International Standard 8248

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Windows and door height windows — Mechanical tests

Fenêtres et portes-fenêtres — Essais mécaniques

First edition — 1985-10-01

UDC 69.028.1/.2 : 620.17 **Ref. No. ISO 8248-1985 (E)**

Descriptors: windows, doors, glazed doors, tests, mechanical tests.

Price based on 20 pages

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8248 was prepared by Technical Committee ISO/TC 162, *Doors and windows*.

Windows and door height windows — Mechanical tests

0 Introduction

Independently of the characteristics they possess when closed, windows are submitted to various stresses while being opened and closed or cleaned.

Mechanical tests performed on the complete window make it possible to

a) determine the forces necessary to open and close the window;

b) examine the reaction of the window to mechanical tests simulating misuse;

c) examine the efficiency of locking opening or restricted opening devices, if fitted.

1 Scope

This International Standard specifies the methods to be used for the mechanical testing of windows and door height windows, supplied in the form of finished products, in their normal conditions of use.

2 Field of application

This International Standard is applicable to all windows, including door height windows, made of any material, in the operating conditions in which they are intended to be used in a finished building, bearing in mind the specified test conditions.

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1 hinge: Rotating device allowing the opening of a window by rotation about an axis parallel to an edge of the window.

3.2 pivot: Rotating device allowing the opening of a window through 180°, by rotation about an axis.

3.3 restricted opening device: Device for restricting the extent of opening of a window.

3.4 locking opening device: Device for locking the window in a stable open position.

4 Tests

A distinction is made between

a) tests intended to be carried out on all types of windows, i.e. measuring the forces necessary to fasten and unfasten, and to move and displace, the window (see 7.1);

b) tests which vary according to the way in which the window opens:

— tests simulating misuse (see 7.2)

— tests for locking opening devices with the windows in an open position or for restricted opening devices (see 7.3).

The table indicates, for the principal types of windows, the tests to be carried out. Windows that open in more than one way shall be tested for each method of opening.

The test procedures are illustrated in the annex.

Table — Tests to be carried out for the principal types of windows

NOTE — The numbers given in the table are those of the figures illustrating the appropriate test except those referring to window type.

Description of window			Window type	Test simulating misuse (see 7.2)				Test for locking opening and restricted opening devices (see 7.3)
				Bending and twisting	Racking test (resistance to vertical force)	Torsion	Diagonal deformation	
Hinged	Vertical axis	opening in	1	7 and 9	26 and 28*			
		opening out		7 and 9	26 and 28*			37 and 39
	Horizontal axis		2	8 and 9				46* 38 and 39*
Pivoted	Vertical axis		3	10 and 12 11 and 12	27 and 28*			40 and 43
	Horizontal axis		4	13 and 15 14 and 15				41 and 43*
Sliding	Horizontal		5	16 and 19 17 and 19 18 and 19		30 and 32	33 and 36 34 and 36	
	Vertical		6	20 and 23 21 and 23 22 and 23		31 and 32	35 and 36	42 and 43*
Floating pivoted axis	Vertical axis		7	24	29			44
	Horizontal axis		8	25				45

* For these windows, the tests shall be repeated with the maximum thickness of glass appropriate for the frame (see clause 6), by agreement with the manufacturer.

5 Apparatus

The basic test apparatus comprises

a) a means of fitting the window in accordance with clause 6;

b) a means of positioning devices for measuring displacement and to ensure their stability during the test;

c) a means of applying the required forces and of measuring these forces;

d) devices for measuring displacements;

e) a device allowing complete movement of the window leaves, in both the opening and closing directions.

6 Preparation of window for testing

The means of fitting the window to the test apparatus shall reproduce as closely as possible the actual jointing of the windows to the building or, if these details are not known, they shall be in conformity with the manufacturer's specifications.

The window shall be fixed plumb, square and without distortion.

The laboratory shall ensure that the influence of "play" in the means of suspension and closing is avoided.

