INTERNATIONAL STANDARD

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Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure

Vêtements de protection contre les produits chimiques liquides — Détermination de la résistance des matériaux des vêtements de protection à la pénétration des liquides sous pression

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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.

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.

International Standard ISO 13994 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing.*

Annexes A and B of this International Standard are for information only.

Introduction

Workers involved in the production, use, and transportation of liquid chemicals can be exposed to numerous compounds capable of causing harm upon contact with the human body. The deleterious effects of these chemicals can range from acute trauma (such as skin irritation and burn) to chronic degenerative disease (such as cancer). Since engineering controls may not eliminate all possible exposures, attention is often placed on reducing the potential for direct skin contact through the use of protective clothing that resists permeation, penetration and degradation.

This test method determines the resistance to penetration by liquids under pressure only. Resistance to permeation and degradation, as well as penetration resistance for liquids not under pressure, should be determined by other methods.

Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure

1 Scope

This International Standard describes a laboratory test method that enables determination of the resistance of materials used in protective clothing to visible penetration under the conditions of continuous liquid contact and pressure, for example, clothing that is exposed to repeated splashes of liquid spray under pressure. Protective clothing "pass/fail" determinations are based on visual detection of liquid penetration.

This test method is normally used to evaluate the barrier effectiveness against liquids of materials used for protective clothing and specimens from finished items of protective clothing.

NOTE Finished items of protective clothing include gloves, arm shields, aprons, suits, hoods, boots and the like. The phrase "specimens from finished items" encompasses seamed and other discontinuous regions as well as the usual continuous regions of protective clothing items.

This test method can be used to identify protective clothing materials and constructions that limit exposures to hazardous liquid chemicals under a variety of circumstances. This test method is particularly useful for demonstrating the liquid hold-out capabilities of microporous fabrics.

Significant amounts of hazardous materials may permeate specimens that pass penetration tests. More sensitive analysis of permeation may be carried out using ISO 6529.

Penetration resistance of protective clothing materials using less severe liquid challenges, without pressure, may be carried out using ISO 6530. ISO 6530 uses a relatively low-volume, short-duration liquid challenge which is appropriate for treated porous and other non-film-based or uncoated materials.

This International Standard addresses only the performance of materials or certain material constructions (e.g. seams) used in protective clothing. It does not address the design, overall construction and components, or interfaces of garments or other factors which may affect the overall protection offered by the protective clothing.

It is emphasized that the test method specified in this International Standard does not necessarily simulate conditions that clothing materials are likely to be exposed to in practice. The use of test data should therefore be restricted to broad comparative assessment of such materials according to their liquid penetration resistance characteristics.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 139:1973, *Textiles — Standard atmospheres for conditioning and testing.*

ISO 2286:1986, *Rubber- or plastics-coated fabrics — Determination of roll characteristics.*

ISO 2859-1:—[1)], *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection.*

ISO 3801:1977, *Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area.*

ISO 5084:1996, *Textiles — Determination of thickness of textiles and textile products.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1
degradation
deleterious change in one or more physical properties of a protective clothing material due to contact with chemicals

3.2
penetration
flow of a liquid through closures, porous materials, seams and holes or other imperfections in a protective clothing material on a non-molecular level

3.3
permeation
combined process of molecular diffusion of a chemical through a solid material forming the whole or part of clothing, and its desorption into a specified medium

3.4
protective clothing
apparel used for the purpose of protecting part of the body from contact with a potential hazard

NOTE In this test method, the materials used in protective clothing are evaluated. The potential hazard is contact with liquid chemicals.

3.5
test liquid
individual liquid chemical or a liquid formulation of chemicals that is submitted for test by the method specified in this International Standard

4 Principle

The resistance of a protective clothing material to penetration by a liquid under pressure is determined by subjecting the material to the liquid for a specified time and pressure sequence and observing if visible penetration of the liquid occurs.

In the penetration test apparatus, the clothing material acts as a partition separating the hazardous liquid chemical from the viewing side of the test cell.

Any evidence of liquid penetration constitutes failure. Results are reported as "pass/fail".

5 Apparatus

5.1 Thickness gage, suitable for measuring thickness to the nearest 0,02 mm, as specified in ISO 2286, used to determine the thickness of each protective clothing material specimen tested.

1) To be published. (Revision of ISO 2859-1:1989)