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Flat Glass

平板玻璃

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Flat Glass

1 Scope

This document specifies the classification and grading, requirements, inspection methods, inspection rules, marking, packaging, transportation and storage of flat glass.

This document is applicable to soda-lime-silicate flat glass with a thickness not less than 2 mm and manufactured through various processes.

This document is not applicable to patterned glass and wired glass.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in this text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 1216 External Micrometer

GB/T 2680 Glass in Building - Determination of Light Transmittance, Solar Direct Transmittance, Total Solar Energy Transmittance, Ultraviolet Transmittance and Related Glazing Factors

GB/T 8170 Rules of Rounding off for Numerical Values & Expression and Judgement of Limiting Values

GB/T 9056 Metal Ruler

GB/T 11942 Colorimetric Methods for Color Building Materials

GB/T 15764 Standard Terminology of Flat Glass

GB/T 22523 Feeler Gauge

JB/T 2369 Reading Microscope

QB/T 2443-2011 Steel Measuring Tapes

3 Terms and Definitions

What is defined in GB/T 15764, and the following terms and definitions are applicable to this document.

3.1 Optical Distortion

Optical distortion refers to the defect of distortion presented when observing an object through glass at a certain angle.

NOTE: the degree of distortion is expressed by the incident angle (commonly known as zebra angle).

3.2 Spot Faults

Spot faults is a general term for defects, such as: air bubbles, inclusions, and spots.

3.3 Edge Defects

Edge defects refer to the phenomenon of convex or concave or incomplete glass plate section.

NOTE: edge defects include bursting edges, edge bumps, missing corners and beveled edges, etc.

3.4 Thickness Wedge

Thickness wedge refers to the difference between the maximum value and the minimum value of thickness of the same glass.

3.5 Bloom

Bloom refers to the light interference color presented through visual observation of the lower surface of the glass (during molding, the surface that is in contact with the tin liquid) after the float glass of different thicknesses is heated and cooled for a specified time.

3.6 Spot Distortion

Spot distortion refers to spots on the surface of flat glass that cause optical distortion.

4 Classification and Grading

4.1 In accordance with the attribute of color, it is classified into two types: colorless transparent flat glass and body-tinted flat glass.

4.2 In accordance with different requirements for appearance quality, it is classified into two grades: ordinary flat glass and high-quality processed flat glass.

5 Requirements

5.1 Overview

The inspection items of flat glass, as well as the corresponding clauses of the requirements and inspection methods are shown in Table 1.

5.9 Color Uniformity

This test is only carried out on body-tinted flat glass. In the same batch of products, the chromatic aberration of ordinary flat glass: $\Delta E_{ab}^* \leq 1.5$; the chromatic aberration of high-quality processed flat glass: $\Delta E_{ab}^* \leq 1.0$.

6 Inspection Methods

6.1 Dimensional Deviations

Use a metal ruler with a division value of 1 mm that complies with the stipulations of GB/T 9056 or a steel measuring tape with Grade-1 precision that complies with the stipulations of QB/T 2443-2011 to respectively measure the distance between two parallel sides in the middle of the long and wide sides. The difference between the measured value and the nominal dimension is the dimensional deviation.

6.2 Diagonal Difference

Use a steel measuring tape with Grade-1 precision that complies with the stipulations of QB/T 2443-2011 to measure the length of two diagonals of the glass plate. The absolute value of the difference is the diagonal difference. Calculate the percentage of the diagonal difference and the average length of the diagonal.

6.3 Thickness

Use a digital display micrometer (or spiral micrometer) with a division value of 0.001 mm that complies with the stipulations of GB/T 1216 to measure five points perpendicular to the pulling direction of the glass plate: at about 15 mm from the edge, respectively take one point inward; equally divide the remaining three points between the two points. The measured value shall take three decimal places. Calculate the difference between the measured values at five points and the clearly stated thickness; compare the maximum value of deviation with Table 3.

6.4 Thickness Wedge

In accordance with the method of 6.3, measure five measured values of thickness; calculate the difference between the maximum value and the minimum value.

6.5 Appearance Quality

6.5.1 Spot faults

Use a reading microscope with a scale value of 0.01 mm that complies with the stipulations of JB/T 2369 to measure the maximum core size of spot faults.

