 Separate/Separation. A material response evidenced by splitting or delaminating.

3.3.87 Service Life. The period for which compliant product can be useful before retirement.

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

3.3.89 Shroud. See 3.3.79, Proximity Fire Fighting Protective Shroud.

Δ 3.3.90* Soiling. The accumulation of sweat, dust, dirt, debris, and other nonhazardous materials on or in an ensemble or ensemble element that could degrade its performance or cause hygiene issues.

3.3.91 Specialized Cleaning. See 3.3.12.2, Specialized Cleaning.

3.3.92 Stress Area. Those areas of the garment that are subjected to more wear, including, but not limited to, crotches, knees, elbows, and shoulders.

3.3.93 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.

3.3.94 Structural Fire Fighting Protective Coat. The element of the protective ensemble that provides protection to the upper torso and arms, excluding the hands and head.

3.3.95 Structural Fire Fighting Protective Coverall. The element of the protective ensemble that provides protection to the torso, arms, and legs, excluding the head, hands, and feet.

3.3.96* Structural Fire Fighting Protective Ensemble. Multiple elements of compliant protective clothing and equipment that when worn together provide protection from some risks, but not all risks, of emergency incident operations.

3.3.97 Structural Fire Fighting Protective Ensemble with Optional Liquid and Particulate Contaminant Protection. A compliant structural fire fighting protective ensemble that is also certified as an entire ensemble to meet the optional requirements for protection from liquid and particulate contaminants.

3.3.98 Structural Fire Fighting Protective Footwear. The element of the protective ensemble that provides protection to the foot, ankle, and lower leg.

3.3.99 Structural Fire Fighting Protective Garments. The coat, trouser, and coverall elements of the protective ensemble.

3.3.100 Structural Fire Fighting Protective Glove. The element of the protective ensemble that provides protection to the hand and wrist.

3.3.101 Structural Fire Fighting Protective Helmet. The element of the protective ensemble that provides protection to the head.

N 3.3.102 Structural Fire Fighting Protective Hood. The interface element of a protective ensemble that provides limited protection to the coat/helmet/SCBA facepiece interface area.

N 3.3.103* Structural Fire Fighting Protective Particulate-Blocking Hood. A structural fire fighting protective hood that reduces particulate penetration.

3.3.104 Structural Fire Fighting Protective Trouser. The element of the protective ensemble that provides protection to the lower torso and legs, excluding the ankles and feet.

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

3.3.106 Tensile Strength. The force at which a fiber or fabric will break when pulled in one dimension.

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

3.3.108 Thermal Barrier. The component of an ensemble element or item that principally provides thermal protection.

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

3.3.110 Trim. See 3.3.117, Visibility Markings.

3.3.111 Trouser. See 3.3.104, Structural Fire Fighting Protective Trouser, and 3.3.80, Proximity Fire Fighting Protective Trouser.

3.3.112* Universal Precautions. An approach to infection control in which human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

3.3.113 Utility Sink. A separate sink used for cleaning ensembles and ensemble elements.

N 3.3.114 Verified Cleaner. An independent cleaning service verified by a third-party certification organization to conduct advanced cleaning and sanitization.

Δ 3.3.115 Verified Independent Service Provider (ISP). An independent service provider verified by a third-party certification organization to conduct advanced inspection, advanced cleaning and sanitization, basic repair, and advanced repair service.

3.3.116 Verified Organization. See 3.3.64.2, Verified Organization.

3.3.117 Visibility Markings. Retroreflective and fluorescent conspicuity enhancements. Retroreflective enhancements improve nighttime conspicuity, and fluorescent enhancements improve daytime conspicuity.

3.3.118 Winter Liner. An optional component layer that provides added insulation against cold.

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

Chapter 4 Program

Δ 4.1 General.

4.1.1* The organization shall develop and implement a program for the selection, care, and maintenance of structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements used by the members of the organization in the performance of their assigned functions.

4.1.2 This program shall have the goal of providing structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements that are suitable for the intended use.

ble and appropriate for the intended use; maintaining such protective ensembles and ensemble elements in a safe, usable condition to provide the intended protection to the user; removing from use such protective ensembles and ensemble elements that could cause or contribute to user injury, illness, or death because of their condition; and reconditioning, repairing, or retiring such protective ensembles and ensemble elements.

4.1.3 Where this program for the selection, care, and maintenance of structural and proximity fire fighting protective ensembles and ensemble elements is part of an organization's overall program on protective clothing and protective equipment, the portion of the organization's overall program that affects structural and proximity fire fighting protective ensembles and ensemble elements shall be in accordance with Section 4.2.

4.2 Program Organization for Structural Fire Fighting Ensembles and Ensemble Elements and Proximity Fire Fighting Ensembles and Ensemble Elements.

4.2.1 The organization's program specified in Section 4.1 shall incorporate at least the requirements in Chapters 4 through 12 of this standard.

4.2.2* The organization shall develop written standard operating procedures (SOPs) that shall identify and define the various parts of the program and the various roles and responsibilities of the organization and of the members in the program parts specified in Table 4.2.2.

4.2.3* The organization shall not add or permit accessories to be added to any ensemble or ensemble element prior to the organization requesting approval in writing and receiving written approval from the ensemble or ensemble element manufacturer for each specific accessory.

4.2.3.1* The organization shall not add or permit accessories to be added to any ensemble or ensemble element where the organization's request for approval has been responded to in writing with a disapproval from the ensemble or ensemble element manufacturer.

4.2.3.2* In the event that the organization cannot make contact with the ensemble or ensemble element manufacturer for a specific accessory to be used on the ensemble or ensemble element, the organization shall be permitted to evaluate the accessory for attachment to an ensemble or ensemble

element using recognized tests to determine that the accessory does not degrade the performance of the ensemble or ensemble element.

4.2.3.3* In the event the organization's written requests for permission have not received a reply from the ensemble or ensemble element manufacturer for a specific accessory to be used on the ensemble or ensemble element, the organization shall be permitted to evaluate the accessory for attachment to an ensemble or ensemble element using recognized tests to determine that the accessory does not degrade the performance of the ensemble or ensemble element.

4.2.4* The organization shall use one or any combination thereof of the following to perform advanced cleaning, sanitization or disinfection, advanced inspection, and repair services of ensembles and ensemble elements (*see Table 4.2.4*):

- (1) Manufacturer verified in cleaning
- (2) Verified organization
- (3) Verified independent service provider (ISP)
- (4) Verified cleaner
- (5) Manufacturer-trained organization for the organization's ensembles and ensemble elements only
- (6) Ensemble or ensemble element manufacturer

Δ 4.2.4.1 Verified organizations, verified ISPs, manufacturers verified in cleaning, and verified cleaners shall meet the requirements of Chapter 11 and shall be verified by a third-party certification organization.

N 4.2.4.1.1 Manufacturers verified in cleaning shall meet the cleaning requirements of Chapter 11 and shall be verified by a third-party certification organization.

N 4.2.4.1.2 Verified cleaners shall meet the cleaning and quality management requirements of Chapter 11 and shall be verified by a third-party certification organization.

4.2.4.2* Where the organization is a verified organization, uses a verified ISP, or uses a verified cleaner, approval from the element manufacturer shall not be required.

Δ 4.2.4.3* Verified organizations and verified ISPs shall receive written verification from the third-party certification organization to conduct garment element advanced cleaning, advanced inspection, and advanced repair services.

N 4.2.4.3.1* Verified cleaners shall receive written verification from the third-party certification organization to conduct garment element advanced cleaning.

N 4.2.4.3.2 Manufacturers verified in cleaning shall receive written verification from the third-party certification organization to conduct garment element advanced cleaning.

• 4.2.4.4 All garment advanced repairs shall be conducted by the garment manufacturer, a verified organization, or a verified ISP.

Δ 4.2.4.5* Manufacturer-trained organizations shall meet the training requirements in this section and shall be permitted to perform the activities identified in Table 4.2.4 for manufacturer-trained organizations.

N 4.2.4.5.1* Training shall be provided by an element manufacturer of the same element type, a verified ISP, a verified organization, a verified cleaner, or any combination thereof.

Δ Table 4.2.2 Required Program Parts for Structural and Proximity Fire Fighting Protective Ensembles and Elements

Program Part	Chapter/Section of NFPA 1851
Records	Section 4.3
Protecting the public and personnel from exposure to contaminated PPE	Section 4.5
Selection	Chapter 5
Inspection	Chapter 6
Cleaning	Chapter 7
Repair	Chapter 8
Storage	Chapter 9
Retirement, disposition, and special incident procedures	Chapter 10

N Table 4.2.4 Responsibilities for Garment Element Inspection, Cleaning, and Repair

	Manufacturer Verified in Cleaning	Verified ISP or Verified Organization	Verified Cleaner	Manufacturer- Trained Organization	User	Ensemble or Ensemble Element Manufacturer
Routine inspections (Section 6.2)					X	
Preliminary exposure reduction (Section 7.2)					X	
Advanced inspection (Section 6.3)	X	X		X		X
Complete liner inspection (Section 6.4)	X	X		X		X
Advanced cleaning (Section 7.3)	X	X	X	X		
Sanitization or disinfection (Section 7.4)	X	X	X	X		
Specialized cleaning (Section 7.5)	X	X	X	X		
Basic repair (Sections 8.2 and 8.3)	X	X		X		X
Advanced repair (Sections 8.2 and 8.4)	X	X				X
Training for cleaning	X	X	X			X
Training for repairs	X	X				X
Training for inspection	X	X				X

N 4.2.4.5.2* Training shall be consistent with the requirements and information provided in this standard and shall incorporate at least the following:

- (1) Program (*see Section 4.2*)
- (2) Records (*see Section 4.3*)
- (3) Protecting the public and personnel from exposure to contaminated PPE (*see Section 4.5*)
- (4) Selection (*see Chapter 5*)
- (5) Inspection (*see Chapter 6*)
- (6) Cleaning (*see Chapter 7*)
- (7) Repair (*see Chapter 8*)
- (8) Storage (*see Chapter 9*)
- (9) Retirement, disposition, and special incident procedures (*see Chapter 10*)
- (10) Specific instructions, parameters or procedures applicable to ensembles or ensemble elements with unique properties or performance as necessary

N 4.2.4.5.3* The entity conducting the training shall provide documentation that the organization has received the required training.

N 4.2.4.5.4 Organizations shall obtain and complete within one year of the edition issuance date the training required in 4.2.4.5.2 each time a new edition of NFPA 1851 is issued or there is a change in personnel overseeing or performing the required aspects of an organization's program.

N 4.2.4.5.5 Organizations shall consult with an ensemble or ensemble element manufacturer when additional training is necessary for special requirements specific to products, components, or materials that are unique to a manufacturer.

4.2.5* The organization shall develop specific criteria for removal of protective clothing and equipment from service, in accordance with Chapter 10, Retirement, Disposition, and Special Incident Procedure. The criteria for retirement shall

include, but not be limited to, issues that are specific to the ensembles or ensemble elements being used by the organization, the manufacturers' instructions, and the experience of the organization.

4.3 Records.

4.3.1* The organization shall compile and maintain records on its structural fire fighting protective ensembles and ensemble elements and proximity fire fighting protective ensembles and ensemble elements.

4.3.2* The records specified in 4.3.1 shall apply to fire fighting protective ensembles and ensemble elements that are utilized by the fire department, including rental or loaner protective ensembles and ensemble elements.

4.3.3 At least the following records shall be kept for each protective ensemble or ensemble element:

- (1) Person to whom element is issued
- (2) Date and condition when issued
- (3) Manufacturer and model name or design
- (4) Manufacturer's identification number, lot number, or serial number
- (5) Month and year of manufacture
- (6) Date(s) and findings of advanced inspection(s)
- (7) Date(s) and findings of advanced cleaning, disinfection or sanitization, or specialized cleaning
- (8) Reason(s) for and who performed advanced cleaning, disinfection or sanitization, or specialized cleaning
- (9) Date(s) of repair(s), who performed repair(s), and brief description of repair(s)
- (10) Date of retirement
- (11) Date and method of disposal

4.3.4 The organization shall compile and maintain records as required by 4.3.3 on fire fighting protective ensembles with

liquid and particulate contaminant protection. The records shall include a list of specific required elements and interface components necessary for structural fire fighting protective ensembles with optional liquid and particulate contaminant protection and proximity fire fighting protective ensembles with optional liquid and particulate contaminant protection.

