BRITISH STANDARD

BS 3712-2: 1973

Incorporating Amendment Nos. 1 and 2

Building and construction sealants —

Part 2: Methods of test for seepage, staining, shrinkage, shelf life and paintability

Confirmed December 2011

UDC 691.58:620.1

Co-operating organizations

The Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

British Association of Synthetic Rubber Manufacturers
British Rubber and Resin Adhesive Manufacturers' Association
British Rubber Manufacturers' Association
British Tar Industries Association
British Whiting Federation
Chemical Industries Association Limited
Confederation of British Industry
Department of the Environment
Department of the Environment — Building Research Establishment
Flat Glass Manufacturers' Association
Greater London Council
Institution of Civil Engineers
Insulation Glazing Association
Mastic Asphalt Council and Employers Federation
Metal Window Federation of Great Britain
National Association of Putty and Building Mastics Manufacturers
National Council of Building Material Producers
National Federation of Building Trades Employers
Natural Rubber Producers' Association
Royal Institute of British Architects
Sealant Applicators' Association
Sealant Manufacturers' Conference
Society of Chemical Industry
Welwyn Hall Research Association
Whiting and Industrial Powders Research Council
Individual manufacturers

This British Standard, having been approved by the Building Divisional Council, was published under the authority of the Executive Board on 19 October 1973

First published April 1964
First revision October 1973

The following BSI references relate to the work on this standard:
Committee references B/89, B/89/1
Draft for comment 72/11191 DC

ISBN 0 580 07626 1

Amendments issued since publication

Amd. No.	Date of issue	Comments
4861	August 1985	
6818	September 1991	Indicated by a sideline in the margin

Contents

		Page
Co-operating organizations		Inside front cover
Foreword		ii
1	General	1
1.1	Scope	1
1.2	Definition	1
1.3	Sampling	1
2	Tests and methods	1
2.1	Seepage	1
2.2	Staining	1
2.3	Shrinkage	2
2.4	*Text deleted*	3
2.5	Shelf life	3
2.6	Paintability	4
Figure 1 — Seepage test ring		5
Publications referred to		6

Foreword

This British Standard was originally issued under the authority of the Building Divisional Council, B/-, in 1973 and has been amended and confirmed under the direction of the Elements and Components (of Diverse Materials) for Buildings Standards Committee in 1985. For further information see the foreword in BS 3712-1:1991 and the following standards:

BS EN 27390, BS EN 28394, BS EN 29046, BS EN 29048 and ISO 9047.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their 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 6, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 General

1.1 Scope

This Part of BS 3712 describes test methods for the following properties of building and construction sealants.

1) Seepage.
2) Staining.
3) Shrinkage.
4) Shelf life.
5) Paintability.

NOTE The titles of the British Standards referred to in this standard are listed on the page 6.

1.2 Definition

For the purpose of this Part of this British Standard, the following definition applies:

building sealant

a joint sealant for buildings applied by hand, gun, knife, or trowel, or in strip form, or by pouring, and intended to maintain a seal between the sides of a joint which is subject to some degree of movement. The strip form materials covered by this definition are plastic at the time of application, i.e. readily deformable but not capable of reverting to their original shape

1.3 Sampling

The samples of building sealants to be used in the following determinations and methods of test shall be taken as follows:

Select at random original unopened packages to provide sufficient material for the tests. Alternatively, select sufficient material at random from the bulk supply. Report any skin formation (which should be removed), any separation of components or foreign matter, and any variability between one sample and another. In special circumstances it may be appropriate to take single samples from a gun for specific tests. The method of sampling shall be reported.

2 Tests and methods

2.1 Seepage

2.1.1 General. The object of the seepage test is to ascertain the extent to which the medium of a sealant may be liable to be removed from the solids of the sealant. This test is particularly applicable to one component non-curing sealants.

2.1.2 Apparatus. Three sets each comprising:

1) A brass ring conforming to Figure 1.
2) A flat bottomed metal 200 g weight greater than 22 mm diameter.
3) 10 Whatman No. 1 filter papers.
4) A piece of non-absorbent film such as polyethylene greater than 25 mm in diameter.
5) A glass plate of convenient size.

2.1.3 Procedure. Prepare 3 test assemblies, each as follows:

Stand one brass ring, with its chamfered edge downwards, centrally on a pad of 10 filter papers, which has previously been placed on a glass plate. Fill the brass ring with sealant and knife off level with the top of the ring. Place a piece of non-absorbent film on top of the ring, then stand a 200 g weight on top of the film centrally over the ring.

Store each of the test assemblies at room temperature in the dark, one for 72 h, one for 7 days and one for 14 days. Examine each assembly at the end of the storage period.

2.1.4 Reporting. Record the degrees of seepage spread (S_1, S_2, S_3) and seepage depth (d_1, d_2, d_3)

where d_1 = the number of filter papers penetrated by the medium of the sealant after 72 h,

d_2 = the number of filter papers penetrated by the medium of the sealant after 7 days,

d_3 = the number of filter papers penetrated by the medium of the sealant after 14 days.

