NFPA 1851

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

2001 Edition

This edition of NFPA 1851, *Standard on Selection, Care, and Maintenance of Structural Fire Fighting Protective Ensembles*, was prepared by the Technical Committee on Structural Fire Fighting Protective Clothing and Equipment, released by the Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment, and acted on by the National Fire Protection Association, Inc., at its November Meeting held November 12-15, 2000, in Orlando, FL. It was issued by the Standards Council on January 13, 2001, with an effective date of February 9, 2001.

This edition of NFPA 1851 was approved as an American National Standard on February 9, 2001.

Origin and Development of NFPA 1851

This first edition of NFPA 1851 was developed to be a companion document for NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*. NFPA 1971, which has been in effect since 1975, is a document that specifies product design, performance, testing, and certification. NFPA 1971 is written for use by manufacturers to design and produce their products and by certification organizations to evaluate and test these products to determine compliance with the standard as well as to provide continuing checks on production to assure the continuing compliance of the product. While NFPA 1971 is primarily written for these groups, the standard is also used by fire departments and other organizations in developing purchase specifications for structural fire fighting protective ensembles and ensemble elements to assure that the products they will purchase are certified as being compliant with the standard.

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

The overall protection and safety of fire fighting personnel is not only dependent on adequate protective clothing, but is equally dependent on the organization's policies, training, and administration of the correct use of the proper protective clothing in fire fighting situations. To satisfy the portion of the organization's overall protective clothing and equipment program that addresses structural fire fighting protective clothing, this document will provide criteria, for the organization and for the users, regarding necessary selection, care, and maintenance of the protective ensemble and ensemble elements.

In this standard, the requirements for several areas are written to begin with the actual person that uses the protective clothing being constantly aware of the protective clothing's condition and need for cleaning, repair, or more in-depth inspection. Users can perform the actions that they can easily undertake to improve the condition of the protective clothing. The more involved actions of advanced inspection, evaluation, cleaning, decontamination, and repair are forwarded on to the organization's designated staff who are trained and authorized to perform more advanced duties. In other areas, the requirements are written for the organization to perform the administrative functions of the program, and also perform periodic actions to evaluate the structural fire fighting protective clothing program to assure the program is achieving its goals and that the quality of the protective ensembles and ensemble elements provides optimum safety to the fire fighters to whom the protective clothing is issued.

This first edition was acted on by the Association membership at the Fall Meeting in Orlando, Florida, on 15 November 2000, and was issued with an effective date of 9 February 2001.

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

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

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

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

Committee Scope: This Committee shall have primary responsibility for documents on special operations protective clothing and protective equipment, except respiratory equipment, that provides hand, foot, torso, limb, head, and interface protection for fire fighters and other emergency services responders during incidents involving special operations functions including, but not limited to, structural collapse, trench rescue, confined space entry, urban search and rescue, high angle/mountain rescue, vehicular extraction, swift water or flooding rescue, contaminated water diving, and air operations.
This Committee shall also have primary responsibility for documents on station/work uniform garments that are not of themselves primary protective garments but can be combined with a primary protective garment to serve dual or multiple functions.
Additionally, this Committee shall have primary responsibility for documents on the selection, care, and maintenance of special operations protective clothing and equipment by fire and emergency services organizations and personnel.

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

Information on referenced publications can be found in Chapter 9 and Appendix B.

Chapter 1 Administration

1.1 Scope.

1.1.1

This standard shall specify the minimum selection, care, and maintenance requirements for structural fire fighting protective ensembles, and the individual ensemble elements that include coats, trousers, coveralls, helmets, gloves, footwear, and interface components that are compliant with NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*.

1.1.2

This standard shall also apply to structural fire fighting protective clothing and equipment certified as compliant to previous editions of NFPA 1971, *Standard on Protective Clothing for Structural Fire Fighting*; NFPA 1972, *Standard on Helmets for Structural Fire Fighting*; NFPA 1973, *Standard on Gloves for Structural Fire Fighting*; and NFPA 1974, *Standard on Protective Footwear for Structural Fire Fighting*.

1.1.3

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

1.1.4

This standard shall not apply to respiratory protective equipment or personal alert safety systems.

1.1.5

This standard shall not apply to protective ensembles or protective clothing that are compliant with NFPA 1976, *Standard on Protective Ensembles for Proximity Fire Fighting*; NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting*; NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*; NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Protective Clothing for Hazardous Materials Emergencies*; and NFPA 1999, *Standard on Protective Clothing for Emergency Medical Operations*.

1.1.6

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

1.1.7

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

1.2 Purpose.

1.2.1

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

1.2.2

This standard shall also establish a basic criteria for evaluating, selecting, and purchasing personal protective clothing and equipment.

1.3 Definitions.

1.3.1 Accessories.

Those items that are attached to an ensemble or ensemble element but designed in such a manner to be removable from the ensemble or the element and that are not necessary 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, lights, and heat sensing devices.

1.3.2 Advanced Cleaning.

See 1.3.9.1.

1.3.3 Biological Agents.

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

1.3.4 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, synovial fluid, and pericardial fluid.

1.3.5* Carcinogen/Carcinogenic.

A cancer-causing substance which is identified in one of several published lists.

1.3.6 Care.

Procedures for cleaning, decontamination, and storage of protective clothing and equipment.

1.3.7 Certification/Certified.

A system whereby a certification organization determines that a manufacturer has demonstrated the ability to produce a product that complies with the requirements of a specific standard(s), authorizes the manufacturer to use a label on listed products that comply with the requirements of that standard(s), and establishes a follow-up program conducted by the certification organization as a check on the methods the manufacturer uses to determine compliance with the requirements of that standard(s).

1.3.8 Char.

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

1.3.9* Cleaning.

The act of removing soils and contaminants from ensembles and elements by mechanical, chemical, thermal or combined processes.

1.3.9.1* Advanced Cleaning.

The thorough cleaning of ensembles or elements by washing with cleaning agents.

1.3.9.2 Contract Cleaning.

Cleaning conducted by a facility outside the organization that specializes in cleaning protective clothing.

1.3.9.3* Routine Cleaning.

The light cleaning of ensembles or elements performed by the end user without taking the elements out of service.

1.3.9.4* Specialized Cleaning.

Cleaning to remove hazardous materials or biological agents.

1.3.10 Coat.

A protective garment; an element of the protective ensemble designed to provide minimum protection to upper torso and arms, excluding the hands and head.

1.3.11 Contamination/Contaminated.

The process by which ensembles and ensemble elements are exposed to hazardous materials or biological agents.

1.3.12 Coverall.

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

1.3.13 Craze.

The appearance of fine cracks in surface of helmet shell or other smooth surface of an element.

1.3.14 Cross Contamination.

The transfer of contamination from one item to another or to the environment.

1.3.15 Crown.

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

1.3.16 Crown Straps.

A helmet term for the part of the suspension that passes over the head.

1.3.17 Decontamination.

The act of removing contaminants from ensembles and ensemble elements by a physical, chemical, or combined process. *(See also 1.3.9, Cleaning, and 1.3.9.3, Specialized Cleaning.)*

1.3.18 Disinfectant.

An agent that destroys, neutralizes, or inhibits the growth of harmful biological agents.

1.3.19 Ear Covers.

An integral part of the helmet designed to provide limited protection for the ears. Provides no significant thermal protection.

1.3.20 Elasticity.

The ability of an ensemble or element, when repeatedly stretched, to return to its original form as applied to wristlets and hoods.

1.3.21 Elements.

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

1.3.22 Embrittlement.

The hardening of a textile material that makes the ensemble or element or a textile material susceptible to easy fracture.

1.3.23 Emergency Medical Operations.

The delivery of emergency medical care and transportation prior to arrival at a hospital or other health care facility.

1.3.24 Energy Absorbing System.

A material, suspension system, or combination thereof incorporated into the design of the helmet to attenuate impact energy.

1.3.25 Ensemble.

Multiple elements of clothing and equipment designed to provide a degree of protection for fire fighters from adverse exposures to the inherent risks of structural fire fighting operations and certain other emergency operations. The elements of the protective ensemble are coats, trousers, coveralls, helmets, gloves, footwear, and interface components.

1.3.26 Faceshield.

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

1.3.27 Field test.

The non-laboratory evaluation of one or more protective ensemble elements used to determine product performance related to organizational expectations or to compare products in a manner related to their intended use.

1.3.28 Fit.

The quality, state or manner in which the length and closeness of clothing, when worn, relates to the human body.

1.3.29 Flame Resistance/Resistant.

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

1.3.30 Footwear.

An element of the protective ensemble designed to provide minimum protection to the foot, ankle, and lower leg.

1.3.31 Functional/Functionality.

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

1.3.32 Garment(s).

The coat, trouser, or coverall elements of the protective ensemble designed to provide minimum protection to the upper and lower torso, arms, and legs, excluding the head, hands, and feet.

1.3.33 Gauntlet.

The circular, flared, or otherwise expanded part of the glove that extends beyond the opening of the glove body.

1.3.34 Gloves.

An element of the protective ensemble designed to provide minimum protection to the fingers, thumb, hand, and wrist.

1.3.35 Glove Wristlet.

The circular, close-fitting part of the glove, usually made of knitted material, that extends beyond the opening of the glove body.

1.3.36 Goggles.

A helmet component intended to help protect the wearer's eyes and a portion of the wearer's face, not intended as primary eye protection.

1.3.37 Hardware.

Nonfabric components of the structural fire fighting protective ensemble including, but not limited to, those made of metal or plastic.

1.3.38 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.

1.3.39 Hazardous Materials Emergencies.

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

1.3.40 Helmet.

An element of the protective ensemble designed to provide minimum protection to the head.

1.3.41 Hood.

The interface component element of the protective ensemble designed to provide limited protection to the coat/helmet/SCBA facepiece interface area.

1.3.42 Integrity.

The ability of a ensemble or element to remain intact and provide continued minimum performance.

1.3.43 Interface Area.

An area of the body where the protective garments, helmet, gloves, footwear, or SCBA facepiece meet (i.e., the protective coat/helmet/SCBA facepiece area, protective coat/protective trouser area, the protective coat/glove area, and the protective trouser/footwear area).

1.3.44 Liner System.

The combination of the moisture barrier and thermal barrier as used in a garment.

1.3.45 Maintenance.

Procedures for inspection, repair, and retirement of protective clothing and equipment.

1.3.46 Manufacturer.

The entity that assumes the liability and provides the warranty for the compliant product.

1.3.47 Melt.

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

1.3.48 Moisture Barrier.

The portion of the composite designed to prevent the transfer of liquids.

1.3.49* Organization.

The entity that provides the direct management and supervision for the emergency incident response personnel.

1.3.50 Outer Shell.

The outermost layer of the composite with the exception of trim, hardware, reinforcing material and wristlet material.

1.3.51 Protective Clothing.

See 1.3.54.

1.3.52 Protective Coat.

See 1.3.10.

1.3.53 Protective Coverall.

See 1.3.12.

1.3.54 Protective Ensemble.

Multiple elements of clothing and equipment designed to provide a degree of protection for fire fighters from adverse exposures to the inherent risks of structural fire fighting operations and certain other emergency operations. The elements of the protective ensemble are coats,

trousers, coveralls, helmets, gloves, footwear, and interface components.

1.3.55 Protective Footwear.

See 1.3.30.

1.3.56 Protective Garments.

See 1.3.32.

1.3.57 Protective Gloves.

See 1.3.34.

1.3.58 Protective Helmet.

See 1.3.40.

1.3.59 Protective Hood.

See 1.3.41.

1.3.60 Protective Trouser.

See 1.3.78.

1.3.61 Reinforcement.

An additional layer placed in or on an element.