N 4.3.5* Where an organization keeps an element(s) in a rotating exchange program and does not assign it to a member, the organization shall develop a program to clean and inspect these elements and the following records shall be kept:

- (1) Manufacturer and model name or designation
- (2) Manufacturer's identification number, lot number, or serial number
- (3) Month and year of manufacture
- (4) Date(s) and findings of advanced inspection(s)
- (5) Date(s) and findings of advanced cleaning, disinfection or sanitization, or specialized cleaning
- (6) Date(s) element is returned to rotating exchange inventory
- (7) Reasons for and who performed advanced cleaning, disinfection or sanitization, or specialized cleaning
- (8) Date(s) of repair(s), who performed repair(s), and brief description of repair(s)
- (9) Date of retirement
- (10) Date and method of disposal

4.4 Manufacturer's Instructions.

4.4.1 When issuing new structural fire fighting protective ensembles and ensemble elements or proximity fire fighting protective ensembles and ensemble elements, the organization shall provide users with the instructions provided by the manufacturer on the care, use, and maintenance of the protective ensembles or ensemble elements, including any warnings provided by the manufacturer. This information shall be permitted to be delivered from the manufacturer in various formats, including, but not limited to, printed materials or instructions to access the information electronically/digitally.

4.4.2* Where the manufacturer's instructions regarding the care or maintenance of the protective ensembles or elements differ from a specific requirement(s) in this standard, the manufacturer's instructions shall be followed for that requirement(s). Manufacturers shall not be permitted to override the requirements of this standard for third-party verification.

4.4.3 The organization shall retain and make accessible to fire department personnel a copy of manufacturers' instructions regarding the care, use, and maintenance of the protective ensembles for reference purposes.

4.5 Protecting the Public and Personnel from Exposure to Contaminated PPE.

4.5.1 The organization shall develop written SOPs that minimize the public's and the fire department personnel's exposure to soiled or contaminated structural or proximity fire fighting protective ensembles and ensemble elements.

4.5.2* The SOPs shall require that protective ensembles or ensemble elements not be worn or stored in the living areas of fire department facilities.

4.5.3* The public shall not be exposed at any time, except during emergency operations, to soiled or potentially contaminated protective ensembles or ensemble elements.

4.5.4* Soiled or potentially contaminated ensembles or ensemble elements shall not be brought into the home, taken to public facilities, or transported in private vehicles.

4.6 Reporting Personal Protective Equipment Health and Safety Concerns.

4.6.1* The organization shall report all personal protective equipment (PPE) health and safety concerns, if caused by a known or suspected element failure, to the element manufacturer and certification organization.

4.6.2* The organization shall notify the manufacturer and the certification organization in writing.

4.6.3 The organization shall request written acknowledgment that the report of health and safety concerns was received by the element manufacturer and certification organization. Written acknowledgment must be received within 30 days of the date of the report of health and safety concerns.

Chapter 5 Selection

5.1* Selection and Purchase.

5.1.1* Prior to starting the selection process of structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements, the organization shall perform a risk assessment.

N 5.1.1.1 The organization shall distinguish between the use of structural fire fighting ensembles and proximity fire fighting ensembles based on the operating area and mission responsibilities of the organization. The risk assessment shall be based on both the frequency and severity of exposure to specific hazards as a means for determining the selection of appropriate fire fighting protective ensembles.

N 5.1.1.2 The organization shall review the risk assessment or conduct a new risk assessment at least every 2 years or under specific circumstances, including, but not limited to, the following:

- (1) When there are changes that affect the findings of the current risk assessment in terms of the specific identification of hazards or availability of fire fighting ensemble product technology
- (2) When there are changes in the organization's standard operating procedures (SOPs) for the use of structural fire fighting ensembles or proximity fire fighting ensembles
- (3) When any personal protective ensemble or ensemble elements are being considered for selection and purchase

5.1.2 The risk assessment shall include, but not be limited to, the hazards that can be encountered by structural or proximity fire fighters based on the following:

- (1)* Type of duties performed
- (2) Distinguishing response activities for different potential incidents
- (3) Organization's experiences
- (4) Incident operations
- (5) Geographic location and climate
- (6)* Specific physical area of operation
- (7)* Likelihood of or response to CBRN terrorism incident
- (8) Need for two sets of ensemble elements or spare ensemble elements

▲ 5.1.3* The organization shall review the current edition of NFPA 1971, NFPA 1994, NFPA 1500, NFPA 600, and any applicable federal or state OSHA standards relating to structural fire fighting protective ensembles and ensemble elements to determine how they affect the selection process.

▲ 5.1.4* The organization shall ensure that elements under consideration are certified as being compliant with NFPA 1971 by a third-party certification organization.

5.1.5* Based on the risk assessment, the organization shall compile and evaluate information on the comparative strengths and weaknesses of the elements under consideration.

■ 5.1.5.1* Organizations shall specifically consider the tradeoffs in the level of thermal insulation versus thermal comfort or stress-related effects of the material composite in their selection of protective garments.

5.1.6* The organization shall ensure the proper interface between ensemble elements, including, but not limited to, coat-to-hood and helmet, coat-to-pant, coat-to-glove, and pants-to-footwear. Any other specialty equipment being used shall also be considered to ensure the equipment does not interfere with the proper function and interface of the protective ensemble or ensemble elements.

■ 5.1.6.1* Based on the risk assessment, the organization shall ensure that eye and face protection components or separate devices are specified to provide adequate eye and face protection for each type of incident identified in the risk assessment.

5.1.7* Where a field evaluation of an ensemble or ensemble element is conducted, the organization shall establish criteria to ensure a systematic method of comparing products in a manner related to their intended use and assessing their performance relative to the organization's expectations.

▲ 5.1.8* Where the organization develops purchase specifications, at least the following criteria shall be included:

- (1) Purchase specifications shall require that the ensemble or ensemble element(s) to be purchased shall be compliant with the current edition of NFPA 1971. Purchasers shall consider that ensembles that are certified to the optional liquid and particulate contamination protection requirement are tested and certified as ensembles and must be worn as an ensemble with all elements and interface components present as stated on the element label.
- (2)* Where the organization selects criteria that exceed the minimum requirements of the current edition of NFPA 1971, such criteria shall be stipulated in the purchase specifications.
- (3)* Purchase specifications shall require that submitted offers or bids include substantiation of certification for each element and model offered.
- (4)* Where applicable, the purchase specifications shall define the process for determining proper fit.
- (5)* The organization shall compare each bid submittal against purchase specifications.

5.1.9 Upon receipt, organizations shall inspect purchased protective ensemble element(s) to determine that they meet their specifications and that they were not damaged during shipment. Organizations shall also verify the quantity and sizes of the protective ensemble element(s) received.

5.1.10 Organizations shall examine information supplied with the products, such as instructions, warranties, and technical data.

5.1.11 Procedures shall be established for returning unsatisfactory products if the organization's specifications are not met.

Chapter 6 Inspection

6.1 General.

6.1.1 Universal precautions shall be observed, as appropriate, when handling ensemble elements. At a minimum, individuals conducting inspections shall wear examination gloves that are certified to NFPA 1999. Consideration shall also be given to having individuals conducting inspections of ensemble elements wear appropriate aprons with sleeves or respirators.

▲ 6.1.2 Any ensemble elements that are found to be soiled or contaminated shall be cleaned before any additional inspection is initiated. Where ensemble elements are found to be contaminated by CBRN agents, the ensemble shall be retired.

6.1.3* The organization shall establish guidelines for its members to follow in determining if an element is soiled to an extent that cleaning is necessary.

▲ 6.1.4 The organization shall determine appropriate actions to be taken if an element is found to be in need of cleaning or repair.

▲ 6.1.4.1 At a minimum, any necessary cleaning shall be done in accordance with the requirements specified in Chapter 7. Where a condition exists that is beyond preliminary exposure reduction in accordance with Section 7.2, the element shall be removed from service, tagged, and referred to personnel responsible for advanced cleaning.

6.1.4.2 At a minimum, any necessary repairs shall be made in accordance with the requirements specified in Chapter 8. Where a condition exists that is beyond basic garment element repair in accordance with Section 8.3, the element shall be removed from service, tagged, and referred to personnel responsible for repair.

6.1.4.3 At a minimum, any necessary testing shall be conducted in accordance with the methods specified in Chapter 12.

6.2 Routine Inspection.

6.2.1 Individual members shall conduct a routine inspection of their protective ensembles and ensemble elements upon issue, at the beginning of each duty period, and after each use.

6.2.2* The routine inspection shall include, at a minimum, the inspections specified in 6.2.2.1 through 6.2.2.7.

6.2.2.1 Coat and trouser garment elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage such as the following:
 - (a) Rips, tears, and cuts
 - (b) Damaged or missing hardware and closure systems
 - (c) Thermal damage (such as charring, burn holes, melting, or discoloration of any layer)
- (4) Damaged or missing reflective trim

- (5) Loss of seam integrity and broken or missing stitches
- (6) Correct assembly and size compatibility of shell, liner, and the drag rescue device (DRD)

6.2.2.2 Hood elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage such as the following:
 - (a) Rips, tears, and cuts
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration of any layer)
- (4) Loss of face opening adjustment
- (5) Loss of seam integrity and broken or missing stitches
- (6)* Damage to the particulate-blocking layer (particulate-blocking hoods only)

6.2.2.3 Helmet elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage to the shell such as the following:
 - (a) Cracks, crazing, dents, and abrasions
 - (b) Thermal damage to the shell (such as bubbling, soft spots, warping, or discoloration)
- (4) Physical damage to the earflaps such as the following:
 - (a) Rips, tears, and cuts
 - (b) Thermal damage (such as charring, burn holes, or melting)
- (5) Damaged or missing components of the suspension and retention systems
- (6)* Damaged or missing components of the faceshield/goggle system, including discoloration, crazing, and scratches to the faceshield/goggle lens limiting visibility
- (7) Damaged or missing reflective trim
- (8) Loss of seam integrity and broken or missing stitches

6.2.2.4 Glove elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage such as the following:
 - (a) Rips, tears, and cuts
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration of any layer)
 - (c) Inverted glove liner
- (4) Shrinkage
- (5) Loss of elasticity or flexibility
- (6) Loss of seam integrity and broken or missing stitches

6.2.2.5 Footwear elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage such as the following:
 - (a) Cuts, tears, and punctures
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration of any layer)
 - (c) Exposed or deformed protective toe, protective midsole, or shank
- (4) Loss of water resistance
- (5) Closure system component damage and functionality
- (6) Loss of seam integrity and broken or missing stitches

6.2.2.6 DRD components shall be inspected for the following:

- (1) Installation in garment
- (2) Soiling

- (3) Contamination
- (4) Physical damage such as the following:
 - (a) Cuts, tears, punctures, cracking, or splitting
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration)
 - (c) Loss of seam integrity and broken or missing stitches

6.2.2.7 Interface components shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage
- (4) Loss or reduction of properties that allow component to continue as effective interface [e.g., loss of shape or inability to remain attached to the respective element(s) where attachment is required]
- (5) Loss of seam integrity and broken or missing stitches

6.2.3 Additional Routine Inspection Requirements for Proximity Fire Fighting Protective Ensembles and Ensemble Elements.

6.2.3.1 Proximity fire fighting coat and trouser garment elements shall be inspected for the following:

- (1) Loss of reflectivity
- (2) Loss of reflective coating(s)
- (3) Delamination as evidenced by separation or peeling of the outer shell

6.2.3.2 Proximity fire fighting helmet element overcover shall be inspected for the following:

- (1) Loss of reflectivity
- (2) Loss of reflective coating(s)
- (3) Delamination as evidenced by separation or peeling of the outer shell
- (4) Damaged or missing reflective trim, if applicable
- (5) Damage and functionality of the overcover to helmet attachment

6.2.3.3 Proximity fire fighting shrouds shall be inspected for the following:

- (1) Loss of reflectivity
- (2) Loss of reflective coating(s)
- (3) Delamination as evidenced by separation or peeling of the outer shell
- (4) If applicable, damage and functionality of the shroud-to-helmet attachment
- (5) Distortion of face opening resulting in gaps around the faceshield

6.2.3.4 Proximity fire fighting helmet elements shall be inspected for the following:

- (1) Loss of faceshield reflectivity
- (2) Loss of shell reflectivity, if applicable

6.2.3.5 Proximity fire fighting glove elements shall be inspected for the following:

- (1) Loss of reflectivity
- (2) Loss of reflective coating(s)

6.2.3.6 Proximity fire fighting footwear elements shall be inspected for the following:

- (1) Loss of reflectivity
- (2) Loss of reflective coating(s)

6.3 Advanced Inspection.

6.3.1 Advanced inspection and any necessary testing shall be performed by the element manufacturer, a manufacturer-trained organization, a verified organization, or a verified ISP.

