NA 075 BR-02 SO N 1359

NA 075 DIN-Normenausschuss Persönliche Schutzausrüstung (NPS)
NA 075 BR-02 SO Sonderausschuss Spiegelausschuss zu ISO/TC 94/SC 14
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Umfrage zum Komitee-Entwurf ISO/CD 23616.2 (ISO/TC 94/SC 14 N 904)

Datum des Dokumentes	2019-12-20
Aktion	Stellungnahme
Antworttermin	2020-02-14

Sehr geehrte Damen und Herren,

wir möchten Sie davon in Kenntnis setzen, dass das Technische Subkomitee ISO/TC 94/SC 14 den Komitee-Entwurf

- **ISO/CD 23616.2**, *Cleaning, Inspection and Repair of Firefighters personal protective equipment (PPE)*

zur komiteeinternen Abstimmung vorgelegt hat. Der oben genannte Komitee-Entwurf steht Ihnen umseitig zur Verfügung.

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Bei der Auswertung der Stimmen werden ausschließlich die bis zu diesem Termin in der Geschäftsstelle eingegangenen Rückmeldungen mitgezählt. Bitte beachten Sie, dass sich DIN der Stimme enthalten wird, sofern keine Rückmeldungen eingegangen sind.

In Absprache mit dem Obmann, Herrn Hagebölling, werden wir danach die deutsche Stellungnahme verfassen. Über das Abstimmungsergebnis und die deutsche Stellungnahme werden wir Sie informieren.

Für eventuelle Fragen stehen wir Ihnen gerne zur Verfügung.

Mit freundlichen Grüßen

DIN-Normenausschuss Persönliche Schutzausrüstung (NPS)

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Firefighters' personal equipment

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N904_ISO CD 23616-2ndCD Final 2nd CD_Dec 2019

Document type:	Committee draft
Date of document:	2019-12-12
Expected action:	INFO
Background:	Pls refer to 2nd CD starting Monay 16 Dec 2019
Committee URL:	https://isotc.iso.org/livelink/livelink/open/tc94sc14

ISO 23616:20(XX)
ISO TC 94/SC 14/WG 1
Secretariat: SA

Cleaning, Inspection and Repair of Firefighters personal protective equipment (PPE)

2nd CD stage

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Published in Switzerland.

Contents

Foreword **5**

Introduction **6**

1 Scope **7**

2 Normative references **7**

3 Terms and definitions **8**

4 General information **8**

4.1 General 8
4.2 Routine inspection 9
4.3 Advanced inspection 9
4.4 Cleaning and decontamination 10
4.5 Routine cleaning 10
4.6 Advanced cleaning 11
4.7 Repair 11

5 Records **11**

5.1 General 11
5.2 Protecting the Public and Personnel from Contamination 12
5.3 Reporting Personal Protective Equipment Health and Safety Concerns 12

6 Garment element **12**

6.1 Inspection 12
6.1.1 Routine inspection 12
6.1.2 Advanced inspection 13
6.2 Cleaning 14
6.2.1 Routine cleaning 14
6.2.2 Advanced cleaning 15

6.3 Drying ... 15
6.4 Repair ... 16
6.4.1 Requirements for both basic and advanced garment element repair ... 16
7 Glove element ... 17
7.1 Inspection ... 17
7.1.1 Routine inspection ... 17
7.1.2 Advanced inspection ... 18
7.2 Cleaning ... 18
7.2.1 Routine cleaning ... 18
7.2.2 Advanced cleaning ... 18
7.3 Drying ... 19
7.4 Repair ... 19
8 Helmet element ... 19
8.1 Inspection ... 19
8.1.1 Routine inspection ... 19
8.1.2 Advanced inspection ... 20
8.2 Cleaning ... 20
8.2.1 Routine cleaning ... 20
8.2.2 Advanced cleaning ... 21
8.3 Drying ... 21
8.4 Repair ... 21
9 Footwear element ... 22
9.1 Inspection ... 22
9.1.1 Routine inspection ... 22
9.1.2 Advanced inspection ... 23
9.2 Cleaning ... 23
9.2.1 Routine Cleaning ... 23
9.2.2 Advanced cleaning ... 23
9.3 Drying ... 24
9.4 Repair ... 24
10 Fire hood element ... 24
10.1 Inspection ... 24
10.1.1 Routine inspection ... 24
10.1.2 Advanced inspection ... 24
10.2 Cleaning ... 25
10.2.1 Routine cleaning ... 25
10.2.2 Advanced cleaning ... 25

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10.3 Drying 26
10.4 Repair 26
11 SCBA 26
11.1 Inspection 27
11.1.1 Inspection of the frame 27
11.1.2 Inspection of the compressed Air cylinder 28
11.1.3 Inspection of the face mask 28
11.1.4 Inspection of the valve 29
11.2 Cleaning 29
11.2.1 Frame cleaning - straps - buckles - belt 29
11.2.2 Cleaning the demand valve 29
11.2.3 Cleaning the cylinder 30
11.2.4 Cleaning the mask 30
11.2.5 Cleaning of the Control and Safety Instrument (ICS) 30
11.3 Drying 30
11.4 Repair 30
Annex A (normative) Records of all items of Firefighters' PPE 31
Annex B (informative)
Protocol AfPS GS 2014:01 PAK » investigates PAH 32

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Foreword

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The committee responsible for this document is ISO/TC 94/SC14.

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Introduction

This document has been developed due to the concerns as to the potential link between contaminants on PPE to health hazards of the Firefighters.
Whilst the Firefighter has such concerns, those responsible i.e. Fire and Rescue Services and the Manufacturers of PPE are keen to see instructions and guidance given to minimize and manage this risk. It should be remembered that initial responsibility for the inspection of the PPE starts with the Firefighter, but there may be a reliable system / mechanism (including training) to ensure that this can be achieved.
The purpose of this document is to provide guidance regarding the inspection and maintenance of firefighting PPE, and establish criteria for its cleaning and repair. This standard has been developed in response to growing concerns about contaminated PPE and potential health hazards for firefighters. Fire and Rescue Services, and the manufacturers of PPE, want to provide guidance and instructions to effectively minimize and manage this risk.
Whilst it is the ongoing responsibility of the firefighter to undertake regular inspections of their PPE, there must also be a reliable system / mechanism (including training) to ensure that this can effectively be achieved. Firefighters have the most regular exposure to their PPE and hold ongoing responsibility for its regular inspection.
This document also provides guidance to Fire and Rescue services regarding more advanced maintenance and repairs.

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Cleaning, Inspection and Repair of Firefighters personal protective equipment (PPE)

1 Scope

This document has been written as a guidance document, but the fire services should review and decide when implementing this standard; which parts should be mandatory and which should be guidance.
This document is a recommendation and guidance for cleaning, inspection and repair of firefighter PPE.
This document is applicable to interface components, garments, gloves, helmets, footwear, fire hood, shikoro and SCBA, as used by firefighters.
This document is intended to be used by persons responsible for the cleaning and repair of PPE.
This document does not cover the following firefighter PPE:
— chemical protective clothing;
— garments required for protection against chemical, biological, radiological and nuclear (CBRN) materials;
— PPE for water rescue activities;
— PPE working at heights;
— PPE for inclement weather;
— PPE for mechanical impact.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.
ISO 11613:2017, *Protective clothing for firefighters who are engaged in support activities associated with structural firefighting*
ISO 11999 series, *PPE for firefighters — Test methods and requirements for PPE used by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures*
ISO 13688:2013, *Protective clothing — General requirements*
ISO 15383:2001, *Protective gloves for firefighters — Laboratory test methods and performance requirements*
ISO 15384:2018, *Protective clothing for firefighters — Laboratory test methods and performance requirements for wildland firefighting clothing*
ISO 16073 series, *Wildland firefighting personal protective equipment*
ISO/DIS 21942, *Station uniform for firefighters*
ISO/TR 19591:2018, *Personal protective equipment for firefighters — Standard terms and definitions*
ISO 18639 series, *PPE ensembles for firefighters undertaking specific rescue activities*
ISO TR 21808, Guidance on the selection, use, care and maintenance of personal protective equipment (PPE) designed to provide protection for firefighters

