



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS T 8031 : 2010

(JSAA/JSA)

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

ICS 13.340.10

Reference number : JIS T 8031 : 2010 (E)

PROTECTED BY COPYRIGHT

Date of Establishment: 2005-09-25

Date of Revision: 2010-05-25

Date of Public Notice in Official Gazette: 2010-05-25

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Protective Equipment for
Occupational Safety

JIS T 8031 : 2010, First English edition published in 2011-08

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2011

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

MT

PROTECTED BY COPYRIGHT

Contents

	Page
Introduction	1
1 Scope.....	1
2 Normative references.....	2
3 Terms and definitions	2
4 Principle.....	3
5 Apparatus	3
6 Test specimens	4
6.1 Selection of test specimens	4
6.2 Preparation of test specimens.....	5
7 Procedure of test	5
8 Test report.....	7
Annex A (informative) Examples of sources of materials	16
Annex JA (informative) Comparison table between JIS and corresponding International Standard	17

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Health, Labour and Welfare and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Safety Appliances Association (JSAA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS T 8031 : 2005** has been replaced with this Standard.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Ministers and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of ISO 13994 published in 2005 and Technical Corrigendum 1 of ISO 13994:2005 published in 2006 with some modifications of the technical contents considering the convenience of use.

The portions with continuous sidelines or dotted underlines in this Standard are the matters in which the contents of the original International Standard have been modified. A list of modifications with explanations is given in Annex JA.

1 Scope

This 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 based on visual detection of liquid penetration.

This test method is used to evaluate the barrier effectiveness against liquids of materials used for protective clothing and specimens from finished items of protective clothing. An example of relevant clothing is the clothing that is exposed to repeated splashes of liquid spray under pressure.

NOTE 1 Finished items of protective clothing include not only the whole-body chemical protective clothing but also gloves, arm shields, aprons, suits, hoods, footwear and the like. Furthermore, 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 is used to identify protective clothing materials and certain material constructions (e.g. seams) that limit exposures to liquid chemicals. It does not address the design, construction and components, or interfaces of garments or other factors that may affect the overall protection offered by the protective clothing. Furthermore, this test does not necessarily simulate all the conditions in which clothing materials are likely to be exposed to liquid chemicals in practice. Therefore the use of test data should be restricted to broad comparative assessment of such materials according to their liquid penetration resistance characteristics.

NOTE 2 The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 13994 : 2005 *Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure* and Technical Corrigendum 1: 2006 (MOD)

In addition, symbols, which denote the degree of correspondence in the contents between the relevant International Standard and JIS, are IDT (identical), MOD (modified), and NEQ (not equivalent) according to ISO/IEC Guide 21-1.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For standards with the year indication, only the editions of the indicated year shall apply but the revision (including amendments) made thereafter shall not apply. The normative references without the indication of the year shall apply only to the most recent edition (including amendments).

JIS K 6404-2-3 *Testing methods for rubber- or plastics-coated fabrics—Determination of roll characteristics—Part 3 : Method for determination of thickness*

NOTE : Corresponding International Standard : ISO 2286-3 *Rubber or plastics-coated fabrics—Determination of roll characteristics—Part 3 : Method for determination of thickness* (MOD)

JIS L 0105 : *General principles of physical testing methods for textiles*

NOTE : Corresponding International Standard : ISO 139 *Textiles—Standard atmospheres for conditioning and testing* (MOD)

JIS L 1096 : *Testing methods for woven fabrics*

NOTE : Corresponding International Standard : ISO 3801 *Textiles—Woven fabrics—Determination of mass per unit length and mass per unit area* and ISO 5084 *Textiles—Determination of thickness of textiles and textile products* (Overall evaluation: MOD)

JIS T 8115 *Protective clothing for protection against chemicals*

JIS Z 9015-1 *Sampling procedures for inspection by attributes—Part 1 : Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

NOTE : Corresponding International Standard : ISO 2859-1 *Sampling procedures for inspection by attributes—Part 1 : Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection* (IDT)

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in JIS T 8115 and the following terms and definitions apply.