1.3.62 Retirement.

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

1.3.63 Routine Cleaning.

See 1.3.9.3.

1.3.64 Seams.

1.3.64.1 Major A Seams.

Outermost layer seam assemblies where rupture could reduce the protection of the garment by exposing the inner layers such as the moisture barrier, the thermal barrier, the wearer's station/work uniform, other clothing, or skin.

1.3.64.2 Major B Seams.

Moisture barrier or thermal barrier seam assemblies where rupture could reduce the protection of the garment by exposing the next layer of the garment, the wearer's station/work uniform, other clothing, or skin.

1.3.64.3 Minor Seams.

Seam assemblies that are not classified as Major A or Major B seams.

1.3.65 Selection.

The process of determining what protective clothing and equipment is necessary for protection of fire and emergency service responders from an anticipated, specific hazard, or other activity, the procurement of the appropriate protective clothing and equipment, and the choice of the proper protective clothing and equipment for a specific hazard or activity at an emergency scene.

1.3.66 Separate.

A material response evidenced by splitting or delaminating.

1.3.67 Service Life.

The period for which a ensemble or element is useful before retirement.

1.3.68 Shall.

Indicates a mandatory requirement.

1.3.69 Shank.

Reinforcement to the area of protective footwear designed to provide additional support to the instep.

1.3.70 Should.

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

1.3.71 Soiled/Soiling.

The accumulation of materials, that are not considered hazardous materials or biological agents, but which could degrade the performance of the ensemble or element.

1.3.72 Specialized Cleaning.

See 1.3.9.4.

1.3.73 Stress Areas.

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

1.3.74 Suspension.

A helmet term for the energy attenuating system made up of the headband and crown strap.

1.3.75 Tensile Strength.

The force at which a fiber or a fabric will break.

1.3.76 Thermal Barrier.

The portion of protective ensemble or element composite that is designed to provide thermal protection.

1.3.77* Trim.

Retroreflective and fluorescent material attached to the outermost surface of the protective ensemble or element for visibility enhancement.

1.3.78 Trouser.

A protective garment. An element of the protective ensemble that is designed to provide minimum protection to the lower torso and legs, excluding the ankles and feet.

1.3.79 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. Under circumstances in which differentiation between body fluids is difficult or impossible, all body fluids shall be considered potentially infectious materials.

1.3.80 Utility Sink.

A separate sink used for cleaning ensembles and ensemble elements.

1.3.81 Winter Liner.

A garment term for an optional component layer designed to provide added insulation against cold.

1.3.82 Wristlet.

An interface component element of the protective ensemble that is the circular, close-fitting extension of the coat sleeve, usually made of knitted material, designed to provide limited protection to the protective coat/glove interface area. *(See also 1.3.33, Gauntlet and 1.3.35, Glove Wristlet.)*

1.4 Units.

1.4.1

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

1.4.2

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

Chapter 2 Program

2.1 General.

2.1.1*

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

2.1.2

This program shall have the goal of providing structural fire fighting protective ensembles and ensemble elements that are suitable and appropriate for the intended use; maintaining such protective ensembles and ensemble elements in a safe, useable condition to provide the intended protection to the user; removing from use such protective ensembles and ensemble elements that could cause or contribute to user injury, illness, or death because of its condition; and reconditioning, repairing or retiring such protective ensembles and ensemble elements.

2.1.3

Where this program for the selection, care, and maintenance of structural fire fighting protective ensembles and ensemble elements is part of an organization's overall program on protective clothing and protective equipment, the portion of the organization's overall program that affects structural fire fighting protective ensembles and ensemble elements shall be in accordance with Section 2.2.

2.2 Program Organization for Structural Fire Fighting Protective Ensembles and Ensemble Elements.

2.2.1

The organization shall develop written standard operating procedures (SOP) that shall identify and define the various parts of the program and the various roles and responsibilities of the organization and of the members.

2.2.2

The program shall at least incorporate the requirements within the chapters listed in Table 2.2.2.

Table 2.2.2 Required Program Parts for Structural Fire Fighting Protective Ensembles and Elements

Chapter Title	Chapter
Selection	3
Inspection	4

Chapter Title	Chapter
Cleaning and Decontamination	5
Repair	6
Storage	7
Retirement, Disposition, and Special Incident Procedure	8

2.2.3*

The organization shall not add accessories and shall not permit accessories to be added to an ensemble element unless:

(1) The accessory has been certified for use with the element in accordance with NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, or

(2) The organization has the equipment manufacturer's approval to use the accessory with their ensemble elements.

2.2.4*

The organization shall develop specific criteria for removal of protective clothing and equipment from service, in accordance with Chapter 8. The criteria for retirement shall include but not be limited to issues that are specific to the ensembles or ensemble elements being used by the organization, the manufacturer instructions, and the experience of the organization.

2.3 Records.

2.3.1*

The organization shall compile and maintain records on their structural fire fighting protective ensembles or ensemble elements.

2.3.2

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

(1) Person to whom element is issued

(2) Date and condition when issued

(3) Manufacturer and model name or design

(4) Manufacturer's identification number, lot number, or serial number

(5) Month and year of manufacture

(6) Date(s) of and findings of advanced inspection(s) by organization

(7) Date(s) of advanced cleaning or decontamination by organization

(8) Reason for advanced cleaning or decontamination and who performed cleaning or

decontamination

(9) Date(s) of repair(s), who performed repair(s), and brief description of any repair(s)

(10) Date of retirement

(11) Date and method of disposal

2.4 Manufacturer's Instructions.

2.4.1

When issuing new structural fire fighting ensembles and ensemble elements, the organization shall provide users with the instructions provided by the manufacturer on the care, use, and maintenance of their protective ensembles or elements, including any warnings provided by the manufacturer.

2.4.2

Where the manufacturer's instructions regarding the care or maintenance of their protective ensembles or elements differ from a specific requirement(s) in this standard, the manufacturer's instructions shall be followed for that requirement(s).

2.4.3

The organization shall retain a copy of manufacturer's instructions regarding the care, use, and maintenance of their protective ensembles for reference purposes.

2.5* Protecting the Public from Contamination.

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

Chapter 3 Selection

3.1* Selection and Purchase.

3.1.1*

Prior to starting the selection process of structural fire fighting ensembles and ensemble elements, a risk assessment shall be performed. The risk assessment shall include, but not be limited to, the hazards that can be encountered by structural fire fighters based on the following:

(1) Type of duties performed

(2) Frequency of use of ensemble elements

(3) Organization's experiences

(4) Incident operations

(5) Geographic location and climate

3.1.2*

The organization shall review the current edition of NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, NFPA 600, *Standard on Industrial Fire Brigades*, and any applicable federal or state OSHA standards relating to structural fire fighting ensembles and ensemble elements in order to determine how they affect the selection process.

3.1.3*

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

3.1.4*

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

3.1.5*

The organization shall ensure that the ensembles and ensemble elements under consideration interface properly with other personal protective items with which they will be used.

3.1.6*

Where a field test is conducted the organization shall establish criteria to ensure a systematic evaluation.

3.1.7*

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

(1) Purchase specifications shall require that the element(s) to be purchased shall be compliant with the current edition of NFPA 1971.

(2) * Where the organization selects criteria that exceed the minimum requirements of NFPA 1971 such criteria shall be stipulated in the purchase specifications.

(3) * Purchase specifications shall require that manufacturers' bids include substantiation of certification for each element and model stated in the bid.

(4) * Where applicable, the purchase specifications shall define the process for determining proper fit.

(5) * The organization shall compare each bid submittal against purchase specifications.

3.1.8

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

3.1.9

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

3.1.10

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

Chapter 4 Inspection

4.1 General.

4.1.1

Any elements contaminated by hazardous materials or biological agents shall be decontaminated before any additional inspection is initiated.

4.1.2*

The organization shall establish guidelines for their members to follow in determining when an element is soiled to the extent that cleaning is necessary.

4.1.3

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

4.1.3.1

As a minimum, any necessary cleaning or decontamination shall be done in accordance with the requirements specified in Chapter 5.

4.1.3.2

As a minimum, any necessary repairs shall be made in accordance with the requirements specified in Chapter 6.

4.2 Routine Inspection.

4.2.1

Each individual member shall conduct a routine inspection of their personal ensemble or

ensemble elements after each use. The organization shall establish what constitutes “use” to at least include each time the element(s) is exposed, or is suspected of having been exposed, to damage or contamination.

4.2.2

The routine inspection shall include, as a minimum, the following inspections specified in 4.2.2.1 through 4.2.2.5.

4.2.2.1

Coats and trousers shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) Physical damage, such as the following:

  a. Rips, tears, and cuts

  b. Damaged/missing hardware and closure systems

  c. Thermal damage such as charring, burn holes, and melting

(4) Damaged or missing reflective trim

4.2.2.2

Hoods shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) Physical damage, such as the following:

  a. Rips, tears, and cuts

  b. Thermal damage such as charring, burn holes, and melting

(4) Loss of face opening adjustment

4.2.2.3

Helmets shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) Physical damage to the shell, such as the following:

  a. Cracks, crazing, dents, and abrasions

  b. Thermal damage to the shell such as bubbling, soft spots, warping, or discoloration

(4) Physical damage to the ear flaps, such as the following:

a. Rips, tears, and cuts

b. Thermal damage such as charring, burn holes, and melting

(5) Damaged or missing components of the suspension and retention systems

(6) * Damaged or missing components of the faceshield/goggle system, including discoloration, crazing, and scratches to the faceshield/goggle lens limiting visibility

(7) Damaged or missing reflective trim

4.2.2.4

Gloves shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) Physical damage, such as the following:

a. Rips, tears, and cuts

b. Thermal damage such as charing, burn holes and melting

c. Inverted liner

(4) Shrinkage

(5) Loss of elasticity/flexibility

4.2.2.5

Footwear shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) Physical damage, such as the following:

a. Cuts, tears, and punctures

b. Thermal damage such as charing, burn holes, and melting

c. Exposed/deformed steel toe, steel midsole, and shank

(4) Loss of water resistance

(5) Closure system component damage and functionality

4.3 Advanced Inspection.

4.3.1*

Advanced inspections of all protective ensembles and ensemble elements shall be conducted

at a minimum of every 12 months, or whenever routine inspections indicate that a problem may exist. The advanced inspections shall be conducted by members of the organization who have received training in the inspection of structural fire fighting protective clothing and equipment.

4.3.1.1*

The findings of the advanced inspection shall be documented on an inspection form.

4.3.1.2

Universal precautions shall be observed, as appropriate, when handling elements.

4.3.2

The advanced inspection shall include, as a minimum, the following inspections specified in 4.3.2.1 through 4.3.2.5.

