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Replacing GB 17841-1999

Heat Strengthened Glass

半钢化玻璃

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Foreword

The consistent degree BETWEEN this Standard AND EN 1863-1:2000 "Glass in Building - Heat Strengthened Soda Lime Silicate Glass - Part 1: Definition and Description" and EN 1863-2:2004 "Glass in building - Heat strengthened soda lime silicate glass - Part 2: Evaluation of conformity/Product standard" is not equivalent. This Standard also refers to ASTM C 1048-04 "Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass".

This Standard replaces GB 17841-1999 "Tempered and heat-strengthened glass used in curtain walls". Compared with GB 17841-1999, the main technical differences are as follows:

— Delete the technical requirements in toughened glass;

— Delete the technical requirements in wind resistance Property; and add the technical requirements in splinters statue and bending strength;

— Add the technical requirements on "ones which the side length is larger than 3000 mm" in the dimension and allowable deviation; and add the technical requirements to round hole;

— Add the requirements of edge-crack defect allowance to appearance quality items;

— Delete the requirements of heat strengthened glass Perpendicularity method to tortuosity factor items;

— Add Annex A (Normative).

Annex A of this Standard is normative.

This Standard was proposed by China Building Materials Federation.

This Standard shall be under the jurisdiction of the State Standardization Committee of Building Glass.

Drafting organization of this Standard: China Building Material Test and Certification Center (CTC).

Participating drafting organizations of this Standard: GUANGDONG GOLDEN GLASS TECHNOLOGIES LTD., Hehe Holding Group Co., Ltd., Zhejiang Zhongli Holding Group Co., Ltd., Jiangsu Xiuqiang Glass Technology Co., Ltd., China South Glass (CSG) Holding Limited, Shanghai Yaohua Pilkington Glass Co., Ltd., Beijing WuHua TianBao Glass CO., LTD., Jiangmen Yinhui Safety Glass Industry Co., Ltd., Hangzhou Qiantangjiang Glass Industry Co., Ltd.

Heat Strengthened Glass

1 Scope

This Standard specifies terms and definitions, classification, technical requirements, test method, test rules and marking, Package and transportation and storage of heat strengthened glass made by the heat treatment.

This Standard is applicable to heat strengthened glass for building made by heat treatment. The heat strengthened glass for other purpose except building may reference to this Standard according to the characteristics of the products.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For dated references, the subsequent amendments or revisions of these publications do not apply. However, parties who enter into agreement based on this part are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies.

GB/T 1216 External micrometer

GB/T 8170 Rules for Rounding Off Of Numerical Values

GB 15763.2-2005 Safety Glazing Materials in Building - Part 2: Tempered Glass

3 Terms and Definitions

The following terms and definitions apply in this Standard.

3.1 Heat strengthened glass

Glasswork of which the surface is arranged with permanent compressive stress layer through heating and cooling control, to make glass has more mechanical strength and thermal shock resistance and special splinters statue.

4 Classifications

Based on production process, heat strengthened glass may be classified as heat strengthened glass made with perpendicularity method and heat strengthened glass made with horizon method.

5 Materials

The quality of the glass sheets for producing heat strengthened glass shall meet the requirements the related product standards.

6 Requirements

Property items and test methods of Heat strengthened glass shall meet the requirements of the items in Table 1.

Table 1 Technical requirements and test method

Items	Technical requirements	Test method
Thickness Deviation	6.1	7.1
Dimensions and allowable deviation	6.2	7.2
Edge quality	6.3	7.3
Appearance quality	6.4	7.4
Tortuosity	6.5	7.5
Bending strength	6.6	7.6
Surface stress	6.7	7.7
Splinters statue	6.8	7.8
Heat shock resistance	6. 9	7.9

6.1 Thickness deviation

The Thickness deviation of the products shall meet the requirements of the standards applying the adopted glass sheets.

6.2 Dimensions and allowable deviation

6.2.1 Allowable deviation of side length

The allowable deviation of side length of rectangle product shall meet the requirements in Table 2.

Table 2 Allowable deviation of side length

Thickness	Side length (L)			
	L≤1 000	1000<L≤2000	2000<L≤3000	L> 3 000
3,4,5,6	+1.0 -2.0	±3.0		±4.0
8,10,12	+2.0 -3.0			

6.2.2 Diagonal difference

The difference of rectangle product shall meet the requirements in Table 3.

requirements of Table 6; the tortuosity factor of flat product with perpendicular method shall be negotiated by the supplying and demanding parties.

