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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 Fibre-reinforced Cement Sheets Association (SKC)/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 5430** : 2004 is replaced with this Standard.

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Fiber reinforced cement boards

Introduction

This Japanese Industrial Standard has been prepared based on the first editions of **ISO 8336** published in 1993 and **ISO 9933** published in 1995 with some modifications of the technical contents.

The portions given continuous sidelines or dotted underlines are the matters in which the contents of the corresponding International Standards have been modified. A list of modifications with explanations is given in Annex JC.

1 Scope

This Standard specifies fiber (other than asbestos)-reinforced and formed slate (corrugated sheets and flat sheets), calcium silicate boards and slag gypsum wall boards (hereafter referred to as “fiber reinforced cement boards”).

NOTE 1 Fittings necessary for construction of slate (corrugated sheets) shall be given in Annex JB for information.

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

ISO 8336:1993 *Fibre-cement flat sheets*

ISO 9933:1995 *Products in fibre-reinforced cement—Long corrugated or asymmetrical section sheets and fittings for roofing and cladding*

(Overall evaluation: MOD)

The symbols which denote the degree of correspondence in the contents between **JIS** and the corresponding International Standards are IDT (identical), MOD (modified) and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

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 1129-1 *Methods of test for length change of mortar and concrete Part 1: Method with comparator*

JIS A 1321 *Testing method for incombustibility of internal finish material and procedure of buildings*

JIS A 1408 *Test methods of bending and impact for building boards*

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 methods for thermal resistance and related properties of thermal insulations—Part 2: Heat flow meter apparatus*

JIS A 1435 *Test methods for frost resistance of exterior wall materials of buildings (Freezing and thawing method)*

JIS A 9510	<i>Inorganic porous thermal insulation materials</i>
JIS B 7502	<i>Micrometer callipers</i>
JIS B 7503	<i>Dial gauges</i>
JIS B 7512	<i>Steel tape measures</i>
JIS B 7516	<i>Metal rules</i>
JIS B 7518	<i>Vernier, dial and digital depth gauges</i>
JIS B 7526	<i>Squares</i>
JIS K 1464	<i>Desiccants, activated for industrial dehumidification</i>
JIS K 8123	<i>Calcium chloride (Reagent)</i>

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply.

3.1 acceptance test

routine test to establish whether a batch of continuous products conforms to a specification

3.2 type test

test concerned with the approval of a new product and/or a fundamental change in formulation and/or method of manufacture

4 Symbols

For the purposes of this Standard, the following symbols are used:

h_{om}	height of the edge of ascending corrugation at edge (mm);
h_{od}	height of the edge of descending corrugation at edge (mm);
R_f	bending strength (N/mm ²);
P	breaking load (N);
l	span (mm);
b	width of test specimen (mm);
t	thickness of test specimen (mm);
W	water absorption (%);
W_0	mass of the specimen after drying (g);
W_2	mass of the specimen after water absorption (g);
ρ	apparent density (g/cm ³);
V	volume of the specimen (cm ³);
W_1	mass of the specimen in the water (g);
ρ_w	density of water (g/cm ³);
Δl	length changing rate by water absorption (%);

l_1	gauge length after drying (mm);
l_2	gauge length after water absorption (mm);
L	ratio of L_s to L_i ;
M_1	average value of the breaking load of the corrugated sheet specimen before warm water immersion test;
M_2	average value of the breaking load of the corrugated sheet specimen after warm water immersion test;
L_i	upper estimation at 95 % confidence level of the result M_1 ;
L_s	lower estimation at 95 % confidence level of the result M_2 ;
s_1	standard deviation of the breaking load of the corrugated sheet specimen before warm water immersion test;
s_2	standard deviation of the breaking load of the corrugated sheet specimen after warm water immersion test;
r_j	ratio of Rf_j to Rfc_j ;
Rf_j	bending strength of the j -th warm water immersion test specimen and the soak-dry test specimen of flat sheets and exterior finishing slag gypsum wall boards;
Rfc_j	bending strength of the j -th before-warm water immersion test specimen and the before-soak-dry test specimen of flat sheets and exterior finishing slag gypsum wall boards
$\bar{r}$	average value of r_j ;
s	standard deviation of r_j ;
L_j	lower confidence limits at 95 % of the average value ($\bar{r}$).