The thickness, type of glass and the method of glazing shall comply with the manufacturer's specifications. In the absence of such specifications, or if there is a possibility that the window will be used with different types of glass, tests shall be carried out with the minimum thickness of glass with respect to the surface area, as specified in national standards.

The tests in which the thickness of the glass plays an important role [1] shall be repeated with the maximum thickness of glass appropriate for the frame, by agreement with the manufacturer.

The thickness of the glass and the method of glazing shall be stated in the test report.

7 Methods of test

7.1 Forces required to operate the window

7.1.1 Fastening and unfastening

The required force or moment shall be applied by means of a device reproducing as accurately as possible the action of the operator's hand on the handle.

The force, or the moment, shall be expressed in newtons or in newton metres, respectively.

1) Tests for determining the forces required to operate the window. See also the table.

7.1.2 Force required to move the window

7.1.2.1 Static test

With the window unfastened, but not loosened, apply a static force on the handle or the operating device in the direction of opening of the window.

Measure the force, in newtons, required to move the window.

7.1.2.2 Dynamic test

If the method of opening the window is such that it opens more easily by jerking (or if the static force required exceeds the limits permitted by specification), the static test shall be supplemented by the following dynamic test.

In this test, the force is produced by allowing a mass of 5 kg to drop, the mass being attached to the handle or operating device by means of a steel rope composed of seven strands of seven wires, and of diameter 2 to 3 mm and approximately 1 m long.

With the window unfastened, apply the dynamic force to the handle or operating device in the direction of opening of the window.

Determine to the nearest millimetre the dropping height at which the window begins to open.

7.1.3 Displacement force (static)

With the leaf loosened from its closed position, move the leaf slowly and measure the force developed during movement.

Record, to the nearest newton, the minimum and maximum values obtained during the opening and closing operations.

7.2 Tests simulating misuse

The purpose of these tests is to determine the behaviour of windows when subject to misuse during normal operation.

The methods and test procedures are illustrated in the annex.

In general, forces are applied to the operating device in a way that avoids any local deformation.

The forces shall be applied progressively, without jerking, the measurements being made only during the second application.

Measure the displacement at the point of application of the force and observe the behaviour of the window.

7.2.1 Warping test

The purpose of this test is to determine the behaviour of a window when it is unfastened and a force is applied perpendicularly to its plane, in order to reproduce, for example:

a) for windows of types 1, 2, 3, 4: the effect of forcing the window open when one corner is jammed (see figure 1), or

b) for windows of types 5, 6, 7, 8: the effect of a person leaning on the open window or the effect of wind on the open window. See figures 7 to 25.

