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Flat glass

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1 Scope

China's mandatory national standard for flat glass. Flat glass is float glass - the process in which molten glass is poured onto a bath of liquid tin and spreads to a surface flat enough that no grinding or polishing is needed, which is why window glass became cheap in the twentieth century. China makes more of it than the rest of the world combined, and it is the raw material of every window, mirror, coated glass and laminated or toughened product downstream. What the standard specifies is what a downstream converter needs to know: the thickness and its tolerance, the flatness, and the optical distortion, which is the property a customer actually notices, because a wave in the surface shows as a bend in the reflection of a straight line. Then the defects that decide a sheet's grade - bubbles, inclusions, scratches and the tin-side surface, which behaves differently in coating and toughening.

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.

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.

5.2 Dimensional deviations Flat glass shall be cut into rectangles, and the dimensional deviations of its length and width shall not exceed those specified in Table 2.

5.3 Diagonal Difference The diagonal difference shall not be greater than 0.2% of the average diagonal length.

5.5 Appearance Quality

5.6 Curvature For ordinary flat glass, the curvature shall not be greater than 0.2%.

5.7 Bloom This inspection is only performed on high-quality processed flat glass produced through the float process. After the test, there shall be no phenomenon of bloom.

5.8 Optical Properties

5.9 Color Uniformity This test is only carried out on body-tinted flat glass. In the same batch of products,

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.

6.5.1 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 Use a metal ruler with a division value of 1 mm that complies with the stipulations of GB/T 9056 to measure the minimum spacing between two spot faults and count the number of spot faults of the specified size within a 100 mm circle.

6.5.3 Lines, scratches, and cracks As it is shown in Figure

1. In an environment not affected by external light, vertically place the specimen at a position

0.6 m away from the screen, which is a black matte screen, equipped with several 40 W fluorescent tubes with a spacing of 300 mm. The observer is

0.6 m away from the specimen, and the line of sight is perpendicular to the surface of the specimen. Use a metal ruler with a division value of 1 mm that complies with the stipulations of GB/T 9056 and a reading microscope with a scale value of

0.01 mm that complies with the stipulations of JB/T 2369 to measure the length and width of scratches.

6.5.4 Optical distortion As it is shown in Figure

2. The specimen is perpendicular to the ground in accordance with the pulling direction and placed at a distance of

4.5 m from the screen. The screen has black and white diagonal stripes with uniform brightness. The observer, who is

4.5 m away from the specimen, observes the stripes on the screen through the specimen.