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BUILDING INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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JG/T 169-2005

Replacing JG/T 3029-1995

Light weight panels for partition walls used in buildings

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Foreword

This Standard replaces JG/T 3029-1995 *Light longish panels for internal partitions in residence*.

This revision extends the scope of application of light weight panels for partition walls used in buildings; it adds the terms, revises the technical requirements and test methods for light weight panels. Compared with JG/T 3029-1995, the main changes are as follows:

- 1 Deleted “50 mm thick plate” in specifications;
- 2 Deleted control indexes of “out heed and inter orifice, mortise and rabbet” in size deviation; added control index of “wall thickness”;
- 3 Modified “areal density”, “air weighted sound reduction index”, “bending failure load”, “impact resistance” and “drying shrinkage value” in physical and mechanical properties; added “compressive strength”, “moisture content”, “softening coefficient”, and “heat transfer coefficient”; deleted “combustion performance”;
- 4 Specified radionuclide limit index of light weight panels;
- 5 Modified stipulated items of product factory inspection.

This Standard was proposed by Research Institute of Standards & Norms of Ministry of Construction.

This Standard shall be under the jurisdiction of National Technical Committee on Building Products and Components of Ministry of Construction.

The drafting organizations of this Standard: China National Engineering Research Center for Human Settlements, Beijing Building Materials Quality Supervision and Inspection Station, Shenzhen Zhongwaijian South Industrial Co., Ltd., Shenzhen Metropolis Synthetic Panel Co., Ltd., Beijing Huali United High-tech Co., Ltd., Henan Mana Building Template Ltd., Langfang Jianning Wall Technology Development Co., Ltd., Yueyang (Hunan) Huaqiang Institute of New Building Materials, Beijing Jianbang Weiye Machine Manufacturing Co., Ltd., Anhui Ahwanda Wallboard Machinery Co., Ltd., and Kaiping Welsun (Soben) Green Board Co., Ltd.

Main drafters of this Standard: Gao Baolin, Zhao Guoqiang, Zhang Zengshou, Zhu Lianbin, Luo Gang, Zhou Xiaoqun, Luo Qiuyuan, Zhu Hengjie, Bao Wei, Chen Bingjun, Qiu Guohui, Li Wei, Zhao Mengqi, Yao Gang, and Wei Jun.

Light weight panels for partition walls used in buildings

1 Scope

This Standard specifies the terms, classification, requirements, test methods, inspection rules, marks, transport and storage of light weight panels for partition walls used in buildings (hereinafter referred to as “light weight panels”).

This Standard is applicable to light weight panels for non-load bearing partition walls used in general buildings.

2 Normative references

The following standards contain the provisions which, through reference in this Standard, constitute the provisions of this Standard. The parties who enter into agreement based on this Standard are encouraged to use the latest versions apply to this Standard.

GB 2828 *Sampling procedures for inspection by attributes*

GB 6566 *Limits of radionuclides in building materials*

GB/T 9978 *Fire-resistance tests - Elements of building construction*

GB/T 13475 *Thermal insulation - Determination of steady-state thermal transmission Properties - Calibrated and guard hot box*

GB/T 17431.1 *Lightweight aggregates and its test methods - Part 1: Lightweight aggregates*

GBJ 75 *Acoustics-measurement of sound insulation in buildings-specifications*

3 Terms and definitions

The following terms and definitions apply to this Standard.

3.1 lightweight panel

Prefabricated panel made by lightweight materials or in lightweight construction,

and used for non-load bearing partition walls, of which areal density is not greater than the value stipulated in this Standard, and length-width ratio is not less than 2.5.

3.2 hollow cores panel

Prefabricated panel of which a number of through-holes along the longitudinal direction of plates.

3.3 solid panel

Prefabricated panel, without holes, that is made by materials of same kind.

3.4 composite sandwich panel

Prefabricated panel composed by two and more materials of different functions, or composed by panel (casting surface layer) and core layer material.

3.5 out heed and inter orifice

General term for mortise, rabbet and joint groove set on both sides of panel.