S_1 = the distance in millimetres from the periphery of the brass ring to the farthest point of seepage on the top filter paper after 72 h,

S_2 = the distance in millimetres from the periphery of the brass ring to the farthest point of seepage on the top filter paper after 7 days,

S_3 = the distance in millimetres from the periphery of the brass ring to the farthest point of seepage on the top filter paper after 14 days.

2.2 Staining

2.2.1 General. The staining tests are used to assess the visual effect which any separated medium may have on an absorbing building material.

2.2.2 Staining by seepage. The seepage values obtained in the test described in **2.1** indicate the extent to which the specimen may lose its medium to the surrounding surface when in use.

Whether staining takes place or not, undue seepage represents a defect in the sealant under test. Nevertheless the degree to which the colour of a stain contrasts with the colour of the material stained is the real criterion of the effect of staining. This can best be assessed by observing the effect of the sealant on a sample of the substrate to be used in practice.

2.2.2.1 *Apparatus.* The following apparatus is required:

1) Sample of substrate.

2) Constant temperature enclosure at 40 ± 2 °C.

2.2.2.2 *Procedure.* Take a sheet, slab, tile or block of the relevant building material, having first applied any sealer recommended by the sealant manufacturer, and press a pad of sealant not less than 25 mm × 25 mm × 5 mm thick firmly into contact with the particular surface of the material to which it is desired to apply the sealant in practice. After two weeks at room temperature and after a further two weeks in the constant temperature enclosure controlled at 40 ± 2 °C, observe and report any staining of the building material.

2.2.3 Staining by alkaline reaction. Some sealants and/or primers may stain due to reaction with the free lime in fresh mortar or concrete. The test below is suggested as a means of assessing such eventualities.

2.2.3.1 *Apparatus.* The following apparatus is required:

1) A freshly prepared mortar block.

2) A constant temperature enclosure at 25 ± 1 °C and 50 ± 5 % relative humidity.

3) A split ring mould 12 mm deep × 75 mm diameter.

4) A glass plate of convenient size.

5) A piece of polyethylene, polypropylene or nylon to form a cylindrical
mandrel 12 mm deep × 20 mm diameter.

6) Gummed paper tape.

7) A beaker containing 400 ml of distilled or deionized water.

2.2.3.2 *Procedure.* The mortar mix shall consist of:

1 part by weight of white Portland cement complying with the requirements of BS 12;

0.2 parts by weight of hydrated high calcium lime complying with BS 890;

3.5 parts by weight of white sand complying with BS 4550-6;

and sufficient water to form a smooth paste.

The cement, lime and sand shall be mixed dry with a trowel on a non-absorbent, non-metallic surface until the mixture is uniform. The water shall then be added and the whole mixed thoroughly. The mortar mix shall then be cast in a split ring mould approximately 10 mm in depth and 75 mm in diameter stood on a smooth glass plate. A central smooth bore cylindrical hole, about 20 mm diameter, shall be formed by standing in the centre of the ring a 20 mm cylindrical mandrel of polythene or similar material to which the mortar will not adhere.

The mortar shall be allowed to set for 3½ ± ½ h at 25 °C in moist air under a damp cloth. After setting, the central mandrel shall be removed. When the sealant manufacturer recommends that a primer shall be used on concrete, half the area of the upper surface of the mortar block and the inner surface of the central hole shall be coated with primer according to the manufacturer's directions. Sufficient of the sealant, mixed if multi-part, shall then be applied to the mortar block by first completely filling the hole and then spreading the remainder evenly over the whole of the top surface of the mortar block to a thickness between 6 mm and 10 mm. If the sealant is of the self-levelling type it will be necessary to erect a temporary barrier, which may be of gummed paper tape, around the periphery of the block to prevent the sealant flowing over the edge. The assembly shall be then stored in a conditioning chamber at 25 ± 1 °C and 50 ± 5 % relative humidity for 24 h, after which it shall be removed from the conditioning chamber and inspected for staining. The specimen shall be completely immersed in 400 ml of distilled or deionized water at room temperature for 1 min, and then returned to the conditioning chamber. This process shall be repeated every 24 h for 14 days. The first appearance of discolouration shall be taken as evidence of staining. If no discolouration occurs after 14 days the test shall be terminated. The report shall state whether the staining occurred on the primed surface or the unprimed surface.

2.3 Shrinkage

2.3.1 General. The object of the shrinkage test is to provide a measure of the reduction of the volume of a sealant with age. The test must therefore be continued over a period until it appears that significant shrinkage has ceased. Shrinkage at room temperature may be very slow, and an accelerated test is therefore given, the results of which must be assessed in conjunction with those obtained at room temperature. Care should be taken in interpreting results of accelerated tests as blowing may occur with some sealants at elevated temperatures.

2.3.2 Apparatus. The following apparatus is required:

1) A tin or aluminium flanged dish 50 mm to 75 mm in diameter, 6 ± 2 mm deep. A small hole is made in the flange through which a fine wire may be threaded. The other end of the wire is looped for attachment to the stirrup of a balance.

