
Cleaning, inspection and repair of firefighters' personal protective equipment (PPE)

*Nettoyage, inspection et réparation des équipements de protection
individuelle (PPE) des pompiers*

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Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General information	2
4.1 General	2
4.1.1 Innocuousness	3
4.2 Management system	3
5 Inspection	4
5.1 Routine inspection	4
5.2 Advanced inspection	4
6 Cleaning and decontamination	4
6.1 General	4
6.2 Management systems	5
6.3 Contamination	6
6.4 Cleaning procedures	6
6.4.1 General	6
6.4.2 Routine cleaning	6
6.4.3 Advanced cleaning	6
7 Repair	7
8 Records	7
8.1 General	7
8.2 Reporting PPE health and safety concerns	8
9 Garment	8
9.1 Inspection	8
9.1.1 General	8
9.1.2 Routine inspection	8
9.1.3 Advanced inspection	9
9.1.4 Periodic fit for purpose testing	10
9.2 Cleaning	10
9.2.1 General	10
9.2.2 Routine cleaning	11
9.2.3 Advanced cleaning	11
9.3 Repellency	12
9.4 Drying	12
9.5 Repair	13
9.5.1 General	13
9.5.2 Basic repair	13
9.5.3 Advanced repair	14
10 Glove	14
10.1 Inspection	14
10.1.1 General	14
10.1.2 Routine inspection	14
10.1.3 Advanced inspection	15
10.2 Cleaning	15
10.2.1 Routine cleaning	15
10.2.2 Advanced cleaning	15
10.3 Drying	15
10.4 Repair	15

11	Helmet	16
11.1	Inspection	16
11.1.1	General	16
11.1.2	Routine inspection	16
11.1.3	Advanced inspection	17
11.2	Cleaning	17
11.2.1	General	17
11.2.2	Routine cleaning	17
11.2.3	Advanced cleaning	18
11.3	Drying	18
11.4	Repair	19
12	Footwear	19
12.1	Inspection	19
12.1.1	General	19
12.1.2	Routine inspection	19
12.1.3	Advanced inspection	20
12.2	Cleaning	21
12.2.1	General	21
12.2.2	Routine cleaning	21
12.2.3	Advanced cleaning	21
12.3	Drying	21
12.4	Repair	21
13	Fire hood	22
13.1	Inspection	22
13.1.1	General	22
13.1.2	Routine inspection	22
13.1.3	Advanced inspection	22
13.2	Cleaning	22
13.2.1	General	22
13.2.2	Routine cleaning	23
13.2.3	Advanced cleaning	23
13.3	Drying	24
13.4	Repair	24
14	Respiratory protective devices (RPD)	24
14.1	General	24
14.2	Inspection	25
14.2.1	General	25
14.2.2	Inspection of the frame	25
14.2.3	Inspection of the compressed air cylinder	26
14.2.4	Inspection of the face mask	27
14.2.5	Inspection of the valves	28
14.3	Cleaning	28
14.3.1	Frame cleaning - straps - buckles - belt	28
14.3.2	Cleaning the demand valve	28
14.3.3	Cleaning the cylinder	28
14.3.4	Cleaning the mask	28
14.3.5	Cleaning of the Control and Safety Instrument (ICS)	29
14.4	Drying	29
14.5	Repair	29
Annex A (informative) Records of all items of firefighters' PPE		30
Annex B (informative) Post incident management of contaminated PPE		32
Bibliography		37

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Personal protective equipment*, Subcommittee SC 14, *Firefighters' personal equipment*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The purpose of this document is to provide the requirements, guidance and recommendations regarding the cleaning, inspection and repair of firefighters' personal protective equipment (PPE) and establish criteria for its cleaning, inspection and repair. This document 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 instructions and guidance to effectively minimize and manage this risk.

It is the responsibility of the firefighter (initially and ongoing) to undertake regular inspections of their PPE, and there shall also be a reliable system / mechanism (including training) to ensure that this can effectively be achieved.

This document also provides instruction and guidance to fire and rescue services regarding more advanced cleaning, inspection and repair.

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Cleaning, inspection and repair of firefighters' personal protective equipment (PPE)

1 Scope

This document gives requirements, guidance and recommendations for the cleaning, inspection, and repair of PPE for use by firefighters.

This document is intended to be used by those responsible for the cleaning, inspections, and repair of firefighters PPE, however, it will also provide vital guidance to those who are responsible for establishing such a programme including fire and rescue services.

