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Protective clothing for use against chemicals

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry and Minister of Labor through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently, **JIS T 8115:1979** is replaced with **JIS T 8115:1998**.

In this revision, **ISO 6529:1990** *Protective clothing — Protection against liquid chemicals — Determination of resistance of air-impermeable materials to permeation by liquids* and **ISO 6530:1990** *Protective clothing — Protection against liquid chemicals — Determination of resistance of materials to penetration by liquids* have been used as the basis.

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Protective clothing for use against chemicals

Introduction This Japanese Industrial Standard was made on the basis of **ISO 6529** *Protective clothing — Protection against liquid chemicals — Determination of resistance of air-impermeable materials to permeation by liquids* published in 1990 as the 1st edition and **ISO 6530** *Protective clothing — Protection against liquid chemicals — Determination of resistance of materials to penetration by liquids* published in 1990 as the 2nd edition in such a way that the corresponding items (permeation test and penetration test) are translated from the corresponding International Standards without changing the technical contents.

Besides, the items not included in the corresponding International Standards (performance, construction, marking, etc.) are added as a part of Japanese Industrial Standard.

1 Scope This Japanese Industrial Standard specifies the protective clothing (hereafter referred to as “protective clothing”) to wear when handling the harmful chemical materials in a state of gas, liquid or particle such as acid, alkali, organic chemicals and others (hereafter referred to as “chemicals”) for the purpose of protecting permeation and/or penetration of chemicals.

2 Normative references The standards given in the Attached Table 1 contain provisions which, through reference in this text, constitute provisions of this Standard. The latest editions of them apply.

3 Definitions For the purpose of this Standard, in addition to the definitions given in **JIS T 8001**, the following definitions apply.

- a) **permeation** Such a phenomenon that a chemical which touches the surface of the protective clothing is absorbed in it resulting in molecular level diffusion within the material and finally removes from the reverse surface of the protective clothing.
- b) **breakthrough time** The elapsed time between the initial application of a test liquid to the appropriate surface of the material and its subsequent presence on the other side of the material.
- c) **penetration** The passage of a liquid chemical through pores and apertures of a protective clothing material.
- d) **repellency** The ability of a material for the protective clothing to shed liquid that is applied to its surface.
- e) **seam** The permanent connecting part of the materials for the protective clothing body.
- f) **assemblage** The permanent connecting part between the protective clothing body and the attendant parts such as hood, gloves, shoes, etc.

- g) **join** The separable connecting part between two different parts of the clothing (for example, between the body and hood, gloves, shoes, etc.).
- h) **closure** The parts used for opening and closing the protective clothing when wearing and taking off such as a fastener.

4 Classification The protective clothing shall be classified into the following types ;

- a) airtight type ;
- b) closed type ;
- c) open type.

5 Performances

5.1 Body The performance of the main material used for the body of protective clothing shall conform to the following requirements :

- a) **Impermeability** The impermeability performance of the protective clothing shall satisfy Table 1 for every chemical used for measurement when the specimen is subjected to the permeation test specified in 7.1.

**Table 1 Permeability of material
for protective clothing**

Grade	Breakthrough time min
6	480 min.
5	240 min.
4	120 min.
3	60 min.
2	30 min.
1	10 min.

- b) **Penetration resistance** The penetration resistance of the material for protective clothing shall satisfy Table 2 for every chemical used for measurement when the penetration resistance test specified in 7.2 is carried out. However, when testing in accordance with 3 of the Annex 2, the acceptability shall be determined visually for individual chemical used for measurement.

**Table 2 Penetration resistance of material
for protective clothing**

Grade	Penetration index
3	1 max.
2	5 max.
1	10 max.

- c) **Repellency** The repellency of the material for protective clothing shall satisfy Table 3 for every chemical used for measurement when tested in accordance with 2 of the Annex 2 among the penetration tests specified in 7.2.

