NFPA 1851 2008 EDITION – OVERVIEW OF REQUIREMENTS

NFPA 1851, Standard on Selection, Care and Maintenance of
Structural Fire Fighting Protective Ensembles

What is Included? Coats, Pants, Coveralls, Helmets, Gloves, Footwear, and Hoods. Applies to elements (individual clothing or equipment items certified to NFPA 1971-2007 or earlier editions).

What does the Fire Department need to do?
The Fire department *Develops*, *Implements*, and *Manages* a program for the selection, care, and maintenance of structural fire fighting protective ensembles.

INSPECTION
Routine Inspection: Each individual member **must** conduct a routine inspection of their PPE after each use. Routine inspection procedures include:

All elements
- Soiling
- Contamination
- Physical damage
- Damaged trim
- Damaged closures and hardware

Hoods
- Loss of elasticity in face opening

Helmets
- Shell damage
- Damaged or missing components

Gloves
- Shrinkage
- Liner inversion
- Loss of flexibility

Footwear
- Loss of water resistance
- Exposed/damaged parts

Drag Rescue Device (DRD)
- Installation in garment.
- Cuts, tears, punctures, cracking, or splitting
- Thermal damage

Interface components
- Loss or reduction of properties that allow component to continue as effective interface such as loss of shape or inability to remain attached to the respective element(s) where attachment is required.

Proximity Fire Fighting Protective Ensembles
- Loss of radiant reflectivity
- Loss of radiant reflective coating(s) from abrasion

Advanced Inspection: Advanced inspections of PPE and ensemble elements are to be conducted by trained persons within the department or a verified ISP(Independent service provider) at a minimum of every 12 months or whenever routine inspections indicate that a problem may exist. Advanced inspection areas include:

All elements
- Soiling
- Contamination
- Physical damage
- Damaged trim
- Damaged closures and hardware

Garments
- Moisture barrier and seam sealing integrity
- Fit and coat/pant overlap
- Seam integrity including broken or missing stitches
- Material integrity for loss of strength due to UV or chemical exposure
- Loss or shifting of thermal liner material via Light Test see Chapter 12 of NFPA 1851
- Wristlet integrity and functionality
- Reflective trim and Velcro integrity, attachment and functionality
- Label integrity and legibility
- Liner attachment systems
- Closure system functionality
- Accessory compliance
- Correct assembly and size compatibility of shell, liner and DRD

Complete Liner Inspection
- Complete liner inspection of all garment elements shall be performed by a verified ISP or the organization's trained personnel.
- The garment element manufacturer or verified ISP shall provide written verification of training.
- Complete liner inspection of all garment elements shall be conducted at a minimum of 3 years in service and annually thereafter, or whenever advanced inspections indicate that a problem may exist. The liner system shall be opened to expose all layers for inspection and testing.
- Where the moisture barrier, the CBRN barrier, or both have been replaced, the complete liner inspection of all garment elements shall be conducted after 2 years in service after replacement and annually thereafter.
- Physical damage to all layers and sides of each layer

- Loss of seam integrity, broken or missing stitches, and loose or missing moisture barrier seam tape.
- Material physical integrity; UV or chemical degradation as evidenced by discoloration, significant changes in material texture, loss of material strength, loss of liner material, or shifting of liner material.
- Delamination as evidenced by separation of film from substrate fabric, flaking, or powdering.
- The moisture barrier shall be tested using the **hydrostatic test** and shall show no leakage.
- The result of each Water Penetration Barrier Evaluation shall be recorded.

Hoods

- Loss of material elasticity and stretching out of shape
- Seam integrity including broken or missing stitches
- Loss of face opening adjustment

Helmets

- Suspension and retention systems functionality
- Damage to impact dissipating components

Gloves

- Seam integrity including broken or missing stitches
- Loss of shape and elasticity in wristlets
- Loss of water resistance

Footwear

- Loss of seam integrity; delaminating, broken or missing stitches
- Loss of water resistance
- Closure system component damage ad function
- Excessive tread wear
- Condition of linings for tears, excessive wear, and separation from outer layer
- Heel counter/cup failure

Drag Rescue Device (DRD)

- Installation in garment.
- Cuts, tears, punctures, cracking, or splitting
- Thermal damage

Interface components

- Loss or reduction of properties that allow component to continue as effective interface such as loss of shape or inability to remain attached to the respective element(s) where attachment is required.

Proximity Fire Fighting Protective Ensembles

- Loss of radiant reflectivity
- Loss of radiant reflective coating(s) from abrasion

Ensembles with Optional CBRN Protection

- Complete liner inspection of all garment elements shall be conducted at a minimum of 2 years in service and annually thereafter, or whenever advance inspections indicate that a problem may exist.
- Loss of interface functionality
- Excessive material or component shrinkage or stretching
- Inward leakage resistance for interface areas where the interface component is used to provide protection against CBRN terrorism agents, and where the ensemble is certified to the optional CBRN terrorism agent protection requirements

CLEANING

Routine Cleaning: A light cleaning of ensemble and ensemble elements performed by the end user without taking the elements out of service and shall be performed after each use.

