SLOVENSKI STANDARD

SIST-TP CEN/TR 15419:2006

01-julij-2006

Varovalna obleka - Smernice za izbiro, uporabo, nego in vzdrževanje varovalne obleke, ki varuje pred kemikalijami

Protective clothing - Guidelines for selection, use, care and maintenance of chemical protective clothing

Schutzkleidung - Leitfaden für Auswahl, Gebrauch, Pflege und Bereithaltung von Chemikalienschutzkleidung

Vetements de protection - Recommandations pour la sélection, l'utilisation, l'entretien et la maintenance des vetements de protection chimique

Ta slovenski standard je istoveten z: CEN/TR 15419:2006

ICS:

13.340.10

SIST-TP CEN/TR 15419:2006 **en**

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 15419

May 2006

ICS 13.340.10

English Version

Protective clothing - Guidelines for selection, use, care and maintenance of chemical protective clothing

Vêtements de protection - Recommandations pour la sélection, l'utilisation et l'entretien des vêtements de protection chimique

Schutzkleidung - Leitfaden für Auswahl, Gebrauch, Pflege und Bereithaltung von Chemikalienschutzkleidung

This Technical Report was approved by CEN on 9 April 2006. It has been drawn up by the Technical Committee CEN/TC 162.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. CEN/TR 15419:2006: E

Contents

Page

Foreword

This document (CEN/TR 15419:2006) 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 DIN.

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

Introduction

Although the general SUCAM document developed within CEN/TC 162 provides a lot of useful information, it was felt that a specific SUCAM document for chemical protective clothing (CPC) was necessary, in view of the very specific problems linked with the use of CPC (very large variety of risks, disinfection, etc.)

Workplace hazards should be reduced to the lowest level reasonably achievable. This can be done by eliminating the risk, by taking engineering measures such as encapsulation of the risk, by system control and/or by providing safe work place practices, which can include the use of CPC.

This means that the role of CPC in controlling the residual risk should be established in the correct context. The performance requirements for CPC should be characterized in terms of the nature, quantity and physical form of the hazardous chemical and the likelihood of contamination.

PPE should be evaluated as a whole, not only by its performance related to protection. Other factors such as usability and maintenance should also be taken into account to match the equipment and the intended use. Selection and use are more people-related, whereas care and maintenance are more product-related.

The risk related to the use of chemicals varies widely with the nature of the hazard and the conditions and duration of exposure to the chemicals. Therefore risk and exposure assessment should be done very carefully in order to avoid overprotection and to ensure full acceptance of the protective clothing, which is often used in extremely dangerous work environments.

1 Scope

This technical report is primarily intended for users, specifiers and others with responsibility for the procurement and provision of chemical protective clothing. It is also intended to be used by manufacturers in their dialogue with the users of PPE.

This technical report is intended to clarify the inter-relationship of the set of standards, developed by CEN/TC 162 WG 3, and to explain the main ideas behind these standards. This set of standards has been developed in support of the European legislation on PPE and is currently used as a major technical tool for the assessment and certification of CPC before it is put on the European market.

These guidelines are intended to assist users and specifiers in selecting the correct type of CPC for the task to be performed, and to help them ensure it is used according to the manufacturer's instructions to provide adequate protection during its entire lifetime. Lifetime and effectiveness of protective clothing depend largely on care and maintenance. When cleaning, disinfection and end-of-life disposal are considered the environmental impact should also be taken into account.

This technical report does not address chemical nuisance factors without potential impact on a person's health and safety, e.g. smell.

2 Terms, definitions and abbreviations

2.1 Terms and definitions

A general glossary document (EN ISO/TR 11610) has been drafted by CEN/TC 162. Most terms, definitions and abbreviations pertaining to PPE can be found in that document.

For the purposes of this Technical Report the following additional terms and definitions are used.

2.1.1
air-impermeable materials
materials through which gases cannot pass except by a diffusion process on a molecular level

2.1.2
air-permeable materials
materials with pores or apertures that allow the transmission of gases

2.1.3
breakthrough time
time elapsed between the initial application of a chemical to the outer surface of a material and its subsequent presence on the other (inner) side of the material, measured by the test method described in the relevant standard

2.1.4
care
actions to keep PPE in good working order, including procedures of cleaning, drying, decontamination and storage

2.1.5
chemical hazard
potential of a chemical to cause harm or damage to a person's health or to the human body

2.1.6
chemical protective clothing (CPC)
combination of garments worn to provide protection to the skin against exposure to or contact with chemicals

2.1.7
exposure
mass flow of chemical against and through the protective garment. Exposure to chemicals depends on the type and duration of work and the dermal effects of chemicals

2.1.8
limited use CPC
CPC for limited duration of use, i.e. to be worn until hygienic cleaning becomes necessary or chemical contamination has occurred and disposal is required. This includes protective clothing for single use and for limited re-use according to the information supplied by the manufacturer