5 Composition

Fiber reinforced cement boards consist essentially of cement, calcareous material, siliceous material, slag, gypsum and fiber other than asbestos, and the admixture of reinforcing material, packing material and so on or pigment may be added.

6 Classification and their abbreviations

Classification, their abbreviations, material and main usages of fiber reinforced cement boards are as shown in table 1.

Table 1 Classification and their abbreviations

Classification			Abbreviations of classifica- tion	Material ^{a)}	Main usages
Slate	Corru- gated sheets	Shallow corrugation	SC	Cement, fiber other than asbestos and admixture.	Exterior wall
		Deep corrugation	LC		Roofing and exterior wall
	Flat sheets	Flexible board	F		Interior and exterior finishing
		Soft flexible board	NF		Interior and exterior finishing
		Flat board	S		Interior and exterior finishing
		Soft board	N		Interior and exterior finishing
Calcium silicate boards	Type 2	0.8 calcium silicate boards	0.8FK	Calcareous material, siliceous material, fiber other than asbestos, and the admixture.	Interior finishing
		1.0 calcium silicate boards	1.0FK		Interior finishing
	Type 3	0.2 calcium silicate boards	0.2TK	Calcareous material, siliceous material, fiber other than asbestos, and the admixture.	Fire resist covering
		0.5 calcium silicate boards	0.5TK		Fire resist covering
Slag gypsum wall boards	0.8 slag gypsum wall boards		0.8SGI	Cement, slag, gypsum, fiber other than asbestos, and the admixture.	Interior finishing
	1.0 slag gypsum wall boards		1.0SGE		Exterior finishing
			1.0SGI		Interior finishing
	1.4 slag gypsum wall boards		1.4SGE		Exterior finishing
			1.4SGI		Interior finishing
Note ^{a)} Siliceous material may be contained for the slate material. Cement may be contained for the calcium silicate board type 2 material.					

7 Quality

7.1 Appearances

The appearances of fiber reinforced cement boards shall satisfy table 2 when visually tested.

Table 2 Classification and level of acceptance of appearance defects

Classification of defects	Level of acceptance
Cracks or penetrating cracks.	Unacceptable.
Chipping, twist, bent, mixing foreign matter, stain and peeling ^{a)} .	Shall not be detrimental to use.
Note ^{a)} Include falling off.	

7.2 Breaking load

The breaking load of slate (corrugated sheet) shall satisfy the specifications of table 3 when tested according to **10.3.1**.

7.3 Bending strength

The bending strength of slate (flat sheets), calcium silicate boards and slag gypsum wall boards shall satisfy the specifications of tables 4, 5 and 6 when tested according to **10.3.2**.

7.4 Water absorption

The water absorption of slate and slag gypsum wall boards (exterior finishing) shall satisfy the specifications of tables 3, 4 and 6 when tested according to **10.4**.

7.5 Apparent density

The apparent density of calcium silicate boards and slag gypsum wall boards shall satisfy the specifications of tables 5 and 6 when tested according to **10.5**.

7.6 Water permeability

The water permeability of slate and slag gypsum wall boards (exterior finishing) shall satisfy the specifications of tables 3, 4 and 6 when tested according to **10.6**.

7.7 Length changing rate by water absorption

The length changing rate by water absorption for slate (flat sheets), calcium silicate boards (type 2) and slag gypsum wall boards shall satisfy the specifications of tables 4, 5 and 6 when tested according to **10.7**.

7.8 Thermal conductivity

The thermal conductivity of calcium silicate boards shall satisfy the specifications of table 5 when tested according to **10.8**.

7.9 Incombustibility or heat generation

The incombustibility or heat generation of slate, calcium silicate boards and slag gypsum wall boards shall satisfy the specifications of tables 3, 4, 5 and 6 when tested according to **10.9**.

Which of the performances, incombustibility or heat generation, is to be tested shall be decided upon the agreement between the manufacturer and the purchaser.

