NFPA®

1891

Standard on Selection, Care, and Maintenance of Hazardous Materials, CBRN, and Emergency Medical Operations Clothing and Equipment

2022

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Standard on Selection, Care, and Maintenance of Hazardous Materials, CBRN, and Emergency Medical Operations Clothing and Equipment

2022 Edition

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

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NFPA® 1891

Standard on

Selection, Care, and Maintenance of Hazardous Materials, CBRN, and Emergency Medical Operations Clothing and Equipment

2022 Edition

This edition of NFPA 1891, *Standard on Selection, Care, and Maintenance of Hazardous Materials, CBRN, and Emergency Medical Operations Clothing and Equipment*, was prepared by the Technical Committee on Hazardous Materials Protective Clothing and Equipment and released by the Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. It was issued by the Standards Council on July 4, 2021, with an effective date of July 24, 2021.

This edition of NFPA 1891 was approved as an American National Standard on July 24, 2021.

Origin and Development of NFPA 1891

The concept for the NFPA 1891 standard has been under development for more than 30 years. It was first proposed by Jan Dunbar, a member of the Technical Committee on Hazardous Materials Protective Clothing and Equipment, during the initial development of the first series of chemical protective standards. The project has been reinvigorated many times by several NFPA staff liaisons including Bruce Teele, David Trebisacci, and Chris Farrell. The current technical committee would like to thank Jan Dunbar, Division Chief of Special Operations (retired) of the Sacramento Fire Department, for his vision, insights, and guidance over the 30-year life of this product.

NFPA 1990, *Standards for Protective Ensembles for Hazardous Materials and CBRN Operations*, sets the performance requirements for the types and levels of protective ensembles for Hazmat/CBRN. NFPA 1891, in turn, establishes procedures as part of a program to provide selection, care, and maintenance requirements to reduce the safety risks and potential health risks associated with poorly selected, poorly maintained, contaminated, and damaged Hazmat/CBRN protective equipment. In addition, NFPA 1891 incorporates ensembles but not individual clothing items, as does NFPA 1999, *Standard on Protective Clothing and Ensembles for Emergency Medical Operations.*

The selection of PPE for a particular response or operational mission should account for specific hazard levels and types of protective ensembles that ensure appropriate levels of protection. Selection of protective equipment that is appropriate for hazardous materials emergencies, CBRN incidents, or emergency medical operations (Hazmat/CBRN/EMO) depends on a thorough hazard and risk assessment that identifies exposure threats and conditions at the response or operations scene. NFPA 1891 provides a standardized approach to the selection process using a decision matrix that is documented in Annex B and is referenced for use in NFPA 470, *Hazardous Materials/Weapons of Mass Destruction (WMD) Standard for Responders.* In addition, NFPA 1891 sets forth the requirements for a Hazmat/CBRN/EMO protective equipment program that includes guidance on inspection and testing, cleaning and decontamination, service and repair, storage, retirement, documentation and records, and test methods.

NFPA 1891 further includes extensive information in Annex A to aid authorities having jurisdiction (AHJs) with recommended approaches for attaining compliance in the standard. Detailed guidance is provided that relates to ensemble inspections, cleaning, and decontamination.

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

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

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

Committee Scope: This Committee shall have primary responsibility for documents on protective clothing and protective equipment, except respiratory protective equipment, that provides hand, foot, torso, limb, and head protection for fire fighters and other emergency services responders during incidents that involve hazardous materials operations. These operations involve the activities of rescue; hazardous material confinement, containment, and mitigation; and property conservation where exposure to substances that present an

unusual danger to responders are present or could occur due to toxicity, chemical reactivity, decomposition, corrosiveness, or similar reactions. Additionally, this Committee shall have primary responsibility for documents on the selection, care, and maintenance of hazardous materials protective clothing and protective equipment by fire and emergency services organizations and personnel.

Contents

NFPA 1891

Standard on

Selection, Care, and Maintenance of Hazardous Materials, CBRN, and Emergency Medical Operations Clothing and Equipment

2022 Edition

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

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

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

Chapter 1 Administration

1.1 Scope.

1.1.1 This standard shall specify the minimum requirements for the selection, care, and maintenance of hazardous materials, CBRN, and emergency medical operations (hazmat/CBRN/EMO) ensembles and ensemble elements, that are used for protection during hazardous materials emergencies, CBRN incidents, and emergency medical operations, and are certified against NFPA 1999 or NFPA 1990, which incorporates NFPA 1991, NFPA 1992, and NFPA 1994.

1.1.1.1* Individual clothing items addressed within this standard are limited to items certified against the NFPA 1992 and NFPA 1994 Class 5 portions of NFPA 1990.

1.1.1.2 Emergency medical operations (EMO) PPE addressed within this standard are limited to single-use and multiple-use ensembles certified against NFPA 1999.

1.1.2 This standard shall also specify requirements for hazmat/CBRN/EMO PPE manufactured to previous editions of NFPA 1991, NFPA 1992, NFPA 1994, and NFPA 1999.

1.1.3 This standard shall not be construed as addressing all of the safety concerns associated with the use of compliant hazmat/CBRN/EMO PPE. The persons and AHJs that use compliant hazmat/CBRN/EMO PPE shall be responsible for establishing safety and health practices and for determining the applicability of regulatory limitations before use.

1.1.3.1 Compliance with this document is not intended to be a substitute for compliance with all applicable laws and regulations.

1.1.4 This standard shall not apply to initial life-safety operations where personnel take immediate action using available PPE to perform a rescue or evacuate an area following a preliminary risk analysis.

1.1.5 This standard shall not specify requirements, such as appropriate use of hazmat/CBRN/EMO PPE for training, operations, or infection control, for other AHJ programs because these programs are under the jurisdiction of other NFPA standards.

1.1.6 This standard shall not apply to ensembles or ensemble elements that are compliant with NFPA 1951, NFPA 1971, NFPA 1977, and NFPA 2112.

1.1.6.1 Products compliant with NFPA 1951, NFPA 1971, NFPA 1977, and NFPA 2112 shall be permitted for use in certain hazmat/CBRN/EMO due to their unique protection capabilities.

1.1.7 This standard shall not apply to ensembles or ensemble elements for protection against ionizing radiation, cryogenic liquid hazards, or explosive atmospheres.

1.1.8 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 procedures as part of a program to provide selection, care, and maintenance requirements for hazmat/CBRN/EMO PPE to reduce the safety risks and potential health risks associated with poorly selected, poorly maintained, contaminated, and/or damaged hazardous materials, CBRN, and emergency medical operations protective equipment.

1.2.2 This standard shall establish a basic criteria for selecting, inspecting, cleaning, decontaminating, repairing, storing, and retiring hazmat/CBRN/EMO PPE compliant with the requirements of NFPA 1999 or NFPA 1990, which consolidates NFPA 1991, NFPA 1992, and NFPA 1994.

1.3 Application.

1.3.1 This standard shall apply to hazmat/CBRN/EMO PPE that is certified compliant in accordance with NFPA 1999 or NFPA 1990, which consolidates NFPA 1991, NFPA 1992, and NFPA 1994.

1.3.2 This standard shall also apply to hazmat/CBRN/EMO PPE that is manufactured to previous editions of NFPA 1991, NFPA 1992, NFPA 1994, and NFPA 1999.

1.3.3 This standard shall not apply to other organizational programs such as the appropriate use of 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 hazmat/CBRN/EMO protective ensembles.

1.3.5 Requirements of this standard shall not apply to accessories attached to any element of the hazmat/CBRN/EMO PPE unless specifically addressed herein.

1.4 Responsibility.

1.4.1 To ensure the greatest possible protection of the organization's employees at the scene of a hazardous materials, CBRN, or emergency medical incident, both employers and employees shall collaborate to establish and maintain a safe and healthy work environment.

1.4.2 At a minimum, employers shall be responsible for the following:

(1) Performing a hazard analysis at the scene of a hazardous materials, CBRN, or emergency medical incident to identify and control physical and health hazards
(2) Identifying and providing appropriate PPE for employees
(3) Advising employees of the hazards they face and the limitations of the selected PPE
(4) Training employees in the use and care of PPE
(5) Maintaining PPE, including replacing worn or damaged PPE
(6) Periodically reviewing, updating, and evaluating the effectiveness of the PPE program

1.4.3 At a minimum, employees shall be responsible for the following:

(1) Wearing PPE properly
(2) Attending training sessions on PPE
(3) Ensuring proper care, cleaning, and maintenance of PPE
(4) Informing a supervisor of the need to repair or replace PPE
(5) Informing a supervisor when they have questions about their PPE

1.5 Implementation.

1.5.1 When the standard is adopted by an AHJ, the AHJ shall set a date or dates for achieving compliance with the requirements of this standard.

1.5.2 The AHJ shall be permitted to establish a phase-in schedule for compliance with specific requirements of this standard.

1.6 Units.

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

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

Chapter 2 Referenced Publications

2.1 General. The following documents or portions thereof are referenced in this standard as mandatory requirements and shall be considered part of the requirements of this standard. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this standard. Some of these mandatory documents might also be referenced in this standard for specific informational purposes and, therefore, are listed in Annex B.

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

NFPA 470, *Hazardous Materials/Weapons of Mass Destruction (WMD) Standards for Responders,* 2022 edition.

NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents,* 2018 edition.

NFPA 473, *Standard for Competencies for EMS Personnel Responding to Hazardous Materials/Weapons of Mass Destruction Incidents,* 2018 edition.

NFPA 475, *Recommended Practice for Organizing, Managing, and Sustaining a Hazardous Materials/Weapons of Mass Destruction Response Program,* 2022 edition.

NFPA 1072, *Standard for Hazardous Materials/Weapons of Mass Destruction Emergency Response Personnel Professional Qualifications,* 2017 edition.

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

NFPA 1581, *Standard on Fire Department Infection Control Program,* 2021 edition.

NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2020 edition.

NFPA 1855, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Technical Rescue Incidents,* 2018 edition.

NFPA 1951, *Standard on Protective Ensembles for Technical Rescue Incidents,* 2020 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 and Urban Interface Fire Fighting,* 2022 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* 2019 edition.

NFPA 1986, *Standard on Respiratory Protection Equipment for Tactical and Technical Operations,* 2017 edition.

NFPA 1990, *Standard for Protective Ensembles and Ensemble Elements for Hazardous Materials, CBRN, and Emergency Medical Response,* 2022 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.

NFPA 2112, *Standard on Flame-Resistant Clothing for Protection of Industrial Personnel Against Short-Duration Thermal Exposures from Fire,* 2018 edition.

2.3 Other Publications.

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

ANSI/ASQ Z1.4, *Sampling Procedures and Tables for Inspection by Attributes,* 2003 (R2018).

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

ASTM F1052, *Test Method for Pressure Testing Vapor Protective Suits,* 2014.

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

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1:Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*, 1999.

2.3.4 NIOSH Publications. National Institute for Occupational Safety and Health, Patriots Plaza 1, 395 E Street, SW, Suite 9200, Washington, DC 20201.

Statement of Standard for NIOSH CBRN APR Testing, 2003.

Statement of Standard for NIOSH CBRN PAPR Testing, 2006.

Statement of Standard for NIOSH CBRN SCBA Testing, 2003.

2.3.5 United Nations Publications. United Nations, 1775 K Street, Suite 500, Washington, DC 20006.

Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 2011.

2.3.6 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 1910.120, "Hazardous Waste Operations and Emergency Response."

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

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

Title 42, Code of Federal Regulations, Part 84, "Respiratory Protective Devices."

U.S. Department of Transportation "Nine Classes of Hazardous Materials," 2014. https://www.fmcsa.dot.gov/regulations/enforcement/nine-classes-hazardous-materials-yellow-visor-card

https://www.fmcsa.dot.gov/regulations/enforcement/nine-classes-hazardous-materials-yellow-visor-card.

2.3.7 Other Publications.

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

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 in another chapter, they shall be defined using their ordinarily accepted meanings in 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 Accessories. Those items that are attached to hazardous materials protective clothing, hazardous materials protective ensembles, or individual elements but designed in such a manner to be removable from the hazardous materials protective clothing, hazardous materials protective ensembles, and individual elements and that are not necessary to be attached to meet the requirements of the standard. Such accessories include, but are not limited to, utility belts, harnesses, backpacks, tools, tool packs, radios, radio packs, suspenders, and lights.

3.3.2 Agents.

3.3.2.1 ***Biological Agents.*** Liquid or particulate agents such as bacteria, viruses, fungi, and other microorganisms and their associated toxins.

3.3.2.2 ***CBRN Agents.*** The term used to refer to chemical terrorism agents including both chemical warfare agents

and toxic industrial chemicals, biological terrorism agents, and radiological particulate terrorism agents.

3.3.2.3 ***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.

3.3.2.4 ***Chemical Warfare (CW) Agents.*** Liquid, solid, gaseous, and vapor chemical agents (most are liquids) traditionally used during warfare or armed conflict to kill or incapacitate an enemy.

3.3.2.5 ***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 the result of a terrorist attack.

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

3.3.4* Carcinogen/Carcinogenic. A cancer-causing substance which is identified in one of several published lists including, but not limited to, the NIOSH "Pocket Guide to Chemical Hazards," SAX's "Dangerous Properties of Industrial Materials," and the ACGIH "Threshold Limit Values and Biological Exposure Indices." *Carcinogenic* is the adjective form of the word.

3.3.5 Care. Procedures for cleaning, decontaminating, and storing hazardous materials protective clothing, hazardous materials protective ensembles and individual elements.

3.3.6 CBRN. The abbreviation used for "chemical, biological, radiological, and nuclear."

3.3.7 CBRN Terrorism Incidents. Situations involving the intentional or accidental release of CBRN agents in civilian areas.

3.3.8 Certification/Certified. A system whereby a certification AHJ determines that a manufacturer has demonstrated the ability to produce a product that complies with the requirements of the standard, authorizes the manufacturer to use a label on listed products that comply with the requirements of the standard, and establishes a follow-up program conducted by the certification AHJ as a check on the methods the manufacturer uses to determine continued compliance with the requirements of the standard.

3.3.9 Cleaning. The act of removing soil and contamination from protective clothing, protective ensembles, and ensemble elements by mechanical, chemical, thermal, or combined processes.

3.3.9.1* ***General Cleaning.*** A specific process applied for removing soil from the wearing of hazmat/CBRN/EMO PPE that has not been exposed to hazardous substances requiring decontamination.

3.3.10* Compliant Product. A product that is covered by NFPA 1891 and has been certified as meeting all applicable requirements of NFPA 1999 or NFPA 1990, which consolidates NFPA 1991, NFPA 1992, and NFPA 1994.

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

3.3.12 Contamination. The process of transferring a hazardous material, or the hazardous component of a weapon of mass destruction (WMD), from its source to people, animals, the environment, or equipment, that can act as a carrier.

3.3.12.1 ***Cross Contamination.*** The process by which a contaminant is carried out of the hot zone and contaminates people, animals, the environment, or equipment.

3.3.13 Craze. The appearance of fine cracks or hairline fractures in the surface a transparent material such as a faceshield or visor.

3.3.14* Decontamination. The physical and/or chemical process of reducing and preventing the spread and effects of contaminants to people, animals, the environment, or equipment involved at a hazmat/CBRN/EMO incident.

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

3.3.16* Emergency Medical Operations (EMO). The provision of emergency patient care and transportation prior to arrival at a medical care facility by emergency medical responders, emergency patient care by medical first receivers at a medical care facility, and body recovery by emergency medical responders.

3.3.17* Emergency Responders. Personnel assigned to organizations that have the responsibility for responding to hazardous materials emergencies and CBRN terrorism incidents.

3.3.18 Encapsulating Ensemble. A type of ensemble that completely covers the wearer and the wearer's respirator.

3.3.19 Ensemble. Multiple ensemble elements that when worn together are designed to provide minimum full-body protection from some, but not all, risks that occur during hazardous materials emergencies, CBRN terrorism incidents, and emergency medical operations. *(See also 3.3.20, Ensemble Elements).*

3.3.19.1 ***NFPA 1991–Certified Ensembles (and Ensemble Elements).***

3.3.19.1.1* ***Vapor-Protective Ensemble.*** Multiple elements of compliant protective clothing and equipment that when worn together provide protection from some, but not all, risks of vapor, liquid splash, and particulate environments during hazardous materials emergencies and CBRN terrorism incidents in vapor, gas, liquid, or particulate forms.

3.3.19.1.2* ***Vapor-Protective Ensemble with Optional Chemical Flash Fire Escape Protection.*** A compliant vapor-protective ensemble that is also certified as compliant with the optional requirements for limited protection against chemical flash fire for escape only.

3.3.19.1.3 ***Vapor-Protective Ensemble with Optional Chemical Flash Fire Escape and Liquefied Gas Protection.*** A compliant vapor-protective ensemble that is also certified as compliant with the optional requirements for both limited protection against chemical flash fire for escape only and for protection against liquefied gases.

3.3.19.1.4* ***Vapor-Protective Ensemble with Optional Liquefied Gas Protection.*** A compliant vapor-protective ensemble that is also certified as compliant with the optional requirements for protection against liquefied gases.

3.3.19.1.5* ***Vapor-Protective Footwear.*** The ensemble element of the protective ensemble that provides chemical protection and physical protection to the feet, ankles, and lower legs.

3.3.19.1.6 ***Vapor-Protective Gloves.*** The ensemble element of the protective ensemble that provides chemical protection to the hands and wrists.

3.3.19.2 ***NFPA 1992–Certified Ensembles (and Ensemble Elements).***

3.3.19.2.1* ***Liquid Splash–Protective Ensemble.*** Multiple elements of compliant protective clothing and equipment products that when worn together provide protection from some, but not all, risks of hazardous materials emergencies involving liquids to the torso, legs, arms, head, hands, and feet.

3.3.19.2.2* ***Liquid Splash–Protective Footwear.*** The element of the protective ensemble, or the item of protective clothing that provides liquid chemical protection and physical protection to the feet, ankles, and lower legs.

3.3.19.2.3* ***Liquid Splash–Protective Garment.*** The element of the protective ensemble or the item of protective clothing that provides liquid chemical protection to the upper and lower torso, arms, and legs, excluding the head, hands, and feet.

3.3.19.2.4 ***Liquid Splash–Protective Gloves.*** The element of the protective ensemble, or the item of protective clothing that provides liquid chemical protection to the hands and wrists.

3.3.19.2.5* ***Liquid Splash–Protective Hood.*** The element of the protective ensemble or an item of protective clothing that provides liquid chemical protection and physical protection to the head and neck.

3.3.19.3 ***NFPA 1994–Certified Ensembles (and Ensemble Elements).***

3.3.19.3.1 ***Class 1 Hazmat/CBRN Protective Ensemble.*** An ensemble comprising ensemble elements that when worn together are designed to protect emergency responders at hazardous materials emergencies and CBRN terrorism incidents involving vapor or liquid chemical hazards where concentrations are at or above immediately dangerous to life and health (IDLH), requiring the use of self-contained breathing apparatus (SCBA).

3.3.19.3.2 ***Class 2 Hazmat/CBRN Protective Ensemble.*** An ensemble comprising ensemble elements that when worn together are designed to protect emergency responders at hazardous materials emergencies and CBRN terrorism incidents involving vapor or liquid chemical hazards where concentrations are at or above immediately dangerous to life and health (IDLH), requiring the use of self-contained breathing apparatus (SCBA).

3.3.19.3.3 ***Class 3 Hazmat/CBRN Protective Ensemble.*** An ensemble comprising ensemble elements that when worn together are designed to protect emergency responders at hazardous materials emergencies and CBRN terrorism incidents involving low levels of vapor or liquid chemical hazards where concentrations are below immediately dangerous to life and health (IDLH), permitting the use of CBRN air-purifying respirators (APR) or CBRN-powered air-purifying respirators (PAPR).

3.3.19.3.4 ***Class 4 Hazmat/CBRN Protective Ensemble.*** An ensemble comprising ensemble elements that when worn together are designed to protect emergency responders at hazardous materials emergencies and CBRN terrorism incidents involving biological or radiological particulate hazards where concentrations are below immediately dangerous to life and health (IDLH), permitting the use of air-purifying respirators (APR) or powered air-purifying respirators (PAPR).

3.3.19.3.5 ***Class 5 Hazmat/CBRN Protective Ensemble.*** An ensemble comprising ensemble elements that when worn together are designed to protect emergency responders at hazardous materials emergencies and CBRN terrorism incidents involving non-skin toxic, flammable gases where the potential exists for chemical flash fires and further requiring the use of self-contained breathing apparatus (SCBA).

3.3.19.4 ***NFPA 1999–Certified Protective Ensembles.***

3.3.19.4.1* ***Multiple-Use Emergency Medical Protective Ensemble.*** Multiple elements of compliant protective clothing and equipment providing full body coverage intended for multiple use that when worn together provide protection from some, but not all, risks of emergency medical operations.