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3 Terms and definitions

For the purposes of this document, the following terms and definitions given in ISO/TR 19591 and the following apply.
ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 General information

4.1 General

Every employer should ensure that any personal protective equipment provided to their employees is maintained (including replaced or cleaned as appropriate), in efficient working order and in good repair.
Every firefighter should ensure that any personal protective equipment provided to them is maintained (including replaced or cleaned as appropriate), in efficient order and in good repair.
An effective cleaning, inspection and repair system includes the following:

1) inspection — checking for faults, damage, wear and tear, dirt, etc.;
2) testing — to ensure PPE is operating as intended;
3) cleaning — including disinfection and decontamination if appropriate;
4) repair;
5) PPE failure
6) replacement
7) recording

All PPE element inspection, cleaning and repair should be carried out according to the manufacturer's instructions and will be conducted by a trained user or competent person or organization, such as, element manufacturer, a trained laundry or other competent organization.
Training should be carried out by the element manufacturers of the same element. This ensures that the competent person or organization has received the necessary training.
The Fire and Rescue Service and/or agreed Organization responsible for cleaning, inspection and repair, should develop and implement a programme for the care and maintenance of firefighter PPE used by the members of the Fire and Rescue Service in the performance of their assigned functions.
This programme should have the goals of providing guidance to the suitable cleaning, inspection and repair of firefighter PPE for the intended use, through:

- maintaining such firefighter PPE in a safe, usable condition to provide the intended protection to the user
- removing from use any firefighter PPE that could cause or contribute to user injury or illness due to poor condition;
- reconditioning, repairing, or retiring such firefighter PPE as necessary

The Fire and Rescue Service and/or agreed Organization should use a qualified and competent laundry or other organization to perform cleaning and repair services of firefighter PPE.

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The Fire and Rescue Service and/or agreed Organization should not add or permit accessories to be added to any firefighter PPE prior to the organization requesting approval in writing and receiving written approval from the firefighter PPE manufacturer for each specific accessory.
The Fire and Rescue Service and/or agreed Organization should develop specific criteria for removal of PPE considered to be not fit for purpose or beyond economic repair.
When handling firefighter PPE prior to cleaning, people handling the firefighter PPE should observe appropriate health and safety precautions to protect them from any contaminants.
Avoid cross contamination at every stage of the process, especially during routine inspection and cleaning.

As it is impossible to identify or to quantify all the existing pollutant, a generalized washing method that can clean as many pollutants as possible should be used to clean all the firefighter PPE.

All firefighter PPE that are found or suspected to be soiled or contaminated should be isolated during the cleaning process from the Fire and Rescue Service and/or Organizations personnel.
If firefighter PPE are found to be contaminated by unidentified CBRN agents, the ensemble should be retired.

The Fire and Rescue Service and/or Organization should establish guidelines or determine appropriate actions to be taken if a PPE is found or suspected that needs cleaning, decontamination, or repair.

All firefighter PPE that are found or suspected to be soiled or contaminated should be cleaned or decontaminated before any additional inspection is initiated.

As a minimum, any necessary cleaning and inspection should be done once per annum, and as and when required.
All necessary repairs should be carried out in accordance with manufacturer's instructions.

4.2 Routine inspection

Individual firefighters should conduct routine inspections of their firefighting PPE upon issue and after each use. Maintenance-in-use inspections should be carried out by the users before and after each use to identify any defects before being exposed to hazardous situations.

Clear criteria to send PPE for cleaning, including procedure to do so to ensure that cross contamination is avoided, workers carrying out the cleaning or repairs are protected.

4.3 Advanced inspection

Cleaning should be carried out prior to advanced inspection
Any advance inspection should be carried according to the manufacturer's instructions by trained users, competent persons or organizations.
The firefighter PPE manufacturer, Fire and Rescue Service and/or Organization should determine the level of training required to perform inspections. They should maintain records of such training.
If the Fire and Rescue Service and/or agreed Organization is endorsed to provide training, it should be permitted to determine the level of training necessary to perform the inspection.
Advanced inspections of all firefighter PPE that are issued should be conducted at a minimum of every 12 months, or whenever routine inspections indicate that a problem could exist.
Firefighter PPE that have been properly stored and are not being used are not required to be subjected to advanced inspection

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New firefighter PPE that has been stored in accordance with manufacturer's instructions is not required to be subjected to advanced inspection.
The findings of the inspection should be recorded.

4.4 Cleaning and decontamination

The Fire and Rescue Service and/or agreed Organizations should provide a means for having firefighter PPE cleaned and decontaminated.
Firefighter PPE should be evaluated by the firefighter for application of appropriate cleaning level after each use.
Fire and Rescue Service should have written procedures detailing the generalized decontamination and cleaning processes for firefighter PPE contaminated.

Firefighter PPE contaminated by unidentified CBRN agents should be destroyed in accord with local laws and legislation after confirmed exposure and should not be subjected to cleaning or decontamination.

Firefighter PPE known or suspected to be contaminated by hazardous materials should be assessed at the incident to determine the appropriate level of treatment. Items should be prepared for safe transportation.
Where possible and where the contaminant and its source have been identified, the Fire and Rescue Service and/or agreed Organization should consult the supplier of the contaminant and the manufacturer of the firefighter PPE for an appropriate decontamination agent and process.
A member(s) of the Fire and Rescue Service or Organization who has received training in the cleaning of firefighter PPE should be responsible for performing or managing advanced cleaning of elements contaminated with hazardous materials.
Soiled or contaminated elements should 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 firefighter PPE.
Commercial dry cleaning should not be used as a means of cleaning or decontaminating firefighter PPE unless approved by the firefighter PPE manufacturer.
When an organization is used for cleaning or decontamination, they should demonstrate to the Fire and Rescue Service's satisfaction that the procedures are effective, do not degrade the intrinsic qualities of the materials and the level of performance of the PPE.
When conducting a partial cleaning with chemicals, the operator should be aware of the safety data sheet and act accordingly wearing the appropriate PPE.
Waste waters discharge form laundry process and its environmental effects should be considered. Refer to local laws and/or national regulations when discharging waste waters or effluent to public drainage or waterways.

4.5 Routine cleaning

Individual Firefighter should conduct a routine cleaning of their firefighter PPE after each use when exposed to heat and /or flames.
The routine cleaning should be carried out according to the instructions given during the manufacturer's training. The routine cleaning will always be done by trained users, competent persons, Fire and Rescue Service and/or agreed organizations.
Cleaning other than the instruction given on the label, must always comply with the manufacturer´s information to ensure an approved of alternative procedures for the routine cleaning is applied.

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4.6 Advanced cleaning

Any advanced cleaning should be carried out according to the manufacturer's instructions by trained users, competent persons, Fire and Rescue Service and/or agreed organizations.

The member(s) of the Fire and Rescue Service and/or agreed Organization who has received training in the advanced cleaning of the firefighter PPE should be responsible for performing, managing, or coordinating advanced cleaning or the advanced cleaning process.
The firefighter PPE manufacturer or Organization should determine the level of training required to perform advanced cleaning. The firefighter PPE manufacturer or Organization should provide written verification of training.
Advanced cleaning should be performed by the firefighter PPE manufacturer, a manufacturer trained organization, agreed organization or trained fire and rescue service or organization.
Firefighter PPE that is issued and used should receive advanced cleaning at the time of advanced inspection if not subjected to advanced cleaning in the preceding 12 months.
Organizations should examine the manufacturer's label and user information for instructions on cleaning and drying that the manufacturer provided with the firefighter PPE. In the absence of manufacturer's instructions or manufacturer's approval of alternative procedures for the firefighter PPE, the advanced cleaning and drying procedures provided in section 6.2.2 and 6.3 should be used.