6.3.2 The member(s) of the organization who has received training in the advanced inspection of the ensembles or ensemble elements shall be responsible for performing, managing, or coordinating advanced inspections or the advanced inspection process.

6.3.2.1* The ensemble or ensemble element manufacturer or a verified ISP and the organization shall determine the level of training required to perform advanced inspections. The ensemble or ensemble element manufacturer or verified ISP shall provide written verification of training. The organization shall be trained on advanced inspection procedures by either an element manufacturer or a verified ISP upon each new revision of this standard.

6.3.2.1.1 If the organization is a verified organization, it shall be permitted to determine the level of training necessary to perform the advanced inspection without any further written verification.

6.3.3* Advanced inspections of all protective ensemble elements that are issued shall be conducted annually and whenever a routine inspection determines potential damage.

6.3.3.1 Ensemble elements that have been properly stored in accordance with Chapter 9 and are not being used are not required to be subjected to advanced inspection.

6.3.4* The findings of the advanced inspection shall be documented.

Δ 6.3.5* The advanced inspection shall include, at a minimum, the inspections specified in 6.3.5.1 through 6.3.7.3.

6.3.5.1* All separable layers of the garment elements shall be individually inspected for the following:

- (1) Soiling
- (2) Contamination
- (3)* Physical damage to all layers, such as the following:
 - (a) Rips, tears, cuts, and abrasions
 - (b) Damaged or missing hardware
 - (c) Thermal damage (charring, burn holes, melting, discoloration of any layer)
- (4)* Loss of moisture barrier integrity as indicated by any of the following:
 - (a) Rips, tears, cuts, or abrasions
 - (b) Discoloration
 - (c) Thermal damage
- (5) Evaluation of system fit and coat/trouser overlap
- (6) Loss of seam integrity and broken or missing stitches
- (7)* Loss of material physical integrity [e.g., ultraviolet (UV) or chemical degradation] as evidenced by discoloration, significant changes in material texture, loss of material strength, loss of liner material, and shifting of liner material
- (8) Loss of wristlet elasticity, stretching, runs, cuts, or burn holes
- (9)* Reflective trim integrity, attachment to garment, reflectivity, or damage
- (10)* Label integrity and legibility
- (11) Hook and loop functionality

- (12) Liner attachment systems
- (13) Closure system functionality
- (14) Accessories for compliance with 4.2.3
- (15) Correct assembly and size compatibility of shell, liner, and DRD

6.3.5.2 Hood elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage, including, but not limited to, the following:
 - (a) Rips, tears, and cuts
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration of any layer)
- (4) Damage to or separation of any material as described by the manufacturer
- (5)* Damage to the particulate-blocking layer, where present, as specified in Section 12.1 or Section 12.2
- (6) Shrinkage
- (7) Loss of material elasticity or stretching out of shape
- (8) Loss of seam integrity or broken or missing stitches
- (9) Loss of face-opening adjustment
- (10)* Label integrity and legibility

6.3.5.3 Helmet elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage to the shell such as the following:
 - (a) Cracks, dents, and abrasions
 - (b) Thermal damage to the shell (such as bubbling, soft spots, warping, or discoloration)
- (4) Physical damage to the ear flaps such as the following:
 - (a) Rips, tears, and cuts
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration of any layer)
- (5) Damaged or missing components of the suspension and retention systems
- (6) Functionality of suspension and retention systems
- (7) Damaged or missing components of the faceshield/goggle system, including discoloration or scratches to the faceshield/goggle lens limiting visibility
- (8) Functionality of faceshield/goggle system
- (9) Damage to the impact cap
- (10) Damaged or missing reflective trim
- (11) Accessories for compliance with 4.2.3
- (12) Loss of seam integrity and broken or missing stitches
- (13)* Label integrity and legibility

6.3.5.4 Glove elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3)* Physical damage such as the following:
 - (a) Rips, tears, and cuts
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration of any layer)
 - (c) Inverted glove liner
 - (d) Loss of seam integrity or broken or missing stitches
- (4) Shrinkage
- (5) Loss of flexibility
- (6) Loss of elasticity and shape in wristlets
- (7) Accessories for compliance with 4.2.3
- (8)* Label integrity and legibility

6.3.5.5 Footwear elements shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage such as the following:
 - (a) Cuts, tears, punctures, cracking, or splitting
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration of any layer)
 - (c) Exposed or deformed steel toe, steel midsole, or shank
 - (d) Loss of seam integrity, delamination, or broken or missing stitches
- (4) Loss of water resistance
- (5) Closure system component damage and functionality
- (6)* Excessive tread wear
- (7) Condition of lining such as the following:
 - (a) Tears
 - (b) Excessive wear
 - (c) Separation from outer layer
- (8) Heel counter failure
- (9) Accessories for compliance with 4.2.3
- (10)* Label integrity and legibility

6.3.5.6 Interface components shall be inspected for the following:

- (1) Soiling
- (2) Contamination
- (3) Physical damage
- (4) Loss or reduction of properties that allow component to continue as effective interface, such as loss of shape or inability to remain attached to the respective element(s), if attachment is required
- (5) Loss of seam integrity and broken or missing stitches

6.3.5.7 DRD components shall be inspected for the following:

- (1) Installation in garment
- (2) Soiling
- (3) Contamination
- (4) Physical damage such as the following:
 - (a) Cuts, tears, punctures, cracking, or splitting
 - (b) Thermal damage (such as charring, burn holes, melting, or discoloration)
 - (c) Loss of seam integrity and broken or missing stitches
- (5)* Label integrity and legibility

6.3.6 Additional Advanced Inspection Criteria for Proximity Fire Fighting Protective Ensembles and Ensemble Elements.**6.3.6.1** Proximity fire fighting garment elements shall be inspected for the following:

- (1) Loss of radiant reflectivity
- (2) Loss of radiant reflective coating(s)
- (3) Delamination as evidenced by separation or peeling of the outer shell

6.3.6.2 Proximity fire fighting helmet overcover components shall be inspected for the following:

- (1) Loss of radiant reflectivity
- (2) Loss of radiant reflective coating(s)
- (3) Damaged or missing reflective trim, if applicable
- (4) Helmet attachment system for damage and functionality
- (5) Delamination as evidenced by separation or peeling of the outer shell

6.3.6.3 Proximity fire fighting shroud components shall be inspected for the following:

- (1) Loss of radiant reflectivity
- (2) Loss of radiant reflective coating(s)
- (3) Helmet attachment system, if applicable, for damage and functionality
- (4) Distortion of face opening resulting in gaps around the faceshield
- (5) Delamination as evidenced by separation or peeling of the outer shell

6.3.6.4 Proximity fire fighting helmet elements shall be inspected for the following:

- (1) Loss of faceshield radiant reflectivity
- (2) Loss of shell radiant reflectivity, if applicable

6.3.6.5 Proximity fire fighting glove elements shall be inspected for the following:

- (1) Loss of radiant reflectivity
- (2) Loss of radiant reflective coating(s)
- (3) Delamination as evidenced by separation or peeling of the outer shell

6.3.6.6 Proximity fire fighting footwear shall be inspected for the following:

- (1) Loss of radiant reflectivity
- (2) Loss of radiant reflective coating(s)

6.3.7 Additional Advanced Inspection Criteria for Ensembles with Optional Liquid and Particulate Contaminant Protection.**6.3.7.1*** Liquid and particulate contaminant protective ensembles shall be inspected according to the manufacturer's instructions.**6.3.7.2** Complete liner inspection of all garment elements shall be conducted at a minimum after 2 years in service and annually thereafter or whenever advance inspections indicate that a problem might exist.**6.3.7.3** Liquid and particulate contaminant protective ensembles shall be inspected for loss of integrity, including, but not limited to, the following:

- (1) Loss of interface functionality
- (2) Excessive material or component shrinkage or stretching

6.4 Complete Liner Inspection.**6.4.1** Complete liner inspection of all garment elements shall be performed by the garment manufacturer, a manufacturer-trained organization, a verified organization, or a verified ISP.**6.4.2** The member(s) of the organization who has received training in the complete liner inspection of the garment element shall be responsible for performing, managing, or coordinating the complete liner inspection or the complete liner inspection process.**6.4.2.1** The garment element manufacturer or a verified ISP and the organization shall determine the level of training required to perform complete liner inspections. The garment element manufacturer or verified ISP shall provide written verification of training.**6.4.2.1.1** If the organization is a verified organization, it shall be permitted to determine the level of training necessary to

perform the complete liner inspection without any further written verification.

6.4.3 Complete liner inspection of all garment elements shall be conducted as part of the advanced inspection annually and whenever a routine inspection determines potential damage. The liner system shall be opened to expose all layers for inspection and testing.

6.4.4 The findings of the complete liner inspection shall be documented.

6.4.5 The complete liner inspection shall include, as a minimum, the inspection specified in 6.4.5.1 through 6.4.5.3.

6.4.5.1* The moisture barrier and the thermal barrier shall be inspected for the following:

- (1) Physical damage to all layers and sides of each layer such as the following:
 - (a) Rips, tears, cuts, and abrasions
 - (b) Thermal damage (charring, burn holes, melting, or discoloration of any layer)
- (2) Loss of seam integrity, broken or missing stitches, and loose or missing moisture barrier seam tape
- (3) Material physical integrity; UV or chemical degradation as evidenced by discoloration, significant changes in material texture, loss of material strength, loss of liner material, or shifting of liner material
- (4) Delamination as evidenced by separation of film from substrate fabric, flaking, or powdering

6.4.5.2 The moisture barrier shall be tested using the hydrostatic test to evaluate the water penetration barrier, as specified in Section 12.3, and shall show no leakage.

6.4.5.3 The result of each water penetration barrier evaluation shall be recorded.

Chapter 7 Cleaning and Decontamination

7.1* General.

Δ 7.1.1 Approach for Handling Ensemble Elements After Incident Response. Organizations shall provide a means for cleaning ensemble elements.

N 7.1.1.1* Cleaning capabilities shall be permitted to be conducted in-house by a manufacturer-trained organization, a verified organization, a verified cleaner, a manufacturer verified in cleaning, a verified ISP, or any combination thereof.

N 7.1.1.2 Organizations shall use the decision tool provided in Figure 7.1.1.2(a) and Figure 7.1.1.2(b) to assist in determining the appropriate cleaning procedures to follow as specified in Sections 7.2 through 7.5.

N 7.1.1.3* With the exception of CBRN contamination or other forms of contamination, where further contact with specific hazardous contaminants requires immediate removal of ensembles or ensemble elements, preliminary exposure reduction procedures shall be applied as specified in Section 7.2 prior to any cleaning.

N 7.1.1.4 Organizations shall develop standard operating procedures for field use that reflect the specific decision-making process described in this section.

N 7.1.1.5 Soiled or contaminated elements shall not be brought into the home, washed in home laundries, or washed in public laundries.