3.3.19.4.2* ***Single-Use Emergency Medical Protective Ensemble.*** Multiple elements of compliant protective clothing and equipment providing full-body coverage intended for a single use that when worn together provide protection from some, but not all, risks of emergency medical operations.

3.3.20 Ensemble Elements. Garment(s), gloves, footwear, hood(s), and other clothing and equipment items used to assemble a complete protective ensemble.

3.3.20.1 ***Faceshield.*** A hazardous materials protective component intended to help protect a portion of the wearer's face, not intended as primary eye protection.

3.3.20.2 ***Footwear.*** The element of the protective ensemble that provides protection to the foot, ankle, and lower leg.

3.3.20.3 ***Footwear Cover.*** The item of the protective ensemble to be worn over standard footwear that provides a barrier and physical protection to the wearer's feet, and possibly ankles and lower legs.

3.3.20.4 ***Garment(s).*** The element or elements of the protective ensemble that provides protection to the upper and lower torso, arms, and legs and possibly the head, excluding the hands and feet.

3.3.20.5 ***Gloves.*** The element of the protective ensemble that provides protection to the wearer's hands and wrists.

3.3.20.6 ***Hood.*** The element of the protective ensemble that provides protection to the wearer's head and neck.

3.3.20.7 ***Sock.*** An extension of the garment or suit leg or a separate item that covers the entire foot and ankle and is intended to be worn inside a protective outer boot.

3.3.21 Exhaust Valve. A one-way vent that releases exhaust to the outside environment and prevents entry of the outside environment.

3.3.22 Fit. The quality, state or manner in which the width, length, and other dimensions of clothing, when worn, relates to the wearer's body.

3.3.23* Gross Decontamination. A phase of the decontamination process where significant reduction of the amount of surface contamination takes place as soon as possible, most often accomplished by mechanical removal of the contaminant or initial rinsing from handheld hose lines, emergency showers, or other nearby sources of water.

3.3.24 Hardware. Nontextile components of the hazardous materials protective clothing, hazardous materials protective ensemble, or individual elements including, but not limited to, those made of metal or rigid plastic.

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

3.3.26 Hazmat/CBRN/EMO PPE. An abbreviation for personal protective equipment worn by emergency responders for hazardous materials emergencies, CBRN terrorism incidents, and emergency medical operations.

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

3.3.28 Hazmat. Abbreviation for the compound term *hazardous materials*, as in hazmat team.

3.3.29 Independent Service Provider (ISP). An independent third party performing services for inspection, cleaning, disinfection, sanitization, decontamination for reuse, and repair of hazmat/CBRN/EMO PPE.

3.3.30 Maintenance. Procedures for inspection, repair, and removal from service of hazardous materials and CBRN protective ensembles, ensemble elements, and clothing.

3.3.31 Manufacturer. The entity that directs and controls 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.

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

3.3.33* Multiple Use. Items designed to be worn repeatedly and used for protection during emergency medical operations.

3.3.34* Nonencapsulating Ensemble. A type of ensemble that does not fully cover the wearer's respirator and relies on the facepiece of the respirator to interface with the garment to complete the enclosure of the wearer.

3.3.35 Organization. The entity that provides the direct management and supervision for emergency incident response personnel. Examples of such entities include, but are not limited to, fire departments, police departments, rescue squads, emergency medical service providers, and hazardous materials response teams.

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

3.3.37 Removal from Active Service. The process of removing from inventory a hazardous materials ensemble so that it is no longer available to be used in an active application at an incident.

3.3.38* Respirator. A certified device that provides respiratory protection for the wearer and is worn as part of an ensemble.

3.3.39 Retirement. The process of removing from inventory hazardous materials and CBRN protective ensembles, ensemble elements, and clothing so that they are no longer available for any purpose, including training.

3.3.40* Ruggedized. A category of ensembles with increased physical durability.

3.3.41* 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.

3.3.42 Seam. A line along which two pieces of protective material are sewn together in a garment or other article. Excludes external fittings, gaskets, and garment closure assemblies.

3.3.43 Selection. The process of determining what hazmat/CBRN/EMO PPE is necessary for protection of responders from an anticipated, specific hazard or other activity; the procurement of the appropriate hazmat/CBRN/EMO PPE; and the choice of hazmat/CBRN/EMO PPE for a specific hazard or activity at an emergency incident.

3.3.44 Service Life. The period for which hazardous materials and CBRN protective ensembles, ensemble elements, and clothing are useful before retirement.

3.3.45* Single Use. A designation applied to an ensemble or ensemble element indicating their one-time use followed by disposal.

3.3.46* Soiling. The accumulation of sweat, dust, dirt, debris, and other nonhazardous materials on or in hazmat/CBRN/EMO PPE that could degrade its performance or cause hygiene issues.

3.3.47 Standard Operating Procedure (SOP). A written directive that establishes specific operational or administrative methods to be followed routinely for the performance of a task or for the use of equipment.

3.3.48 Storage Life/Shelf Life. The useful life expected of the hazardous materials and CBRN protective ensembles, ensemble elements, and clothing from the date of manufacture when it has been stored, inspected, and has undergone proper care and maintenance in accordance with manufacturer's instructions, but has not been used, donned, doffed, or repaired.

3.3.49* 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.

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

3.3.51 Visor. The portion of the hazardous materials protective ensemble or hazardous materials protective clothing that permits the wearer to see outside of the ensemble or clothing.

3.3.52 Wear Test. A controlled evaluation of one or more hazardous materials and CBRN protective ensembles, ensemble elements, and clothing involving selected AHJ members wearing hazardous materials and CBRN protective ensembles, ensemble elements, and clothing in actual or simulated activities with the objective of providing quantitative ratings and subjective comments from participating members.

Chapter 4 Program

4.1 General.

4.1.1 The AHJ shall develop and implement a program for the selection, care, and maintenance of hazmat/CBRN/EMO protective ensembles and ensemble elements used by the members of the organization in the performance of their assigned functions or as required by the AHJ.

4.1.2 This program shall have the goal of providing hazmat/CBRN/EMO PPE that are suitable and appropriate for the intended use; maintaining such hazmat/CBRN/EMO PPE in a safe, usable condition to provide the intended protection to the user; removing from use such hazmat/CBRN/EMO PPE that could cause or contribute to user injury, illness, or death because of its condition; and reconditioning, repairing, or retiring such hazmat/CBRN/EMO PPE.

4.1.3 Where this program for the selection, care, and maintenance of hazmat/CBRN/EMO PPE is part of an AHJ's program on protective clothing and protective equipment, the portion of the AHJ's program that affects hazmat/CBRN/EMO PPE shall be in accordance with this standard.

4.2 Program Parts.

4.2.1 As part of the program, the AHJ shall develop written standard operating procedures (SOPs) that identify and define various roles and responsibilities of the organization and of its members.

4.2.2 The program shall incorporate at least the requirements in the chapters listed in Table 4.2.2.

4.2.3 The AHJ shall not add accessories that compromise the scope and purpose of the product certification and shall not permit accessories to be added to hazmat/CBRN/EMO PPE unless the following have taken place:

(1) The accessory has been certified for use with the element in accordance with NFPA 1999, or NFPA 1990, which consolidates NFPA 1991, NFPA 1992, and NFPA 1994.
(2) The AHJ has the equipment manufacturer's approval to use the accessory with their hazmat/CBRN/EMO PPE.

4.3 Records.

4.3.1 The AHJ shall compile and maintain records on their hazmat/CBRN/EMO PPE.

Table 4.2.2 Required Program Parts for Hazmat/CBRN/EMO PPE

Chapter Title	Chapter
Referenced Publications	2
Selection	5
Inspection and Testing	6
Cleaning and Decontamination	7
Service and Repair	8
Storage	9
Retirement	10
Documentation and Records	11
Test Methods	12
Explanatory Material	Annex A
Selection of Hazmat/CBRN/EMO Protective Ensembles	Annex B

4.3.2 At least the following records shall be kept for hazmat/CBRN/EMO PPE:

(1) Date and condition when received
(2) Manufacturer and model name or design
(3) Manufacturer's identification number, lot number, or serial number
(4) Month and year of manufacture
(5) Date(s) and findings of advanced inspection(s) by AHJ
(6) Date(s) of advanced cleaning or decontamination by AHJ
(7) Reason for advanced cleaning or decontamination and individual(s) who performed cleaning or decontamination
(8) Date(s) of maintenance(s), names of individual(s) who performed maintenance(s), and brief description of any maintenance(s)
(9) Date of removal from active service inventory or retirement
(10) Date and method of destruction and/or disposal

4.4 Manufacturer's Instructions.

4.4.1 When issuing new hazmat/CBRN/EMO PPE, the AHJ shall provide users with the instructions provided by the manufacturer on the care, use, and maintenance of the hazmat/CBRN/EMO PPE, including any warnings provided by the manufacturer.

4.4.2 Where the manufacturer's instructions regarding the care or maintenance of their hazmat/CBRN/EMO PPE differ from a specific requirement(s) in this standard, the manufacturer's instructions shall be followed for that requirement(s).

4.4.3 The AHJ shall retain a copy of the manufacturer's instructions for the hazmat/CBRN/EMO PPE for reference purposes.

4.5 Protecting the Public from Contamination. The AHJ shall develop written SOPs as part of the program, which minimize the public's exposure to soiled or contaminated hazmat/CBRN/EMO PPE.

Chapter 5 Selection

5.1 Selection for Procurement.

5.1.1 The AHJ shall establish a process to conduct selection for procurement of hazmat/CBRN/EMO PPE.

5.1.2 The following reference materials shall be considered:

(1) Standards related to selection, use, care, and maintenance:
   (a) NFPA 1891
   (b) NFPA 1500
   (c) NFPA 1581
(2) Standards and regulations related to training and end-user qualification:
   (a) NFPA 470, which consolidates NFPA 472, NFPA 473, and NFPA 1072
   (b) 29 CFR 1910.120
(3) Standards and regulations related to respiratory protective equipment:
   (a) NFPA 1981
   (b) NFPA 1986
   (c) 42 CFR Part 84
   (d) 29 CFR 1910.134
   (e) NIOSH *Statement of Standard for CBRN Full Facepiece Air-Purifying Respirators (APR)*
   (f) NIOSH *Statement of Standard for CBRN Powered Air-Purifying Respirators (PAPR)*
   (g) NIOSH *Statement of Standard for CBRN Self-Contained Breathing Apparatus (SCBA)*
(4) Standards related to applicable PPE:
   (a) NFPA 1990, which consolidates NFPA 1991, NFPA 1992, and NFPA 1994
   (b) NFPA 1999
   (c) NFPA 1971
   (d) NFPA 1951
(5) All applicable federal, state, and local regulations

5.1.3 Before starting the procurement process for hazmat/CBRN/EMO protective ensembles and ensemble elements (i.e., liquid splash–protective clothing or emergency medical protective clothing), a hazard assessment and risk analysis study shall be conducted following the procedures provided in NFPA 475, Chapter 5, Risk Assessment. The risk assessment shall include the following steps:

(1) Hazard identification and vulnerability assessment
(2) Consequence identification
(3) Risk analysis

5.1.3.1 The hazard identification and vulnerability assessment process shall include collecting information regarding the locations and types of hazardous materials present in the jurisdiction covered by the AHJ. The process shall include, but not be limited to, the following:

(1) Identification of facilities that manufacture/produce, store, transport, use, treat, or dispose of hazardous materials, including transportation routes where hazardous materials throughout the AHJ's jurisdiction might be present
(2) Identification of all materials capable of causing death, injury, property damage, and system disruptions following an accidental or intentional release at identified locations
(3) Identification of materials, material properties, quantities, concentrations, containers, storage considerations, transportation routes, potential hazards associated with spills or releases, and surrounding conditions
(4) The likelihood of members to be exposed to biological hazards that occur as the result of exposure to bloodborne pathogens or other infectious diseases that could occur as the result of emergency medical operations
(5) The potential for acts of terrorism or other releases of CBRN agents

5.1.3.1.1 Special consideration shall be given to hazards specifically related to the selection of PPE including, but not limited to, the following:

(1) State of hazardous material (gas/vapor, liquid, or solid) and potential length of exposure
(2) Potential for flash fire or detonation
(3) Whether a continuous fire is possible
(4) Risk of a structural collapse or other severe physical hazards
(5) Ruggedness or physical hazards within the response environment
(6) Operations on elevated platforms, near roadways, or around open water
(7) Activities involving rescue of affected victims or other protection of affected civilian personnel
(8) Compatibility of hazmat/CBRN/EMO PPE with operational equipment
(9) General chemical permeation, liquid penetration, or viral penetration resistance data associated with hazmat/CBRN/EMO PPE under consideration
(10) Other specific conditions that might include substances in a cryogenic state, radiation exposure hazards, and explosive atmospheres

5.1.3.2 The consequences of a release of hazardous materials found at each location in the jurisdiction covered by the AHJ shall be analyzed by evaluating the likely behavior of a container and its contents to determine the hazards associated with the release and the likely outcomes (e.g., deaths and injuries, environmental and property damage, and system disruptions) associated with that release.

5.1.3.2.1 Analyzing the consequences of exposure shall include identifying the potential risks to emergency responders of exposure to liquid-borne or airborne biological hazards that result in the infection or debilitation of affected responders or the local population.

5.1.3.3 Risk analysis shall be a judgment of the likelihood or probability of a release occurring coupled with the severity of outcomes, based on hazardous materials in the jurisdiction covered by the AHJ and an estimate of the likely outcomes associated with their release in the jurisdiction.

5.1.3.3.1 On conclusion of the risk analysis study, the AHJ shall determine the required levels of protection in vapor protection, liquid splash protection, particulate protection, flash fire protection, liquefied gas protection, CBRN protection, and biological protection.

5.1.4* The AHJ shall ensure that hazmat/CBRN/EMO PPE under consideration is certified as compliant with NFPA 1999 or NFPA 1990, which consolidates NFPA 1991, NFPA 1992, and NFPA 1994.

5.1.4.1 The AHJ shall also consider the role and protective capabilities of other certified PPE in use by the emergency responders.

5.1.5 The AHJ shall conduct a review of commercially available NFPA-compliant hazmat/CBRN/EMO PPE and shall consider the following factors:

(1) Hazmat/CBRN/EMO protection against specific hazards in the area of jurisdiction
(2) Resistance to physical and other hazards in the area of jurisdiction
(3) Hazmat/CBRN/EMO ensemble and ensemble element design features and options
(4) Available sizes of hazmat/CBRN/EMO protective ensembles and ensemble elements provided by the manufacturer
(5) Human factors assessments including ease of donning/doffing and wearer mobility, visibility, dexterity, tactility, and tactical considerations required for the area of jurisdiction
(6) Compatibility with other protective equipment and accessories (e.g., respiratory equipment, head protection, undergarments, communication systems, and cooling devices)
(7) Durability and suitability for single use or reuse
(8) Ease of decontamination and availability of decontamination procedures for doffing and reuse, including the provision of gross decontamination and transfer of contaminants during doffing
(9) Storage recommendations and considerations
(10) Warranties and disclaimers
(11) User information and technical data package
(12) Cost
(13) Return policy, ability to repair, and replacement of individual elements
(14) Recommended periodic testing and testing procedures
(15) Recommended inspection programs
(16) Stated hazmat/CBRN/EMO PPE storage life and recommendations for removal from active service inventory
(17) Recommendations for how decisions are made for retirement of hazmat/CBRN/EMO PPE
(18) Recommendations for destruction methods and disposal

5.1.6 The AHJ shall verify that hazmat/CBRN/EMO PPE under consideration interface properly and shall confirm compatibility of all operational equipment to be worn with the certified PPE.

5.1.7* When a wear trial of hazmat/CBRN/EMO PPE is performed by the AHJ, the wear trial shall include the following:

(1) Mimicking expected operational scenarios
(2) Using the hazmat/CBRN/EMO PPE as it would be used in the field, including use of all operational equipment and simulating typical wear times and activities
(3) Using an objective rating system based on the needs of the AHJ
(4) Providing an equal comparison of any similarly evaluated PPE against the incumbent PPE or all PPE on the same basis

5.1.8 Where the AHJ develops purchase specifications, those specifications shall indicate that the hazmat/CBRN/EMO PPE shall be certified as compliant with the most current editions of NFPA 1991, NFPA 1992, NFPA 1994, or NFPA 1999. The purchase specifications shall also include any other performance features found to be critical to acceptability for use based on the AHJ hazard assessment, wear trial, and selection process.

5.2 Selection for Use.

5.2.1 The AHJ shall ensure that a selection process based on the decision logic provided in Figure B.1 for hazmat/CBRN/EMO PPE is in place and is conducted at the scene of all hazardous materials emergencies, CBRN incidents, and emergency medical operations.

5.2.1.1 Before starting the selection process for hazmat/CBRN/EMO PPE, a hazard assessment and risk analysis study shall be conducted following the procedures provided in NFPA 475, Chapter 5, Risk Assessment; NFPA 1500, Chapter 8, Emergency Operations; and NFPA 1581, Chapter 7, Protection for Emergency Service Operations.

5.2.2 The AHJ shall designate a position in the organization with the authority to select the appropriate hazmat/CBRN/EMO PPE at each hazardous materials incident response.

5.2.2.1 The designated individual shall have all pertinent information about the hazmat/CBRN/EMO PPE available to them for selection consideration at each incident response.

5.2.2.2 The designated individual shall be trained according to NFPA 470 and shall have a minimum level of training to operations level responder with the mission-specific knowledge and skills identified in Section 6.8, Mission-Specific Competencies: Personal Protective Equipment (PPE), of NFPA 470.

5.2.3 Before starting the selection process for the use of hazmat/CBRN/EMO PPE, a hazard assessment and risk assessment shall be conducted by the designated individual.

5.2.4 The hazard assessment shall include an examination of the expected hazards and threats involving hazardous materials that might be encountered by members of the organization at the scene of the hazardous materials incident to include, but not be limited to, the following:

(1) Categorization of the substance(s) in relation to its hazard(s) by using a classification system, such as the U.S. Department of Transportation "Nine Classes of Hazardous Materials" or the *Globally Harmonized System of Classification and Labelling of Chemicals*, and including cryogenics and carcinogens as separate categories
(2) Listing of the chemical, physical, reactive, and toxicological properties of the substance(s)
(3) Documentation of the type of facility or property on which the incident is located including, but not limited to, manufacturing, storage, packaging, distribution, transportation system, and/or consumption
(4) Documentation of any potential threat to adjacent sensitive occupancies including, but not limited to, public assembly, government facilities, schools, shopping complexes, churches, underground occupancies, and abovegrade occupancies
(5) Documentation of the size, condition of, damage to, and estimated integral strength of containers and container types, plumbing, valving, tanks, distribution systems, channels, holding ponds, and racking systems

(6) Documentation of potentially vulnerable infrastructures, types of terrain, existing weather conditions, and limitations of the AHJ

5.2.5 The risk analysis study shall follow the hazards assessment study at the scene of a hazardous materials emergency, CBRN incident, or emergency medical operation.

5.2.5.1 The risk analysis shall include documentation of the projected dangers and unsafe situations that might be encountered by members of the AHJ if the decision is made that intervention activities are necessary.

5.2.6 On conclusion of the risk analysis, the designated individual shall determine the required level(s) of protection from gases/vapors, liquid splashes, particulates, biological agents, flash fire, other flame or thermal hazards, liquefied gases, and physical hazards.

5.2.7 The designated individual shall ensure that the hazmat/CBRN/EMO PPE under consideration for use is certified as compliant with the appropriate PPE category or class of NFPA 1999 or NFPA 1990, which consolidates NFPA 1991, NFPA 1992, and NFPA 1994.

5.2.7.1 The designated individual shall also consider the role and protective capabilities of other certified PPE in use by emergency responders such as PPE certified as compliant with NFPA 1971 for structural firefighting.

5.2.8 The designated individual shall verify that hazmat/CBRN/EMO PPE under consideration for use shall interface properly and shall be compatible with all operational equipment and accessories to be worn.

5.2.9* Where the response involves emergency medical operations exclusively, the EMO PPE shall be selected on the basis of the following factors:

(1) Exposure type (airborne or liquid-borne)
(2) Relative risk of contact with pathogen
(3) Expected exposure time and concentration (for airborne pathogens)
(4) Exposure volume (for liquid-borne pathogens)
(5) Exposure pressure (for liquid-borne pathogens)
(6) Physical environment and other hazards present

Chapter 6 Inspection and Testing

6.1 General.

6.1.1 Nothing in this standard shall restrict any AHJ from exceeding these minimum requirements for inspection and testing.

6.1.2* Before any inspection or testing procedure is initiated, the AHJ shall ensure that all items to be inspected or tested are clean and free of any contamination in accordance with Chapter 7.

6.1.3* The AHJ shall develop an inspection and testing program for hazmat/CBRN/EMO protective ensembles and ensemble elements.