**Table 3 Repellency of material
for protective clothing**

Grade	Repellent index
3	95 min.
2	90 min.
1	80 min.

5.2 Connecting part (seam, assemblage and join) and closure The performance of the connecting part and closure shall comply with the following requirements :

- a) **Impermeability** The impermeability of the connection and closure of the protective clothing shall satisfy Table 1 for every chemical used for measurement when the permeation test specified in 7.1 is carried out.
- b) **Penetration resistance** The penetration resistance of the connection and closure of the protective clothing shall satisfy Table 2 for every chemical used for measurement when the penetration test specified in 7.2 is carried out. When the test is carried out in accordance with 3 of Annex 2, the acceptance or rejection shall be decided visually for each chemical used for measurement.
- c) **Tensile strength** The tensile strength of the connection and closure of the protective clothing shall satisfy Table 4 when the tensile strength test specified in 7.3 is carried out.

**Table 4 Tensile strength of connecting part
and closure of protective clothing**

Grade	Tensile strength N
5	300 min.
4	125 min.
3	75 min.
2	50 min.
1	30 min.

5.3 Airtightness The airtight type protective clothing shall be such, when the airtightness test specified in 7.4 is carried out, that the inside air pressure does not lower by 0.1 kPa or more during three minutes of measuring time.

5.4 Performance to keep inside pressure The inside pressure of the air feed type airtight protective clothing shall be within a range of 0.1 kPa to 0.3 kPa higher than the ambient air pressure throughout the whole process of the test when the inside pressure keeping test specified in 7.5 is carried out, in order to avoid the excessive rise of the inside pressure in service.

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5.5 Noise level The noise level of the air feed type protective clothing shall, when tested in accordance with the method specified in 5.3.1, (3) (e) of JIS T 8153 and measured at the air flow rate 200 l/min in the neighbourhood of wearer's ear, be not more than 80 dB (A).

6 Construction

6.1 Construction in general The construction in general shall be as follows :

- a) The protective clothing shall be so constructed that it is comfortable to wear, does not obstruct wearer's free action, is of light weight and is unlikely to be stained by pollutant attaching to the surface.
- b) The protective clothing shall be so constructed that it is possible to wear and remove easily and promptly and, is unlikely to stain the body surface and cloths, when undressing.
- c) The eye piece of the protective clothing shall have sufficient visual field and less optical defect. It shall also be of the construction difficult to be clouded and possible to read a refuge and guidance mark from the distance of 6 m when wearing. The head construction of the protective clothing for which protective effect against an impact given to the head is required shall conform to the performance specified in 5.1 and 5.2 of JIS T 8131.
- d) The exhauster shall be decontaminated easily, occupy less space, not extrude excessively, be protected from flying object and spraying liquid, and not fall in a closed state in any case in service.

For disposable exhauster, no consideration for decontamination is required.

- e) The protective clothing shall be so constructed that the wearer can continue respiration even when air feeding is interrupted, if necessary.
- f) The protective clothing shall be so constructed that control of the temperature inside the clothing is possible, if necessary.

6.2 Construction of protective clothing by types

6.2.1 Airtight type protective clothing (airtight clothing) The airtight type protective clothing which is designed to protect the whole body including the hands and legs shall be provided with the function to keep the inside of the clothing airtight and at positive pressure, and be so constructed that chemicals do not penetrate into the inside.

- a) **Airtight clothing equipped interiorly with protective apparatus for self contained breathing apparatus** The inside of the clothing is equipped with the protective apparatus for self contained breathing apparatus.
- b) **Airtight clothing equipped exteriorly with protective apparatus for self contained breathing apparatus** The outside of the clothing is equipped with the protective apparatus for self contained breathing apparatus.
- c) **Air feed type airtight clothing** This is an airtight clothing (including the type using jointly the protective apparatus for breathing) to which the respiratory air is sent through a hose from the outside of the clothing.

