BS 8449:2005

Building and construction sealants with movement accommodation factors greater than 25 % — Method of test for determination of adhesion/cohesion properties at variable temperatures

ICS 91.100.50

Confirmed
January 2011

BSI
British Standards

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee B/547, Sealants for building and construction, upon which the following bodies were represented:

Association of Sealant Applicators

BRE — Building Research Establishment

British Adhesives and Sealants Association

Flat Glass Manufacturers' Association

Glass and Glazing Federation

Institution of Civil Engineers

Water UK

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 11 February 2005

Amendments issued since publication

Amd. No.	Date	Comments

The following BSI references relate to the work on this British Standard:
Committee reference B/547
Draft for comment 04/30101494 DC

ISBN 0 580 44831 2

Contents

Foreword

This British Standard has been prepared by Technical Committee B/547.

The scope of this British Standard is relevant to a group of sealants with high movement accommodation factors (MAFs) not covered by any other existing or provisional, British or International Standard.

Experience has shown that extending the method described in BS EN ISO 9047 to test sealants with a MAF greater than 25 % does not accurately reflect the behaviour of the sealant in service.

This standard addresses this issue by using a definition of MAF that takes into account the difference in behaviour between compression and extension. The test method anticipates such properties.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 7 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

1 Scope

This British Standard specifies requirements for sealants with a movement accommodation factor (MAF) greater than 25 %, which are selected according to the procedures in BS 6213 and BS 6093 and are installed according to the procedures in BS 8000-16.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 26927, *Building construction — Jointing products — Sealants — Vocabulary.*

BS ISO 13640, *Building construction — Jointing products — Specifications for test substrates.*

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS EN 26927 apply.

4 Principle

Test specimens are prepared, in which the sealant to be tested adheres to two parallel contact surfaces. After submission to cycles of compression and extension under defined conditions, the test specimens are examined for evidence of loss of adhesion or cohesion.

5 Materials

5.1 Substrate materials

The substrates used shall conform to BS ISO 13640.

Select the substrate material(s) from mortar, and/or aluminium, and/or glass, or from other substrate materials as agreed by the parties concerned.

Two substrate pieces of the same material shall be used for each test specimen. These shall have a cross-section of dimensions as shown in Figure 1 or Figure 2, depending on the material. Test substrates and spacers (see **5.2**) of other dimensions may be used, but the dimensions of the sealant bead and the area of adhesion shall be the same as those shown in Figure 1 and Figure 2 [(12 ± 1) mm and (12 ± 1) mm × (50 ± 1) mm respectively].

5.2 Spacers

Spacers for the preparation of the test specimens shall be rigid and of dimensions (12 ± 1) mm × (12 ± 1) mm × (12 ± 1) mm with an anti-adherent surface.

5.3 Anti-adherent material

The test specimens shall be prepared upon a non-adhesive material, e.g. polyethylene film.

NOTE The choice of material should follow the advice of the sealant manufacturer.

6 Equipment

6.1 *Ventilated convection type oven*, capable of being maintained at (70 ± 2) °C.

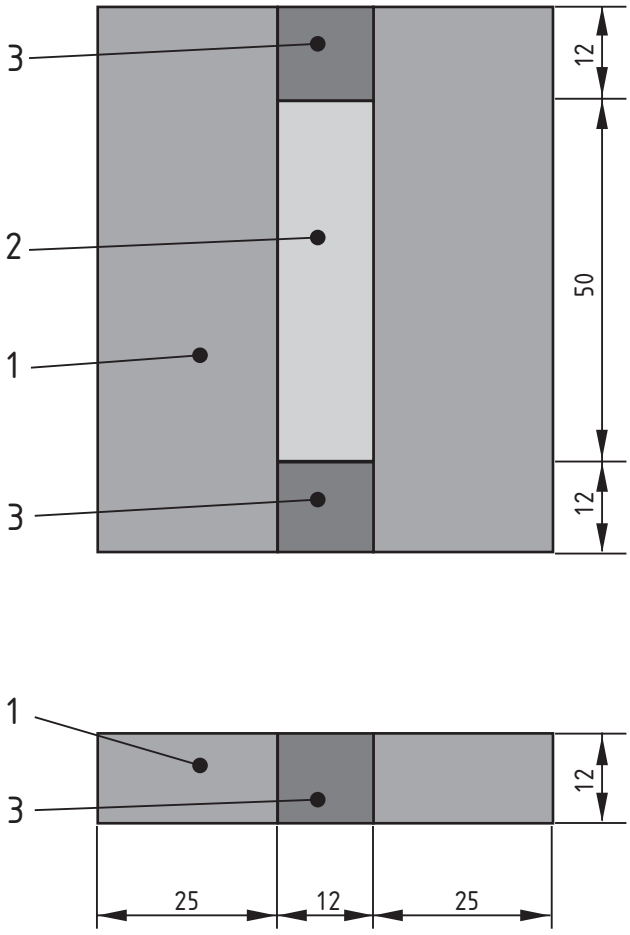
6.2 *Refrigerated enclosure*, capable of being maintained at (–20 ± 2) °C.

