
International Standard



3867

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Agglomerated cork material of expansion joints for construction and building — Test methods

Aggloméré de liège — Matériau de remplissage de joints de dilatation pour travaux publics et bâtiments — Méthodes d'essai

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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.

International Standard ISO 3867 was developed by Technical Committee ISO/TC 87, *Cork*, and was circulated to the member bodies in August 1980.

It has been approved by the member bodies of the following countries :

Australia	Portugal	United Kingdom
France	Romania	USSR
Hungary	South Africa, Rep. of	
Italy	Spain	

No member body expressed disapproval of the document.

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Agglomerated cork material of expansion joints for construction and building – Test methods

1 Scope and field of application

This International Standard specifies the test methods to be used for the determination of the following characteristics of agglomerated cork intended for use in filler material of expansion joints between elements of construction in concrete or in similar applications (for example runways, roads, dams, buildings) :

- thickness;
- tensile strength;
- compression;
- compression set;
- transversal expansion;
- swelling in boiling water;
- behaviour in hydrochloric acid at 100 °C;
- behaviour after artificial ageing.

2 Reagent

2.1 Hydrochloric acid, concentrated, $\rho_{20} = 1,19$ g/ml.

3 Apparatus

3.1 Chronometer.

3.2 Conditioning chamber, adjustable for temperature and humidity.

3.3 Electric oven, capable of being controlled at 103 ± 2 °C.

3.4 Tensile testing machine, accurate to 1 N, with one fixed jaw and one mobile jaw, 12 mm apart. The mobile jaw shall move unloaded at a speed of 300 mm/min.

3.5 Static load press, with a non-deformable plane plate of dimensions greater than those of the test pieces and equipped with the following items :

3.5.1 Cylindrical steel pressure plate, of diameter 28,2 mm (625 mm² surface area), fitted on the movable head.

3.5.2 Micrometer, accurate to 0,01 mm, fitted on the movable head and giving by direct reading the thickness of the compressed material.

3.5.3 Weights, for adjusting the load applied by the movable head.

3.6 Variable load press, with a non-deformable plate of dimensions greater than those of the test pieces and equipped with the following items :

3.6.1 Cylindrical steel pressure plate, fitted on the movable head and with dimensions identical to or greater than those of the test pieces.

3.6.2 Micrometer, accurate to 0,01 mm.

3.7 Transverse expansion testing device (see the figure), equipped with the following items :

3.7.1 Ground rigid metal plate, on which the test specimen tests.

3.7.2 Stop, fitted on the rigid plate (3.7.1), against which the test specimen comes to rest.

3.7.3 Dial micrometer, accurate to 0,01 mm, equipped with a rod carrying a cylindrical feeler of diameter 20 mm, the axis of which is 12 mm away from the base and which applies a load of 1 to 2 N to the face of the test specimen opposite to the stop.

3.8 Open container, for water.

3.9 Heating device, for hydrochloric acid test, adjustable for temperature.

3.10 Metal rule, graduated in 0,5 mm.

3.11 Cutting dies.

3.12 Graduated thermometer, accurate to 1 °C.

3.13 Refrigerator, capable of reaching temperatures down to -25 °C.

3.14 Vernier calliper.

Table — Dimensions and number of test pieces

Characteristics	Dimensions of test pieces mm	Number of test pieces	Remarks
Thickness	50 × 50	9	The test pieces can be used for tests specified in 5.6, 5.7 and 5.8
Tensile strength	50 × 100	5	
Compressibility and recovery	50 × 50	3	
Transverse expansion	100 × 100 × 50	3	The user who wishes to do the test must receive a sample of the material with these dimensions
Swelling in boiling water	50 × 50 or cylindrical having sectional area of 625 mm ²	3	
Behaviour in hydrochloric acid at 100 °C	50 × 50 or cylindrical having sectional area of 625 mm ²	3	
Behaviour after artificial ageing	50 × 50 or cylindrical having sectional area of 625 mm ²	3	

4 Test pieces

4.1 Preparation

Use the dies (3.11) to cut from each unity of the material to be tested, the test pieces situated at the edges and the middle of the sample, in accordance with the table.

4.2 Conditioning

Unless otherwise specified, tests shall be carried out at room temperature on test pieces conditioned in the oven (3.2) for 24 ± 4 h at 20 ± 2 °C and 65 ± 5 % relative humidity.

5 Test methods

5.1 Determination of thickness

If the thickness of the test piece is less than 10 mm, use the press (3.5), apply the pressure plate (3.5.1) to the centre for 15 s under a load of 7 kPa, and read the thickness on the micrometer (3.5.2).

If the thickness of the test piece is greater than 10 mm, carry out the determination with the vernier calliper (3.14).

Take as the thickness of the sample the average of the results obtained for the nine test pieces tested.

Express the results in millimetres rounded off to the nearest 0,1 mm.

5.2 Determination of tensile strength

5.2.1 Procedure

Clamp each test piece with the long edges vertical, in the jaws of the machine (3.4), set the machine in operation and record the force at which rupture occurs.

Any test piece the rupture of which occurs in the jaws or near a jaw shall be rejected and replaced by another test piece.