6.1.3.1 The inspection and testing program shall identify, at a minimum, the following parts:

(1)* Specific recommended inspection and testing procedures provided by the PPE manufacturer
(2) The types and frequency of inspection and testing as applicable to each item of PPE
(3) Specific procedures to be applied to each item of PPE
(4) The individual within the AHJ responsible for conducting the inspections and testing.
(5) The documentation or records that are kept when inspections and testing are performed.

6.1.3.2 Types of Inspections.

6.1.3.2.1 Depending on the type of PPE and its intended use or reuse, the types of inspections specified in Table 6.1.3.2.1 shall be applied.

6.1.3.2.2 Based on information provided by the manufacturer of the PPE, the AHJ shall determine if the PPE is intended for a single use, single exposure, or can be reused for determining which inspections to perform.

6.1.3.2.3 Inspections on Receipt of PPE Items. On receipt of PPE items, the AHJ shall perform the following:

(1) Inspect purchased hazmat/CBRN/EMO PPE items to ensure that the correct items were ordered, they meet any specifications provided by the AHJ, and they were not damaged prior to or during shipment.
(2) Verify quantity and sizes of all items in the shipment received.
(3) Review the manufacturer's recommendations for placing the garment or suit in service.
(4) Ensure that procedures are established for returning unsatisfactory products, items not meeting specifications, errors in lot or model numbers, items not ordered, and items arriving damaged.

6.1.3.2.4* Annual or Periodic Inspections. The AHJ shall conduct annual or periodic inspections in accordance with the specific recommendations provided by the hazmat/CBRN/EMO manufacturer, the procedures specified in 6.1.3.3, and the following additional provisions:

(1) The AHJ shall inspect all hazmat/CBRN/EMO PPE at least annually, except for single-use examination gloves, cleaning/utility gloves, or other PPE items that are packaged in a sealed container that remains sealed until use.
(2) The AHJ shall be permitted to change the frequency of the inspection to once during a period longer than 1 year if some form of sampling is provided to address large inventories of PPE.
(3)* The AHJ shall be permitted to apply an acceptable sampling scheme for a larger volume of PPE in accordance with either ANSI/ASQ Z1.4, *Sampling Procedures and Tables for Inspection by Attributes*, or ISO 2859-1, *Sampling Plans for Inspection by Attributes*.
(4) The AHJ shall test encapsulated vapor-protective ensembles for gas-tight integrity as specified in Section 12.1, conduct any other tests that are recommended by the manufacturer, and record the test results.

6.1.3.2.5 Prior to Donning Inspections. Individual members of the AHJ shall inspect their hazmat/CBRN/EMO PPE prior to donning the PPE and entering a specific hazardous materials emergency, CBRN incident, or emergency medical operation in accordance with the specific recommendations provided by the hazmat/CBRN/EMO PPE manufacturer and the procedures specified in 6.1.3.3.

6.1.3.2.6 Inspections Following Use, Cleaning, and Decontamination. The AHJ shall inspect any hazmat/CBRN/EMO PPE

following use and cleaning or decontamination if the PPE is to be reused, in accordance with the specific recommendations provided by the hazmat/CBRN/EMO PPE manufacturer, the procedures specified in 6.1.3.3, and the following provisions:

(1) If the PPE is used but is not exposed to any hazardous substances, the AHJ shall inspect the PPE prior to placing it back in service regardless of whether it was contaminated.
(2) If the PPE is used, exposed to hazardous substances, and decontaminated, the AHJ shall apply universal precautions in the inspection of the PPE.
(3) The AHJ shall test encapsulating, vapor-protective ensembles for gas-tight integrity in accordance with Section 12.1.
(4) The AHJ shall conduct any other tests, as applicable, that are specified in Chapter 12 or by the manufacturer, or deemed appropriate based on the type of PPE.

6.1.3.2.7 Inspections Following Repairs.

6.1.3.2.7.1 If hazmat/CBRN/EMO PPE is subject to repairs by the manufacturer, the AHJ shall include a report from the manufacturer that includes the following:

(1) A description of the repairs made, including the type, location, and methods used in making the repairs
(2) The specific results of any testing or other assessments that are made with respect to ascertaining the quality of the repair and the fitness of the product to be operationally used

6.1.3.2.7.2 AHJs shall inspect hazmat/CBRN/EMO PPE that has been subject to any repairs prior to placing the repaired PPE back into service in accordance with the specific recommendations provided by the hazmat/CBRN/EMO PPE manufacturer, the procedures specified in 6.1.3.3, and the following provisions:

(1) The AHJ shall focus their inspections on those parts of the PPE that were subject to repair.
(2) The AHJ shall test encapsulating vapor-protective ensembles for gas-tight integrity in accordance with Section 12.1.
(3) The AHJ shall conduct any other tests, as applicable, that are specified in Chapter 12, by the manufacturer, or deemed appropriate by the AHJ based on the type of PPE.

6.1.3.3 Inspection Procedures.

6.1.3.3.1 The AHJ shall inspect hazmat/CBRN/EMO PPE according to the specific attributes or characteristics as specified by the manufacturer in their user information and according to the specific attributes and types of inspections listed in Table 6.1.3.3.1.

6.1.3.3.2 The AHJ shall undertake specific actions with respect to inspections as specified in 6.1.3.4.

6.1.3.3.3 The AHJ shall classify the findings of inspections as specified in Section 6.3.

6.1.3.4 Inspection Actions. The AHJ shall include in the inspection program the actions to be taken if deficiencies are found with any hazmat/CBRN/EMO PPE that would lead to the recommendation of appropriate follow-up actions determined by the inspection program.

6.1.3.4.1 Where the PPE is soiled or contaminated, the AHJ shall perform any necessary cleaning or decontamination in accordance with the requirements specified in Chapter 7 as appropriate for the type and level of contamination.

6.1.3.4.2 Where the results of the inspection indicate the need for repair of the PPE, the AHJ shall perform any necessary repairs in accordance with the requirements specified in Chapter 8, as permitted or instructed by the manufacturer.

6.1.3.4.3 Where the results of the inspection indicate the need for changes in the storage conditions applied to the PPE, the AHJ shall make any necessary modifications or recommendations to storage practices in accordance with the requirements specified in Chapter 9.

6.1.3.4.4 Where the results of the inspection indicate the retirement of hazmat/CBRN/EMO PPE is necessary, the AHJ shall retire the PPE in accordance with the requirements specified in Chapter 10.

Table 6.1.3.2.1 Applicability of Inspections to Different Types of PPE

	Type of Inspection				
Type of PPE	**On Receipt of PPE**	**Annual or Periodic Frequency**	**Prior to Donning**	**Following Use, Cleaning, and Decontamination**	**Following Repairs**
Hazmat/CBRN/EMO PPE, intended for single use	X	X	X	NA	NA
Hazmat/CBRN/EMO PPE, intended for single exposure	X	X	X	X	X
Hazmat/CBRN/EMO PPE, intended for reuse	X	X	X	X	X
Single-use EMO protective clothing or ensemble	X	X	X	NA	NA
Multiple-use EMO protective clothing or ensemble	X	X	X	X	X

X: Applicable. NA: Not applicable.

Table 6.1.3.3.1 Inspection Attributes by Type of PPE and Inspection

Inspection Attribute	On Receipt of PPE	Annual or Periodic Frequency	Prior to Donning	Following Use, Cleaning, and Decontamination	Following Repairs
Single-use garments (including hoods)					
Missing or nonfunctional components	X	X	X		
Physical defects	X	X	X		
Unexplained stains or discoloration	X	X	X		
Seam integrity	X	X	X		
Rips, tears, cuts, or punctures	X	X	X		
Repairs, including patches	X	NA	NA		
Multiple-use or reusable garments (including hoods)					
Missing or nonfunctional components	X	X	X	X	X
Physical defects	X	X	X	X	X
Rips, tears, cuts, or punctures	X	X	X	X	X
Repairs, including patches	X	NA	NA	NA	X
Seam integrity	X	X	X	X	X
Clarity of visor (if present)	X	X	X	X	X
Soiling, contamination, staining, or unexplained discoloration	X	X	X	X	X
Indications of chemical or environmental degradation (e.g., swelling, softness, or stiffness)					
Gas-tight integrity (if applicable)	X	X	X	X	X
Other form of integrity evaluation as recommended by the manufacturer	X	X	X	X	X
Single-use gloves					
Physical defects	X	X	X	X	X
Unexplained stains or discoloration	X	X	X		
Seam integrity (if applicable)	X	X	X		
Rips, tears, cuts, or punctures	X	X	X		
Multiple-use or reusable gloves					
Physical defects	X	X	X	X	X
Rips, tears, cuts, or punctures	X	X	X	X	X
Repairs, including patches	X	NA	NA	NA	X

(continues)

Table 6.1.3.3.1 *Continued*

Inspection Attribute	On Receipt of PPE	Annual or Periodic Frequency	Prior to Donning	Following Use, Cleaning, and Decontamination	Following Repairs
Seam integrity	X	X	X	X	X
Clarity of visor (if present)	X	X	X	X	X
Soiling, contamination, staining, or unexplained discoloration	X	X	X	X	X
Indications of chemical or environmental degradation (e.g., swelling, softness, or stiffness)					
Gas-tight integrity (if applicable)	X	X	X	X	X
Other form of integrity evaluation as recommended by the manufacturer	X	X	X	X	X
Single-use footwear (e.g., footwear covers)					
Missing or nonfunctional components	X	X	X		
Physical defects	X	X	X		
Unexplained stains or discoloration	X	X	X		
Seam integrity	X	X	X		
Rips, tears, cuts, or punctures	X	X	X		
Multiple-use or reusable footwear					
Missing or nonfunctional components	X	X	X	X	X
Physical defects	X	X	X	X	X
Rips, tears, cuts, or punctures	X	X	X	X	X
Repairs, including patches	X	NA	NA	NA	X
Seam integrity	X	X	X	X	X
Soiling, contamination, staining, or unexplained discoloration	X	X	X	X	X
Indications of chemical or environmental degradation (e.g., swelling, softness, or stiffness)	X	X	X	X	X
Condition of outer sole wear surface	X	X	X	X	X
Other form of integrity evaluation as recommended by the manufacturer	X	X	X	X	X

X: Applicable. NA: Not applicable.

6.1.4 The AHJ shall keep records for inspections in accordance with the requirements specified in Chapter 11.

6.2 Inspection Training and Authorization.

6.2.1 The AHJ shall identify a training program in the inspection program for those who are authorized to conduct inspections and to make decisions for hazmat/CBRN/EMO PPE.

6.2.2 Members of the organization that are approved to use hazmat/CBRN/EMO PPE shall be trained and familiar with conducting the prior-to-donning inspection.

6.2.3 The AHJ shall identify the person or persons responsible for making decisions regarding in-service or out-of-service hazmat/CBRN/EMO PPE, based on the findings of any conducted inspection.

6.2.4 Inspection categories that shall be addressed and explained in the inspection program, in addition to the manufacturer's recommendation, shall include the following:

(1) General cleanliness
(2) Physical condition
(3) Contamination residue
(4) Mechanical function and integrity
(5) Storage, stacking, and packaging.

6.3* Classification of Inspection Findings and Other Inspection Elements.

6.3.1 The AHJ shall determine the disposition of the hazmat/CBRN/EMO ensemble and ensemble elements following the identification of any specific inspection attributes, which includes, but is not limited to, the following actions:

(1) The ensemble and ensemble element are considered acceptable for use or reuse.
(2) Specific attribute(s) of the ensemble, ensemble element, or clothing item require further investigation such as contacting the manufacturer for more information or follow-on testing.
(3) The ensemble, ensemble element, or clothing item is removed from service for repair, if permitted by the manufacturer in accordance with Chapter 8.
(4) The ensemble, ensemble element, or clothing item is subject to further cleaning or decontamination.
(5) Additional ensembles, ensemble elements, or clothing items are inspected to determine if the same inspection finding is widespread.
(6) The ensemble, ensemble element, or clothing item is permanently removed from service and disposed of.

6.3.2 The inspection program shall address categories and subcategories for hazmat/CBRN/EMO PPE that include, but are not limited to, the following:

(1) General cleanliness
(2) Physical condition
(3) Residual contamination not removed by cleaning or decontamination
(4) Mechanical function and integrity
(5) Storage (stacking and packaging)

6.3.3 The inspection program for annual inspections shall include, at a minimum, the inspection elements recommended by the manufacturerthat include a determination of the integrity of the following additional inspection elements, as applicable:

(1) Packaging
(2) Outer gloves
(3) Outer fabric
(4) Outer seams
(5) Elastomeric seals
(6) Inner surface fabric
(7) Inner seams
(8) Inner gloves
(9) Zipper
(10) Label

Chapter 7 Cleaning and Decontamination

7.1 General Requirements.

7.1.1* The AHJ shall be responsible for providing cleaning, gross decontamination, sanitization or disinfection, and decontamination for reuse of hazardous materials, CBRN, or emergency medical operations protective ensembles, ensemble elements, and hazmat/CBRN/EMO PPE following their use as needed and depending on the type of protective ensembles, the type of use, the type of exposure, the nature of the contamination, and their intended reuse.

7.1.2* Specific personnel identified by the AHJ shall be trained in at least the proper cleaning and gross decontamination of hazmat/CBRN/EMO PPE.

7.1.2.1 Cleaning and gross decontamination of hazmat/CBRN/EMO PPE shall be carried out only by those individuals who have been trained according to the AHJ's standard operating procedures (SOPs).

7.1.2.2* The AHJ shall be permitted to use qualified independent service providers for the cleaning of hazmat/CBRN/EMO PPE.

7.1.3 AHJs whose emergency responders encounter body fluids, potentially infectious materials, or other biological agents as part of the hazardous materials operations or emergency medical operations shall develop SOPs for either the sanitization or disinfection of hazmat/CBRN/EMO PPE.

7.1.3.1 Disinfection or sanitization of hazmat/CBRN/EMO PPE shall be carried out only by those individuals in the AHJ who have been trained according to the AHJ's SOPs.

7.1.3.2* Organizations shall be permitted to use independent service providers for the disinfection or sanitization and any subsequent cleaning of hazmat/CBRN/EMO PPE.

7.1.4 Where hazmat/CBRN/EMO PPE is considered by the AHJ as potentially reusable, AHJs shall develop SOPs that indicate the circumstances where reuse is possible and the specific methods for decontamination of hazmat/CBRN/EMO PPE for allowing safe reuse.

7.1.4.1 Decontamination of hazmat/CBRN/EMO PPE for reuse shall be carried out only by those individuals in the AHJ who have been trained and qualified according to the AHJ's SOPs.

7.1.4.2 AHJs shall be permitted to use ISPs for the decontamination of hazmat/CBRN/EMO PPE for reuse.

7.1.4.2.1* AHJs shall confirm that procedures to be used by the ISPs for decontamination for reuse are appropriate.

7.2 AHJ Standard Operating Procedures.

7.2.1 AHJs shall establish SOPs that address gross decontamination, decontamination for reuse (where permitted), cleaning, and decontamination or sanitization of hazmat/CBRN/EMO PPE.

7.2.2 AHJ SOPs shall be consistent with the instructions provided by the manufacturer of the hazmat/CBRN/EMO PPE. In the absence of detailed manufacturer instructions, AHJs shall be permitted to use the specific procedures included in this chapter.

7.2.3 AHJ SOPs shall account for the following factors:

(1) The type of hazmat/CBRN/EMO PPE in use by the AHJ
(2) The intended applications for the hazmat/CBRN/EMO PPE provided by the AHJ
(3) Specific hazardous materials or categories of hazardous materials that are covered by the procedures, including chemical contaminants, products of combustion, body fluids, infectious materials, other biological contaminants, and radiological particulate contaminants
(4) The specific circumstances for which cleaning, gross decontamination, decontamination for reuse, and disinfection or sanitization are to be carried out
(5) The specific competencies of individuals or independent service providers that are able to perform cleaning, gross decontamination, decontamination for reuse, and disinfection or sanitization of hazmat/CBRN/EMO PPE

7.3* Approach for Making Cleaning and Decontamination Decisions. AHJs shall undertake the following approaches as shown in Figure 7.3 for cleaning and decontamination unless otherwise specified for the particular incident.

7.3.1 Where hazmat/CBRN/EMO PPE is used in hazardous materials, CBRN, or emergency medical operations and is not exposed to hazardous materials, hazmat/CBRN/EMO PPE shall be cleaned if intended to be reused as specified in Section 7.4 if intended for reuse.

7.3.2 Where hazmat/CBRN/EMO PPE are exposed to hazardous materials or CBRN agents, at a minimum, gross decontamination procedures shall be applied to allow for the safe doffing of the hazmat/CBRN/EMO PPE as specified in Section 7.5.

7.3.3 Where hazmat/CBRN/EMO PPE has been used in hazardous materials, CBRN, or emergency medical operations and was exposed to body fluids, potentially infectious materials, or other biological agents, additional disinfection or sanitization procedures shall be undertaken for the hazmat/CBRN/EMO PPE as specified in Section 7.6, if intended for reuse.

7.3.4 Where hazmat/CBRN/EMO PPE has been used in hazardous materials, CBRN, or emergency medical operations and was exposed to hazardous materials or other hazardous substances, additional decontamination procedures shall be undertaken for the hazmat/CBRN/EMO PPE as specified in Section 7.7, if intended for reuse.

7.3.5 Where hazmat/CBRN/EMO PPE has been used in hazardous materials, CBRN, or emergency medical operations involving potentially infectious materials, the AHJ shall consider conducting an evaluation of the decontamination effectiveness for the applied decontamination procedures if prior evidence has not demonstrated that the hazmat/CBRN/EMO PPE is safe to reuse as specified in Section 7.7.

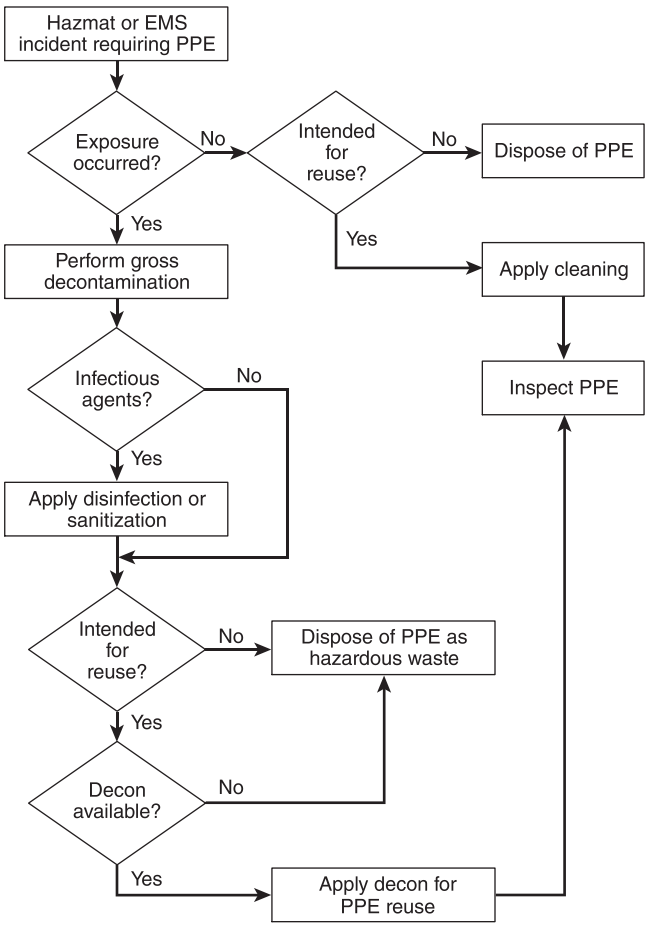

FIGURE 7.3 Decision Logic for Applying Cleaning, Decontamination, Disinfection, and Sanitization Procedures.

7.4 Cleaning Procedures.

7.4.1 General Cleaning Procedures.

7.4.1.1 Hazmat/CBRN/EMO PPE that was worn and became soiled from sweat or nonhazardous materials shall be cleaned in accordance with the manufacturer's instructions. If not damaged, the AHJ shall make an assessment whether the hazmat/CBRN/EMO PPE can be reused.

7.4.1.2 Unless otherwise specified by the manufacturer, hazmat/CBRN/EMO PPE shall be cleaned in a utility sink subject to the following restrictions and procedures:

(1)* Any components on the hazmat/CBRN/EMO PPE that can be damaged during the cleaning shall be removed if designed for removal.
(2) The utility sink shall not be used for personal applications and shall be of a suitable size for washing and rinsing the protective ensemble or ensemble element(s).
(3)* Water at a temperature no greater than 40°C (105°F) shall be used.
(4)* A mild detergent with a pH in the range of 6.0 to 10.5, as specified on the detergent safety data sheet (SDS), shall be used at the dilution recommended by the detergent supplier.

