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

GB/T 15227-2019

Replacing GB/T 15227-2007

**Test methods for the air permeability, watertightness and wind
load resistance of curtain walls**

建筑幕墙气密、水密、抗风压性能检测方法

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1 Scope

China's national test method for the three performance properties on which a building curtain wall is bought and accepted: air permeability, watertightness and resistance to wind load. It specifies the terms and definitions, the general requirements, the test principles, the test apparatus, the specimens and their installation, and the procedures for each of the three. A curtain wall is a non-load-bearing skin hung on a building, and those three properties are what it exists to provide. Air permeability determines the heating and cooling load and whether the building is draughty. Watertightness determines whether rain driven at the facade by wind gets past the joints - and a curtain wall leak is the most expensive defect in a modern building, because the water appears far from where it entered and the facade has to be opened up to find it. Wind load resistance determines whether the wall stays on the building. The method is a chamber test: a full-size specimen of the wall, built as it will be built on site, is mounted in a test rig and subjected to controlled pressure differences, with water sprayed at a prescribed rate for the watertightness test and with static and cyclic pressure for the wind load test. What the standard has to fix, and what

most of it consists of, is the things that make the result representative: the size of the specimen and how many bays and joints it must include, since a leak occurs at a joint and a specimen without the right joints proves nothing; the installation, which must reproduce the site fixing rather than an idealised one; the sequence of the three tests, since the wind load test damages the specimen and what follows it is no longer testing the same wall; and the criteria by which each result is judged. Issued on 10 December 2019 and in force since 1 November 2020, it replaces GB/T 15227-2007.

This standard specifies the terms and definitions, general requirements, testing principles, testing devices, specimens and installation, air permeability performance testing, water tightness performance testing, wind pressure resistance performance testing of building curtain walls, as well as the test reports. This standard is applicable to laboratory testing of air permeability, water tightness, wind pressure resistance of building curtain walls. The testing objects are limited to the curtain wall specimen itself, as well as its connection structure with other structures.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 31433 General specification for building curtain walls, windows and doors

GB/T 34327 Terminology for curtain wall

GB 50178 Standard of climatic regionalization for architecture

3 Terms and definitions

The terms and definitions, which are defined in GB/T 34327, as well as the following terms and definitions, apply to this document.

3.1 Standard condition The test conditions where the air temperature is 293 K (20 °C), the atmospheric pressure is 101.3 kPa (760 mm Hg), the air density is

3.2 Pressure difference The absolute air pressure difference -- between the indoor and outdoor surfaces of the specimen.

Note. When the surface pressure on the outdoor is higher than the surface pressure on the indoor, the pressure difference is positive; otherwise, it is negative.

3.3 Air permeability performance The ability of the specimen to prevent air leakage, when the openable part is closed.

3.4 Watertightness performance When the openable part is in a closed state, the

specimen's ability to prevent rainwater from leaking indoor, under the simultaneous action of wind and rain.

3.5 Wind load resistance performance When the openable part is in a closed state, under the action of wind pressure, the deformation of the main stress-bearing components of the specimen does not exceed the allowable value and no structural damage or functional impairment occurs.

3.6 Grade testing Testing, which is carried out to determine the performance level of the specimen.

3.7 Engineering testing Testing, which is conducted to determine whether the specimen meets the performance requirements of the engineering design.

4 General requirements

4.1 The grading and index values of air permeability, watertightness, wind pressure resistance performance of building curtain walls shall comply with the requirements of GB/T 31433.

4.2 The testing shall be carried out, under the condition that the ambient temperature is not lower than 5 °C.

4.3 The order of grade testing should be carried out, in the order of air permeability and wind pressure deformation resistance p_1 , watertightness and wind pressure resistance repeated pressurization p_2 , design wind load standard value of wind pressure resistance product p_3 , design wind load value of wind pressure resistance product p_{max} .

4.5 The air permeability performance of a double-layer curtain wall is graded, based on its overall air permeability performance index. The watertightness performance of a double-layer curtain wall is graded, based on the watertightness performance index of the first layer of curtain wall, which has watertight requirements. For the wind pressure resistance of a double-layer curtain wall, the inner layer and outer layer are tested and graded, respectively.

4.6 Watertight performance testing is divided into stable pressurization method and fluctuating pressurization method. For engineering testing in tropical storm and typhoon areas, the fluctuating pressure method shall be used.

4.7 Necessary safety protection measures shall be taken during testing.

Note. Safety protection includes protection of personnel and protection of instruments and equipment.

5 Testing principle

Install the full-scale specimen on the pressure box. Use the pressure supply device to form

a stable pressure difference or a pressure difference that fluctuates according to a certain period, on both sides of the specimen, to simulate the state of the specimen when it is subjected to different wind loads.

6 Testing device

6.1 Composition The testing device consists of a pressure box, an installation cross frame, a pressure supply device (including air supply equipment, pressure control device), a water spray device, a measurement device (including a differential pressure meter, air flow measurement device, water flow meter, displacement meter). The structure of the testing device is as shown in Figure 1.

6.2 Requirements

6.2.1 The opening size of the pressure box shall be able to meet the installation requirements of the specimen. The box shall be able to withstand the pressure difference, that may occur during the testing process.

6.2.6 The measuring device shall meet the following requirements.

6.3 Calibration

6.3.1 Please refer to Appendix A, for the calibration method of air flow measurement system.

6.3.2 Please refer to Appendix B, for the calibration method of the sprinkler system.

7 Specimens and installation

7.1 The specimen shall be of sufficient size and configuration. It shall include typical vertical joints, horizontal joints, openable parts. The ratio of the openable parts to the total area of the specimen shall be close to that of the actual project. The specimen shall be able to represent the performance of typical parts of building curtain walls.

7.5 The all-glass curtain wall specimen shall have a complete span height; the width shall have at least 3 glass lateral grids or 4 glass ribs.

7.6 The unit type curtain wall shall have at least one unit, which has the same joints formed by the four sides of the unit and adjacent units as in the actual project; the height shall be greater than 2 floor high; the width shall not be less than 3 lateral grids.

7.7 Point-supported curtain wall specimens shall meet the following requirements.

7.8 The specimens of double-layer curtain walls shall meet the following requirements.

7.9 The installation of the specimen shall meet the design requirements; the stress condition shall be consistent with the actual situation; no special accessories shall be