#365
AB1/67029
September 1966
69.028.2 : 620.1.05
p6377
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AB1/67029
September 1966

JOINT DIRECTIVES
FOR THE
ACCEPTANCE OF WINDOWS

UNION EUROPÉENNE

POUR L'AGRÉMENT TECHNIQUE DANS LA CONSTRUCTION

Translated from the French, "Directives communes pour l'agrément des fenêtres". Centre Scientifique et Technique du Bâtiment. April 1965. pp. 21

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CHAPTER IV

TESTS

1. INTRODUCTION

Functional requirements dictate the basic conditions to be satisfied by all types of window, whatever their system of opening (casement, sash, sliding-sash, etc.) or material (wood, metal, plastic, etc.). Their ability to conform to functional requirements may be verified by submitting them to a series of standard tests. These tests should be so designed that they reproduce as faithfully as possible the conditions to which the window is subjected in use, or factors stemming from an external source. The tests should therefore be conducted on windows built and installed under exactly the same conditions as would apply in practice. However, in view of the difficulties which this would create and of certain factors which are difficult to control (quality of the workmanship, etc.) exact reproduction in the laboratory of the actual conditions of installation of the window into the loadbearing framework will not be considered essential to the proper conduct of the tests if a precise analysis of the conditions so warrants.

At all events, all tests, regardless of their nature or purpose, must be conducted on finished windows - painted, glazed, hardware in place, in short ready for use. Units not forming an integral part of the window will be systematically excluded, taking account of its dimensions.

2. TYPES OF TEST

Tests may be grouped under three categories:

- air-penetrqtion tests
- watertightness tests
- mechanical tests

In general, all these tests are valid whatever the material of which the window is made (steel, aluminium, wood, plastics, composites, etc.). The properties of the material will be assumed known, and will be verified in accordance with existing Standards and official technical codes of practice

in this field*. If no standards have yet been set up, as is the case for plastics, for example, the materials will be made the object of a special identification study and laboratory tests, including ageing tests.

Mechanical tests will differ for each type of window (casement, sash, sliding sash, etc.) but air-penetration and watertightness tests will be the same for all types of window.

3. AIR PENETRATION TESTS

3.1 Nature and object of the tests

Air penetration is defined by the volume of air passing through the joints of a window under a static pressure maintained at a constant level. The pressure-difference between the exterior and interior should correspond to actual conditions determined by measurement.

3.2 Description of the apparatus

The testing equipment consists of a sealed chamber in the shape of a rectangular parallelopiped one side of which is the window to be tested, with the exterior face of the window facing inwards.

All joints between the chamber and the support** are sealed by caulking. The chamber is subjected to a specific air pressure by injection. Constant pressure is maintained throughout the test with the aid of manometers. The air may be injected by compressor, ventilator or any other effective system.

Measuring apparatus for determining the volume of air, in m^3/h, which penetrates the joints of the window (diaphragms or Venturi tubes may be used, provided they are sufficiently sensitive to register small volumes) is to be installed.

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* Methods of protection and the state of the surface will be considered in studies of durability and maintenance.

** Where ordinary masonry walls are used, which are more or less porous, their permeability relative to that of the window may be ignored.

For measuring pressures, precision manometers should be used, which may be of the differential type (containing alcohol, mercury or any other suitable fluid).

The sensitivity of the measuring devices should not be less than ± 2%.

Regulation of the pressure may be manual or, with the aid of a self-regulating valve, rendered automatic.

3.3 Conditions of test

The window should be installed for the air-penetration test in the same conditions as found on the site (the manufacturer must furnish the necessary instructions and installation details), or else it should be mounted on a test frame, with all joints between the window and the test frame sealed. Glazing may be effected by the manufacturer or by the institute conducting the test.

Before the test is started, the window must open and close normally, and all working parts should be checked to ascertain that they function properly.

In the case of wooden windows, the moisture content of the wood will have an effect on the results of the test. It must therefore be ensured that this value is in the range 13 to 18 % (if necessary the moisture content can be adjusted to meet this requirement). The windows should also receive their final coat of paint.

Many windows are designed and constructed to conform to minimum standards of impermeability without the need for supplementary sealing devices (felt, rubber or metal). Such devices should therefore not be used to improve the seal, and tests should be conducted without them.

