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## **Clothing for protection against heat and flame — General recommendations for selection, care and use of protective clothing**

*Vêtements de protection contre la chaleur et les flammes —  
Recommandations générales pour la sélection, l'entretien et l'utilisation  
des vêtements de protection*

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Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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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.

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is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.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 2801 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing*.

ISO/TR 2801 cancels and replaces ISO 2801:1998, which has been technically revised. ISO/TR 2801 is based on CEN/TR 14560:2003.

## Introduction

The information in this Technical Report has been produced to assist employers (or people who advise employers) in making the necessary decisions regarding the selection, use, care and maintenance of protective clothing, for employees exposed to risks related to heat and flame (e.g. welding, firefighting).

The purpose of this Technical Report is to highlight the main areas that an employer needs to consider. Most paragraphs of this Technical Report contain bullet-lists. These lists are provided to give guidance only and are not exhaustive.

Normative references are not provided in this Technical Report. All references are of an informative nature only. Annex A gives details of the current International Standards relating to clothing designed to provide protection from heat and flame.

For European legislation on personal protective equipment (PPE), see Directive 89/656/EEC and Directive 89/686/EEC.

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# Clothing for protection against heat and flame — General recommendations for selection, care and use of protective clothing

## 1 Scope

This Technical Report sets out guidance for the selection, use, care and maintenance of clothing designed to provide protection against heat and flame.

## 2 Terms and definitions

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

### 2.1

#### **hazard**

substances, situations or events that can cause harm/injury

### 2.2

#### **risk**

combination of the probability of the occurrence of a hazard in a particular situation and the consequences or extent of harm to the individual to be expected from the hazard

### 2.3

#### **selection**

the process of determining the type of protective clothing assembly (garment) that is necessary for the required protection

### 2.4

#### **use**

application of protective clothing including its limitations

### 2.5

#### **care**

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

### 2.6

#### **maintenance**

procedure for inspection, care and repair with the aim of retaining the protective properties and preventing excessive deterioration of the clothing

### 3 Selection

#### 3.1 General

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

#### 3.2 Risk assessment

The process of carrying out a risk assessment should include:

- identification of the activities to be undertaken by the person(s) who will require to wear the protective clothing;
- a list of the hazards present;
- a quantification of the risks that would result from exposure to the hazards;
- considerations of the protection provided by other control measures before the application of PPE;
- determination of the level and extent of protection required from the protective clothing (in absolute or relative terms);
- determining whether adding badges to a garment may increase the risk (e.g. adding a badge may create a raised surface to which molten splash can cling).

A number of risk assessment models may be used to determine the level of risk associated with the activities. Annex B gives reference to some of the existing documents on this subject.

#### 3.3 Defining the level of protection required for each activity from the protective clothing

The process of defining the level of protection required for each activity from the protective clothing should include:

- determining what parts of the body require protection;
- identifying the appropriate standard or method which will provide the protection required;
- determining the level(s) of protection required (for the relevant parts of the body) in relative or absolute terms for each item of protective clothing.

Annex C provides guidance and examples of hazards and applicable standards.

#### 3.4 Collecting information on available protective clothing

The process of collecting information on available protective clothing should include:

- carrying out market research to determine products that are available;
- obtaining information from the potential suppliers on performance levels and manufacturer information;

NOTE 1 Depending on the region, some types of protective clothing can be subject to specific requirements and are therefore certified by a notified body.

- gathering information from comparable organizations using similar items of protective clothing for similar tasks;
- determining compatibility of all items of PPE to be used.



NOTE 2 If after collating all available data, it is established that suitable protective clothing is not available, then it can be necessary for an organization to carry out research and development work.

Annex A provides a list of the relevant ISO standards for clothing designed to protect against heat and flame.

### 3.5 Wearer trials

The purpose of a wearer trial is to assess the compatibility and the ergonomic practicality of the protective clothing. 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 protective clothing, and also give confidence to the users, thus ensuring that the selected items are used.