(5) Washing shall be carried out using a soft cloth, sponge, or soft bristle brush.
(6) Both the exterior and interior of the hazmat/CBRN/EMO PPE shall be washed.
(7) The hazmat/CBRN/EMO PPE shall be thoroughly rinsed following washing, and the rinsing shall be repeated if necessary.
(8) Hazmat/CBRN/EMO PPE shall not be machined dried.
(9) The hazmat/CBRN/EMO PPE shall be hung on a rack or other supporting device in a well-ventilated area for drying out of direct or indirect sunlight.
(10) The hazmat/CBRN/EMO PPE shall be inspected in accordance with the manufacturer's instructions and the procedures provided in Chapter 6 before being returned to service.

7.4.2 Machine Cleaning.

7.4.2.1 Where permitted by the manufacturer, hazmat/CBRN/EMO PPE shall be machine cleaned as an option to utility sink cleaning.

7.4.2.2 Unless otherwise specified by the manufacturer, the following procedures shall be used for machine cleaning of the hazmat/CBRN/EMO PPE:

(1)* Any components on the hazmat/CBRN/EMO PPE that can be damaged during the cleaning shall be removed if designed for removal.
(2)* A washer/extractor having a suitably sized wash basket shall be used where the extraction acceleration does not exceed 100 G.
(3)* The washer/extractor shall be loaded to no more than 80 percent of the rated capability of the washbasin as based on the dry weight of the wash load.
(4)* Wash water temperature shall not exceed 40°C (105°F).
(5) Unless a cold wash water temperature is used, the rinse water temperature shall be cooler than the wash water temperature.
(6)* A mild detergent with a pH in the range of 6.0 to 10.5 as specified on the detergent SDS shall be used at the dilution recommended by the detergent supplier.
(7)* A minimum of two rinses shall be used as part of the wash formulation with an extraction step following each rinse.
(8)* Machine drying shall be performed only if permitted by the manufacturer of the hazmat/CBRN/EMO PPE.
(9)* Where machine drying is used, a low- or no-heat setting shall be used.
(10)* If machine drying is not permitted, drying shall be accomplished by hanging the hazmat/CBRN/EMO PPE on a rack or other supporting device in a well-ventilated area out of direct or indirect sunlight.
(11) The hazmat/CBRN/EMO PPE shall be inspected in accordance with the manufacturer's instructions and procedures provided in Chapter 6 before being returned to service.

7.4.3* Limitations on General Cleaning.

7.4.3.1 Detergents and other cleaning or pretreatment chemical used in the cleaning of hazmat/CBRN/EMO PPE shall be appropriate for the respective ensemble or ensemble element.

7.4.3.1.1* Chlorine bleach, chlorinated solvents, or solvents shall not be used without the ensemble or ensemble element manufacturer's or verified ISP's approval.

7.4.3.1.2 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.

7.4.3.2 AHJ SOPs for general cleaning shall indicate the maximum number of cycles for which specific hazmat/CBRN/EMO PPE can be cleaned.

7.5* Gross Decontamination Procedures.

7.5.1 Gross decontamination shall be applied where the hazmat/CBRN/EMO PPE has been subject to exposure and contamination by hazardous materials to enable the safe exit of the wearer and to minimize transfer of contaminant to the wearer and items in the contamination control zone.

7.5.2 Gross decontamination shall be carried out in the contamination control corridor of the warm zone of the hazardous materials incident scene or other emergency scene.

7.5.2.1* Where possible, emergency responders shall carry out gross decontamination immediately after exiting the emergency scene at any incident where their hazmat/CBRN/EMO PPE could have become contaminated.

7.5.2.2* When respiratory protection is required based on a risk assessment, that respiratory protection shall remain in place throughout the gross decontamination process.

7.5.2.3 If returning to the emergency scene after an air cylinder or filter change, any dry debris shall be brushed off the hazmat/CBRN/EMO PPE, including the respirator, before changing out the cylinder or filters.

7.5.2.4 Prior to doffing, dry or wet mitigation techniques shall be conducted before the removal of any hazmat/CBRN/EMO PPE.

7.5.2.4.1 Dry Technique. The dry mitigation technique shall be performed by brushing debris or solid contaminants from the exterior of hazmat/CBRN/EMO PPE with a soft bristle brush before removal.

7.5.2.4.2 Wet Technique. The wet mitigation technique shall be performed by gently rinsing the exterior of the hazmat/CBRN/EMO PPE using low pressure and low-volume flow water. A mild detergent with a pH in the range of 6.0 to 10.5, as specified in the detergent SDS, shall be permitted to be used to aid in the wet mitigation technique followed by gentle rinsing. Heavy scrubbing or spraying with high-velocity water jets such as a power washer shall not be used.

7.5.2.4.3 If used in combination, dry mitigation shall precede wet mitigation.

7.5.2.5* Following dry or wet mitigation, hazmat/CBRN/EMO PPE shall be isolated and bagged. Where possible, hazmat/CBRN/EMO PPE, even when bagged, shall not be transported in the passenger areas of apparatus or personal vehicles.

7.5.2.6 Following gross decontamination, hazmat/CBRN/EMO PPE shall be subject to the appropriate cleaning and decontamination procedures specified in Sections 7.4 and 7.6 as needed and depending on the intended reuse of hazmat/CBRN/EMO PPE.

7.5.3 Transport.

7.5.3.1 Following gross decontamination, protective clothing and hazmat/CBRN/EMO PPE that are intended for disposal shall be bagged as specified in Chapter 10.

7.5.3.2* Where intended for reuse, the hazmat/CBRN/EMO PPE shall be placed in an appropriate plastic bag or other airtight container for transport to the appropriate facility for further decontamination or inspection, as needed.

7.5.3.3* Bagged and isolated hazmat/CBRN/EMO PPE shall not be transported in the passenger spaces of response or personal vehicles.

7.5.3.4* Bagged and isolated hazmat/CBRN/EMO PPE shall not be stored and should be removed for further decontamination and inspection as soon as practically possible following the exposure incident.

7.6 Disinfection or Sanitization Procedures.

7.6.1* Organizations and other facilities that engage in cleaning and disinfection or sanitization of hazmat/CBRN/EMO PPE contaminated with body fluids and other forms of microbial-containing liquids or aerosols shall comply with the applicable regulations in 29 CFR, Part 1910.1030, "Bloodborne Pathogens."

7.6.2* Hazmat/CBRN/EMO PPE that is contaminated with body fluids and other potentially infectious liquids shall be subject to either disinfection or sanitization. If the disinfection or sanitization process is not already part of a decontamination process, the disinfection or sanitization shall be followed by cleaning, depending on the types of cleaning and disinfection or sanitization agents and processes that are available and the type and composition of the protective clothing or ensemble element.

7.6.2.1 Disinfectants and sanitizers used shall be registered with the U.S. Environmental Protection Agency (EPA) for efficacy for the appropriate product type — hard surface versus fabrics and textiles.

7.6.2.2 Where disinfectants and sanitizers are used, they shall not degrade the performance properties of the hazmat/CBRN/EMO PPE.

7.6.2.3 Disinfectants and sanitizers shall be used in accordance with the instructions provided by the supplier.

7.6.2.4* It shall be permitted to include disinfection or sanitization as part of a cleaning or decontamination process only when its effectiveness has been demonstrated as providing disinfection or sanitization as required for the specific hazmat/CBRN/EMO PPE.

7.6.2.5* Where deemed appropriate for the purpose of sanitization of hazmat/CBRN/EMO PPE garments, a maximum washer/extraction water temperature of 60°C (140°F) shall be permitted for those ensembles or ensemble elements that can be laundered using the general machine cleaning procedures specified in 7.4.2 based on the AHJ review of the manufacturer's recommendations.

7.6.2.6* 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 hazmat/CBRN/EMO PPE.

7.7* Decontamination for Reuse Procedures.

7.7.1* Where a decision has been made for considering the reuse of hazmat/CBRN/EMO PPE, procedures shall be specific to the type of contaminant and hazmat/CBRN/EMO PPE.

7.7.2* Organizations shall rely on expertise from experienced hazardous materials teams, infection control specialists, independent service providers, or other individuals knowledgeable of the type of contaminant and how it can be removed from hazmat/CBRN/EMO PPE. This expertise shall be relied on for determining whether the type of contamination can be removed effectively and determining the procedures to be used for the removal of the specific contaminant(s).

7.7.2.1 In cases where a determination is made that the contaminant(s) cannot be removed sufficiently, the ensemble 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.

7.7.2.2* In cases where a determination is made that the contaminant(s) can be removed sufficiently, 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 with the same hazmat/CBRN/EMO PPE.
(2) Testing of the contaminated garment or suit was performed that provides detailed results showing the absence of any residual contamination or levels of contaminants that are deemed to be safe.

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

7.7.2.4* Where deemed appropriate for the purpose of decontamination of hazmat/CBRN/EMO PPE, a maximum washer/extraction water temperature of 60°C (140°F) shall be permitted for those ensembles or ensemble elements that can be laundered using the general machine cleaning procedures specified in 7.4.2 based on the AHJ review of the manufacturer's recommendations.

7.7.2.5 When specialized cleaning is applied for the cleaning of ensembles or ensemble elements involving highly hazardous contaminants, consideration shall be given to the disposition of the effluent (wastewater) from the cleaning process and whether disposal into the local sewer system is acceptable according to federal, state, and local regulations.

Chapter 8 Service and Repair

8.1 General Repair Requirements.

8.1.1 The AHJ shall institute a repair program for hazmat/CBRN/EMO ensembles and ensemble elements. If the hazmat/EMO PPE fails an inspection as identified in Chapter 6, the manufacturer shall be contacted for repair instructions of the hazmat/CBRN/EMO PPE.

8.1.1.1 The manufacturer shall provide specific instructions, including testing, about permissible repairs that do not compromise the integrity or performance of the protective clothing and are authorized by the manufacturer.

8.1.1.2 Replaceable components, as identified by the manufacturer, shall not be considered a repair and shall be permitted to be conducted by the AHJ.

8.1.2 The AHJ shall not ship hazmat/CBRN/EMO PPE to the manufacturer for repair without prior acceptance for receipt by the manufacturer.

8.1.2.1* If hazmat/CBRN/EMO PPE is to be shipped to a manufacturer or a manufacturer-approved repair facility, the following shall apply:

(1) If the hazmat/CBRN/EMO PPE is not contaminated, it shall be shipped according to the manufacturer's instructions.
(2) If the hazmat/CBRN/EMO PPE is contaminated, it shall be decontaminated prior to shipping, and documentation of decontamination and requisite SDS shall be affixed to the outside of the shipping container.

8.1.2.2 The AHJ shall provide written documentation to the manufacturer on the exposures and decontamination processes employed on the hazmat/CBRN/EMO PPE to be repaired, if applicable.

8.1.3 For all hazmat/CBRN/EMO PPE that are identified to be in need of repair, the AHJ shall institute a program that will accomplish the following:

(1) Guarantee immediate removal of the item from active service
(2) Mark or identify the item “out of service” properly and clearly
(3) Coordinate with the manufacturer to obtain returned goods authorization
(4) Prepare for packaging and shipping
(5) Document the need for repair, including descriptions why the product is being returned for repair, such as failed pressure tests
(6) Document any past exposures and decontamination processes, if applicable
(7) Determine the facility that will conduct the repair in conjunction with the manufacturer
(8) On return of the item, validate and document that repairs were applied or replacement of the item has occurred. If the manufacturer provides a replacement item, the item shall be treated as a new procurement and shall follow the procedures detailed in Section 11.2.

8.1.4 All repairs to hazmat/CBRN/EMO PPE shall be performed by the manufacturer or a repair facility approved by the manufacturer.

8.1.4.1 Where the AHJ has incorporated an in-house maintenance function as part of their program, the AHJ shall ensure that only the members trained and qualified by the manufacturer maintain the hazmat/CBRN/EMO PPE.

8.1.4.2 Where the AHJ has incorporated an in-house maintenance function as part of their program, the AHJ shall ensure that the proper tools, replacement parts, equipment, and written procedures are provided as specified by the manufacturer(s).

8.1.5 The incorporation of replacement parts shall not jeopardize the original NFPA certification of the garment.

8.1.5.1 In the event that the original part is no longer available, and replacement parts have been certified to meet the minimum requirements of the standard, the manufacturer or a repair facility designated by the manufacturer shall incorporate the new or replacement parts.

8.1.6 After completion of all repairs approved or provided by the manufacturer, the hazmat/CBRN/EMO PPE submitted for repairs shall be inspected in accordance with the requirements in Chapter 6 of this standard before being placed back into service.

8.1.6.1 In the event that the original part is no longer available, and replacement parts have been certified to meet the minimum requirements of the standard, the manufacturer or repair facility designated by the manufacturer shall provide the new or replacement parts.

8.1.7 A record of repairs shall be maintained for each inventoried hazmat/CBRN/EMO PPE in accordance with Chapter 4 of this standard.

Chapter 9 Storage

9.1 General.

9.1.1 The AHJ’s hazmat/CBRN/EMO PPE storage program shall include compliant products not limited to the following:

(1) Ensembles or garments
(2) Gloves
(3) Socks
(4) Boots or boot covers
(5) Visors or faceshields
(6) Hoods
(7) Accessories

9.1.2 When the AHJ finds deficiencies with any garment or suit, directions developed in the storage program shall be followed. The storage program shall include the following:

(1) Cleaning
(2) Decontamination
(3) Repair or replacement
(4) Storage or stocking modifications
(5) Removal from active service inventory
(6) Retirement
(7) Destruction and/or disposal

9.1.2.1 The AHJ shall ensure the cleaning or decontamination of items shall be completed in accordance with Chapter 7, before any storage procedure is initiated.

9.1.2.2 Repairs shall be completed in accordance with the requirements specified in Chapter 8.

9.1.2.3 Removal from active service inventory, retirement, and/or destruction and disposal practices shall be carried out in accordance with the requirements specified in Chapter 10.

9.1.3 The AHJ shall follow the recommended storage procedures of the manufacturer for hazmat/CBRN/EMO PPE. In the event information is not provided, the AHJ shall follow recommended procedures from the manufacturer and the AHJ's storage program.

9.1.3.1 Routine storage of hazmat/CBRN/EMO PPE shall be as follows:

(1) Not be subjected to direct sunlight or UV exposure
(2) Be provided with good ventilation to ensure that stored items are maintained clean and dry
(3) Be arranged, organized, and/or designed in such a manner to limit exposure to temperature extremes, as specified by the manufacturer
(4) Always be stored dry, and the storage method be such that it prohibits the formation of condensation
(5) Be stored only in manufacturer-recommended storage containers

9.1.4 The AHJ shall ensure that all members are aware that a storage procedure exists and only personnel trained and authorized in the AHJ's storage practices are allowed to implement, conduct, and supervise such procedures.

9.2 Packaging and Storage for Restocking or Use.

9.2.1 The storage program guidelines shall ensure that items held in storage for restocking or use are not exposed to the following:

(1) Solvents
(2) Hydrocarbons
(3) Corrosives
(4) Cleaning compounds
(5) Oxidizing agents
(6) Chemicals used in hazardous materials testing kits and equipment
(7) Hydraulic fluids
(8) Exhaust fumes
(9) Other materials specified by the manufacturer

9.2.2 The AHJ shall include in the written storage program guidelines to ensure that items inventoried for restocking or use are packaged and arranged in a manner to avoid damage from the following:

(1) Sharp objects, corners, protruding bolts, hardware
(2) Tools, tool receptacles, latching devices
(3) Abrasion
(4) Inappropriate stacking
(5) Temperature and humidity extremes, as defined by the manufacturer

9.2.2.1 When the AHJ selects storage containers that are not provided by the manufacturer, the AHJ shall consult with the manufacturer to ensure the proper container is used.

9.2.3 Compliant products shall be removed from packaging systems, containers, and storage cases, and inspected and refolded or rehung, in accordance with the manufacturer's frequency recommendations and the AHJ's guidance to ensure that folds and creases do not cause permanent damage.

9.3 Storage and Packaging for Soiled Items.

9.3.1 The storage program shall include guidelines for proper packaging of soiled or contaminated garments or suits. Proper markings, paperwork, and procedures by the cleaning service shall be followed and included in the storage program guidelines.

9.3.1.1 Soiled or contaminated items shall not be transported or stored under the following conditions:

(1) With personal belongings
(2) With noncontaminated PPE
(3) In passenger compartments of vehicles
(4) In living quarters or adjacent to air intakes for living quarters
(5) In an area with uncontrolled public access

9.3.1.2 Soiled or contaminated items that must be transported shall be containerized in such a manner as to prevent cross contamination.

Chapter 10 Retirement

10.1 General.

10.1.1 The AHJ shall develop guidelines for the disposition of hazmat/CBRN/EMO ensembles and ensemble elements to include, but not be limited to, the following:

(1) Removal from active service inventory in accordance with this standard
(2) Retirement
(3) Destruction
(4) Disposal practices
(5) Any additional required directions

10.1.2 The AHJ shall follow and institute removal from active service inventory, retirement, and destruction and/or disposal recommendations as provided by the manufacturer.

10.1.3 The AHJ shall include, but not be limited to, criteria regarding each of the following contributing factors that affect the development of guidelines for the removal from active service inventory, the retirement of, and/or the destruction and disposal of, hazmat/CBRN/EMO PPE:

(1) Defects and degradation caused by physical exposure that cannot be repaired or corrected
(2) Defects and degradation caused by chemical exposure that cannot be remedied by cleaning or decontamination
(3) Ensembles and/or ensemble elements that are manufactured only for single-use application
(4) Ensembles and/or ensemble elements that have become obsolete and are no longer available
(5) Replacement parts that would rehabilitate the ensemble and/or ensemble elements are no longer available
(6) Ensembles and/or ensemble elements have seriously deteriorated while in storage
(7) Ensembles and/or ensemble elements that are labeled or designated by the manufacturer for a specified life expectancy

10.2 Removal from Active Service Inventory.

10.2.1 The AHJ shall develop guidelines that will identify and explain the criteria to be used to determine when hazmat/CBRN/EMO PPE is to be removed from active service inventory, with review of referred section.

10.2.2 Written procedures shall be developed by the AHJ to accomplish the following:

(1) Identify and explain a system for the removal from active service inventory of hazmat/CBRN/EMO PPE to include, but not be limited to, the following:
   (a) Identification of the hazmat/CBRN/EMO PPE that shall be removed from active service inventory
   (b) Determination of the disposition of hazmat/CBRN/EMO PPE removed from active service inventory to include reassignment to training and/or demonstration use, or to destruction and disposal
   (c) Preparation, packaging, and labeling or marking hazmat/CBRN/EMO PPE removed from active service inventory
   (d) Documentation and record upkeep for the hazmat/CBRN/EMO PPE removed from active service inventory
(2) Written procedures shall also include the following:
   (a) Procedures for reassignment for training or demonstrations only
   (b) Procedures for retirement in accordance with Section 10.3
   (c) Procedures destruction in accordance with Section 10.4
   (d) Procedures for disposal in accordance with Section 10.5

10.2.3 Written procedures shall be developed by the AHJ to identify and explain who in the AHJ has the ultimate responsibility for each of the requirements listed in 10.2.2.

10.2.4 In the event that hazmat/CBRN/EMO PPE has been removed from active service inventory and has been considered for reassignment to a training-only status, the following procedures shall be instituted:

(1) The hazmat/CBRN/EMO PPE shall be marked or labeled boldly and legibly in such a manner as to identify clearly its reassignment and use, such as "OUT OF SERVICE" or "TRAINING."
(2) The hazmat/CBRN/EMO PPE shall be mutilated in an overt and obvious fashion to render the garment or item not usable for emergency use.
(3) Storage procedures for hazmat/CBRN/EMO PPE reassigned to training and demonstrations-only status shall be such that accidental restocking of the hazmat/CBRN/EMO PPE into the active service inventory shall not occur.

10.3 Retirement.

10.3.1 The AHJ shall develop guidelines, consistent with the manufacturer's recommendation, that will identify and explain the criteria to be used to determine when hazmat/CBRN/EMO PPE is to be retired.

10.3.2 Written procedures shall be developed by the AHJ to document and record the hazmat/CBRN/EMO PPE that has been retired.

10.3.3 Written procedures shall be developed by the AHJ to provide guidelines for preparing, packaging, and labeling hazmat/CBRN/EMO PPE that has been retired.

10.3.4 Written procedures shall be developed by the AHJ to identify and explain who in the AHJ has the ultimate responsibility for each of the retirement requirements.

10.4 Destruction.

10.4.1 The AHJ shall develop guidelines that will identify and explain the criteria to be used to determine when hazmat/CBRN/EMO PPE is to be destroyed.

10.4.2 Written procedures shall be developed by the AHJ to identify and explain a system for the destruction of hazmat/CBRN/EMO PPE to include, but not be limited to, the following:

(1) AHJ's inventory number
(2) Description of the garment or ensemble
(3) Explanation why item is being removed from active service
(4) Date removed from active service
(5) Date reassigned to inactive service
(6) An indication of the type of labeling or stenciling for inactive service assignment
(7) Date of reassignment for destruction
(8) An indication of the type of destruction to render nonfunctional
(9) An indication that any applicable hardware has been removed
(10) Date of disposal
(11) An indication of the disposal method

10.4.3 Written procedures shall be developed by the AHJ to identify who in the AHJ has the ultimate responsibility for each of the requirements as listed in 10.4.2.