4.7 Repair

All repairs should be carried out according to the manufacturer's instructions and will be conducted by trained users, competent persons, Fire and Rescue Service and/or agreed organizations.
The member(s) of the Fire and Rescue Service and/or agreed Organization who has received training in the repair of the firefighter PPE should be responsible for performing repairs.
Firefighter PPE should be subjected to advanced cleaning, when necessary, before any repair work is undertaken.
All repairs and alterations to firefighter PPE should be done in a consistent manner and using like materials and components that are compliant with the relevant standard(s).
Due to the different methods of construction, the firefighter PPE manufacturer should be contacted if the Fire and Rescue Service or Organization is unsure of whether a repair can be accomplished without adversely affecting the integrity of the firefighter PPE.

5 Records

5.1 General

The Fire and Rescue Service and/or agreed Organization should compile and maintain records on its firefighting personal protective equipment.
Records kept should apply to firefighter PPE that are used by the Fire and Rescue Service and/or agreed organization (Annex A).
At least the following records should be kept for each protective ensemble or ensemble element:

1) Person to whom element is issued;
2) Date and condition when issued;
3) Manufacturer and model name or design;
4) Manufacturer's identification number, lot number, or serial number;
5) Month and year of manufacture;
6) Date(s) and findings from advanced inspection(s).

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The following are the responsibilities covered in later relevant sections of this Standard for firefighter PPE:

a) Reason for cleaning or decontamination and who performed cleaning or decontamination;
b) Date(s) of repair(s), who performed repair(s), and brief description of repair(s);
c) Date of retirement;
d) Date and method of disposal.

5.2 Protecting the Public and Personnel from Contamination

The Fire and Rescue Service and/or agreed organization should develop written procedures that minimize the public's and the Fire and Rescue Service and/or agreed organization personnel's exposure to soiled or contaminated firefighting PPE.

The procedure should require that firefighter PPE will not be worn or stored in the non-operational living areas of the fire and Rescue Service facilities. The procedure should also provide for direction to staff that PPE is to be stored in a correctly lit and ventilated, dedicated PPE storage room, which is automatically isolated from any other section of the fire station.

The public should not be unnecessarily exposed at any time, except during emergency operations, to soiled or potentially contaminated Firefighter PPE.

Soiled or potentially contaminated Firefighter PPE should not be taken into the cabin of the fire appliance, cleaned in home laundries, or cleaned in public laundries.

5.3 Reporting Personal Protective Equipment Health and Safety Concerns

The Fire and Rescue Service and/or agreed Organization should report all PPE health and safety concerns, if caused by a known or suspected PPE failure, to the manufacturer.

The Fire and Rescue Service and/or agreed Organization should notify the manufacturer in writing.

6 Garment element

6.1 Inspection

Firefighter should conduct a routine inspection of their garment element upon issue and before and after each use, in accordance with manufacturer's instructions, provided the garment is not contaminated. If contaminated inspection post return from laundry.

The routine inspection should be done in accordance with manufacturer's instructions, provided the garment is not contaminated. If contaminated inspection post return from laundry.

Ensure the items still fit the individual correctly, and provide the designed protection, including at the interface with other items of PPE.

6.1.1 Routine inspection

The routine inspection should include, as a minimum, the follow:

Soiling

Contamination

Physical damage such as the following:

1) Rips, tears, and cuts;
2) Damaged or missing hardware and closure systems;
3) Thermal damage (charring, burn holes, melting, discoloration of any layer);
4) Damaged or missing reflective trim;
5) Loss of seam integrity and broken or missing stitches.

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Thermal damages such as following:

1) Charring, burn holes, melting, discoloration of any layer, especially outer shell
2) Charring and discoloration of the retro-reflective trims

Correct assembly and size compatibility of shell, liner, and the drag rescue device (DRD) if applicable.

6.1.2 Advanced inspection

The advanced inspection should be done in accordance with manufacturer's instructions. If contaminated inspection post return from laundry.
Garment elements, and if possible, all separate layers, or as a minimum the outer and the inner layer of the garment elements should be individually inspected. Attention should be given to going through all the items listed for routine inspection (section 6.1.1) with additional focus on the following defects:

1) Outer fabric and reinforcement:
   a) The presences of holes
   b) Stitching seams removed, broken (seams pockets, flaps, slides, hook-and-loop fasteners, etc.);
   c) Change in outer fabric's colour and flexibility over 10 mm in length;
   d) Completely destroyed knee, trousers hem and cuff reinforcements;
   e) Torn Edge side;
   f) Damaged fastener that no longer closing, a flap and/or pocket.
   g) Physical integrity [e.g., ultraviolet (UV) or chemical degradation] as evidenced by discolouration, significant changes in material texture, loss of material strength

2) Retro-reflective trim:
   a) stitching seam with a gap of 30 mm;
   b) Torn off;
   c) Damaged by heavy abrasion;
   d) Loss of reflectivity due to heat damage or heavy staining by stubborn soot or chemical

3) Lining:
   a) Loss of fabric material physical integrity due to UV or chemical degradation in the forms of discoloration, significant changes in texture, loss of material strength, loss of liner material and shifting of liner material;
   b) Gaps in assembly seam;
   c) Holes not greater than 5 mm on critical locations like sleeves, jacket front, and shoulder.

4) Moisture barrier (if accessible):
   a) Membrane burn with hole formation or tear, loose sealing strip;
   b) Rips, tears, cuts, or abrasions;
   c) Discolouration;
   d) Thermal damage.

5) Anti-wicking material on jacket, sleeves or trousers 'hem:
   a) no delamination;

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b) no holes with length greater than 20 mm

6) Closure systems:
   a) No loss of functionality or corrosion on zipper or snap button;
   b) No loss of functionality on hook and loop fastener

7) Elastic bands at the waist and shoulder straps:
   a) no loss of elasticity;
   b) no broken buckle
8) Loss of wristlet elasticity, stretching, runs, cuts, or burn holes.
9) Label integrity and legibility.
10) Liner attachment systems.
11) Correct assembly and size compatibility of shell, liner, and DRD, where appropriate.
12) Pocket (deterioration of pockets pocket closures)
13) Label (stitching and readability of labels)
14) Batch testing - Periodic testing should be conducted to ensure that the thermal, moisture management and particulate protection (where present) is fit for purpose and still conforms to the entirety of the required Standard.

When selecting items of PPE, consideration should also be given to items of PPE that have been purchased as a complete roll out or those issued on an “as required” basis.

The identified items of PPE should be selected strategically from a broad selection that have been exposed to numerous hazards, have been in the field for at least 2 years and are selected from different locations.

The quantity and location of the selected PPE should be identified by the Fire Service.

6.2 Cleaning

All cleaning should be done in accordance with manufacturer’s instructions, and will be conducted by a trained users, competent persons, Fire and Rescue Service and/or agreed organization.

Soiled garments should be separate from the cleaned garments to avoid cross contamination

Cleaning personnel are trained and have appropriate PPE to handle the soiled PPE.

Clean water should be used for each wash cycle to reduce risk of cross contamination

6.2.1 Routine cleaning

Where possible, the contamination type should be evaluated, and field decontamination should be initiated at the emergency scene.

Garments should be contained wherever possible and should be isolated whenever possible to avoid cross contamination.

Personnel cleaning PPE should be trained and provided with appropriate PPE to handle the contaminated PPE.

Any dry debris should be brushed off.

