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Thermal insulating products for building applications -

Determination of bending behaviour

建筑用绝热制品 弯曲性能的测定

(ISO 12344:2010, IDT)

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Table of Contents

Foreword	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	5
4 Principle	5
5 Apparatus	6
6 Specimens	8
7 Procedure	9
8 Calculation and expression of results	10
9 Precision	11
10 Test report	12

Thermal insulating products for building applications - Determination of bending behaviour

1 Scope

This standard specifies the test equipment and procedures for determining the three-point bending behaviour of full-size products (Method A) and small specimens (Method B). This standard applies to thermal insulating products for building applications.

This standard is applicable to the determination of the bending strength of products and the deformation under specified loads.

This standard can be used to determine the bending stress that products can withstand during transportation and application.

2 Normative references

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

ISO 5725-1 Accuracy (trueness and precision) of measurement methods and results
- Part 1: General principles and definitions

ISO 5725-2 Accuracy (trueness and precision) of measurement methods and results
- Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method

ISO 29465 Thermal insulating products for building applications - Determination of length and width

ISO 29466 Thermal insulating products for building applications - Determination of thickness

ISO 29768 Thermal insulating products for building applications - Determination of linear dimensions of test specimens

6 Specimens

6.1 Dimensions of specimens

6.1.1 Method A

The specimen is a full-size product. The specimen shall be rectangular and cut according to the following dimensions:

- thickness: the original thickness of the product;
- length: the length of the full-size product, with a maximum of 1300 mm;
- width: the width of the full-size product; if limited by the testing machine, the width shall be at least 300 mm.

6.1.2 Method B

The specimen shall be rectangular and cut according to the following dimensions:

- thickness: the original thickness of the product; the maximum thickness is 100 mm;
- length: 5 times the nominal thickness of the product plus 50 mm (not exceeding 550 mm);
- width: 150 mm.

Specimens of other dimensions may be specified in accordance with relevant product standards or technical specifications, or may be agreed upon by all relevant parties.

6.2 Number of specimens

The number of specimens shall be specified in accordance with relevant product standards or technical specifications. If there are no relevant regulations, there shall be no less than 3 specimens.

If there are no relevant product standards or technical specifications, the number of specimens can be agreed upon by all relevant parties.

If the direction of the bending force endured by the product in its application cannot be known, and/or the two main surfaces of the product have different skins, facings and/or coatings, additional specimens shall be tested.

6.3 Specimen preparation

The specimen preparation method shall not destroy the original structure of the product.

Any skins, facings and/or coatings shall be retained.

6.4 Conditioning of specimens

The specimens shall be placed in an environment of (23 ± 5) °C for at least 6 hours. In case of dispute, the specimens shall be placed in an environment of (23 ± 2) °C and (50 ± 5) % relative humidity for the time specified in the relevant product standards, for at least 6 h.

In tropical areas, different specimen conditioning and test environments can be used. In this case, the temperature and relative humidity shall be (27 ± 2) °C and (65 ± 5) % respectively, and shall be noted in the test report.

7 Procedure

7.1 Test environment

The test shall be carried out at (23 ± 5) °C. In case of dispute, the test shall be conducted in an environment of (23 ± 2) °C and (50 ± 5) % relative humidity.

In tropical areas, different specimen conditioning and test environments can be used. In this case, the temperature and relative humidity shall be (27 ± 2) °C and (65 ± 5) % respectively, and shall be noted in the test report.

7.2 Test procedures

Measure the length and width of the full-size product specimen (Method A) in accordance with ISO 29465, and measure the thickness of the specimen in accordance with ISO 29466.

Measure the length, width, and thickness of the specimen (Method B) in accordance with ISO 29768, accurate to $\pm 1\%$.

The span L shall meet the following requirements, accurate to $\pm 0.5\%$:

- Method A: subtract 100 mm from the length of the full-size product;
- Method B: 5 times the nominal thickness of the specimen.

Other spans are specified according to relevant product standards or agreed upon by all relevant parties.

Place the specimen symmetrically on the two support edges, with the loading direction perpendicular to the long axis of the specimen.

Adjust the test speed to (10 ± 1) mm/min.

Record the force-deflection curve and mark the maximum force F_m (see Figure 3).

Record the specimen failure mode.

8 Calculation and expression of results

8.1 Overview

Take the average value of all measured values as the test result, rounded to 3 significant figures.

The results shall not be used to extrapolate products of other thicknesses.

8.2 Bending strength

The bending strength σ_b is calculated according to formula (1), expressed in kPa:

$$\sigma_b = 3 \times 10^3 \times \frac{F_m \times L}{2 \times b \times d^2} \dots\dots\dots (1)$$

where:

F_m -- the maximum applied force, in Newtons (N);

L -- the span, in millimeters (mm);

b -- the width of the specimen, in millimeters (mm);

d -- the thickness of the specimen, in millimeters (mm).

8.3 Bending stress and deflection

All displacements X and the corresponding force F_X can be obtained from the force-deflection curve. This procedure can be seen in Figure 3.

The bending stress σ_X is calculated according to formula (2), expressed in kPa:

$$\sigma_X = 3 \times 10^3 \times \frac{F_X \times L}{2 \times b \times d^2} \dots\dots\dots (2)$$

where:

F_X -- the force corresponding to the displacement X , in Newtons (N);

L -- the span, in millimeters (mm);

b -- the width of the specimen, in millimeters (mm);

10 Test report

The test report shall include the following:

- a) A state that the test is carried out according to this standard;
- b) Product identification:
 - 1) Product name, company name, and manufacturer or supplier;
 - 2) Product code;
 - 3) Product specifications;
 - 4) Packaging;
 - 5) The status of the product when arriving at the laboratory;
 - 6) Facing or coating;
 - 7) Other relevant information (such as the nominal thickness and nominal density);
- c) Test steps:
 - 1) Sampling, such as sampling personnel and sampling locations;
 - 2) Test environment;
 - 3) Any deviations related to Chapters 6 and 7;
 - 4) Test date;
 - 5) Relevant test information:
 - Test method (Method A or Method B);
 - The direction of the force applied during the test;
 - Dimensions of specimens;
 - Span;
 - Load distribution plates;
 - The position of the facing (or coating) relative to the loading edge;
 - 6) Any other information that may affect the results;

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