BRITISH STANDARD

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13034:2005

Protective clothing against liquid chemicals — Performance requirements for chemical protective clothing offering limited protective performance against liquid chemicals (Type 6 and Type PB [6] equipment)

The European Standard EN 13034:2005 has the status of a British Standard

ICS 13.340.10

National foreword

This British Standard is the official English language version of EN 13034:2005.

The UK participation in its preparation was entrusted by Technical Committee PH/3, Protective clothing, to Subcommittee PH/3/3, Clothing for protection from chemicals and radioactive contamination, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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Protective clothing against liquid chemicals - Performance requirements for chemical protective clothing offering limited protective performance against liquid chemicals (Type 6 and Type PB [6] equipment)

Vêtements de protection contre les produits chimiques liquides - Exigences relatives aux vêtements de protection chimique offrant une protection limitée contre les produits chimiques liquides (équipement de type 6 et Type PB (6))

Schutzkleidung gegen flüssige Chemikalien - Leistungsanforderungen an Chemikalienschutzkleidung mit eingeschränkter Schutzleistung gegen flüssige Chemikalien (Ausrüstung Typ 6 und Typ PB [6])

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Contents

Page

Foreword 3
Introduction 4
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Performance requirements for materials, seams joins and assemblages 6
4.1 Materials 6
4.2 Seams, joins and assemblages 7
5 Performance requirements for a whole suit 8
5.1 General 8
5.2 Resistance to penetration by liquids in the form of a light spray (mist test) 8
6 Marking 9
7 Information supplied by the manufacturer 10
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC Personal Protective Equipment 12
Bibliography 13

Foreword

This document (EN 13034:2005) 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.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 89/686/EEC.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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Introduction

Protection should be proportional to the risk to avoid excessive discomfort due to overprotection. The categorisation into types of chemical protective clothing is an attempt to discriminate between different general levels of risk.

The determination of the actual risk level should follow from a risk assessment, which takes all relevant parameters into account, e.g. the nature of the chemical, temperature, pressure, quantity, parts of the body likely to be exposed, climatic conditions, intensity of work etc. This risk assessment will give important indications about suitable types of materials, clothing design and composition of the most effective solution, e.g. combination with other types of PPE or other items of chemical protective clothing.

Type 6 and PB [6] are intended to be used in cases where risk has been assessed as low and a full liquid permeation barrier is not necessary, i.e. when wearers are able to take timely adequate action when their clothing is contaminated. Type 6 and PB [6] protective clothing form the lowest level of chemical protection and are intended to protect from a potential exposure to small quantities of spray or accidental low volume splashes.

A technical report to give guidance on questions pertaining to selection, use, care and maintenance is currently under development.

1 Scope

This document specifies the minimum requirements for limited use and re-useable limited performance chemical protective clothing. Limited performance chemical protective clothing is intended for use in cases of a potential exposure to a light spray, liquid aerosols or low pressure, low volume splashes, against which a complete liquid permeation barrier (at the molecular level) is not required.

This document covers both chemical protective suits (Type 6) and partial body protection (Type PB [6]).

Chemical protective suits (Type 6) cover and protect at least the trunk and the limbs, e.g. one-piece coveralls or two piece suits, with or without hood, boot-socks or boot-covers. This document specifies minimum requirements for the connections between different parts of Type 6 suits by the use of a reduced whole suit spray test using a variant of EN 468, as described in 5.2.

Partial body protection of similar limited performance (Type PB [6]) covers and protects only specific parts of the body, e.g. coats, aprons, sleeves etc. They should not be tested to the whole suit test (5.2).

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 340:2003, *Protective clothing — General requirements*

EN 468, *Protective clothing — Protection against liquid chemicals — Test method: Determination of resistance to penetration by spray (Spray Test)*

EN 14325:2004, *Protective clothing against chemicals — Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages*

EN 23758, *Textiles - Care labelling code using symbols (ISO 3758:1991)*

EN ISO 13935-2, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 2: Determination of maximum force to seam rupture using the grab method (ISO 13935-2:1999)*

3 Terms and definitions

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

3.1
aerosol
suspension of solid, liquid or solid and liquid particles in a gaseous medium having negligible falling velocity (generally considered to be less than 0,25 m/s)

3.2
chemical protective clothing material
any material or combination of materials used in an item of protective clothing for the purpose of isolating parts of the body from direct contact with a chemical

3.3
join
non-permanent fastening between two different garments, or between chemical protective clothing and accessories

3.4
seam
permanent fastening between two or more pieces of chemical protective clothing material

