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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 18144-2008

**Test method for measurement of stress in glass
(English Translation)**

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Foreword

The consistency of this standard with the ASTM standard ASTM C1279-05 Test Method for Non-Destructive Photoelastic Measurement of Surface and Edge Stresses in Annealed Glass,

Half-Toughened Glass, and Toughened Glass, ASTM C1048-04 Heat-Strengthened Flat Glass-HS Class, FT Class Coating and Non-Coating Glass, and Japanese industrial technology standard JIS R3222-2003 Half-Toughened glass IS NOT equivalent.

This standard replaces GB/T 18144-2000 Test method for measurement of stress in glass.

This standard, in comparison with GB/T 18144-2000, has the major changes as follows.

- In Chapter "Scope", ADD laminated glass used in car's front windshield and hot bending glass, DELETE annealed glass;
- ADD nondestructive test method for measurement of edge stress in glass with coating;
- Specific values of instrument constants of the surface stress meter and edge stress meter are not described in the standard.

This Standard was proposed by China Building Materials Federation.

This standard shall be centralized by the National Architectural Glass Standardization Technical Committee.

Drafting organization of this standard. China Building Material Test & Certification Center.

1 Scope

This standard specifies the definitions and methods related to the tests on surface stress and edge stress of glass. In this standard, the method of surface stress test is suitable for toughened glass and half-toughened glass made of float glass. The method of edge stress test is fit for toughened glass, half-toughened glass, laminated glass of car's front windshield, and hot bending glass.

For chemical toughened glass, it may refer to the method of surface stress test in this standard.

This test method is a nondestructive test method.

2 Normative references

The articles contained in the following documents have become part of this standard when they are quoted herein. For the dated documents so quoted, all the modifications (excluding corrections) or revisions made thereafter shall not be applicable to this Standard. For the undated documents so quoted, the latest edition shall be applicable to this Standard.

JC/T 632 Road vehicles - Safety glazing materials - Terminology

3 Terms and definitions

For the purpose of this standard, the following terms and definitions and those defined in JC/T 632 apply.

3.1

Polarizer

A kind of optical device, through which natural light becomes plane-polarized light with a certain vibration direction, and which is usually placed between the light source and samples under test.

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4.1.1 Measurement principle

The testing principle of surface stress meter is to use optical waveguide effect of the tin diffusion layer on the surface of float glass to measure. The scattered light, emitted from a light source (incandescent light bulb) and through a slit, turns into parallel light after being converged by cylindrical prism of a high refractive index.

4.1.2 Reagents for test

Refraction oil. Its refractive index shall be greater than the glass but not greater than the instrument prism. Refraction oil shall not have a corrosive effect on the instruments.

4.1.4 Preparation and preservation of sample

Use finished products as the sample. If there is coating on the surface of the tin diffusion layer of the sample (such as curtain wall glass, glaze coating of car's back windshield glass), use hydrofluoric acid or abrasive cloth to remove it. And take the area where the coating is removed as the stress testing point of the sample. In order to avoid the generation of thermal stress, the temperature inside and outside the sample must be consistent and same as the ambient temperature.

4.1.6 Test procedures

- a) The tin diffusion layer of the sample to be measured shall be placed upwards and horizontally at a stable state;
- b) Wipe and clean the glass surface. And drop 1 ~ 2 drops of refraction oil on the testing point;
- c) Make the instrument prism parts to contact with the measuring points reliably;
- d) Adjust the light source position, the slit position and the retro-reflector angle to ensure a clear image with light-shade stairs appear in the observation field;
- e) Use the micrometer eyepiece to read the height of the stair d , accurate to 0.01 mm;
- f) Compressive stress and tensile stress shall be determined by Figure 2.

4.2.1 Measurement principle

Put the sample in a plane polarized light field. Rotate the polarizer and analyzer to keep their polarization axes orthogonal to each other and 45° to the direction of the sample's principal stress which is parallel or vertical to the edge of the sample. Put a $1/4$ wave plate in the left light path close to the analyzer. And make it parallel to its fast axis, slow axis and polarization axis. Compensate by rotating the analyzer to obtain the compensation angle.

4.2.6 Test results calculation

Edge stress is calculated by Formula (4).

4.2.7 Test Report

The report shall include the following contents.

4.3.1 Principles of test

Use reflective light path to put the concentrator system, the polarizer and the analyzer receiving reflective light on the same side of the sample, so as to ensure that the polarized light can be reflected back by the coating on the back of the glass after entering into the glass, and then going through the glass sample under test. The testing principle of this test method is same as 4.2.1. And the only difference is that the polarized light passes through the glass sample under test twice from the direction of the thickness of the glass.

4.3.2 Test device

Reflective edge stress gauge. It is mainly consisted of four parts, namely, concentrator system, polarizer, analyzer, and $1/4$ wave plate. The instrument structure is shown in

4.3.3 Sample

Use the finished product as sample. The edge on one side of it shall be coated (such as curtain wall glass, glaze surface of car's shatter-proof glass). In order to avoid the generation of thermal stress, the temperature inside and outside the sample must be consistent and be same with the ambient temperature.