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Thermal insulation materials for buildings

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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 in accordance with the Industrial Standardization Law.

Consequently **JIS A 9521**:2011 is replaced with this Standard.

However, **JIS A 9521**:2011 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 September 21, 2015.

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Thermal insulation materials for buildings

1 Scope

This Japanese Industrial Standard specifies the thermal insulation materials mainly used for dwellings or buildings at the ordinary temperature (hereafter referred to as “thermal insulation materials”). In this Standard, the cellular plastics thermal insulation materials in which fluorocarbons¹⁾ are not used as a foaming agent are included in the scope.

This Standard is not applicable to the thermal insulation materials used under the condition at particular temperature and humidity such as a cold-storage warehouse, and the heat insulation materials used for facility equipment, piping, etc. for dwellings or buildings.

Note ¹⁾ Fluorocarbons refer to chlorofluorocarbon (CFC), hydrochlorofluorocarbon (HCFC) and hydrofluorocarbon (HFC), but do not include hydrofluoroolefin (HFO) which is represented by HFO-1233zd and HFO-1336mzz.

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 1423 *Simplified test method for emissivity by infrared radio meter*

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

JIS A 1902-1 *Determination of the emission of volatile organic compounds and aldehydes for building products—Sampling, preparation of test specimens and testing condition—Part 1: Boards, wallpaper and floor materials*

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

JIS A 5430 *Fibre reinforced cement boards*

JIS A 6111 *House wrapping sheets*

JIS A 6930 *Plastic films vapour barrier for residential use*

- JIS B 7502 *Micrometer callipers*
JIS B 7503 *Mechanical dial gauges*
JIS B 7507 *Vernier, dial and digital callipers*
JIS B 7512 *Steel tape measures*
JIS B 7516 *Metal rules*
JIS G 4305 *Cold-rolled stainless steel plate, sheet and strip*
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 0208 *Testing methods for determination of the water vapour transmission rate
of moisture-proof packaging materials (dish method)*
JIS Z 1514 *Polyethylene coated paper*
JIS Z 1520 *Laminated aluminium foils*
JIS Z 1702 *Polyethylene films for packaging*

3 Terms and definitions

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

3.1 thermal insulation material

material used for the purpose of thermal insulation of which the thermal conductivity at 23 °C is 0.065 W/(m·K) or under

NOTE : The definition in **JIS A 0202** is altered.

3.2 base material

portion indispensable to make the most of the thermal insulation property of a thermal insulation material

It refers to the fibrous porous medium portion for fibrous thermal insulation materials, and the cellular porous medium portion for cellular plastics thermal insulation materials.

3.3 covering material

material that covers a base material used for the purpose of vapour barrier, radiation, protection, improvement in workability, etc. of man made mineral fibre thermal insulation materials

NOTE : The definition in **JIS A 0202** is altered.

3.4 facing

sheet-like or film-like material integrated with the front face or back face of the base material of cellular plastics thermal insulation materials

3.5 moulded facing

facing necessary for moulding a base material which is integrated with the base material at the time of manufacturing thermal insulation materials

3.6 skin layer

resin layer of a base material moulded on the surface of thermal insulation material at the time of foaming cellular plastics thermal insulation materials

4 Classification and product symbols

4.1 Classification

The thermal insulation materials are classified as follows.

- a) **Classification according to base material** The classification of thermal insulation materials according to base materials shall be as given in table 1.

Table 1 Classification according to base materials

Type		Base material	Explanation
Man made mineral fibre thermal insulation materials	Glass wool thermal insulation materials	Glass wool	Thermal insulation material that fibre manufactured by melting glass is moulded using binder. Covering material is used as necessary.
	Rock wool thermal insulation materials	Rock wool	Thermal insulation material that fibre manufactured by melting slags and minerals whose main components are lime and silicic acid using binder. Covering material is used as necessary.
Organic fibre thermal insulation materials	Insulation fibre thermal insulation materials	Wood fibre	Fibreboards made by moulding vegetable fibre such as wood, mainly.