4 Classification

4.1 Classification and code

According to sectional configuration, lightweight panel is divided into hollow cores panel, solid panel and composite sandwich panel; OR ordinary panel, door frame panel and irregular panel, according to component type of panel. The classification and code of lightweight panel are shown in Table 1.

Table 1 Classification and code of lightweight panel

Classification method	Name	Code
According to sectional configuration	Hollow cores panel	K
	Solid panel	S
	Composite sandwich panel	F
According to component type of panel	Ordinary panel	PB
	Door frame panel	MCB
	Irregular panel	YB

4.2 Product type

The lightweight panel can be made as hollow cores, sandwich and composite sandwich type. It shall use different out heed and inter orifice, and opening but it shall all comply with the provisions of Article 3.1 and Clause 5 of this Standard.

	mm × 30 mm	
6	Wall thickness ^b / mm	≥ 12
NOTE Defects in 3, 4, and 5 that are lower than the limits are negligible while defects that are higher than the limits are unqualified.		
^a This inspection is for composite sandwich panel.		
^b Wall thickness shall be inspected for hollow cores panel.		

5.3 Size deviation

Panel size tolerance shall comply with the provisions in Table 3.

Table 3 Size tolerance

unit: mm

No.	Item	Size tolerance
1	Length	± 5
2	Width	± 2
3	Thickness	± 1
4	Panel surface levelling	≤ 2
5	Diagonal difference	≤ 6
6	Lateral bending	L / 1000

5.4 Physical and mechanical properties

Corresponding use area, physical and mechanical properties indexes stipulated by different moisture content of panel shall comply with the provisions in Table 4 and Table 5.

Table 4 Corresponding use area stipulated by different moisture content of panel

Moisture content %	≤ 12	≤ 10	≤ 8
Use area	Moist	Medium	Dry
NOTE Moist area refers to the area where annual average relative humidity is greater than 75%; Medium area refers to the area where annual average relative humidity is 50% ~ 70%; Dry area refers to the area where annual average relative humidity is less than 50%.			

be equal to panel width.

6.4.2.5 Place it for 2 min after the first four grades are applied. When the fifth grade of load is applied to 1.5 times panel weight, place it for 5 min. If it continues to applying load, circulate this grade loading mode till it breaks and cracks.

6.4.2.6 Record the total load from the first grade of load to the fifth grade (or the grade before it breaks and cracks) as test results.

6.4.2.7 The test results only apply to panels of which the length is within the size scope of panels for test.

6.4.3 Compressive strength test

6.4.3.1 Along with the direction of panel width, Successively cut out unit test specimen of which the thickness equals to panel thickness, height is 100 mm and length is 100 mm (for hollow cores panel, the length shall include a whole hole's length and the unit test sample's of two complete holes ribs). Three unit specimens form a group.

6.4.3.2 Process the upper surface and the lower surface of specimen, so as to make it a plane that is parallel to each other and vertical to specimen hole cylinder axis. Modulate the cement mortar to process the upper surface and the lower surface. And use horizontal rule to adjust it level.

6.4.3.3 Place specimen on testing machine's bearing plate, so as to make specimen axis coincide with pressure center of bearing plate. Apply load at 0.05~0.10 MPa/s till specimen breaks. Record the maximum failure load P.

6.4.3.4 Compressive strength of each specimen shall be calculated according to formula (1), and make it accurate to 0.1 MPa.

$$R = \frac{P}{lb} \dots\dots\dots (1)$$

Where,

R - Compressive strength of specimen, in megapascal (MPa);

P - Failure load, in newton (N);

l - Length of specimen's receiving surface, in millimeter (mm);

b - Width of specimen's receiving surface, in millimeter (mm).

Panel's compressive strength shall be represented by the arithmetic mean of compressive strength of three panels, and make it accurate to 0.1 MPa.

