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Guidelines for selection, use, care and maintenance of smart garments protecting against heat and flame

Lignes directrices relatives à la sélection, l'utilisation, l'entretien et la maintenance des vêtements intelligents contre la chaleur et la flamme

Leitfaden für Auswahl, Gebrauch, Pflege und Instandhaltung von smarter Schutzkleidung gegen Hitze und Flammen

This Technical Report was approved by CEN on 12 March 2021. It has been drawn up by the Technical Committee CEN/TC 162.

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European foreword

This document (CEN/TR 17620:2021) has been prepared by Technical Committee CEN/TC 162 “Protective clothing including hand and arm protection and lifejackets”, the secretariat of which is held by NBN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under mandate M/553 given to CEN by the European Commission and the European Free Trade Association.

Introduction

For manufacturers and users of personal protective equipment (PPE) the following European Regulation and Directive are important:

— Regulation (EU) 2016/425 of the European Council of 9th March 2016 on personal protective equipment;

— Directive 89/656/EEC on use of personal protective equipment.

Regulation (EU) 2016/425 indicates that in order to place PPE on the market it shall meet essential health and safety requirements, and not necessarily the various relevant EN or EN ISO standards. Nevertheless, nearly all PPE meet the essential requirements through standards, as harmonized standards give presumption of conformity with the requirements of the regulation. This is the reason why we will spend some time explaining certain standards and what information they provide on smart garments protecting against heat and flame.

The interest in and the use of smart or electronic solutions in professional garments increases exponentially. Individual smart (intelligent) solutions integrated into garments have a large variety of functions, e.g. improving protection against various risks, in-built communication systems etc., but also drawbacks, e.g. connection cables acting as heat transfer medium, risks of a protective system failure due to damage in a component, data security risks during communication, etc. The smart equipment that employ a variety of physical functions and response effects integrated into garments allow reduction of workplace risks. Requirements and test methods should, as far as possible, be representative of the risks posed to the user under the foreseeable conditions.

The reader should be aware that for most PPE intended for use in a place of work, national and union legislation towards ensuring the safety of employees applies. When one mentions PPE, it is essential that it meets the requirements of Regulation (EU) 2016/425. Based on the above mentioned regulation and directive, the national legislations may postulate that if the employer fails to provide suitable PPE then it may be considered as a criminal offence, and an employee suffering foreseeable injury may trigger liability. Conversely, if the employee, after proper training and instructions, fails to wear the suitable PPE, the employee may also be prosecuted and/or dismissed and if injured or suffering disease in consequence may lose right to all or certain part of the reimbursement for damages.

For non-textile elements containing active medical devices, radio and electrical operated components, which might be integrated in the finished advanced garments or ensembles of garments that provide protection against heat and flame, the relevant Union legislation may apply, notably with Directive 2007/47/EC of the European Parliament and of the Council, Directive 2011/65/EU of the European Parliament and of the Council, Directive 2014/30/EU of the European Parliament and of the Council, Directive 2014/35/EU of the European Parliament and of the Council and Directive 2014/53/EU of the European Parliament and of the Council.

The provisions of other legal acts are also applicable to advanced garments and ensembles of garments that provide protection against heat and flame, notably Directive 2014/34/EU of the European Parliament and of the Council.

The information in this document has been produced to assist users, employers and purchasers (or the person advising the users, employers and/or purchasers) 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. industrial welding, fire-fighting, first response). This information may also be of interest to manufacturers for designing their products and resellers to identify the products their clients need.

This guideline will furthermore be a basis for those who are committed to the development and conformity assessment of novel PPE for protection from heat and flame, hence including research and technology organizations (RTOs), notified bodies and other third parties that support activities in development and conformity assessment. Further groups of stakeholders involved in the life cycle of smart PPE against heat and flame include textile service providers (leasing and washing) as well as companies providing the labelling of smart PPE (care instructions).

The purpose of this document is to establish a guidance document for smart garments for protecting against heat and flames with the goal to evaluate and reduce the safety risks and potential health risks associated with poorly maintained, contaminated or damaged protective garments with integrated smart solutions. This selection, use, care and maintenance guidance provides basic answers, criteria, and options for the persons that are selecting or using smart protective garments through their life cycle with respect to the protection they provide, guidance related to heat and flame or damaged protective clothing.

