TECHNICAL REPORT

ISO/TR 21808

First edition
2009-11-01

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

Guidage sur la sélection, l'utilisation, le soin et l'entretien des équipements de protection individuelle (PPE) conçus pour pourvoir à la protection des pompiers

Reference number
ISO/TR 21808:2009(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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.

ISO/TR 21808 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 14, *Fire-fighters' personal equipment*.

Introduction

The information in this Technical Report is designed to assist in making the necessary decisions regarding the selection, use, care and maintenance of personal protective equipment (PPE) for firefighters.

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

1 Scope

This Technical Report sets out guidance for the selection, use, care and maintenance of PPE designed to provide protection for firefighters while carrying out their duties.

The PPE covered in this Technical Report is intended for firefighting personnel exposed to risks associated with, but not necessarily limited to, the following activities:

— structural firefighting;

— wildland firefighting;

— incidents involving hazardous materials;

— incidents involving motor vehicles;

— urban search and rescue;

— swift water rescue;

— emergency medical response;

— storm and flood recovery.

The purpose of this Technical Report is to highlight the main areas that an organization needs to consider when providing PPE to its members. Most paragraphs of the document contain bullet lists; these lists are provided for guidance only and they are not exhaustive.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
personal protective equipment
PPE
equipment that can include, but is not limited to, clothing, gloves, helmets, footwear and face protection

2.2
hazard
substances, situations or events that can cause harm/injury

2.3
risk
factor, R, that reflects both likelihood, L, of the occurrence of a hazard in a particular situation and severity, S, of the consequences or extent of harm to the individual to be expected from the hazard

$$R = L \times S$$

2.4
selection
process of determining the type of personal protective equipment that is necessary for the protection of firefighters and other response personnel from an anticipated, specific hazard, or other activity, the procedure of the appropriate PPE, and the choice of the proper PPE for a specific hazard or activity at an emergency incident

2.5
use
application of personal protective equipment considering its limitations

2.6
care
keeping in good working order, including procedures for cleaning, decontamination and storage

2.7
maintenance
preserving from loss or deterioration, including procedures for inspection, repair and ultimate removal from service

3 General

An organization should develop and implement a structured training programme for all firefighters on the selection, care, use and maintenance of PPE.

4 Selection

4.1 General

Subject to requirements, the process of selecting PPE can be divided into a number of stages.

4.2 Identify risk and assess

The process of carrying out a risk assessment should include:

a) identification of the activities to be undertaken by person(s) wearing the PPE;

b) a list of the hazards present;

c) a quantification of the risks that would result from exposure to the hazards;

d) considerations of the protection provided by other control measures before the application of PPE;

e) determination of the level and extent of protection required from the PPE (in absolute or relative terms);

f) frequency of use of the PPE;

g) organization’s knowledge;

h) type of incident;

i) geographical location and climate;

j) evaluation of risks resulting from the use of the PPE.

A number of risk assessment models may be used to determine the level of risk associated with the activities. See Annex A.

4.3 Defining the level of protection required for each activity from the PPE

a) determine which parts of the body require protection;

b) identify what kind of protection is required;

c) identify the appropriate standards or methods that provide the required protection;

d) determine the level(s) of protection required (for the relevant parts of the body) in relative or absolute terms for each item of PPE.

4.4 Collecting information on available PPE

a) carry out market research to determine products that are available;

b) obtain information from the potential suppliers on performance levels and manufacturer's information including the compliance to relevant standards and certification by a recognised independent certification body;

c) gather information from comparable organizations using similar items of PPE for similar tasks;

d) determine compatibility of all items of PPE to be used.

NOTE If, after collating all available information, it is established that suitable PPE is not available, then it might be necessary for an organization to carry out research and development work.

4.5 Wearer trials

The purpose of a wearer trial is to assess the compatibility and the ergonomic practicality of the PPE. Obtaining feedback from the intended users is imperative at this stage, as such information will provide valuable data relating to the practical performance of the PPE, and also give confidence to the users, thus ensuring that the selected items are used.

Structured trials with participants undertaking standardized, representative tasks are recommended.

When conducting wearer trials, a systematic approach should be adopted with the following issues considered:

a) ease and speed of putting on and taking off;

b) ease and extent of adjustability;

c) acceptance in terms of comfort, weight and metabolic heat release;

d) compatibility with all other items of PPE;

e) ability to undertake all tasks expected without hindrance or difficulty;

f) preservation of the protection in all working positions;

g) selection of participants based on a cross section of the relevant occupational group (height, weight, age, gender, etc.);

h) participants' evaluation of each individual item of the PPE on trial;

i) evaluation feedback, obtained in a structured manner allowing for both qualitative and quantitative data collection and analysis; using a structured questionnaire, structured or semi-structured interviews and/or group discussions;

j) sufficient number of participants to ensure that the results obtained are statistically significant and representative of the total workforce;

k) performance of the garments after a number of cleaning cycles according to the manufacturer's instructions;

l) objective physiological measurements should be used to determine thermal impact (metabolic heat release/retention).

NOTE 1 For consistency of data, the same participants should be used to conduct the wearer trials.

NOTE 2 Further guidance on the ergonomics of PPE in general can be found in EN 13921. A detailed test protocol, specifically for firefighters' PPE, can be found in BS 8469.

4.6 Additional testing

4.6.1 Additional whole product testing

The following might be required to assist in any decision making:

— instrumented manikin testing.

4.6.2 Laboratory material testing

Examples of tests that may be carried out to determine PPE durability are:

— resistance to/behaviour after laundry/cleaning;

— resistance to/behaviour after decontamination;

— resistance to/behaviour after UV exposure;

— abrasion resistance;

— durability of the properties (protective or other) of the garment after extended period of use;

— resistance of seams and/or other assembling systems;

— chemical repellence;

— flex fatigue;

— liquid barrier properties.

4.7 Other considerations

In order to establish the overall performance and the total cost of ownership of the PPE, the following considerations might need to be made:

a) is training offered as part of the procurement package (including training provided by third parties)?

b) is a post procurement service offered?

c) what quality assurance measures are in place prior to the delivery?

d) what are the quality procedures of subcontractors for, e.g., care and maintenance of the PPE?

e) what are the requirements for cleaning and decontamination?

f) what are the inspection and maintenance requirements?

g) what are the replacement requirements and considered life cycle of PPE?

h) what is the delivery time for standard and special sizes?

i) what sizes are available?

j) are stock items held by the supplier?

k) what are the collection and delivery arrangements?

l) should stock be held within the organization?

m) how is the internal distribution to the users to be organized?

n) how is the PPE to be safely disposed of?

o) can corporate/role identity (e.g. badges on garments) be incorporated without adversely affecting performance?

p) compliance and certification of PPE?

q) how is the contaminated PPE to be disposed of?

r) in the case of leased PPE, what are the guarantees of quality offered by the rental company?

s) in the case of leased PPE, does the rental company ensure care and maintenance of PPE?

When the outcome of a selection process results in the employer providing a number of items of PPE for different tasks/activities, the user/wearer may be permitted (after being provided with appropriate training) to select the item(s) that provide the necessary protection at the time of use. Any selection made at that stage must be based upon the risk assessment carried out by the employer and based upon an informed dynamic risk assessment by the user at the time of use.