10.4.4 For preparation, packaging, and labeling of the hazmat/CBRN/EMO PPE for destruction, ensembles and ensemble elements shall be properly packaged according to established procedure. Once packaged, the materials shall be properly and clearly marked for destruction, such as a clearly visible attached tag or card labeled "TO BE DESTROYED. DO NOT USE."

10.4.4.1 Where a bagging or packaging policy is instituted, the bag or package shall also be marked or labeled in a manner as described in 10.4.4.

10.4.4.2 Temporary storage procedures for hazmat/EMO PPE designated for destruction shall be such that accidental restocking of the hazmat/CBRN/EMO PPE into the active service inventory shall not occur.

10.4.5 For the method of destruction of the hazmat/CBRN/EMO PPE, the following procedures shall be instituted:

(1) Hazmat/CBRN/EMO PPE shall be rendered totally nonfunctional, such as cutting a garment in half or the complete removal of arms or legs, and cutting gloves in half.
(2) Other items, including hardware and accessories, shall be removed if possible, and rendered totally nonfunctional, such as destruction of exhaust valves, destruction of screw threads, removal of pass-through, etc.

10.4.6 Where destruction procedures are to be implemented, the AHJ shall ensure the process is conducted following established guidelines in a safe location.

10.5 Disposal.

10.5.1 Hazmat/CBRN/EMO PPE removed from active service inventory and retirement and designated for disposal shall be disposed of in accordance with all appropriate local, state, and federal regulations and program guidelines regarding hazardous waste to include, but not be limited to, the following:

(1) Packaging, packing, and containerization
(2) Transfer to a hazardous waste company
(3) Labeling
(4) Transportation
(5) Invoicing and hazardous waste manifests

10.5.2 Written procedures shall be developed by the AHJ to identify and explain who in the AHJ has the ultimate responsibility for each of the requirements in this chapter.

Chapter 11 Documentation and Records

11.1 General.

11.1.1 Documentation of selected ensembles and ensemble elements purchased for use in hazmat/CBRN/EMO operations shall be created and maintained by the AHJ authorized person in accordance with Section 11.2.

11.1.2 Documentation of the inspection procedures of hazmat/CBRN/EMO PPE shall be maintained in accordance with Section 11.3.

11.1.3 Documentation of decontamination of hazmat/CBRN/EMO PPE shall be maintained in accordance with Section 11.4.

11.1.4 Documentation of damage and repair of hazmat/CBRN/EMO PPE shall be maintained in accordance with Section 11.5.

11.1.5 Documentation of storage, stocking, and packaging of hazmat/CBRN/EMO PPE shall be maintained in accordance with Section 11.6.

11.1.6 Documentation of removal from active service, retirement, destruction, and disposal of hazmat/CBRN/EMO PPE shall be maintained in accordance with Section 11.7.

11.1.7 All AHJ records shall be maintained for the length of active service of the garments or suits and elements and in accordance with local, state, and federal regulations or requirements.

11.1.8 The AHJ shall ensure that the record-keeping system be managed by an individual who is trained, qualified, and authorized to ensure that information is obtained, collected, maintained, communicated, retrieved, used, and stored in accordance with the AHJ's written plan.

11.1.8.1 The supervisor of the record-keeping system shall educate and train designated personnel in the AHJ in completing, filing, and using various components of the record-keeping system. The supervisor shall be assisted by sufficient staff to fulfill all duties.

11.1.8.2 The supervisor of the record-keeping system shall conduct an annual audit of records, reports, inventories, and documents. Following the audit, the supervisor shall recommend changes or improvements to the record-keeping system, as needed.

11.1.9 The AHJ shall provide in its documentation and records policy written instructions on how each of its forms are to be completed correctly.

11.2 Documentation for Selection and Use.

11.2.1 A written policy shall be developed and provided by the AHJ to include instructions on how to collect and assemble data that correspond to the selection for purchase of hazmat/CBRN/EMO PPE and the establishment and maintenance of an inventory system.

11.2.1.1 The written policy shall identify and describe what minimum forms are necessary to successfully support the documentation of the selection for purchase process, and for the maintenance of an inventory system.

11.2.1.2 At least the following records shall be maintained for the purchase of hazmat/CBRN/EMO PPE:

(1) Written specifications for purchase, if necessary
(2) Date of submission of purchase order
(3) Manufacturer or supplier
(4) Model name, number, or design
(5) Base material and component material description
(6) Size(s)
(7) Number of each garment, item, or element
(8) Manufacturer's identification number, lot number, or serial number
(9) Month and year of manufacture
(10) Manufacturer's recommended storage life
(11) AHJ's purchase order number or contract number
(12) Date of delivery

11.2.2 The AHJ shall create, tabulate, and maintain an accurate, up-to-date, and complete inventory of all hazmat/CBRN/EMO PPE.

11.2.2.1 At least the following information shall be included in the development and maintenance of a complete inventory list:

(1) Organizations' inventory number assigned to each garment or item
(2) Date of purchase
(3) Date of assignment to active service or storage
(4) Item description
(5) Size
(6) Serial number or model number
(7) Operational unit to whom garment or item is assigned

11.2.3 A written policy shall be developed and provided by the AHJ to include instructions on how to collect and assemble data that documents the use of hazmat/CBRN/EMO PPE and shall explain the specific types of garments and/or ensembles for which such documentation is maintained.

11.2.3.1 The written policy shall identify and describe what minimum forms are necessary to support the documentation of use successfully.

11.3 Inspection Records.

11.3.1 A written policy shall be developed and provided by the AHJ to include instructions on how to collect and assemble data that correspond to the inspections of hazmat/CBRN/EMO PPE.

11.3.1.1 The written policy shall identify and describe what minimum forms are necessary to support successfully the docu-

mentation of the inspections processes, and shall at a minimum include the routine and advanced inspection types described in 4.3.2 of this standard.

11.3.1.2 At least the following records shall be maintained for routine inspections of hazmat/CBRN/EMO PPE:

(1) AHJ's ensemble or ensemble element inventory number
(2) Description of ensemble or ensemble element
(3) Date compliant product manufactured
(4) Date compliant product placed in service
(5) Date of inspection(s)
(6) Employee conducting inspection
(7) Description of compliant product inspected
(8) Documentation that notes the location of any physical damage to a compliant product that requires removal from service or repair
(9) Pass/fail recording for each routine inspection

11.3.1.3 At least the following records shall be maintained for advanced inspections of hazmat/CBRN/EMO PPE:

(1) All of the records indicated in 11.3.1.2
(2) Pass/fail recording for each of the advanced inspection elements noted in 4.3.2.
(3) Performance of the pressure test ASTM F1052, *Test Method for Pressure Testing Vapor Protective Suits,* when applicable
(4) Documentation that notes the location of any damage to a garment or item that requires removal from service or repair

11.4 Decontamination Records.

11.4.1 A written policy shall be developed and provided by the AHJ that includes instructions on how to collect and assemble data that correspond to the decontamination of hazmat/CBRN/EMO PPE.

11.4.1.1 The written policy shall identify and describe what minimum forms are necessary to support the documentation of the decontamination process successfully, and shall at a minimum include the types and kinds of decontamination described in Chapter 7.

11.4.1.2 At least the following records shall be maintained when documenting the decontamination of hazmat/CBRN/EMO PPE:

(1) Manufacturer and model name, number, or design
(2) Manufacturer's identification number, lot number, or serial number
(3) AHJ's ensemble or ensemble element inventory number
(4) Description of operational use
(5) Date of the decontamination
(6) Method or type of decontamination
(7) Decon agent used, if any
(8) Name or identification number of employee applying or supervising decontamination
(9) Location where decontamination was performed
(10) General condition before and after decontamination
(11) Method of drying
(12) Exposed material (chemical, biological, blood-borne, etc.)
(13) Other AHJ decontamination requirements

11.5 Damage and Repair Records.

11.5.1 A written policy shall be developed and provided by the AHJ to include instructions on how to collect and assemble data that correspond to the damage and repair of hazmat/CBRN/EMO PPE.

11.5.1.1 The written policy shall identify and describe what minimum forms are necessary to successfully support the documentation of the damage and repair process described in Chapter 8.

11.5.1.2 At least the following records shall be maintained when documenting the damage and repair or replacement records of hazmat/CBRN/EMO PPE:

(1) AHJ's inventory number
(2) Description of the compliant product
(3) Date damage or inspection failure was discovered (pulled from service)
(4) Who discovered the damage or inspection failure
(5) Description of damage found and how it was discovered
(6) Who is to administer the repairs
(7) Repairs or replacements performed and date(s)
(8) Results of inspection following repairs or replacements
(9) Date item was placed back into service

11.6 Storage, Stocking, and Packaging Records.

11.6.1 A written policy shall be developed and provided by the AHJ to include instructions on how to collect and assemble data that correspond to the storage, stocking, and packaging of hazmat/CBRN/EMO PPE.

11.6.1.1 The written policy shall identify and describe the following what minimum forms necessary to support the successful documentation of the storage, stocking, and packaging as described in Chapter 9:

(1) Storage location
(2) Storage conditions (e.g., climate controlled, on rig) following manufacturers recommendations
(3) Packaging practices (e.g., garment bag, vacuum packed)

11.7 Removal from Active Service, Retirement, Destruction, and Disposal Records.

11.7.1 A written policy shall be developed and provided by the AHJ to include instructions on how to collect and assemble data that correspond to the removal from active service, retirement, destruction, and disposal of hazmat/CBRN/EMO PPE.

11.7.1.1 The written policy shall identify and describe what minimum forms are necessary to support the successful documentation of the removal from active service, retirement, destruction, and disposal process, as described in Chapter 10.

11.7.1.2 At least the following records shall be maintained when documenting the removal from active service, retirement, destruction, and disposal of hazmat/CBRN/EMO PPE:

(1) Organization's inventory number
(2) Description of the ensemble or ensemble element
(3) Explanation why item is being removed from active service
(4) Date removed from active service
(5) Date of reassigned to inactive service
(6) An indication of the type of labeling or stenciling for inactive service assignment
(7) Date of reassignment for destruction
(8) An indication of the type of destruction to render nonfunctional
(9) An indication that any applicable hardware has been removed

(10) Date of disposal
(11) An indication of the disposal method

Chapter 12 Test Methods

12.1 Gas-Tight Integrity Evaluation.

12.1.1 Application. This evaluation method shall apply to encapsulated vapor-protective ensembles that are in service.

12.1.2 Evaluation Equipment.

12.1.2.1 The evaluation equipment shall conform to ASTM F1052, *Test Method for Pressure Testing of Vapor Protective Suits.*

12.1.2.2 The specific equipment used shall have the appropriate fittings or accessories present to allow the evaluation of the specific vapor-protective ensemble being tested.

12.1.2.3 The use of specific equipment available from manufacturers that has automation features shall be permitted.

12.1.3 Procedure.

12.1.3.1* Specimens shall be tested in accordance with ASTM F1052, *Test Method for Pressure Testing of Vapor Protective Suits*, using the following pressures during testing:

(1) Pretest expansion pressure of 125 mm (5 in.) water gauge
(2) Test pressure of 100 mm (4 in.) water gauge

12.1.3.2 A soapy water solution using a mild dishwashing detergent shall be used to determine any areas of potential leakage, including, but not limited to, the following:

(1) Suit closure, especially at the top
(2) Juncture between visor and suit hood
(3) Juncture between suit sleeve and attached gloves or interface devices
(4) Major seams used in the construction of the suit
(5) Any areas of high wear (e.g., socks and knees)

12.1.4 Results.

12.1.4.1 The ending pressure shall be recorded and reported for each vapor-protective ensemble evaluated.

12.1.4.2 If a soapy solution is applied, comments shall be recorded and reported for any areas where bubbling of the applied soapy solution is observed.

12.1.5 Actions.

12.1.5.1 If the ending pressure is below 80 mm (3.2 in.) water gauge, then the vapor-protective ensemble shall be removed from service and an evaluation shall be conducted to determine the cause of the failing results.

12.1.5.2 If the ending pressure is below 80 mm (3.2 in.) water gauge, then the AHJ shall determine if the vapor-protective suit can be repaired in accordance with Chapter 11.

12.2 Water Penetration Barrier Evaluation.

12.2.1 Application. This evaluation method shall apply to barrier materials and barrier seams found in hazmat/CBRN/EMO protective ensembles or garments that are in service.

12.2.2 Evaluation Areas.

12.2.2.1 A minimum of three barrier material areas and a minimum of three barrier areas with a seam shall be tested on each garment element.

12.2.2.1.1 Barrier material areas shall be from high-abrasion areas of the garment elements, including, but not limited to, the following:

(1) Broadest part of the shoulders
(2) Back waist area of the coat
(3) Knees
(4) Crotch area
(5) Seat area

12.2.2.1.2 In addition to the areas listed in 12.2.2.1.1 where potential damage to the garment outer layer or barrier layer has been detected, the evaluation shall be conducted on the corresponding area of the barrier material.

12.2.2.2 Barrier material areas shall be positioned in the evaluation apparatus such that the exterior side of the garment or barrier faces the water in the evaluation apparatus.

12.2.2.3 Barrier material areas with seams shall be positioned on the evaluation apparatus so that the seam divides the specimen into two equal halves.

12.2.3* Evaluation Apparatus.

12.2.3.1 The apparatus used to evaluate water penetration shall have the following characteristics:

(1) The apparatus shall consist of a means of clamping the area to be evaluated in a roughly horizontal position, providing a watertight seal with the pressurized portion of the apparatus and water reservoir.
(2) The apparatus shall accommodate evaluations of barrier materials and seams without the removal of the specimens.
(3) The apparatus shall have a clamping area that provides a water exposure and viewing area that is at least 75 mm (3 in.) in diameter.
(4) The apparatus shall have a water reservoir containing sufficient water for carrying out the evaluation.
(5) The apparatus shall provide for the pressurization of water against the garment element barrier material area at a pressure of 6.9 kPa (1 psi) for at least 15 seconds, and the 6.9 kPa (1 psi) pressure shall be achieved within 10 seconds.
(6) The apparatus shall be equipped with a pressure gauge that is accurate to the nearest 0.2 kPa (0.1 psi).
(7) The apparatus shall be equipped with a means of bleeding air pressure and permit the drainage of water from the pressurized portion of the apparatus.

12.2.3.2 A stopwatch or other timer shall be used to ensure that pressure is applied for the specified duration of 15 seconds.

12.2.4 Procedure. The evaluation shall be conducted using the following procedure:

(1) Place the selected area of barrier material in the apparatus and clamp to provide a watertight seal with the apparatus.
(2) Introduce a water pressure of 6.9 kPa (1 psi) against the barrier material for a period of not less than 15 seconds.

(3) Visually inspect the visible side of the barrier material after 15 seconds to determine if water penetration has occurred.

12.2.5 Results.

12.2.5.1 If any water passes through the barrier material or barrier material seam, the barrier shall be removed from service and repaired or replaced.

12.2.5.2 If no water passes through the barrier material or barrier material seam, the barrier shall be allowed to dry completely before being returned to service.

12.3 Footwear Water Resistance Evaluation.

12.3.1 Application. This evaluation method shall apply to footwear.

12.3.2 Procedure. The evaluation shall be conducted using the following procedure:

(1) Paper toweling shall be placed inside the footwear specimen such that the paper toweling intimately contacts all areas inside the footwear specimen to a minimum height of 200 mm (8 in.).
(2) The footwear specimen shall be placed upright in a container that allows the entire footwear specimen to be immersed in tap water.
(3) The container shall be filled with tap water to a height of 200 mm, +0/−25 mm (8 in., +0/−1 in.).
(4) After 3 minutes, the paper toweling shall be removed and examined for evidence of liquid leakage.

12.3.3 Results.

12.3.3.1 If any water passes through the footwear, the footwear shall be removed from service and repaired or replaced.

12.3.3.2 If no water passes through the footwear, the footwear shall be allowed to dry completely before being returned to service.

12.4 Smoke Penetration Evaluation.

12.4.1 Application.

12.4.1.1 This evaluation method shall apply to garments and hoods that are in service and are intended to provide protection from particulates.

12.4.1.2* This evaluation method shall be conducted either qualitatively or quantitatively.

12.4.2 Evaluation Areas.

12.4.2.1 Relevant portions of the element shall be chosen for evaluation, which include both material and seams.

12.4.2.2 As a minimum, three areas of base material and three different seams shall be evaluated.

12.4.2.3 Other areas of garment subject to 12.4.2.1 shall also be permitted to be evaluated.

12.4.3 Evaluation Apparatus.

12.4.3.1 The overall evaluation apparatus shall consist of a sample clamping device, a smoke generator, and a flowmeter for the qualitative approach. The evaluation apparatus for the quantitative approach shall also include a light transmission meter in addition to the same equipment used for the qualitative approach.

12.4.3.2* A sample clamping device shall be used that has the following characteristics:

(1) The device shall provide a transparent cylindrical reservoir of a diameter of 100 mm ± 25 mm (4.0 in. ± 1.0 in.), a height of 140 mm ± 50 mm (5.5 in. ± 2.0 in.), and a wall thickness of at least 6 mm (0.25 in.), and shall have a minimum volume of 800 mL (50 $in.^3$).
(2) A cylinder cap shall be placed on top of the reservoir that provides a minimum viewing area of 60 mm (2.4 in.) in diameter and shall provide a clamping surface that includes a rubber gasket between the cylinder cap and the reservoir.
(3) The device shall have a means of clamping the portion of the ensemble garment element on top of the open cylindrical reservoir with a clamp such that all areas of the ensemble garment element can be evaluated and that creates an effective seal between the clamping mechanism and the clamping surface of the transparent cylindrical reservoir.
(4) The device's transparent cylindrical reservoir shall have a fitting that permits a leak-free connection to a smoke generator with a hose that is connected to the smoke generator.
(5) A leak-free connection shall also be provided to the transparent cylindrical reservoir for the measurement of pressure inside the reservoir using a pressure gauge in kPa (psi).

12.4.3.3* A smoke generator shall be used that has the following characteristics and capabilities:

(1) The smoke generator shall have the capability of providing smoke through an orifice that establishes a direct, leak-free connection between the smoke generator and the sample clamping device.
(2) The smoke generator shall have the capability of adjusting the flow of smoke and producing smoke at a rate of at least 1.0 L/min to 2.5 L/min (1.06 qt/min to 2.65 qt/min).
(3) The smoke generator shall generate visible smoke based on a cosmetic grade mineral oil or an aqueousbased smoke-generating agent that provides smoke particles ranging from 1 µm to 10 µm.
(4) When connected to the sample clamping device, the smoke generator shall not create a pressure greater than 1.0 kPa (0.15 psi) when operating for a period of 1 minute.

12.4.3.4 A flowmeter, which is a rotometer or other flow measurement device capable of measuring air flow rate in L/min to the nearest 0.1 L/min, shall be placed in the connection line from the smoke generator to the device's transparent cylindrical reservoir.

12.4.3.5* A light transmission meter shall be used for quantitative evaluation approaches, that consists of a light source and light receiver with the following characteristics:

(1) The light source shall be a light emitting diode (LED) source that generates a continuous tight beam of light.
(2) The light receiver shall be a photoresistor capable of reporting light transmission from 0 to 100 percent on a digital display with an optional RS232 port for recording measurements.
(3) The light transmission device shall be capable of being mounted on the sample clamping device, such that the light beam is generated and received parallel to the test

garment surface at a height of 34 mm ± 3 mm (1.3 in. ± 0.1 in.) and with a distance between the light source and light receiver of 90 mm ± 10 mm (3.5 in. ± 0.3 in.).

12.4.4 Procedure.

12.4.4.1 The evaluation procedure shall be conducted indoors in a well-lit area that is free from air currents and provides good visibility.

12.4.4.2 The qualitative evaluation approach shall be conducted using the following procedure:

(1) The smoke generator shall be operated in accordance with the manufacturer's instructions by adding the appropriate smoke-generating liquid and any other supplies for its operation.
(2) Prior to testing, the smoke generator shall be turned on and the device shall be allowed to generate smoke for 5 minutes.
(3) After 5 minutes, the smoke generator shall be switched to air to clean out the remaining smoke-generating liquid in the hose and to prepare for testing.
(4) With the air on at the smoke generator and the hose not connected to the cylindrical reservoir, the hose shall be connected to the flowmeter and the flow rate shall be adjusted to 1.7 L/min ± 0.1 L/min (0.45 gal/min ± .03 gal/min).
(5) Following the adjustment of the flow rate, the air to the smoke generator shall be turned off and hose shall be securely attached to the transparent cylindrical reservoir.
(6) The portion of the garment element to be tested shall be positioned over the top of the transparent cylindrical reservoir and shall be securely clamped into position.
(7) The viewing area within the cylindrical clamping fixture shall be observed for up to 120 seconds for the presence of smoke coming through the clamped area of the garment element.
(8) After 120 seconds, the smoke generator shall be turned off and the cylindrical chamber shall be flushed with air.
(9) The garment element shall be removed from the sample clamping device, inspected, and subjected to an advanced cleaning, if deemed necessary.
(10) The interior of the cylindrical reservoir shall be wiped to remove any chemical residue, and the hose shall be detached and turned upside down to clear out any residual smoke or smoke-generating liquid.
(11) Each area of the garment element selected in 12.4.2 shall be evaluated.
(12) At the conclusion of testing, the level of smoke-generating liquid shall be checked to ensure that it has not decreased more than 50 percent. If less than 50 percent of the liquid remains, additional smoke-generating liquid shall be added to bring the liquid reservoir up to its full capacity.