This document does not cover the following at this time:

- a) chemical protective clothing;
- b) garments required for protection against chemical, biological, radiological and nuclear (CBRN) materials.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TR 19591, *Personal protective equipment for firefighters — Standard terms and definitions*

ISO/TR 21808, *Guidance on the selection, use, care and maintenance of personal protective equipment (PPE) designed to provide protection for firefighters*

3 Terms and definitions

For the purposes of this document, the following terms and definitions given in ISO/TR 19591, ISO/TR 21808 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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

3.1

advanced cleaning

cleaning by the product manufacturer, the manufacturers approved organisation, or mutually agreed organisation when a PPE item has been, or is potentially exposed to a hazardous or dangerous contaminant

Note 1 to entry: CBRN *contaminated PPE* (3.4) are to be disposed of not cleaned. PPE should be disposed of following local laws and regulations.

Note 2 to entry: Some known chemicals are commercially available for industrial use. PPE that have been exposed to known chemicals may not have to be disposed of. Specialist advice shall be sought on the contamination, however, the PPE shall be treated in the first instance as if the contamination is unknown.

Note 3 to entry: The decision shall be made following a detailed risk assessment.

3.2

competent organization

organization that is experienced and certified to inspect, clean, maintain or repair PPE for firefighters

3.3

contaminant

undesirable solid, liquid, gaseous or particulate hazardous substance such as

- a) products of combustion (e.g. soot),
- b) body fluids,
- c) infectious micro-organisms, and
- d) chemicals (e.g. asbestos or respirable fibres, flammable, corrosive, carcinogenic, mutagenic, toxic or sensitizing substances)

3.4

contaminated PPE

any items of PPE that has been exposed to a *contaminant* ([3.3](#))

3.5

routine cleaning

cleaning as per manufacturers or suppliers' instructions

3.6

routine inspection

superficial inspections by user of their PPE upon issue, or after return from cleaning or repair, and after each use

3.7

advanced inspection

inspection to ensure PPE is fit for purpose before return to use looking at all aspects of the PPE (e.g. inside, outside, defects, wear and tear, need for repairs or disposal)

3.8

repair

rectification of defects identified in PPE so that the required level of protection is re-established

4 General information

4.1 General

Any PPE provided to a firefighter shall be maintained without interruption of service during maintenance in efficient working order and good repair.

Every firefighter shall ensure that any PPE provided to them is maintained, in optimum working order and good repair before being used.

When an item of PPE needs to be cleaned or repaired the fire and rescue service shall ensure that suitable replacement PPE is made available.

The fire and rescue service shall ensure that its firefighters, service providers or members of the public are not unnecessarily exposed to soiled or potentially contaminated PPE.

An effective cleaning, inspection and repair system includes the following:

- a) inspection — checking for faults, damage, wear and tear, dirt, etc.;
- b) testing — to ensure PPE is operating as intended;

- c) cleaning — including disinfection and decontamination if appropriate;
- d) repair;
- e) replacement;
- f) recording.

4.1.1 Innocuousness

Any cleaning, repair or maintenance carried out by the firefighter or manufacturer shall not impact the innocuousness of the firefighters PPE.

See ISO 13688:2013, 4.2 and ISO 13688:2013/Amd.1:2021.

4.2 Management system

All PPE inspection, cleaning and repair shall be carried out according to the manufacturers or supplier's instructions and shall be conducted by a trained firefighter or competent person or competent organization, such as PPE manufacturer, a trained laundry or other competent organization.

Training shall be carried out by the PPE manufacturers or suppliers of the same PPE item. 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, shall 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.

The program shall consider the service continuity during cleaning and maintenance.

This programme shall have the goals of providing instruction and guidance to the suitable cleaning, inspection and repair of firefighter PPE for its intended use, through:

- a) Maintaining such firefighter PPE in a safe, usable condition to provide the intended protection to the firefighter.
- b) Removing from use any firefighter PPE that could cause or contribute to firefighter injury or illness.
- c) Reconditioning, repairing, or retiring such firefighter PPE as necessary.

The fire and rescue service and/or agreed organization shall develop specific criteria for removal of PPE considered to be not fit for purpose or beyond economic repair.

When handling PPE prior to cleaning, those handling the PPE shall observe appropriate health and safety precautions to protect them from any contaminants. Cross contamination shall be avoided at every stage of the process, especially during routine inspection and cleaning.

All PPE found or suspected to be soiled or contaminated shall be isolated during the cleaning process. If PPE are found to be contaminated by unidentified CBRN agents, the item shall be decommissioned and disposed of appropriately.

The fire and rescue service and/or organization shall establish guidelines that include appropriate actions to be taken with planning of temporary alternative, maintained PPE if the PPE item is found to be contaminated or suspected that it requires cleaning, decontamination, or repair.