6.3 *Container for water immersion* of the specimens for conditioning according to method B (**8.2**).

6.4 *Test machine*, capable of extending and compressing the test specimens at a rate of (5.5 ± 0.7) mm/min.

6.5 *Measuring device*, capable of measuring the depth of cracks and tears, in the sealant bead, to a resolution of 1 mm.

All dimensions are in millimetres

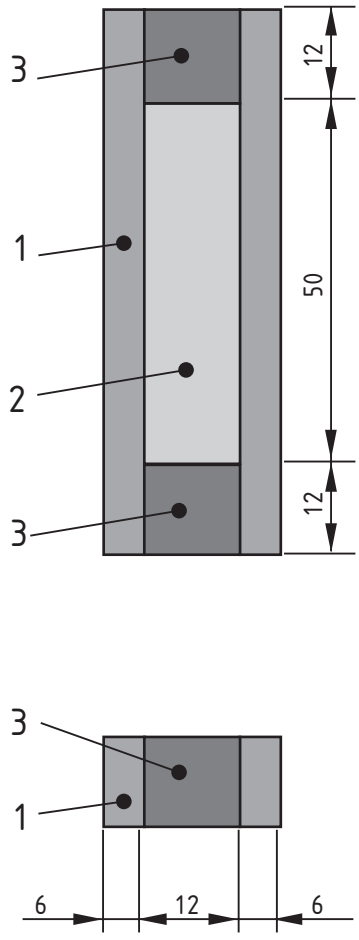


Key

1 Mortar substrate
2 Sealant under test
3 Spacers

Figure 1 — Test specimen with mortar substrates

All dimensions are in millimetres



Key

1 Aluminium or glass substrate

2 Sealant under test

3 Spacers

Figure 2 — Test specimen with aluminium or glass substrates

7 Preparation of test specimens

7.1 For each substrate material, prepare three test specimens.

7.2 For each specimen, assemble two substrates (**5.1**) and two spacers (**5.2**), as described by Figure 1 or Figure 2, upon the anti-adherent material (**5.3**).

7.3 Follow the instructions of the sealant manufacturer concerning, for instance, whether a primer should be used and the mixing procedure for multi-component sealants.

Fill the hollow volume formed by the substrates and spacers with the sealant, taking the following precautions:

a) avoid the formation of air bubbles;

b) press the sealant in order that it makes good contact with the substrates;

c) tool the sealant surface so that it is flush with the top faces of the substrates and spacers.

7.4 Keeping the pieces in the arrangement described in Figure 1 or Figure 2, set the test specimens on the edge of one of the substrates.

7.5 Remove the anti-adherent surface as soon as practicable. Store the specimens in this position during pre-conditioning. Keep the spacers in place during pre-conditioning and conditioning.

7.6 Pre-condition the sealant and the substrate material for 24 h at (23 ± 2) °C.

8 Conditioning of test specimens

8.1 Conditioning method A

Condition the test specimens for 28 days at (23 ± 2) °C and (50 ± 5) % relative humidity.

8.2 Conditioning method B

First condition the test specimens according to method A and subsequently subject them three times to the following storage cycle:

a) 3 days in the oven (**6.1**) at (70 ± 2) °C;

b) 1 day in distilled water (**6.3**) at (23 ± 2) °C;

c) 2 days in the oven (**6.1**) at (70 ± 2) °C;

d) 1 day in distilled water (**6.3**) at (23 ± 2) °C.