2.1.9
maintenance
actions to preserve CPC from loss of protective performance. Maintenance includes procedures for inspection, repair and eventually removal from service

2.1.10
re-usable CPC
CPC made from materials that allow repeated cleaning after exposure to chemicals such that it remains suitable for subsequent use

2.1.11
risk
probability of a specific undesired event occurring so that a hazard is realised

2.1.12
risk assessment
quantification of the risk relating to one or several hazards (including the process of determining these)

2.1.13
selection
process of determining the type of protective equipment (garments, gloves, etc.) necessary to provide the required protection

2.2 Abbreviations

For the purposes of this Technical Report the following abbreviations are used:

2.2.1
CPC
chemical protective clothing

2.2.2
PPE
personal protective equipment

2.2.3
SUCAM
selection, use, care and maintenance

3 Selection

3.1 General

Selection is a step by step procedure starting with risk assessment for a given work situation.

Risk assessment should take into account the use of preventive measures other than the use of CPC and related PPE. If the chemical risk can not be adequately reduced by these preventive measures, CPC and related PPE should be specified to protect against the residual risk.

To ensure the correct choice and use of CPC by the user, the protective performance of the CPC, its correct use and the limitations to its use should be made clear.

The following steps should be considered:

- Assessment of the nature of the hazard;
- Assessment of risk;
- Assessment of need of protection;
- Additional considerations;
- Definition of CPC material criteria;
- Selection of CPC.

3.2 Assessment of the nature of the hazard

To assess the nature of the hazard, "material safety data sheets" and other relevant literature should be used. The following considerations should be taken into account in assessing the hazardous nature of the chemical:

a) The access route of the chemical to the body: an assessment of the adverse health effects from chemical contact is the most important factor in the determination of the right CPC, with an emphasis on the local effects on the skin (e.g., effects of skin contact such as chemical burns, corrosion, staining, irritation, etc.), and the systemic effects of chemicals that might permeate the skin and enter the blood stream

   1) by skin damage: corrosive chemicals destroy the unprotected skin and flesh by direct attack. Other chemicals such as petrol, paint, solvents and cleaning fluids will dissolve the skin's natural oils, leaving the skin dry and liable to form painful cracks or to develop dermatitis and/or sensitization. Such damage to the skin, together with any existent cuts and grazes, provides entry points for foreign substances and thus increases the risk of harm to the body,

   2) by absorption through the skin: chemicals can pass through the skin and be carried in the bloodstream resulting in injury to other parts of the body that are remote from the initial point of contact. Rapid absorption by the skin is a very important issue to consider. Poisoning due to phenol and related compounds can be quoted as an example where skin exposure and subsequent absorption is of particular concern. A large contact surface area on the skin provides a significant route of chemical entry,

   3) by other access routes, e.g. the eyes or the respiratory or digestive tract;

b) The body's tolerance and rate of elimination of a foreign substance varies from person to person, and can also vary within the same individual at different times or under different circumstances;

c) The harmful effects will depend roughly on the amount of substance in contact with the skin or absorbed by it. Hence they will be related to the mass of substance to which the body has been exposed, the area of contact, the in-use concentration, and to the frequency and duration of exposure;

d) Exposure to high doses of a chemical, e.g. by a jet of liquid or a copious splash, should be an immediate major concern, besides the risk of exposure through inadvertent ingestion and inhalation;

e) The pattern of skin exposures to substances will vary across the spectra of frequency, duration and concentration. Long term adverse health effects can be linked with low level exposures (small amounts of

substances) on a regular basis. Because acute and chronic exposures can result in very different adverse effects on human health, both need to be considered in the overall risk assessment;

f) Mixtures (multi-components of chemicals) can increase the risk from exposure, e.g. the rate of absorption through the skin can be higher if a chemical is used in conjunction with some solvents. The effects of mixtures (whether or not they include solvents) can be greater than those of their constituent parts.

3.3 Assessment of the risk

Risk assessment should be carried out by suitably qualified personnel. The knowledge and experience of the PPE users should be taken into account.

A risk assessment procedure includes:

— identification of the activities that require the use of CPC;

— list of the hazards present;

— quantification of the risks that would result from exposure to the hazards at the foreseeable level and duration;

— whether CPC is needed or whether the problem can be solved by other measures; considerations of the protection provided by other control measures;

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

— environment where the protection has to be worn;

— additional risks inherent to the use of PPE (ergonomic considerations, heat stress, etc.).

A number of risk assessment models may be used to determine the level of risk associated with the activities. Annex A gives an example of a risk assessment scheme.