12.4.4.3 The quantitative evaluation approach shall be conducted using the same procedures in 12.4.4.2 with the following additional procedures:

(1)* The light transmission meter shall be calibrated before each set of measurements using a standard reference material that provides a range of light transmission from 40 percent to 90 percent.
(2) Light transmission readings shall be taken every 10 seconds starting at 60 seconds, through 120 seconds in accordance with 12.4.4.2(7).

12.4.5 Results.

12.4.5.1 For the qualitative evaluation approach, observations of smoke coming out of each evaluated area of the garment element shall be reported.

12.4.5.2 For the quantitative evaluation approach, the measured light transmission values recorded from 60 to 120 seconds shall be reported and the average transmission value for each garment shall be calculated.

12.4.6 Interpretation.

12.4.6.1 For the qualitative evaluation approach, any observed smoke coming through the tested portion of the garment element shall be considered as a possible indication of a defect or other damage that compromises the garment's performance.

12.4.6.2* For the quantitative evaluation approach, the values for the garment element shall be compared with known values of performance for an unused garment element. Any decrease in a light transmission value of 5 percent or more shall be considered as possible evidence of a defect or other damage that compromises the garment's performance.

Annex A Explanatory Material

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

A.1.1.1.1 Garments certified against NFPA 1992 and NFPA 1994 Class 5 are not required to be tested as an ensemble.

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

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

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

A.3.3.4 Carcinogen/Carcinogenic. Lists of carcinogens are available from the following sources. Each AHJ uses a different way to classify specific substances or activities as carcinogenic.

(1) U.S. National Toxicology Program (NTP): *Report on Carcinogens,* Fourteenth Edition. https://ntp.niehs.nih.gov/pubhealth/roc/index-1.html#toc1
(2) International Agency for Research on Cancer (IARC): *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans.* http://monographs.iarc.fr
(3) National Institute for Occupational Safety and Health (NIOSH): Occupational Cancer Carcinogen List .https://www.cdc.gov/niosh/topics/cancer/npotocca.html
(4) American Conference of Governmental Industrial Hygienists (ACGIH): *Documentation of the Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs).* https://www.acgih.org/publications/publication-categories/signature-publications

A.3.3.9.1 General Cleaning. General cleaning is intended for those circumstances where emergency responders wear hazmat/CBRN/EMO PPE either during training where no contact with contaminants occurs, or in hazardous materials, CBRN, or emergency medical operations where there is no exposure to hazardous substances that requires either advanced cleaning or decontamination.

If specific hazmat/CBRN/EMO PPE is designated by the manufacturer for single use and the single use is defined by the manufacturer as a single wearing, then general cleaning is not applied.

A.3.3.10 Compliant Product. For the purpose of NFPA 1891, this standard applies to hazmat/CBRN/EMO PPE, including protective ensembles and ensemble elements certified to NFPA 1999 or NFPA 1990, which consolidates NFPA 1991, NFPA 1992, and NFPA 1994.

A.3.3.14 Decontamination. Three types of decontamination (commonly known as "decon") are performed by emergency responders: emergency, mass, and technical. Decontamination performed sometimes on victims in a hospital setting is referred to as definitive decontamination, but is not covered in this standard.

Gross decontamination is a phase of decontamination where significant reduction of the amount surface contamination takes place as quickly as possible. This is usually accomplished by mechanical removal of the contaminant or initial rinsing from handheld hose lines, emergency showers, or other nearby sources of water.

Gross decontamination is performed on the following:

(1) Team members before their technical decontamination
(2) Emergency responders before leaving the incident scene
(3) Victims during emergency decontamination
(4) Persons requiring mass decontamination
(5) Personal protective equipment (PPE) used by emergency responders before leaving the scene

A.3.3.15 Disinfectant. Disinfectants as antimicrobial agents are considered pesticides and thus subject to regulations established by the U.S. Environmental Protection Agency (EPA). All disinfectants must be registered with the EPA and meet specific labeling requirements. A listing of currently registered disinfectants is posted at www.epa.gov/oppad001/chemregindex.htm.

Disinfectants are required to be used as specified on the product label as determined by the EPA registration process. Disinfectants can be used on either hard surfaces such as helmet shells, eye and face protection devices, or as a presoak treatment for fabrics and textiles. Appropriately labeled and registered disinfectants might also be used for disinfecting laundry. The specific requirements for demonstrating acceptable performance are in the following EPA Office of Chemical Safety and Pollution Prevention (OCSPP) product performance test guidelines:

(1) OCSPP 810.2200, *Disinfectants for Use on Hard Surfaces — Efficacy Data Recommendations*
(2) OCSPP 810.2400, *Disinfectants and Sanitizers for Use on Fabrics and Textiles — Efficacy Data Recommendations*

Each of these documents provides different classifications of disinfectants for their intended use. Classifications include limited (primarily for household use), general or broad spectrum (used in commercial areas), and hospital or health care. Specific procedures and target microorganisms are used to demonstrate the effectiveness of the respective disinfectant. In general, a disinfectant must kill all target microorganisms.

A.3.3.16 Emergency Medical Operations (EMO). Emergency medical operations include the provision of emergency patient care by emergency medical responders and medical first receivers. For emergency medical responders, this care might be provided at the scene of an accident or in the transport of patients to a medical facility. For medical first receivers, care is generally provided at a medical facility, although medical first receivers might also provide emergency patient care at various temporary emergency medical facilities. Body recovery is included as emergency medical operations, because some patients could die in the course of treatment, and some events, including large-scale disasters, could require body removal in which significant blood-borne or airborne pathogen hazards exist.

A.3.3.17 Emergency Responders. Emergency responders include medical services providers, law enforcement officers, firefighters, volunteer firefighters or officers of a nonprofit volunteer fire company, emergency medical technicians, emergency nurses, ambulance operators, providers of civil defense services, or any other personnel who render mitigation, isolation, emergency care, or other forms of assistance at the scene of a hazardous materials emergency or CBRN terrorism incident, including post-event clean-up and recovery activities.

A.3.3.19.1.1 Vapor-Protective Ensemble. The vapor-protective ensemble elements are the suit, gloves, and footwear.

A.3.3.19.1.2 Vapor-Protective Ensemble with Optional Chemical Flash Fire Escape Protection. Ensembles meeting these requirements are intended to offer the wearer limited protection for escape only, in situations that can result in chemical flash fires. This requirement does not imply any protection for any firefighting activities but offers minimum protection from the thermal effects of a chemical flash fire.

A.3.3.19.1.4 Vapor-Protective Ensemble with Optional Liquefied Gas Protection. Ensembles meeting these requirements are intended to offer the wearer limited protection for exposure to liquefied gases for a maximum exposure time of 15 minutes.

A.3.3.19.1.5 Vapor-Protective Footwear. Vapor-protective footwear includes boots or outer boots worn in conjunction with socks.

A.3.3.19.2.1 Liquid Splash–Protective Ensemble. Liquid splash–protective ensemble elements include, but are not limited to, the garments, gloves, and footwear.

A.3.3.19.2.2 Liquid Splash–Protective Footwear. Liquid splash–protective footwear includes boots, or outer boots in conjunction with socks.

A.3.3.19.2.3 Liquid Splash–Protective Garment. Liquid splash–protective garments include coveralls, multi-piece splash suits, encapsulating ensembles, and nonencapsulating ensembles.

A.3.3.19.2.5 Liquid Splash–Protective Hood. Hoods used for liquid splash protection during hazardous materials emergencies can have several different configurations that include, but are not limited to, the following:

(1) The hood can be a separate item of protective clothing that covers the head and neck of the wearer and includes a face opening for a respirator to provide complete head and neck protection.
(2) The hood can be a separate item of protective clothing that includes a visor, with a respirator worn under the hood.
(3) The hood can be a loose-fitting facepiece powered air-purifying respirator (PAPR) that includes a hood or other materials that enclose the wearer's head and neck while also providing respiratory protection. In this configuration, the PAPR is certified by the National Institute for Occupational Safety and Health (NIOSH) for respiratory protection; however, the hood is addressed in this standard as a separate item of clothing or as an element of an ensemble and is subject to separate labeling, design, and performance requirements.

A.3.3.19.4.1 Multiple-Use Emergency Medical Protective Ensemble. Multiple-use medical protective ensembles are intended for high-risk applications where no exposed skin is permitted and the majority of the elements can be reused, if properly cleaned and decontaminated. High-risk applications include situations where there is an increased likelihood of contacting individuals or contaminated items where exposure to contaminated fluids can occur. The risk of exposure increases based on the amount and reliability of information available if an individual is infected with a liquid-borne pathogen, the expected proximity of the wearer to the affected individual, the duration the wearer might be in proximity to an infected individual, and the likelihood of any exposure with contaminated liquids or waste as part of the operations.

Multiple-use protective ensembles further offer a higher degree of ruggedness and resistance to physical hazards. These ensembles consist of a multiple-use emergency medical garment that can be a coverall with or without a hood, or multiple garments that can include a hood. Hand protection is provided by the combination of a single-use examination glove worn underneath either a single-use emergency medical cleaning/utility glove or a multiple-use emergency medical work glove.

Foot protection is provided by multiple-use emergency medical or multiple-use medical care facility footwear. Footwear certified to NFPA 1951, NFPA 1971, NFPA 1991, NFPA 1992, or NFPA 1994 can be substituted, since these items have demonstrated material, seam, and overall product biopenetration resistance, integrity, and physical hazard resistance that is equivalent or greater than multiple-use emergency medical footwear specified in NFPA 1999. Garments that include sock extensions as part of their construction can be used with any footwear that meets ASTM F2413, *Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear.*

Single-use emergency medical footwear covers can be provided but are not required for the certification of these ensembles.

These covers are suggested for minimizing contamination to more durable, reusable footwear. Eye or face protection is provided by either (1) a NIOSH-approved full facepiece air-purifying respirator (APR) with P100 filters, or (2) a NIOSH-approved appropriate tight- or loose-fitting powered air-purifying respirator (PAPR) with a protection level of HE.

Alternative respiratory protective equipment can include CBRN APR, CBRN PAPR, or SCBA that is certified to NFPA 1981.

A.3.3.19.4.2 Single-Use Emergency Medical Protective Ensemble. Single-use medical protective ensembles are intended for applications where no exposed skin is permitted and the majority of the elements, including the garment, gloves, footwear covers, and certain eye and face protection devices are disposable after use. These ensembles include a single-use medical protective garment that might be a coverall with or without a hood, or separate garments that can include a hood. These ensembles include two pairs of any NFPA 1999–certified single-use emergency medical examination gloves.

The use of double gloving is a precaution intended to offer additional protection and minimize the risk of cross contamination during doffing.

These ensembles are also either configured with multiple-use emergency medical or multiple-use medical care facility footwear or single-use emergency medical footwear covers worn over standard footwear.

Footwear certified to NFPA 1951, NFPA 1971, NFPA 1991, NFPA 1992, or NFPA 1994 can be substituted since these items have demonstrated material, seam, and overall product biopenetration resistance, integrity, and physical hazard resistance that is equivalent or greater than multiple-use emergency medical footwear specified in NFPA 1999.

If single-use footwear covers are used as part of the ensemble, it is recommended that additional physical foot protection be achieved by the use of footwear that complies with ASTM F2413, *Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear.* Garments that include bootie foot extensions as part of their construction can be used with any footwear that meets ASTM F2413. Eye and face protection is provided by a combination of emergency medical eye and face protection devices that can include goggles and faceshields that comply with ANSI Z87.1, *American National Standard for Occupational and Educational Personal Eye and Face Protection*

Devices requirements, and respirators approved by NIOSH as N95 filtering facepieces that further demonstrate fluid resistance. Single-use medical protective ensembles can also be configured with the types of respirators established for multiple-use protective ensembles.

A.3.3.23 Gross Decontamination. Victims of a hazardous material release that is potentially life threatening due to continued exposure from contamination are put through a gross decontamination initially, which will significantly reduce the amount of additional exposure. This is usually accomplished by mechanical removal of the contaminant or initial rinsing from handheld hose lines, emergency showers, or other sources of water. Responders operating in a contaminated zone in PPE are put through gross decontamination, which makes it safer for them to remove the PPE without exposure and for members assisting them.

A.3.3.25 Hazardous Materials Emergencies. Hazardous materials emergencies are a special subset of activities that occur during hazardous materials incidents. These emergencies are characterized as activities where significant hazards exist to personnel or the environment. Emergency activities occur in the hot zone as opposed to the warm and cold zones, where support functions take place.

A.3.3.33 Multiple Use. For PPE used in hazardous materials emergencies and CBRN terrorism incidents, certain items including ensembles and ensemble elements can be considered for multiple use by the AHJ. In NFPA 1999, garments, footwear, face protection devices, cleaning/utility gloves, and work gloves can be certified as multiple-use items. The continued use of these items is subject to applying the care and use instructions provided by the manufacturer. While some multiple-use items are evaluated for performance after repeated laundering, these conditioning treatments do not indicate a specific wear life for the item. The AHJ is responsible for determining when any particular item should be retired based on its condition and expected performance in protecting the first responder or first receiver. Multiple use does not always mean multiple exposures; that must be determined by the AHJ in their review of manufacturer recommendations.

A.3.3.34 Nonencapsulating Ensemble. Criteria are provided in NFPA 1992–certified and NFPA 1994–certified ensembles that permit the certification of either an encapsulating protective ensemble, which fully encloses the individual wearer and their respirator, or a nonencapsulating ensemble, where the respirator (primarily the full facepiece) completes the enclosure of the individual wearer in conjunction with garments, gloves, and footwear. Certification of nonencapsulating ensembles requires that the manufacturer specify each type of respirator. Each combination of a nonencapsulating ensemble and a respirator is evaluated for the relevant design and performance criteria of a relevant standard.

In addition, respirators are not evaluated to the chemical permeation or penetration resistance requirements that are applied to primary materials of nonencapsulating ensembles. Organizations specifying and using nonencapsulating ensembles should take into consideration the absence of these performance criteria where performing a hazard and risk assessment for determining the appropriate use of hazmat/CBRN protective ensembles.

A.3.3.36 Products of Combustion. Normal products of combustion during fires include smoke (carbon particulates) and fire gases such as carbon dioxide, water, carbon monoxide, hydrogen chloride, nitric oxide, and a number of other chemicals at different concentrations. The type and quantities of combustion products produced during a fire extensively vary with the type of fuels and fire conditions. Most fires are highly complex and entail a myriad of different materials that serve as fuels and create a large number of chemicals that are carcinogenic, toxic, corrosive, or create allergic reactions. Many products of combustion include chemical substances that are persistent due to their low relative volatility or their adsorption onto soot or carbon particles created during combustion.

A.3.3.38 Respirator. Respirators for hazardous materials and CBRN terrorism incidents can include, but are not be limited to, self-contained breathing apparatus (SCBA), supplied air respirators (SAR), air-purifying respirators (APR), and powered air-purifying respirators (PAPR).

Respirators for emergency medical operations include respirators approved by NIOSH as N95 filtering facepieces that further demonstrate fluid resistance as part of single-use emergency medical protective ensembles, and either of the following:

(1) A NIOSH-approved full facepiece air-purifying respirator (APR) with P100 filters
(2) A NIOSH-approved appropriate tight- or loose-fitting powered air-purifying respirator (PAPR) with a protection level of HE as part a of multiple-use emergency medical protective ensemble

The minimum type of respirator for an individual ensemble is specified by the respective standard to which the ensemble is certified.

A.3.3.40 Ruggedized. Specific criteria exist in NFPA 1994 that define Class 2, Class 3, and Class 4 ensembles as ruggedized.

A.3.3.41 Sanitizer. Like disinfectants *(see A.3.3.15)*, sanitizers are considered pesticides and thus are subject to regulations established by the U.S. Environmental Protection Agency (EPA). All sanitizers must be registered with the EPA and meet specific labeling requirements. A listing of currently registered sanitizers is posted at www.epa.gov/oppad001/chemregindex.htm. Sanitizers are required to be used as specified on the product label as determined by the EPA registration process.

Sanitizers can be used on either hard surfaces such as helmet shells, eye and face protection devices, or as presoak treatments or laundry additives for fabrics and textiles. Specific requirements for demonstrating acceptable performance are in the following EPA Office of Chemical Safety and Pollution Prevention (OCSPP) product performance test guidelines:

(1) OCSPP 810.2300, *Sanitizers for Use on Hard Surfaces — Efficacy Data Recommendations*
(2) OCSPP 810.2400, *Disinfectants and Sanitizers for Use on Fabrics and Textiles — Efficacy Data Recommendations*

Each of these documents provides different classifications of disinfectants for their intended use. Classifications include sanitizers for food contact and nonfood contact products. Specific procedures and different target microorganisms are used to demonstrate the effectiveness of the respective sanitizer. In general, a sanitizer must reduce the number of microorganisms by 99.9 percent (a $\log_{10}$ 3 reduction).

A.3.3.45 Single Use. In this standard, the designation of an ensemble or ensemble element as "single use only" is provided by the product manufacturer. A single use could include unpackaging, one donning, or one wearing while responding. In the absence of any manufacturer's specific information, one "use" should be considered any wearing of the item. Inspection of any item should be conducted in accordance with the manufacturer's instructions and NFPA 1891, and should include assessing the overall condition and suitability of an item for a specified use.

A.3.3.46 Soiling. Soiling excludes contaminants that could adversely affect the wearer such as products of combustion and other hazardous materials including toxic, corrosive, or sensitizing chemicals, potentially infectious body fluids, other infectious microorganisms, and CBRN agents.

A.3.3.49 Universal Precautions. Under circumstances in which differentiation between body fluids is difficult or impossible, all body fluids should be considered potentially infectious materials.

A.5.1.4 A detailed decision logic is provided in Figure B.1, which shows the selection of hazmat/CBRN/EMO PPE that can be related to each of the standards, individual classes, and types of protection provided in those standards.

A.5.1.7 The following criteria should be used for designing a systematic wear trial evaluation procedure:

(1) Test participants representing the AHJ should be selected based on a cross section of personnel, willingness to participate, objectivity, and level of operational activity.
(2) Participants should wear test each product model being considered from each manufacturer for a particular hazmat/CBRN/EMO protective ensemble, ensemble element, or clothing. Participants should be fitted for each product model being evaluated from each manufacturer. Evaluations should be conducted using the same participants to evaluate all hazmat/CBRN/EMO protective ensembles, ensemble elements, or clothing categories. It is not necessary to have the same wearer evaluate all 1991 ensembles, all 1992 ensembles/clothing, and all 1994 ensembles, but it is important for the same wearer to evaluate all ensembles, ensemble elements, or clothing certified to the same level of protection.
(3) A product evaluation form should be developed for each hazmat/CBRN/EMO protective ensemble, ensemble element, or clothing candidate. The form should include a rating system for the characteristics considered important to the AHJ that will facilitate a quantitative evaluation. Evaluation forms that provide only narrative responses should be avoided.
(4) The AHJ should confirm that wear trial participants are aware of all PPE that they are to assess so that all candidate PPE is rated.
(5) The AHJ should solicit periodic reports from participants in the field tests.
(6) The AHJ should conclude the evaluation process and analyze the results.

A.5.2.9 Additional information for applying specific selection factors is indicated as follows:

(1) *Exposure type.* Differentiate between pathogens that are spread by air (including coughing or sneezing) versus those spread by liquid contact (i.e., blood or body fluids).
(2) *Relative risk of contact with pathogen.* Many pathogens pose respiratory hazards only, with no risk of disease or effects through skin contact. However, if work clothing or skin becomes contaminated by airborne pathogens and can be rereleased to wearer's respiratory system when unprotected, risk of dermal exposure is high. Likewise, some pathogens can provide cutaneous or dermal routes of exposure, especially to cuts or abrasions on the wearer's skin.
(3) *Exposure volume (based on relative volume of liquid-borne pathogens).* Some AHJs have suggested that 500 mL (16.9 oz) can be the difference between a high- and low-volume exposure. However, a decision between a high- and low-volume exposure should be made relative to the pathogen of concern. Exposure volume can occur in a single exposure or over multiple exposures in a single wearing of a BCPC item.
(4) *Exposure pressure.* These pressures can occur in a work task that might be accompanied by kneeling or leaning in contaminated liquid or with the release of fluid, such as a spurting artery. Tasks involving these exposures are considered high pressure. Low pressure involves minor contact with little or no force against contaminated fluids.