7.10 Freezing and thawing resistance

The freezing and thawing resistance of slate and slag gypsum wall boards (exterior finishing) shall satisfy the specifications of tables 3, 4 and 6 when tested according to **10.10**.

7.11 Warm water immersion resistance

The warm water immersion resistance of slate and slag gypsum wall boards (exterior finishing) shall satisfy the specifications of tables 3, 4 and 6 when tested according to **10.11**.

7.12 Heat-rain resistance

The heat-rain resistance of slate and slag gypsum wall boards (exterior finishing) shall satisfy the specifications of tables 3, 4 and 6 when tested according to **10.12**.

7.13 Soak-dry resistance

The soak-dry resistance of slate (flat sheets) and slag gypsum wall boards (exterior finishing) shall satisfy the specifications of tables 4 and 6 when tested according to **10.13**.

Table 3 Characteristics of slate (corrugated sheet)

Classification	Acceptance test (compulsory)		Type test (compulsory)		Type test (optional) ^{a)}		
	Breaking load	Water absorption	Water permeability	Incombustibility or heat generation	Freezing and thawing resistance	Heat-rain resistance	Warm water immersion resistance
	N	%					
Shallow corrugation	1 470 or over	30 or under	No existence of drop of water at rear side.	Incombustibility first grade or heat generation first grade	No cracks, delamination or other defects detrimental to use.		No cracks, delamination or other defects detrimental to use, when <i>L</i> is 0.7 or over.
Deep corrugation	3 920 or over						
Note ^{a)} Shall be applied only upon the agreement of necessity between the manufacturer and the purchaser.							

Table 4 Characteristics of slate (flat sheets)

Classification	Acceptance test (compulsory)		Type test (compulsory)			Type test (optional) ^{a)}				Informative value
	Bending strength	Water absorption	Water permeability	Length changing rate by water absorption	Incombustibility or heat generation	Freezing and thawing resistance	Heat-rain resistance	Warm water immersion resistance	Soak-dry resistance	Apparent density
	N/mm ²	%		%						g/cm ³
Flexible board	28.0 or over	24 or under	No existence of drop of water at rear surface.	0.20 or under	Incombustibility first grade or heat generation first grade	No cracks, delamination or other defects detrimental to use.		L_j value shall be 0.75 or over.		Approx. 1.6
Soft flexible board	28.0 or over	28 or under		0.25 or under						Approx. 1.6
Flat board	18.0 or over	28 or under								Approx. 1.5
Soft board	14.0 or over	33 or under								Approx. 1.3
NOTE : If there is orientation of fiber because of producing method, bending strength in loading parallel to the direction of fiber is usually about 60 % of that in loading rectangular to the direction of fiber.										
Note ^{a)} See Note ^{a)} of table 3.										

Table 5 Characteristics of calcium silicate boards

Classification		Acceptance test (compulsory)		Type test (compulsory)		
		Apparent density	Bending strength	Length changing rate by water absorption	Thermal conductivity	Incombustibility or heat generation
		g/cm ³	N/mm ²	%	W/m • K	
Type 2	0.8 calcium silicate boards	0.6 or over to and excl. 0.9	10.0 or over	0.15 or under	0.18 or under	Incombustibility first grade or heat generation first grade
	1.0 calcium silicate boards	0.9 or over to and excl. 1.2	13.0 or over		0.24 or under	
Type 3	0.2 calcium silicate boards	0.15 or over to and excl. 0.35	0.39 or over	—	0.10 or under	
	0.5 calcium silicate boards	0.35 or over to and excl. 0.70	1.5 or over		0.14 or under	
NOTE : If there is orientation of fiber because of producing method, bending strength in loading parallel to the direction of fiber is usually about 60 % of that in loading rectangular to the direction of fiber.						

