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**Preformed cellular plastics thermal
insulation materials**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by 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 Thermal Insulation Association (JTIA)/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 A 9511:2009** is replaced with this Standard.

However, **JIS A 9511:2009** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until March 20, 2018.

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Preformed cellular plastics thermal insulation materials

Introduction

This Japanese Industrial Standard has been revised to redefine its scope in relation to **JIS A 9521** (Thermal insulation materials for buildings). The revision of **JIS A 9521** made in September 2014 expanded its scope to cover all thermal insulation materials intended for use in dwellings and building structures at the ordinary temperature, part of which was originally included in this Standard. In this revised edition, the scope of this Standard is defined to include the preformed cellular plastics thermal insulation materials for industrial purposes such as plants and building facilities, to be clearly distinguished from the scope of **JIS A 9521**.

1 Scope

This Standard specifies the preformed cellular plastics thermal insulation materials to be used as thermal insulator.

This Standard is mainly applicable to thermal insulation materials intended for general industrial applications, and also applicable to those used under special temperature and humidity conditions such as in a cold-storage warehouse, and those used for facility equipment, piping, etc. of dwellings or buildings. It is not applicable to insulation materials for dwellings and buildings that are mainly intended for use at the ordinary temperature.

The comparison table between previous and current editions of this Standard on technically significant revisions is given in Annex A.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS A 0202 *Thermal insulation—Vocabulary*

JIS A 1324 *Measuring method of water vapor permeance for building materials*

JIS A 1412-1 *Test method for thermal resistance and related properties of thermal insulations—Part 1: Guarded hot plate apparatus*

JIS A 1412-2 *Test method for thermal resistance and related properties of thermal insulations—Part 2: Heat flow meter apparatus*

JIS A 1412-3 *Test method for thermal resistance and related properties of thermal insulations—Part 3: Circular pipe apparatus*

JIS A 1901 *Determination of the emission of volatile organic compounds and aldehydes by building products—Small chamber method*

JIS A 1902-4 *Determination of the emission of volatile organic compounds and aldehydes by building products—Sampling, preparation of test specimens and testing condition—Part 4: Heat-Insulating material boards*

- JIS A 6005 *Asphalt roofing felts*
- JIS B 7507 *Vernier, dial and digital callipers*
- JIS B 7512 *Steel tape measures*
- JIS B 7516 *Metal rules*
- JIS G 3452 *Carbon steel pipes for ordinary piping*
- JIS K 6742 *Unplasticized poly(vinyl chloride) (PVC-U) pipes for water supply*
- JIS K 6767 *Cellular plastics—Polyethylene—Methods of test*
- JIS K 7100 *Plastics—Standard atmospheres for conditioning and testing*
- JIS K 7201-2 *Plastics—Determination of burning behaviour by oxygen index—
Part 2: Ambient-temperature test*
- JIS K 7220 *Rigid cellular plastics—Determination of compression properties*
- JIS K 7221-2 *Rigid cellular plastics—Determination of flexural properties—Part 2:
Determination of flexural strength and apparent flexural modulus of
elasticity*
- JIS K 7222 *Cellular plastics and rubbers—Determination of apparent (bulk) density*
- JIS K 7225 *Rigid cellular plastics—Determination of water vapour transmission
properties*
- JIS P 3401 *Kraft papers*
- JIS Z 1514 *Polyethylene coated paper*
- JIS Z 1520 *Laminated aluminium foils*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS A 0202**, and the following apply.

3.1 preformed cellular plastics thermal insulation materials

generic term for materials used for thermal insulation purposes including beads method polystyrene foam thermal insulation material, extrusion method polystyrene foam thermal insulation material, rigid urethane foam thermal insulation material, polyethylene foam thermal insulation material and phenol foam thermal insulation material

3.2 facing

sheet or film material integrally stuck to the front face and/or back face of the foam of the preformed cellular plastics thermal insulation material

3.3 moulded facing

facing integrally stuck to the foam through self-adhesion of the foam at the time of its foaming process

3.4 skin layer

resin layer of the foam, which is formed on the surface of preformed cellular plastics thermal insulation material at the time of its production

3.5 fluorocarbons

generic term for hydrofluorocarbon (HFC), chlorofluorocarbon (CFC), and hydrochlorofluorocarbon (HCFC)

NOTE 1 Hydrofluoroolefin (HFO) does not fall under this category. Hydrofluoroolefin (HFO) refers to HFO-1233zd, HFO-1336mzz and others.