6.2.2 Closed type protective clothing (closed clothing) The closed type protective clothing which is designed to protect the whole body or a part of the body shall be so constructed that the outside air is difficult to enter by closing tightly the open part at the end of clothing such as cuff and dress hem by means of rubber or the like. Airtightness and sufficient positive pressure within the clothing are not required, but its construction shall be that the skin is not directly exposed to or does not touch chemicals and the chemicals do not enter into the inside even if they adhere to the clothing surface.

- a) **Closed clothing which also serves as protective apparatus for self contained breathing apparatus** This closed clothing also serves as the protective apparatus for self contained breathing apparatus.
- b) **Air feed type closed clothing** This is a closed clothing (including the type used with protective apparatus for self contained breathing apparatus) to which the respiratory air is sent through a hose from the outside of the clothing.
- c) **Non-air feed closed clothing** This is a closed clothing used together with the air purifying respirator.

6.2.3 Open type protective clothing (open clothing) This protective clothing is for protecting the whole body or a part of the body and has apertures. It shall be so constructed that chemicals do not enter into the inside from other places than the aperture even if they attach to the surface of the clothing.

7 Test methods

7.1 Permeation test The permeation test shall be carried out in accordance with any one of the following tests :

- a) **Clause 2 of Annex 1.** However, the breakthrough time shall be the time until the permeation time comes to $1 \mu\text{g}/\text{cm}^2/\text{min}$.
- b) **Clause 3 of Annex 1.** However, the breakthrough time shall be the standard break point detecting time.

7.2 Penetration test The penetration test shall be carried out in accordance with any one of the following :

- a) **Clause 2 of Annex 2.**
- b) **Clause 3 of Annex 2.**

7.3 Tensile strength test The test specified in 6.1 of JIS L 1093 shall apply.

7.4 Airtightness test The airtightness test shall be carried out in accordance with the following procedures :

- a) Close tight all apertures of the airtight type protective clothing ;
- b) Send the air into the clothing from the air inlet or exhaust hole until the pressure in the clothing comes to 0.75 kPa ;

- c) Send the air so that the pressure in the clothing does not decrease lower than 0.5 kPa in order to remove the wrinkles and to make the inside pressure even ;
- d) After three minutes, adjust the pressure in the clothing to 0.5 kPa ;
- e) Close the air inlet or exhaust hole when 0.5 kPa is attained and, measure and record continuously the pressure in the clothing for three minutes.

7.5 Inside pressure keeping test The test shall be carried out in accordance with 8.2 of JIS Z 4809. The duration of each loading movement shall be 120 seconds and a series of the movements shall be repeated three times.

8 Standard test solution The standard test solution to be used for the permeation test and penetration test shall be as follows :

- | | |
|---|-------------------|
| a) acetonitrile | CAS No. 75-05-8 |
| b) acetone | CAS No. 67-64-1 |
| c) ethyl acetate | CAS No. 141-78-6 |
| d) diethylamine | CAS No. 109-89-7 |
| e) dichloromethane | CAS No. 75-09 |
| f) N,N-dimethyl formamide | CAS No. 68-12-2 |
| g) sodium hydroxide water solution 50 % (W/W) | CAS No. 1310-73-2 |
| h) tetrachloroethylene | CAS No. 127-18-4 |
| i) tetrahydrofuran | CAS No. 109-99-9 |
| j) toluene | CAS No. 108-88-3 |
| k) nitrobenzene | CAS No. 98-95-3 |
| l) carbon disulfide | CAS No. 75-15-0 |
| m) normal hexane | CAS No. 110-54-3 |
| n) methanol | CAS No. 67-56-1 |
| o) sulfuric acid 93.1 % solution | CAS No. 7664-93-9 |

Remarks : "CAS No." is a registry number of the chemical material in the data base "CAS ONLINE" supplied by Chemical Abstracts Service in American Chemical Society.

9 Inspection The inspection shall be carried out on performance and construction and the results shall conform to the requirements in 5 and 6. The inspection may be conducted in accordance with reasonable sampling method.