Table 6 Characteristics of slag gypsum wall boards

Usage	Classi- fication	Acceptance test (compulsory)			Type test (compulsory)			Type test (optional) ^{a)}			
		Appar- ent density	Water absorp- tion	Bending strength	Water perme- ability	Length chang- ing rate by water absorp- tion	Incombus- tibility or heat genera- tion	Freez- ing and thaw- ing resist- ance	Heat- rain resist- ance	Warm water immer- sion resist- ance	Soak- dry resist- ance
		g/cm ³	%	N/mm ²		%					
Interior finish- ing	0.8 slag gypsum wall boards	0.6 or over to and excl. 0.9	—	7.5 or over	—	0.20 or under	Incombus- tibility first grade or heat generation first grade	—	—	—	—
	1.0 slag gypsum wall boards	0.9 or over to and excl. 1.2	—	10.5 or over							
	1.4 slag gypsum wall boards	1.2 or over	—	16.5 or over							
Exterior finish- ing	1.0 slag gypsum wall boards	0.9 or over to and excl. 1.2	40 or under	10.5 or over	No existe- nce of drop of water at rear surface.	0.25 or under		No cracks, de- lamination or other defects detrimental to use.		L_j value shall be 0.75 or over.	
	1.4 slag gypsum wall boards	1.2 or over	30 or under	16.5 or over							
NOTE : If there is orientation of fiber because of producing method, bending strength in load- ing parallel to the direction of fiber is usually about 60 % of that in loading rectangular to the direction of fiber.											
Note ^{a)} See Note ^{a)} to table 3.											

8 Shape, dimension and tolerances

8.1 Slate (corrugated sheet)

Shape, dimension and tolerances of slate (corrugated sheet) shall be as shown in figure 1 and table 7.

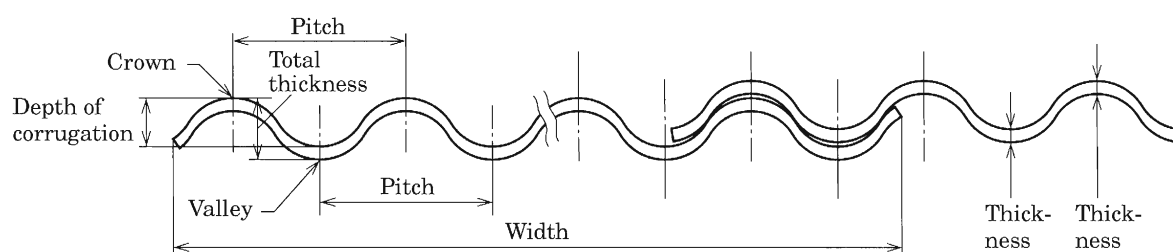


Figure 1 Cross section of slate (corrugated sheet)

Table 7 Dimension and tolerances of slate (corrugated sheet)

Unit: mm

Classification	Length	Width	Tolerances for length and width	Thickness	Tolerances for thickness	Number of corrugations	Depth of corrugation	Tolerances for pitch	Squareness mm/ total width	Height of edge	(Informative value)		
											One pitch	Total thickness	Mass kg/sheet
Shallow corrugation	1 820	720				11.5	15 or over	508 ± 2.0 for 8 pitches excluding both ends		The value specified by the manufacturer within the range not interfering the construction.	63.5	27 or under	13 to 16
	2 120												15 to 18
	2 420												17 to 21
Deep corrugation	1 820	950	±5	6.3	±0.6	7.5	35 or over	650 ± 2.0 for 5 pitches excluding both ends	6 or under		130	47 or under	18 to 23
	2 000												20 to 24
	2 120												21 to 25
	2 420												24 to 29

- a) **Length and width** The length and width shall satisfy the specifications of table 7 when tested according to **10.2.1 a)**.
- b) **Thickness** The thickness shall satisfy the specifications of table 7 when tested according to **10.2.1 b)**.
- c) **Number of corrugations** The number of corrugations shall satisfy the specifications of table 7.
- d) **Depth of corrugation** The depth of corrugation shall satisfy the specifications of table 7 when tested according to **10.2.1 c)**.
- e) **Pitch** The pitch shall satisfy the specifications of table 7 when tested according to **10.2.1 d)**.
- f) **Squareness** The squareness of four corners shall satisfy the specifications of table 7 when tested according to **10.2.1 e)**.
- g) **Height of edge** The height of edge shall satisfy the specifications of table 7 when tested according to **10.2.1 f)**.