Other debris should be gently rinsed off with water. Heavy scrubbing or spraying with high-velocity water jets such as a power washer should not be used.

Where necessary, a soft bristle brush should be used to gently scrub, and the garment element should be rinsed off again.

For spot cleaning only, garment elements can be cleaned in a utility sink designated for personal protective equipment (PPE) cleaning and decontamination using the following procedures:

- To avoid cross contamination, garment element layers should be isolated whenever possible.

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- Cleaning of the entire garment element should be accomplished using advanced cleaning procedures.
- To avoid contamination of personnel, minimal handling should/should be done when processing PPE.

6.2.2 Advanced cleaning

Advanced cleaning of ensembles and ensemble elements should be conducted by machine according to an adapted and specific program.
The following procedures should be used for machine washing:
The recommended loading is 50 to 60%. (In case of higher loading, the dirt may not be sufficiently removed, in case of lower loading the mechanical action will cause faster damage)
Heavily soiled or spotted areas should be pre-treated. Chlorine bleach, chlorinated solvents, active-ingredient cleaning agents, or solvents should not be used without the ensemble or ensemble element manufacturer's approval.
All closures, including pocket closures, snaps, zippers, and hook and loop fasteners should be fastened;
NOTE: pockets can contain sharp objects so care may be taken when checking/emptying pockets.
Water temperature should not exceed the temperature stated on the care label and the manufacturer instruction. If no temperature is given on the care label, the water temperature should not exceed 60°C (140°F)"
A detergent with a pH range of not less than 6.0 pH and not greater than 10.5 pH as indicated on the product SDS or original product container should be used.
Washing machines with the capability of drum RPM adjustment should be adjusted such that the maximum spin speed be no greater than 800 RPM, or the g force is not greater than 100 g.
To remove all detergent and chemical residues after the washing, rinsing is very important.
The rinsing may be carried out with enough water (ratio weight/quantity of water = 1/7) several rinses, advised minimum 3 rinsing cycles
Machine manufacturer's instructions should be followed for proper settings or program selection for the specific garment element being washed.
The garment element should be inspected and rewashed if necessary.
Note: Where the machine is also used to wash items other than garment element, it should be rinsed out by running the machine without a laundry load through a complete cycle with detergent and filled to the maximum level with water at a temperature of 60°C (140°F).
The garment element should be dried in accordance with Section 6.3
Where the outer shell and liners of protective garment elements are separable, those items should be cleaned and decontaminated only with like items.
Separable liner systems should be turned inside out so the moisture barrier is on the inside for both machine washing and machine drying.
Independent verification of the cleaning process should be obtained at least annually. This will prove that the clean process remains effective.

6.3 Drying

Organizations should examine the manufacturer's label and user information for instructions on drying procedures that the manufacturer provided with the garment element. In the absence of manufacturer's instructions or manufacturer's approval of alternative procedures, the drying procedures provided in this section should be used. Based on manufacturer's instruction, minimum temperatures may need to be increased to ensure re-activation of repellency.
The following procedures should be used for air drying:

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1) Elements should be placed in an area with good ventilation.
2) Elements should not be dried in direct sunlight.

The following procedures should be used for machine drying:

a) The recommended capacity of the machine should not be exceeded.
b) All closures, including pocket closures, snaps, zippers, and hooks and loop fasteners should be fastened.
c) A "no heat" or "air dry" option should be used, if available.
d) In the absence of a "no heat" or "air dry" option, the basket temperature should not exceed 60°C (140°F) unless otherwise indicated on the garment label or in the manufacturer's instructions.
e) The use of a heat cycle should be discontinued prior to the removal of all moisture from the ensemble element.
f) The remainder of the drying process should be accomplished by a "no heat" machine setting or removal of the ensemble element from the machine dryer to air dry.

Tunnel drying is forbidden.

6.4 Repair

6.4.1 Requirements for both basic and advanced garment element repair

Repairs specified in this section should be performed by the manufacturer, or their approved agent.

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

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

Repairs of minor tears, char marks, ember burns, and abraded areas should be limited to those where the damaged area can be covered by a maximum 160 cm^2 patch of the same material as the original garment. For any tears, char marks, ember burns, and abraded areas that require a patch larger than 160 cm^2, the manufacturer or the organization, in conjunction with the organization, should be consulted.

The finished edges of the patch should extend at least 25 mm in all directions beyond the damaged area.

To prevent fraying, the patch should have no raw edges.

Where moisture barrier tears, holes, or abrasions are being repaired guidance should sought from the moisture barrier supplier. If no information is available, the following method should be used. A single width of seam tape should be used and should be required to extend at least 12.5 mm in all directions beyond the edge of the repaired damage. Where the moisture barrier has a hole or abrasion measuring more than 12.5 mm in diameter in any direction or a tear greater than 75 mm in length, a patch consisting of the same moisture barrier fabric should be used for repair.

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

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

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

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

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Visibility markings being replaced should be completely removed so that no new visibility marking is placed over an older visibility marking.
No repair or alteration should result in the reduction of the minimum required visibility marking pattern specified in the garment Standard.
Where the complexity of the visibility marking repair is uncertain, the garment element manufacturer should be consulted.
Basic repairs should be limited to the following:
1) Patching of minor tears, char marks, and ember burns to a separable outer shell;
2) Repairing of skipped, broken, and missing stitches to a separable outer shell;
3) Replacement of missing hardware, excluding positive closure systems to a separable outer shell;
4) Reclosing of the liner of a garment after inspection.

The following are considered Advanced Garment Element Repairs.
Repairs to the garment outer shell should be performed consistent with the garment element manufacturer's methods. The garment element manufacturer should be contacted if the Organization is unsure of the complexity of the repair.
All repairs to the garment moisture barrier should be performed consistent with the moisture barrier manufacturer's methods. The original garment element manufacturer should be contacted if the Organization is unsure as to whether an area to be repaired contains a moisture barrier.
Repairs to garment thermal liners should be permitted provided there is no stitching through the moisture barrier.
Due to labelling requirements, as well as the complexity and specialized equipment needed to replace entire garment element component layers (e.g. the outer shell, moisture barrier, or thermal liner), only the garment element manufacturer or the garment element manufacturer's designated organization should replace entire garment component layers.
Re-stitching of more than 25 mm continuous (1 in. continuous) of a Major A seam should require consulting the garment element manufacturer and should be conducted in a manner consistent with the garment element manufacturer's methods.
Re stitching should be carried out in accordance with the manufacturer instruction.
If replacing trim necessitates sewing into a Major A seam, trim replacement should be conducted in a manner consistent with the garment element manufacturer's methods.
Replacement hook-and-loop fastener tape should be installed in a manner consistent with the garment element manufacturer's method of construction. If the complexity of the repair is uncertain, the garment element manufacturer should be consulted.
Replacement reinforcement materials should be installed in a manner consistent with the garment element manufacturer's method of construction.

7 Glove element

7.1 Inspection

7.1.1 Routine inspection

Individual Firefighters should conduct a routine inspection of their gloves upon issue and after each use. Maintenance-in-use inspections should be carried out by the firefighter before and after each use to identify any defects before being exposed to hazardous situations.
Firefighter should conduct a routine inspection of their glove upon issue and before and after each use, in accordance with manufacturer's instructions, provided the glove is not contaminated. If contaminated inspection post return from laundry.

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When the firefighter has been burned, the gloves may be removed from service and replaced in order to carry out an advanced inspection. The membrane cannot be visually inspected at the routine level.
The routine inspection should include, as a minimum, the checks specified below:
1) Soiling;
2) Contamination;
3) Physical damage such as the following:
    a) Rips, tears, and cuts;
    b) Thermal damage (charring, burn holes, melting, discolouration of any layer);
    c) Inverted liner.