When conducting wearer trials, the following issues should be considered:

- a) ease and speed of putting on and taking off;
- b) ease and extent of adjustability;
- c) acceptance in terms of comfort and weight;
- 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) whether adding badges to a garment may increase the risk, i.e. the positioning of a badge (e.g. will it be in a high risk area?) and the type of badge (e.g. is it flame retardant?) should be considered;

When wearer trials are conducted a systematic approach should be adopted:

- participants should be selected based on a cross section of the relevant occupational group (height, weight, age, gender, etc.);
- participants should evaluate individually each item of the protective clothing assembly they wear;
- evaluation feedback should be obtained in a structured manner allowing for both qualitative and quantitative data collection and analysis: this may be achieved by using a structured questionnaire, structured or semi-structured interviews and/or group discussions;
- the number of participants should be sufficient to ensure that the results obtained are statistically significant and representative of the total workforce.

### 3.6 Additional testing

To assist any decision making process, additional testing may be required, e.g.

- instrumented manikin testing;
- laboratory testing:
  - assessment of/behaviour after laundry/cleaning;
  - assessment of/behaviour after decontamination;
  - assessment of/behaviour after UV exposure;
  - abrasion resistance;
  - chemical repellency.

### 3.7 Other considerations

In order to establish the overall performance and the total cost of ownership of the protective clothing, other considerations may need to be made, e.g.

- is training offered as part of the procurement package (including training provided by third parties)?
- is a post procurement service offered?
- what quality assurance measures are in place prior to the delivery?
- what are the requirements for cleaning and decontamination?
- what are the inspection and maintenance requirements?
- what are the replacement requirements and costs for components?
- what is the delivery time for standard and special sizes?
- what sizes are available?
- are stock items held by the supplier?
- what are the collection and delivery arrangements?
- should stock be held within the organization?
- how is the internal distribution to the users to be organized?
- how is the protective clothing to be safely disposed of?
- can corporate/role identity be incorporated without affecting performance?

NOTE When the outcome of a selection process results in the employer providing a number of items of protective clothing for different tasks/activities, the user/wearer can 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 is based upon the risk assessment carried out by the employer or based upon an informed dynamic risk assessment by the user at the time of use.

## 4 Use

### 4.1 General

After the selection of the protective clothing, a number of stages should be followed to ensure its correct use.

### 4.2 Training

All employees/users should be trained how to use their protective clothing correctly, prior to the equipment being introduced into active service. Such training should include:

- a) information concerning limitations and capabilities of the protective clothing:
  - what the protective clothing will protect from;
  - what the protective clothing will not protect from;
  - what the effects are (if any) of long term use;

- b) how to use/wear the protective clothing;
- c) the importance of complying with the manufacturers or suppliers instructions;
- d) how to store the protective clothing when not in use;
- e) information concerning arrangements for cleaning and decontamination;
- f) how to determine when the protective clothing is no longer fit for purpose and should be discarded;
- g) procedures for discarding clothing no longer fit for purpose in an environmentally correct way;
- h) how to obtain replacements;
- i) the importance of using garments which are not contaminated by inflammable liquids or substances which could create a spontaneous combustion.

NOTE The instructions/training provided to the wearer/user will depend on the level of risk and complexity of the protective clothing to be provided. The provision of written instructions or information might not be sufficient and the users/wearers might need to be involved in practical demonstrations, training and exercise.

### 4.3 Introducing protective clothing into service

**WARNING — When individual items of a PPE ensemble are replaced, care should be taken to ensure that the required level of protection to the body is maintained.**

### 4.4 Record keeping

In the overall management of protective clothing, it is essential to build a full life history for each item, from manufacture to disposal.

Record keeping should incorporate the following:

- a) the specification of the protective clothing (manufacturer, delivery date, batch number, ...);
- b) the service history of the protective clothing (date of issue, name of wearer, ...);
- c) training records of operatives using the protective clothing, including the duration of exposure to risks and the identity of the risks;
- d) details of hazards to which the protective clothing has been exposed;
- e) information relating to care:
  - cleaning (number and conditions);
  - decontamination (when, how and by whom);
  - storage;
- f) records of maintenance:
  - inspection (when, how and by whom);
  - damage and repair;
  - disposal;