H-56-14

International Standard 7850

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

Cellular plastics, rigid — Determination of compressive creep

Plastiques alvéolaires rigides — Détermination du fluage en compression

First edition — 1986-08-15

UDC 678-405.8 : 620.173.2 **Ref. No. ISO 7850-1986 (E)**

Descriptors : plastics, rigid plastics, cellular plastics, tests, creep tests.

Price based on 3 pages

Foreword

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International Standard ISO 7850 was prepared by Technical Committee ISO/TC 61, *Plastics*.

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Printed in Switzerland

INTERNATIONAL STANDARD ISO 7850-1986 (E)

Cellular plastics, rigid — Determination of compressive creep

1 Scope and field of application

This International Standard specifies a method for the determination of compressive creep under various conditions of stress, temperature and relative humidity.

2 References

ISO 291, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 1923, *Cellular plastics and rubbers — Determination of linear dimensions.*

3 Principle

Deformation due to compressive stress is determined under specified conditions of time, temperature, relative humidity and applied stress.

4 Apparatus

4.1 Dial-gauge micrometer, as specified in ISO 1923, or equivalent.

4.2 Test chamber, capable of being maintained within ± 2 °C of the required temperature and within ± 5 % of the required relative humidity.

4.3 Loading device, consisting of two flat plates, at least one of which shall be movable, so arranged that they compress the test specimen in a vertical direction. The movable plate shall be guided in such a manner as to be self-aligning and with its lateral movement restricted to less than 1 mm. The plates shall be capable of being loaded as required without bending and so that during the period of test the static stress does not change by more than ± 5 %. The distance between the plates shall be capable of being measured to within 0,1 mm. The apparatus shall be placed on a substantial support to minimize the effects of vibration.

5 Test specimens

5.1 Dimensions

The test specimens may be either square or circular with the area of the surface to which the stress is to be applied being at least 25 cm^2. The standard specimen thickness shall be 50 ± 1 mm. Minimum thickness shall be 20 ± 1 mm. For specimens exceeding 50 mm in thickness, the area of the surface to be stressed shall be at least equal to the square of the thickness. The distance between the two test surfaces shall not vary by more than 1 % (tolerance on parallelism). Material skins that form an integral part of the product in its end use application shall be retained.

NOTE — Test results of materials with and without integral skins and/or of different thicknesses are not comparable.

5.2 Preparation

Specimens shall be cut from the sample in such a manner that the thickness direction shall correspond to the direction in which the compressive force will be applied in the intended end use of the material. If this direction is unknown, then two sets of specimens shall be tested in the two principal directions of anisotropy.

Specimens shall be prepared using a mechanical saw, knife or other cutting device and in such manner as to assure that the specimens are undamaged.

5.3 Conditioning

The test specimens shall be conditioned for a minimum of 24 h in the standard atmosphere of 23 ± 2 °C and 50 ± 5 % RH, as specified in ISO 291.

5.4 Number of test specimens

At least three specimens shall be tested for each set of test conditions.

6 Procedure A: Loading at standard conditions

6.1 After conditioning, measure the thickness of each specimen to the nearest 0,1 mm using the dial-gauge micrometer (4.1). Measurements shall be taken at a minimum of three locations and the mean thickness (H_1) calculated.

6.2 Place the test specimen in the loading device (4.3), apply the selected stress uniformly and within 60 ± 10 s determine the thickness of the loaded specimen (H_2). Place the loaded

specimen in the test chamber (4.2), previously stabilized at the selected temperature and relative humidity conditions. Measure its thickness (H_3) at the agreed time-intervals (see 8.4) at the selected test conditions.

7 Procedure B: Loading at selected temperature and relative humidity

7.1 After conditioning, measure the thickness of each specimen to the nearest 0,1 mm using the dial-gauge micrometer (4.1), taking the measurements at a minimum of three locations and calculating the mean thickness (H_1).

7.2 Place the unloaded test specimen and the loading apparatus in the test chamber (4.2), previously stabilized at the selected temperature and relative humidity conditions. After 24 h, apply the selected stress uniformly to the test specimen and measure its thickness (H_4) within 60 ± 10 s. At the agreed time intervals (see 8.4), measure the specimen thickness (H_5) at the selected test conditions.

8 Recommended test conditions

Test conditions shall be agreed upon by the interested parties. The following are recommended:

8.1 Temperature: 23, 40, 60, 80, 100, 120, 140 ± 2 °C.

8.2 Stress: 10, 20, 30, 40, 50, 70, 100, 150 kPa ± 5 %.

8.3 Relative humidity: 0, 5, 50, 90 ± 5 % or ambient.

8.4 Time: 1, 2, 7, 14, 28 days ± 5 %. Longer time intervals may be used if long-term studies are needed.

9 Expression of results

9.1 Procedure A

9.1.1 Calculate the initial percentage deformation due to loading, D_{Ai}, using the equation

$$D_{Ai} = \frac{H_1 - H_2}{H_1} \times 100$$

where

H_1 is the initial thickness of the unloaded specimen after conditioning;

H_2 is the thickness of the specimen after loading at standard conditions for 60 ± 10 s.

9.1.2 Calculate the percentage deformation due to creep, D_{Ac}, using the equation

$$D_{Ac} = \frac{H_2 - H_3}{H_2} \times 100$$

where H_3 is the thickness of the specimen after the selected time at the selected conditions, after initial loading at standard conditions.

9.2 Procedure B

9.2.1 Calculate the initial percentage deformation due to loading at the selected conditions of temperature and relative humidity, D_{Bi}, using the equation

$$D_{Bi} = \frac{H_1 - H_4}{H_1} \times 100$$

where H_4 is the thickness of the specimen after 60 ± 10 s loading at the selected conditions.

9.2.2 Calculate the percentage deformation due to creep, D_{Bc}, using the equation

$$D_{Bc} = \frac{H_4 - H_5}{H_4} \times 100$$

where H_5 is the thickness of the specimen after the selected time at the selected conditions, after the initial loading time at the selected conditions.

10 Precision and accuracy

10.1 The precision of this method is not known because inter-laboratory round robin data are not available.

10.2 The accuracy of this method cannot be determined because standard reference materials are not available.

11 Test report

The test report shall include the following particulars:

a) reference to this International Standard;

b) type of material, sample nominal dimensions, lot identification and/or date of manufacture;

c) the presence or absence of integral skins;

d) the thickness of the test specimens, if other than 50 mm;

e) the direction of applied stress if other than normal to the use direction;

f) the procedure used (A or B), the stress applied, the test temperature and relative humidity, and the duration of loading;

g) the average values of D_{Ai} and D_{Ac} or D_{Bi} and D_{Bc} for the three test specimens;

h) the date the creep test was started.

NOTE — It may be useful to present the test results in graphical form on a semi-logarithmic paper.