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Chemically strengthened glass

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Table of Contents

Foreword.....	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Classification and marks.....	5
5 Technical requirements	5
6 Test methods	11
7 Inspection rules	15
8 Package, marks, transport and storage.....	17
Appendix A.....	18
Appendix B	21

Foreword

This Standard was modified on the basis of European standard EN 12337-1:2000 *Glass in Building - Chemically Strengthened Soda Lime Silicate Glass - Part 1: Definition and Description*.

Compared with EN 12337-1:2000, the main technical differences are as follows:

- Deleted measurement method for squareness of planar rectangular products; added requirements for diagonal difference;
- Added requirements and measurement methods for surface stress and compressive stress layer depth by referring to ASTM C1422-99 *Standard Specification for Chemically Strengthened Flat Glass*.

Appendix A of this Standard is normative. Appendix B is informative.

This Standard was proposed by China Building Materials Industry Association.

This Standard shall be under the jurisdiction of National Technical Committee on Building Glass of Standardization Administration of China.

Main drafting organization of this Standard: Glass Science Institute of China Building Materials Academy.

Drafting organizations of this Standard: China Southern Glass Technology Holdings (Group) Co., Ltd., Beijing Gelin Jingfeng Fireproof Glass Co., Ltd..

Main drafters of this Standard: Yang Jianjun, Wang Rui, Gong Shuyi, Zhang Baojun, Xiong Wei, Song Li, Shi Xinyong, Mo Jiao, Wu Huiting, Hu Yue.

This Standard was issued for the first time.

Chemically strengthened glass

1 Scope

This Standard specifies the term and definition, classification and marks, technical requirements, test methods, inspection rules, package, marks, transport and storage of chemically strengthened glass.

This Standard is applicable to flat chemically strengthened glass.

2 Normative references

The following standards contain the provisions which, through reference in this Standard, constitute the provisions of this Standard. For dated references, subsequent amendments (excluding corrections) or revisions do not apply to this Standard. However, the parties who enter into agreement based on this Standard are encouraged to investigate whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this Standard.

GB/T 1216 *Micrometers*

GB/T 5137.1-2002 *Test Methods of Safety Glazing Materials Used on Road Vehicle*

GB 11614-1999 *Float glass*

GB/T 18144 *Test method for measurement of stress in glass*

JB/T 8788 *Feeler gauges*

3 Terms and definitions

The following terms and definitions apply to this document.

Chemically strengthened glass

Glass of which alkali metal ions of glass surface are replaced by other alkali metal ions in molten salt, so as to improve mechanical strength.

Stain trace, smog	There shall be no obvious stain trace, smog on the surface of chemically tempered glass.
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5.6 Edge and hole machining quality

5.6.1 Edge machining quality of chemically tempered glass

The edge of chemically tempered glass used in construction shall be chamfered and fine grinded. The edge quality of chemically tempered glass used for non-construction shall be determined by the seller and the buyer.

5.6.2 Hole edge machining quality

Hole edge machining quality shall be determined by the seller and the buyer.

5.6.2.1 The tolerance of hole aperture of chemically tempered glass products used for construction shall comply with provisions of Table 6. This provision only applies to the glass of which nominal thickness is not less than 4 mm. The tolerance of hole aperture of chemically tempered glass used for non-construction shall be determined by the seller and the buyer.

Table 6 Hole aperture and its tolerance

unit: mm

Nominal hole aperture (D)	Tolerance
$D < 4$	Determined by the seller and the buyer
$4 \leq D \leq 20$	± 1.0
$20 < D \leq 100$	± 2.0
$D > 100$	Determined by the seller and the buyer

5.6.2.2 The distance a BETWEEN hole edge of chemically tempered glass products used for construction AND glass edge shall not be less than twice glass nominal thickness d , as shown in Figure 1. The distance b between two hole edges shall not be less than twice glass nominal thickness d , as shown in Figure 2. The distance c BETWEEN hole edge AND glass corner shall not be less than 6 times glass nominal thickness d , as shown in Figure 3. The hole center position shall expressed by referring to Figure 4: build coordinate system as Figure 4 and use hole center position's coordinates (x, y) to show hole center position. Since the tolerance of hole center position x, y is same with tolerance of glass side length (see Table 3), this provision is only applicable to glass products of which nominal thickness is not less than 4 mm and the holes of whole glass plate do not exceed 4. Hole position requirements for chemically tempered glass products used for non-construction shall be determined by the seller and the buyer.

Category B	$25 < d \leq 50$
Category C	$d > 50$

5.12 Impact resistance

Impact resistance of chemically tempered glass shall comply with provisions of Table 10.

Table 10 Impact resistance of chemically tempered glass

Glass thickness d mm	Impact height m	State after impact
$d < 2$	1.0	The specimen must not be destroyed.
$d \geq 2$	2.0	

6 Test methods

6.1 Thickness determination

Use micrometer that complies with provisions of GB/T 1216, of which the accuracy is 0.01 mm, or instrument of same accuracy to measure at quadrilateral midpoint within 15 mm from glass plate edge. The arithmetic mean of measurement results shall be its thickness value. Round it to one decimal place.