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

Minimum Steps for Routine Cleaning

- Manufacturer's label and user information shall be referenced for instructions on cleaning and drying that the manufacturer provided with the ensemble or ensemble element.
- Brush off debris
- Water temperature shall not exceed 40°C (105°F).
- Rinse with water
- Lightly scrub item with soft bristle brush. *Note: NEVER use a brush or any other abrasive cleaning devices when cleaning Outer shell and other radiant reflective components of proximity fire fighting protective ensembles and ensemble elements.
- Spot clean, if needed
- Use cleaning solutions with a pH range of not less than 6.0 and not greater than 10.5
- Chlorine bleach, chlorinated solvents, active ingredient cleaning agents, or solvents shall NOT be used.
- No high velocity water jets such as power washers.
- Inspect item
- Clean again as necessary
- Cleaning of the entire garment element shall be accomplished using advanced cleaning procedures as stated in NFPA 1851

Procedures when cleaning in a utility sink

1. Do not overload sink

2. Pre treat if necessary
3. Water not to exceed 105°F
4. Add cleaning solution or detergent
5. Wear protective gloves & eye/face splash protection
6. Scrub gently using a soft bristle brush. Use care with moisture barrier assemblies
7. Drain water from sink
8. Refill sink; agitate gently using gloved hand or stir stick
9. Gently wring out garments and drain water
10. Repeat (7) and (8) until garment is rinsed
11. Dry the elements
12. Inspect and rewash if necessary
13. Rinse out sink

Advanced Cleaning: A thorough cleaning of ensembles and ensemble elements accomplished by machine washing unless specifically prohibited.

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

Ensemble and ensemble elements that are soiled shall receive advanced cleaning prior to reuse.

Ensemble and ensemble elements that are issued and used shall receive advanced cleaning at the time of advanced inspection if not subjected to advanced cleaning in the previous twelve months.

Cleaning and Decontamination Procedures

1. Examine manufacturer's label
2. DO NOT USE Chlorine bleach or chlorinated solvents
3. Use cleaning solutions with a pH range of not less than 6.0 and not greater than 10.5
4. Washing machines with the capability of drum RPM adjustment shall be adjusted so the g-force does not exceed 100 g (980 m/s^2) for all elements
5. No high velocity water jets such as power washers
6. Clean and decontaminate protective ensembles separately from non-protective items
7. If the coat element has a Drag Rescue Device and the DRD is removable, the DRD shall be removed prior to the coat being laundered. If the DRD also requires cleaning it shall be placed in a separate mesh bag for washing and hung to dry
8. Where shells and liners are separable, clean and decontaminate those items with like items i.e. shells with shells and liners with liners.
9. Separable liner systems shall be turned inside out so the moisture barrier is on the inside for both machine washing and machine drying**.**

Procedures for machine washing

1. Do not overload the machine
2. Pre treat if necessary
3. Fasten all closures, including pocket closures, hook and loop, snaps, zippers, hooks and dees
4. Wash temperature not to exceed 105°F
5. Add detergent
6. Run one complete cycle, rinsing at least twice
7. Dry the elements
8. Inspect and rewash if necessary
9. If the machine is to be used for other than protective ensemble elements rinse out machine by running while empty through a complete cycle with 120°F to 125°F water and detergent

Air Drying Procedure

1. Place elements in an area with good ventilation
2. Do not dry in direct sunlight

Additional Procedures for Other Elements

Proximity Fire Fighting Ensembles and Ensemble Elements

- Do not use a brush or other abrasive cleaning devices.
- Do not machine wash.
- Do not machine dry.

Hoods

- Permitted to be machine washed and machine dried with garment liners.

Helmets

- Do not use machine cleaning or drying using equipment that produces mechanical action from tumbling or agitation.
- Clean helmets shells, headbands, ear covers, crown straps and suspensions in a utility sink using mild detergent and water
- Consult the manufacturer if strong cleaning agents are required
- Do not use solvents shall to clean goggles or faceshields

Gloves

- Clean gloves in utility sink using mild detergent and water
- Do not machine dry using equipment that produces mechanical action from tumbling or agitation.
- Squeeze out excess water, but do not wring.

Footwear

- Do not machine clean or dry footwear using equipment that produces mechanical action from tumbling or agitation.
- Clean footwear in utility sink using mild detergent, water, and soft brush
- Consult manufacturer for information on strong cleaning agents
- Air dry footwear in well ventilated areas out of direct sunlight.

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

REPAIRS

- Only persons who have received training can repair or manage repair of elements.
- Subject garments to advanced or specialized cleaning before repair work is undertaken.
- Always contact the manufacturer to determine whether a repair can be made.
- Repairs must use materials and be made in a manner approved by the manufacturer.
- Replacement interface components shall be installed in a manner consistent with the ensemble or ensemble element manufacturer's method of construction.
- All repairs and alterations shall be performed in the same manner and using like materials as the garment element manufacturer, including but not limited to fabric, thread type, seam construction, hardware, and hardware backing, unless approved by the garment element manufacturer.