N 7.1.1.6* Commercial dry cleaning, particularly those processes using perchloroethylene or related solvents, shall not be used as a means of cleaning ensembles and ensemble elements unless approved by the ensemble or ensemble element manufacturer.

Δ 7.1.2* Approach for Deciding the Handling, Cleaning, and Disposition of Ensemble Elements.

N 7.1.2.1 Ensembles and ensemble elements shall be evaluated by the wearer or a designated individual within the organization for application of preliminary exposure reduction, cleaning, disinfection, or sanitization after each use based on the guidance provided in Figure 7.1.1.2(a).

Δ 7.1.2.2 Ensembles and ensemble elements contaminated by CBRN terrorism agents shall be immediately retired after confirmed exposure and shall not be subjected to cleaning.

N 7.1.2.2.1 CBRN terrorism agent-contaminated ensembles and ensemble elements shall be doffed as soon as possible, bagged, and disposed of as hazardous waste in accordance with federal, state, and local regulations.

N 7.1.2.3 Ensembles and ensemble elements that were used in a hazardous materials incident shall be subject to preliminary exposure reduction as specified in Section 7.2 and then assessed by qualified members of the hazardous materials team or other qualified experts with knowledge about the specific exposures that took place.

N 7.1.2.3.1 The information gained from the hazardous materials team or other experts shall be used to determine whether cleaning is possible.

N 7.1.2.3.1.1 If it is determined that cleaning is possible, an appropriate form of specialized cleaning shall be applied to the affected ensembles and ensemble elements to remove contamination or reduce it to a safe level.

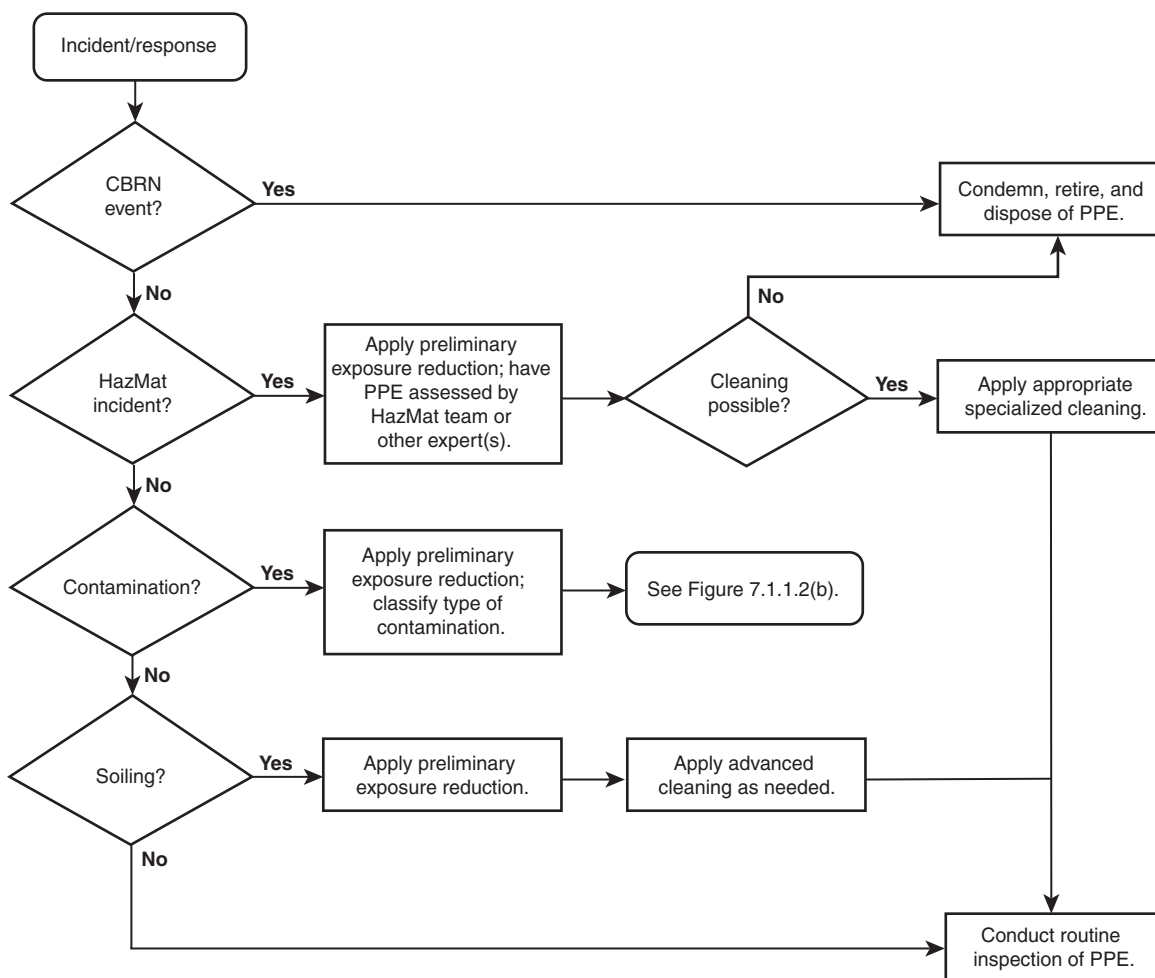
N 7.1.2.3.1.2 If it is determined that cleaning is not possible or that the ensemble or ensemble elements have been damaged beyond repair, the affected ensembles and ensemble elements shall be condemned, retired, and not subjected to cleaning.

N 7.1.2.3.2 Ensembles and ensemble elements that were contaminated during a hazardous materials incident and cannot be cleaned shall be disposed of as hazardous waste in accordance with federal, state, and local regulations.

7.1.2.4 Ensembles and ensemble elements that are known or suspected to be contaminated with bulk chemicals, asbestos, or other designated hazardous substances, body fluids, or other microbial contamination, or products of combustion from a structural or other fire shall be subject to preliminary exposure reduction as specified in Section 7.2.

N 7.1.2.5 Ensembles and ensemble elements that are soiled but not contaminated shall be subject to preliminary exposure reduction as specified in Section 7.2.

N 7.1.2.5.1 If the ensemble and ensemble elements have been subjected to soiling, the ensemble and ensemble elements shall be subjected to advanced cleaning as needed and as specified in Section 7.3.



Note: Contaminants shown in relative hierarchy of exposure risk. Multiple forms of contamination might apply. Clean according to highest risk.

FIGURE 7.1.1.2(a) Approach for Deciding Handling, Cleaning, and Disposition of Ensemble Elements.

7.1.2.5.2 If the ensemble and ensemble elements are not soiled and do not require advanced cleaning, the ensemble and ensemble elements shall be subjected to routine inspection as specified in Section 6.2.

7.1.3* Approach for Addressing Specific Types of Contamination. Where ensembles and ensemble elements have been suspected or found to have contamination from bulk chemicals, asbestos, or other designated hazardous substances, body fluids, or other forms of microbial contamination, or products of combustion products from a structural or other fire, the organization shall apply the steps shown in Figure 7.1.1.2(b).

7.1.3.1 General Decontamination Actions.

7.1.3.1.1 Where the form of contamination cannot be identified, contaminated ensembles and ensemble elements shall be subject to preliminary exposure reduction, isolated, and removed from service until the suspected contaminant(s) is identified and the elements can receive advanced or specialized cleaning, as necessary, to remove it.

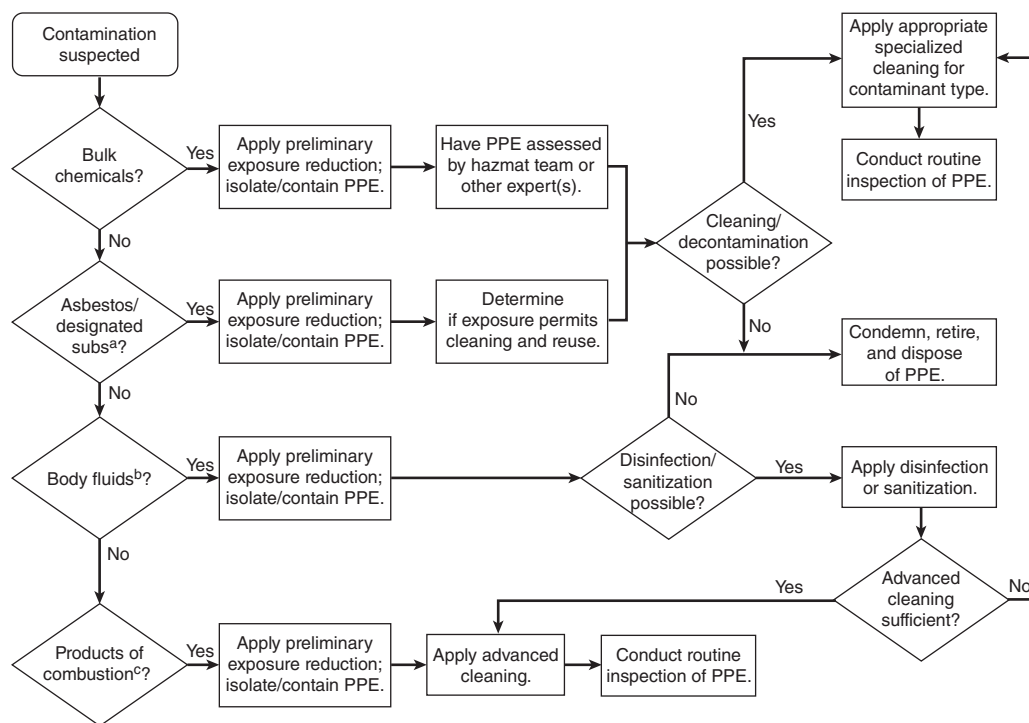
7.1.3.1.2 Where multiple forms of contamination are present, the actions for the handling and cleaning and disposition of ensemble and ensemble elements shall be according to the contamination posing the highest risk.

7.1.3.2 Bulk Chemical Decontamination Actions.

7.1.3.2.1 Ensembles and ensemble elements that are known or suspected to be contaminated with bulk chemicals shall be subject to preliminary exposure reduction as specified in Section 7.2 and isolated, tagged, and bagged at the incident scene.

7.1.3.2.2 The type of bulk chemical contamination shall be assessed by the organization's hazardous materials team or other qualified experts to determine if cleaning or decontamination of the ensembles and ensemble elements is possible.

7.1.3.2.2.1 Where the contaminant and its source have been identified, the organization shall consult the supplier of the contaminant, the manufacturer of the ensemble and ensemble elements, a verified cleaner, or a verified ISP for an appropriate decontamination agent and process.



Notes:

^aAnd other designated substances^bIncludes other microbial contamination^cIncludes any significant structural fire exposure

FIGURE 7.1.1.2(b) Approach for Addressing Specific Types of Contamination.

7.1.3.2.2.2 Based on the assessment of the type of contamination conditions, if cleaning or decontamination is not possible, then the affected ensemble and ensemble elements shall be condemned, retired, and disposed of as hazardous waste in accordance with federal, state, and local regulations.

7.1.3.2.2.3 Based on the assessment of the contamination conditions, if cleaning or decontamination is considered possible, then the affected ensemble and ensemble elements shall be subjected to specialized cleaning as specified in Section 7.5.

7.1.3.3 Asbestos and Other Designated Hazardous Substance Decontamination Actions.

7.1.3.3.1 Ensembles and ensemble elements that are known or suspected to be contaminated with asbestos or other designated highly hazardous substances shall be subject to preliminary exposure reduction as specified in Section 7.2 and isolated, tagged, and bagged at the incident scene.

7.1.3.3.2 The organization's hazardous materials team or other qualified experts shall determine if cleaning or decontamination of the ensemble and ensemble elements is possible.

7.1.3.3.2.1 Based on the assessment of the contamination conditions, if cleaning or decontamination is not possible, then the affected ensemble and ensemble elements shall be condemned, retired, and disposed of as hazardous waste in accordance with federal, state, and local regulations.

7.1.3.3.2.2 Based on the assessment of the contamination conditions, if cleaning or decontamination is considered possible,

then the affected ensemble and ensemble elements shall be subjected to specialized cleaning as specified in Section 7.5.