3.5
assemblage
permanent fastening between two or more different garments, or between chemical protective clothing and accessories, obtained e.g. by sewing, welding, vulcanising or gluing

3.6
closure
device, e.g. a zipper, a touch-and-close fastener etc., to close openings for the donning of protective clothing

3.7
chemical protective suit (or whole suit)
clothing worn to protect against chemicals, that covers at least trunk, arms and legs and where various types of additional protection e.g. hood or helmet, boots and gloves may be joined with. Several garments may be combined to provide the desired level of protection

3.8
partial body protection
protective clothing item worn to protect one or more parts of the body, which are particularly exposed to the risk. Partial body protection may be used separately or in combination with other garments to increase the protection level of specific parts of the body. Examples of partial body protection are sleeves, aprons and laboratory coats

3.9
limited use protective clothing
clothing intended for limited wear life usage (single use or limited re-use according to the manufacturer's instructions), i.e. to be worn until hygienic cleaning becomes necessary or until disposal is required after chemical contamination

3.10
re-usable chemical protective clothing
clothing intended to be re-used after the necessary reprocessing steps, such as e.g. hygienic cleaning, decontamination, or reapplication of repellent treatments, whilst still providing adequate protection

3.11
penetration
process by which chemicals and/or micro-organisms move through porous materials, seams, pinholes and other imperfections of a material on a non-molecular level

4 Performance requirements for materials, seams joins and assemblages

4.1 Materials

Chemical protective clothing materials shall be tested and classified in accordance with Table 1 (see also EN 14325:2004, Clause 4).

If not otherwise specified in the test methods, at least five specimens shall be tested for each property. The lowest individual value shall be calculated and used to describe the performance level.

Pre-conditioning and conditioning shall be carried out in accordance with EN 14325:2004, 4.2 and 4.3, as required. Manufacturer's instructions with regard to number of cleaning cycles, cleaning procedures and possible reapplication of treatments shall be observed.

For all requirements, except for liquid penetration and repellency, at least performance level 1 shall be obtained.

For liquid repellency a performance level 3 shall be obtained for at least one of the chemicals referred to in EN 14325:2004, Clause 4.

For resistance to penetration by liquids a performance level of at least 2 shall be obtained for at least one of the chemicals referred to in EN 14325:2004, Clause 4.

Table 1 — Test requirements

Clause in EN 14325:2004	Performance requirement
4.4	Abrasion resistance
4.7	Tear resistance (trapezoidal test specimen)
4.9	Tensile strength
4.10	Puncture resistance
4.12	Liquid repellency
4.13	Resistance to penetration by liquids
4.14	Resistance to ignition

If a material does not provide a clearly measurable test result for any of the requirements in Table 1, "not applicable" shall be marked in both the test report and in the manufacturer's information. The reason why the test could not be applied or completed, shall be indicated, e.g. that the elasticity of the specimen prevents to determine an end-point in the puncture resistance test.

Materials shall be known not to cause skin irritation or have any adverse effect to health (see EN 340:2003, 4.2).

NOTE The material of construction should be as light and as flexible as possible in order to ensure wearer comfort as well as providing effective protection. Material properties are only one element for the determination of wearer comfort of protective clothing. Design features of the clothing may have a more important influence on wearer comfort than material properties.

4.2 Seams, joins and assemblages

4.2.1 Resistance to penetration by liquids

The construction of seams shall prevent penetration of liquid through stitch holes or through other components of a seam and not obstruct run-off of the liquid.

The requirements of this clause apply to the seams, joins and assemblages of the whole garment up to and including component parts, such as gloves or boots, which are integral to the garment.

For type 6 suits the result of the whole suit spray test (see 5.2) should also be considered as it gives an indication of the resistance to liquid penetration of seams, joins and assemblages.

4.2.2 Seam strength

A straight sample of each type of seam construction, used in the mains seams of the garment, shall be tested in accordance with EN ISO 13935-2. Three specimens of each type of seam shall be tested and the lowest result of each set of three samples shall be used for further classification.

The garment seam performance shall be classified according to the levels of performance given in 5.5 (Table 13) of EN 14325:2004, using the lowest result, i.e. the weakest seam type. Seam strength of at least class 1 shall be obtained.

5 Performance requirements for a whole suit

5.1 General

Type 6 chemical protective suits and partial body protection items (Type PB [6]) shall fulfil the relevant requirements of EN 340.

Type 6 chemical protective suits shall fulfil the requirements of 5.2, when combined with additional protective equipment (i.e. for protection of hands, feet, face, head, respiration) as specified in the manufacturer's instructions.