Table 1 (concluded)

	Type	Base material	Explanation
Cellular plastics thermal insulation materials	Beads method polystyrene foam thermal insulation materials	Beads method polystyrene foam	Thermal insulation material cut out from block made by foamed-moulding in frame or foamed-moulding of expandable beads of polystyrene or its copolymer to which foaming agent, flame retardant agent (not including HBCD) and additive agent are added.
	Extruded polystyrene foam thermal insulation materials	Extruded polystyrene foam	Thermal insulation material moulded by continuous extrusion of foamed-moulding of polystyrene or its copolymer to which foaming agent and additive agent are melted and mixed, or by cutting out from the extruded foamed-moulded block.
	Rigid urethane foam thermal insulation materials	Rigid urethane foam	Thermal insulation material made by foamed-moulding with polyisocyanate, polyol and foaming agent as base compounds, by cutting out from block made by foamed-moulding, or that with moulded facing made by foamed-moulding between moulded facings for integration.
	Polyethylene foam thermal insulation materials	High-expanding polyethylene foam	Thermal insulation material that polyethylene or its copolymer is foamed-moulded to which foaming agent and additive agent are mixed.
	Phenolic foam thermal insulation materials	Phenolic foam	Thermal insulation material with moulded facing made by foaming resol resin, foaming agent and curing agent as base compounds between moulded facings to be moulded to sandwich-like form, or without moulded facing made by foaming resol resin, foaming agent and curing agent as base compounds.

- b) **Classification according to packaging** The classification of thermal insulation materials according to the packaging method shall be as given in table 2. For those not requiring the compressed package, the symbol may be omitted.

Table 2 Classification according to packaging

Packaging method	Symbol
Compressed package	L
Uncompressed package	H

- c) **Classification according to covering materials, facing or skin layer** The classification of thermal insulation materials according to covering materials, facing or skin layer shall be as given in table 3.

Table 3 Classification according to covering material, facing or skin layer

Type	Type of covering material, facing or skin layer	Sym- bol	Explanation
Man made mineral fibre thermal insulation materials	With glossy surface covering material	F	Glossy surface covering material (covering material with glossy surface): laminated aluminium foil, metal-evaporated plastic film, etc. specified in JIS Z 1520 of which the emissivity ϵ obtained according to JIS A 1423 is 0.2 or under.
	With vapour barrier covering material	V	Vapour barrier material (covering material for vapour barrier as main purpose): polyethylene film specified in JIS Z 1702 , plastic vapour barrier film specified in JIS A 6930 and asphalt-saturated water proof paper, etc. of which the vapour permeability obtained according to the test method using the test apparatus in JIS Z 0208 or that with accuracy equivalent to or better to this is 75 g/m ² or under per 24 h. The test condition at this time shall be the condition A specified in JIS Z 0208 .
	With other covering material	C	Other covering materials (covering materials for protection and workability improvement as main purpose): house wrapping sheet specified in JIS A 6111 , craft paper specified in JIS P 3401 , perforated polyethylene film, glass fibre non-woven fabric, cloth such as victoria lawn, etc.
	Without covering material, facing or skin layer	N	—
Cellular plastics thermal insulation materials	With water vapour permeance facing	S	Moisture permeable facing: craft paper specified in JIS P 3401 , polyester non-woven fabric, polypropylene non-woven fabric, glass fibre non-woven fabric filled with inorganic material, glass fibre non-woven fabric, etc.
	With non-water vapour permeance facing	P	Non-moisture permeable facing: polyethylene coated paper specified in JIS Z 1514 , the laminated aluminium foils specified in JIS Z 1520 or materials equivalent or superior thereto in quality.
	With skin layer	X	—
	Without covering material, facing or skin layer	N	—
The covering material checked that it does not ignite by the ignition test method specified in Annex A shall be used. For the man made mineral fibre thermal insulation materials, symbols shall be arranged so as to be that of indoor side followed by that of outdoor side. Example 1 Indoor one side with glossy surface covering material and outdoor one side with vapour barrier covering material: FV Example 2 Both sides with vapour barrier covering material: VV For the cellular plastics thermal insulation materials, one symbol shall be used when the facings in both front-face and back-face sides are the same, and two symbols shall be arranged when they are different. Example 1 Both sides with water vapour permeance facing: S, both sides with non-water vapour permeance facing: P, both sides with skin layer: X Example 2 One side with water vapour permeance facing and one side with non-water vapour permeance facing: SP, one side with non-water vapour permeance facing: PN			

4.2 Product symbols

The types and product symbols for thermal insulation materials shall be as given in table 4 to table 6.