6.4.4 Softening coefficient test

6.4.4.1 Take a piece of test panel. Extract specimen along with panel length direction, i.e., a specimen of which the height is 100 mm, and length is 100 mm, six specimens in total in two groups, three specimens for a group (for hollow cores panel, the length shall include a whole hole's length and the unit test sample's of two complete holes ribs).

6.4.4.2 Process the upper surface and the lower surface of specimen, so as to make it a plane that is parallel to each other and vertical to specimen hole cylinder axis. Modulate the cement mortar to process the upper surface and the lower surface when necessary. And use horizontal rule to adjust it level

6.4.4.3 After specimen is processed, bake it in an oven to constant weight (baking temperature shall refer to Table 7 for panels of different materials). Soak a group, 3 specimens, in $20 \pm 2^\circ\text{C}$ water. Take them out after 72 h. Use wet towel to dry the surface. Then carry out compressive strength test with another group of un-soaking specimens on testing machine.

$$I = \frac{R_1}{R_0} \quad \dots\dots\dots (2)$$

Where,

I - Softening coefficient;

R_1 - The average compressive strength of the specimen under saturated aqueous state, in megapascal (MPa);

R_0 - The average compressive strength of the specimen under absolute dry state, in megapascal (MPa).

6.4.5 Areal density test

6.4.5.1 Take three specimens as a group to conduct the test. Use a scale of which the precision is not less than 0.5 kg, measuring range is ≥ 500 kg to weigh test panel's weight G. Read the reading to 0.5 kg.

6.4.5.2 The areal density of each test panel shall be calculated according to formula (3), and make it accurate to 0.5 kg/m^2 .

$$P = \frac{G}{L \times B} \quad \dots\dots\dots (3)$$

Where,

P - Areal density of test panel, in kilograms per square meter (kg/m^2);

G - Weight of test panel, in kilograms (kg);

L - Length of test panel, in meters (m);

B - Width of test panel, in meters (m).

6.4.6 Moisture content test

6.4.6.1 Specimen preparation: extract specimen along with panel length direction, three specimens as a group, of which a specimen height is 100 mm, length is equal to panel width and thickness is equal to panel thickness. If specimen test site is far away from sampling site, it shall seal the specimen in a plastic bag immediately after sampling.

6.4.6.2 Immediately weigh sampling weight m_1 after sampling and make it accurate to 0.01 kg. If the specimen is sealed with plastic bag, weigh the specimen with plastic bag before unsealing. Then weigh the plastic bag. Observe if there are drops precipitated by specimen before weighing. Wipe drops if there are. Calculate the weigh difference of two weighings as specimen's weight in sampling, and make it accurate to 0.01 kg.

6.4.6.3 Put the specimen into an electric drying oven (specimen drying temperatures are shown in Table 7) to dry for 24 h. Weigh once every 2 h till the difference between two weighings not exceed 0.2% of the latest weighing value.

6.4.6.4 Take the specimen out when it is in the electric drying oven for cooling and the temperature difference between oven and room temperature is not greater than 20°C. Immediately weigh its absolute dry weight m_0 , and make it accurate to 0.01 kg. Test data calculation and results: moisture content of each specimen shall be calculated according to formula (4) and make it accurate to 0.1%.

$$W_1 = \frac{m_1 - m_0}{m_0} \times 100 \quad \dots\dots\dots (4)$$

Where,

W_1 - Specimen's moisture content, in %;

m_1 - Specimen's sampling weight, in kilograms (kg);

m_0 - Specimen's absolute dry weight, in kilograms (kg).

measure specimen length l_2 (excluding shrink head).

6.4.7.5 Put the specimen in thermostatic chamber of which the temperature is $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and relative humidity is $(50 \pm 5)\%$. Conduct shrinkage value measurement, once a day, till it reaches to shrinkage balance, i.e., fluctuation in length readings of any 2 d within continuous 3 d are is than 0.01 mm. Measure the length l_2 after the specimen is dried.