A.6.1.2 It is recognized that certain items of PPE, such as examination gloves and other items that might be considered to be disposable or of a one-time use will be inspected only in a new and unused condition upon receipt by the AHJ and by the individual wearer prior to its use.

A.6.1.3 The primary intent of the AHJ's inspection and testing program is to ensure the focus of inspections and testing is to promote the highest level of readiness of the protective garments and provide the highest level of protection for hazmat/CBRN/EMO PPE wherever it is used.

A.6.1.3.1(1) The source of PPE manufacturer-recommended inspection and testing procedures is the user information that the PPE manufacturer is required to provide with each item of PPE.

A.6.1.3.2.4 The minimum frequency for periodic inspections is annually. However, the AHJ should determine a frequency for periodic inspections primarily based on the advice of the manufacturer, but should also consider changing that frequency depending on the type of PPE, its service life, the expected level of use that also accounts for any use specifically for training, and the overall number of PPE items that require inspection. While it is expected that inspections be conducted as a minimum on an annual basis, the AHJ is permitted to conduct more frequent or less frequent inspections depending on how often the hazmat/CBRN/EMO PPE is to be used or how it is stored or staged. For example, an AHJ can choose to conduct more frequent inspections if the use of ensembles and ensemble elements occurs routinely. In contrast, an AHJ that purchases and then stores or stockpiles hazmat/CBRN/EMO PPE could choose to conduct less frequent inspections if the ensembles and ensemble elements are stored under ideal conditions.

A.6.1.3.2.4(3) Both ANSI/ASQ Z.1.4 and ISO 2859-1 provide statistically based approaches for sampling products based on inspection of products' attributes. These standards provide a means for determining the number of products that should be inspected given a large population of ensembles and ensemble elements, depending on desired inspection levels and confidence that the sample represents the larger population of

products. This approach is also often used to determine whether or not an AHJ's internal controls are being followed correctly.

A.6.3 Table A.6.3 provides a summary of recommended findings for classifying potential defects when receiving equipment from a contractor, as well as an example of an inspection program that can also be used to institute, support, or improve maintenance and care programs. Explanations of the classifications are as follows:

(1) A *critical defect* might critically reduce the functionality or protection provided by the equipment. The AHJ is strongly encouraged to categorize the item as out of service and to contact the distributer or manufacturer for guidance on repair or replacement.
(2) A *major defect* is one that might reduce the functionality or protection of the equipment. The AHJ is recommended to do the following:
    (a) Annotate and take action to remediate the defect before use
    (b) Contact the distributer for guidance
    (c) Exercise additional discretion before putting the equipment into service
(3) A *minor defect* can be considered a cosmetic defect with little to no impact on functionality or protection. The AHJ is recommended to examine and note the cosmetic deficiency and put the equipment into service in accordance with standard operating procedures (SOPs).

Table A.6.3 also provides examples of inspection categories and subcategories that demonstrate a comprehensive inspection and evaluation program.

A.7.1.1 For some types of hazmat/CBRN/EMO PPE, particularly products designated by the manufacturer as single use only, gross decontamination can be the only form of cleaning or decontamination that is applied.

A.7.1.2 Training for sanitization or disinfection and decontamination for reuse are considered specialized forms of cleaning and decontamination that can be outsourced.

A.7.1.2.2 Qualified service providers for cleaning and sanitization are service providers that are verified in accordance with NFPA 1851 as either a verified independent service provider (ISP) or verified cleaner. ISPs that receive this verification are listed by certification organizations, which independently verify that ISPs clean and sanitize garments effectively in accordance with NFPA 1851.

When considering ISPs for these services, the following questions should be asked:

(1) Does the ISP have experience in evaluating similar types of products?
(2) Can the ISP provide references for its cleaning effectiveness on related products?
(3) What certification organization is the ISP listed with for its verification?
(4) What specific cleaning process does the ISP use for conducting cleaning?
(5) Is the ISP aware of any known limitations for its cleaning process, particularly as related to common contaminants (e.g., grease, oils)?
(6) What procedures does the ISP expect to be followed for the AHJ to send or provide clothing for cleaning?
(7) What is the normal turnaround time for cleaning?

A.7.1.3.2 See A.7.1.2.2; however, the questions should be applied to the ISP's specific experience and capabilities for sanitization or disinfection of hazmat/CBRN/EMO PPE. Additional specific questions include the following:

(1) Does the ISP have demonstrated efficacy for disinfection or sanitization for specific biological contamination that might be pertinent to the exposed hazmat/CBRN/EMO PPE?
(2) Are there specific forms of biological contamination that the ISP is unable to disinfect or sanitize hazmat/CBRN/EMO PPE?
(3) What special instructions apply for the submission of hazmat/CBRN/EMO PPE with biological contamination?

A.7.1.4.2.1 See A.7.1.2.2; however, the questions should be applied to the ISP's specific experience and capabilities for decontamination of hazmat/CBRN/EMO PPE. Additional specific questions include the following:

(1) Does the ISP have demonstrated efficacy for decontamination for exposed hazmat/CBRN/EMO PPE with respect to the contamination involved in the specific exposure?
(2) Are there specific forms of contamination that the ISP is unable to address for decontamination of hazmat/CBRN/EMO PPE?
(3) What special instructions apply for the submission of hazmat/CBRN/EMO PPE with chemical or other hazardous contamination?

Table A.6.3 Classification of Defects

	Defect	Critical	Major	Minor	Notes
Carton	**Packaging Integrity**				
	Damaged			X	Considered cosmetic only if carton contents are not damaged.
	Missing			X	Minor as long as suit is not damaged.
	Soiled			X	Considered cosmetic only if carton contents are not soiled.
Storage Bag	**Storage Bag Integrity**				
	Storage bag damaged			X	Considered minor/cosmetic if damage does not extend to contents. Bags might be opened during inspection processes, which will be noted on bag and box.
	Storage bag missing			X	Considered minor if all components (manual, gloves) are included and no damage to the ensemble. If any components are missing or damaged, upgrade to major.
Technical Manual	**Technical Manual**				
	Technical manual missing			X	
	Incorrect manual			X	
Outer Gloves	**Outer Glove Integrity**				
	Outer gloves missing	X			
	Incorrect glove sizes			X	
	Incorrect glove type	X			
	Damaged gloves (holes, rips, punctures, etc.)	X			Suit must be worn with glove(s) for proper protection.

(continues)

Table A.6.3 *Continued*

	Defect	Critical	Major	Minor	Notes
End Item	**Overall Integrity**				
	Shelf life expired	X			All ensembles and ensemble elements have a specific shelf life that must be managed.
	Defect that could cause injury to wearer	X			Any defect or damage such as holes, burns, tears, exposed stitching of seams, etc., that prevents suit from providing proper protection and would result in exposure to the wearer.
	Patches anywhere on the suit		X	X	Users are encouraged to determine before delivery a maximum acceptable quantity or area of patches that are placed by manufacturer on the item. Users are encouraged to note location and quantity, and if the total exceeds user-defined threshold, then upgrade to a major defect and consult with manufacturer.
	Staining/discoloration anywhere on suit		X	X	Blemishes might not affect performance. This might include areas adjacent to seam tape, visors, gloves, or other seams. Users are encouraged to determine an acceptable quantity or area of stained or discolored areas on the item at delivery. Users are encouraged to note location and quantity, and if the total exceeds user-defined threshold, then upgrade to a major defect and consult with manufacturer.
	Equipment Data				
	Illegible marking on suit label		X		
	Illegible marking on carton, storage bag, or base glove			X	
	Missing marking on suit label		X		
	Missing marking on carton, storage bag, or base glove			X	
	Incorrect data on suit label		X		
	Incorrect information on unit applied labels			X	
	Incorrect or inconsistent data on carton, storage bag, or base glove			X	
	Improperly located labels or any strike through			X	

(continues)

Table A.6.3 *Continued*

	Defect	Critical	Major	Minor	Notes
Outer Fabric (including Outer Boot Flap, Glove Flap, Hood, and Attached Socks and Gloves)	**Surface Integrity**				
	Any hole, tear, burn, or mis-stitch that fully penetrates suit (excluding boot/glove flap) and is not repaired with tape patch	X			
	Any hole, tear, burn, or mis-stitch that fully penetrates material on boot or glove flap and is not repaired with tape patch		X		
	Any hole, tear, burn, mis-stitch repaired with tape patch inside suit. Tape must be centered and extend equally on all sides of defect		X	X	All tape repairs should be centered and extend equally past the defect on either side. If tape is not sufficient, then suggest upgrade to major defect.
	Any other weakening defect such as abrasion, thin spot, nonpenetrating mis-stitch, or worn spot that does not penetrate suit, not repaired with tape		X		
	Any other weakening defect such as abrasion, thin spot, nonpenetrating mis-stitch, worn spot, or repair with tape			X	All tape repairs should be centered and extend equally past the defect on either side. If tape is not sufficient, then suggest upgrade to major defect.
	Any missing component (sock, boot flap, glove flap, hood, exhaust valves, pass-through, etc.)	X			Refer to user manual for all required components.
	Visor (if present) punctured, cracked, or otherwise damaged to an extent that a clear field of vision is not provided	X			
	Staining/Marking				
	Surface staining or discoloration (excluding seam tape adhesive) on the outer level that doesn't penetrate to inner fabric. Includes oil, grease, ink, or other surface staining (might have seam tape patch located on inside of suit)			X	Users might want to consider a maximum acceptable quantity or percentage of surface area stained/discolored before considering a major defect.
	Any size surface stain (excluding seam tape adhesive) on outer surface that penetrates to inner fabric without seam tape patch		X		Any stain that penetrates a protective layer might have compromised the protection of the garment.
	Fasteners				
	Nonfunctioning hook and loop tape		X		
	Missing hook and loop tape on critical flaps		X		Critical flaps, such as the zipper flap, cover protective hardware of the ensemble.
	Missing hook and loop tape on noncritical flaps			X	Noncritical hook and loop tape go over pockets or accessories that do not provide protection.
	Flattened or crushed teeth			X	
	Wrong type, color, width, or misplaced/not positioned as specified			X	
	Stitching is too loose or too tight, causing puckering or twisting			X	

(continues)

Table A.6.3 *Continued*

	Defect	Critical	Major	Minor	Notes
	If snaps or other fasteners present are damaged or otherwise not in good working order		X		
	Glove				
	Any hole, tear, burn, or mis-stitch that penetrates glove material	X			
	Any other weakening defect such as abrasion, thin spot, nonpenetrating needle chew, or worn spot on glove material	X			
	Any gaps in seams around fingers	X			Check all seams, especially in the finger crotch area, for gaps that penetrate the glove. Do not completely invert attached glove, laterally pull fingers away from each other, or pull with excessive force as that might damage the glove.
Outer Seams (Primary Garment Structural Seams)	**Seam Accuracy**				
	Any joining seams that have missing or misplaced stitching or incomplete ultrasonic welds that result in an open seam	X			One or more broken stitches, two or more continuous skipped or runoff stitches, or a visibly incomplete/damaged weld on joining seam constitutes an open seam.
	Stitches skipped or broken (or incomplete ultrasonic welds) not resulting in an open seam		X		
	Seam irregular, twisted, puckered, or pleated		X		
	Material caught in stitching/welds		X		
	Missing stitching/welds on noncritical seam			X	Critical seams are defects that allow direct exposure of the wearer to threats.
	Missing stitching/welds on critical seam		X		
Outer Boot and Glove Splash Flap	**Seam Integrity**				
	Loose or lifting seam tape under the boot flap			X	When examining flap, do not invert the flap completely. Lift and examine underneath. If sticking is noticed use hand or visual inspection to avoid damaging tape.
	Loose, skipped, or twisted threads			X	
	Material caught in sewing or seam tape			X	
	Wrinkled seam tape where wrinkling extends to one edge of seam tape			X	

(continues)

Table A.6.3 *Continued*

	Defect	Critical	Major	Minor	Notes
	Seal Integrity				
Elastomeric Mask Seal	Any abrasions, cut, tears, punctures, brittleness, unexplained discoloration, or dry rot present on rubber seal that prevents seal from functioning correctly	X			
	Seal missing or incorrect	X			
	Loss of elasticity		X		
	Material caught in sewing		X		
	Broken stitches or poor stitch tension		X		
	Mask seal air pocket deflated or missing	X			
	Any weakening defect such as a closed blister, burn or pinch, thin spots, or pits		X		
	Visible soiling and staining of any material layer by oil, grease, ink, powder, or other contaminating substance more than ½ in. in size (largest dimension in any direction)		X		
	Thread ends unsecured			X	
	Seam twisted, component not adhered or attached securely, foreign matter, or any malformation or distortion		X		
	Any repair or patch		X		
	Delamination in material		X		

(continues)

Table A.6.3 *Continued*

	Defect	Critical	Major	Minor	Notes
Inner Surface Fabric (including attached sock and label)	**Surface Integrity**				
	Any hole, tear, burn, or mis-stitch that penetrates suit	X			
	Any other weakening defect such as abrasion, thin spot, nonpenetrating needle chew, or worn spot that does not penetrate suit		X		
	Any minor defect in inner liner fabric such as minor pull that does not penetrate barrier layer			X	
	Unidentified patch			X	Patch on inside of fabric without any detectable defect. Users are encouraged to determine before delivery a maximum acceptable quantity or area of patches that are placed by manufacturer. Users are encouraged to note location and quantity, and if the total exceeds user-defined threshold, then upgrade to a major defect and consult with manufacturer.
	Staining/Marking				
	Surface staining or discoloration (excluding seam tape adhesive) on the outer level that doesn't penetrate to inner fabric. Includes oil, grease, ink, or other surface staining (might have seam tape patch on inside of suit)			X	Users might want to consider a maximum acceptable quantity or percentage of surface area as stained/discolored before considering a major defect.
	Any size surface stain (excluding seam tape adhesive) on inner surface that is visible on both sides of suit		X		Any stain that penetrates a protective layer might have compromised the protection of the garment.
	Adhesive transfer			X	During the manufacturing process, if the garments were folded when the adhesive was not completely dry, there might be visible adhesive transfer that appears as white, colorless, yellow, frosted, etc., and does not affect performance.
	Label				
	Safety/certification labels not present		X		
	Safety/certification labels illegible		X		

(continues)

Table A.6.3 *Continued*

	Defect	Critical	Major	Minor	Notes
Inner Seams	**Seam Accuracy**				
	Any joining seams stitching missing, misplaced, or a visibly incomplete/damaged weld(s) resulting in an open seam	X			One or more broken stitches, or two or more continuous, skipped, or runoff stitches on joining seam constitute an open seam. Scored as a critical defect when seriously affecting performance or serviceability.
	Stitches skipped or broken or a visibly incomplete/damaged weld not resulting in an open seam		X		
	Seam irregular, twisted, puckered, or pleated		X		
	Material caught in sewing or seam tape		X		
	Loose, missing, or lifting seam tape that exposes the seam		X		
	Loose or missing stitching		X		
	Wrinkled seam tape where wrinkling extends to one edge of tape			X	
	Loose or lifting seam tape that does not expose the seam			X	
Zipper	**Zipper Integrity**				
	Zipper missing	X			
	Damaged teeth or fastener	X			
	Fails to function properly	X			
	Improperly positioned		X		
	Cuts or tears in the zipper tape material	X			
	Cosmetic issue such as staining or discoloration			X	
	Zipper difficult to operate		X		

A.7.3 The decision tree in Figure 7.3 shows the following several required decisions and steps associated with the process for determining the appropriate cleaning and decontamination approach:

(1) *Exposure Occurred Decision.* The first decision is to determine if an exposure has occurred. This requires the judgement of the on-scene coordinator or other individual in charge of the response operations designated by the AHJ to assess whether emergency responders have come in contact with hazardous substances or otherwise been exposed in a way that they believe results in contamination of the hazmat/CBRN/EMO being worn. There are circumstances where individual emergency responders might respond to an emergency or incident, or be part of emergency operations, but not actually be exposed to hazardous substances that result in contamination. There are also certain contaminants that, due to their physical properties, might not result in contamination of hazmat/CBRN/EMO PPE.

(a) If exposure is deemed not to have occurred, a second decision must be made if the ensemble is intended for reuse.

(b) If the responsible individual determines that exposure has occurred, gross decontamination should be performed *(see Section 7.5)*.

(2) *Intended for Reuse Decision.* Certain hazmat/CBRN/EMO PPE can be either designated by the manufacturer for single use or certified as a single-use ensemble or ensemble element (as applied to NFPA 1999). For these forms of hazmat/CBRN/EMO PPE, the clothing is disposed of as specified in Chapter 10. For other hazmat/CBRN/EMO PPE, judgement must be applied by the responsible individual or AHJ as to whether the item can be reused based on their review of the manufacturer's recommendations.

This decision is applied in two areas of the decision tree that include the circumstances of the hazmat/CBRN/EMO PPE being either exposed or not exposed to hazardous substances, as follows:

(a) Where hazmat/CBRN/EMO PPE is judged as not having been exposed, the decision to reuse the PPE will include several factors related to the ruggedness of the PPE, its expected service life, and any specific damage to the PPE. If hazmat/CBRN/EMO PPE has not been exposed to hazardous substances and is intended for reuse, it should be cleaned as specified in Section 7.4.

(b) If the hazmat/CBRN/EMO PPE has been exposed, the same factors are considered but the type and extent of contamination must also be considered. Hazmat/CBRN/EMO PPE that does not warrant reuse is disposed of as specified in Chapter 10. Hazmat/CBRN/EMO PPE that does warrant reuse involves the further evaluation of whether appropriate decontamination methods are available.

(3) *Infectious Agents Decision.* The third required decision shown in the decision tree is a determination if infectious agents have been encountered. While this circumstance might apply mainly to emergency medical operations, other emergencies or incidents can also involve exposure to various forms of aerosol, liquid, or solid-based biological contamination. The judgement for whether exposure to infectious agents has occurred is the responsibility of the on-scene coordinator or other individual in charge of the incident designated by the AHJ.

(a) If exposure to infectious agents has occurred, then hazmat/CBRN/EMO PPE must be subject to disinfection or sanitization as appropriate and described in Section 7.6. It is important to note that certain infectious agent exposures might always warrant isolation and disposal, given the hazards associated with the specific infectious agent. It is further possible that some form of field disinfection might be needed to mitigate the potential exposure hazards for individuals handling contaminated PPE.

(b) If exposure to infectious agents has not occurred, then the decision for whether the hazmat/CBRN/EMO PPE is intended for reuse as described above should be made.

(4) *Decon Available Decision.* The fourth decision involves determining if the contaminated hazmat/CBRN/EMO can be effectively decontaminated. This determination also must be made by the on-scene coordinator or other individual in charge of the incident as designated by the AHJ. The decision to apply decontamination is highly dependent on information related to the type and level of exposure and available information that indicates if the contamination can be removed from the hazmat/CBRN/EMO PPE. There are certain types of exposure for which the AHJ might indicate that disposal is always warranted.

(a) If the decision is made to decontaminate the hazmat/CBRN/EMO PPE for reuse, the appropriate decontamination procedures are applied as specified in Section 7.7.

(b) If the hazmat/CBRN/EMO PPE cannot be decontaminated, the PPE is disposed of as specified in Chapter 10.

A.7.4.1.2(1) An example of a removable component that could be damaged by cleaning is an exhaust valve or other hardware installed in the garment.

A.7.4.1.2(3) While higher wash temperatures provide greater effectiveness in removing many types of soils, the use of higher temperatures must be weighed against their potential effects on the performance properties and continued service life of the ensemble and ensemble elements.

A.7.4.1.2(4) The pH for the product can be indicated on the detergent product container and should be the pH for the product in an undiluted form if it is a liquid. If the detergent is a powder, the pH will be reported at a specific concentration of the solid on a weight basis in water. If the pH is not listed on the product container, then the SDS should be requested from the product supplier. Most suppliers will normally provide the SDS for their respective products as part of the shipment, and it might also be possible to obtain a copy of the SDS online from the supplier's website.

The pH for the product is typically listed in Section 9 of the SDS for the product's physical and chemical properties.

The selection of the detergent should include considering several factors in addition to the pH range. Foremost is the supplier's demonstration that the detergent is safe to use with the respective hazmat/CBRN/EMO PPE. This demonstration consists of the following two parts:

(1) The effectiveness of the detergent in removing soils and other contaminants as indicated later in this section

(2) The impact of the detergent on the protective element through multiple washings as described in A.7.4.3. This information might be available from the supplier of the detergent, the manufacturer of the protective element, or the fabric suppliers. If there is uncertainty about a particular detergent or cleaning agent, the manufacturer of the protective element should be contacted.

A.7.4.2.2(1) See A.7.4.1.2(1).

