INTERNATIONAL STANDARD

ISO 13982-1

First edition
2004-11-15

Protective clothing for use against solid particulates —

Part 1: Performance requirements for chemical protective clothing providing protection to the full body against airborne solid particulates (type 5 clothing)

Vêtements de protection à utiliser contre les particules solide —

Partie 1: Exigences de performance des vêtements de protection contre les produits chimiques offrant une protection au corps entier contre les particules solides transportées par l'air (vêtements de type 5)

Reference number
ISO 13982-1:2004(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.

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 13982-1 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets*, in collaboration with Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 13982 consists of the following parts, under the general title *Protective clothing for use against solid particulates*:

— *Part 1: Performance requirements for chemical protective clothing providing protection to the full body against airborne solid particulates (type 5 clothing)*

— *Part 2: Test method of determination of inward leakage of aerosols of fine particles into suits*

Introduction

It is necessary to determine the suitability of type 5 clothing for each specific chemical substance and its acceptable exposure limits in relation to the inward leakage of the type 5 garment. Hence, it is possible, that this type of clothing does not offer adequate protection from aerosols of highly hazardous substances, where a type 1 garment might be necessary to obtain the level of protection needed.

Protective clothing for use against solid particulates —

Part 1: Performance requirements for chemical protective clothing providing protection to the full body against airborne solid particulates (type 5 clothing)

1 Scope

This part of ISO 13982 specifies the minimum requirements for chemical protective clothing resistant to penetration by airborne solid particles (type 5). These garments are full-body protective clothing, i.e. covering trunk, arms and legs, such as one-piece coveralls or two piece suits, with or without hood or visors, with or without foot protection. Requirements for component parts, such as hoods, gloves, boots, visors or respiratory protective equipment might be specified in other International and European Standards.

This part of ISO 13982 is applicable only to airborne solid particulates. It is not applicable to other forms of challenge by solid chemicals, e.g. penetration of chemical dust through materials by rubbing or flexing, which may form the object of separate standards.

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.

ISO 3758, *Textiles — Care labelling code using symbols*

ISO/TR 11610, *Protective clothing — Vocabulary*

ISO 13982-2:—[1)], *Protective clothing for use against solid particulates — Part 2: Test method for determination of inward leakage of aerosols of fine particles into suits*

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

EN 12941:1998, *Respiratory protective devices — Powered filtering devices incorporating a helmet or a hood — Requirements, testing, marking*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 11610 apply.

1) To be published.

4 Performance requirements

4.1 Materials

Chemical protective clothing materials for type 5 clothing shall be tested and classified in accordance with the provisions of EN 14325:2004 for the following properties:

— abrasion resistance (4.4);

— flex cracking resistance (4.5);

— trapezoidal tear resistance (4.7);

— puncture resistance (4.10).

The materials shall also meet the requirement for resistance to ignition (EN 14325:2004, 4.14).

These requirements also apply to additional protective items, e.g. hood or overboots, if they constitute an integral part of the garment.

All samples shall undergo five cycles of cleaning according to the manufacturer's instructions before testing, if the manufacturer's instructions indicate that the garment can be cleaned.

All test specimens shall be conditioned by storage at (20 ± 2) °C and (65 ± 5) % relative humidity for at least 24 h. Unless otherwise indicated in the test procedure, tests shall start within 5 min of removing the test specimens from the conditioning atmosphere.

When classified in accordance with EN 14325, chemical protective clothing materials shall obtain at least a performance level 1 for each of the properties quoted. If a test method fails to provide a clearly measurable result, the words “not applicable” shall be marked in the instructions for use and in the test report with regards to the corresponding property. The reason why the test could not be completed properly shall also be indicated, e.g. if the elasticity of the specimen prevents reaching a measurable end-point in the puncture resistance test.

Materials which are known to cause skin irritation or to have any adverse effects on health shall not be used (see also EN 340:2003, 4.2).

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.

NOTE Material properties are only one element for the determination of wearer comfort of protective clothing. Design features of the clothing can have an important influence on wearer comfort.