4.3.2.1*

All layers of the garment elements shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) * Physical damage to all layers, such as the following:

  a. Rips, tears, cuts, and abrasions

  b. Damaged/missing hardware

  c. Thermal damage such as charring, burn holes, melting, or discoloration of any layer

(4) * Loss of moisture barrier integrity as indicated by:

  a. rips, tears, cuts, and abrasions

  b. discoloration

  c. thermal damage

(5) Evaluation of system fit and coat/trouser overlap

(6) Loss of seam integrity; broken or missing stitches

(7) * Material integrity: UV or chemical degradation, loss of liner material, shifting of liner material

(8) Wristlets: loss of elasticity, stretching, runs, cuts, burn holes

(9) * Reflective trim integrity, attachment to garment, reflectivity, damage

(10) * Label integrity, legibility

(11) Hook and loop functionality

(12) Liner attachment systems

(13) Closure system functionality

(14) Accessories for compliance with 2.2.3

4.3.2.2

Hoods shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) Physical damage, such as the following:

a. Rips, tears, and cuts

b. Thermal damage such as charring, burn holes, and melting

(4) Shrinkage

(5) Loss of material elasticity; stretching out of shape

(6) Loss of seam integrity; broken or missing stitches

(7) Loss of face opening adjustment

4.3.2.3

Helmets shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) Physical damage to the shell, such as the following:

a. Cracks, dents, and abrasions

b. Thermal damage to the shell such as bubbling, soft spots, warping, or discoloration

(4) Physical damage to the ear flaps

a. Rips, tears, and cuts

b. Thermal damage such as charring, burn holes, or melting

(5) Damaged or missing components of the suspension and retention systems

(6) Suspension and retention systems functionality

(7) Damaged or missing components of the faceshield/goggle system, including discoloration or scratches to the faceshield/goggle lens limiting visibility

(8) Faceshield/goggle system functionality

(9) Damage to the impact cap

(10) Damaged or missing reflective trim

(11) Accessories for compliance with 2.2.3

4.3.2.4

Gloves shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) * Physical damage, such as the following:

a. Rips, tears, and cuts

b. Thermal damage such as charing, burn holes, and melting

c. Inverted liner

d. Loss of seam integrity; broken or missing stitches

(4) Shrinkage

(5) Loss of flexibility

(6) Loss of elasticity and shape in wristlets

(7) Accessories for compliance with 2.2.3

4.3.2.5

Footwear shall be inspected for the following:

(1) Soiling

(2) Contamination from hazardous materials or biological agents

(3) Physical damage, such as the following:

a. Cuts, tears, punctures, cracking, or splitting

b. Thermal damage such as charing, burn holes, and melting

c. Exposed/deformed steel toe, steel midsole, and shank

d. Loss of seam integrity; delamination, broken or missing stitches

(4) Loss of water resistance

(5) Closure system component damage and functionality

(6) * Excessive tread wear

(7) Condition of lining, such as the following:

a. Tears

b. Excessive wear

c. Separation from outer layer

(8) Heel counter failure

(9) Accessories for compliance with 2.2.3

Chapter 5 Cleaning and Decontamination

5.1 General.

5.1.1*

Organizations shall provide a means for having elements cleaned and decontaminated.

5.1.2

Soiled or contaminated elements shall not be brought into the home, washed in home laundries, or washed in public laundries unless the public laundry has a dedicated business to handle fire fighting protective clothing.

5.1.3*

Commercial dry cleaning shall not be used as a means of cleaning or decontaminating ensembles and ensemble elements unless approved by the ensemble or element manufacturer.

5.1.4*

When contract cleaning or decontamination is used, the contract cleaner shall demonstrate, to the organization's satisfaction, procedures for cleaning and decontamination that do not compromise the performance of ensembles and ensemble elements.

5.2 Routine Cleaning.

5.2.1*

After each use any elements that are soiled shall receive routine cleaning.

5.2.2

The end user shall be responsible for the routine cleaning of their personal ensemble or ensemble elements.

5.2.3

The following process shall be used:

(1) * When possible, initiate cleaning at the incident scene.

(2) Brush off any dry debris.

(3) Gently rinse off debris with a water hose.

(4) If necessary, scrub gently with a soft bristle brush and rinse off again.

(5) If necessary, spot clean utilizing a utility sink.

(6) Inspect for soiling and contamination, and repeat process if necessary.

5.2.4

Should routine cleaning fail to render the element(s) sufficiently clean for service, the element(s) shall receive advanced cleaning.

5.3 Advanced Cleaning.

5.3.1*

Every six months, at a minimum, elements that have been issued, used, and are soiled, shall receive advanced cleaning.

5.3.2*

A member(s) of the organization who has received training in the cleaning of structural fire fighting protective clothing and equipment shall be responsible for performing or managing advanced cleaning.

5.3.3

The following process shall be used:

(1) Brush off any dry debris.

(2) Clean following utility sink cleaning procedures or machine cleaning procedures, or utilize a qualified contract cleaner.

(3) Inspect for soiling and contamination, and repeat process if necessary.

5.4 Specialized Cleaning.

5.4.1*

Elements that are contaminated with hazardous materials or biological agents shall receive specialized cleaning as necessary to remove the specific contaminant(s).

5.4.2

Elements that are known or suspected to be contaminated shall be isolated, tagged, and bagged. The contaminated elements shall be removed from service until they can receive specialized cleaning as necessary to remove the specific contaminant(s).

5.4.3

A member(s) of the organization who has received training in the cleaning of structural fire

fighting protective clothing and equipment shall be responsible for performing or managing specialized cleaning.

5.4.4

Universal precautions shall be observed when handling elements known or suspected to be contaminated with hazardous materials or biological agents.

5.4.5

For elements that have been soiled with body fluids the following process shall be used:

(1) Follow manufacturer's instructions to determine appropriate disinfectant to use.

(2) Clean following utility sink cleaning procedures or machine cleaning procedures or utilize a qualified contract cleaner.

(3) Inspect for effectiveness of cleaning, and repeat process if necessary.

5.4.6*

Where elements are known or suspected of being contaminated with a hazardous material or biological agent, the contaminant or suspected contaminant shall be identified by the organization, if possible.

5.4.6.1

When the contaminant has been identified, the organization shall consult the manufacturer of the contaminant for an appropriate decontamination agent and process.

5.4.6.2*

In the absence of detailed manufacturer's instructions, the following process shall be used:

(1) Utilize a qualified contract cleaner.

(2) Inspect for contamination, and repeat process if necessary.

5.4.6.2.1

Contaminated elements shall be shipped in accordance with federal, state, and local regulations.

5.5 Cleaning and Decontamination Procedures.

5.5.1

Organizations shall examine the manufacturer's label and user information for instructions on cleaning that the manufacturer provided with the ensemble or element. In the absence of manufacturer's instructions or manufacturer's approval of alternative procedures, the cleaning procedures provided in this section shall be used.

5.5.2*

Chlorine bleach or chlorinated solvents shall not be used to clean or decontaminate garments.

5.5.3

Cleaning and decontamination solutions shall have a pH range of not less than 6.0 pH and not greater than 10.5 pH.

5.5.4

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

5.5.5*

Protective ensembles and protective ensemble elements shall be cleaned and decontaminated separately from non-protective items.

5.5.5.1*

Where the shells and liners of protective garment elements are separable, those items shall only be cleaned and decontaminated with like items, including but not limited to, shells with shells and liners with liners.

5.5.6*

The following procedures shall be used when cleaning in a utility sink.

(1) Do not overload the sink.

(2) * If necessary, pre-treat heavily soiled or spotted areas.

(3) * Fill the sink with water not to exceed 40°C (105°F).

(4) Add cleaning solution or detergent.

(5) * Wear protective gloves and eye/face splash protection.

(6) Scrub gently using a soft bristle brush. Use extra care with moisture barrier assemblies.

(7) Drain the water from the sink.

(8) Refill the sink; agitate gently using gloved hand or stir stick.

(9) Gently wring out garments and drain the water from the sink.

(10) Repeat steps 7 and 8 until garment is thoroughly rinsed.

(11) Dry the elements.

(12) Inspect and rewash if necessary.

(13) Rinse out the sink.

5.5.7*

The following procedures shall be used for machine cleaning:

(1) * Do not overload the machine.

(2) * If necessary, pre-treat heavily soiled or spotted areas.

(3) Fasten all closures, including pocket closures, hook and loop, snaps, zippers, hooks and dees, and so forth.

(4) Turn garment inside out and place in mesh laundry bag.

(5) * Set and start the machine cycle; use a water temperature setting not to exceed 40°C (105°F).

(6) Add detergent.

(7) * Run one complete cycle, rinsing at least twice.

(8) Dry the elements.

(9) Inspect and rewash if necessary.

(10) * If the machine is also used to wash items other than protective ensemble elements, rinse out the machine by running it while empty through a complete cycle with 49°C to 52°C (120°F to 125°F) water and detergent.

5.6 Drying Procedures.

5.6.1*

Organizations shall examine the manufacturer's label and user information for instructions on drying procedures that the manufacturer provided with the ensemble or element. In absence of manufacturer's instructions or manufacturer's approval of alternative procedures, the drying procedures provided in this section shall be used.

5.6.2*

The following procedures shall be used for air-drying:

(1) * Place elements in an area with good ventilation.

(2) * Do not dry in direct sunlight.

5.6.3*

The following procedures shall be used for machine drying:

(1) Do not overload the machine.

(2) Fasten all closures, including pocket closures, hook and loop, snaps, zippers, hooks and dees, and so forth.

(3) Turn garments inside out and place in a mesh laundry bag.

(4) * If the dryer has a no-heat option, use it.

(5) * If heat must be used, basket temperature shall not exceed 40°C (105°F).

(6) * If heat is used, remove garments before they are completely dry.

5.7 Additional Procedures for Helmets.

5.7.1

Organizations shall examine the manufacturer's label and user information for instructions on cleaning and drying procedures that the manufacturer provided with the ensemble or element. In absence of manufacturer's instructions or manufacturer's approval of alternative procedures, the cleaning and drying procedures provided in this section shall be used.

5.7.2

Helmets shall not be machine cleaned or dried.

5.7.3

Helmet shells, headbands, crown straps, ear covers, and suspension systems shall be cleaned in a utility sink using mild detergent and water.

5.7.4

The manufacturer shall be consulted if stronger cleaning agents are required.

5.7.5

No solvents shall be used to clean or decontaminate faceshields or goggles. The manufacturer shall be consulted when more thorough cleaning is necessary.

5.8 Additional Procedures for Gloves.

5.8.1

Organizations shall examine the manufacturer's label and user information for instructions on cleaning and drying procedures that the manufacturer provided with the ensemble or element. In absence of manufacturer's instructions or manufacturer's approval of alternative procedures, the cleaning and drying procedures provided in this section shall be used.

5.8.2

Gloves shall be cleaned in a utility sink using mild detergent and water.

5.8.3

Gloves shall not be machine dried with heat.

5.9 Additional Procedures for Footwear.

5.9.1

Organizations shall examine the manufacturer's label and user information for instructions on cleaning and drying procedures that the manufacturer provided with the ensemble or element. In absence of manufacturer's instructions or manufacturer's approval of alternative procedures, the cleaning and drying procedures provided in this section shall be used.

5.9.2

Footwear shall not be machine cleaned or dried.

5.9.3

Footwear shall be cleaned in a utility sink using mild detergent, water, and a soft bristle brush.

5.9.4

The manufacturer shall be consulted if stronger cleaning agents are required.

5.9.5*

Footwear shall be air dried in a well-ventilated area, away from direct sunlight.

5.10 Additional Procedures for Hoods.

5.10.1

Organizations shall examine the manufacturer's label and user information for instructions on cleaning and drying procedures that the manufacturer provided with the ensemble or element. In absence of manufacturer's instructions or manufacturer's approval of alternative procedures, the cleaning and drying procedures provided in this sections shall be used.

5.10.2

Hoods shall be cleaned in accordance with the general provisions in Section 5.5.

5.10.3

Hoods shall be dried in accordance with the provisions in Section 5.6.

Chapter 6 Repair

6.1 Garment Repair.

6.1.1

A member(s) of the organization who has received training in the repair of garment elements shall be responsible for performing or managing specialized repairs.

6.1.2

Garments shall be subjected to advanced cleaning, or specialized cleaning when necessary, before any repair work is undertaken.

6.1.3

All repairs and alterations to garments shall be done in a manner and using materials that are approved by the manufacturer including, but not limited to, fabric, thread type, stitch construction, hardware, and hardware backing.