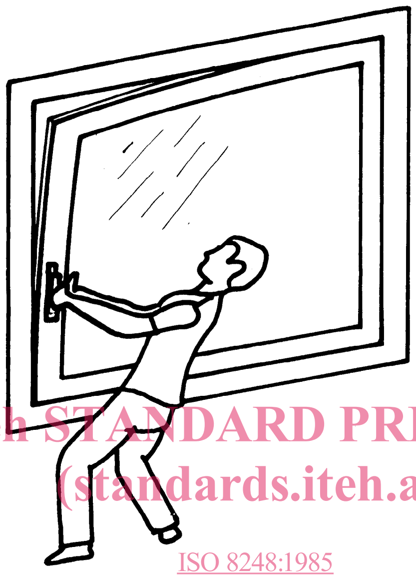


Figure 1 — Warping test situation with one corner jammed

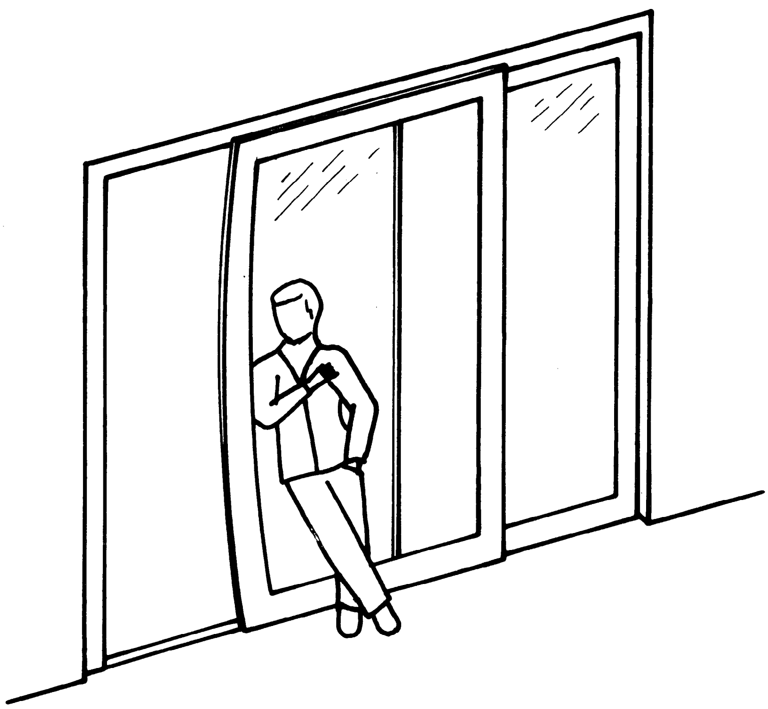


Figure 2 — Warping test situation with person leaning on open window

7.2.2 Racking test (resistance to vertical force)

The purpose of this test is to determine the behaviour of windows when an additional vertical force is applied (for example, by the user; see figure 3) to the open window.

See figures 26 to 29.

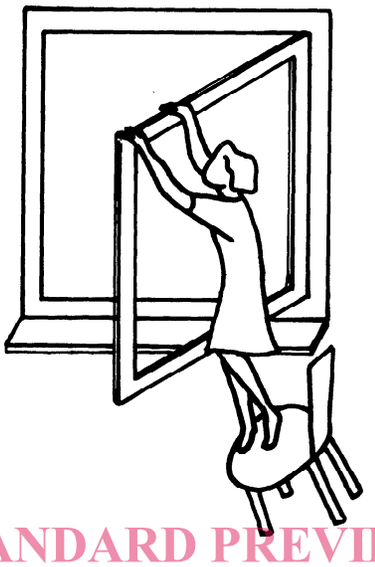


Figure 3 — Racking test situation with additional vertical force applied to window

7.2.3 Torsion test

The purpose of this test is to determine the behaviour of sliding windows (types 5, 6) when a force is applied at the end of the operating device which tends to create a torsion of the section where the device is fitted (see figure 4).

See figures 30 to 32.