Partial body protection items (Type PB [6]) shall not be tested according to 5.2.

NOTE 1 The requirements of this clause apply to the garment tested with additional equipment, such as gloves, boots, hoods or respiratory equipment that are not integral to the garment, in accordance with the manufacturer's instructions. The joins and assemblages attaching this additional equipment to the suit are covered by the scope of this document. The performance criteria for the additional equipment itself are specified in other European Standards.

The design of the clothing shall guarantee that there are no features which may collect liquid chemicals and hold them onto the fabric surface, e.g. unprotected pockets etc.

The clothing shall be made so that the wearer has freedom of movement and shall be as comfortable as possible, consistent with the protection to be afforded by the garment. The clothing shall pass the practical test ("seven movements") sequence, described in 5.2.

NOTE 2 The clothing should ensure wearer comfort as well as protection. Wearer comfort can be judged in wear trials of the clothing with test persons experienced in the type of work and environments for which the garments are intended as protective clothing. In the case of protective suits assessed under 5.2, this can be judged by the seven movement sequence.

Prior to testing, the chemical protective clothing shall be cleaned, if the manufacturer's instructions indicate that cleaning is allowed. Manufacturer's instructions with regard to number of cleaning cycles, cleaning procedures and possible reapplication of treatments shall be observed. If no maximum number of cleaning cycles is indicated, the clothing shall undergo five cleaning cycles.

5.2 Resistance to penetration by liquids in the form of a light spray (mist test)

Three suits shall be tested after preconditioning in accordance with 5.1 (if applicable) and each test shall be made with a new preconditioned suit.

Prior to testing protective suits in accordance with a variant of EN 468, a sequence of seven movements (described below) shall be carried out by a human test subject. If more than one size of chemical protective suit is manufactured, the test subject is asked to select the appropriate size according to the manufacturer's information. The test shall comprise three repetitions of the "seven movements" sequence and shall be performed for each suit to be tested in the spray test.

— movement 1: kneel on both knees, lean forward and place both hands on the floor (45 ± 5) cm in front of the knees; crawl forward and backwards on hands and knees for a distance of three metres in each direction;

— movement 2: climb a vertical ladder at least four steps, rungs to be as encountered on a typical ladder;

— movement 3: position hands at chest level, palms out; reach directly overhead, interlock thumbs, extend arms fully upwards;

— movement 4: kneel on right knee, place left foot on floor with left knee bent (90 ± 10)°; touch thumb of right hand to toe of left shoe;

— movement 5: extend arms fully in front of body, lock thumbs together, twist upper body (90 ± 10)° left and right;

— movement 6: stand with feet shoulder width apart, arms at side; raise arms until they are parallel to the floor in front of the body; squat down as far as possible;

— movement 7: kneel as in movement 4, left arm hanging loosely at side; raise arm fully overhead.

If the test subject is not able to perform the test due to the hindrance of the suit or if the test results in substantial damage to the suit, the suit will be considered to have failed.

The test method of EN 468 shall be modified as follows for low-level spray testing conditions:

— the four hydraulic nozzles shall be hollow cone type nozzles, with a spray angle of (75 ± 5)° at 3 bar, each nozzle supplying liquid at a rate of (0,47 ± 0,05) l/min at 300 kPa pressure;

— the liquid used shall be modified to have a surface tension of (52,5 ± 7,5)·10^{-3} N/m in order to form suitable spray droplets; calibration of the test apparatus shall also be carried out with test liquid at the same surface tension.

NOTE The low-level spray testing conditions result in about 10 % of the liquid loading onto the suit surface compared with the full level spray test of EN 468, as used for the testing of type 4 chemical protective clothing.

When tested in accordance with EN 468 using the modifications described above, all chemical protective suits shall pass the test, i.e. there shall be no penetration of any suit, i.e. the total stain area on the undergarment shall be less than or equal to three times the total calibrated stain area.

For suits which do not cover the entire body, the test report shall specify such other components with which the suit was worn to achieve the mist test performance, e.g. an appropriate hood, gloves, boots etc.