8.2 Slate (flat sheets), calcium silicate boards and slag gypsum wall boards

Dimensions and tolerances of the slate (flat sheets), calcium silicate boards and slag gypsum wall boards shall be as follows.

- a) **Length and width** The length and width, when measured by the method of **10.2.2 a)**, shall satisfy the requirements in table 9.

There are goods stored and those ordered for slate (flat sheets), calcium silicate boards and slag gypsum wall boards. Goods stored shall satisfy the specifications of table 8. And goods ordered shall be specified according to the agreement between the manufacturer and the purchaser.

- b) **Thickness** The thickness shall satisfy the specifications of table 9 when tested according to **10.2.2 b)**.
- c) **Squareness** The squareness of four corners shall satisfy the specifications of table 9 when tested according to **10.2.2 c)**.
- d) **Straightness** The straightness of cut surface shall satisfy the specifications of table 9 when tested according to **10.2.2 d)**.

Table 8 Dimensions of length and width of stored slate (flat sheets), calcium silicate boards and slag gypsum wall boards

Unit: mm

Length	Width									
	455	606	610	900	910	1 000	1 040	1 090	1 200	1 210
1 000	—	—	TK ^{b)}	—	—	—	—	—	—	—
1 520	—	—	—	—	—	TK ^{b)}	—	—	—	—
1 820	—	—	—	F, NF, S, N, FK ^{a)} , SGE ^{d)} , SGI ^{c)}	F, NF, S, N, FK ^{a)} , SGE ^{d)} , SGI ^{c)}	—	—	—	—	—
2 000	—	—	—	—	F	F, NF, S, FK ^{a)} , SGE ^{d)} , SGI ^{c)}	—	—	—	—
2 420	—	SGE ^{d)} , SGI ^{c)}	—	F, NF, S, FK ^{a)} , SGE ^{d)} , SGI ^{c)}	F, NF, S, FK ^{a)} , TK ^{b)} , SGE ^{d)} , SGI ^{c)}	—	—	—	F, NF, FK ^{a)} , SGE ^{d)} , SGI ^{c)}	F, NF, FK ^{a)} , SGE ^{d)} , SGI ^{c)}
2 730	—	—	—	F, NF, FK ^{a)} , SGE ^{d)} , SGI ^{c)}	F, NF, FK ^{a)} , SGE ^{d)} , SGI ^{c)}	—	—	—	—	—
3 030	SGE ^{d)} , SGI ^{c)}	—	—	—	—	—	—	—	—	—
3 050	—	—	—	—	—	TK ^{b)}	—	—	—	—
3 130	—	—	—	—	—	—	TK ^{b)}	TK ^{b)}	—	—
Notes ^{a)} FK shows 0.8FK and 1.0FK. ^{b)} TK shows 0.2TK and 0.5TK. ^{c)} SGI shows 0.8SGI, 1.0SGI and 1.4SGI. ^{d)} SGE shows 1.0SGE and 1.4SGE.										

Table 9 Thickness and dimensional tolerances of slate (flat sheets), calcium silicate boards and slag gypsum wall boards

Unit: mm

Classification	Thickness	Tolerance		Squareness (mm/m)	Straightness (mm/m)
		Thickness	Length and width		
Flexible boards	3	± 0.3	0 −3	4 or under	3 or under
	4				
	5	± 0.4			
	6				
	8				
Soft flexible boards	3	± 0.3			
	4				
	5	± 0.4			
	6				
Flat boards	5	± 0.4			
	6				
Soft boards	4	± 0.3			
Calcium silicate boards (type 2)	5	± 0.3	0 −3		
	6	± 0.4			
	8				
	10	± 0.5			
	12				
Calcium silicate boards (type 3)	12	± 1.0	±3		
	15				
	20	± 2.0			
	25				
	30				
	35				
	40				
	45				
	50				
	55				
	60				
	70				
Slag gypsum wall boards	5	± 0.3	0 −3		
	6	± 0.4			
	8				
	10	± 0.5			
	11				
	12				