Basic Repair: Performed by the element manufacturer or a verified ISP(independent service provider) Basic repair shall be limited to the following:

- Patching of minor tears, char marks, and ember burns to a separable outer shell.
- Repair of skipped, broken, and missing stitches to a separable outer shell.
- Replacement of missing hardware, excluding positive closure systems to a separable outer shell.

Major repairs of the outer shell and thermal barrier, and all repairs of moisture barriers, can only be undertaken by the manufacturer or a verified Independent Service Provider (ISP).

Advanced Repair: Conducted by the element manufacturer, a verified organization, or a verified ISP. Advanced Repair is limited to the following:

- Moisture Barrier Repair
- Thermal Barrier Repair
- Only the garment element manufacturer or the garment element manufacturer's designated verified ISP shall replace entire garment component layers.
- Re-stitching of more than 25 continuous mm (1 continuous inch) of a Major A seam
- Major B seams in the moisture barrier
- Major B seams in the thermal liner
- Replacement of trim involving Major A seam
- Replacement zipper
- Replacement hook and loop fastener tape
- Replacement reinforcement materials

Helmet Element Repair

- For shell damage on helmets, contact the manufacturer to determine serviceability (small nicks may be repaired according to manufacturer's instructions and small scratches may be removed with abrasive compounds recommended by the manufacturer).

Glove Element Repair

- All repairs shall be performed in accordance with the glove element manufacturer's instructions.

Footwear Element Repair

- Other than the replacement of bootlaces and zipper assemblies, all repairs to boots shall be performed by the footwear element manufacturer or their designated ISP.

Structural Fire Fighting Hood and Proximity Fire Fighting Helmet Over-Cover and Proximity Fire Fighting Shroud Repair.

- All repairs to hood, helmet cover, or proximity shroud shall be performed in accordance with the element manufacturer's instructions.

VERIFICATION

- Verification of the organization or ISP shall be limited to repairs of garment elements only. Verification of the organization or ISP shall not apply to helmet elements, glove elements, footwear elements, hood elements or optional CBRN ensembles.
- All verification of the organization or ISP shall be performed by a certification organization.

Verification Program

- Require the organization or the ISP to establish and maintain a quality management program**.**
- One random and one unannounced visit per 12-month period to verify continued compliance.

- The certification organization shall be permitted to conduct specific testing to verify continued compliance.
- Reference section 11.3.7 for complete test protocol and diagram.
- The organization's or the ISP's management shall define and document its policy and objectives for, and commitment to quality, and shall ensure that this policy is understood, implemented and maintained at all levels in the organization or the ISP.
- The organization or the ISP shall operate an effective quality system appropriate to the type, range and volume of work performed.
- The management of the organization or the ISP shall designate a person who, irrespective of other duties, shall have defined authority and responsibility for quality assurance within the organization or ISP. The quality system shall be maintained relevant and current under the responsibility of the same person.
- Quality system shall be fully documented in a Quality Manual.
- Maintain a system for control of all documentation relating to its activities.
- Documented procedures for dealing with feedback and corrective action whenever discrepancies are detected in the quality system and/or in the performance of inspections.
- Review the quality system at least annually to ensure its continuing suitability and effectiveness

STORAGE

- Keep out of direct sunlight when not in use
- Clean and dry before storing
- Store in clean, dry, and well-ventilated area
- Do not store in air-tight container unless new and unused
- Do not store at very high or low temperatures
- Keep soiled gear out of living quarters and away from personal belonging
- Place soiled gear in case to prevent cross contamination
- Store away from contaminants
- Proximity fire fighting protective coat and trouser elements shall be stored by hanging and shall not be stored folded, to limit the damage caused by creasing.

RETIREMENT

General Retirement:

1. Structural fire fighting ensembles and ensemble elements shall be retired no more than 10 years from the date the ensembles or ensemble elements were manufactured.
2. Proximity fire fighting ensembles and ensemble elements shall be retired no more than 10 years from the date the ensembles or ensemble elements were manufactured.
3. In all cases, the radiant reflective outer shell of the proximity fire fighting ensembles and ensemble elements shall be replaced at a maximum of 5 years.
4. PPE that is so worn, damaged or contaminated such that repairs or cleaning are not possible or cost effective must be destroyed and/or properly disposed of in a manner assuring it will not be used for fire fighting, emergency operations or training.
5. PPE contaminated by CBRN terrorism agents shall be immediately retired after confirmed exposure, and shall not be reused.
6. PPE that is no longer of use for emergency operations but is not contaminated, defective or damaged must be retired but can be used in non-live fire training when appropriately marked for such use.

Special Incident Procedures: Used in the event of a serious injury or death to a fire fighter, NFPA 1851 requires the organization to have procedures for the handling and custody of PPE if directly related to such an event.

- Remove items from service, maintain chain of custody, and control access to items
- Tag items and store in paper or cardboard containers
- Have items examined by qualified members or outside experts

This guide is only a synopsis of the primary requirements in NFPA 1851. Please refer to NFPA 1851 and its appendices for determining the actual requirements and guidance for selection, care, and maintenance of structural fire fighting protective ensembles.