6.1.4

Because there are different methods of construction, the clothing manufacturer shall be contacted if the organization is unsure of whether a field repair can be accomplished without adversely affecting the integrity of the garment.

6.1.5

Major repairs to the outer shell shall only be accomplished by the manufacturer or by a manufacturer recognized repair facility consistent with the manufacturer's instructions and methods. The manufacturer shall be contacted if the organization is unsure of whether a repair is major or minor, or can be accomplished without adversely affecting the integrity of the garment.

6.1.6*

All repairs to the moisture barrier shall only be performed by the manufacturer or by a manufacturer's recognized repair facility consistent with the manufacturer's instructions and methods. The organization shall contact the original manufacturer if unsure as to whether an area to be repaired contains a moisture barrier.

6.1.7*

Minor field repairs to thermal liners shall be permitted providing there is no stitching through the moisture barrier. The types of field repairs permitted are: patching of minor tears, char marks and ember burns, repair of skipped, broken and missing stitches, and replacement of missing hardware. All repairs and alterations to thermal liners including minor field repairs, shall be performed in the same manner and using the same materials as the manufacturer, including but not limited to fabric, thread type, stitch construction, hardware and hardware backing.

6.1.8

Repairs shall be completed on all components and on all layers of the composite that have been damaged or that are affected by the repair.

6.1.9

Repairs and alterations shall be performed using seaming methods consistent with the manufacturer's instructions. Seaming methods shall include but not be limited to seam type, stitches per inch, and manner of construction.

6.1.10

Major A seams are critical to the integrity of the garment and restitching of more than 1 continuous inch of a major A seam shall require consulting the manufacturer, or shall be performed by the manufacturer or by a manufacturer recognized repair facility in a manner consistent with the manufacturer's instructions.

6.1.11

Major B seams in the moisture barrier shall be repaired or altered only by the manufacturer or by a manufacturer recognized repair facility and shall not be repaired in the field.

6.1.12

Repairs to major B seams in the thermal liner that do not affect any moisture barrier material shall be permitted. Restitching of more than 1 continuous inch of major B seams shall require consulting the manufacturer, or shall be performed by the manufacturer or by a manufacturer recognized repair facility in a manner consistent with the manufacturer's instructions.

6.1.13

All minor seams, other than moisture barrier seams, shall be repaired or altered in a manner consistent with the manufacturer's instructions.

6.1.14

Minor seams in the moisture barrier shall be repaired or altered only by the manufacturer or by a manufacturer recognized repair facility and shall not be repaired in the field.

6.1.15*

All repaired stress areas shall be reinforced in a manner consistent with the manufacturer's instructions.

6.1.16

Repairs of minor tears, char marks, ember burns, and abraded areas shall be limited to those where the damaged area can be covered by a maximum of a 32 cm^2 (50 $in.^2$) patch. The finished edge of the patch shall extend at least 25 mm (1 in.) in all directions beyond the damaged area. The patch shall have no raw edges to prevent fraying. When repairing tears, holes, or abrasions the damaged areas shall be mended to prevent further damage *prior* to applying the patch.

6.1.17

Replacement trim shall be installed in a manner consistent with the garment manufacturer's method of construction, and replacement trim shall be obtained from the garment manufacturer or the manufacturer's recognized source. Trim being replaced shall be completely removed so that no new trim is sewn over older trim. No repair or alteration shall result in a reduction of the total amount of trim on the garment. If a repair or alteration

necessitates replacing trim, an equal amount of trim shall be installed. If replacing trim necessitates sewing into a major A seam, trim replacement shall only be done by the manufacturer or by a repair facility recognized by the manufacturer. If unsure of the complexity of the repair, the manufacturer shall be consulted.

6.1.18*

Replacement hardware shall be installed in a manner consistent with the garment manufacturer's method of construction. Replacement hardware shall be obtained from the garment manufacturer or the manufacturer's recognized source. When replacing hardware, the reinforcement backing material shall either be reinstalled, or if no longer serviceable, the backing material shall be replaced. If unsure of the complexity of the repair, the manufacturer shall be consulted.

6.1.19*

Replacement zippers shall be installed in a manner consistent with the garment manufacturer's method of construction, and replacement zippers shall be obtained from the manufacturer or the manufacturer's recognized source. If unsure of the complexity of the repair, the manufacturer shall be consulted.

6.1.20*

Replacement hook and loop fastener tape shall be installed in a manner consistent with the garment manufacturer's method of construction, and replacement hook and loop shall be obtained from the garment manufacturer or the manufacturer's recognized source. If unsure of the complexity of the repair, the manufacturer shall be consulted.

6.1.21*

Replacement reinforcement materials shall be installed in a manner consistent with the garment manufacturer's method of construction. Replacement reinforcement material shall be obtained from the garment manufacturer or the manufacturer's recognized source. If unsure of the complexity of the repair, the manufacturer shall be consulted.

6.1.22

Replacement wristlets shall be installed in a manner consistent with the garment manufacturer's method of construction, and replacement wristlets shall be obtained from the garment manufacturer or the manufacturer's recognized source. If unsure of the complexity of the repair, the manufacturer shall be consulted.

6.2 Helmet Repair.

6.2.1

A member(s) of the organization who has received training in the repair of helmet elements shall be responsible for performing or managing specialized repairs.

6.2.2

Helmets shall be subjected to advanced cleaning, and specialized cleaning when necessary, before any repair work is undertaken.

6.2.3*

All repairs and alterations to helmets shall be done in a manner and using materials that are approved by the manufacturer.

6.2.4

Where replacement of a helmet component is performed, the replacement component(s) shall be obtained from the helmet manufacturer or the manufacturer's recognized source.

6.2.5

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

6.2.6

The helmet manufacturer shall be contacted if the organization is unsure of the complexity of the repair, or whether a field repair can be accomplished without adversely affecting the integrity of the helmet.

6.2.7

Small surface knicks shall be repaired in accordance with the manufacturer's instructions.

6.2.8

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

6.2.9

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

6.3 Glove Repair.

6.3.1

A member(s) of the organization who has received training in the repair of glove elements shall be responsible for performing or managing specialized repairs.

6.3.2

Gloves shall be subjected to advanced cleaning, or specialized cleaning when necessary, before any repair work is undertaken.

6.3.3

All repairs to gloves shall be done in a manner and using materials that are approved by the glove manufacturer.

6.4 Footwear Repair.

6.4.1

A member(s) of the organization who has received training in the repair of footwear elements shall be responsible for performing or managing specialized repairs.

6.4.2

Footwear shall be subjected to advanced cleaning or specialized cleaning when necessary before any repair work is undertaken.

6.4.3

All repairs and alterations to footwear shall be done in a manner and using materials that are approved by the footwear manufacturer. Repairs to footwear shall be performed by the boot manufacturer or a repair service recognized by the manufacturer.

6.4.4

All repairs to leather boots, other than the replacement of boot laces, insoles and zipper assemblies, shall be performed by the manufacturer or a repair service recognized by the manufacturer. All replacement boot laces, zippers, and insoles shall be provided by the boot manufacturer or the manufacturer's recognized source.

6.5 Hood Repair.

6.5.1

A member(s) of the organization who has received training in the repair of hood elements shall be responsible for performing or managing specialized repairs.

6.5.2

Hoods shall be subjected to advanced cleaning, or specialized cleaning when necessary, before any repair work is undertaken.

6.5.3

All repairs to hoods shall be done in a manner and using materials that are approved by the hood manufacturer.

Chapter 7 Storage

7.1* Requirements for all Ensembles and Ensemble Elements.

7.1.1*

Ensembles or ensemble elements shall not be stored in direct sunlight or exposed to direct sunlight while not being worn.

7.1.2*

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

7.1.3

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

7.1.4

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

7.1.5*

Ensembles and ensemble elements shall not be stored at temperatures below -40°C (-40°F) or above 82°C (180°F).

7.1.6*

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

7.1.7*

Soiled ensembles and ensemble elements shall not be stored inside living quarters or with personal belongings, or taken or transported within the passenger compartment of personal vehicles. Where ensembles or ensemble elements must be transported or stored in these environments, the ensembles or element(s) shall be placed in a protective case or bag to prevent cross-contamination.

7.1.8*

Ensembles and ensemble elements shall not be stored in contact with hydraulic fluids, solvents, hydrocarbons, hydrocarbon vapors, or other contaminants.

Chapter 8 Retirement, Disposition, and Special Incident Procedure

8.1 Retirement.

8.1.1*

Structural fire fighting ensembles and ensemble elements that are worn or damaged to the extent that the organization deems it not possible or cost effective to repair them shall be retired in accordance with 8.2.1.

8.1.2

Structural fire fighting ensembles and ensemble elements that are contaminated to the extent that the organization deems it not possible or cost effective to decontaminate them, shall be retired in accordance with 8.2.1.

8.1.3*

Structural fire fighting ensembles and ensemble elements that are no longer of use to the organization for emergency operations service but are not contaminated, defective, or damaged shall be retired in accordance with 8.2.1 or 8.2.2.

8.1.4*

Structural fire fighting ensembles and ensemble elements that were not in compliance with the edition of the respective NFPA standard that was current when the element(s) were manufactured shall be retired in accordance with 8.2.1.

8.2 Disposition of Retired Elements.

8.2.1

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

8.2.2

Retired structural fire fighting ensembles and ensemble elements as determined in 8.1.3 shall be permitted to be:

(1) Used for training that does not involve live fire provided they are appropriately marked as such or;

(2) Utilized as determined by the organization.

8.3 Special Incident Procedure.

8.3.1*

The organization shall have procedures for the handling and custody of ensembles and ensemble elements that are directly related to serious fire fighter injuries and fire fighter

fatalities.

8.3.2*

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

(a) Provisions for the immediate removal from service and preservation of all personal protective clothing and equipment utilized by the injured or deceased fire fighter. Custody of such clothing and equipment shall be maintained at a secure location with controlled, documented access.

(b) All such clothing and equipment should be non-destructively tagged and stored only in paper or cardboard containers to prevent further degradation or damage. Plastic or airtight containers shall not be used.

(c) Review of the personal protective clothing and equipment by qualified members of the organization or outside experts to determine the condition thereof.

8.3.3*

The organization shall determine a specific period of time for retaining custody of the personal protective clothing and equipment.

Chapter 9 Referenced Publications

9.1

The following documents or portions thereof are referenced within 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 also listed in Appendix B.

9.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 600, *Standard on Industrial Fire Brigades*, 2000 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 1997 edition.

NFPA 1581, *Standard on Fire Department Infection Control Program*, 2000 edition.

NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, 2000 edition.

NFPA 1976, *Standard on Protective Ensemble for Proximity Fire Fighting*, 2000 edition.

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

1998 edition.

NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*, 2000 edition.

NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies*, 2000 edition.

NFPA 1999, *Standard on Protective Clothing for Emergency Medical Operations*, 1997 edition.

Appendix A Explanatory Material

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

A.1.3.5 Carcinogen/Carcinogenic.

The lists include, but are not limited to, NIOSH Pocket Guide, Hazardous Chemicals, and ACGIH TLVs and Biological Indices.

A.1.3.9 Cleaning.

In this standard, cleaning is divided into three categories, routine, advanced, and specialized.

A.1.3.9.1 Advanced Cleaning.

Advanced cleaning usually requires elements to be temporarily taken out of service. Examples include hand washing, machine washing, and contract cleaning.

A.1.3.9.3 Routine Cleaning.

Examples include brushing off dry debris, rinsing off debris with a water hose, and spot cleaning.

A.1.3.9.4 Specialized Cleaning.

This level of cleaning involves specific procedures and specialized cleaning agents and processes.

A.1.3.49 Organization.

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.

A.1.3.77 Trim.