4.2 Seams, joins and assemblages

4.2.1 General

Seams shall be constructed to minimize or prevent penetration of solid particles through stitch holes or through other components of a seam. The performance of the garment may be different from that of the material from which it is made, but shall be adequate for the intended use.

No specific testing of specimens containing seams, joins and assemblages is required with regards to the penetration of solid airborne particles, as this is verified in the whole-suit test (see 4.3).

NOTE The requirements of this clause apply to the garment as a whole, including component parts, such as gloves or boots, that are integral to the garment. The seams, joins and assemblages attaching these accessories are included within the scope of this part of ISO 13982. The performance criteria for the accessories, gloves, boots or RPE are given in other International and European Standards.

4.2.2 Seam strength

Seam strength shall be determined and classified in accordance with the provisions of EN 14325:2004, 5.5. Seams shall obtain at least a performance level 1 for this property.

4.3 Whole suit

4.3.1 General

Chemical protective clothing type 5 shall fulfil the general requirements of EN 340:2003, in particular with respect to health and safety (Clause 4), ageing (Clause 5) and sizing (Clause 6).

Type 5 clothing is of the “full-body” type, i.e. it provides protection to at least the trunk, arms and legs, and consists of a one-piece coverall or a two-piece suit. Head protection, e.g. a hood with visor, and/or foot protection may be worn additionally. Type 5 clothing shall fulfil the requirements of the whole-suit test described in 4.3.2. The joints and assemblages attaching accessories (hoods, gloves, boots, respiratory protective equipment, etc.) to the garment are covered by the scope of this part of ISO 13982.

NOTE Performance criteria for the components can be found in other International and European Standards.

The suit shall be made so that the wearer has freedom of movement and shall be as comfortable as possible, consistent with the protection afforded by the garment. This shall be verified by the sequence of movements specified in 4.3.2.

The protective clothing should ensure wearer comfort as well as protection. Wearer comfort is best judged in wear trials of the suit with test persons experienced in the type of work and environments for which the suits are intended as protective clothing.

4.3.2 Inward leakage of aerosols of solid particles

Protective suits shall be tested for inward leakage of airborne solid particles according to the test method described in ISO 13982-2.

The inward leakage test and the preliminary movements shall be carried out by test subjects wearing a complete protective equipment according to the manufacturer's instructions, i.e. a protective suit worn in combination with additional protective equipment (e.g. for protection of hands, feet, face, head, respiratory tract) that are not integral to the garment. Manufacturer's instructions shall also specify whether some of the additional equipment shall be taped to the suit or not and how taping should be done.

Prior to testing a suit in accordance with ISO 13982-2, the test subject shall repeat three times the following sequence of three movements outside the test chamber at normal working speed:

— movement 1: Kneel on both knees, lean forward and place both hands on the floor 45 cm in front of the knees. Crawl forward on hands and knees over a distance of 3 m and crawl backwards again over the same distance.

— movement 2: 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 3: Kneel on right knee, place left foot on floor with left knee bent 90°, left arm hanging loosely at side. Raise left arm fully overhead.

Upon completion of the movements, each protective suit shall be inspected visually for tears or rips in fabrics, seams, closures or connections to gloves, boots or mask, if any. Such damage shall be mentioned in the test report. The test shall be discontinued if damage is too important or if the test subject cannot carry out properly the sequence of movements due to hindrance from the garment. In such a case, the garment shall be considered to have failed the test.

When tested in accordance with ISO 13982-2, the type 5 protective clothing shall be characterized by the following parameters:

— $L_{jmn,82/90}$: the inward leakage value, expressed in percent, corresponding to the 82nd L_{jmn} value of 90, i.e., the inward leakage values measured over all exercises, all sampling positions, all suits and sorted in ascending order;

— $L_{S,8/10}$: the "total inward leakage per suit" value, corresponding to the 8th L_S value of 10, i.e., the L_S values of all suits sorted in ascending order.

Type 5 chemical protective clothing shall meet at least the following requirements:

— $L_{jmn,82/90} \leqslant 30$ %;

— $L_{S,8/10} \leqslant 15$ %.

