International Standard

ISO 17491-5

Second edition
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Protective clothing — Test methods for clothing providing protection against chemicals —

Part 5: Determination of resistance to penetration by a spray of liquid (manikin spray test)

Habillement de protection — Méthodes d'essai pour les vêtements fournissant une protection contre les produits chimiques —

Partie 5: Détermination de la résistance à la pénétration par pulvérisation de liquide (essai au brouillard à l'aide d'un mannequin)

Reference number
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html. This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Personal protective equipment*, Subcommittee SC 13, *Protective clothing*.

This second edition cancels and replaces the first edition (ISO 17491-5:2013), which has been technically revised.

The main changes are as follows:

— various editorial revisions;

— clarification of the test liquid;

— adding measurements for the test manikin;

— adding additional specifications for the test overall and manikin platform;

— adding tolerances for measurements of the nozzles;

— adding annex material for overall material;

— adding annex material for use of this method in other nationally recognized standards.

A list of all parts in the ISO 17491 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Chemical protective clothing is worn in conjunction with appropriate respiratory protective devices when required in order to isolate the body of the wearer from the environment. Several tests exist for determining the resistance of chemical protective clothing materials to either the permeation or penetration of gaseous or liquid chemicals.

However, the effectiveness of the overall protective clothing item in preventing exposure from chemical hazards depends on the integrity of the clothing item's design in eliminating or reducing inward leakage of chemicals.

The selection of the appropriate integrity test method will depend on the application of the chemical protective clothing and the exposure hazards present. Usually, the integrity test method will be specified in the overall chemical protective clothing specification.

Evaluations of protective clothing material chemical resistance are carried out by the appropriate test.

The following test methods are used when measuring the chemical resistance of materials, seams and assemblages:

— ISO 6529 specifies methods for measuring the resistance of the protective clothing materials, seams, and assemblages to permeation by either liquids or gases.

— ISO 13994 specifies a method for determining the penetration resistance of protective clothing materials under conditions of continuous liquid contact and pressure, and can be applied to microporous materials, seams, and assemblages.

— ISO 6530 specifies a procedure for measuring the penetration resistance of protective clothing materials from the impact and runoff of liquids.

The integrity test methods specified by the ISO 17491 series are used when measuring the chemical resistance of complete items or ensembles and are as follows:

— ISO 17491-1 specifies a method to be performed either at minimum test settings (method 1) or at more rigorous test settings (method 2), for assessing the resistance of a gas-tight suit to outward leakage of air through, for example, essential openings, fastenings, seams, interface areas between items, pores, and any imperfections in the materials of construction.

— ISO 17491-2 specifies two different methods for determining the inward leakage of chemical protective clothing in an aerosol environment (method 1) or gaseous environment (method 2). The procedure is applicable to gas-tight suits and non-gas-tight suits according to ISO 16602 and provides an evaluation of chemical protective suit integrity, particularly leakage in the breathing zone, under dynamic conditions through the use of human subjects.

— ISO 17491-3 specifies a method for determining the resistance of chemical protective clothing to penetration by jets of liquid chemicals. This procedure is applicable to clothing worn where there is a risk of exposure to a forceful projection of a liquid chemical and intended to be resistant to penetration under conditions which require total body surface cover but not gas-tight clothing.

— ISO 17491-4 specifies a method to be performed either at minimum test settings (method A, low-level spray test) or at more rigorous test settings (method B, high-level spray test), for determining the resistance of chemical protective clothing to penetration by sprays of liquid chemicals. This procedure applies to protective clothing intended to be worn when there is a risk of exposure to slight splashes of a liquid chemical or to spray particles that coalesce and run off the surface of the garment and intended to be resistant to penetration under conditions which require total body surface cover but not gas-tight clothing.

— ISO 17491-5 This method determines the resistance to chemical spray penetration and differs from the method in ISO 17491-4 in that it uses a static manikin instead of a test subject. It also uses a different spray configuration and duration. Since ISO 16602 is considering adoption of this method, the availability

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of such laboratories should be maintained and therefore this standard will not preclude the use of ASTM F1359 in order to meet the requirements of this standard.

General protective clothing requirements are specified in ISO 13688.

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Protective clothing — Test methods for clothing providing protection against chemicals —

Part 5: Determination of resistance to penetration by a spray of liquid (manikin spray test)

1 Scope

This document specifies a test method for determining the resistance of complete protective clothing to inward leakage of liquid chemicals (protective clothing integrity).

This method specifies an alternative method for determining the resistance to spray penetration because it uses a static manikin instead of a test subject; it also uses a different spray configuration and duration than the other methods within ISO 17491 series. This test method is aligned with ASTM F1359 since the only laboratories with equipment of this kind are performing testing according to that standard.

This test method is not appropriate for evaluating the permeation or penetration of liquid chemicals through the material from which the clothing is made.

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.

ISO 13688, *Protective clothing — General requirements*

ISO 11610, *Protective clothing — Vocabulary*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
absorbent overall
overall made from an absorbent material, worn under the test suit and intended for collecting liquid penetration during testing of chemical protective clothing

3.2
calibrated stain
fluorescent or visible stain, with a defined minimum area, generated by dropping a specified quantity of test liquid on to an *absorbent overall* (3.1)

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