Retroreflective materials enhance nighttime visibility, and fluorescent materials improve daytime visibility.

A.2.1.1

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and NFPA 1581, *Standard on Fire Department Infection Control Program*, also provide requirements and information on cleaning and decontamination.

Protective ensembles and ensemble elements are important tools that enable fire fighters to perform their jobs in a safe and effective manner. Organizations need to recognize that these items do not have an indefinite life span and that regular inspections are a necessary part of any protective equipment program.

A.2.2.3

Organizations should ensure that accessories do not degrade the performance of ensemble elements.

A.2.2.4

Retirement criteria should be based on a number of factors, including but not limited to: the overall condition of the item, specific deterioration of materials or components beyond their repair economically, or the inability to adequately remove hazardous materials, and other contaminants. Physical damage from use or improper cleaning are other factors that can affect when an item should be retired. The actual service life of ensembles and ensemble elements will vary depending upon the amount of their use and the care they receive.

A.2.3.1

Records are an important part of an overall protective clothing management program. Records can be used to provide information about the life cycle of protective ensembles and elements, they can be used to document repair and decontamination efforts, and can be used to compare the effectiveness of elements that are made of different materials or by different manufacturers.

A.2.5

The public should not be exposed at any time, except during emergency operations such as rescue, to soiled or contaminated protective equipment used by emergency response personnel. Extra caution should be practiced to avoid exposing children to soiled protective equipment since they are usually more interested in actually touching and handling the equipment than are adults. Children are also less likely to wash off any dirt or soot that they might have picked up from handling the ensemble or elements. Under no circumstances should soiled or contaminated personal protective equipment be brought into the home, washed in home laundries, or washed in “public” laundries unless the public laundry has a dedicated business to handle fire fighting protective clothing.

A.3.1

The organization should consider establishing a committee to oversee the process of selecting ensembles or ensemble elements. This committee should consist of interested

individuals representing a cross section of the organization (i.e., from both labor and management who collectively have several years of experience in fire fighting activities). The role of the committee should be to set and define goals and requirements and identify areas of responsibility for each member, plus provide recommendations to the authority making the final decisions.

Copies of specifications on the organization's current ensembles and ensemble elements should be distributed to the committee as a point of reference. The committee should consider if there are possible areas for improvement to the existing specifications. Examples of improvement criteria over existing specifications include heat stress, weight, design, style, interface with other components, durability, comfort, flexibility, safety, performance, price, customer service, delivery, compliance, reliability and warranty.

A.3.1.1

The safety officer is the logical individual to perform this function as it is his/her role in the organization. The safety officer should also consider national trends when performing this task. NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, substantiates OSHA's regulations in Sections

(1) 2.3, Mandatory evaluation of safety and health programs

(2) 2.4.1.1, Mandating compliance to state and federal laws

(3) 2.5.2, Safety officer responsibilities related to protective ensemble elements (which is also defined in NFPA 1521)

(4) 5.1, Requirements for ensembles and ensemble elements

A.3.1.2

These standards provide minimum requirements. Additional requirements may be necessary. Organizations should also solicit and exchange information with other organizations as a further informational resource. Fire service user groups such as SAFER, NAFER, CAFER, and FIERO are also avenues to aid in this process.

A.3.1.3

Certification of protective elements can be checked by examining the product label for the mark of the certification organization. The organization should further check the certification of the specific protective element by contacting the certification organization and asking if the item is listed as being certified as compliant with NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*. Finally, the organization can check the legitimacy of the certification organization by asking for documentation that shows that the certification organization has been accredited to ANSI Z34.1, *Standard for Third-Party Certification Programs for Products, Processes, and Services* or ISO 65, *General requirements for bodies operating product certification systems. (See also A.8.1.4.)*

A.3.1.4

Products that are compliant with NFPA 1971, *Standard on Protective Ensemble for*

Structural Fire Fighting, offer different materials and construction with different properties.

A.3.1.5

The organization should consider the interface of items such as helmets with hoods and SCBA, gloves and hoods with coats, trousers with boots, etc.

A.3.1.6

Organizations should contact manufacturers or vendors about field tests programs. Many will provide sample items for tests. The following criteria should be used to conduct an effective field test.

(a) Test participants should be selected based on a cross section of personnel, willingness to participate, objectivity and level of operational activity.

(b) Participants should wear test each different product model being evaluated from each manufacturer for a particular ensemble element. Participants should be fitted for each product model being evaluated from each manufacturer. Evaluations should be conducted using the same participants, who use/evaluate each ensemble.

(c) A product evaluation form should be developed for each element and interface area. The form should include a rating system for those characteristics considered important to the organization that will facilitate a quantitative evaluation. Evaluation forms should include general performance criteria; a specific length of timer for the field test; and criteria addressing ease of movement, ability to work, and so forth. Size and fit issues should be addressed since they relate to comparative evaluation of ensembles and ensemble elements. Evaluation forms that provide only narrative responses should be avoided.

(d) The organization should solicit periodic reports from participants in the field test. At least three evaluation reports should be completed. These evaluation reports should be filled out independently.

(e) The organization should conclude the evaluation process in a timely manner and analyze the results.

A.3.1.7

Specifications translate the organization's needs into performance or design requirements that can be met by manufacturers of protective equipment. Specifications should clearly address every aspect of the department's needs and expectations in regard to both the performance and the delivery of the ensembles or ensemble elements. Organizations should specify delivery time requirements, and if appropriate, penalty assessments for not meeting delivery dates. Warehousing requirements, if desired, should also be established in the procurement specification.

Organizations should, however, be careful not to write specifications that are redundant, contradictory or that cannot be met by manufacturers of ensembles or ensemble elements. For example, be sure the TPP specified can be achieved with the materials specified. A pre-bid meeting with participation of potential bidders or manufacturers is useful in eliminating inconsistencies or explaining requirements, which can be unclear in the

specifications.

Organizations should continuously review and document how their specifications and ensembles and ensemble elements meet their needs and applicable standards. There are many ways to improve the quantity and quality of information received from prospective bidders. Additionally, increased purchasing power potential can be gained by forming collective buys with other organizations for possible volume discounts.

Purchase specifications should indicate the organization's selection of choice for the following required NFPA 1971 element components:

(1) Garment outer shell material: fabric, weight, color

(2) Garment thermal liner material

(3) Garment moisture barrier material: base fabric, film or coating

(4) Garment trim: configuration, material, color

(5) Garment closure system

(6) Garment wristlets: material, design

(7) Hood: material, face opening design

(8) Gloves: composite materials, wristlet or gauntlet, wristlet material

(9) Helmet: material, color, retention system, trim configuration, trim color, ear cover material, ear cover dimension, eye protection

(10) Boots: composite materials

A.3.1.7(2)

An organization should consider their needs for performance or features in excess of the minimum requirements of NFPA 1971, such as the following:

(a) *Garments.*

(1) Any styling issues

(2) Any specific range of motion requirements

(3) Any sleeve retraction requirements

(4) Any garment rise with overhead reach requirements

(5) Any winter liner requirements

(6) Any additional reinforcement needs (recognizing multiple layering can modify protective performance in several areas, especially breathability)

(7) Any specific additional thread requirements

(8) Any specific additional requirements for stitch characteristics

(9) Any customized sizing requirements

(10) Any attachment requirements for liners and outer shells

(11) Any specific requirements for placement and materials of trim (and reflective lettering, if desired)

(12) Any specific material choices

(13) Any requirements for weight reduction

(14) Any specific details of required suspender construction or suspender/garment interface

(15) Any requirements for spot or localized enhanced insulative performance

(16) Any requirements for field interchangeability or replacement of reinforcement pieces

(17) Any requirements for enhanced flexibility at movement sensitive areas

(18) Any requirements for notification systems to indicate liner absence

(19) Any requirements for MB substrate or thermal fill accessibility to allow field inspection

(20) Any requirements for lumbar support systems

(21) Any customization requirements

(22) Any passport/accountability system requirements

(23) Any specialized or additional pocketing requirements

(24) Any flashlight clips required

(25) Any PASS interface features required

(26) Any requirements for personal escape or rescue features

(27) Any requirements for sizing adjustment

(28) Any requirements for temperature sensing features

(29) Any requirements for interface area compatibilities

(b) *Helmets.*

(1) Any styling requirements

(2) Any customization requirements

(3) Any faceshield/goggles requirements

(4) Any reflective marking requirements

(5) Any customized sizing requirements

(6) Any specific material choices

(7) Any specific requirements for earflaps (design, materials, and dimensions and attachment to shell specifics)

(8) Any specific requirements for suspension construction

(9) Any requirements for weight reduction

(c) *Gloves.*

(1) Any specific material choices

(2) Any overall styling requirements

(3) Any details of cuff styling (wristlet or gauntlet)

(d) *Boots.*

(1) Any specific material choices

(2) Any overall styling requirements

(3) Any interface with trouser requirements

(e) *Hoods.*

(1) Any specific material choices

(2) Any styling requirements

(3) Any coverage requirements

(f) *All elements.*

(1) Any additional certification requirements (i.e., Project FIRES, State OSHA, Fed OSHA)

(2) Any requirements for interface with existing elements of the protective ensemble

(3) Any warranty requirements

(4) Any requirements for cleaning and repair support

(5) Any requirements for manufacturer or dealer references

A.3.1.7(3)

Depending on the items being purchased and the size of the order, organizations should consider requiring product representatives to provide samples with their proposals. Manufacturers should also be required to provide complete user instructions and warranty information with each bid. Organizations should review the past record of each manufacturer concerning length of time for delivery, repair turn around times and similar "customer service" issues.

A.3.1.7(4)

Organizations can obtain assistance in garment sizing from ASTM F 1731, *Standard Practice for Body Measurements and Sizing of Fire and Rescue Services Uniforms and Other Thermal Hazard Protective Clothing*. Helmets are adjustable and fit a wide range of sizes. If a helmet is not adjusted correctly, it might not stay on the users head during active periods of wear. In addition to the sizing and depth adjustments, many models are also

available with quick adjusters to accommodate varying conditions for proper fitting. (i.e., with or without SCBA facepiece).

A.3.1.7(5)

Organizations should consider comparing a pre-production sample from the apparent winning submitter against the purchase specifications before awarding the bid.

A.4.1.2

It is not the intent of this standard to require the cleaning of ensembles and ensemble elements if those elements are not soiled. Organizations should establish guidelines for judging the extent of soiling that requires cleaning based on their needs and experience. In applying this judgement organizations should, however, also take into consideration the importance of keeping ensembles and ensemble elements clean. Soiled elements can pose a health risk to the wearer and can provide reduced levels of protective performance.

A.4.2.2.3(6)

Ensure that sides and edges of both faceshields and goggles are maintained to preserve peripheral vision.

A.4.3.1

For any inspection program to be effective, ensembles and ensemble elements should be evaluated by trained individuals. The individuals evaluating the ensembles and ensemble elements should understand the limitations of each element and recognize the signs of failure. Utilizing trained individuals will provide consistency on whether an item should be repaired or retired. The organization should determine the level of training appropriate for their organization. Resources for training that should be considered, as a minimum, are the manufacturer(s) of the elements in use, the FEMSA User Guide, NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, professional cleaning and repair facilities, and fire service organizations such as SAFER, NAFER, CAFER, and FIERO.

A.4.3.1.1

The inspection grading scale provided below is designed to assist fire department personnel in identifying and documenting the condition of ensembles and ensemble elements. It describes the overall condition of the equipment and an asterisk is used to note that a specific component can require repair even though the general condition is acceptable. Grade definitions are as follows:

(a) *New or as-new condition.* Newly purchased items that are in like new condition.