Table 6 Tortuosity

Defect	Tortuosity	
	Float glass	Other
Lune /(mm/mm)	0.3%	0.40%
Waveform /(mm/300mm)	0.3	0.5

6.6 Bending strength

The bending strength is negotiated by the supplying and demanding parties, and shall be inspected with 95% confidence interval and 5% damage probability in accordance with 7.6. The bending strength shall meet the requirements in Table 7.

Table 7 Bending strength

Type of original glass sheet	Bending strength /MPa
Float glass, coated glass	≥70
Figured glass	≥55

6.7 Surface stress

Inspected in accordance with 7.7, the surface stress shall meet the requirements in Table 8.

Table 8 Surface stress

Type of original glass sheet	Surface stress
Float glass, coated glass	24 MPa≤Surface stress≤60 MPa
Figured glass	-

6.8 Splinters statue

The splinters statue of the glass of which the thickness is not larger than 8mm shall be inspected in accordance with 7.8; the splinters statue of each test sample shall meet the requirements in 6.8.1. The splinters statue of the glass of which the thickness is larger than 8mm shall be negotiated by the supplying and demanding parties.

6.8. 1 Requirements in splinters statue

6.8.1.1 At least a side of splinter shall extend into non-inspection area.

6.8.1.2 When all sides of splinter are not able to extend into the non-inspection area, then this splinter is classified into "islet" splinter and "grain" splinter (See Figure 6). Above-mentioned splinters shall meet the following requirements:

a) There shall not be two or more islet splinters;

difference of 100°C without damage.

7 Test Method

7.1 Thickness inspection (test)

With outer-diameter micrometer (meet the requirements of GB/T1216) or the instrument with same precision, measure the test sample (product) on center-points of four sides 15 mm from the edge. If there is sling point, the edge area within the circle of radius 100mm of which the sling point acts as the center shall be avoided for measurement. The arithmetic mean value of the measured result is the thickness (mm); it shall be corrected to 2 decimal places in accordance with the provisions of GB/T 8170.

7.2 Dimensions and allowable deviation

7.2.1 Inspection of Side length allowable deviation

With straight steel ruler or steel tape of which the minimum scale is 1mm, measure the test sample (from products).

7.2.2 Inspection of Diagonal difference

With straight steel ruler or steel tape of which the minimum scale is 1 mm, measure the lengths of two diagonals of the test sample (from products); and work out the absolute value of the difference of two lengths.

7.2.3 Round hole

With Vernier calipers with the minimum scale of 0.02mm or instrument with same precision, measure the hole size of the round hole (test sample from products).

Measure the relative position of the round holes with the straight steel ruler or steel tape with the minimum scale of 1mm.

7.3 Edge processing

Under the condition of good natural light or scattered light, do visual test on the position 600mm away from the front of the test sample (from products).

7.4 Visual testing

Under the condition of good natural light or scattered light, do visual test on the position 600mm away from the front of the test sample (from products). The defect size (dimension) is measured with reading-microscope of which the magnification is 10 times and the precision is 0.1mm; the length-defects such as edge-crack, scar and cramp stamp shall be measured with straight steel ruler or steel tape with the

d — Glass thickness (mm);

ρ — Density of glass (2.5 g/cm^3).

7.9 Heat shock resistance

7.9.1 Test sample

The test sample (300mm X 300mm) is same to the product in thickness and technical conditions; and it is rectangle flat pattern test sample without round hole and groove.

7.9.2 Testing procedure

Place test sample in oven (100°C±2°C); stay for 4h or longer; take the test sample out; vertically immerge it into 0 °C ice-water mixture. Over 1/3 of the test sample height shall be immerged in water. After 5 min, observe whether the glass is damaged. The glass of which the surface and edge appear fish-scale shape shall not be regarded as "damaged".

8 Test Rules

8.1 Testing items

Inspection refers to exit-factory inspection and type inspection.

8.1.1 Type inspection

The testing items cover all technical requirements specified in this Standard, except bending strength and heat shock resistance. The type inspection shall be done if any one of the following conditions occurs.

— Pilot production evaluations of new products, or old products transferring plant;

— Large change of structure, material and process after trial run may affect the product performance;

— When regular production runs a year;

— Half a year or longer after restoring the production from shutdown;

— The exit-factory inspection result is significantly different from the one of last type inspection;

— Quality supervision agency proposes the requirements of type inspection.