6 Marking

The chemical protective clothing shall be marked with at least following information. The marking shall be clearly visible and as durable as adequate for the life of the clothing.

a) the name, trade mark or other means of identification of the manufacturer;

b) the type, i.e. Type 6 for chemical protective suits or Type PB [6] for partial body protection;

c) the number and date of publication of this document;

d) the year of manufacture, and also the month of manufacture if the expected shelf-life of the clothing is less than 24 months. This information may be marked on every commercial packaging unit instead of being marked on every item of clothing;

e) the manufacturer's type, identification or model number;

f) the size range as defined in EN 340;

g) a pictogram showing that the clothing is intended to protect against chemicals and a pictogram inviting to read the instructions for use and any other information supplied by the manufacturer;

h) re-usable PPE shall be marked with care pictograms according to EN 23758. Single-use PPE shall be marked with the warning phrase: ”Do not re-use.” (see also EN 340).

NOTE Consideration should be given to suitable additional marking.

7 Information supplied by the manufacturer

This information shall accompany every item of chemical protective clothing or at least every commercial packaging unit. The purpose is to guarantee that the wearer is confronted with these instructions.

The information shall be at least in the official language(s) of the country or region of destination. They shall be unambiguous and - if helpful - illustrations, part numbers, marking etc. shall be added. If appropriate, warnings shall be given against problems likely to be encountered.

The instructions together with the information on the marking shall contain at least the following information:

a) the name, trademark of other means of identification, and address of the manufacturer and/or his authorised representative established in the European Union or the country where the product is placed on the market;

b) the reference number of this document;

c) the type, i.e. Type 6 for chemical protective suits or Type PB [6] for partial body protection;

d) if applicable, additional items of personal protective equipment to be worn to ensure the level of protection needed and how to attach them. This statement shall be precise enough to help the user to select the appropriate equipment, e.g. a hood model YY or equivalent, or respiratory protection including a full face mask, etc.;

e) the manufacturer's type, identification or model number;

f) the size range (as defined in EN 340);

g) the names of chemicals and chemical products (including the names and approximate concentrations of the components) to which the protective clothing has been tested. This will include the performance levels obtained for liquid repellency and penetration for each chemical/composition tested. If additional information is available, a reference to where this information can be obtained (e.g. manufacturer's telephone or fax number or web site) shall be added;

NOTE Permeation data may be added if relevant and available.

h) all other performance levels, as specified in Table 1, preferably in a table;

i) a statement that:
- Type 6 chemical protective suits have been tested to the whole suit test (5.2);
- Type PB [6] partial body protection has not been tested to the whole suit test (5.2);

j) for re-usable items: the explanation of the care pictograms according to EN 23758 and additional information on cleaning and disinfection (see also EN 340:2003, 5.4); in particular the number of times the clothing can be cleaned before it no longer meets the liquid repellency requirements, or until reapplication of repellency treatments becomes necessary (see also 7m));

k) the expected shelf-life of the garment if ageing can occur;

l) information necessary for trained persons on:
   - application, limitations of use (temperature range etc.);
   - tests to be carried out by the wearer before use (if applicable);
   - fitting;
   - use;
   - removal;
   - maintenance and cleaning (including guidance for decontamination and disinfection);
   - storage;

m) special attention to potential problems which may be caused by deterioration of special repellency treatments and the correct way of reapplying and/or regenerating these treatments;

n) if applicable, a statement to advise that the prolonged wearing of chemical protective suits may cause heat stress.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC Personal Protective Equipment

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 89/686/EEC Personal Protective Equipment.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 89/686/EEC

Clause(s) of this standard	Clause(s) of EU Directive 89/686/EEC, Annex II	
4.1	1.2.1	Absence of risks and other nuisance factors
4.1	1.2.1.1	Suitable constituent materials
4.1	1.3.2	Lightness and design strength
4.1	3.10.2	Protection against dangerous substances and infective agents – cutaneous and ocular contact
4.2.1	3.10.2	Protection against dangerous substances and infective agents – cutaneous and ocular contact
4.2.2	1.3.2	Lightness and design strength
5.1	1.2.1.3	Maximum permissible user impediment
5.1	2.4	PPE subject to ageing
5.1	3.10.2	Protection against dangerous substances and infective agents – cutaneous and ocular contact
5.2	1.1.1	Ergonomics
5.2	1.2.1.3	Maximum permissible user impediment
5.2	3.10.2	Protection against dangerous substances and infective agents – cutaneous and ocular contact
6	2.12	PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety
7	1.3.3	Compatibility of different classes of PPE designed for simultaneous use
7	2.4	PPE subject to ageing
7	2.12	PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] EN 136, *Respiratory protective devices — Full face masks — Requirements, testing, marking*

[2] EN 12941, *Respiratory protective devices — Powered filtering devices incorporating a helmet or a hood — Requirements, testing, marking*

[3] EN 31092, *Textiles — Determination of physiological properties. Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test) (ISO 11092:1993)*

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