Table 4 Types and product symbols for man made mineral fibre thermal insulation materials

Type			Product symbol	Division according to packaging	Division according to covering material
Glass wool thermal insulation materials	Common product	10-50	GW10-50	L	FF
		10-49	GW10-49	H	FV
		10-48	GW10-48		FC
	High-performance product	HG10-47	GWHG10-47		FN
		HG10-46	GWHG10-46		VF
		HG10-45	GWHG10-45		VV
		HG10-44	GWHG10-44		VC
		HG10-43	GWHG10-43		VN
	Common product	12-45	GW12-45		CF
		12-44	GW12-44		CV
	High-performance product	HG12-43	GWHG12-43		CC
		HG12-42	GWHG12-42		CN
		HG12-41	GWHG12-41		NF
	High-performance product	HG14-38	GWHG14-38		NV
		HG14-37	GWHG14-37		NC
	Common product	16-45	GW16-45		NN
		16-44	GW16-44		
	High-performance product	HG16-38	GWHG16-38		
		HG16-37	GWHG16-37		
		HG16-36	GWHG16-36		
	Common product	20-42	GW20-42		
		20-41	GW20-41		
		20-40	GW20-40		
	High-performance product	HG20-38	GWHG20-38		
		HG20-37	GWHG20-37		
		HG20-36	GWHG20-36		
		HG20-35	GWHG20-35		
		HG20-34	GWHG20-34		
	Common product	24-38	GW24-38		
	High-performance product	HG24-36	GWHG24-36		
		HG24-35	GWHG24-35		
		HG24-34	GWHG24-34		
		HG24-33	GWHG24-33		
	High-performance product	HG28-35	GWHG28-35		
		HG28-34	GWHG28-34		
		HG28-33	GWHG28-33		

Table 4 (concluded)

Type			Product symbol	Division according to packaging	Division according to covering material
Glass wool thermal insulation materials	Common product	32-36	GW32-36		
	High-performance product	HG32-35	GWHG32-35		
		HG32-34	GWHG32-34		
		HG32-33	GWHG32-33		
	High-performance product	HG36-34	GWHG36-34		
		HG36-33	GWHG36-33		
		HG36-32	GWHG36-32		
		HG36-31	GWHG36-31		
	High-performance product	HG38-34	GWHG38-34		
		HG38-33	GWHG38-33		
		HG38-32	GWHG38-32		
		HG38-31	GWHG38-31		
	Common product	40-36	GW40-36		
	High-performance product	HG40-34	GWHG40-34		
		HG40-33	GWHG40-33		
		HG40-32	GWHG40-32		
	Common product	48-35	GW48-35		
	High-performance product	HG48-33	GWHG48-33		
		HG48-32	GWHG48-32		
		HG48-31	GWHG48-31		
	Common product	64-35	GW64-35		
	Common product	80-33	GW80-33		
	Common product	96-33	GW96-33		
Rock wool thermal insulation material	24 kg/m ³ or more in density		RWLA		
			RWLB		
			RWLC		
			RWLD		
	30 kg/m ³ or more in density		RWMA		
			RWMB		
			RWMC		
	60 kg/m ³ or more in density		RWHA		
			RWHB		
			RWHC		

Table 5 Types and product symbols for organic fibre thermal insulation material

Type			Product symbol
Insulation fibre thermal insulation material	Fibremat		IM
	Fibreboard	Unpolished board	DIB
		Polished board	DIBP

Table 6 Types and product symbols for cellular plastics thermal insulation materials