7.1.3.4 Body Fluid and Other Microbial Contamination Disinfection and Sanitization Actions.

7.1.3.4.1* Ensembles and ensemble elements that are known or suspected to be contaminated with body fluids or other forms of microbial contaminants shall be subject to preliminary exposure reduction as specified in Section 7.2 and isolated, tagged, and bagged at the incident scene.

7.1.3.4.2 The organization or qualified experts shall determine if disinfection or sanitization and cleaning of the ensemble and ensemble elements is possible.

7.1.3.4.2.1 Based on the assessment of the contamination conditions, if disinfection or sanitization and cleaning is not possible, then the affected ensemble and ensemble elements shall be condemned, retired, and disposed of as biological waste in accordance with federal, state, and local regulations.

7.1.3.4.2.2 Based on the assessment of the contaminant, if disinfection or sanitization is considered possible, then the affected ensemble and ensemble elements shall be subjected to disinfection or sanitization procedures, followed by either advanced cleaning or specialized cleaning procedures as specified in Sections 7.4 and 7.3 or 7.5, respectively.

7.1.3.4.2.3* The organization or qualified experts shall determine whether advanced cleaning or specialized cleaning shall be applied in conjunction with disinfection or sanitization. Specialized cleaning shall be permitted to be used in lieu of

advanced cleaning, in conjunction with disinfection or sanitization, for those contamination circumstances where advanced cleaning is not considered sufficient to provide appropriate cleaning conditions in conjunction with the procedures used for disinfection or sanitization.

N 7.1.3.5 Products of Combustion Cleaning Actions.

N 7.1.3.5.1* Ensembles and ensemble elements that have been exposed to products of combustion shall be subject to preliminary exposure reduction as specified in Section 7.2 and isolated, tagged, and bagged at the incident scene.

N 7.1.3.5.2* Following preliminary exposure reduction, ensembles and ensemble elements shall be subject to advanced cleaning as specified in Section 7.3 as soon as possible following the event.

N 7.1.3.6 Special Provisions for Ensemble Elements. Where elements of an ensemble are connected, the following procedures shall be used:

- (1) When one element is connected to another element and they are not permanently attached to each other, individual elements shall be disassembled from each other prior to beginning the cleaning process of elements and all disassembled elements shall undergo a separate cleaning process.
- (2) When one element is connected to another element and they are not permanently attached to each other and are subsequently disassembled from each other prior to beginning the cleaning process, they shall be reassembled prior to any return to service in a like manner to their original manufactured state.

7.2* Preliminary Exposure Reduction.

N 7.2.1 General.

N 7.2.1.1* Organizations shall include preliminary exposure reduction as part of their overall program for the care and maintenance of structural fire-fighting ensembles and ensemble elements and proximity fire-fighting ensembles and ensemble elements.

7.2.1.2* Organizations shall be responsible for implementing preliminary exposure reduction procedures on scene for ensemble and ensemble elements.

• 7.2.2* Preliminary Exposure Reduction Procedures.

7.2.2.1* End users shall carry out preliminary exposure reduction immediately after exiting the emergency scene at any incident where their protective ensemble or ensemble elements could have become soiled or contaminated.

7.2.2.2* Upon exiting the emergency scene, the end user shall remain on self-contained breathing apparatus (SCBA) air.

7.2.2.3 If returning to the emergency scene after an air cylinder change, any dry debris shall be brushed off the helmet, facepiece, and SCBA prior to changing out the cylinder.

N 7.2.2.4* If the end user is completing their time on scene, dry or wet mitigation techniques shall be conducted prior to the removal of any ensemble or ensemble elements.

N 7.2.2.4.1* The dry mitigation techniques shall be performed by brushing debris from the exterior of ensembles and ensemble elements with a soft bristle brush prior to removal.

7.2.2.4.2* The wet mitigation techniques shall be performed by gently rinsing the exterior of ensembles and ensemble elements using low-pressure and low-volume flow water.

N 7.2.2.4.2.1 A mild detergent shall be permitted to be used to aid in the wet mitigation technique, followed by gentle rinsing.

N 7.2.2.4.2.2 Heavy scrubbing or spraying with high-velocity water jets such as a power washer shall not be used.

• 7.2.2.4.3 If used in combination, dry mitigation shall precede wet mitigation.

N 7.2.2.5* Following dry or wet mitigation, ensemble or ensemble elements shall be isolated and bagged. Where possible, ensemble or ensemble elements, even when bagged, shall not be transported in the passenger areas of apparatus or personal vehicles.

N 7.2.2.6 Following preliminary exposure reduction, the ensemble or ensemble element(s) shall be subjected to the appropriate cleaning procedures specified in Section 7.1.

N 7.2.3 Additional Requirements for Preliminary Exposure Reduction of Hood Interface Components. Following each structural fire or emergency service use, hood interface components shall be subjected to preliminary exposure reduction and advanced cleaning as specified in Section 7.3.

N 7.2.4* Additional Requirements for Preliminary Exposure Reduction of Eye and Face Protection Components. After each use, eye and face protection components that are provided as part of the helmet or as separate devices shall be subjected to preliminary exposure reduction and wiped off and cleaned.

7.2.5 Additional Requirements for Preliminary Exposure Reduction of Proximity Fire-Fighting Ensembles and Ensemble Elements. During preliminary exposure reduction, the use of a brush or any other abrasive cleaning devices on radiant reflective outer shells and other components of proximity fire-fighting protective ensembles and ensemble elements shall not be permitted.

• Δ 7.3 Advanced Cleaning.

7.3.1 Advanced cleaning shall be performed by an element manufacturer verified in cleaning, a verified cleaner, a manufacturer-trained organization, a verified organization, or a verified ISP.

N 7.3.1.1 In the absence of a method to verify effectiveness of cleaning, manufacturers of certified ensembles and ensemble elements shall be permitted to provide advanced cleaning.

7.3.1.2 The member(s) of the organization who has received training in the advanced cleaning of the ensembles or ensemble elements shall be responsible for performing, managing, or coordinating advanced cleaning or the advanced cleaning process.

• 7.3.1.3* Training shall meet the requirements specified in 4.2.4.5.

N 7.3.2 If the organization is a verified organization, it shall be permitted to determine the level of training that is needed for carrying out the advanced cleaning.

Δ 7.3.3* Ensembles and ensemble elements that are soiled or contaminated shall receive advanced cleaning.

N 7.3.3.1 Ensembles or ensemble elements that have been exposed to blood or other body fluids shall be subjected to sanitization or disinfection prior to advanced cleaning as specified in Section 7.4.

N 7.3.3.2* Advanced cleaning shall be permitted in lieu of sanitization or disinfection if the procedures for advanced cleaning have proven effective for sanitization or disinfection of the ensemble or ensemble elements.

N 7.3.3.3* Ensembles or ensemble elements that have been exposed to bulk chemicals, unusual biological contaminants, asbestos, or other substances of a highly hazardous or unusual nature shall be subjected to specialized cleaning as specified in Section 7.5 in lieu of advanced cleaning.

N 7.3.3.3.1 Advanced cleaning shall only be applied for the contaminants described in 7.3.3.3 if known to be effective for removing the specific contaminants.

7.3.4* Where not subjected to prior advanced cleaning, ensembles and ensemble elements that are issued and used shall receive advanced cleaning at least every six months, resulting in a minimum of two advanced cleanings in a 12-month period, with one of these advanced cleanings occurring at the time of annual advanced inspection.

7.3.5* Where the use of machine cleaning is specified for ensembles and ensemble elements, advanced cleaning shall be conducted using a washer/extractor with the following characteristics unless specifically prohibited:

- (1) The washer/extractor shall be programmable to permit multiple formulations for adjustments of detergent application, water temperature, water level, cycle type/function, and cycle time.
- (2)* The washer/extractor shall not have a g-force that exceeds 100 G or shall have the capability of drum revolutions per minute (RPM) adjustment such that the g-force can be adjusted to not exceed 100 G for all washed ensembles and ensemble elements.

N 7.3.6* Top-loading washing machines with or without a center post agitator shall not be used for advanced cleaning of ensembles and ensemble elements or components.

N 7.3.6.1* Before using any cleaning device other than a washer/extractor, the element manufacturer, verified cleaner, or verified ISP shall be contacted for instructions on how to best clean the ensemble(s) or ensemble element(s) using the respective cleaning device.

N 7.3.7 Detergents and other cleaning or pretreatment chemicals used in the advanced cleaning of ensembles and ensemble elements shall be appropriate for the respective ensemble or ensemble element.

N 7.3.7.1 Chlorine bleach, chlorinated solvents, or solvents shall not be used without the ensemble or ensemble element manufacturer's or verified ISP's approval. (See A. 7.3.6.1.)

N 7.3.7.2* For advanced cleaning, a mild detergent with a pH range of not less than 6.0 pH and not greater than 10.5 pH as indicated on the product safety data sheet (SDS) or original product container shall be used.

N 7.3.7.3* Selected detergents and cleaning agents shall not knowingly cause significant long-term degradation of ensemble or ensemble element performance when applied at the expected

cleaning frequency over the service life of the ensemble or ensemble element.

N 7.3.7.4* Any testing used in the evaluation of the cleaning effectiveness of specific ensembles or ensemble elements subjected to advanced cleaning procedures shall account for both contaminated and cleaned sample analyses.

N 7.3.8* Universal precautions shall be applied in the washing of all soiled or contaminated ensembles or ensemble elements.

Δ 7.3.9 Where machine washing with a washer/extractor is specified, the following procedures shall be used:

- (1)* The washer/extractor shall not be overloaded or under loaded.
- (2)* Heavily soiled or spotted areas shall be pretreated.
- (3) All closures, including pocket closures, hooks and loops, snaps, zippers, and hooks and dees, shall be fastened.
- (4)* Water temperature shall not exceed 40°C (105°F).
- (5)* The specific formulation for the washer/extractor shall include a series of steps for filling the wash basket, adding detergent, performing multiple rinses, and including separate extractions between wash and rinse steps.
- (6) The element shall be inspected and rewashed if necessary.

Δ 7.3.10* Drying Procedures.

N 7.3.10.1 Ensembles and ensemble elements shall be dried using one of the following procedures in:

- (1)* Air drying, as follows:
 - (a)* Place ensembles or ensemble elements in an area with good ventilation.
 - (b)* Do not dry ensembles or ensemble elements in direct or indirect sunlight, under fluorescent light, or under UV light.
 - (c) Do not allow the area used for drying to exceed 40°C (105°F).
- (2)* A drying cabinet, as follows:
 - (a) Place ensembles or ensemble elements in the drying cabinet to allow good air circulation between each ensemble or ensemble element.
 - (b) Use a specific drying time and drying temperature to provide sufficient drying of the ensembles or ensemble elements.
 - (c) Do not allow the area used for drying to exceed 40°C (105°F).
- (3)* Machine drying, as follows:
 - (a) The recommended capacity of the machine shall not be exceeded.
 - (b) All closures, including pocket closures, hooks and loops, snaps, zippers, and hooks and dees, shall be fastened. A hook that is not part of a closure shall be covered with a piece of loop.
 - (c)* A "no heat" or "air dry" option shall be used, if available.
 - (d)* In the absence of a "no heat" or "air dry" option, the basket temperature shall not exceed 40°C (105°F).
 - (e)* The use of a heat cycle shall be discontinued prior to the removal of all moisture from the ensembles or ensemble elements.
 - (f)* The remainder of the drying process shall be accomplished by a "no heat" machine setting or

removal of the ensembles or ensemble elements from the machine dryer to air dry.

N 7.3.10.2 Ensembles or ensemble elements that are not completely dry shall not be returned to service.

7.3.11 Additional Requirements for Advanced Cleaning of Garment Elements.

N 7.3.11.1 Garment elements shall be subjected to advanced cleaning using a washer/extractor with an appropriate formulation.

N 7.3.11.1.1 A top loading washing machine or utility sink shall not be used for advanced cleaning.