Furthermore the following factors should be considered:

— Permeation takes place without visible evidence;

— Even the best CPC will not perform properly if torn, cut, damaged, degraded or contaminated;

— A barrier may protect against one chemical properly, but perform poorly against another or a mixture of chemicals;

— Higher temperatures usually decrease the breakthrough time, whereas lower temperatures increase the time;

— Degradation may be the most important factor in chemical resistance for many chemicals (acids, etc.);

— Generally, thicker barrier material increases the time to break through, but reduces glove tactility and dexterity;

— Once a chemical has been absorbed by the barrier material, it continues to permeate through the material after chemical exposure has ceased.

3.4 Assessment of the need of protection (developing a product specification for CPC)

The determination of a product specification for CPC should not focus exclusively on chemical risk. Other types of risk (accumulation of electrostatic charges, biological risks, flammability, thermal risks, mechanical risks, etc.) should also be considered.

A step-by-step procedure should be followed (from the German BBA guidelines for pesticides – see Annex A):

— quantify the risk (see risk assessment);

— determine if all steps have been taken to reduce the risk, i.e. if the residual risk is such that the use of CPC is justified;

— determine which parts of the body require protection;

— identify the relevant product standard(s) (and/or test methods) for the type of PPE needed for this work situation;

— determine the level(s) of protection required (for the relevant parts of the body) in relative or absolute terms for each item of protective clothing;

— determine the residual risk after introduction of the PPE.

3.5 Other considerations

3.5.1 General

All other elements that influence the overall performance and the total cost of ownership of limited-use and reusable protective clothing, need to be considered.

3.5.2 Quality assurance offered by the supplier

— service after sales;

— quality assurance measures put in place by the supplier (e.g. certified quality management system in accordance with EN ISO 9001);

— if relevant, quality assurance guarantees offered by the rental company.

3.5.3 Logistics

— available sizes, delivery time for standard and special sizes;

— delivery from stock held by the supplier;

— provision of corporate identity clothing (without affecting performance);

— arrangements for collection of soiled items and delivery of clean items;

— stock within the organisation;

— internal distribution to the end-users.

3.6 Garment material selection criteria

3.6.1 General

The performance of CPC in a specific work situation is largely determined by the performance of the materials used for its construction, and the way they are assembled into a protective garment.

A large variety of material product families is used for the production of CPC materials, e.g. woven and knitted textiles, nonwovens, nonwoven laminates, coated fabrics, films, and rubber. Moreover, each of these groups

comes in an infinite variety of combinations, modifications or variations. Hence a generic material performance indication is not sufficient to characterize a specific material.

It should not be assumed that the use of a specific polymer material will provide the level of chemical protection required. Neither should weight or thickness of a fabric be assumed to relate automatically to its ability to protect. The specifier should always seek written confirmation from the manufacturer that the material used in the garment has been tested against the specific hazardous chemical encountered in the work situation, and that the level of protection measured is sufficient for the task.

The applied test procedure should be clearly referenced. References to the appropriate test method standards and conventional performance levels can be found in EN 14325.

The European standards for chemical protective clothing use the approach of "performance profiles" for material assessment. This means that no strict minimum values are required. For a series of relevant parameters (chemical, mechanical, burning behaviour) test methods are established and performance classes are defined. This creates a common base for discussion between users and manufacturers. The manufacturers have a tool to express the performance profile of their product and the user should try to define his "needs profile" with the same parameters, based on the interpretation of his risk assessment.

3.6.2 Chemical barrier properties

3.6.2.1 General

These tests intend to assess the barrier properties of materials against the ingress of chemicals by a diffusive molecular process (permeation test) or through small openings in the material (penetration test). The permeation test is performed on air-impermeable materials, whereas the penetration test is more appropriate for air-permeable materials.

3.6.2.2 Chemical permeation

Test method standards: EN ISO 6529 (clothing materials) and EN 374-3 (gloves and clothing material).

Principle of test: The test cell is divided in two compartments by the protective material, which acts as a barrier. One of the compartments is filled with a determined quantity of chemical. The concentration of that chemical on the other side of the barrier is monitored and the breakthrough time is established.

Performance classes: from 1 to 6 based on breakthrough times. Class 1 corresponds to a breakthrough time of at least 10 minutes, whereas class 6 represents a breakthrough time of more than 8 hours.

Comments:

— Breakthrough times should be considered as an indication of the resistance of materials to diffusive permeation, not as real use times. Real use times depend on a lot of other factors, e.g. temperature, movements, pressure etc.

— This test method is only applicable to gases and liquids. Some solids, such as phenol, permeate barrier materials as well.

— Although class 6 performance is to be preferred, fabrics that only achieve class 2 or 3 may still give adequate protection, provided that any surface contamination is washed off the garment promptly and that no gross chemical degradation is apparent.

— Permeation data should be made available by the manufacturer for the chemicals encountered in the actual work situation. If the chemical hazard is not known in advance, for example in emergency situations, a test-battery of chemicals may be used. Such a battery includes examples of many different types of chemicals and includes some of those that are most likely to permeate fabrics. An example is given in EN 943-2.