4) Serious Shrinkage;
5) Loss of dexterity or flexibility;
6) Loss of seam integrity and broken or missing stitches;
7) loss of elasticity of the wrist knit.
8) The glove still fits the individual correctly

7.1.2 Advanced inspection

Attention should be given to going through all the items listed for routine inspection (section 7.1.1), with the following additional focus:
1) Loss of seam integrity or broken or missing stitches;
2) Loss of elasticity and shape in wristlets;
3) Label integrity and legibility

7.2 Cleaning

7.2.1 Routine cleaning

Additional Requirements for Routine Cleaning of Glove Elements.
Use a washing machine wherever possible to avoid cleaning by hand (by soaking)
Water temperature should not exceed the temperature stated on the label and the manufacturer. If no temperature is given on the label, the temperature should not exceed 40 °C (105°F).
A mild detergent with a neutral pH range should be used.
Special attention is required during drying. Select a moderate programme with reduced agitation and reduced spin speed. Do not dry the glove completely in the machine, the residual moisture is removed from the gloves be drying in a flat position in a heated room or in a drying cabinet with or without ozone.

7.2.2 Advanced cleaning

Additional requirements for advanced cleaning of glove elements.
Washing method for gloves with leather: 1 washing cycle moderate stirring at 40°C (105°F) (4M) + 1 rotating drum drying at 40°C (105°F).
Type of detergent: Phosphate-free detergent, with optical brightener and with enzymes.
Detail of the washing cycle:
Washing 15 to 20 min at 40 °C (105°F) alternating speed 35 rpm.
The glove should be inspected and washed again if necessary.
To remove all detergents and chemical residues after washing, several rinses are necessary.
Rinsing: 1 rinse of 3 min then 2 rinses of 2 min each alternating rotation speed 30 rpm.
Spin: 1 spin at low speed (500 rpm) for 2 min.

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The test load is 2 kg, if necessary it is added fillers (polyester) to achieve these 2 kg.
An independent verification of the cleaning process may be obtained at least once a year. This will prove that the cleaning process remains effective.

7.3 Drying

After routine cleaning: machine drying is possible. Select a moderate programme with a reduced spin speed. Do not completely dry the glove in the machine, finish drying in the open-air flat in a heated room or in a drying cabinet with or without ozone.
Drying method: drying at 40°C and drying flat.
After an advanced cleaning: Do not fully dry the glove in the machine, finish drying on a forced air form.

7.4 Repair

It is not expected for gloves to be repaired. If they are unfit for service, they should be replaced.

8 Helmet element

8.1 Inspection

8.1.1 Routine inspection

The routine inspection without having to dissemble the helmet should include, as a minimum, the visual inspections specified below

1) Outer shell

    a. Heavily soiled or contamination with carbon, oil or chemicals, or peeled paints;
    b. Physical damages like cracks, crazing, dents, punctured holes, sign of heavy abrasion;
    c. Thermal damages like bubbling, soft spots, warping, distortion, serious discoloration, contact with molten metals or hot solids;
    d. Serious discoloration due to contact with strong chemicals;
    e. Those with edge beading they dislocate, broken, distorted or melted.

2) Suspension and retention systems
    a. Brittle, deformed, broken or missing quick release buckle and other plastic components;
    b. Quick release buckle cannot release or cannot lock;
    c. Frayed, torn, serious abraded, or discoloured webbing straps;
    d. Loss of sewing integrity with broken, cut, missing or frayed stitches;
    e. Dirty or soiled leather/fabric comfort padding;
    f. Velcro fastener no longer catches, worn out or missing.

3) Face shield / eye protector / goggle
    a. Heavily soiled or contaminated with carbon, oil or chemicals;
    b. Physical damages like cracks, penetrating holes, or deep scratches that impair vision;
    c. Thermal damages like charred lens, blistered/bubbled lens, distortion, discoloured lens, optical distortion, or elongated goggle straps/loss of elasticity.
    d. Chemical damages like pitting, blooming, or crazing;
    e. Mechanical failures like broken attachment piece, visor unable to stay up when stowed, or visor unable to deploy.

4) Neck protector

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a. Heavily soiled or contaminated with carbon, oil or chemicals;
b. Physical damages like rips, tears or cuts on the fabric, broken or missing stiches, and opened seams;
c. Thermal damages like charring, burn holes, and serious discoloration.

5) Accessories like badges, decal and retro-reflective trims:
   a. Physical damages like tears, lifting, or missing;
   b. Thermal damages like charring, discoloration, loss of reflectivity.

8.1.2 Advanced inspection

Advanced inspection requires the disassembly of helmet element in order for each component to be thoroughly inspected and evaluated.
Attention should be given to going through all the items listed for routine inspection (section 8.1.1), with the following additional focus:

1) Damage to the underside of the shell, for example signs of delamination, stress marks, micro-crack lines, and discolouration due to exposure to extreme heat.
2) Damages to the shock absorbing liner, for example “halo effect” (ring of discoloured foam due to heat), blisters or brittle foam due to extreme heat, depression marks as evidence of impact, cracks and distortion.
3) Significant impact: visible impact inside the cap after disassembly. This type of impact shows a degradation of the mechanical structure, compulsory of the cap.

8.2 Cleaning

8.2.1 Routine cleaning

Manual cleaning in accordance with manufacturer instructions:

Routine cleaning steps:

1. Remove all soft material (e.g. neck protector, leather/fabric sweat pads, and comfort sponge) from the helmet.
2. Use mild detergent with a pH range between 6.0 to 10.5. Do not use chlorine bleach, chlorinated solvents, active-ingredient cleaning agents or petroleum-based solvents.
3. Immerse the helmet in the sink with cleaning solution at the temperature of between 40 °C to 45 °C.
4. Scrub the helmet shell gently with a soft bristle brush to remove carbon stains, dirt, oil and harden debris.
5. Scrub inside the impact liner, chinstrap webbing and other plastic parts to remove grime, dirt and soil.
6. Rinse the helmet thoroughly with fresh water. Inspect again and rinse if necessary until it is totally clean.
7. Air dry the helmet in accordance with 8.3.

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Put the soft material into a mesh bag and wash it together with the garment elements in the same laundry set-up and cycle. Reassemble them back into the helmet after they have been properly air-dried following the procedure in accordance with 8.3.

For the cleaning of face shield/eye protector (either permanently affixed or detachable), the following procedure should be applied:
1. Use a soft sponge or cloth dampened with a solution of warm water and mild detergent to wipe the surface gently to remove dirt and stains;
2. To remove light scratches, smoke stains or stubborn dirt, use plastic cleaner/polish that is no abrasive and use as recommended by the manufacturer.
3. Cleaning solvents, oils, varnishes, or polishes should not be used to clean or decontaminate helmet elements or the visors. The manufacturer should be consulted if stronger cleaning agents are required.

Helmets should not be machine-washed or machine-dried using equipment that produces mechanical actions from tumbling or agitation. Following air drying procedure in 8.3.

8.2.2 Advanced cleaning

Detachable items should be removed from the helmet and should be washed and dried separately.
Helmets should not be machine-washed or dried using equipment that produces mechanical action by tumbling or agitation.
Protective gloves and protection against splashing of eyes and face should be worn. Remove all removable parts inside (padding, chinstrap, visors, etc.) and external accessories (attachment devices, neck protector).
1) Rinse each part of the helmet individually;
2) Wash each part of the helmet individually, ensuring that all “hook and loop” components are free of any contamination e.g. Asbestos and fire ground particulates etc.;
3) Rinse;
4) Dry with a microfiber cloth;
5) Reassemble the helmet.

8.3 Drying

Drying methods could be one of the following:
1) Drying in well ventilated room with free moving air for the duration up to 24 h, or;

2) Drying in a heated room with maximum temperature set at 40 °C for the duration required to totally dry the helmet and its components, or;

3) Drying in a convection air drying cabinet with or without ozone with maximum temperature set at 40 °C for 2 h.