If more than 10 suits are submitted to the tests, the inward leakage and total inward leakage per suit limit values should be calculated proportional to the number of inward leakage measurements (i.e., 82/90 corresponding to 91,1 % of all inward leakage values) and the number of suits tested (i.e., 8/10 or 80 % of all total inward leakage per suit values).

4.4 Visor

4.4.1 General

Where a visor is fitted as part of the suit, as distinct from a respirator facemask joined to the suit, the visor shall comply with 4.4.2 and 4.4.3.

When tested in accordance with 4.4.3, visors shall not distort vision.

Where anti-fogging compounds are used or specified by the manufacturer, they shall not have an adverse effect on the health of the wearer or on the protective garment.

4.4.2 Mechanical strength of visor

The visor shall not be visibly damaged in such a way as to be likely to affect the performance of the complete device, when tested in accordance with EN 12941:1998, 7.5.

4.4.3 Field of and distortion of vision

During the inward leakage test (4.3.2), the field of vision shall be satisfactory as judged by the test subject. This shall be verified by questioning the test subject at the end of each exercise.

With regards to the distortion of vision, the test subject shall be able to read a sign with four letters 100 mm high and of proportional width, selected at random, at a distance of 6 m.

5 Marking

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

Consideration should be given to suitable additional marking.

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

b) manufacturer's type number, identification number or model number;

c) type of this chemical protective clothing, i.e. type 5;

d) reference number and date of publication of this part of ISO 13982 (i.e. ISO 13982-1:2004);

e) year of manufacture and, if appropriate, the expected shelf-life of the clothing (this information may be marked on every commercial packaging unit instead of being marked on every item of clothing);

f) size designation as defined in EN 340:2003, Clause 6;

g) pictogram showing that the suit is for protection against chemicals [ISO 7000-2414; see Figure 1 a)] and pictogram to show that the manufacturer's instructions should be read [ISO 7000-1641; see Figure 1 b)];

a) **b)**

Figure 1 — Pictograms

h) care pictograms in accordance with ISO 3758, indicating whether the clothing is suitable for cleaning and disinfection and can be re-used.

6 Information supplied by the manufacturer

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

The instructions shall be at least in the official language(s) of the country or region of application.

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

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

b) identification of the type of chemical protective clothing, i.e. type 5, and the reference number of this part of ISO 13982. It shall be clearly indicated to which parts of the body protection is provided. If the claimed performance can only be obtained by wearing additional protective items or components (e.g. hood, gloves, boots), the manufacturer shall clearly identify these items or components and describe their method of attachment to the protective clothing;

c) manufacturer's type number, identification number or model number;

d) size range as defined in EN 340:2003, Clause 6;

e) statement that the suit passes the requirement $L_{jmn,82/90} \leqslant 30$ % and $L_{S,8/10} \leqslant 15$ %;

f) other material test performance levels, preferably presented in a table;

g) care pictograms according to ISO 3758, indicating whether the clothing is suitable for cleaning and disinfection and can be re-used;

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

i) information necessary for trained persons on

- application, limitations of use (temperature range, etc.),
- tests to be carried out by the wearer before use (if required),
- fitting (including how and where the suit should be taped to the body or to other items of protective equipment, if this is relevant),
- use,
- maintenance and cleaning (including, for example, guidance for decontamination and disinfection); if the cleaning procedure or cleaning agents used can lead to an appreciable and rapid decrease of protective properties, the maximum number of cleaning cycles shall be reported,
- storage;

j) statement to advise that the wearing of chemical protective clothing may cause heat stress and recommendations on how to avoid this (e.g., use of absorbent undergarments or cooled garments, alternation of work and rest periods, etc.).

The instructions shall be unambiguous. If helpful, illustrations, part numbers, marking, etc. shall be added. Warnings (if appropriate) shall be given against problems likely to be encountered.

Bibliography

[1] ISO 7000:2004, *Graphical symbols for use on equipment — Index and synopsis*

ICS 13.340.10

Price based on 7 pages