There shall always be alternative PPE provided by the fire and rescue service and/or organization in such circumstances.

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

As a minimum, cleaning and inspection shall be done once per annum, and as required. All repairs shall be carried out in accordance with manufacturer's instructions by trained/approved organizations.

5 Inspection

5.1 Routine inspection

Individual firefighters shall conduct routine inspections of their PPE upon issue and after each use, cleaning and/ or repair. Maintenance-in-use checks shall be carried out by the firefighters before and after each use to identify any defects before being exposed to hazardous situations.

There shall be clear criteria provided to firefighters for when and how to send PPE for cleaning. This shall include details of how to prevent cross contamination and how those transporting or receiving these items can be protected.

The inspection criteria and the response to the magnitude of the consequences shall be specified. The response may include the following actions:

If the abnormality is

- a) minor: take no action,
- b) moderate: send for repair, and
- c) major: prohibit use, major repair or discard and replacement.

5.2 Advanced inspection

Cleaning shall be carried out prior to advanced inspection.

Any advance inspection shall be carried out according to the manufacturer's instructions by trained firefighters, competent persons or organizations.

The PPE manufacturer, or supplier, fire and rescue service and/or organization shall determine the level of training required to perform advanced inspections. They shall maintain records of such training.

If the fire and rescue service and/or agreed organization is endorsed to provide training, it shall be permitted to determine the level of training necessary to perform the inspection.

Advanced inspections of all PPE which has been issued shall be conducted at a minimum of every 12 months, or whenever routine inspections indicate that a problem could exist. PPE which has been properly stored and are not being used are not required to be subjected to advanced inspection.

New PPE that have been stored in accordance with manufacturer's instructions are not required to be subjected to advanced inspection.

The findings of the inspection shall be recorded, see [Clause 8](#).

6 Cleaning and decontamination

6.1 General

PPE shall be evaluated by the firefighter for application of appropriate cleaning level after each use in accordance with the fire and rescue service and/or agreed organizations procedures.

One should distinguish cleaning requirements due to different factors: soiling due to normal wear require hygienic cleaning, biological contamination (e.g. blood), fire contamination due to fire smoke, chemical contamination (e.g. oil, grease, acid such as battery acid), unidentified CBRN agents, soiling due to other activities not listed above. The cleaning methods are determined in [6.4.2](#) and [6.4.3](#).

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

Some known chemicals are commercially available for industrial use. PPE that has been exposed to known chemicals may not have to be disposed of, specialist advice shall be sought on the contamination, however, the PPE shall be treated in the first instance as if the contamination is unknown. The decision shall be made following a detailed risk assessment.

The member(s) of the fire and rescue service and/or agreed organization who has received training in the cleaning of firefighter PPE shall be responsible for performing or managing advanced cleaning of PPE contaminated with hazardous materials.

Contaminated PPE shall not be brought into the home. Where cleaning of PPE is required, guidance shall be provided to the firefighter by the fire and rescue service on how to identify contamination, as opposed to soiling, and on how best to clean the PPE in a safe and effective manner.

Commercial dry cleaning shall not be used as the means of cleaning or decontaminating PPE unless approved by the PPE manufacturer.

When an organization is used for cleaning or decontamination, they shall demonstrate to the fire and rescue service's satisfaction that the procedures are effective and do not degrade neither the intrinsic qualities of the item nor the material, nor the level of performance of the PPE.

When conducting a partial cleaning with cleaning chemicals, the operator shall be aware of the safety data sheet and act accordingly by wearing the appropriate PPE.

Waste waters discharged from the laundry process and its environmental effects shall be considered and shall conform to local laws and/or national regulations when discharging waste waters or effluent to public drainage or waterways.

6.2 Management systems

The fire and rescue service and/or agreed organizations shall provide the means for having PPE cleaned and decontaminated.

Fire and rescue service shall have written procedures that:

- a) Detail the generalized decontamination and cleaning processes for contaminated PPE.
- b) Minimize the public's and the fire and rescue service and/or agreed organization personnel's exposure to soiled or contaminated firefighting PPE.
- c) Require that PPE shall not be worn or stored in the non-operational living areas of the fire and rescue service facilities.
- d) Ensure 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.
- e) Provide training in identifying contamination and determining the cleaning methods (routine and advanced cleaning) to be applied.

PPE known or suspected to be contaminated by hazardous materials shall be assessed at the incident to determine the appropriate level of treatment.

Items shall be prepared for safe transportation. For further guidance, see [Annex B](#) on post incident management of contaminated PPE.