(b) *Good condition.* Items in good serviceable condition; might show wear but replacement or repair is not necessary.

(c) *Maintenance needed.* The item is in need of repair. The organization will determine if the item is to be repaired or retired. Maintenance details shall be described in the "Comments" section of the inspection form.

(d) *Immediate replacement.* The item is unsafe and should be removed from service.

A.4.3.2.1

When garments have an optional winter liner, the winter liner should be inspected during each advanced inspection.

A.4.3.2.1(3)

All charred, burned, or discolored areas should be thoroughly checked for strength and integrity by aggressively flexing the material and attempting to push a finger or thumb through the fabric. Any loss of strength or weakening of the materials to the degree where the material can be torn with manual pressure is a sign of deterioration and the garment should be removed from service.

A.4.3.2.1(4)

While all materials and components in protective elements are susceptible to different types of damage from wear or abuse, the moisture barrier is one of the most difficult parts of the protective garment to inspect and evaluate. This is because the film or coating side, of most moisture barriers, faces the interior of the liner and is hidden from easy examination. Even where a garment is equipped with a means of opening the liner to view the film or coating side, it is difficult to conduct a visual evaluation of the moisture barrier film or coating. Even a physical examination of the moisture barrier film or coating side will not detect all types of damage or defects that can lead to loss of liquid-penetration resistance for the protective garment.

Moisture barrier coatings or films could become abraded, tear, or have pinholes from use. In severe cases, this degradation in some moisture barrier materials can take the form of separation, cracking, or flaking. Tapes used on moisture barrier seams, to ensure garment integrity against liquid penetration, could also crack, lift, or completely separate. Only the most obvious damage is usually observable, therefore, the following field evaluation procedure is recommended.

The field evaluation procedure should be performed on high abrasion areas of the garments; such as the broadest part of the shoulders and the back waist area of the coat, and the knees, crotch, and seat of the trousers. However, where potential damage to the garment outer shell or thermal barrier has been detected, the procedure should be conducted on the corresponding area of the moisture barrier; and where potential damage to the moisture barrier has been detected or is expected, the procedure should be conducted on that area.

The field evaluation procedure should be performed at room temperature. An alcohol-water mixture should be made by combining 1 part rubbing alcohol (70 percent isopropanol alcohol) with 6 parts of tap water. If there are any questions about using alcohol-tap water mixture for evaluating the protective garment, the garment manufacturer should be contacted directly for advice.

A dry thermal/moisture barrier liner should be placed over a bucket with the thermal barrier

side facing down and the moisture barrier side facing up. About 1 cup of the alcohol-tap water mixture should be poured into a cupped area of the moisture barrier side of the liner and the mixture should stand for 2 to 3 minutes. If the liquid passes through the moisture barrier and wets the thermal barrier, the liner should be removed from service and repaired or replaced. After performing this field evaluation procedure, the liner should be cleaned and allowed to completely dry to remove all traces of the alcohol-tap water mixture.

It is important to realize that this field evaluation procedure can produce results that are inconsistent with more comprehensive or sophisticated testing, and might only detect the worst-case failure areas. To perform more comprehensive or sophisticated testing of the moisture barrier, the garment manufacturer should be contacted for advice.

A.4.3.2.1(7)

Material discoloration can indicate many types of possible damage, including but not limited to: dye loss, heat degradation, ultraviolet (UV) damage, and chemical contamination.

A.4.3.2.1(9)

Trim can appear to be undamaged to the human eye when it has actually lost much of the ability to reflect. To check for continued retroreflective properties, perform a simple flashlight test. Hold a bright, focused flashlight at eye level, either next to the temple or on the bridge of the nose. Stand approximately 40 ft from the trim sample; aim the light beam at the sample. Compare the brightness of the reflected light coming back to a sample of new trim. If the reflected light is substantially less than that seen on the new trim, the trim should be replaced.

While this procedure provides a practical evaluation of trim retro reflective performance, it does not evaluate trim fluorescence or mean that the trim will provide adequate fire fighter visibility. Trim can lose fluorescence (day-time visibility) and still remain retro reflective. Trim can also appear to be retro reflective and not have sufficient intensity for night time visibility at far distances. Only testing under laboratory conditions can provide an accurate determination of trim visibility properties.

A.4.3.2.1(10)

If a label problem is identified, the organization should contact the manufacturer of the ensemble or element.

A.4.3.2.4(3)

The watertight integrity of gloves can be evaluated by conducting the following test. Have a test subject wear the gloves and immerse them into water up to the wrist crease of the gloves. The test subject should wear lightweight cotton gloves under the gloves being inspected. The test subject should repeatedly flex his or her hands for a period of 2 minutes and then remove hands from the water. Then remove the test gloves and examine the cotton gloves for signs of watermarks. Gloves showing signs of leakage should be removed from service.

A.4.3.2.5(6)

Excessive tread wear significantly reduces traction and safe footing on many surfaces such as wet flooring and roads, roofs, ladder rungs and apparatus steps and platforms. Inspection of tread wear should focus on the heel and ball of foot areas as these two areas carry the majority of a firefighter's body weight and are the most critical in maintaining adequate traction. The organization should consult with the manufacturer and set guidelines for a minimum tread depth that must be present for footwear to remain in service.

A.5.1.1

The importance of maintaining the cleanliness of ensembles and ensemble elements should not be underestimated. Soiled or contaminated ensembles and ensemble elements are a hazard to fire fighters since soils and contaminates can be flammable, toxic, or carcinogenic. Additionally, soiled or contaminated ensembles and ensemble elements can have reduced protective performance. Clean elements offer the emergency responder better protection and can add to the life of the elements. Ensembles and ensemble elements should, therefore, be cleaned whenever they have become soiled.

In normal everyday use, personal protective equipment becomes dirty by absorbing sweat from the wearer and soils, soot, etc., from the outside environment. Cleaning of ensembles and ensemble elements removes these substances. Ensembles and ensemble elements can also become contaminated with other substances, principally hazardous materials, particulates, and biological agents. The removal of these substances is most often referred to as decontamination. In structural fire fighting, both general cleaning and decontamination of ensembles and ensemble elements might be needed.

Health risks of soiled or contaminated ensembles and ensemble elements. Soiled or contaminated ensembles and ensemble elements can expose fire fighters to toxins and carcinogens that enter the body through ingestion, inhalation, or absorption. Repeated small exposures to some contaminants can add up over time and cause health problems.

Although great emphasis is placed on safety to avoid injury or inhalation hazards while working on the fire ground, many of the toxins which lead to health risks are being carried away from the fire scene on personal protective equipment used by the fire fighter.

Toxins that a fire fighter will come into contact with can be, trapped within the fibers of soiled ensembles and ensemble elements or absorbed into the materials themselves. Contact with the soiled ensembles and ensemble elements increases the risk of the toxic contaminants being introduced into the body.

Clothing contaminated with blood or other body fluids presents a potential risk of a communicable disease being transmitted to the person coming into contact with the contaminated clothing system.

Reduced performance hazards of contaminated ensembles and ensemble elements. When clothing or equipment becomes laden with particles and chemicals, other problems are faced in addition to being exposed to toxins, such as the following:

(a) Soiled ensembles and ensemble elements typically reflects less radiant heat.

After materials are saturated with hydrocarbons, they will tend to absorb rather than reflect the radiant heat from the surrounding fire.

(b) Ensembles and ensemble elements heavily contaminated with hydrocarbons are more likely to conduct electricity, increasing the danger when entering a building or vehicle where wiring can still be live.

(c) Clothing materials impregnated with oil, grease, and hydrocarbon deposits from soot and smoke can ignite and cause severe burns and injuries, even if the materials are normally flame resistant.

Even though the number of specialized hazardous materials response teams is growing, individual fire fighters can still encounter various chemicals in their normal fire fighting activities. Exposures to oils, gasolines, and lubricants can occur around fire station vehicles. During responses, exposures to liquids ranging from pesticides to acids to chemical solvents can occur, knowingly or unknowingly. These contaminants, in addition to being hazardous, can also degrade protective clothing material. For example:

(1) Clothing fabrics can become weakened and tear more easily.

(2) Thread or seam sealing tape can become loose.

(3) Flame retarding or water repelling treatments can be removed.

(4) Reflective trim can become less visible.

(5) Helmet shells, helmet faceshields, or goggles can pit or craze.

(6) Ensemble and ensemble elements hardware can become corroded.

A.5.1.3

Some dry cleaning solvents that are used in lieu of water can damage components of the ensembles and ensemble elements; reflective trim and leather gloves, in particular, can be adversely effected by these solvents. Consult with the manufacturer prior to dry cleaning to confirm that ensembles and ensemble elements will not be damaged.

A.5.1.4

For ensembles and ensemble elements that are to be cleaned or decontaminated by contract cleaning, refer to the following questions to assist in determining if the contract cleaner is knowledgeable enough to provide adequate service and not cause damage to the ensembles and ensemble elements.

(1) Can the ensembles or ensemble elements be effectively cleaned or decontaminated? (See information following A.5.1.4, item 14).

(2) Does the contract cleaner have references for cleaning and/or decontamination of ensembles and ensemble elements?

(3) Does the contract cleaner have liability insurance to clean protective clothing (i.e., for the repair or replacement of ensembles and ensemble elements damaged in laundry, from wash water contamination, etc.)?

(4) Does the contract cleaner take reasonable precautions for protecting their personnel from contaminant exposures while handling ensembles and ensemble elements?

(5) Is the contract cleaner familiar with the requirements of NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, and NFPA 1581, *Standard on Fire Department Infection Control Program*, as well as federal state, and local regulations?

(6) Does the contract cleaner have a quality assurance program?

(7) What type of process does the contract cleaner use? Are Material Safety Data Sheets (MSDS) available? If the process is proprietary, it is approved by the ensemble's or ensemble elements; manufacturer?

(8) Does the contract cleaner take appropriate steps to prevent cross contamination between any and all products laundered in the facility?

(9) How does the contract cleaner demonstrate the effectiveness of the cleaning process?

(10) What testing or evaluation method(s) will be used to assure that decontaminated ensembles or ensemble elements are truly decontaminated and safe to wear?

(11) Does the contract cleaner comply with applicable federal, state, and local wastewater discharge regulations and standard?

(12) Does the contract cleaner provide delivery and pick-up services for soiled and/or contaminated ensembles and ensemble elements?

(13) Does the contract cleaner have the capability to restore water repellent properties of ensembles and ensemble elements?

(14) What is the turn around time provided by the contract cleaner?

It is important that the organization request information from the contract cleaner or cleaning agent supplier about the effectiveness of cleaning agents and cleaning procedures, in addition to the effects of the cleaning agents and cleaning procedures on ensembles and ensemble elements. There are few established procedures for making these determinations, although the following guidelines are offered.

Request information about the cleaning effectiveness of their process or the cleaning agent. Actual cleaning effectiveness should be demonstrated by washing clothing that has either become soiled from use or is intentionally soiled. Cleaning effectiveness is typically confirmed by a visual comparison of the before and after cleaned samples. It is important to note that clothing that appears clean, might not be fully clean and can contain chemical contaminants.

Request data about the effects of their cleaning process or cleaning agent on protective garments for structural fire fighting. The effects of the cleaning agent or cleaning process on clothing should be judged on the basis of tests performed on representative material or clothing samples following several cleaning cycles (washing and drying). These samples should be subjected to at least 10 cleaning cycles; however, organizations may want to have suppliers or contract cleaners demonstrate effects on clothing after as many as 25 cleaning

cycles. Ideally, clothing should be evaluated for each of the performance properties listed in NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, however, key properties can be selected. Table A.5.1.4 provides a recommended list of key properties for evaluation.