N 7.3.11.1.2 Separate washer/extractor formulations shall be permitted for garment outer shells and liners. [See A. 7.3.9(5).]

N 7.3.11.2* Where the shells and liners of protective garment elements are separable, those components shall be cleaned only with similar components.

N 7.3.11.2.1 Heavily soiled outer shells shall be permitted to be pretreated by soaking in an appropriate solution of detergent and water.

N 7.3.11.2.2 Separable liner systems shall be oriented such that the moisture barrier is on the inside for advanced cleaning for both laundering and drying.

N 7.3.11.2.3 Separate washer/extractor formulations shall be permitted for washing garment shells versus garment liners.

7.3.11.3 If the coat element has a drag rescue device (DRD) and the DRD is removable, the DRD shall be permitted to be laundered with the coat shell or coat liner.

N 7.3.11.3.1 Where recommended as being washed separately, removable DRDs shall be placed in a separate mesh bag for advanced cleaning.

N 7.3.11.3.2 DRDs placed in mesh bags shall be permitted to be washed with garment outer shells.

N 7.3.11.4 If the garment includes fall protection components, and the fall protection components are removable, the fall protection components shall be removed prior to advanced cleaning.

N 7.3.11.4.1 If the fall protection components also require cleaning, the fall protection components shall be cleaned separately according to the manufacturer's instructions.

7.3.12 Additional Requirements for Advanced Cleaning of Helmet Elements.

7.3.12.1* Detachable or separate components, such as ear covers, suspensions covers, and goggles, shall be removed from the helmet and shall be washed and dried separately.

N 7.3.12.2* Detachable components that are textile based shall either be separately hand washed or washed in a washer/extractor with other components such as garments or hoods as specified in 7.3.11.

7.3.12.3 Helmets shall not be machine cleaned or dried using equipment that produces mechanical action by tumbling or agitation.

N 7.3.12.4* Unless otherwise specified, helmets shall be hand washed in a utility sink using the following procedures:

- (1) The individual washing the helmet shall observe universal precautions and put on a pair of examination gloves, an apron and protective sleeves or coveralls, and a pair of safety glasses or goggles.
- (2)* The utility sink shall be filled with warm water at temperature no warmer than 40°C (105°F) and a mild detergent having a pH of not less than 6.0 or more than 10.5 at the detergent manufacturer's recommended ratio of detergent to water.
- (3) The individual shall use a soft bristle brush to reach between components and scrub both the exterior and interior of the helmet.
- (4) The helmet shall be thoroughly rinsed following washing.
- (5) Following rinsing, the helmet shall be air dried. It shall be permitted to use a soft towel to aid in drying the helmet after cleaning.

N 7.3.12.5 Attached faceshields shall be hand washed with a soft cloth.

7.3.13 Additional Requirements for Advanced Cleaning of Glove Elements.

N 7.3.13.1* Gloves shall not be machine dried using equipment that produces mechanical action by tumbling or agitation.

N 7.3.13.2 Unless otherwise specified, gloves shall be hand washed in a utility sink or other container of sufficient size using the following procedures:

- (1) The individual washing the gloves shall observe universal precautions and shall put on a pair of examination gloves, an apron and protective sleeves or coveralls, and a pair of safety glasses or goggles.
- (2)* The utility sink shall be filled with warm water at temperature no warmer than 40°C (105°F) and a mild detergent having a pH of not less than 6.0 or more than 10.5 at the detergent manufacturer's recommended ratio of detergent to water.
- (3) The individual shall then don the fire-fighting gloves over the examination gloves and shall briskly rub the gloves together, ensuring the cleaning of all surfaces. A soft bristle brush shall be permitted to scrub the exterior of the gloves.
- (4)* The individual shall then remove the fire-fighting gloves and refill the utility sink with clean water.
- (5) The interior and exterior of the gloves shall be thoroughly rinsed with clean water.
- (6) Gloves shall not be wrung out, but instead slightly squeezed to remove excess water.
- (7)* Gloves shall be dried using ambient or slightly raised temperatures no warmer than 40°C (105°F). Equipment that provides airflow into the interiors of gloves shall be permitted to aid the faster drying of gloves.

7.3.14 Additional Requirements for Advanced Cleaning of Footwear Elements.

N 7.3.14.1* Footwear shall not be machine cleaned or dried using equipment that produces mechanical action by tumbling or agitation.

N 7.3.14.2 Unless otherwise specified, footwear shall be hand washed in a utility sink or other container of sufficient size using the following procedures:

- (1) The individual washing the footwear shall observe universal precautions and put on a pair of examination gloves,

an apron and protective sleeves or coveralls, and a pair of safety glasses or goggles.

- (2)* The utility sink shall be filled with warm water at a temperature no warmer than 40°C (105°F) and a mild detergent having a pH of not less than 6.0 or more than 10.5 at the detergent manufacturer's recommended ratio of detergent to water.
- (3)* The individual shall first scrub the interior of the footwear with a soft bristle brush.
- (4) The individual shall then scrub the exterior of the footwear with a soft bristle brush, ensuring the cleaning of all exterior surfaces.
- (5) The interior and exterior of the footwear shall be thoroughly rinsed with clean water.
- (6)* In the absence of specialized drying equipment, the footwear shall be suspended upside down to dry, with attention that water runoff does not create a slip hazard.
- (7) If specified by the manufacturer, a sealant, conditioning, or polish shall be applied to leather footwear after the footwear has completely dried.

▲ 7.3.15 Additional Requirements for Advanced Cleaning of Hood Elements.

N 7.3.15.1 Hoods shall be permitted to be hand or machine washed, independently or with garment liners, as allowed by the hood manufacturer. The hood manufacturer's instructions shall be consulted for further cleaning instructions.

N 7.3.15.2 If hoods are hand washed in a utility sink or other suitable container, hoods shall not be wrung out to dry, but instead slightly squeezed to remove excess water after rinsing.

N 7.3.15.3 Hoods shall be permitted to be air dried or machine dried.

N 7.3.15.4 Special care shall be applied to the advanced cleaning of particulate-blocking hoods. Advanced cleaning of particulate-blocking hoods shall be in accordance with procedures provided by the manufacturer.

N 7.3.15.5 Where hoods are subjected to hand cleaning and unless otherwise specified, hoods shall be hand washed in a utility sink or other container of sufficient size using the following procedures:

- (1) The individual washing the hood shall observe universal precautions and put on a pair of examination gloves, an apron and protective sleeves or coveralls, and a pair of safety glasses or goggles.
- (2) The utility sink shall be filled with warm water at temperature no warmer than 40°C (105°F) and a mild detergent having a pH of not less than 6.0 or more than 10.5 at the detergent manufacturer's recommended ratio of detergent to water.
- (3) After allowing the hood to presoak for a period of at least 10 minutes, the individual shall lightly rub the hood material together, starting with the exterior and then turning the hood inside out and similarly rubbing the material against itself. A soft wash cloth shall be permitted for washing the hoods.
- (4) Stretching or wringing the hood out shall be avoided during hand washing.
- (5) The hood shall be thoroughly rinsed following washing.
- (6) Following rinsing, if using air drying, the hood shall be air dried by laying on a drying rack or other surface that helps promote draining of water from the hood.

7.3.16 Additional Requirements for Advanced Cleaning of Proximity Fire-Fighting Ensembles and Ensemble Elements.

N 7.3.16.1 Except as noted in 7.3.16.2, proximity fire-fighting protective ensembles and ensemble elements shall be cleaned in accordance with the same requirements as non-proximity fire-fighting protective ensembles and ensemble elements.

▲ 7.3.16.2 Outer shell and other radiant reflective components of proximity fire-fighting protective ensembles and ensemble elements shall be cleaned in accordance with the following:

- (1) They shall not be cleaned with a brush or other abrasive cleaning devices.
- (2) They shall not be machine washed or dried.
- (3) They shall be wiped with a moist soft cloth or sponge.
- (4) They shall be hung without any folding of the shell and air dried without any mechanical action.

7.3.17 Additional Requirements for Advanced Cleaning of Ensembles Certified to the Optional Liquid and Particulate Contaminant Protection Requirements of NFPA 1971. The manufacturer shall be consulted to determine if any special handling procedures or the removal of interface components or other components must be undertaken prior to advanced cleaning.

N 7.4 Disinfection or Sanitization and Biological Decontamination.

N 7.4.1 Processes for disinfecting or sanitizing, cleaning, and decontaminating protective ensembles and ensemble elements that have been contaminated with body fluids and other potentially infectious materials shall be performed by a manufacturer verified in cleaning, a verified cleaner, a manufacturer-trained organization, a verified organization, or a verified ISP.

N 7.4.1.1 In the absence of a method to verify effectiveness of cleaning, manufacturers of certified protective ensembles and ensemble elements shall be permitted to perform disinfection or sanitization and biological decontamination.

N 7.4.2* Organizations and other facilities that engage in disinfection or sanitization and biological decontamination of protective ensembles and ensemble elements contaminated with body fluids and other potentially infectious materials shall comply with the applicable regulations in 29 CFR 1910.1030, "Bloodborne Pathogens."

N 7.4.3* Protective ensembles and ensemble elements that are contaminated with body fluids and other potentially infectious materials shall be subject to either disinfection or sanitization.

N 7.4.3.1 If not already part of an advanced cleaning process, disinfection or sanitization shall be followed by advanced cleaning depending on the type of disinfection or sanitization, the cleaning agents and processes that are available, and the type and composition of the ensemble or ensemble element.

N 7.4.3.2* Disinfectants and sanitizers shall be registered with the U.S. Environmental Protection Agency (EPA) for efficacy for hard surfaces or fabrics and textiles, whichever is applicable.

N 7.4.3.2.1* Where disinfection or sanitization is required for specific microbial contamination as determined by the organization or qualified experts, those disinfectants and sanitizers registered with the EPA for the specific form of microbial contamination shall be used.