The main topics that an employer needs to consider are highlighted in this document. Many paragraphs of the document contain bullet-lists as thought provokers and options that may need to be considered. A number of flowcharts have been created to help understand the flow of this document and these can be used as a process in the life cycle of smart garments for protection against heat and flame from selection to disposal. These flowchart(s) may need to be reiterated a number of times to come to the optimum solution or to ensure continued adequate protection. The Annexes A to H include additional details that would make the main body too complicated to read, but are necessary to describe hazards and risks, the value of the test methods for the end user, etc.

Annex A gives details of the current European Standards relating to clothing designed to provide protection from heat and flame, smart textiles and solutions that may be integrated into the garments. In the areas where European Standards are not yet available, for example, testing smart systems in harsh environments, some other documents are listed for reference.

Compatibility with other items of PPE that protect against heat and flames and integrate smart features should be considered. Simultaneously, other risks in the related jobs, e.g. exposure to UV radiation, pollutants, mechanical impact, etc., should also be taken into account.

Selection of smart garments for protection against heat and flames should be based on your own risk assessment and should not be copied from other procurement documents.

1 Scope

The purpose of this document is to assist employers (or the person who advises the employer such as suppliers of PPE or services, inspection, insurance companies, etc.) in taking the necessary decisions regarding the selection, use, care and maintenance (SUCAM) of advanced garments and ensembles of garments that provide protection against heat and flame, with integrated smart textiles and smart non-textile elements for enhanced health, safety and survival capabilities that are compliant with the European legislation.

This document supports developers and manufacturers in designing and producing garments with smart textiles and smart non-textile elements that will meet the user's needs during the whole life cycle of the garment and comply with standard requirements set for protective clothing on use, care and maintenance up to and including the disposal of the protective gear.

This document is not exhaustive in addressing all the safety concerns associated with the use of compliant protective equipment for protection against heat and flames and other related risks.

It is essential not to construe this document as addressing all the safety concerns, if any, associated with the use of this document by testing or repair facilities. It is the responsibility of the persons and organizations that use this document and any other standards or technical report related to PPE:

— to conduct a risk assessment at the workplace;

— to select the protective clothing and other PPE, including those with smart (intelligent) features, and to verify that the manufacturer has indicated the selected PPE to be suitable for the identified risks at the workplace;

— as well as to ensure that these provide a holistic protection, only when the compatibility has been assessed including understanding the workplace and the work environment to determine the properties of protective clothing against heat and flames to establish health and safety practices;

— to verify that the manufacturer has provided information for risk assessment of the potential risks that may occur due to the smart (intelligent) features in the intended working environment, and that the manufacturer has suggested measurements to compensate such new risks, whilst the employer has to ensure that these measurements are brought to action;

— and to determine the applicability of regulatory limitations prior to using this document for any designing, manufacturing, and testing.

This document is meant for all end users that are using smart garments for protection against heat and flame. It contains information that can also be useful to other people, such as manufacturers, designers, service providers and educators who may be confronted with smart garments used to protect against heat and flame risks although it will focus on the first four in the list below:

— petrochemical and chemical industry;

— welders and foundries;

— utilities (electrical, gas, water);

— firefighters and emergency response;

— sports (motor sports, boating, etc.);

— security forces (military, police and private).

It is essential that nothing herein restricts any jurisdiction from exceeding the minimum requirements as provided in the relevant standards.

This document is not intended to cover the aspects related to data security and privacy. For employers using smart garments that monitor and/or collect data, the General Data Protection Regulation (GDPR, Regulation (EU) 2016/679) and national regulations can apply. It is essential that the smart protective garments are selected, used, taken care and maintained in a way that will neither compromise the safety and privacy of the user nor the security of the enterprise or authority using the smart garment systems.

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.

CEN/TR 17512, *Personal protective equipment — Smart garments — Terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TR 17512 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 https://www.iso.org/obp

3.1
aging
change of one or more initial properties of the materials during the passage of time

3.2
component assembly
combination of all materials of a multi-layer garment presented exactly as the finished garment construction

3.3
care
to keep protective clothing in good condition, including procedures for cleaning, decontamination, storage and registration

3.4
char
formation of a brittle residue when material is exposed to thermal energy

3.5
cleaning
act of removing soils and contaminants from ensembles and ensemble elements by mechanical, chemical, thermal, or combined processes