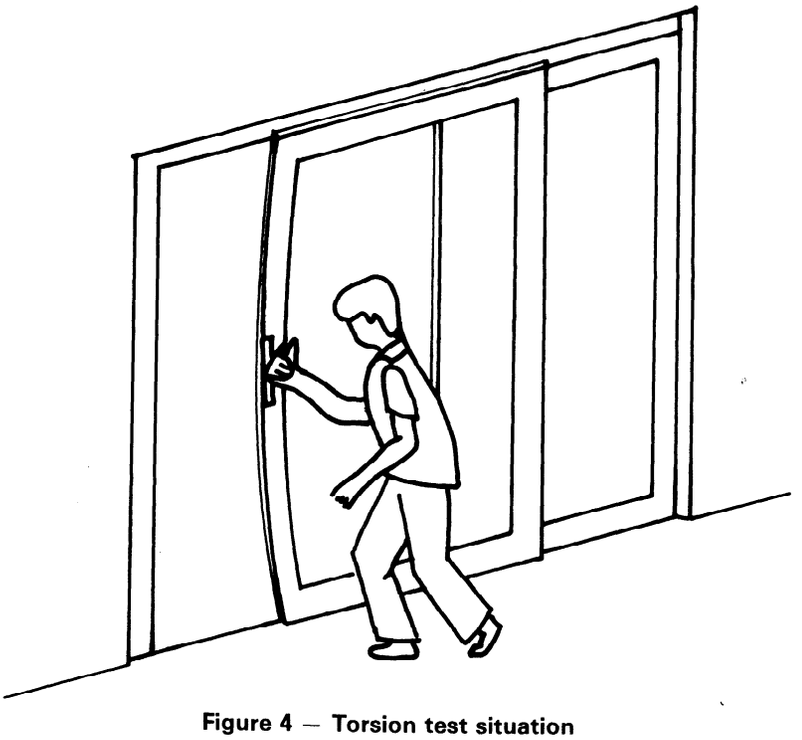


Figure 4 — Torsion test situation

7.2.4 Diagonal deformation test

The purpose of this test is to determine the behaviour of sliding windows in the case of accidental obstruction during opening or closing (see figure 5).

See figures 33 to 36.

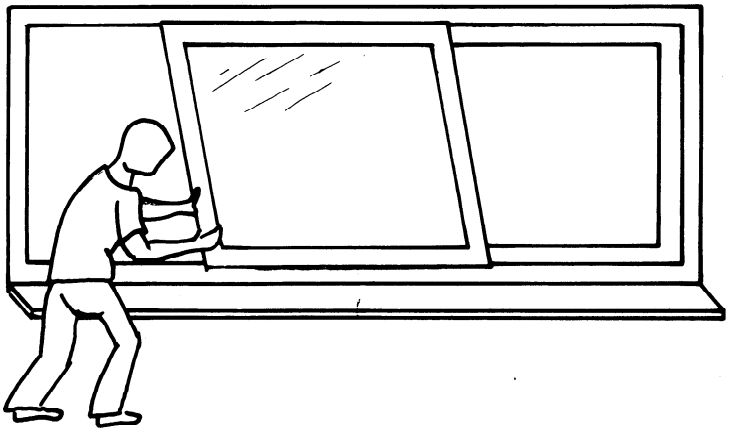


Figure 5 — Diagonal deformation test situation

7.3 Tests for locking opening or restricted opening devices

The purpose of these tests is to determine the behaviour of locking opening or restricted opening devices for windows, in the case of application of a sudden load (for example a gust of wind or a blow from the hand; see figure 6).

The tests are illustrated in figures 37 to 46, which show the test procedure according to the type of window.

When testing locking opening devices, the leaf is secured in its stable open position by means of the device. The force is applied perpendicular to the plane of opening, in the middle of the side furthest from the rotating axis.

The conditions of application of the force are as specified in 7.2.

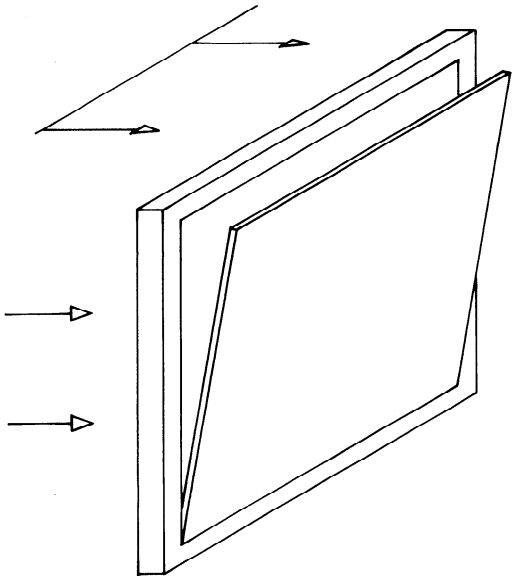


Figure 6 — Test situation for window exposed to a gust of wind

7.3.1 Test for locking opening devices

See figures 37 to 45.

7.3.2 Test for restricted opening devices

See figure 46.

8 Expression of results

For each test, record the results as indicated in clause 7.

Note also any incidents that occurred during the test and the general condition of the window after the test.