5.2.2 Expression of results

The tensile strength of each test piece, expressed in megapascals, is given by the formula

$$\frac{F}{bd}$$

where

F is the force at which rupture occurs, in newtons, rounded off to the nearest integer;

b is the width of the test piece, in millimetres, rounded off to the nearest integer;

d is the thickness of the test piece, in millimetres, rounded off to the nearest 0,1 mm.

Take as the tensile strength of the sample the average of the values obtained from the test pieces tested.

Express the result rounded off the nearest 0,01 MPa.

5.3 Determination of compression

5.3.1 Procedure

Place each test piece on the stationary plate of the press (3.5), place the pressure plate (3.5.1) over its centre and apply pressure, without impact and with application of load sufficient to compress 50 % in not less than 30 s and not more than 60 s.

5.3.2 Expression of results

The compression of each test piece, expressed in megapascals, is given by the formula

$$\frac{F}{S}$$

where

F is the load required to compress the test piece to 50 % of its original thickness, in newtons, rounded off to the nearest integer;

S is the area of the pressure plate (625 mm²).

Take as the compression of the sample the average of the values obtained from the test pieces tested.

Express the result rounded off to the nearest 0,01 MPa.

5.4 Compression set

5.4.1 Procedure

Carry out a compression test as specified in 5.3. As soon as the test piece is compressed to 50 % of its original thickness, reduce the pressure to zero. Wait for 1 h + ¹⁵/₀ min and apply pressure again, without impact, until the test piece is compressed to 50 % of its second thickness.

Remove the pressure immediately, wait for 1 h and repeat the process again. Record the pressures applied and the different thicknesses of the test piece.

5.4.2 Expression of results

The compression set of each test piece, expressed as a percentage, is given by the formula

$$\frac{d_0 - d_r}{d_0} \times 100$$

where

d_0 is the original thickness of the test piece, in millimetres, rounded off to the nearest integer;

d_r is the thickness of the test piece 1 h after the last test, in millimetres, rounded off to the nearest integer.

Take as the compression set of the sample the average of the values obtained from the test pieces tested.

Express the result rounded off to the nearest 1 %.

5.5 Determination of transverse expansion

5.5.1 Procedure

Measure the original thickness of the test piece in accordance with 5.1. Place the test piece in the device (3.7) and apply by press (3.6) an increasing load until the test piece is compressed to 20 % of its original thickness.

5.5.2 Expression of results

The transversal expansion as measured by the comparator is expressed in millimetres to within 0,01 mm.

5.6 Determination of swelling in boiling water

5.6.1 Procedure

Measure the original thickness of each test piece in accordance with 5.1. Immerse the test pieces in boiling water for 1 h, remove them and allow to stand at ambient temperature for 15 min.

Measure the final thickness in accordance with 5.1.

5.6.2 Expression of results

Swelling of each test piece in boiling water, expressed as a percentage, is given by the formula

$$\frac{d_1 - d_0}{d_0} \times 100$$

where

d_0 is the original thickness of the test piece, in millimetres, rounded off to the nearest integer;

d_1 is the final thickness of the test piece, in millimetres, rounded off to the nearest integer.

Take as the swelling of the sample the average of the values obtained from the test pieces tested.

Express the results rounded off to the nearest integer.

5.7 Determination of behaviour in hydrochloric acid at 100 °C

5.7.1 Procedure

Boil the test pieces for 1 h in the hydrochloric acid (2.1) in a covered beaker in an extracted area. Remove the test pieces and examine them visually.

5.7.2 Expression of results

The result of the test is given in terms of presence or lack of disintegration¹⁾ in the agglomerated cork.

5.8 Determination of behaviour after artificial ageing

5.8.1 Procedure

Place the test pieces for 7 days in the oven (3.3) controlled at 75 ± 2 °C. At the end of this period, remove them from the oven and immerse them in water at ambient temperature for 24 h. After this treatment, place them in the container (3.8) and pour in water to a depth of half the length of the test pieces. Keep the test pieces in place by suitable means.

Place the container holding the partially immersed test pieces in the refrigerator (3.13) and keep it there during the period of time needed to freeze the water completely.

Keep the temperature between -20 and -10 °C, then remove the container from the refrigerator and partly immerse it in water at 20 ± 2 °C.

The first cycle is completed when the ice surrounding the test pieces has entirely thawed. Repeat the process seven times, then remove the test pieces from the water and place them in

the conditioning chamber (3.2), maintained at standard temperature and relative humidity. After 48 h, remove the test pieces and examine them visually.

5.8.2 Expression of results

The result of the test is given in terms of presence or lack of disintegration in the agglomerated cork.

6 Test report

The test report shall include the following information :

- a) all results obtained and the average of five determinations;
- b) the method used;
- c) all operating details not specified in this International Standard (particularly, for the artificial ageing test, dimensions of the container, duration of the operation and effective temperature obtained) or details regarded as optional;
- d) any circumstances which may have influenced the results;
- e) all data needed to fully identify the sample.

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1) A specimen is said to disintegrate if it cracks open and/or if it shows substantial separation of particles during the test.