8.1.2 Exit-factory inspection

They are appearance quality, size (dimension), allowable deviation, and tortuosity

factor. If additional inspection is required, it shall be negotiated by the supplying and demanding parties.

8.2 Batch sampling method

8.2.1 Random sampling shall be done for appearance quality, size (dimension), allowable deviation, and tortuosity in accordance with the requirements in Table 9.

Table 9 Random sampling

Batch number	Sample size	Acceptance Number	Reject number
1~8	2	0	1
9~15	3	0	1
16~25	5	1	2
26~50	8	1	2
51~90	13	2	3
91~150	20	3	4
151~280	32	5	6
281~500	50	7	8

8.2.2 For other required technical properties, if the test are conducted with the finished products, the samples (quantity required by the test item) are selected randomly from the products of this batch; if tested with test samples, the test samples shall be made under the same process condition. If the quantity of this batch is larger than 500 pieces, 500 pieces are grouped as a batch for sampling. If the testing items are non-destructive test, these samples may be used for other test items.

8.3 Decision rules

8.3. 1 For inspection (test) of appearance quality, dimensions, allowable deviation, and tortuosity, the result of the test item is accepted if the reject number is not larger than the Acceptance Number in Table 9; the products of this batch are rejected if the reject number is larger than the Acceptance Number in Table 9.

8.3.2 For bending strength test, all test samples shall meet the requirements; otherwise, the products are rejected.

8.3.3 For surface stress test, all test samples shall meet the requirements; otherwise, the products are rejected.

8.3.4 In splinter inspection, the result of this test item is accepted if all test samples meet the requirements in 6.8.1; if a sample cannot meet the requirement of 6.8.1, but it meets the requirement of 6.8.2, then this item is also accepted, otherwise, this test item is rejected.

8.3.5 For heat shock resistance test, all test samples shall meet the requirements; otherwise, the products are rejected.

8.3.6 For all test items, the products of this batch are rejected if a test item is rejected.

9 Marking, Package, Transportation and Storage

9.1 Package

Glass shall be packaged with wooden case or container case (frame); and case (frame) shall be convenient for loading, unloading and transporting. A case (frame) shall be used for glass with same thickness and dimension. Protective measures shall be adopted between glass, or glass and case (frame) to prevent glass from being damaged or scuffed.

9.2 Packing mark

The packing mark shall meet the requirements of the relevant national standards; the marks or phrases like "Upward ", "Handle with care", and "Rain-proof and keep dry" shall be indicated on each case.

9.3 Transportation

In the course of transportation, glass shall be fixed firmly to prevent slipping or pumping; rain-proofing measures shall be available.

9.4 Storage

Products shall be stored at place with rainproof facilities.

Annex A

(Normative)

Test Method of Bending Strength

A.1 Test conditions

Environmental temperature: 23°C±5°C; environmental humidity: 40%~ 70 %.

A.2 Test sample

Prepare at least 13 pieces of test samples for test. The test sample is 1100mm± 5mm in length and 360mm± 5mm in width. In the preparation, the cutting points of parting tool shall be on same surface of the test sample; and the edge shall be processed with rough edge grinding.

The test samples shall be processed or treated within 24h before the test. if the shield film is covered on test sample, it shall be wiped off 24 h before the test. Before the test, the test samples shall be placed under the condition specified in A.1 for at least 4 h.

A.3 Test equipment

Material testing machine is adopted for test. The testing machine can load test sample continually and evenly, and minimize shocking caused by loading. Testing machine can be equipped with metering equipment and the error within its measurement range shall be less than ±2%. The diameter support roller and loading roller shall be 50mm and the length shall not be less than 365mm. Support roller and loading roller all can rotate around the roll shaft line.

A.4 Test procedure

A.4.1 Measurement of test sample width and thickness

From two ends and center line of long side, measure width of test sample; work out the arithmetic mean value of the measured values, accurate to 1 mm.

For the thickness measurement, the measurement shall be done at both ends (at least on the part of the test sample outside the loading roller) to avoid surface damage. Measure on four points; work out the arithmetic mean value, accurate to 0.01 mm; or measure the thickness of broken test sample after the tests; 4 pieces of splinters are selected per test sample; the arithmetic mean value is worked out, accurate to 0.01mm.

A.4.2 The surface with parting tool cutting points shall be turn up. Film may be covered on the test sample to facilitate to find out fracture origin and prevent

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