Contaminated or potentially contaminated PPE should not be worn or taken into the cabin of the fire appliance/truck. Where this is unavoidable, the cabin of the fire appliance/truck shall be cleaned and decontaminated at the first possible opportunity once firefighting operations have ceased.

When firefighters are combating a moving wildland fire, they are often required to move on an ongoing basis during firefighting operations with no opportunity to change PPE. Where possible and where the contaminant and its source have been identified, the fire and rescue service and/or agreed organization shall consult the supplier of the contaminant and the manufacturer of the PPE for an appropriate decontamination agent and process.

6.3 Contamination

Cleaning requirements will be dictated by contaminant and exposure. Soiling due to normal wear shall require routine cleaning to be undertaken. Biological, product of combustion and chemical contamination shall require advanced cleaning. The cleaning levels are described in [6.4.2](#) and [6.4.3](#).

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

6.4 Cleaning procedures

6.4.1 General

A member(s) of the fire and rescue service and/or agreed organization who has received training in the cleaning of PPE shall be responsible for performing or managing advanced cleaning of PPE contaminated with hazardous materials.

When cleaning or decontamination is completed, there shall be a method to periodically 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. As it is impossible to identify or to quantify all the existing pollutants, a generalized washing method that can clean as many pollutants as possible shall be used to clean all the firefighter PPE.

Waste waters discharged from laundry process and its environmental effects shall be considered. Refer to local laws and/or national regulations when discharging waste waters or effluent to public drainage or waterways.

6.4.2 Routine cleaning

Routine cleaning includes

- a) hygienic cleaning, and
- b) partial cleaning completed by fire fighter (e.g. brushing of clothing).

Firefighters shall ensure that their PPE is cleaned routinely and as required. The routine cleaning shall be done by a trained and competent person. The routine cleaning shall be carried out according to the manufacturer's or supplier's instructions.

Cleaning other than by the instruction given on the label, shall always comply with the manufacturer's guidance to ensure an approved alternative procedure for the routine cleaning is applied.

6.4.3 Advanced cleaning

Any advanced cleaning shall be carried out according to the manufacturer's instructions by trained firefighters, competent persons, fire and rescue service and/or agreed organizations.

Before advanced cleaning is undertaken advice shall be taken on whether the contaminant can be removed.

Advance cleaning includes

- a) decontamination for chemical contamination,

- b) decontamination for biological contamination, and
- c) decontamination from contamination due to products of combustion.

Cleaning items contaminated by CBRN must be disposed of according to local laws and regulations.

Some known chemicals are commercially available for industrial use. PPE that have been exposed to those known chemicals may not have to be disposed of. Specialist advice shall be sought on the contamination, however, the PPE shall be treated in the first instance as if the contamination is unknown. The decision shall be made following a detailed risk assessment.

The member(s) of the fire and rescue service and/or agreed organization who has received training in the advanced cleaning of the PPE shall be responsible for performing, managing, or coordinating advanced cleaning or the advanced cleaning process.

Advanced cleaning shall be performed by the PPE manufacturer, a manufacturer trained organization, an agreed organization or trained fire and rescue service personnel. PPE that is issued and used shall receive advanced cleaning at the time of advanced inspection if not subjected to advanced cleaning in the preceding 12 months.

Organizations shall examine the manufacturer's label and instructions on cleaning and drying that were provided with the PPE. In the absence of manufacturer's instructions or manufacturer's approval of alternative procedures for the PPE, the advanced cleaning and drying procedures provided in [9.2.3](#) and [9.4](#) (for garments) shall be used for other items (e.g. see [10.2](#), [11.2](#), [13.2](#) and [14.2](#)).

7 Repair

All repairs shall be carried out according to the manufacturer's instructions and will be conducted by trained firefighters, competent persons, fire and rescue service and/or agreed organizations.

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

All repairs and alterations to PPE shall 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 PPE manufacturer shall be contacted if the fire and rescue service or agreed organization is unsure of whether a repair can be accomplished without adversely affecting the integrity and/or performance of the PPE.

Poor repair can impact the protection provided by the PPE. This may lead to firefighter injury and/or inability to perform tasks.

8 Records

8.1 General

The fire and rescue service and/or agreed organization shall compile and maintain records on its PPE.

Records shall be kept for PPE that are used by the fire and rescue service (see [Annex A](#)).

At least the following records shall be kept for each item of PPE:

- a) person to whom PPE is issued;
- b) date and condition when issued;
- c) manufacturer and model name or design;
- d) manufacturer's identification number, lot number, or serial number;
- e) month and year of manufacture;