On the other hand where such sealing strips are intended to be installed at particular points designed to receive them permeability tests will be conducted with the strips installed.

3.4 Test procedure

A static pressure of 10 mm water-column is brought about inside the chamber and the volume of air passing the joints of the window is measured. In the calculation of the surface area and length of the jamb of a composite window

by the opening parts are to be taken into account.

If the volume-flow falls within the range 12 to 60 m^3 per hour per square metre of the surface, the test will be continued by measurements of the volume-flow at a pressure of 5 and of 2 mm water-column.

If the volume-flow is less than 12 m^3 per hour per square metre of surface, the test will be continued by measurement of the volume-flow at pressures of 25 and 50 mm water-column.

Further measurements will be conducted on each joint in turn, the other joints being sealed off.

3.5 Interpretation of results - classification

At a static pressure of 10mm water-column:

- if air penetration through the windows falls within the range 12 to 60 $m^3/h/m^2$ of the surface, and if there is no very marked difference in performance between individual joints, these windows shall be designated as having "normal resistance to air penetration";
- if air penetration through the windows falls below 12 $m^3/h/m^2$ of the surface, these windows shall be designated as having "improved resistance to air penetration".

4. WATERTIGHTNESS TESTS

4.1 Nature and object of the tests

This test is designed to determine watertightness when the window is subjected to artificial rainfall under specific conditions of projection and volume of water under pressure. Pressure and volume may be varied to determine the action of rain alone and of rain in combination with wind.

4.2 Description of the apparatus

As in the case of the air-penetration test, a completely sealed chamber

Etting on to the exterior face of the window is to be used, such that the only joints accessible to rain penetration shall be the joints of the window.

Inside the chamber is installed a device running below the top rail and over the effective length thereof which distributes the flow of water over the window in a continuous sheet.

This effect can be achieved either by projecting the droplets through a pipe barrel by compressed air, or else through a pressure hose. Whichever system is used, the spray must ensure uniform dispersion and distribution of the droplets over the whole surface of the window. After falling on the window, the water runs down to the bottom.

4.3 Test procedure

The test is conducted in two phases. In phase 1, the volume-flow of water is 0.20 ± 0.05 litres per minute per square metre of surface of the window; in phase 2 the volume-flow is increased to 0.75 ± 0.05 litres per minute per square metre of surface.

In the first phase, the excess air pressure in the case will rise in successive stages, as follows:

a) 0 and 4 mm water-column;

b) 0 - 4 and 16 mm water-column;

c) 0 - 4 - 16 - 30 and 50 mm water-column.

And in the second stage:

a) 0 and 4 mm water-column;

b) 0 - 4 and 16 mm water-column;

c) 0 - 4 - 16 and 30 mm water-column.

Each excess pressure will be applied for five minutes, except for the first which will be applied for fifteen minutes.

4.4 Interpretation of results - classification

The criterion is complete resistance to water penetration, except for the

ts under a pressure of 50 mm water-column (see below), where account must be taken of the possibility of water being forced through the ducts for draining off condensation moisture.

If the windows satisfy this criterion under the test conditions (a), these windows will be said to possess "normal watertightness".

Windows satisfying the criterion under test conditions (b) shall be said to possess "improved watertightness".

If the windows satisfy the criterion under test conditions (c), given that only small leaks not liable to damage the finish are observed under the pressure of 50 mm water-column, then these windows will be said to possess "reinforced watertightness", it being understood that windows satisfying this requirement shall also possess improved resistance to air penetration.

N.B. - Certain types of windows require other watertightness tests than those described above. These may relate to certain aspects difficult to determine from the general test. Thus the following factors need to be determined:

- that downpipes have a sufficiently large section (sliding sash windows);
- that the number and diameter of the drainage outlets are adequate;
- that the drip channels and pipes are correctly sloped to prevent rainwater being blown back up by the wind.

Ease of cleaning in case of blockage should also be ascertained. These are not strictly speaking tests, but rather simple empirical checks.

5. MECHANICAL TESTS

5.1 General conditions

5.11 Nature of the tests. Mechanical tests are functional in nature. They illustrate the actual behaviour of windows under the stresses exerted by the principal mechanical loadings to which they may be subjected, in normal service conditions or accidental cases.

These tests will vary according to the type of window under consideration.

5.12 Object of the tests. The main factors to be determined by the tests are