- N 7.4.3.3*** Where disinfectants and sanitizers are used, they shall not degrade the performance properties of the protective ensemble or ensemble elements.
- N 7.4.3.4** Disinfectants and sanitizers shall be used in accordance with the instructions provided by the supplier.
- N 7.4.3.5*** It shall be permitted to include disinfection or sanitization as part of the advanced cleaning process only when its effectiveness has been demonstrated as providing the disinfection or sanitization required for the specific ensemble or ensemble element.
- N 7.4.3.6*** In cases where the area of contamination is limited and clearly visible, spot sanitization or disinfection followed by spot cleaning shall be permitted for the sanitization or disinfection of the affected contaminated area of the ensemble or ensemble element.
- N 7.4.3.7*** Specialized cleaning shall be permitted to be used in lieu of advanced cleaning when ensembles and ensemble elements are disinfected or sanitized.
- N 7.4.4 Additional Requirements for Sanitization and Cleaning of Garment Elements.**
- N 7.4.4.1*** Garment elements shall be subjected to a minimum of sanitization.
- N 7.4.4.2** The sanitizer or process used for the sanitization of the garment element shall meet the verification testing requirements in 11.3.7.5.
- N 7.4.4.3*** Handling of garment elements shall be kept to a minimum prior to sanitization.
- N 7.4.4.4** Where specific components such as the DRD or fall protection devices are provided as part of garment elements, these items shall only be removed from the garment if their presence will interfere with the sanitization process.
- N 7.4.4.4.1*** Both garment element outer shells and liners shall be subject to sanitization, including garments that have been contaminated with pathogenic bioaerosols.
- N 7.4.4.5** Advanced cleaning procedures that are used in conjunction with or that follow sanitization for removal of soils associated with body fluids or other infectious materials shall meet the applicable garment requirements specified in Section 7.3.
- N 7.4.4.6** Advanced cleaning or specialized cleaning shall be performed after sanitization.
- N 7.4.4.6.1*** Advanced cleaning shall be permitted in lieu of sanitization or disinfection if the procedures for advanced cleaning have proven effective for sanitization or disinfection of the ensemble or ensemble elements.
- N 7.4.5 Additional Requirements for Disinfection or Sanitization and Cleaning of Helmet Elements.**
- N 7.4.5.1*** Detachable or separate components shall be removed from the helmet and shall be sanitized or disinfected separately.
- N 7.4.5.2** Detachable components that are textile based shall be sanitized as specified in 7.4.4 for garment elements.
- N 7.4.5.3*** Hard surface components of the helmet shall be subject to disinfection using an appropriate disinfection process.
- N 7.4.5.4** Subsequent advanced cleaning of helmets following their disinfection or sanitization shall meet the requirements specified in 7.3.12.
- N 7.4.6 Additional Requirements for Sanitization and Cleaning of Glove Elements.**
- N 7.4.6.1*** Sanitizers or processes for sanitization of gloves shall be selected as appropriate for the materials used in the construction of the glove.
- N 7.4.6.2** Subsequent advanced cleaning of gloves following their sanitization shall meet the requirements specified in 7.3.13.
- N 7.4.7 Additional Requirements for Sanitization and Cleaning of Footwear Elements.**
- N 7.4.7.1*** Sanitizers or processes for sanitization of footwear shall be selected as appropriate for the materials used in the construction of the footwear.
- N 7.4.7.2** Subsequent advanced cleaning of footwear following their sanitization shall meet the requirements specified in 7.3.14.
- N 7.4.8 Additional Requirements for Sanitization and Cleaning of Hood Elements.**
- N 7.4.8.1*** Hoods shall be sanitized as specified in 7.4.4 for garment elements.
- N 7.4.8.2** Subsequent advanced cleaning of hoods following their sanitization shall meet the requirements specified in 7.3.15.
- N 7.4.9 Additional Requirements for Sanitization and Cleaning of Proximity Fire-Fighting Ensembles and Ensemble Elements.**
- N 7.4.9.1** Any sanitizer or process used for sanitization shall not degrade the radiant reflective outer shell or other radiant reflective elements of the ensemble or ensemble elements.
- N 7.4.9.2** Any additional cleaning of proximity fire-fighting ensembles and ensemble elements shall meet the requirements specified in 7.3.16.
- N 7.4.9.3** Nonreflective portions of the ensemble or ensemble elements shall be treated as specified in 7.4.4.
- N 7.4.10 Additional Requirements for Sanitization and Cleaning of Ensembles and Ensemble Elements Certified to the Optional Liquid and Particulate Contaminant Protection Requirements of NFPA 1971.** The manufacturer shall be consulted to determine if any special handling procedures exist for the sanitization or disinfection and subsequent cleaning of the elements of the protective ensemble or ensemble element.
- N 7.5 Specialized Cleaning.**
- N 7.5.1** Specialized cleaning of protective ensembles and ensemble elements shall be performed by a manufacturer verified in cleaning, a manufacturer-trained organization, a verified organization, a verified cleaner, or a verified ISP.
- N 7.5.1.1** In the absence of a method to verify effectiveness of cleaning for specific types of soils or contaminants, manufac-

turers of certified ensembles or ensemble elements shall be permitted to perform specialized cleaning.

N 7.5.2* Organizations shall employ specialized cleaning when the ensemble or ensemble elements cannot be adequately cleaned with advanced cleaning.

N 7.5.2.1 Organizations shall apply disinfection or sanitization in accordance with Section 7.4 with specialized cleaning for the removal of body fluids or other infectious materials that cannot be removed using disinfection or sanitization with advanced cleaning.

N 7.5.3* Organizations shall designate any specific substances or contaminants that warrant specialized cleaning and shall determine specific approaches for decontamination for these substances, if warranted.

N 7.5.4 Organizations shall rely on expertise from hazardous materials teams, infection control specialists, verified independent service providers, or other individuals knowledgeable for the type of contaminant and how it can be removed from protective clothing and equipment.

N 7.5.4.1 The expertise described in 7.5.4 shall be relied upon for determining whether the type of contamination can be effectively removed and for determining the procedures to be used for the removal of the specific contaminant(s), if applicable.

N 7.5.4.2 Where deemed appropriate for the purpose of specialized cleaning of garment elements, a maximum washer/extractor water temperature shall be permitted to be 60°C (140°F) for those ensembles or ensemble elements that are specified for advanced cleaning using a washer/extractor. [See A.7.3.9(4).]

N 7.5.4.3 Where it is determined that the contaminant(s) cannot be sufficiently removed, the ensembles or ensemble elements shall be condemned and disposed of in accordance with federal, state, and local regulations for the handling and disposal of hazardous materials.

N 7.5.4.4* Where it is determined that the contaminant(s) can be sufficiently removed, specific procedures shall be conducted for cleaning, treating, or decontaminating the contaminated ensembles or ensemble elements based on one of the following:

- (1) Evidence is provided from a documented source that the applied procedures have shown effectiveness in the past under similar exposure circumstances and contamination conditions.
- (2) Testing of the contaminated clothing items is performed that provides detailed results showing the absence of any residual contamination or showing levels of contaminants that are deemed to be safe.

N 7.5.4.5* Any testing procedures that are used for assessing residual levels of contamination shall be specific to the contaminants of concern and shall be performed by a laboratory that is accredited for the specific types of analysis carried out on the ensembles or ensemble elements.

N 7.5.4.6 When specialized cleaning is applied for the cleaning of ensembles or ensemble elements involving highly hazardous contaminants, consideration should be given to the disposition of the effluent from the cleaning process and whether disposal

into the local sewer system is acceptable according to federal, state, and local regulations.

Chapter 8 Repair

8.1 Requirements for All Ensembles and Ensemble Elements.

Δ 8.1.1 All repairs shall be performed by the original manufacturer, a verified ISP, or a member of the organization who has received training.

8.1.1.1 Training shall be provided by an element manufacturer of the same element type or by a verified ISP in the repair of ensembles or ensemble elements.

8.1.1.2 Requirements for garment element repair shall be specified in Sections 8.2 through 8.4.

8.1.2 The member(s) of the organization who has received training in the repair of the ensembles or ensemble elements shall be responsible for performing or managing repairs.

8.1.3 Ensembles or ensemble elements shall be subjected to advanced cleaning, when necessary, before any repair work is undertaken. Ensembles contaminated by CBRN terrorism agents shall be immediately retired after CBRN exposure is confirmed and shall not be reused.

Δ 8.1.4* All repairs and alterations to the ensemble or ensemble element shall be done in a manner and using like materials and components that are compliant with NFPA 1971.

8.1.5 Due to the different methods of construction, the ensemble or ensemble element manufacturer shall be contacted if the organization or verified ISP is unsure of whether a repair can be accomplished without adversely affecting the integrity of the ensemble or ensemble element.

8.1.6 Replacement interface components shall be installed in a manner consistent with the ensemble or ensemble element manufacturer's method of construction.

8.2 Requirements for Both Basic and Advanced Garment Element Repair.

8.2.1 All repairs and alterations shall be performed in the same manner and using like materials as the garment element manufacturer, including, but not limited to, fabric, thread type, seam construction, hardware, and hardware backing, unless approved by the garment element manufacturer.

8.2.2 Repairs shall be made to all components and to all layers of the composite that have been damaged or that have been affected by the repair.

Δ 8.2.3 Repairs of minor tears, char marks, ember burns, and abraded areas shall be limited to those where the damaged area can be covered by a maximum 160 cm² (25 in.²) patch of the same material that is compliant with NFPA 1971. For any tears, char marks, ember burns, and abraded areas that require a patch larger than 160 cm² (25 in.²), the manufacturer or the verified ISP, in conjunction with the organization, shall be consulted.

8.2.3.1 The finished edges of the patch shall extend at least 25 mm (1 in.) in all directions beyond the damaged area.

8.2.3.2 To prevent fraying, the patch shall have no raw edges.

▲ 8.2.3.3 Where tears, holes, or abrasions are being repaired, the damaged areas shall be mended using flame-resistant (FR) thread that is compliant with NFPA 1971 to prevent further damage prior to application of the patch.

▲ 8.2.3.4 Where moisture barrier tears, holes, or abrasions are being repaired, the repair tape shall be required to extend at least 12.5 mm (½ in.) in all directions beyond the edge of the repaired damage. Where the moisture barrier has a hole or abrasion measuring more than 12.5 mm (½ in.) in diameter in any direction or a tear greater than 75 mm (3 in.) in length, a patch consisting of the same moisture barrier fabric shall be used for repair. Where a moisture barrier manufacturer provides repair tape in various sizes, it shall be permitted to be used for the repair.

8.2.4* Replacement hardware shall be installed in a manner consistent with the garment element manufacturer's method of construction.

8.2.4.1 When hardware is replaced, the reinforcement backing material shall be reinstalled or, if it is no longer serviceable, the backing material shall be replaced.

8.2.5 If the complexity of the repair is uncertain, the garment element manufacturer shall be consulted.

8.2.6 Replacement visibility markings shall be installed in a manner consistent with the garment element manufacturer's method of construction, unless an alternative method is approved by the garment element manufacturer.

8.2.6.1 Visibility markings being replaced shall be completely removed so that no new visibility marking is sewn over an older sewn visibility marking. New visibility markings shall be permitted to be applied over older visibility markings by alternative methods where approved by the garment manufacturer.

▲ 8.2.6.2 No repair or alteration shall result in the reduction of the minimum required visibility marking pattern specified in Section 6.2 of NFPA 1971.

8.2.6.3 Visibility marking patches that do not exceed 75 mm (3 in.) in length shall be permitted. The visibility marking patch shall extend 25 mm (1 in.) beyond the damaged area. A maximum of two visibility marking patches per stripe shall be permitted.

8.2.6.4 Where a repair or alteration necessitates replacing visibility markings, an equal amount of visibility markings shall be installed.

8.2.6.5 Where the complexity of the visibility marking repair is uncertain, the garment element manufacturer shall be consulted.

8.3 Additional Requirements for Basic Garment Element Repair. The repairs specified in this section shall be performed by the element manufacturer, the organization, manufacturer-trained organizations, verified organizations, or verified ISPs. Basic repairs shall be limited to the following:

- (1) Patching of minor tears, char marks, and ember burns to a separable outer shell
- (2) Repairing of skipped, broken, and missing stitches to a separable outer shell
- (3) Replacement of missing hardware, excluding positive closure systems to a separable outer shell
- (4) Reclosing of the liner of a garment after inspection

8.4 Additional Requirements for Advanced Garment Element Repair.

8.4.1* The repairs specified in this section shall be conducted only by the element manufacturer, a verified organization, or a verified ISP meeting the requirements as specified in Chapter 11, Verification.

8.4.2 Repairs to the garment outer shell shall be performed consistent with the garment element manufacturer's methods. The garment element manufacturer shall be contacted if the organization is unsure of the complexity of the repair.

8.4.3* All repairs to the garment moisture barrier shall be performed consistent with the moisture barrier manufacturer's methods. The original garment element manufacturer shall be contacted if the organization is unsure as to whether an area to be repaired contains a moisture barrier.

8.4.4* Repairs to garment thermal liners shall be permitted provided the repair does not result in any stitching through the moisture barrier.

8.4.5* Due to labeling requirements, as well as the complexity and specialized equipment needed to replace entire garment element component layers (e.g., the outer shell, moisture barrier, or thermal liner), only the garment element manufacturer or the garment element manufacturer's designated verified ISP shall replace entire garment component layers.

8.4.6 Restitching of more than 25 mm continuous (1 in. continuous) of a Major A seam shall require consulting the garment element manufacturer and shall be conducted in a manner consistent with the garment element manufacturer's methods.

8.4.7 Repairs to Major B seams in the moisture barrier shall require consulting the garment element manufacturer and shall be conducted in a manner consistent with the barrier manufacturer's recommendations.

8.4.7.1 Repairs to Major B seams in the thermal liner that do not affect any moisture barrier material shall be permitted. Restitching of more than 25 mm continuous (1 in. continuous) of any Major B seams shall require consulting the garment element manufacturer and shall be conducted in a manner consistent with the garment element manufacturer's methods.

8.4.8* All repaired stress areas shall be reinforced in a manner consistent with the garment element manufacturer's methods.