9 Test report

The test report shall include the following information:

a) detailed information about the type and dimensions, shape and construction of the specimen;

b) thickness, type of glass and method of glazing;

c) description of hardware used;

d) method of closing the specimen;

e) the forces necessary for operating the window;

f) the reaction of the window to mechanical tests simulating misuse;

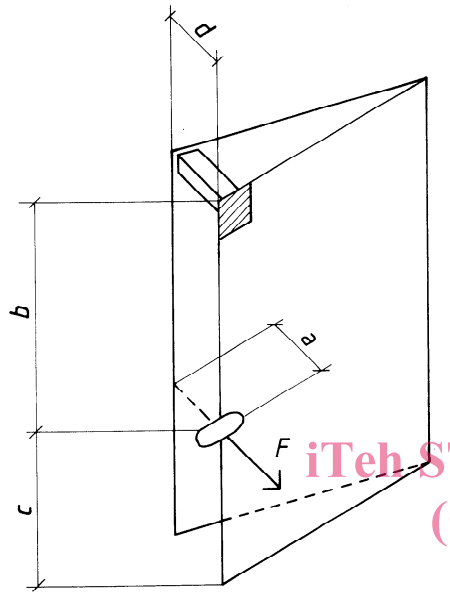
g) the efficiency of locking opening or restricted opening devices, if fitted.

Annex

Illustrations of test procedures [1)]

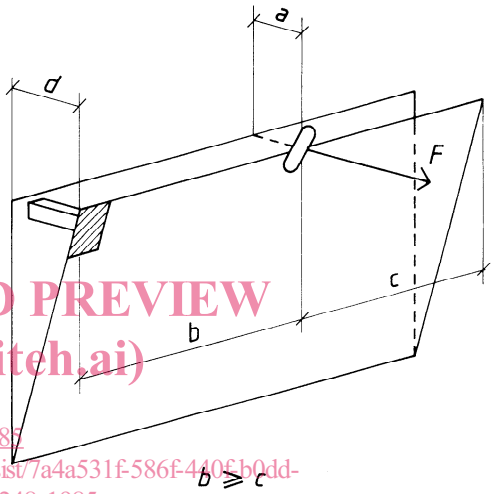
A.1 Warping test

A.1.1 Hinged windows



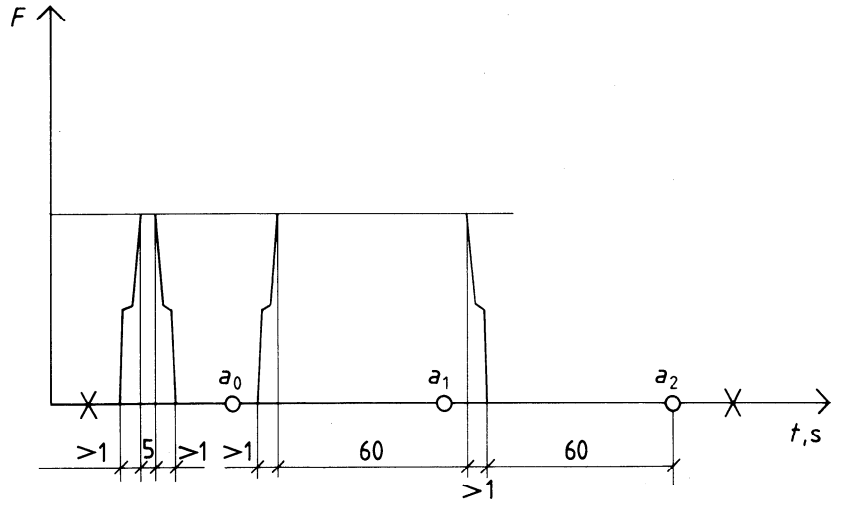
$b \geqslant c$
$d \leqslant 50\ mm$

Figure 7 — Type 1 window



$b \geqslant c$
$d \leqslant 50\ mm$

Figure 8 — Type 2 window



$a_1 - a_0 =$ mm
$a_2 - a_0 =$ mm

Figure 9 — Test procedure

1) See the table for explanation of window type.