6.4.7.6 Specimen's drying shrinkage value shall be calculated according to formula (5):

$$S = \frac{l_1 - l_2}{l_1 - (\eta_1 + \eta_2)} \times 1000 \quad \dots\dots\dots (5)$$

Where,

S - Drying shrinkage value, in millimeters per meter (mm/m);

l_1 - Specimen's initial length, in millimeters (mm);

l_2 - Length after specimen is dried, in millimeters (mm);

$(\eta_1 + \eta_2)$ - Length contraction of exposed parts outside two shrink heads, in millimeters (mm).

6.4.7.7 Take arithmetic mean of drying shrinkage values of three specimens as test result, and make it accurate to 0.01 mm/m.

6.4.8 Hanging force test

6.4.8.1 Take a piece of test panel. At the height of 1600 mm in the panel, cut a hole of 50 mm × 40 mm × 90 mm (depth × height × width). After dusts are cleared, use cement- water glass paste (or other adhesives) to adhere, as steel hanging piece shown in Figure 10. The spacing between hanging piece hole and panel is 100 mm. After 24 h, check if the hanging piece is fixed installed and reinstall if it is not.

6.4.8.2 Fix the test panel as Figure 11 and the spacing between the upper tube and the lower tube is (L-100)mm.

6.4.12 Heat transfer coefficient test

Carry out the test according to the provisions of GB/T 13475.

7 Inspection rules

7.1 Inspection classification

7.1.1 Factory inspection

Manufactured products must be inspected by factory inspection which includes all items stipulated by appearance quality and size deviation as well as areal density, bending failure load, and moisture content. Products shall leave the factory after being inspected as qualified.

7.1.2 Type inspection

7.1.2.1 Type inspection conditions

It shall conduct type inspection in case of one of the following situations:

- a) Identification of new product for production;
- b) Great changes in material, formulation and techniques which affect product performance;
- c) Products of continuous production per year or when it produces 70000 m² (conduct air weighted sound reduction test and fire resistance test once every three years);
- d) Production has been suspended for more than half a year and production is resumed;
- e) Great differences between factory inspection results and previous type inspection results;
- f) When user has special requirements;
- g) When it is requested by national quality supervision organization.

7.1.2.2 Type inspection items refer to all items stipulated in 5.2, 5.3 and 5.4 (see Table 8).

inspections shall be conducted according to Table 9. Samples for physical and mechanical properties items shall be extracted at random from qualified products in appearance quality and size deviation inspections. Sampling shall be conducted according to table 10.

Table 10 Sampling for physical and mechanical properties inspection

No.	Item	The first sample	The second sample
1	Impact resistance, group	1	2
2	Bending failure load, block	1	2
3	Compressive strength, group	1	2
4	Softening coefficient, group	1	2
5	Areal density, group	1	2
6	Moisture content, group	1	2
7	Drying shrinkage value, group	1	2
8	Hanging force, block	1	2
9	Air weighted sound reduction, piece	1	2
10	Fire resistance, piece	1	2
11	Heat transfer coefficient, piece	1	2
12	Radioactivity limits, group	1	2

7.3 Determination rules

7.3.1 Determination rules for appearance quality and size deviation

7.3.1.1 Based on sample inspection results, if appearance quality and size deviation inspection items all comply with the provisions in 5.2 and 5.3 of this Standard, then this panel shall be determined as qualified. If one or two of appearance quality and size deviation inspection items fails to comply, then this panel shall be determined as unqualified.

7.3.1.2 Based on sample inspection results, if rejection number (u_1) in the first sample (n_1) is less than or equals to the first acceptance number (A_1), then this batch of appearance quality and size deviation inspection items shall be determined as qualified. If rejection number (u_1) in the first sample (n_1) is greater than or equals to the first rejection number (R_1), then this batch of appearance quality and size deviation inspection items shall be determined as unqualified.

If rejection number (u_1) in the first sample (n_1) is greater than the first

acceptance number (A_1) and less than the first rejection number (R_1), then it shall conduct sampling in the second sample (n_2) for inspection.