8.4.9 If replacing trim necessitates sewing into a Major A seam, trim replacement shall be conducted in a manner consistent with the garment element manufacturer's methods.

8.4.10* Replacement zippers shall be installed in a manner consistent with the garment element manufacturer's method of construction. If the complexity of the repair is uncertain, the garment element manufacturer shall be consulted.

8.4.11* Replacement hook-and-loop fastener tape shall be installed in a manner consistent with the garment element manufacturer's method of construction. If the complexity of the repair is uncertain, the garment element manufacturer shall be consulted.

8.4.12* Replacement reinforcement materials shall be installed in a manner consistent with the garment element manufacturer's method of construction.

8.5 Helmet Element Repair.

8.5.1 In addition to the requirements in Section 8.1, all repairs to helmet components other than as specified herein shall be performed in accordance with the helmet element manufacturer's instructions.

8.5.2* Where there is an indication of a crack, dent, abrasion, bubbling, soft spot, discoloration, or warping in the helmet shell, the helmet element manufacturer shall be contacted to determine serviceability.

8.5.3 Small surface nicks shall be repaired in accordance with the helmet element manufacturer's instructions.

8.5.4 Small scratches on the helmet shell shall be permitted to be removed by using mildly abrasive compounds recommended by the helmet element manufacturer.

8.5.5 Helmet faceshield and goggle components that become cracked or badly scratched shall be replaced.

8.6 Glove Element Repair. In addition to the requirements in Section 8.1, all repairs to glove components shall be performed in accordance with the glove element manufacturer's instructions.

8.7 Footwear Element Repair.

8.7.1 In addition to the requirements in Section 8.1, all repairs to footwear components shall be performed in accordance with the footwear manufacturer's instructions.

8.7.2 Other than for the replacement of bootlaces and zipper assemblies, the footwear manufacturer shall be contacted to determine feasibility of the repair.

8.7.3 All replacement bootlaces and zippers shall be provided by the footwear element manufacturer.

8.8 Structural Fire Fighting Hood and Proximity Fire Fighting Helmet Overcover and Proximity Fire Fighting Shroud Repair. In addition to the requirements in Section 8.1, all repairs to hoods, helmet covers, and proximity shrouds shall be performed in accordance with the element manufacturers' instructions. Repairs of these interface components containing a particulate blocking layer shall not be undertaken unless authorized by the manufacturer.

8.9 Additional Requirements for Structural Fire Fighting Ensembles and Proximity Fire Fighting Ensembles with Optional Liquid and Particulate Contaminant Protection. In addition to the requirements in Section 8.1, all repairs to ensembles with optional liquid and particulate contaminant protection shall be referred to the ensemble manufacturer.

Chapter 9 Storage

9.1* All Ensembles and Ensemble Elements.

9.1.1* Ensembles or ensemble elements not in use shall not be exposed to lighting that emits UV rays, including, but not limited to, fluorescent lighting, direct sunlight, and indirect sunlight.

9.1.2* Ensembles and ensemble elements shall be clean and dry before storage.

9.1.3 Ensemble and ensemble elements shall not be stored in airtight containers unless they are new and unissued.

9.1.4* Ensembles and ensemble elements shall not be stored at temperatures below -32°C (-25°F) or above 82°C (180°F).

9.1.5 Ensembles and ensemble elements shall not be stored or transported in compartments or trunks with sharp objects, tools, or other equipment that could damage the ensembles or ensemble elements. Where ensembles or ensemble elements must be transported or stored in such environments, the ensemble or element(s) shall be placed in a protective case or bag to prevent damage.

9.1.6* Issued ensembles and ensemble elements shall not be allowed in living quarters. Contaminated or soiled clothing shall not be transported in the cab of fire department apparatus when not being worn for operational duties unless placed in an airtight protective case or bag to prevent cross contamination. If placed in a protective case or bag, the ensemble(s) or ensemble element(s) shall be removed from such environments as soon as possible following transport. Wet ensembles or ensemble elements shall not be stored in a protective case or bag used for transport.

9.1.7* Ensembles and ensemble elements shall not be stored in contact with contaminants such as, but not limited to, oils, solvents, acids, or alkalis.

9.1.8 Proximity fire fighting protective coat and trouser elements shall be stored by hanging to limit the damage caused by creasing and shall not be stored folded.

N 9.1.9 Eye and face protection shall be readily accessible to the user and, when not in use, shall be stored in such a manner so as to prevent at least the following:

- (1) Thermal damage
- (2) Mechanical damage
- (3) Hazardous materials contamination

9.1.10 Ensemble and ensemble element storage areas shall be clean, dry, and well ventilated.

Chapter 10 Retirement, Disposition, and Special Incident Procedure

10.1 Retirement.

10.1.1* The organization shall develop specific criteria for removal of structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements from service, which includes, but is not limited to, issues that are specific to the ensembles or ensemble elements being used by the organization, the manufacturer's instructions, and the experience of the organization.

10.1.2* Structural fire fighting ensembles and ensemble elements shall be retired in accordance with 10.2.1 or 10.2.2, no more than 10 years from the date the ensembles or ensemble elements were manufactured.

10.1.3 Proximity fire fighting ensembles and ensemble elements shall be retired in accordance with 10.2.1 or 10.2.2, no more than 10 years from the date the ensembles or ensemble elements were manufactured.

10.1.3.1* In all cases, the radiant reflective outer shell of the garment element shall be replaced no more than 5 years from the date the ensembles or ensemble elements were manufactured.

▲ **10.1.4*** Structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements that are worn or damaged to the extent that the organization deems it not possible or cost effective to repair shall be retired in accordance with 10.2.1.

10.1.5* Structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements that were not in compliance with the edition of the applicable NFPA standard that was current when the ensembles and ensemble elements were manufactured shall be retired in accordance with 10.2.1.

10.1.6 Structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements that are contaminated to the extent that the organization deems it not possible or cost effective to **clean** them shall be retired in accordance with 10.2.1.

10.1.7 Structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements that are contaminated by CBRN terrorism agents shall be immediately retired as specified in 10.2.1 after confirmed exposure and shall not be reused.

10.1.8* Structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements that are no longer of use to the organization for emergency operations service but are not contaminated, defective, or damaged shall be retired in accordance with 10.2.1 or 10.2.2.

10.2 Disposition of Retired Elements.

10.2.1 Retired structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements shall be destroyed or disposed of in a manner ensuring that they will not be used in any fire fighting or emergency activities, including live fire training.

10.2.2 Retired structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements **determined to be no longer of use in accordance with 10.1.8** shall be permitted to be used as follows:

- (1) For training that does not involve live fire, provided the ensembles and ensemble elements are appropriately marked as being for non-live fire training only
- (2) As determined by the organization

10.3 Special Incident Procedure.

10.3.1* The organization shall have procedures for the handling and custody of structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements that were worn by fire fighters who were victims at incidents where serious injuries or fatalities to the fire fighters occurred.

10.3.2 In the absence of any other prevailing rules of evidence, the organization's procedures shall include at least the following:

- (1) Provisions shall be made for the immediate removal from service and preservation of all structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements utilized by the injured or deceased fire fighter.

- (2) Custody of such ensembles and ensemble elements shall be maintained at a secure location with controlled, documented access.
- (3) All such structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements shall be nondestructively tagged and stored only in paper or cardboard containers to prevent further degradation or damage. Plastic or airtight containers shall not be used.
- (4) Examination of the structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements shall be made by qualified members of the organization or by outside experts to determine the condition thereof.

10.3.3 The organization shall determine a specific period of time for retaining custody of structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements.

Chapter 11 Verification

11.1 General.

11.1.1 In order for an organization, **ISP, cleaner, or manufacturer** to be verified, it shall meet the requirements of this chapter.

11.1.1.1* Verification of the organization or ISP shall include advanced inspection, advanced cleaning, **sanitization**, and advanced repairs of garment elements only as specified in **Table 11.1.1.1**.

■ **11.1.1.1.1** Cleaning and sanitization verification of the organization or ISP shall not apply to helmet elements, glove elements, footwear elements, hood elements, or optional liquid and particulate contaminant protective ensembles.

■ **11.1.1.1.2** Cleaning and sanitization verification of cleaners and manufacturers shall not apply to helmet elements, glove elements, footwear elements, hood elements, or optional liquid and particulate contaminant protective ensembles.

11.1.1.2 An organization or **manufacturer** shall be permitted to be verified for **any combination of advanced cleaning, sanitization, advanced inspection, and repairs**.

■ **11.1.1.2.1** An ISP shall be verified for advanced cleaning, sanitization, advanced inspection, and repairs but shall not be permitted to be verified for advanced cleaning and advanced inspection only.

■ **11.1.1.2.2** A cleaner shall only be verified for advanced cleaning and sanitization of garment elements.

■ **11.1.1.2.3** Manufacturers verified in cleaning shall be verified per the verified cleaner requirements in accordance with Table 11.1.1.1 and shall be permitted to perform advanced inspection and advanced repair.

11.1.1.3 Where an organization or ISP is verified for conducting repairs, the organization or ISP shall also be verified for advanced cleaning, **sanitization**, and advanced inspection.

11.1.1.4 The verified organization, **verified ISP, manufacturer verified in cleaning, or verified cleaner** shall be listed.

■ **11.1.1.4.1** The listing shall specify the services the listee is verified to conduct.

N Table 11.1.1.1 ISP and Organization Verification Designation Criteria

Function/Capability	Verified ISP or Verified Organization	Verified Cleaner
Advanced cleaning	Required	Required
Heavy metals cleaning efficiency	≥50% for each metal	≥50% for each metal
Semivolatile organic compound cleaning efficiency	≥50% average of all compounds	≥50% average of all compounds
Biological sanitization effectiveness — <i>Staphylococcus aureus</i>	3 log reduction or better	3 log reduction or better
Biological sanitization effectiveness — <i>Klebsiella pneumoniae</i>	3 log reduction or better	3 log reduction or better
Advanced inspection	All ensembles and ensemble elements of structural and proximity fire fighter protective clothing	Not allowed
Advanced repair	All ensembles and ensemble elements capable of being repaired for structural and proximity fire fighter protective clothing that they have been specifically verified to repair	No repairs allowed
Advanced repairs for moisture barriers	ISPs have a choice of which moisture barriers to verify	Not allowed
Verification testing timing	Every two years, or when processes change	Every two years, or when processes change
Verification facility quality review and inspection	Every six months	Every six months

N 11.1.1.4.2 Repair categories shall be garment outer shell repairs, garment moisture barrier repairs, and garment thermal barrier repairs.

11.1.1.5 Where the certification listing includes the moisture barrier repair category, the listing shall include the moisture barrier manufacturer and trade name designation, and the repair tape manufacturer and trade name or part number.

Δ 11.1.2 All verification of the organization, ISP, manufacturer verified in cleaning, or verified cleaner shall be performed by a certification organization that meets at least the requirements specified in Section 11.2 and that is accredited for personal protective equipment (PPE) in accordance with ISO/IEC 17065, *Conformity assessment — Requirements for bodies certifying products, processes and services*. The accreditation shall be issued by an accreditation body operating in accordance with ISO 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

11.1.3 The verified organization, verified ISP, manufacturer verified in cleaning, or verified cleaner shall not use the NFPA name or the name or identification of this standard, NFPA 1851, in any statements about its services unless the services are verified as compliant to this standard.

11.1.3.1* No provider of the services covered by this standard shall claim to be an ISP, a verified ISP, a verified organization, a manufacturer verified in cleaning, or a verified cleaner unless they comply with all of the requirements in this standard and are third-party verified in accordance with the requirements of this chapter.

11.1.4 The certification organization shall not issue any new verifications to the 2014 edition of NFPA 1851 on or after the NFPA effective date for the 2020 edition.

11.1.5 Organizations, ISPs, or manufacturers verified to the 2014 edition of NFPA 1851 shall undergo verification to the 2020 edition of NFPA 1851 within 18 months of the NFPA effective date for the 2020 edition.