6.2 Size determination

Use steel tape of which the minimum graduation is 1 mm to measure.

6.3 Diagonal difference

Use steel tape of which the minimum graduation is 1 mm to measure.

6.4 Appearance quality

Inspect in accordance with requirements of 5.3 in GB 11614-1999.

6.5 Edge and hole machining quality

Use caliper of which the minimum graduation is 0.1 mm to measure.

6.6 Curvature determination

Place the specimen at room temperature for more than 4h. When measuring, make the specimen perpendicular and pad with two pads at 1/4 place under its long side. Use a ruler or wire level closely against two sides of specimen or

stress.

7.1.2 Type inspection

Inspection items are all technical requirements stipulated by this Standard. In case one of the following situation, type inspection shall be conducted:

- a) trial type identification of new product or old product transferring production;
- b) after trial production, when there are major changes in structure, material, process etc. which may affect product performance;
- c) when normal production reaches one year;
- d) when production resumes after the production is shutdown for more than six months;
- e) when there is significant difference between factory inspection results and previous type inspection;
- f) when type inspection requirements are requested by quality supervision department.

7.2 Batching and sampling

7.2.1 Batching

Chemically tempered glasses, produced by same type of raw material under same process conditions, shall be grouped as a batch.

7.2.2 Sampling

7.2.2.1 Thickness, size, appearance quality, curvature, surface stress shall be randomly sampled according to Table 11.

7.2.2.2 For product's technical requirements, if it uses product to inspect, random sampling shall be conducted from this batch of products according to the quantity required by inspection items. If it uses specimen to inspect, it shall use the specimen of same-material, same-thickness and prepared under same-process conditions as the products.

7.3 Determination rules

If the number of rejects of any one of thickness, size, appearance quality, curvature and surface stress is greater than or equals to the number of rejects in Table 11, then this inspection item of this product shall be deemed as unqualified.

Appendix A

(Normative)

Bending strength test method

A.1 Test conditions

Ambient temperature: $23^{\circ}\text{C}\pm 5^{\circ}\text{C}$. Ambient humidity: 40%~70%. To avoid thermal stress, during the whole process of test, the fluctuation of ambient temperature shall not be greater than 1°C .

A.2 Specimen

Take 12 pieces of specimens to conduct the test. The length of each specimen is $1100\text{ mm}\pm 5\text{ mm}$; the width is $360\text{ mm}\pm 5\text{ mm}$. When preparing specimen, cutting edges shall be on the same surface of the specimen.

Within 24 h before the test, it must not conduct any processing or treatment to specimen. If specimen surface is affixed with a protective film, it needs to be removed 24 h before the test. Before the test, the specimen shall be placed for at least 4 h under conditions stipulated in 6.5.1.

A.3 Test devices

Take material testing machine to conduct the test. The test machine shall be able to continuously and uniformly perform sample loading and reduce the shock caused by loading to the minimum. The testing machine shall be equipped with loading measurement device. The error within its range shall be less than $\pm 2\%$. The diameter of support roller and load roller is 50 mm; the length shall not be less than 365 mm. The support roller and the load roller shall be able to rotate around each roller axis.

A.4 Test procedure

A.4.1 Width and thickness of measurement specimen

Respectively measure the width for three times. Take its arithmetic mean, accurate to 1 mm.

When measuring thickness, in order to avoid surface damage caused by measurement, the measurement shall be respectively conducted at both ends of specimen (at least it shall measure at the part of specimen beyond load roller). Respectively measure four points, take arithmetic mean, accurate to 0.01 mm.

Appendix B

(Informative)

Relevant explanation on chemically tempered glass

B.1 Chemically tempered glass is strengthened glass obtained after ion exchange. Ion exchange process can effectively improve the mechanical strength of glass, especially applicable to enhanced ultra-thin, small size or complex shape of glass products. Glass shall not produce obvious optical distortion after ion exchange.

B.2 Strength of chemically tempered glass is related to glass composition, surface and edge state, ion exchange process and environmental factors of use, etc.

B.3 Although surface stress of chemically tempered glass is very high, the balancing intermediate tensile stress is very small. Therefore, chemically tempered glass has no self- explosion.

B.4 Chemical glass must maintain a certain depth of exchange layer. The depth of exchange layer shall increase with the extension of exchange time. However, surface stress shall extend to the maximum as exchange time is prolonged, then gradually decrease.

B.5 The chemically tempered glass made by monolithic ordinary annealed glass after ion exchange is not safety glass. The state of its fragments after crushing is similar with the state after ordinary annealed glass is crushed. When it is used in places related to personal safety, it needs to be further processed, for example, to make laminated glass, etc.

B.6 The chemically tempered glass can be cut. However, the new cut edge shall cause reduction in strength. Therefore, the manufacturer is recommended to complete necessary pre-processing before chemically strengthening.

B.7 Ion exchange process changes the surface properties of glass. Therefore, subsequent processing (e.g., interlaying or coating) of chemically tempered glass shall be different from the processing of non- chemically tempered glass.

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