NOTE 2 Among the above, only hydrofluorocarbon currently approved for use in Japan is HFC.

4 Classification and product symbols

Classification and product symbols of preformed cellular plastics thermal insulation materials shall be as given in Table 1. Classification and symbols of facings and skin layers shall be as given in Table 2.

Rigid urethane foam thermal insulation materials are classified into the following according to the use of fluorocarbons. Fluorocarbons are not used for any other preformed cellular plastics thermal insulation materials than rigid urethane foam thermal insulation material.

Class A: those using hydrocarbons (HC) or carbon dioxide (CO₂) as the foaming agent, and not using any fluorocarbons.

Class B: those using hydrofluorocarbon (HFC) as the foaming agent.

Table 1 Classification and symbols of preformed cellular plastics thermal insulation materials

Classification			Product symbol	Summary
Beads method polystyrene foam thermal insulation material	Thermal insulation board	Extra	EPS-B-extra	The thermal insulation boards, pipe insulation and joint covers made by mould foaming the expandable beads of polystyrene or its copolymer with addition of foaming agent, fire retardant (excluding HBCD) and additive or by cutting out from the foamed block. Suitable temperature for use is 80 °C or lower for thermal insulation boards, and 70 °C or lower for pipe insulation and joint covers. Classification of thermal insulation materials of this category is based on thermal conductivity and mechanical properties. Some products have facings adhered to their front and/or back surfaces.
		No. 1	EPS-B-1	
		No. 2	EPS-B-2	
		No. 3	EPS-B-3	
	Pipe insulation ^{a), b)}	No. 4	EPS-B-4	
		No. 1	EPS-C-1	
		No. 2	EPS-C-2	
		No. 3	EPS-C-3	
	Joint cover ^{a), b)}		EPS-F	

Table 1 (continued)

Classification					Product symbol	Summary
Extrusion method polystyrene foam thermal insulation material	Thermal insulation board	Class 1	b	A	XPS1bA	The thermal insulation boards made by continuous extrusion foaming of the polystyrene or its copolymer to which foaming agent, fire retardant (excluding HBCD) and additive are added through melt-mixing, or by cutting out from the block foamed by extrusion. Suitable temperature for use is 80 °C or lower. Classification of thermal insulation materials of this category is based on thermal conductivity and compressive strength. Some products have facings adhered to their front and/or back surfaces.
				B	XPS1bB	
				C	XPS1bC	
		Class 2	b	A	XPS2bA	
				B	XPS2bB	
				C	XPS2bC	
		Class 3	a	A	XPS3aA	
				B	XPS3aB	
				C	XPS3aC	
				D	XPS3aD	
			b	A	XPS3bA	
				B	XPS3bB	
				C	XPS3bC	
				D	XPS3bD	
Class A	Rigid urethane foam thermal insulation material	Thermal insulation board	Class 1	No. 1	A-PUF-B-1.1	The thermal insulation boards and pipe insulation made by foaming polyisocyanate, polyol and foaming agent as the base compound, which are classified according to foaming method, thermal conductivity and mechanical properties. Suitable temperature for use is 100 °C or lower. Class 1: Thermal insulation boards or pipe insulation made by foaming or by cutting out from the foamed block. Some products have facings adhered to their front and/or back surfaces.
				No. 2	A-PUF-B-1.2	
				No. 3	A-PUF-B-1.3	
				No. 4	A-PUF-B-1.4	
			Class 2	No. 1	A-PUF-B-2.1	
				No. 2	A-PUF-B-2.2	
				No. 3	A-PUF-B-2.3	
				No. 4	A-PUF-B-2.4	
		Pipe insulation ^{a), b)}	Class 3	No. 1	A-PUF-B-3.1	Class 2: Thermal insulation boards or pipe insulation with non-moisture permeable facings, made by producing the foam between facings, and allowing the self-adhesion of the foam to stick the foam and facings together into a sandwich-like composite.
				No. 2	A-PUF-B-3.2	
			Class 1	No. 1	A-PUF-C-1.1	
				No. 2	A-PUF-C-1.2	
				No. 3	A-PUF-C-1.3	
				No. 4	A-PUF-C-1.4	
Class B	Rigid urethane foam thermal insulation material	Thermal insulation board	Class 1	No. 1	B-PUF-B-1.1	Class 3: Thermal insulation boards with moisture permeable facings, made by producing the foam between facings and allowing the self-adhesion of the foam to stick the foam and facings together into a sandwich-like composite.
				No. 2	B-PUF-B-1.2	
			Class 2	No. 1	B-PUF-B-2.1	
				No. 2	B-PUF-B-2.2	
		Pipe insulation ^{a), b)}	Class 1	No. 1	B-PUF-C-1.1	
				No. 2	B-PUF-C-1.2	
			Class 2		B-PUF-C-2	