Table A.5.1.4 Recommended Performance Tests for Evaluating Effects of Cleaning Agents or Cleaning Procedures

Performance Property	Test Method[1]	Type of Samples	Specimens Re
Thermal protective performance	Section 6.10	Composite	3 - 150 mm × 150 mm squar
Flame resistance	Section 6.2	Outer shell Moisture barrier Thermal barrier	5 - 75 mm × 305 mm (3 in. (in each material direction)
Tear strength	Section 6.12	Outer shell Moisture barrier Thermal barrier	5 - 75 mm × 150 mm (3 in. (in each material direction)
Tensile strength	Section 6.50	Outer shell	5 - 100 mm × 200 mm (4 in. (in each material direction)
Water absorption	Section 6.26	Outer shell	3 - 200 mm (8 in.) squares
Cleaning shrinkage	Section 6.27	Outer shell Moisture barrier Thermal barrier	5 - 375 mm (15 in.) squares
Fuel C penetration resistance	Section 6.28	Moisture barrier seams	3 - 75 mm (3 in.) squares
Viral penetration	Section 6.29	Moisture barrier seams	4 - 75 mm (3 in.) squares
Trim visibility	Section 6.46	Trim sections	4 - 305 mm (12 in.) lengths

[1] Section from NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting* (2000 edition).

[2] Specimens that would either be removed from clothing or representative material samples.

Other properties can be evaluated that are of interest to the organization. Examples include

(1) Composite weight

(2) Composite thickness

(3) Composite total heat loss (breathability)

(4) Outer shell colorfastness to washing

(5) Outer shell colorfastness to light exposure

(6) Outer shell or thermal barrier abrasion resistance

The effects of cleaning properties are evaluated by comparing the measured property after washing with the same property measured for new material. Both the after-cleaning level and the change for the measured property are important to review. Properties should remain at or above the minimum performance requirements established in NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*. Nevertheless, it is important to take note of large changes in clothing material properties. For example, the tear strength of a material can be measured at a level of 11.4 kg (25 lb) before cleaning and then 10 kg (22 lb) after

several cycles whereas a different material could begin at 18.2 kg (40 lb) and drop to 11.4 kg (25 lb) after the same number of cleaning cycles. This particular case points out the case where one material might be more susceptible to cleaning.

It is also possible that some measured properties may increase after multiple cleaning samples. For example, thermal insulation as measured in the thermal protective performance test often improves after washing because the thickness (or loft) of the materials increase.

The loss of water absorption resistance for outer shell can be reduced by the reapplication of water-repellent finishes. It is essential that chemicals used in this process be determined to be safe without any adverse effects on the clothing.

In evaluating the effects of a cleaning agent or cleaning procedures on clothing, it is important to realize that applying multiple cleaning cycles to protective clothing does not simulate its use. Cleaning is but one factor in the "wear" of protective clothing. Cleaning when properly applied might also extend the life of the protective clothing.

A.5.2.1

Routine cleaning is a light cleaning of ensembles and ensemble elements performed by the end user without taking the elements out of service. Routine cleaning can be accomplished by brushing off dry debris, rinsing off debris with a water hose, and spot cleaning.

A.5.2.3(1)

Routine cleaning immediately after the termination of an incident can remove substantial amounts of surface contaminants before they have a chance to "set in." This can also help to limit the transfer of contaminates to apparatus and stations.

A.5.3.1

Advanced Cleaning is a thorough cleaning of ensembles and ensemble elements accomplished by washing them with cleaning agents. Advanced cleaning usually requires elements to be temporarily taken out of service. Advanced cleaning can be accomplished by hand washing in a utility sink, machine washing, or contract cleaning.

Soiling can not always be visible. Soiling can be difficult to observe on darkly-colored materials. In addition, exposure can occur where clothing is contaminated with fire gases, and result in clothing that can be relatively unsafe for use. Clothing that has not been cleaned and appears to be unsoiled has been shown to contain numerous fire gas chemicals including carcinogenic polynuclear aromatic compounds. Periodic cleaning of clothing is required to avoid use of clothing that could be contaminated without visible evidence of soiling.

A.5.3.2

The organization should determine the level of training appropriate for their organization. Resources for training that should be considered, as a minimum, are the manufacturer(s) of the elements in use, the FEMSA User Guide, NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, professional cleaning and repair facilities, and fire service organizations such as SAFER, NAFER, CAFER, and FIERO.

A.5.4.1

Specialized Cleaning can involve specific procedures and specialized cleaning agents and processes as necessary to remove hazardous materials or biological agents.

The effectiveness of cleaning processes will vary with the type of cleaning process used. In some cases, advanced cleaning can accomplish the same functions as specialized cleaning, such as in the removal of body fluids.

A.5.4.6

Organizations should consult the local hazardous materials team or health department and seek their assistance in determining what the contaminate(s) is and if the contamination is a true hazardous materials situation. Should it be determined that the contamination is not a hazardous material, advanced cleaning should be performed.

A.5.4.6.2

Organizations should be aware that decontamination of protective clothing and equipment is a complicated process for which there is no guarantee for demonstrating that protective elements are free from contamination.

While the purpose of decontamination is to remove all contaminant(s) from element, decontamination procedures or cleaning processes are not always 100 percent effective in removing all contamination. The actual success of a decontamination process can only be determined by measuring the concentration of the contaminant(s) in the element before and after the selected decontamination or cleaning process. The sole evaluation of contamination levels in rinse water is not an appropriate measure of decontamination effectiveness. Claims for protective elements being contaminant-free based on statements from contract cleaners or from the use of specific cleaning products should be viewed with caution.

Procedures used for measuring contamination levels in clothing should be specific the contaminant(s), if known. Useful analytical procedures for measuring levels of semi-volatile organic chemicals in materials are found in EPA methods 3540 (extraction) and 8720 (analysis). These procedures involve extracting a small piece of fabric in a solvent such as methylene chloride and analyzing the extract solution using gas chromatography in conjunction with mass spectrometry. The gas chromatography separates chemical contaminants and quantifies their amount, while the mass spectrometry identifies the specific chemical.

Similar analytical procedures for measuring levels of inorganic chemicals (such as heavy metal contaminants like chromium and lead) in materials are found in EPA methods 3015 (digestion) and 6010 (extraction). These procedures similarly involve analysis of a small clothing material specimen by digesting the specimen in nitric acid and then treating with 50 percent hydrogen peroxide. The solution of the digested specimen is then diluted for analysis by atomic absorption or ion coupled plasma spectroscopy to identify and determine the amount of different inorganic substances.

Since these procedures are very sensitive for quantifying many forms of contamination, any

testing for measuring contamination levels should involve “control” tests. Control tests are separate measurements of clothing to determine other background contamination that might be present in the material or in residue left from the cleaning agents or cleaning procedures. Failure to consider these chemicals can interfere with the accuracy of measurements for actual contaminants. In general, two control tests are needed:

(1) A test of the same material being analyzed without contaminant present (this could be taken from clothing having a similar history that was unexposed to the contaminants)

(2) A test of the same material after washing that have been subjected to the cleaning process (this could be accomplished on a piece of new material that has been cleaned using the subject cleaning agent and procedures).

The levels of residual contaminants from these control tests should be subtracted from the after-cleaning samples. The residual contamination from the first control test should be subtracted from the pre-cleaning samples.

Decontamination effectiveness can be determined by calculating the proportion of contaminant removed using the following equation.

$$\text{Percent decontamination efficiency} = \frac{\text{Initial level of } C - \text{Final level of } C}{\text{Initial level of } C}$$

where:

C = contaminant in clothing

The decontamination effectiveness will vary with each contaminant because some contaminants can be more easily removed other contaminants given differences in the properties of the contaminant and properties of the contaminated element materials. For example, chemicals such as hexane and benzene that evaporate easily will usual be removed relatively easy when compared with non-volatile (non-evaporating) chemicals found in tars and oily chemicals.

The remaining level of contaminant in protective element can be used to determine the potential risk to the wearer. However, there are no established safe levels of surface concentration for most contaminants. The decision to reuse a protective element based on known, measured levels of contamination must be undertaken by a trained professional who is familiar with the properties and hazards of the contaminant. Any uncertainty in the risk presented by residual contamination in the protective element can be cause for retirement and disposal of the protective item.

The procedures for measuring contamination levels in protective elements are usually destructive in that they require that a specimen be taken from the protective element and subjected to extraction or digestion with a solvent. This requirement in addition to the expense of the analytical testing can make the decision to investigate contamination levels in protective elements cost-prohibitive.

Specimens of protective elements taken for determination of contamination levels can not be

representative for all areas of the protective element being sampled. For example, a specimen taken from the pocket of the coat can not reflect the contamination levels for the back of the coat or the bottom of the trousers. In addition, sampling of one protective element can not be representative of all elements from a certain group that arc, or are suspected of being, contaminated. Contamination levels within different protective elements of the same type depend on the type of exposure, the condition of the protective element and the care provided to that protective element.

Concerns over protective element contamination can arise from a single incident involving a contamination event or can be an ongoing consideration as contaminants from routine situations accumulate within the clothing. Organizations can wish to periodically sample clothing to determine the effectiveness of cleaning processes in removing harmful contaminants. Organizations engaged in the process should understand the limitations of the approach, specifically that sampling cannot be representative of protective elements in use.

Further details about this information is provided in the report for the U.S. Fire Administration, "Research, Testing, and Analysis on the Decontamination of Fire Fighting Protective Clothing and Equipment." A synopsis of this report is provided in ASTM Special Technical Publication (STP) 1237, "Evaluating the Effectiveness of Different Decontamination and Laundering Approach for Structural Fire Fighting Clothing."

A.5.5.2

Chlorine will damage the fibers of the protective fabrics used in ensemble elements.

A.5.5.5

Ensembles and ensemble elements should only be cleaned and decontaminated with like elements, including but not limited to, hoods with hoods, gloves with gloves, and boots with boots.

A.5.5.5.1

It is highly recommended that garment liner systems be removed (if possible) and cleaned separately to avoid contamination with the debris found in the shell. Removing the liner will result in better cleaning since the moisture barrier limits the flow of water through the outer shell fabric. Separating the liner from the outer shell will also reduce drying time.

A.5.5.6

Cleaning in a utility sink is an appropriate method for cleaning ensemble elements such as helmets, footwear, and gloves. Utility sink cleaning can also be used for garment elements items such as coats, trousers, coveralls, and hoods.

A.5.5.6(2)

Soak garments per the detergent manufacturer's instructions. Remove the garments and drain the soak water.

A.5.5.6(3)

Water above 40°C (105°F) can cause scalding of the hands when washing is performed in a utility sink. Water above 40°C can also cause damage to some components on protective clothing.

A.5.5.6(5)

Appropriate precautions should be taken to provide protection from possible exposure to contaminants during the cleaning process.

A.5.5.7

Machine cleaning is an appropriate method for cleaning ensemble elements such as coats, trousers, coveralls, and hoods. (In some cases, gloves can be machine cleaned.) It is the most effective means of loosening and removing dirt, soot, and other debris. There are two basic types of automatic washing machines. These are top loading (typical home laundry machines), and front loading washer/extractors. Outlined below are some of the advantages and disadvantages of each type of machine.

Top Load Washers. Top load machines are similar to the type used in most homes. They use a center post agitator to whisk water through the fibers of garments. They are designed to clean multiple garments of minimum bulk. As a result of the center post agitation, it is generally accepted that top load machines are more damaging to ensembles and ensemble elements than front load machines. Top load, agitating machines, have the potential to reduce the longevity of garments due to mechanical damage. If top load machines are used, stainless steel wash tubs are recommended to protect against rusting and chipping, and the associated wear on garments.