A.7.4.2.2(2) Machine cleaning using a front-loading washer/extractor is the most effective method for cleaning certain types of textile-based hazmat/CBRN/EMO PPE. It is the most effective means of loosening and removing dirt, soot, and other debris. Front-loading washer/extractors are the appropriate machine type for many types of ensembles and ensemble elements.

Front-loading washer/extractors have a door on the front of the machine through which garments are loaded. They clean by lifting garments out of the water and gently dropping them back into the water. These units provide better mechanical action because of the size and type of rotation, as well as the degree of extraction. They have various capacities and are designed to handle heavy loads of bulky items and also to save water and energy.

It is very important for machine operators to ensure correct water temperatures and proper detergent selection and to adjust the g-forces of the spinning/extraction cycle. Careful adherence to manufacturers' recommendations of cleaning processes has a significant impact on cleaning thoroughness and maintenance of protection factors inherent in each element, as well as extending the life expectancy of elements. When possible, organizations should provide a washer/extrac-

tor(s) for the sole purpose of cleaning ensembles and ensemble elements.

A.7.4.2.2(3) The capacity of a washer/extractor is important for several reasons, including the following:

(1) Washer/extractors that are overloaded do not clean effectively because there is not enough movement of the ensemble elements to provide for mechanical action.
(2) Washer/extractors that are underloaded do not clean effectively because the wash articles do not make sufficient contact with mechanical action.
(3) Large washer/extractors require more water and energy and also output a lot of water during the extraction discharge steps of the washing process.

A washer/extractor with a minimum load capacity of 13.6 kg (30 lb) and a minimum volumetric capacity of 0.11 m^3 (4.0 ft^3) is recommended. However, the capacity selection for the wash can be increased or decreased depending on the expected throughput of ensemble elements and the frequency of cleaning.

Proper load size is essential for effective cleaning. An overloaded washer prevents the wetted load from dropping during the washing process from an 11 o'clock to a 5 o'clock drop in a clockwise wash rotation. Overloading occurs when this drop of the wash load does not happen. In addition, full loads are best for washing as the agitation and cleaning are most efficient with full loads. Therefore, it is also important to avoid underloading the washer/extractor.

The capacity of a washer/extractor is provided both in the weight of the load, usually reported in pounds, and the overall volume, usually reported in cubic feet, of the basket. As a rule of thumb, 28.3 L (1 ft^3) of a washer/extractor basket allows a capacity of two garments. For example, a 13.6 kg (30 lb) washer/extractor has a basket volume of 116 L (4.1 ft^3). Thus, a washer/extractor with this capacity would fit four pieces. Similarly, a 27.2 kg (60 lb) washer/extractor with a 254.7 L (9.0 ft^3) basket would fit nine pieces. Where there is a fractional amount of cubic feet in the washer/extractor capability, it is recommended to round up to get a whole number of garment pieces.

A.7.4.2.2(4) See A.7.4.1.2(3).

A.7.4.2.2(6) *[See also A.7.4.1.2(4).]* Organizations should be cautious about detergent or chemical suppliers that offer several different chemicals for cleaning ensembles or ensemble elements. Many chemical suppliers will provide the organization with an automated dispenser that can feed liquid chemicals into the washer/extractor at no cost, on the requirement that chemicals are purchased from that supplier. Certain types of chemicals, such as alkali builders and sours, should be avoided. Alkali builders are used to significantly increase the pH of the wash water for enhancing the cleaning performance of certain detergents. These chemicals typically have pH values that are greater than 10.5. When alkali builders are used, the pH is usually brought to a lower level using a "sour," an acid-based agent used to bring the wash water back to a neutral pH.

Sour cleaning agents are added toward the end of the wash formulation and almost always have pH values much lower than 6.0. The combination of alkali builders and sours is most often used in institutional laundering facilities, but is not appropriate for protective elements unless the manufacturer of the respective protective element has indicated that these types of products can be used safely.

In general, mild domestic laundry detergents can be used if applied with the instructions provided for the laundry in terms of the amount of detergent added for the wash water volume used in the suds (detergent addition step) for the specific washing machine or washer/extractor.

A.7.4.2.2(7) A wash formulation is a set of instructions or a program for how the washer/extractor injects specific wash chemicals, controls the water temperature and water level, and sets the specific times for each step. In the absence of a manufacturer-specified wash formulation, a suggested wash formulation for general cleaning is provided in Table A.7.4.2.2(7).

An appropriate detergent should be dispensed once the drum is filled with water during the suds/detergent step.

Consideration should be given to the levels of soiling and contaminants (light, medium, or heavy) in ensemble and ensemble elements for selecting the amount of detergent. Organizations should avoid using too much detergent. It is imperative that organizations check with the detergent supplier to ensure that the correct amounts of detergent are used according to the specific instructions for laundering hazmat/CBRN/EMO ensemble elements. If automatic detergent dispensers are used, it is important to perform regular maintenance to ensure proper function and dispensing of the recommended amounts.

A.7.4.2.2(8) Machine drying of ensembles and ensemble elements is generally not recommended. Dryers can reach high basket temperatures during operation, potentially damaging ensembles or ensemble elements. Machine drying also includes mechanical action that can cause damage. Nevertheless, a tumble dryer with a moisture-sensing feature can dry a saturated load with higher than 40°C (105°F) heat; when it reaches a percent dryness level, the heat can then be reduced or stopped.

Table A.7.4.2.2(7) Suggested Wash Formulation for Cleaning of Reusable Hazmat/CBRN/EMO PPE Garments (Note: Wash formulations assume a full load for the washer size.)

Operation	Time (min)	Temperature	Water Level
Prewash fill, flush	—	≤40°C (≤105°F)	High
Agitate	3	—	—
Drain	—	—	—
Fill	—	≤40°C (≤105°F)	Low-Med
Wash, add detergent	—	—	—
Agitate	9–12	—	—
Drain	—	—	—
Rinse, fill/agitate	5	Cold	High
Drain	—	—	—
Rinse, fill/agitate	5	Cold	High
Drain	—	—	—
Rinse, fill/agitate	5	Cold	High
Extract at 100 G	5	—	—

Excessive temperatures can cause damage to ensembles and ensemble elements, excessive garment shrinkage, and potentially premature failure and retirement of protective equipment. Temperatures can rise as the garments in the basket dry out.

A.7.4.2.2(9) "No heat" is the preferred method of machine drying because it effectively accomplishes forced air ventilation.

A.7.4.2.2(10) Air drying is the most appropriate method for drying ensembles and ensemble elements. It causes no mechanical damage and little or no shrinkage. The most efficient method of air drying involves forced air ventilation. This method can be achieved by simply using fans to recirculate air in the room with the ensembles and ensemble elements. The basic drying room should include floor drains, a method to exchange the air to the outside environment, and drying racks for hanging ensembles and ensemble elements to provide maximum air exposure.

Overall drying time will depend on the efficiency of the drying room and the ambient conditions. Heating the room or the inlet air up to 38°C (100°F) can further improve the efficiency of the drying process. Drying ensembles and ensemble elements in ambient air, as opposed to drying rooms, takes a considerable length of time, depending on the ambient environmental conditions.

The use of racks to provide maximum air exposure of the ensembles and ensemble elements will decrease the overall drying time.

Exposure to direct and indirect sunlight will cause degradation of fibers in ensembles and ensemble elements, resulting in loss of fabric strength. Similar effects have been observed for extended exposures to fluorescent or ultraviolet (UV) light. A suitable alternative to air drying involves the use of a drying cabinet. Drying cabinets, available from different machine manufacturers, are contained cabinets where ensembles and ensemble elements can be suspended with the introduction of heated air over a specified period of time. This type of drying approach enables greater control of the air temperatures and, if properly used, can result in improved efficiency of ensemble and ensemble element drying and lower utility costs.

A.7.4.3 Specific detergents or cleaning agents and cleaning processes can have different effects on the performance properties of protective ensembles or ensemble elements, especially when repeated multiple times over the life cycle of the ensemble or ensemble element. The effects of the cleaning agent or cleaning process should be judged on the basis of tests performed on representative material samples following several cleaning cycles (washing and drying). The samples should be subjected to at least maximum number of cleaning cycles recommended by the manufacturer; however, the AHJ might want to demonstrate effects after a larger number of cleaning cycles. Ideally, ensembles and ensemble elements should be evaluated for each of the performance properties listed established in the respective NFPA product standard; however, key properties can be selected. One approach for evaluating these properties is to construct large panels of the composites, with finished edges and including seams and other components of interest used in representative ensemble element, and subject these samples to the cleaning process multiple times. It is recommended the AHJ check with the manufacturer for the availability of this information.

A.7.4.3.1.1 It should be noted that chlorine bleach is often used as a decontaminating agent following exposure, especially for contact with infectious agents. This information pertains to general cleaning and not to sanitization, disinfection, or decontamination for reuse.

A.7.5 Gross decontamination refers to the application of decontamination for permitting the wearer to safely remove their PPE. In this form of decontamination, the objectives of the process are primarily to limit contaminant transfer from the PPE to the wearer, other personnel, or outside the site.

Gross decontamination is generally accomplished using detergents (surfactants) in water combined with a physical scrubbing action. This form of decontamination removes most forms of surface contamination including dusts, many inorganic chemicals, and some organic chemicals. Soapy water scrubbing of protective suits might not be effective in removing oily or tacky organic substances (e.g., PCBs in transformer oil). This approach is also unlikely to remove any contamination that has permeated or penetrated the PPE materials.

Use of organic solvents such as petroleum distillates could allow easier removal of heavy organic contamination; however, there are several problems associated with using organic solvents for decontamination that include the following:

(1) Some solvents could cause degradation of PPE materials.
(2) Permeation of the solvent into clothing components can pull the contaminant with it.
(3) Localized contaminant could spread into other areas of the clothing.
(4) Large volumes of contaminated solvents are generated that require special disposal. Alternative approaches for gross decontamination might involve dry decontamination where sorbents are brushed over clothing to pick up contaminant, or wetted wipes are used that also absorb or adsorb contaminants.

Organizations involved in decontamination generally establish procedures in anticipation of decontamination needs. This includes the development of a decontamination plan that is specified by OSHA 29 CFR 1910.120, which requires that a decontamination plan be developed and set up before any personnel or equipment are allowed to enter areas where the potential for exposure to hazardous substances exists. Decontamination plan goals include determining or establishing the following:

(1) The number and layout of decontamination stations
(2) The decontamination equipment needed
(3) Appropriate decontamination methods
(4) Procedures to prevent contamination of clean areas
(5) Methods and procedures to minimize wearer contact with contaminants during removal of personal protective clothing
(6) Approaches for disposing of clothing and equipment that are not completely decontaminated

Decontamination plans should be revised whenever the type of personal protective clothing or equipment changes, the use conditions change, or the on-scene hazards are reassessed based on new information.

The decontamination process consists of a series of procedures performed in a specific sequence. For chemical protective ensembles, outer, more heavily contaminated items (e.g., outer boots and gloves) are decontaminated and removed first,

followed by decontamination and removal of inner, less contaminated items (e.g., suits). Each procedure is performed at a separate station in order to prevent cross contamination. Together and in the right sequence, these separate stations form the decontamination line that also has the following characteristics:

(1) Stations are separated physically to prevent cross contamination, arranged in order of decreasing contamination, preferably in a straight line.
(2) Entry and exit points to exposed areas are conspicuously marked.
(3) Dressing stations for entry to the decontamination area are separate from redressing areas for exit from the decontamination area.
(4) All equipment used for decontamination must be decontaminated and/or disposed of properly.
(5) Buckets, brushes, clothing, tools, and other contaminated equipment are collected, placed in containers, and labeled.
(6) Spent solutions and wash water are collected and disposed of properly.
(7) PPE items that are not completely decontaminated should be placed in plastic bags, pending further decontamination and/or disposal.
(8) In some cases, decontamination personnel sometimes wear the same types of ensembles as workers in the exposure or contaminated areas. In other cases, decontamination personnel can be sufficiently protected by wearing one level lower protection.

The decontamination line is a practice applied to hazardous material operations and CBRN events with several variants, depending on the specific types of response or operation and expected contaminants. Different practices, which are usually less rigorous, are employed in other applications. Biological agent decontamination might employ different procedures, but generally the aim is disinfection or sanitization of surfaces where a more limited line is used. Disinfection can be carried out by application of bleach solution or other agents specific for the microorganisms involved. Some equipment might involve special sprayers or fogging with aerosol of hydrogen peroxide or other disinfectants. The protective clothing worn by decontamination operators is generally more for isolation than for barrier properties.

A.7.5.2.1 Gross decontamination after an incident can remove substantial amounts of surface contaminants before they have a chance to set in, and it can help limit the transfer of contaminants to apparatus, personal vehicles, and stations. Many contaminants that cause damage to hazmat/CBRN/EMO PPE materials and components can be removed if gross decontamination is performed as soon as possible after an exposure to those contaminants. It is recognized that it is not always practical for AHJs to carry out gross decontamination because of constraints in personnel, on-scene resources, the availability of spare gear, weather, and other operational factors. Nevertheless, it is important for AHJs to implement some form of gross decontamination as soon as possible, particularly following an event where hazmat/CBRN/EMO PPE is contaminated.

Use of a portable decontamination shower unit that conforms to the requirements in ANSI/ISEA 113, *American National Standard for Fixed and Portable Decontamination Shower Units*, provides one means for providing wet mitigation.

A.7.5.2.2 The purposes of maintaining respiratory protection are to minimize the user's exposure to contaminants that might off-gas from the hazmat/CBRN/EMO PPE following contaminant exposure during a hazardous materials incident or emergency medical care and to avoid breathing in particulates that might be dislodged from the ensemble or ensemble elements during dry mitigation.

A.7.5.2.5 The removal of hazmat/CBRN/EMO PPE at the scene might require additional clothing to be present, particularly under inclement or cold weather conditions. Portable facilities might be required for users to change clothing. Portable decontamination showers conforming to ANSI/ISEA 113, *American National Standard for Fixed and Portable Decontamination Shower Units,* can be set up at the scene in a relatively short time and require limited resources to provide protection from weather and modesty to emergency responders. In addition, it is recommended that personnel use disposable wet wipes to clean face and skin when known to be directly exposed to contaminants, change into a clean station/work uniform, and take a shower as soon as possible.

For isolation of hazmat/CBRN/EMO PPE, airtight protective containers or bags should be used to minimize cross contamination. Examples include disposable polyethylene bags or sealable plastic cases, which are cleanable. If a plastic bag is used, it is recommended that the bag be transparent to ensure that the contents of the bag can be readily identified. Ensembles or ensemble elements should not be transported from the incident scene in passenger areas of apparatus or personal vehicles. This helps to reduce further exposure of personnel to contaminated ensembles and helps to reduce cross contamination of apparatus or personal vehicles.

If hazmat/CBRN/EMO PPE are wet, the hazmat/CBRN/EMO PPE should be removed as soon as possible following transport from the emergency scene because ensembles and ensemble elements that remain wet under closed conditions can result in the growth of mold and mildew that causes damage. It is important that following their transport, protective ensembles and elements should be stored under conditions where they can dry until appropriate cleaning and decontamination procedures can be conducted as specified in Chapter 7.

A.7.5.3.2 For isolation of ensembles and ensemble elements, airtight protective containers or bags should be used to minimize cross contamination. Examples include disposable, heavy-duty polyethylene bags or sealable plastic cases, which are cleanable. If a plastic bag is used, it is recommended that the bag be clear to ensure that the contents of the bag can be readily identified. Relatively thick plastic bags, at least 6 mils in thickness, are recommended to resist punctures.

A.7.5.3.3 Ensembles or ensemble elements should not be transported from the incident scene in the passenger areas of apparatus or personal vehicles. This reduces further exposure of personnel to contaminated ensembles and ensemble elements and also reduces cross contamination of apparatus or personal vehicles.

A.7.5.3.4 If the protective ensemble or ensemble elements are wet, the protective ensemble or ensemble elements must be removed as soon as possible following transport from the emergency scene, since ensembles and ensemble elements that remain wet under closed conditions can result in the growth of damaging mold and mildew. It is also important that, following

their transport, protective ensembles and ensemble elements be stored under conditions where they can dry until appropriate decontamination procedures can be conducted as specified in Section 7.7.

A.7.6.1 Applicable regulations in 29 CFR, Part 1910.1030, "Bloodborne Pathogens," include observing universal precautions, instituting engineering and workplace controls, using appropriate PPE, and ensuring that the decontamination area is in a clean and sanitary condition. Universal precautions are applied to prevent contact with blood or other potentially infectious materials where all body fluids are considered potentially infectious. Engineering and workplace controls include providing hand-washing facilities and prohibiting food and beverages in the areas where handling and decontamination are carried out. In addition, controls include bagging and appropriately identifying clothing contaminated by body fluid, using either a biohazard symbol or red bag to indicate potential infectious materials. PPE used includes gloves, aprons, full torso covers, arm covers, and eye/face protection. At a minimum, personnel involved in cleaning contaminated ensembles and ensemble elements should wear cleaning gloves, an apron and protective sleeves or a coverall, and a pair of goggles or faceshield that conform to NFPA 1999. In addition, cleaning of contaminated ensembles and ensemble elements should take place in a designated area with sinks and counters made of materials, such as stainless steel, that can be decontaminated following an element-cleaning procedure.

NFPA 1581 and NFPA 1855 should be consulted for additional guidance.

A.7.6.2 The contamination of hazmat/CBRN/EMO PPE with body fluids or other potentially infectious materials, such as contaminated floodwater, requires specific procedures to be applied for eliminating the health threats associated with microbial contamination. At a minimum, hazmat/CBRN/EMO PPE should be subject to sanitization where the levels of microbial contamination are reduced to acceptable levels, or disinfection where all viable microbial contamination is eliminated. In general, sanitization is most often applied to fabrics and textiles associated with garments, gloves, footwear, and hoods; whereas disinfection is applied to hard surfaces such as respirators, with the exception of any textile-based straps or other components.

In many cases, disinfection or sanitization is applied initially to the hazmat/CBRN/EMO PPE for inactivating the microbial contamination and is then followed up by cleaning. Any sanitizer or disinfectant that is used on the ensemble or ensemble elements should be registered with the EPA, which has approval processes for types of sanitizers and disinfectants. The EPA has established guidelines for demonstrating the efficacy of both disinfectants and sanitizers on both textiles or fabrics and hard surfaces. These procedures are established in the following publications:

(1) OCSPP 810.2200, *Disinfectants for Use on Hard Surfaces — Efficacy Data Recommendations*
(2) OCSPP 810.2300, *Sanitizers for Use on Hard Surfaces — Efficacy Data Recommendations*
(3) OCSPP 810.2400, *Disinfectants and Sanitizers for Use on Fabrics and Textiles — Efficacy Data Recommendations*

A listing of currently registered disinfectants and sanitizers is posted at www.epa.gov/oppad001/chemregindex.htm.

Where these types of products are used, it is essential that the instructions provided by the supplier be followed, because the efficacy for their disinfection or sanitization is based on specific ratios of agent to water, residence time, and other application factors. Unless specifically indicated as a laundry additive, many disinfectants and sanitizers are not to be used as part of the wash chemicals.

Since disinfection or sanitization affects only microbial contamination, it must be followed up with cleaning to remove soils associated with body fluid or other infectious material.

A.7.6.2.4 The determination of the effectiveness for a specific sanitizer or disinfectant can be accomplished by using products registered with the EPA as appropriate for the type and materials for the ensemble element.

The application of spot sanitization and cleaning requires judgment because not all blood and body fluid contamination might be clearly visible. This judgment should take into account how the exposure occurred so that a determination can be made whether spot sanitization and cleaning will remove the contamination completely. Some forms of biological contamination are not likely to be visible, such as MRSA or other population and health care infections.

A.7.6.2.5 See A.7.4.1.2(3).

A.7.6.2.6 For the purposes of this standard, the removal of visible blood or body fluids is considered the absence of staining. More sophisticated methods can be used where the clothing material area(s) are nondestructively extracted and evaluated for the presence of proteins and carbohydrates associated with these types of fluids compared to a noncontaminated area.

A.7.7 Decontamination for reuse of PPE can also be performed, but here the extra purpose involves ensuring the PPE is clean enough such that all contamination is removed or contamination is at least removed to a level considered safe, depending on the exposure contaminants.

There are three primary methods for decontamination of PPE, as follows:

(1) Physical removal of contaminants.
(2) Inactivation of contaminants by chemical, neutralization, detoxification, or disinfection/sterilization.
(3) Removal of contaminants by a combination of both physical and chemical means. For performing decontamination where the possible reuse of PPE is considered, other approaches can be used but there is far less information and details to determine effectiveness. A variety of procedures have been investigated, but very few actual studies have been performed to assess the effectiveness of contaminant removal. These approaches span general methods, which are very similar to those used for gross decontamination, and more sophisticated methods depending on the type and state of the contaminant(s). Examples range from water washing with mild detergent and rinsing, to the use of specialized decontamination agents with various properties, to non-liquid methods involving dry adsorbents. Table A.7.7(a) lists and classifies many of these methods.