Based on inspection results of the first sample and the second sample, if the sum of rejection number ($u_1 + u_2$) found in the first sample and the second sample is less than or equals to the second acceptance number (A_2), then this batch shall be determined as qualified in appearance quality and size deviation inspections. If the sum of rejection number ($u_1 + u_2$) found in the first sample and the second sample is greater than or equals to the second rejection number (R_2), then this batch shall be determined as unqualified in appearance quality and size deviation inspections.

Table 11 Determination results

$u_1 \leq A_1$	Qualified
$u_1 \geq R_1$	Unqualified
$A_1 < u_1 < R_1$	Sampling the second sample for inspection
$(u_1 + u_2) \leq A_2$	Qualified
$(u_1 + u_2) \geq R_2$	Unqualified

7.3.2 Determination rules for physical and mechanical properties test

7.3.2.1 Determination rules for mechanical properties inspection items of factory inspection

- Based on test results, if areal density, bending failure load, and moisture content all comply with the provisions in 5.4 of this Standard, then this batch of products shall be determined as qualified; if these three inspections all fail to comply with the provisions in 5.4 of this Standard, then this batch of products shall be determined as unqualified;
- If one of these three inspections is found unqualified, then it shall conduct sampling in the second sample for this unqualified item to inspect according to Table 10. For the second sample inspection, if none does not fail, then this batch of products shall be determined as qualified; if one is still unqualified, then this batch of products shall be determined as unqualified.

7.3.2.2 Determination rules for mechanical properties inspection items of type inspection

- Based on sample inspection results, if rejection number found in all the first sample items is 0, then this type inspection shall be determined as qualified; if rejection number found in all the first sample items is greater than or equals to 2, then this type inspection shall be determined as

unqualified;

- b) If rejection number found in all the first sample items is 1, then extract the second sample to conduct inspection for this unqualified item;
- c) For the second sample inspection, if none does not fail, then this type inspection shall be determined as qualified; if one is still unqualified, then this type inspection shall be determined as unqualified.

7.4 Re-inspection rules

User is entitled to conduct re-inspection for products according to this Standard. Items and location for re-inspection shall be in accordance with contract provisions of both parties. Re-inspection shall be conducted when purchase contract takes effect or within 20 d after purchaser receives the product.

8 Marks, transport and storage

8.1 Marks

Manufacturer's name and date of production shall be indicated on the manufactured panel. The manufactured product shall have quality certificate and warning marks.

8.1.1 Product certificate shall contain the following information:

- a) Product name, product standard number, production license number and trademark;
- b) Manufacturer's name and address;
- c) Product specifications, model number and main technical parameters;
- d) Inspector's code and inspection organization seal in product inspection report;
- e) Product instructions for use and certificate.

8.1.2 Warning marks shall be written according to requirements of 8.2 and 8.3, for example, "handle vertically and keep from rain".

8.2 Transport and transport method

Panel's short-distance transport shall be done by trolley. Use vehicle or ship to carry out long-distance transport. For long-distance transport, panels shall be bundled. Each bundle shall not exceed 8 blocks. Hanging on and off carefully. During transport, it shall use ropes to wring out. Make reasonable support to

keep panels from impact, damage or deformation. It shall have tarpaulin to cover and keep from rain.

8.3 Storage

8.3.1 Storage site and conditions

Panels shall be stored at room temperature and under normal humidity. Keep it dry and ventilated. Storage site shall be solid, smooth and convenient for carrying. Panels can be stored in warehouse. Open storage is not recommended. However, open storage shall take measures to prevent aggressive medium and rain. After panel products are modeled, they shall be stored in the factory for not less than 28 d.

8.3.2 Storage method

Products shall be stored according to model and specification. Storage site shall be flat and it shall use square wood or brick to booster the lower part. For vertically stacked panels, the angle between panel and vertical plane shall not be greater than 15°. The heap length shall not exceed 4 m. Stack two layers. For horizontally stacked panels, the heap height shall not exceed 2 m.

8.3.3 Storage life

When storage life exceeds 6 months, it shall change and turn the panel's exposition and side position. When it exceeds 12 months, make sampling inspection before the product leaves the storage or before use according to this Standard.

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