A.1.2 Vertically pivoted windows

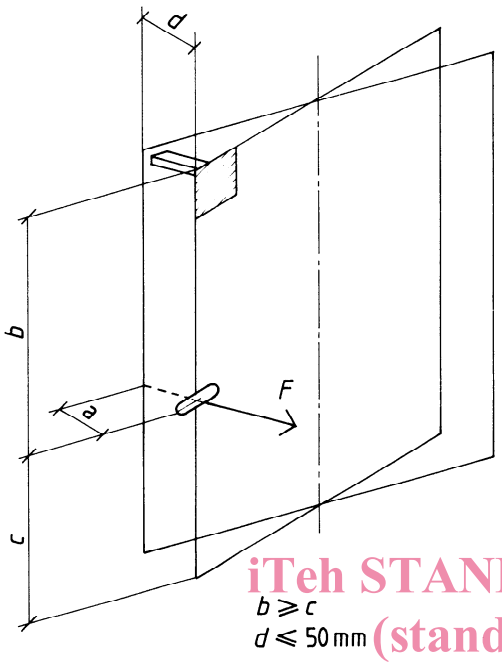


Figure 10 — Type 3 window

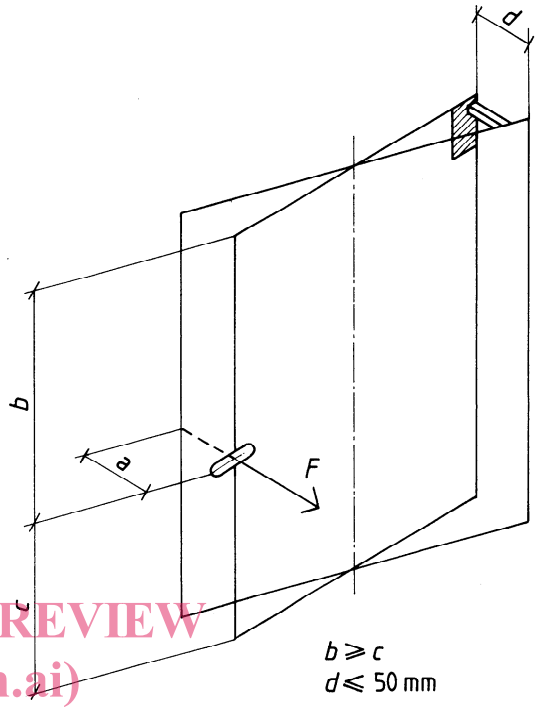
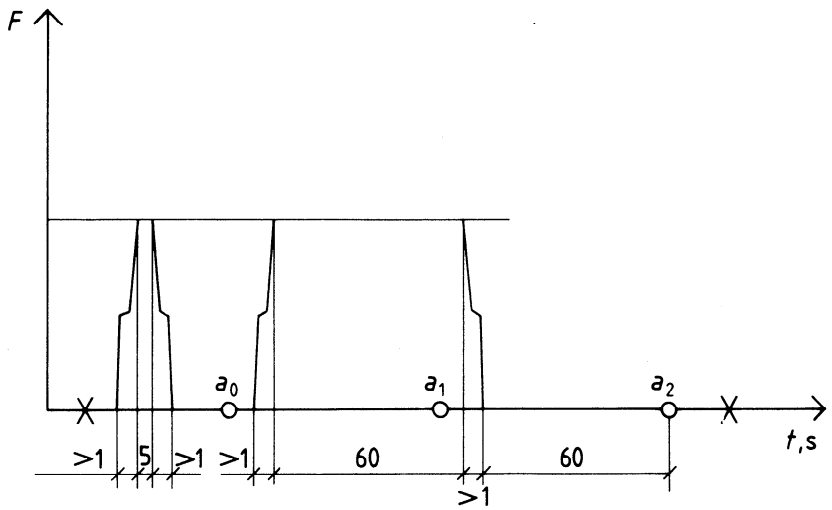


Figure 11 — Type 3 window



$a_1 - a_0 =$ mm
$a_2 - a_0 =$ mm

Figure 12 — Test procedure