Type					Product symbol	Division according to facing or skin layer
Beads method polystyrene foam thermal insulation material	No. 1			EPS1		S, P, X, SP, SX, SN, PX, PN, XN, N ^{a)}
	No. 2			EPS2		
	No. 3			EPS3		
	No. 4			EPS4		
Extruded polystyrene foam thermal insulation material	Class 1	b	A	XPS1bA		
			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		
Rigid urethane foam thermal insulation material	Class 1			PUF1		N ^{a)}
	Class 2	No. 1		PUF2.1		P
		No. 2		PUF2.2		
		No. 3		PUF2.3		
		No. 4		PUF2.4		
Polyethylene foam thermal insulation material	Class 1	No. 1		PE1.1		N ^{a)}
		No. 2		PE1.2		
	Class 2			PE2		
	Class 3			PE3		
Phenolic foam thermal insulation material	Class 1	No. 1	A	I	PF1.1A1	S, P, N ^{a)} SP, SN, PN
				II	PF1.1A2	
			B	I	PF1.1B1	
				II	PF1.1B2	
			C	I	PF1.1C1	
				II	PF1.1C2	
			D	I	PF1.1D1	
				II	PF1.1D2	
			E	I	PF1.1E1	
				II	PF1.1E2	

Table 6 (concluded)

Type					Product symbol	Division according to facing or skin layer
Phenolic foam thermal insulation material	Class 1	No. 2	A	I	PF1.2A1	
				II	PF1.2A2	
			B	I	PF1.2B1	
				II	PF1.2B2	
			C	I	PF1.2C1	
				II	PF1.2C2	
			D	I	PF1.2D1	
				II	PF1.2D2	
			E	I	PF1.2E1	
				II	PF1.2E2	
		No. 3	A	I	PF1.3A1	
				II	PF1.3A2	
			B	I	PF1.3B1	
				II	PF1.3B2	
			C	I	PF1.3C1	
				II	PF1.3C2	
			D	I	PF1.3D1	
				II	PF1.3D2	
			E	I	PF1.3E1	
				II	PF1.3E2	
	Class 2	No. 1	A	I	PF2.1A1	
				II	PF2.1A2	
		No. 2	A	I	PF2.2A1	
				II	PF2.2A2	
		No. 3	A	I	PF2.3A1	
				II	PF2.3A2	
	Class 3	No. 1	A	I	PF3.1A1	
				II	PF3.1A2	
Note ^{a)} It means the marking on product or package is not required.						

5 Quality

5.1 Characteristics

The characteristics shall comply with table 7 to table 10 when tested according to **6.5** to **6.14**.

However, for the product that does not use the materials emitting formaldehyde 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 taken as F☆☆☆☆ without performing the test of **6.5**. The product here refers to the product itself identified by product symbols in table 4 to table 6.

Table 7 Characteristics of man made mineral fibre thermal insulation materials

Type			Density kg/m ³	Thermal conductivity W/(m • K)
Glass wool thermal insulation materials	Common product	10-50	10 ± 2	0.050 max.
		10-49		0.049 max.
		10-48		0.048 max.
	High-performance product	HG10-47		0.047 max.
		HG10-46		0.046 max.
		HG10-45		0.045 max.
		HG10-44		0.044 max.
		HG10-43		0.043 max.
	Common product	12-45	12 ± 2	0.045 max.
		12-44		0.044 max.
	High-performance product	HG12-43		0.043 max.
		HG12-42		0.042 max.
		HG12-41		0.041 max.
	High-performance product	HG14-38	14 ± 2	0.038 max.
		HG14-37		0.037 max.
	Common product	16-45	16 ± 2	0.045 max.
		16-44		0.044 max.
	High-performance product	HG16-38		0.038 max.
		HG16-37		0.037 max.
		HG16-36		0.036 max.
	Common product	20-42	20 ± 2	0.042 max.
		20-41		0.041 max.
		20-40		0.040 max.
	High-performance product	HG20-38		0.038 max.
		HG20-37		0.037 max.
		HG20-36		0.036 max.
		HG20-35		0.035 max.
		HG20-34		0.034 max.
	Common product	24-38	24 ± 2	0.038 max.
	High-performance product	HG24-36		0.036 max.
		HG24-35		0.035 max.
		HG24-34		0.034 max.
		HG24-33		0.033 max.
	High-performance product	HG28-35	28 ± 4	0.035 max.
		HG28-34		0.034 max.
		HG28-33		0.033 max.
	Common product	32-36	32 ± 4	0.036 max.
	High-performance product	HG32-35		0.035 max.
		HG32-34		0.034 max.
		HG32-33		0.033 max.