8.4 Repair

All repairs to helmet components should be performed in accordance with the helmet manufacturer’s instructions.
Where there is an indication of a crack, dent, abrasion, bubbling, soft spot, discolouration, or warping in the helmet shell, the helmet manufacturer should be contacted to determine serviceability.

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Small surface nicks should be repaired in accordance with the helmet manufacturer's instructions.
Small scratches on the helmet shell should be permitted to be removed by using mildly abrasive compounds recommended by the helmet manufacturer.
Helmet face shield and goggle components that become cracked or badly scratched should be replaced.

9 Footwear element

9.1 Inspection

In order to be able to detect any defect in good time which may give rise to dangerous situations, individual firefighters should conduct a routine inspection of their footwear element upon issue, before (including after repair or cleaning) and after each use in accordance with manufacturer's instructions, provided the footwear is not contaminated. If contaminated inspection post return from laundry.

9.1.1 Routine inspection

Firefighters should conduct a routine inspection of their footwear upon issue and before and after each use.

The routine inspection should include, as a minimum, the inspections specified below:

1) Soiling;
2) Contamination;
3) Physical damage such as the following:
   a) Cuts, tears, and punctures, including protective toe caps;
   b) Thermal damage (charring, burn holes, melting, discoloration of any layer);
   c) Exposed or deformed metal/composite toe, metal/composite midsole, or shank;
4) Loss of water resistance;
5) Closure system component damage and loss of functionality;
6) Loss of seam integrity and broken or missing stitches;
7) Check the inside of the footwear by hand for signs of deterioration of the lining or toe protection area

Note: it is imperative to wear disposable plastic gloves during this inspection;

8) Check the thickness of the sole pad:
   The height of the tread must be less than 1.5 mm.
9) Check the integrity of the insole (if existing);
10) Check the date of obsolescence (if applicable)

Footwear should be repaired or replaced when showing at least one sign of wear:

1) Exterior materials:
   a) Deep crack affecting half of the thickness of the material constituting the rod;
   b) High abrasion of the material constituting the rod and the "hard end" located at the end of the foot when the protection against shocks (shell) became visible;
   c) The stem has significant deformations (sagging), the upper or the quarters have burns, bubbles, seams cut, loose son;
2) Outsole:
   a) The outsole has cracks with a width > 10 mm and a depth > 3 mm;
   b) The sole is separated over a length of > 10 mm and a depth > 5 mm;
   c) The depth of the sole tread must not be less than 1.5 mm.
3) Inside lining:
   a) The sock liner is deformed or crushed;

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b) The lining is damaged at the heel;
c) sharp edges appear at the area of protection of the toes (detectable by passing the hand inside the footwear).

4) Closure systems:
a) Closing systems (when present) are not in working order (zipper, cut or damaged lace, broken eyelet, crooked hook, burnt or missing hook-and-loop fastener);

9.1.2 Advanced inspection

The following checks should be undertaken, in additional to all checks in section 9.1.1.

1) Loss of seam integrity, delamination, or broken or missing stitches.
2) Condition of lining such as the following:
a) Tears;
b) Excessive wear;
c) Separation from outer layer.
3) Heel counter failure;
4) Label integrity and legibility.

9.2 Cleaning

9.2.1 Routine Cleaning

Footwear should not be machine dried using equipment that produces mechanical action from tumbling or agitation.
Where routine cleaning fails to render footwear sufficiently clean for service, the footwear should receive advanced cleaning.
Where possible, contamination levels should be assessed and decontamination in the field initiated at the emergency site.
Rinse the footwear with a water jet to remove the largest dirt.
Routine cleaning procedure - protective gloves must be worn, and protection against splashing of the eyes and face may be worn.
1) First clean off the surfaces using a brush and scrub all parts of the footwear (top and bottom);
Clean in a sink provided for this purpose:
2) Rinse with water 40°C to 45°C (without wetting the inside of the footwear);
3) Wash with PH 7 liquid soap using a microfiber cloth or sponge;
4) Wipe using a dry microfiber cloth;
5) Apply a wax if necessary. Dyed waxes are optional, where approved by the manufacturer;
6) Leave to air dry.

9.2.2 Advanced cleaning

Additional Requirements for Advanced Cleaning of footwear.
Advanced cleaning procedure - protective gloves may be worn and protection against splashing of the eyes and face may be worn

1) Remove the laces, protect the hook-and-loop fasteners (if they exist);
2) Clean off the surfaces using a brush, scrub all parts of the footwear (top and bottom);
Clean in a sink provided for this purpose:
3) Rinse footwear with a water jet to remove as much soiling as possible. Rinse with water 40 ° to 45 ° C (without wetting the inside of the footwear);
4) Wash with pH 7 liquid soap using a microfiber cloth or sponge;
5) Wipe using a dry microfiber cloth;
6) Apply a wax if necessary. Dyed waxes are optional, where approved by the manufacturer;

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7) Leave to air dry;
8) Disinfection of the footwear is recommended every six months, and when advanced cleaning is required.

9.3 Drying

Footwear should not be machine dried using equipment that produces mechanical action from tumbling or agitation.
Allow to dry in the open air. Drying should be away from direct heat sources and away from UV.

9.4 Repair

All repairs to footwear components should be performed in accordance with the footwear manufacturer's instructions.
Other than for the replacement of footwear laces and zipper assemblies, the footwear manufacturer should be contacted to determine feasibility of the repair.
All replacement footwear laces and zippers should be provided by the footwear element manufacturer.

10 Fire hood element

10.1 Inspection

Firefighters should conduct a routine inspection of their fire hood upon issue, and before and after each use, in accordance with manufacturer's instructions, provided the fire hood is not contaminated. If contaminated inspection post return from laundry.

The routine inspection should include, as a minimum, the inspections specified below.

10.1.1 Routine inspection

1) Soiling;
2) Contamination;
3) Physical damage such as the following:
   a) Rips, tears, and cuts;
   b) Thermal damage (charring, burn holes, melting, discolouration of any layer).
4) Loss of face opening adjustment;
5) Loss of seam integrity and broken or missing stitches;
6) loss of shape or elasticity;
7) loss of integrity of particulate barrier, if present.

10.1.2 Advanced inspection

In addition to the checks undertaken as part of the routine inspection (section 10.1.1), the label should also be checked for integrity and legibility

Periodic testing should be conducted to ensure that the thermal, moisture management and particulate protection (where present) is fit for purpose and still conforms to the entirety of the required Standard.

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10.2 Cleaning

10.2.1 Routine cleaning

Where possible, contamination levels should be assessed and decontamination in the field initiated at the emergency site.
The fire hood should be separated as much as possible from other PPE to avoid cross contamination.
Washing is recommended after each use.
NEVER use a stiff brush or other abrasive cleaning product to clean the fire hood as it may damage the knit.
Avoid hand cleaning and machine cleaning is recommended.
Hoods should be washed separately from other different PPE items.
For cleaning non-polar dirt and specific decontamination of personal protective equipment (PPE), the cleaning of the fire hood may be done using advanced cleaning procedures.
The temperature of the water must not exceed the temperature indicated on the label and the manufacturer's instruction.
If no temperature is indicated on the label, the temperature should not exceed 60°C (140°F)
A detergent with a pH range of not less than 6.0 pH and not greater than 10.5 pH should be used.
Special attention is required during drying. Select a moderate programme with a reduced agitation cycle.