Front Load Washers. Front load washers 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. For these reasons, it is generally accepted that front load machines are more appropriate for protective clothing.

A.5.5.7(1)

For example, no more than one set of garments in a top load machine and follow machine manufacturer’s instructions for front load machines. Proper load size is essential for effective cleaning.

A.5.5.7(2)

Soak the garments per the detergent manufacturer’s instructions. Remove the garment and drain the soak water. If necessary, scrub gently using a soft bristle brush. Extra care should be taken with liner assembles.

A.5.5.7(5)

It is important to check with the manufacturer as the appropriate wash temperature for

machine washing of protective garments because different materials and components in the garment can have different susceptibility to wash temperatures and other washing conditions. For example, leather, rubber coated materials, and some fluorescent film based materials can be affected by relatively high wash temperatures, and can degrade prematurely when repeated washed under these conditions.

A.5.5.7(7)

If machine does not automatically have a second rinse, run an additional complete cycle without detergent.

A.5.5.7(10)

When possible, organizations should provide a washing machine(s) for the sole purpose of cleaning protective clothing.

A.5.6.1

The decision of how to dry ensembles and ensemble elements after cleaning should be made with two factors in mind: time constraints and the affect of the drying method on the ensembles and ensemble elements.

A.5.6.2

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 of drying can be achieved by simply using fans that re-circulate air inside a room where ensembles and ensemble elements are drying. 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 be dependent on the efficiency of the drying room and the ambient conditions. Heating of the room or the inlet air at temperatures 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.

A.5.6.2(1)

The use of racks providing maximum air exposure of the ensembles and ensemble elements will decrease the overall drying time that is necessary.

A.5.6.2(2)

Exposure to direct sunlight will cause degradation of fibers in protective garments resulting in fabric strength loss.

A.5.6.3

Machine drying of ensembles and ensemble elements is generally not recommended. Dryers can reach very high basket-temperatures during operation, potentially damaging ensemble

elements. Machine drying also includes mechanical action which can cause damage to ensembles and ensemble elements.

A.5.6.3(4)

No-heat is the preferred method of machine drying as it effectively accomplishes forced air ventilation.

A.5.6.3(5)

Excessive temperatures can cause damage to ensembles and ensemble elements, excessive garment shrinkage, and potentially cause premature failure and retirement of protective equipment.

A.5.6.3(6)

Temperatures can rise as the garments in the basket dry out.

A.5.9.5

On leather footwear, a leather conditioner can be used in accordance with the footwear manufacturer's instructions.

A.6.1.6

Moisture barrier materials are found in collars, collar closure systems, and can also be found in other assemblies, including but not limited to, stormflaps and sleevewells.

A.6.1.7

While some loss of quilting threads on thermal liners is the normal result of wear, excessively large areas where quilt stitching is broken or missing can indicate the need to replace the liner.

A.6.1.15

Stress areas are generally considered to be at the corners of pockets and flaps, the base of the fly, the top and bottom of the storm flap, or any place where the stitching begins or ends.

A.6.1.18

Although some hardware can be replaced in the field, it should be noted that this field application might not be as permanent or as strong as when the hardware is replaced at the factory, or at repair facilities recognized by the original manufacturer.

A.6.1.19

Depending upon the method of construction, broken zippers can be replaced in the field, providing this can be accomplished without causing a breach to any moisture barrier material and without affecting the garment integrity.

A.6.1.20

Depending upon the method of construction, hook and loop can be replaced in the field, providing this can be accomplished without causing a breach to any moisture barrier material and without affecting the garment integrity.

A.6.1.21

Reinforcing materials include, but are not limited to, suede leather, and outer shell fabrics.

A.6.2.3

Manufacturers literature supplied with the helmet should be consulted for disassembly instructions. If the manufacturer's instructions cannot be located, contact the manufacturer for a new set of inspection/maintenance instructions. Accessories to structural fire fighting helmets should include only those items, which are provided by, or recommended by, the manufacturer. Since after-market accessories affect the weight and balance of the helmet, they should not be utilized unless they have the approval of the manufacturer. Never attempt to drill out pre-existing holes to accommodate after-market accessories.

A.7.1

Proper storage of ensembles and ensemble elements will extend their life, maintain their performance, and reduce potential health risks. Improper storage can result in damage to the ensemble or element and can compromise the fire fighter's safety. Certain conditions can result in a deterioration of performance of the ensemble or element, or create potential health hazards.

A.7.1.1

UV light, especially from sunlight, is a known cause of protective ensemble degradation. Storage in direct sunlight will cause degradation of fibers in protective garments resulting in fabric strength loss, and can cause accelerated aging of other equipment. In addition, other UV light sources, such as fluorescent light, can cause similar degradation, although ongoing research suggests that the degradation from fluorescent light is far less severe than exposure to direct sunlight. Therefore, ensembles and ensemble elements should be stored to minimize exposure to all sources of UV light.

A.7.1.2

Storage of wet or moist ensembles and ensemble elements will promote the growth of mildew and bacteria, which can lead to skin irritation, rashes, or more serious medical conditions. Mildew and bacteria growth can also affect the strength of some materials.

A.7.1.5

Storage in extreme temperatures for extended periods can accelerate the deterioration of ensembles and ensemble elements. A cold performance parameter of -40°C (-40°F) is used in NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*. A temperature

of 82°C (180°F) could cause some adhesives to lose their integrity.

A.7.1.6

Storage in abrasive environments or in contact with sharp objects can cause mechanical damage. Avoid contact with tools, and other equipment when storing elements in compartments or trunks. Where ensembles and ensemble elements are transported or stored in these environments, the use of a protective bag is required.

A.7.1.7

Soiled ensembles and ensemble elements can present a health risk to individuals who come into contact with them and need to be segregated from other protective clothing, uniform clothing, personal clothing, or other materials that come into contact with humans. To prevent the spread of disease or infections through cross-contamination, soiled elements should not be cleaned with other items of clothing or laundry.

A.7.1.8

Storage in contact with hydraulic fluids, solvents, hydrocarbons, hydrocarbon vapors, or other contaminants can cause material degradation, transfer toxins to individuals, and reduce self-extinguishing properties of ensembles and ensemble elements.

A.8.1.1

Organizations should develop specific criteria for removal of protective clothing and equipment from service that are specific to the ensembles and ensemble elements being used, the instructions of the manufacturer, and the experience of the organization. Retirement criteria should be based on a number of factors, including but not limited to, the following:

(1) Overall condition of the item

(2) Specific deterioration of materials or components beyond their economical repair

(3) Ability to adequately remove hazardous materials and other contaminants

Physical damage from use or improper cleaning are other factors that can affect when an item should be retired. The actual service life of ensembles and ensemble elements will vary depending upon the amount of their use and the care that they receive.

Where elements are worn, damaged, or contaminated, organizations should determine if it will be more appropriate for them to be repaired, decontaminated, or replaced. One general guideline is if the cost of the repair or decontamination is greater than 50 percent of the replacement cost of the ensemble and ensemble elements, replacement should be considered. Organizations should use a member(s) who has received training in the inspection of structural fire fighting protective ensembles, understands the limitations of each ensemble and element, and recognized the signs of failure, to help them make these decisions.

A.8.1.3

Changes in the type of structural fire fighting ensembles and ensemble elements by a fire

department can result in the retirement of elements that have not reached the end of their service life. These items might be of no further use to the organization in front line service, but can be of use for training or donation to other organizations.

A.8.1.4

All structural fire fighting protective ensembles and protective ensemble elements are required by NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, to be certified by an independent, third-party certification organization. In order for ensembles or elements to meet the requirements of NFPA 1971, the item should carry a statement on the product label stating compliance and also the label, symbol, or other identifying mark of that certification organization.

Any structural fire fighting ensemble or element that does not bear the appropriate compliance statement AND the mark of an independent, third-party certification organization is NOT COMPLIANT with NFPA 1971, even if the product label states that the ensemble or element is compliant.

Third-party certification is an important means of ensuring the quality of fire and emergency services protective clothing and equipment. To be certain that an item is properly certified, labeled, and listed, the NFPA strongly recommends that prospective purchasers require appropriate evidence of certification for the specific product and model from the manufacturer before purchasing. Prospective purchasers also should contact the certification organizations and request copies of the certification organization's "list" of certified products to the appropriate NFPA standard. This "listing" is a required of third-party certification by NFPA 1971 and is a service performed by the certification organization.

Details about certification and product labeling can be found in Chapters 2 and 3 of NFPA 1971. Also, the definitions for "certification/certified," "labeled," and "listed" in Section 1.3 of NFPA 1971 should be reviewed.

The National Fire Protection Association (NFPA), from time to time, has received complaints that certain items of fire and emergency services protective clothing or protective equipment might be carrying labels falsely identifying them as compliant with an NFPA standard.

NFPA advises those purchasing fire and emergency services protective clothing or protective equipment to be aware of the following:

All NFPA standards on fire and emergency services protective clothing and equipment require that the item be certified by an independent, third-party certification organization and, as with NFPA 1971 ensembles and ensemble elements, all items of fire and emergency services protective clothing and equipment should carry the appropriate compliance statement AND the label, symbol, or other identifying mark of that certification organization.

Any item of fire and emergency services protective clothing or protective equipment, covered by an NFPA standard, that does not bear the mark of an independent, third-party certification organization is NOT COMPLIANT with the appropriate NFPA standard, even if the product label states that the item is compliant.

When in doubt as to the authenticity of a certification claim, contact the certification organization *directly*, or the consumer protection agency of your state/provincial government.

A.8.3.1

Organizations can find additional guidance related to the processing of ensembles and ensemble elements that are directly related to serious fire fighter injuries and fire fighter fatalities in the International Association of Fire Fighters manual, "Line of Duty Notification, Assistance, and Investigation Policy," available at www.iaff.org/iaff/Health_Safety/lineofdutydeath.html and the International Association of Fire Chiefs manual, "Guide for Investigating a Line-of-Duty Death," available at www.iafc.org.

A.8.3.2

When developing these procedures, the organization should coordinate with other agencies such as the medical examiner, law enforcement, or other experts to determine what actions a appropriate.

A.8.3.3

See A.8.3.2.

Appendix B Referenced Publications

B.1

The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not considered part of the requirements of this standard unless also listed in Chapter 9. The edition indicated here for each reference is the current edition as of the date of the NFPA issuance of this standard.

B.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 1997 edition.

NFPA 1521, *Standard for Fire Department Safety Officer*, 1997 edition.

NFPA 1581, *Standard on Fire Department Infection Control Program*, 2000 edition.

NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, 2000 edition.

B.1.2 Other Publications.

B.1.2.1 ASTM Publications

American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM Special Technical Publication (STP) 1237, "*Evaluating the Effectiveness of Different Decontamination and Laundering Approach for Structural Fire Fighting Clothing*," 1996 edition.

ASTM F 1731, *Standard Practice for Body Measurements and Sizing of Fire and Rescue Services Uniforms and Other Thermal Hazard Protective Clothing*, 1996 edition.

B.1.2.2 ANSI Publication.

American National Standards Institute, Inc., 11 West 42nd Street, 13th Floor, New York, NY 10036.

ANSI Z34.1, *Standard for Third-Party Certification Programs for Products, Processes, and Services*, 1993.

B.1.2.3 ISO Publication.

International Standards Organization, 1 rue de Varembé, Case Postale 56, CH-1211 Geneve 20, Switzerland.

ISO Guide 65, *General requirements for bodies operating product certification systems*, 1996 edition.

B.1.2.4 USFA Publication.

U.S. Fire Administration, Emmitsburg, MD 21727.

Research, Testing, and Analysis on the Decontamination of Fire Fighting Protective Clothing and Equipment.