Table 7 (concluded)

Type			Density kg/m ³	Thermal conductivity W/(m · K)
Glass wool thermal insulation materials	High-performance product	HG36-34	36 ± 4	0.034 max.
		HG36-33		0.033 max.
		HG36-32		0.032 max.
		HG36-31		0.031 max.
	High-performance product	HG38-34	38 ± 4	0.034 max.
		HG38-33		0.033 max.
		HG38-32		0.032 max.
		HG38-31		0.031 max.
	Common product	40-36	40 ± 4	0.036 max.
	High-performance product	HG40-34		0.034 max.
		HG40-33		0.033 max.
		HG40-32		0.032 max.
	Common product	48-35	48 ± 4	0.035 max.
	High-performance product	HG48-33		0.033 max.
		HG48-32		0.032 max.
		HG48-31		0.031 max.
Common product	64-35	64 ± 6	0.035 max.	
Common product	80-33	80 ± 7	0.033 max.	
Common product	96-33	96 ± 9	0.033 max.	
Rock wool thermal insulation materials	LA		24 min.	0.045 max.
	LB			0.043 max.
	LC			0.041 max.
	LD			0.039 max.
	MA		30 min.	0.038 max.
	MB			0.037 max.
	MC			0.036 max.
	HA		60 min.	0.036 max.
	HB			0.035 max.
	HC			0.034 max.

Table 8 Characteristics of organic fibre thermal insulation material

Type		Density kg/m ³	Thermal conductivity W/(m • K)	Bending strength N/cm ²	Swelling in thickness after immersion in water %	Moisture content %
Insulation fibre thermal insulation material	Fibremat	30 min.	0.040 max.	Not specified	Not specified	5 or over up to and incl. 13
	Fibreboard	150 min.	0.052 max.	0.5 min.	10 max.	

Table 9 Characteristics of cellular plastics thermal insulation materials

Type				Density	Thermal conductivity	Coefficient of moisture permeability (For thickness 25 mm)	Compressive strength	Bending strength	Combustibility	Water absorption amount
				kg/m ³	W/(m·K)	ng/(m ² ·s·Pa)	N/cm ²	N/cm ²		g/100 cm ²
Beads method polystyrene foam thermal insulation material	No. 1			30 min.	0.034 max.	145 max.	16 min.	32 min.		1.0 max.
	No. 2			25 min.	0.036 max.	205 max.	12 min.	25 min.		
	No. 3			20 min.	0.038 max.	250 max.	8 min.	18 min.		
	No. 4			15 min.	0.041 max.	290 max.	5 min.	10 min.		
Extruded polystyrene foam thermal insulation material	Class 1	b	A	20 min.	0.040 max.	Without skin layer 145 max., With skin layer 55 max.	16 min.	20 min.	Flame shall be extinguished within 3 s without ember, and combustion shall not be continued exceeding the combustion limiting 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.					
Rigid urethane foam thermal insulation material	Class 1			35 min.	0.029 max.	185 max.	20 min.	25 min.	Combustion time shall be within 120 s and combustion length shall be 60 mm or under.	3.0 max.
	Class 2	No. 1	35 min.	0.023 max.	40 max.	10 min.	25 min.			
		No. 2	25 min.	0.024 max.		8 min.	15 min.			
		No. 3	35 min.	0.027 max.		10 min.	25 min.			
		No. 4	25 min.	0.028 max.		8 min.	15 min.			
Polyethylene foam thermal insulation material	Class 1	No. 1		10 min.	0.042 max.	30 max.	2 min.	—	—	2.0 max.
		No. 2				55 max.				
	Class 2			20 min.	0.038 max.	30 max.				
	Class 3			10 min.	0.034 max.	150 max.				
Phenolic foam thermal insulation material	Class 1	No. 1	A	45 min.	0.022 max.	60 max.	15 min.	25 min.	Oxygen index 28 min.	4.0 max.
			B		0.021 max.					
			C		0.020 max.					
			D		0.019 max.					
			E		0.018 max.					