Table 1 (continued)

Classification					Product symbol	Summary		
Polyethylene foam thermal insulation material	Thermal insulation board	Class 1	No. 1	A-PE-B-1.1		The thermal insulation boards or pipe insulation made by foaming polyethylene or its copolymer with addition of foaming agent and additive into the form of board or pipe, or first into the form of board or sheet, and then further forming that board or sheet into pipe. Insulation boards are classified by thermal conductivity into Class 1 to Class 3, and pipe insulation, by thickness shrinkage percentage into Class 1 and Class 2. Suitable temperature for use is 70 °C or lower for thermal insulation boards and for Class 1 pipe insulation, and 120 °C or lower for Class 2 pipe insulation. Some products have facings adhered to their front and/or back surfaces.		
			No. 2	A-PE-B-1.2				
		Class 2		A-PE-B-2				
		Class 3		A-PE-B-3				
	Pipe insulation ^{a), b)}	Class 1		A-PE-C-1				
		Class 2		A-PE-C-2				
Phenol foam thermal insulation material	Thermal insulation board	Class 1	No. 1	A	PF-B-1.1A	Thermal insulation boards with moulded facings, made by producing the foam between the facings with the base compound consisting of resol resin, foaming agent and curing agent so as to form a sandwich-like composite, or thermal insulation boards without moulded facings, made by producing the foam with the base compound consisting of resol resin, foaming agent and curing agent. Suitable temperature for use is 130 °C or lower. Classification of thermal insulation materials of this category is based on thermal conductivity and mechanical properties. Some products have facings adhered to their front and/or back surfaces.		
				B	PF-B-1.1B			
				C	PF-B-1.1C			
				D	PF-B-1.1D			
				E	PF-B-1.1E			
			No. 2	A	PF-B-1.2A			
				B	PF-B-1.2B			
				C	PF-B-1.2C			
				D	PF-B-1.2D			
				E	PF-B-1.2E			
			No. 3	A	PF-B-1.3A			
				B	PF-B-1.3B			
				C	PF-B-1.3C			
				D	PF-B-1.3D			
				E	PF-B-1.3E			
		Class 2	No. 1A		PF-B-2.1A			
			No. 2A		PF-B-2.2A			
			No. 3A		PF-B-2.3A			
		Class 3	No. 1A		PF-B-3.1A			
			No. 2A		PE-B-3.2A			
	Pipe insulation ^{a), b)}	Class 1	No. 1		PF-C-1.1			
			No. 2		PF-C-1.2			
			Class 2	No. 1			PF-C-2.1	
				No. 2			PF-C-2.2	
				No. 3			PF-C-2.3	

Table 1 (concluded)

Notes	a) The pipe insulation and joint cover may have a lengthwise slit, or split in the length direction. In addition, they may be provided with shiplap or tongue and groove joint (see JIS A 0202).
b)	The facings provided on the outside surface of the pipe insulation and joint cover may protrude beyond the foam. In this case, the back surface of the protrusion may be applied with a layer of adhesives not using formaldehyde.

Table 2 Marking of facings and skin layers

Facings and skin layers	Symbol	Description
Moisture permeable facing	S	Kraft paper specified in JIS P 3401 , polyester non-woven fabric, polypropylene non-woven fabric, glass fibre non-woven fabric filled with inorganic materials, glass fibre non-woven fabric and the like
Non-moisture permeable facing	P	Polyethylene coated paper specified in JIS Z 1514 , the laminated aluminium foils specified in JIS Z 1520 , or the materials equivalent or superior thereto in non-moisture permeability. For Class 2 rigid urethane foam pipe insulation, the sheet materials specified in JIS A 6005 , JIS Z 1514 , JIS Z 1520 or materials equivalent or superior thereto in non-moisture permeability.
Skin layer	X	Skin layer, and no facing
Without facing or skin layer	N	No facing or skin layer
Marking of facing and skin layer shall consist of one symbol if the facing/skin layer condition is the same for both faces, and of two symbols arranged side by side if it is different between two faces. Example 1 Both faces with moisture permeable facings: S, both faces with non-moisture permeable facings: P, both faces with skin layers: X Example 2 One face with moisture permeable facing, the other face with non-moisture permeable facing: SP, one face with non-moisture permeable facing: PN		