6.5.2 Concentration of spot faults

Randomly take 3 pieces from a batch of products; cut 1 specimen from each piece. In accordance with the methods specified in GB/T 2680, determine the visible light transmittance and take the average value. For products with a thickness other than the commonly used specifications specified in 5.4.1, firstly, measure the thickness of the specimen in accordance with the methods of 6.3. After rounding off the measured value, take two decimal places. In accordance with the methods specified in GB/T 2680, determine its visible light transmittance. In accordance with Formula (2), calculate the visible light transmittance converted into 5 mm standard thickness and take the average value.

$$T_s = \left(\frac{T_v}{92} \right)^{\frac{5}{D}} \times 92 \quad \dots\dots\dots (2)$$

Where,

T_s ---the visible light transmittance converted into 5 mm standard thickness, expressed in (%);

T_v ---the visible light transmittance of the specimen, expressed in (%);

D ---the thickness of the specimen, expressed in (mm).

6.8.2 Transmittance deviation of body-tinted flat glass

Randomly take 3 pieces from a batch of products; cut 1 specimen from each piece. In accordance with the methods specified in GB/T 2680, determine the visible light transmittance, direct sunlight transmittance and total solar energy transmittance. The transmittance deviation is the difference between the maximum value and the minimum value.

6.9 Color Uniformity

Randomly take 5 pieces from a batch of products. In accordance with the methods specified in GB/T 11942, at the same position, measure the values of L^* , a^* and b^* ; take the one with the largest or smallest a^* or b^* as the standard piece; compare the transmitted color of the remaining 4 pieces with the standard piece; respectively determine the ΔE_{ab}^* value of four pieces and take the maximum value.

7 Inspection Rules

7.1 Exit-factory Inspection and Type Inspection

7.1.1 Exit-factory inspection

The exit-factory inspection items include: dimensional deviations, diagonal difference, thickness, thickness wedge, appearance quality and curvature.

7.1.2 Type inspection

The type inspection items are all items in Chapter 5. Under the following circumstances, type

7.3 Determination Rules

7.3.1 Determination rules for single pieces: when carrying out the inspection of dimensional deviations, diagonal difference, thickness, thickness wedge, appearance quality and curvature, if all items of any piece of glass comply with the requirements of the corresponding clauses, then, the piece of glass shall be determined as qualified, otherwise, it shall be determined as disqualified. When there are multiply disqualified items on one piece of glass, then, it shall be determined as a disqualified piece, and shall not be repeatedly counted.

7.3.2 Determination rules for items: compare with the sample size in Table 8, when carrying out the inspection of the items specified in 7.3.1, if under a certain item, the number of disqualified pieces due to the non-conformity with the requirements of the corresponding clauses is less than or equal to the acceptance number in Table 8, it shall be determined as qualified in this inspection item, otherwise, it shall be determined as disqualified in this inspection item.

7.3.3 When inspecting the item of bloom, if none of the 4 pieces of sample presents bloom, then, it shall be determined as qualified in this item.

7.3.4 When inspecting the visible light transmittance of colorless transparent flat glass, if the inspection result complies with the stipulations of 5.8.1, then, it shall be determined as qualified in this item.

7.3.5 When inspecting the transmittance deviation of body-tinted flat glass, if the inspection result complies with the stipulations of 5.8.2, then, it shall be determined as qualified in this item.

7.3.6 When inspecting the color uniformity of body-tinted flat glass, if the inspection result complies with the stipulations of 5.9, then, it shall be determined as qualified in this item.

7.3.7 Comprehensive determination rules: the inspection results shall be comprehensively determined in accordance with the two determination results: determination rules for single pieces and determination rules for items. Compare with the sample size in Table 9: in the items specified in 7.3.1, when the total number of disqualified pieces determined by the determination rules for single pieces is less than or equal to the acceptance number in Table 8, then, the batch of glass shall be determined as qualified; otherwise, the batch of glass shall be determined as disqualified. In all inspection items specified in Chapter 5, when any item is determined as disqualified in accordance with the determination rules for items, then, the batch of glass shall be determined as disqualified.

8 Marking, Packaging, Transportation and Storage

8.1 Marking

There shall be a marking or label on the glass packaging, indicating the product name, manufacturer, registered trademark, factory address, quality grade, color, size, thickness,

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