3.1 penetration

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

3.2 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

3.3 chemical protective clothing

assemblage of garments to be worn in order to prevent exposure or contact of the skin against chemicals

3.4 chemical protective clothing material

materials or combination thereof to be used for chemical protective clothing in order to protect various parts of body against potential hazard

The chemical protective clothing materials contain such materials that serve as the primary barrier of wearers.

3.5 test liquid

individual liquid chemical or a liquid formulation of chemicals that is used for test

4 Principle

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

Any evidence of liquid penetration constitutes penetration of that specimen. The penetration of a specimen terminates the test. Presence or absence of penetration under the pressure shall be described in the test report.

5 Apparatus

The test apparatus is as follows.

5.1 Thickness gage, suitable for measuring thickness to the nearest 0.02 mm, as specified in **JIS K 6404-2-3**, used to determine the thickness of each protective clothing material specimen tested.

5.2 Penetration test cell, to restrain the specimen during contact with the pressurized test fluid.

In the test cell, the specimen acts as a partition separating the test liquid from the viewing side of the test cell. It consists of a cell body that is fastened to a cell support. The cell body has a capacity of approximately 60 ml for liquid. The cell body has the following: a flange cover with an open area to allow visual observation, a transparent cover (optional), a top port for filling the penetration test cell with the test liquid and a drain valve for draining the test liquid. Other items, such as a fitting to allow attachment of the air line to the top port in the cell body, gaskets and the retaining screen are also required. Figure 1 shows the schematics of the liquid penetration test apparatus. Figure 2 shows an example of test apparatus. Figure 3 shows an exploded view of the penetration test cell with the retaining screen. Figure 4 to figure 10 show examples of specifications for parts of a penetration test apparatus whose interior diameter is 57 mm.

Examples of suppliers of the penetration test cells are shown in Annex A.

5.3 Retaining screen Sometimes the tests of flexible or elastic materials pressurize the specimen, deforming the specimen and producing abnormal values in the test result. In that case, a retaining screen may be placed, at the time of test, between the flange cover and the specimen as separated by appropriate gaskets.

The screen shall comprise a smooth finish plastic or metal square mesh screen, meeting the following specifications:

- a) open area shall exceed 50 %;
- b) deflection of sample shall be 5.0 mm or less.

5.4 Air pressure source, capable of providing air at (35.0 ± 3.5) kPa.

5.5 Stopwatch or electronic timer

5.6 Balance, with a precision of 0.001 g.

5.7 Vessel, graduated to measure water, with a precision of 1 mL.

6 Test specimens

6.1 Selection of test specimens

6.1.1 Select specimen from materials used for or sampled from the finished product of protective clothing. Select specimens from single material samples or individual protective clothing items, consisting of either a single layer or a composite of multiple layers that is representative of an actual protective clothing construction with all layers arranged in the proper order.

If different locations of clothing use materials of different quality or thickness, then select specimens from each location, or select specimens from materials used for each location.

If the seams of clothing are required to have the same protection as materials, then test additional specimens containing such seams.

Cut each specimen as squares with a minimum dimension of 70 mm.

The number of specimens shall be three. Take three specimens each at random from each material, each location (in the case of heterogeneous design), or location of other different conditions. If needed, generate random specimens as described in JIS Z 9015-1.

6.1.2 It is possible that protective clothing materials incorporating an impervious layer between two fabric layers are sensitive to false liquid penetration by wicking at the edges. Seal the edges of the test specimens to prevent “wicking” modes of failure. Prior to testing, seal test specimens with an adhesive, parafilm, paraffin wax or adhesive backed foam. Seal only the edges of the test specimens, leaving the centre 57 mm area (57 mm square) open for testing. Do not allow sealants to intrude, block or occlude the structure of the test specimen in the test area, as this may compromise the test procedure. Choose sealants and sealing methods that are suitable for the protective clothing materials.