Alternatively, this cycle may be carried out in the sequence: c) – d) – a) – b).

Store the test specimens for a further period of 24 h at (23 ± 2) °C and (50 ± 5) % relative humidity before testing.

NOTE Conditioning method B is a normal conditioning procedure using the influence of heat and water. It is not intended to give information on the durability of the sealant.

9 Procedure

9.1 Pre-examination

After preparation and conditioning, the sealant test pieces shall be examined for defects. Any test specimens deemed unsuitable for testing shall be rejected. Remove the spacers.

9.2 Calculation of test parameters

The speed of extension and compression used in the test procedure shall be (5.5 ± 0.7) mm/min.

The amplitudes of movement to be used during testing, depending on the expected MAF, shall be as shown in Table 1.

Table 1 — Test amplitudes

Movement accommodation factor (MAF) %	Extension %	Compression %	Width after extension mm	Width after compression mm
35	35	26	16.2	8.8
50	50	34	18.0	7.9
70	70	42	20.4	6.9
100	100	50	24.0	6.0

If a sealant is to be tested for a MAF value other than those shown in Table 1, then the following equations give the extension and compression required:

$$E = k_{\mathrm{MAF}} \tag{1}$$

$$C = \frac{100 k_{\mathrm{MAF}}}{100 + k_{\mathrm{MAF}}} \tag{2}$$

where:

E is the extension (%);

C is the compression (%);

k_{MAF} is the movement accommodation factor.

9.3 Test

9.3.1 *First week*

Day 1: Place the test specimens in the refrigerated enclosure (**6.2**) at (–20 ± 2) °C. After three hours, extend the test specimens in the test machine (**6.4**) to the required extension. Maintain the extension at (–20 ± 2) °C for 21 h.

Day 2: Release the extension. Place the test specimens in the oven (**6.1**) at (70 ± 2) °C. After three hours compress the test specimens in the test machine (**6.4**) to the required compression. Maintain the compression for 21 h at 70 °C.

Day 3: Release the compression and follow the procedure of Day 1.

Day 4: Follow the procedure of Day 2.

Days 5 to 7: Release the compression, store at (23 ± 2) °C and (50 ± 5) % relative humidity without applying any mechanical force.

9.3.2 *Second week*

Repeat the procedure of the first week.

10 Test specimen examination and definition of failure

10.1 After the test specimens have been submitted to the above cycles, examine them for loss of cohesion and/or adhesion. Measure the depth of any adhesive or cohesive failures using the measuring device (**6.5**).

10.2 Record the maximum depth of adhesion loss or cohesion loss and the position of that maximum for each test specimen.

10.3 If loss of adhesion or loss of cohesion exceeds two millimetres anywhere on the sealant surface, the sealant test piece shall be reported as having failed.

10.4 If two or more of the test specimens fail, the sealant shall be reported as having failed.

10.5 If only one test specimen fails then the complete test shall be repeated. If, after the repeated test, one or more test specimens fail, the sealant shall be reported as having failed.

11 Test report

The test report shall contain the following information:

a) laboratory's name and date of test;

b) reference to this British Standard, i.e. BS 8449;

c) name and type of sealant;

d) identification of the sealant batch from which the test specimens were produced;

e) substrates used (see **5.1**);

f) primer(s) used, if applicable;

g) method of conditioning;

h) MAF tested for and the extension/compression cycle used (see Clause **9**);

i) location and maximum value of the depth of adhesion loss or cohesion loss for each test specimen;

j) which test specimens, if any, have passed;

k) which test specimens, if any, have failed;

l) whether the sealant has passed or failed; and

m) any deviation from the procedure specified in this standard.

Bibliography

Standards publications

BS 6093, *Code of practice for design of joints and jointing in building construction.*

BS 6213, *Selection of construction sealants — Guide.*

BS 8000-16, *Workmanship on building sites — Code of practice for sealing joints in buildings using sealants.*

BS EN ISO 9047, *Building construction — Jointing products — Determination of adhesion/cohesion properties of sealants at variable temperatures.*

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL