BS ISO 23616:2024

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

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National foreword

This British Standard is the UK implementation of ISO 23616:2024. It supersedes BS 8617:2019 and BS ISO 23616:2022, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PH/14, Firefighters' personal protective equipment.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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

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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 document 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).

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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*.

This second edition cancels and replaces the first edition (ISO 23616:2022), which has been technically revised.

The main changes are as follows:

— editorial changes throughout the document.

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.

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Introduction

The purpose of this document is to provide the requirements, guidance, and recommendations, and establish criteria regarding the cleaning, inspection, and repair of firefighters' personal protective equipment (PPE). 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.

Following the designation by the World Health Organization of firefighting as an at risk occupation from cancer, the intent of this document is to consider all technologies for decontaminating and cleaning firefighters PPE, including all new technologies, i.e $LC0_2$ processes.

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

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 provides 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 program including fire and rescue services.

This document does not cover the following at this time:

a) chemical protective clothing;

b) PPE required for protection against chemical, biological, radiological and nuclear (CBRN) materials.

The selection and use of personal protective equipment (PPE) for firefighters are covered by ISO/TR 21808.

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/TS 16975-1, *Respiratory protective devices — Selection, use and maintenance — Part 1: Establishing and implementing a respiratory protective device programme*

ISO/TS 16975-2, *Respiratory protective devices — Selection, use and maintenance — Part 2: Condensed guidance to establishing and implementing a respiratory protective device programme*

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

ISO/TR 21808, *Best practices on the selection and use 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/

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3.1
advanced cleaning
cleaning by the product manufacturer, the manufacturers approved organization, a specialized competent organization, or mutually agreed competent organization when a PPE item has been, or is potentially exposed to a hazardous or dangerous contaminant

Note 1 to entry: CBRN *contaminated PPE* 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 to decontaminate or dispose of PPE shall be made following a detailed risk assessment.

3.2
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)

3.3
competent organization
organization that is experienced in the inspection, cleaning, maintainance or repair of firefighters PPE

3.4
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)

3.5
contaminated PPE
any PPE that has been exposed to a *contaminant* (3.4)

3.6
repair
rectification of defects identified in PPE so that the required level of protection is re-established

3.7
routine cleaning
periodic cleaning conducted by the user as per manufacturers or suppliers' instructions

3.8
routine inspection
superficial inspections by user of their PPE upon issue, or after return from cleaning or repair, and after each use

4 General information

4.1 General

Any PPE provided to a firefighter shall be maintained in efficient working order and good repair. During cleaning, inspection and repair, alternative PPE shall be provided to ensure continually operational availability of the firefighter.

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Every firefighter shall ensure that any PPE provided to them is clean, in optimum working order and in 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) cleaning — including disinfection and decontamination if appropriate;

c) repair;

d) replacement;

e) recording.

f) testing — to ensure PPE is operating as intended;

4.2 Innocuousness

Any cleaning, repair or maintenance carried out on firefighting PPE shall not impact the innocuousness of that PPE.

See ISO 13688:2013, 4.2 and ISO 13688:2013/Amd.1:2021, 4.2, and ISO 21420 and ISO 21420:2020/Amd.1:2022, 4.2.

4.3 Management system

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

All advanced PPE cleaning, inspection and repair shall be carried out by a competent organization. Training shall be provided by the PPE manufacturers or suppliers of the same PPE item to the competent person or organization undertaking the advanced cleaning, inspection, and repair.

The competent organization responsible for cleaning, inspection and repair, shall develop and implement a program for the care and maintenance of PPE used by the members of the fire and rescue service in the performance of their assigned functions.

The program shall provide sufficient PPE to maintain service continuity during cleaning inspection and repair.

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

a) Maintaining such PPE in a safe, usable condition to provide the intended protection to the firefighter.

b) Removing from use any PPE that could cause or contribute to firefighter injury or health issues.

c) Reconditioning, repairing, or retiring such PPE as necessary.

The competent organization shall develop and provide 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 cleaning and inspection.

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

All repairs shall be carried out in accordance with manufacturer's instructions by competent organizations. All PPE that is found or suspected to be soiled or contaminated shall be cleaned or decontaminated before any additional inspection is initiated.

As a minimum, advanced cleaning (see 6.4.3) and advance inspection (see 5.2) shall be carried out as required and at least once per year.

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. These 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 and instructions provided to the firefighters for when and how to send PPE for cleaning and inspection. The instructions shall include details of how to prevent cross contamination and how those transporting or receiving these items can be protected.

The inspection criteria shall be selected based on the potential consequence and may include:

If the abnormality is

a) minor: take no action,

b) moderate: send for repair, and

c) major: prohibit use, major repair or discard and replace.

5.2 Advanced inspection

Advanced cleaning shall be carried out prior to advanced inspection.

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

The PPE manufacturer, or supplier, or competent organization shall determine the level of training required to perform advanced inspections. They shall maintain records of such training.

If the competent 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 according to the manufacturer's instruction 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.

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6 Cleaning and decontamination

6.1 General

Firefighters shall evaluate and determine the required cleaning level (routine cleaning or advanced cleaning) in accordance with the procedures of a competent organization.

Firefighters shall distinguish between appropriate cleaning levels by reference to the following factors:

a) soiling:

— soiling in regular use require hygienic cleaning.

b) contamination:

— biological contamination (e.g. blood);

— fire contamination due to combustion products during fire (e.g. smoke, soot);

— chemical contamination (e.g. oil, grease, 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 unintentionally by unidentified CBRN agents shall 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. The PPE shall be isolated until the contamination is identified and an appropriate decontamination process is identified. The decision regarding decontamination shall be made following a detailed risk assessment.

Only competent organization persons shall be responsible for performing or managing advanced cleaning of PPE contaminated with hazardous materials.

Contaminated PPE shall not be brought into the home or transported in fire apparatus cabs or passenger compartments within personal vehicles. It is recommended that a procedure be established within the fire service whereby contaminated PPE is removed from the body as soon as possible after the intervention and packed in a vapour-proof and puncture resistant bag/container. 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 the intrinsic qualities of the item, the materials used in the construction of the item, or the level of performance of the PPE.

Consideration shall be taken of all new technologies for improving the efficacy of cleaning PPE. These considerations shall also take into account any impact in the performance of the PPE.

When conducting a 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.

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6.2 Management systems

The competent organizations shall provide the means for having PPE cleaned and decontaminated.

Fire and rescue services shall have written procedures that detail decontamination and cleaning processes for contaminated PPE. These procedures shall:

a) Minimize the risk of contamination to all people from exposure to contaminated garments/firefighting PPE.

b) Require that PPE not be worn or stored in the non-operational living areas of the fire and rescue service facilities.

c) Ensure PPE be stored in a correctly lit, ventilated and dedicated storage room, which is isolated from any other section of the fire station.

d) 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, therefore the PPE shall be cleaned at the first possible opportunity, this may be at the end of an allocated shift.

Where possible and where the contaminant and its source have been identified, the competent 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 shall be destroyed in accordance 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

The member(s) of the competent 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 cleaning method that can clean as many pollutants as possible shall be used to clean all the 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.

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