5 Quality

5.1 Characteristics

The preformed cellular plastics thermal insulation material shall be tested for characteristics of the foam independently from facings, except for formaldehyde emission characteristics, in accordance with the methods specified in clause 6. The test results shall comply with requirements specified in Tables 3 and 4. However, thermal insulation boards with moulded facings shall be tested for characteristics of the product as a whole, i.e. including the facings, except for density and combustibility. Pipe insulation with moulded facings shall be tested for characteristics of the foam independently from facings, except for coefficient of moisture permeability.

Formaldehyde emission characteristics shall be evaluated for the whole product, i.e. including the facings, for all products with facings. However, for products not containing formaldehyde-emitting materials such as urea resin, melamine resin, phenol resin, resorcinol resin, formaldehyde system antiseptics, monomer containing methylol group and rongalite system catalyst, the formaldehyde emission characteristics may be evaluated as F☆☆☆☆ without performing the test specified in 6.15.

Table 3 Characteristics

Classification			Density kg/m ³	Thermal conductivity W/(m • K) (mean temperature 23 °C)	Coefficient of moisture permeability ng/(m ² • s • Pa) (when tested with 25 mm thickness) ^{a)}	Compressive strength N/cm ²	Bending strength N/cm ²	Tensile strength N/cm ²	Thickness shrinkage percentage %	Combustibility	Water absorption amount g/100 cm ²
Applicable test subclause			6.6	6.7	6.8	6.9	6.10	6.11	6.12	6.13	6.14
Beads method polystyrene foam thermal insulation material	Thermal insulation board	Extra	27 min.	0.034 max.	185 max.	14 min.	29 min.	Not specified.	Not specified.	Flame shall extinguish within 3 s without afterglow, and combustion shall not continue past the combustion limit line.	1.0 max.
		No. 1	30 min.	0.036 max.	145 max.	16 min.	32 min.				
		No. 2	25 min.	0.037 max.	205 max.	12 min.	25 min.				
		No. 3	20 min.	0.040 max.	250 max.	8 min.	18 min.				
		No. 4	15 min.	0.043 max.	290 max.	5 min.	10 min.				1.5 max.
	Pipe insulation	No. 1	35 min.	0.036 max.	Not specified.	Not specified.	40 min.				For thickness less than 30 mm: 2.0 max. For thickness 30 mm or over: 1.0 max.
		No. 2	30 min.	0.036 max.			32 min.				
		No. 3	25 min.	0.037 max.			25 min.				
	Joint cover		25 min.	0.037 max.			25 min.				

Table 3 (continued)

Classification					Density	Thermal conductivity	Coefficient of moisture permeability	Compressive strength	Bending strength	Tensile strength	Thickness shrinkage percentage	Combustibility	Water absorption amount
					kg/m ³	W/(m · K) (mean temperature 23 °C)	ng/(m ² · s · Pa) (when tested with 25 mm thickness) ^{a)}	N/cm ²	N/cm ²	N/cm ²	%		g/100 cm ²
Applicable test subclause					6.6	6.7	6.8	6.9	6.10	6.11	6.12	6.13	6.14
Extrusion method polystyrene foam thermal insulation material	Thermal insulation board	Class 1	b	A	20 min.	0.040 max.	Without skin layer 145 max. With skin layer 55 max.	16 min.	20 min.	Not specified.	Not specified.	Flame shall extinguish within 3 s with no afterglow, and combustion shall not continue past the combustion limit line.	0.01 max.
				B		0.038 max.							
				C		0.036 max.							
		Class 2	b	A	25 min.	0.034 max.		18 min.					
				B		0.032 max.							
				C		0.030 max.							
		Class 3	a	A	25 min.	0.028 max.		10 min.					
				B		0.026 max.							
				C		0.024 max.							
				D		0.022 max.							
			b	A		0.028 max.		20 min.	25 min.				
				B		0.026 max.							
				C		0.024 max.							
				D		0.022 max.							