10.2.2 Advanced cleaning

Advanced cleaning of fire hoods may be done by machine.
Organizations should review the manufacturer's label and user information for instructions on cleaning procedures that the manufacturer has provided with the hood. In the absence of manufacturer's instructions or approval by the manufacturer of other procedures, the cleaning procedures described in this section should be used.
The following procedures should be used for machine washing:

1) The recommended load is 60 % to 70 % of the machine capacity. (In case of higher load, the dirt may not be sufficiently removed, in case of lower load the mechanical action will cause faster damage)
2) Heavily soiled or spotted areas should be pre-treated. Chlorine bleach, chlorinated solvents, cleaning agents containing active ingredients or solvents should not be used without the approval of the assembly kit assembly or manufacturer.
3) The temperature of the water may not exceed the temperature indicated on the maintenance label and the manufacturer's instructions. If the maintenance label gives no temperature, the water temperature should not exceed 60°C (140°F)
4) A detergent with a pH range of not less than 6.0 pH and not greater than 10.5 pH should be used.
5) To remove all detergent and chemical residues after washing, rinsing is very important. The rinsing may be carried out with sufficient water (specify the weight/water ratio 1/5), several rinses, minimum recommended 2 rinsing cycles.
6) The machine manufacturer's instructions should be followed for appropriate settings or program selection for the specific garment item to be washed.

When the machine is also used for washing items other than fire hoods, it may be rinsed by running it without any laundry for a complete cycle with detergent and filled to the maximum with water at a temperature of 60°C (140°F).
The hood may be dried in accordance with section 10.3.

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An independent verification of the cleaning process may be obtained at least once a year. This will prove that the cleaning process remains effective.
Recommendation:
1) Machine wash at 60 °C (140°F) maximum;
2) Bleaching agents are prohibited;
3) Ironing 1 point 110°C;
4) if non-polar dirt: Dry cleaning allowed.

10.3 Drying

Manufacturer's instructions should be followed for drying the fire hood.
In the absence of manufacturer's instructions or approval by the manufacturer of other procedures, the drying procedures described in this section should be used.
They should not be dried in direct sunlight.
The following procedures should be used for machine drying:
1) The recommended capacity of the machine may not be exceeded;
2) Drying as per the manufacturer's instructions. In the absence of instructions, basket temperature should not exceed 60 °C (140 °F) unless otherwise specified on the fire hood label;

10.4 Repair

All repairs to hoods should be performed in accordance with the manufacturers' instructions.

11 SCBA

In order to be able to detect any defect in good time which may give rise to dangerous situations, individual Firefighters should conduct a routine inspection of their SCBA upon issue, before (including after repair or cleaning) and after each use.
The structure of the compressed air breathing apparatus is based on a modular design. This allows the user to configure the compressed air breathing apparatus from the modules available to match his specific requirements.
The different parts of the SCBA
1) The frame
   The composition of the frame is complex: a plate, shoulder straps, hip belt hip belt plate, cylinder support, cylinder buckle, cylinder retaining strap, manifold, quick-fill coupling, pressure reducer, pneumatic systems, etc.
2) The face masks
   The face blank is made of a special soft rubber compound and assures a snug, comfortable fit and a tight seal. The face blank is also available in yellow silicone. Some versions of the mask are also available in small size. The inhalation air flows from the connector of the mask past the inhalation valve to the inside of the lens [thus keeping the lens largely fog-free] and then through the check valves into the nose cup. The exhalation air passes through the exhalation valve directly to the ambient air.
   Components:
   a) Face blank;
   b) Head harness;
   c) Buckle;
   d) Lens;
   e) Nose cup with check valves;
   f) Connector and speech diaphragm;
   g) Exhalation valve;

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h) Carrying strap.

3) The demand valve
The positive pressure lung governed demand valves are breath-controlled dosing systems. They consist mainly of a housing with integrated diaphragm control.
They are connected to the pressure reducer with a swivelling, highly elastic medium pressure hose.

11.1 Inspection

Because the SCBA is an important personal protective equipment, and the functionality may be ensured, there is only one type of inspection, and that is a very thorough inspection.
In order to be able to detect any defect in good time which may give rise to dangerous situations, individual Firefighter should conduct a routine inspection of their SCBA upon issue, before (including after repair or cleaning) and after each use or at the start of each shift.
The inspection should be carried out according to the manufacturer's instructions and will be conducted by a trained user or competent person or organization, such as, element manufacturer, a trained laundry or other competent organization.
Training should be carried out by the manufacturers of the same element.
This ensures that the competent person or organization has received the necessary training.

11.1.1 Inspection of the frame

The frame is a complex item, a lot of different parts: a plate, shoulder straps, hip belt hip belt plate, cylinder support, cylinder buckle, cylinder retaining strap, manifold, quick-fill coupling, pressure reducer, pneumatic systems, etc.
Check the frame – ensure all items are correct mounted or connected, see instruction of manufacturer.
Check the general condition of the frame (cleanliness, burns, etc ...):
— Ensure the presence and the good condition of the straps (harness, dorsal, shoulder strap, belt, support, pneumatic system);
— Ensure the passage of the hoses;
— Check that the main and emergency hoses are free of movement;
— Ensure the presence of all plastic and metal buckles including mask fasteners;
— Check that the valve on demand holder is correctly held on the belt and that the belly clip is working properly;
— Ensure proper connection of the demand valve to the main and emergency medium pressure hoses;
— Check the correct fixing of the cylinder by simply pulling on the coupling and the strap;
— Check the pressure needle (following the manufacturer's instructions).

Weekly:
Frame Check:
— Check the condition of the back plate (cleanliness, breaks, burns, deformation, etc ...);
— Ensure the presence and the good condition of the straps (harness, dorsal, cylinder and handle extraction);
— Check the presence of all plastic and metal buckles including mask fasteners;
— Check the condition of the protections of the shoulders (burning, tearing, putting snaps, ...);
— Check the condition of the hoses (cracks, burns or deformation under pressure);
— Make sure that the hose of the valve on demand connects correctly to the main and emergency exit;
— Make sure that the valve on demand is properly held in its standby position by having checked the sealing lip seal beforehand;
— If there is a RFID, check the RFID identification chip;
— Ensure the correct position and maintenance of the belt;

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— Check that all frames have the same colour.

11.1.2 Inspection of the compressed Air cylinder

The composite cylinders are to be presented in regular intervals for the periodic inspections to a certified or appointed authority in the sense of the national or local regulations or guidance from the manufacturer if no national or local regulations. Legal basis for the periodic inspections are the national regulations.
The periodic inspection intervals are determined by the certified authority. An interval for the first periodic inspection is 3 or 5 years, respectively, depending on cylinder type (see indication in manufacturers type approval or on the cylinder label, resp.). Depending on cylinder type the life is limited to 15 years or is unlimited. Observe the national regulations in the country of use!

Visual Check

inclined hand wheel, leaking cylinder valve, cracks in hand wheel, damaged cylinder connection, etc.).

— Composite cylinders may be checked carefully for outside damage (abrasion, impact, dents, cuts and delamination). Depending on the damage, three categories are defined:

A/. Category 1 = non-critical superficial damage, like e.g. small abrasion, small cuts, scores or scratches. Such cylinders may be used again.
B/. Category 2 = if damages are considered to be repaired, take contact with the manufacturer.
C/. Category 3 = damage down to the carbon fibre layer. These cylinders may be taken out of service.

— Check validity of periodic inspection

A defective compressed air cylinder must be taken out of service immediately, it is to be emptied (depressurized) in a safe area, and must be presented to an inspection station and or a certified authority for a cylinder.

Tightness Test

The compressed air cylinder filled to service pressure and with closed valve less sealing plug is immersed into water. Air leaking from the cylinder valve outlet connection indicates a leakage in the valve between the lower shaft and the valve body. Air leaking at the cylinder neck thread indicates an insufficient packing of the cylinder valve to the cylinder. To blow out the water from the valve, put cylinder into holding fixture (use only holding fixtures which do not exert impermissible forces to the cylinder and which do not damage the cylinder surface), open cylinder valve carefully and briefly, and close again.

