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

Part 4:
**Determination of resistance to
penetration by a spray of liquid (spray
test)**

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

*Partie 4: Détermination de la résistance à la pénétration par
vaporisation de liquide (essai au brouillard)*

ISO 17491-4:2008

<https://standards.iteh.ai/catalog/standards/iso/a985224e-e456-4ec2-b7c9-092dc56aa15b/iso-17491-4-2008>



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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.

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 17491-4 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).

This first edition of ISO 17491-4, together with ISO 17491-3, cancels and replaces ISO 17491:2002, Clauses 6 and 7 of which have been technically revised.

ISO 17491 consists of the following parts, under the general title *Protective clothing — Test methods for clothing providing protection against chemicals*: [7491-4:2008](https://standards.iteh.ai/catalog/standards/iso/a985224e-e456-4ec2-b7c9-092dc56aa15b/iso-17491-4-2008)

— *Part 3: Determination of resistance to penetration by a jet of liquid (jet test)*

— *Part 4: Determination of resistance to penetration by a spray of liquid (spray test)*

The following parts are under development:

— *Part 1: Determination of resistance to outward leakage of gases (internal pressure test)*

— *Part 2: Determination of resistance to inward leakage of aerosols and gases (inward leakage test)*

Introduction

This part of ISO 17491 describes a test method for determining the spray penetration resistance of chemical protective clothing Type 4 (with spray-tight connections between different parts of the clothing and, if applicable, between the clothing and other items of personal protective equipment) and Type 6 (limited performance protective clothing).

Such clothing comprises one or more items covering the full surface of the body and is intended to be worn under conditions where there is a risk of exposure to a spray of a liquid chemical. Other requirements with regard to this type of clothing and its constituent materials can be found in the respective product standards (see Bibliography [4]).

Interlaboratory testing has shown that this test method is a repeatable pass/fail method.

A document on the selection, use and maintenance of chemical protective clothing is available (see Bibliography [5]).

CAUTION — Some of the procedures specified in this part of ISO 17491 involve the use of processes which could lead to hazardous situations and hence appropriate precautions should be taken.

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

Part 4:

Determination of resistance to penetration by a spray of liquid (spray test)

1 Scope

This part of ISO 17491 specifies methods for determining the resistance of chemical protective clothing to penetration by sprays of liquid chemicals at two different levels of intensity:

- a) Method A: low-level spray test. This is applicable to clothing that covers the full body surface and is intended to be worn when there is a potential risk of exposure to small quantities of spray or accidental low-volume splashes of a liquid chemical.
- b) Method B: high-level spray test. This is applicable to clothing with spray-tight connections between different parts of the clothing and, if applicable, between the clothing and other items of personal protective equipment, which covers the full body surface and which is intended to be worn when there is a risk of exposure to sprayed particles of liquid.

This part of ISO 17491 does not address chemical permeation resistance of the materials from which the chemical protective clothing is made.

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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/TR 11610, *Protective clothing — Vocabulary*

3 Terms and definitions

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

3.1

connection

assemblage or join

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

NOTE The calibrated stain is used to measure liquid penetration during spray and jet testing of chemical protective clothing.

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

4 Principle of test method

An aqueous spray, containing a fluorescent or visible dye tracer, is directed under controlled conditions at the chemical protective clothing worn by a human test subject. Inspection of the inside surface of the clothing and the outside surface of the absorbent overall worn under the test garment allows any points of inward leakage to be identified.

5 Liquid for application in the form of a spray

A test liquid containing the following substances shall be used:

- water at (20 ± 2) °C;
- a water-soluble fluorescent or visible dye, e.g. methyl blue (CAS number [28983-56-4]);
- a surfactant, e.g. Genapol LRO liquid (sodium lauryl ether sulphate, CAS number [009004-82-4]);
- a stabilizer for the dye (if needed), e.g. citric acid (CAS number [77-92-9], analytical grade).

Prepare the test liquid by dissolving the dye in water. Add the surfactant and the dye stabilizer (if needed) in the appropriate proportions to obtain a solution with following characteristics:

- a) for method A: a surface tension of $(52 \pm 7,5) \times 10^{-3}$ N/m;
- b) for method B: a surface tension of $(30 \pm 5) \times 10^{-3}$ N/m.

NOTE A typical concentrated solution for a high-level spray test can be made by dissolving 4 g methyl blue, 25 ml Genapol LRO liquid and 125 g citric acid in 1 l of tap water. The mixture is stirred for 15 min to 20 min with a magnetic stirrer and eventually 200 ml of the mixture is diluted in 10 l of water.

To measure the surface tension within the stated tolerance, any suitable method may be used, e.g. a Wright torsion balance using a standard 12 mm diameter platinum ring. Agents other than surfactants may be mixed with water if the same surface tension can be obtained.

It shall be ensured that the surface tension is stable throughout the test, i.e. the surface tension of the liquid leaving the nozzle as well as the tension of the liquid in the tank shall meet the requirements. This shall be verified before and after each test.

Avoid dyes that adhere too strongly to the fibres of the absorbent material resulting in a wet spot larger than the coloured spot.

The necessary measures shall be taken to protect the test subject and to avoid contamination of the surface water drainage system.