— Seal cylinder valve outlet connection with sealing plug, open and close again cylinder valve. Immerse cylinder with cylinder valve into water. Air leaking under the hand wheel indicates a damaged packing of the upper valve shaft.
— After tightness test dry cylinder valve
— If the tightness between cylinder valve and cylinder only is to be checked, the joint may alternatively be brushed with soap water. This save Repair the cylinder valve.

11.1.3 Inspection of the face mask

Important: before each use the user need to do a “user check” on the face mask.
After each use, the face mask needs to be: cleaned and disinfected followed by a visual, functional and tightness check.
Visual inspection of the face mask:
Inspect the mask for possible damages like for example deformations, sticking’s or cracks.

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Valve discs, especially exhalation valve discs, are crucial functional elements of the mask.
Remark: Defective or damaged parts may be replaced immediately, using original spare parts.
Functional test of the face mask:
After assembling the mask, the mobile parts, especially the valve discs, have to be tested for unrestricted mobility.
Tightness test of the face mask:
A/. For Negative Pressure
1) Fit mask tight onto the test instrument.
2) Generate a negative pressure of 10 mbar.
3) Measure the pressure change after 1 min.

The mask including the exhalation valve meets the requirements if for a moistened exhalation valve and a negative pressure generated inside the mask the pressure change does not exceed 1 mbar in a minute.
Remark: Leaking masks may not be used.
B/. For Positive Pressure
1) Opening Pressure Test of the exhalation valve
2) opening pressure of the exhalation valve at 10 l/min has to be at least 4.2 mbar, otherwise the mask may not be used

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11.1.4 Inspection of the valve

Visual inspection of the valve:
Inspect the valve for possible damages.

11.2 Cleaning

The cleaning should be carried out according to the manufacturer's instructions and will be conducted by a trained user or competent person or organisation, such as, element manufacturer, a trained laundry or other competent organization.
Training should be carried out by the element manufacturers of the same element.
This ensures that the competent person or organization has received the necessary training.
Where possible, the contamination levels should be evaluated, and field decontamination should be initiated at the emergency scene. If not possible, put the contaminated SCBA in a bag, before transportation to avoid cross-contamination.

11.2.1 Frame cleaning - straps - buckles - belt

For cleaning see manufacturer instructions, including for use of any other chemicals or any abrasive materials.
The cleaning may be carried out exclusively with water and mild non-abrasive soap, a brush can be used for particularly dirty parts and textile parts.
For maintenance see manufacturer instructions, including for use of any other chemicals or any abrasive materials.
IMPORTANT: Screw or connections as well as medium pressure connectors may be protected against splashing.

11.2.2 Cleaning the demand valve

For cleaning see manufacturer instructions, including for use of any other chemicals or any abrasive materials.

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Cleaning should only be done with water and mild non-abrasive soap, a "nailbrush" brush can be used for particularly dirty parts.
For maintenance see manufacturer instructions, including for use of any other chemicals or any abrasive materials.
During cleaning, make sure that no fluid enters the demand valve through the medium pressure hose.
For this, the demand valve may be in the standby position and the medium pressure hose connected to a frame. If it is not connected to necessary to put the cap on the fitting.

11.2.3 Cleaning the cylinder

For cleaning see manufacturer instructions, including for use of any other chemicals or any abrasive materials.
Cleaning should be done with a sponge with mild non-abrasive soap and water.
For maintenance see manufacturer instructions, including for use of any other chemicals or any abrasive materials.

11.2.4 Cleaning the mask

For cleaning see manufacturer instructions, including for use of any other chemicals or any abrasive materials.
Cleaning should be done with mild non-abrasive water and soap.
For maintenance see manufacturer instructions, including for use of any other chemicals or any abrasive materials.
Dry in clean open air that is not exposed to direct sunlight, indoors, or in a dedicated dryer.

11.2.5 Cleaning of the Control and Safety Instrument (ICS)

For cleaning see manufacturer instructions, including for use of any other chemicals or any abrasive materials.
The ICS case is an auxiliary equipment for users of air-insulated breathing apparatus compressed. It tells the bearer:
— the pressure of the cylinder;
— The remaining autonomy;
— The internal temperature of the case;
— The capacity of the battery
If the unit is very dirty, it should be cleaned with warm water and mild non-abrasive soap.
Do not use organic solvents, nitrous solutions, alcohol, gasoline, trichlorethylene, etc. the use of sponge scraper is strictly forbidden. For maintenance see manufacturer instructions, including for use of any other chemicals or any abrasive materials.

11.3 Drying

The drying should be carried out according to the manufacturer’s instructions and will be conducted by a trained user or competent person or organization, such as, element manufacturer, a trained laundry or other competent organization.
Training should be carried out by the element manufacturers of the same element.
This ensures that the competent person or organization has received the necessary training.
Can be manual or by machines.

11.4 Repair

The repair can only be done by the manufacturer.

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Annex A (normative)
Records of all items of Firefighters' PPE

Fire service name:
User's name:
Issue date:
Inspected by: End user / authorized personnel

	Clothing			Gloves	Hood	Helmet	SCBA	Footwear	Other please specify	Interfaces
	Coat	Trousers	Coveral							
Condition:										
New										
Good										
Reasonable										
Bad										
Manufacturer										
Model type										
Identification										
Lot number										
Date of manufacture										
Size										
Training provider										
Cleaning/decontamination date										
Reason for cleaning/decontamination										
Results of cleaning/decontamination										
Repair date										
Results of repair(s), including a brief description										
Retirement date										
Date and disposal method										

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Annex B
(informative)

Protocol AfPS GS 2014:01 PAK » investigates PAH

General

Polycyclic aromatic hydrocarbons PAHs are hydrocarbons, organic compounds, containing only carbon and hydrogen, that are composed of multiple aromatic rings. Also named “polyaromatic hydrocarbons”

Incomplete combustion produces PAH’s

Depending on the number of benzene rings, they are classified as light PAHs (up to three cycles) or heavy PAHs (more than three cycles) and have very different physicochemical and toxicological characteristics.
PAHs are uncharged, non-polar and lipophilic (hydrophobic)molecules they are not easily soluble in water, except associates to chemicals.
They can contaminate the air in the vapor phase and be present in the water.

Not all PAH are proven to be toxic or cancerogenic, but some of them are proven to be very toxic and cancerogenic, see list EPA

This table is under development at this time and approval is being sought to use the information found in the Federal Institute for Occupational Safety and Health publications, in particular reference to the Environmental Protection Agency (EPA) list of Polycyclic aromatic hydrocarbons (PAHs)

There is a need to have a test method and requirements to evaluate materials contaminated is necessary

The protocol AfPS GS describe the test method to analyse the quantity of PAH in materials, for examples in the materials of a firefighter PPE
This test is destructive, a sample of the test specimen is cut and tested according the test method AfPS GS

This protocol AfPS GS imposes requirements that materials must meet in order to be safe.
The materials are subdivided into categories according to use.

1/. Category 1: Materials intended to be put in the mouth, or materials of toys with intended long-term skin contact (longer than 30 s) ➔ not applicable for PPE
2/. Category 2: This category is provided for material with foreseeable contact to skin longer than 30 seconds (long- term skin contact). They have also given a limit value of 10 mg/kg (250 ng/cm2) for the sum of the 18 PAHs being in category 2
3/. Category 3: Materials not covered by category 1 or 2 with foreseeable skin contact up to 30seconds (short term skin contact)

This table is under development at this time and approval is being sought to use Table 1 that appears in the Product Safety Commission General Specification: AfPS GS 2014:01 PAK.
Table 1 is intended to present the maximum levels of PAH in product materials, which must not be exceeded.

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