2) A balance capable of weighing up to 200 g and accurate to 0.01 g.

3) A beaker of suitable dimensions containing sufficient water at 20 ± 2 °C to cover the suspended dish. A small quantity[1)] of wetting agent shall also be added to the water.

4) An Archimedes bridge.

5) An oven complying with the requirements of BS 2648.

2.3.3 *Preparation of the specimen*

1) *For single part sealants.* No preparation is necessary for single part sealants except that pre-formed sealants should be moulded with as little effort as possible into shapes capable of fitting into the test dish.

2) *For multi-part sealants.* Mix together the constituent parts of the sealant in any convenient container before placing immediately into the test dish, after previously having determined the volume of the dish by the method described below.

2.3.4 *Procedure*

1) Weigh the dish in air (W_1) and in water (W_2).

2) Dry the dish and fill it with sealant, taking care not to occlude air; strike off the sealant level with the top of the dish. Weigh in air (W_3) and in water (W_4).

3) Allow as much water as possible to drain from the sample after determining initial volume, and leave the dish in a ventilated dust-free atmosphere at room temperature for 14 days. Weigh in air and in water. Repeat, at intervals of 7 days, until both weights do not differ from the corresponding penultimate weights by more than 0.1 %. The final weights shall be W_5 and W_6 in air and water respectively.

4) Allow as much water as possible to drain from a fresh sample after determining initial volume, and leave dish in the oven at 70 ± 2 °C for 7 days. Allow to cool in a dust-free atmosphere for at least 20 min; weigh in air and in water. Return to the oven and repeat at convenient intervals of not less than 24 h, until both weights do not differ from the corresponding penultimate weights by more than 0.1 %. The final weights shall be W_7 and W_8 in air and water respectively.

5) *Reporting.* Calculate the volumes as follows:

$$V_0 = W_1 - W_2$$
$$V_2 = W_3 - W_4$$
$$V_1 = V_2 - V_0$$
$$V_n = W_5 - W_6 - V_0$$
$$V_a = W_7 - W_8 - V_0$$

where V_0 = volume of apparatus in ml

V_2 = volume of sealant and apparatus in ml

V_1 = initial volume of sealant in ml

V_n = final volume of sealant after shrinkage in ml

V_a = final volume of sealant after accelerated shrinkage in ml

The percentage volume shrinkage at room temperature (L_n) is given by:

$$L_n = \frac{(V_1 - V_n) \times 100}{V_1}$$

The percentage volume shrinkage by accelerated test (L_a) is given by:

$$L_a = \frac{(V_1 - V_a) \times 100}{V_1}$$

2.4 *Text deleted.*

2.5 Shelf life

The shelf life of a building sealant is the period of time during which the sealant in its original unopened containers and packages and stored in defined conditions remains unimpaired. It shall be workable, capable of application by its appropriate method and shall behave satisfactorily in practice, even though some unimportant changes in properties may have occurred in storage.

[1)] 1 : 10 000 appropriate.

In order to determine the shelf life of a sealant, knowledge of its properties and performance are required to ensure that any effects resulting from the method of packaging and conditions of storage are evaluated by appropriate test methods and so that limits can be specified for any changes in properties that may be measured.

The various parts of this standard contain methods of tests for assessing and evaluating some properties of building sealants. A number of tests may be selected as the basis for a specification for a sealant. It is implicit that the tests are normally carried out on sealants of recent manufacture.

It is considered that comparison of the results of tests carried out at specified intervals of storage with the results of the same tests carried out at the beginning of the storage period, will enable an assessment to be made of the shelf life of the sealant.

To check the shelf life specified by the manufacturer of a sealant, the sealant shall be capable of meeting all the requirements of the specification for the particular sealant, after storage in its original unopened containers under the manufacturer's specified storage conditions of temperature, humidity etc. for the shelf life period stated by the manufacturer.

Whatever properties are being assessed, it is essential that the sealant shall remain uniform and homogeneous in consistency, be free from lumps or coarse particles or be capable of being restored to homogeneity by limited working or stirring.

2.6 Paintability

2.6.1 General. The object of the paintability test is to determine:

1) The minimum time interval needed after applying the compound in a joint and the first successful application of the paint system to the surface of the sealant.

2) The ability of the sealant to accommodate the paint film on its surface without retardation of drying, wrinkling or other surface defects.

3) The ability of the sealant to accommodate on its surface the paint film without staining or bleeding of the sealant constituents into the paint film bringing about defects in the paint film.

2.6.2 Apparatus. The following apparatus is required:

1) A suitable apparatus to apply a strip of sealant approximately 6 mm thick by 100 mm long by 25 mm wide to a metal or glass surface.

2) A controlled enclosure at 5 ± 1 °C and 80 ± 5 % relative humidity.

3) A quantity of the specified painting system.

4) 12 mm varnish brush complying with BS 2992, Item No 8/1.

2.6.3 Procedure. Lay down sufficient strips of sealant on the metal or glass plates, leaving a portion of the plate exposed between the strips, and place in controlled enclosure. After an appropriate interval of time apply the first coat of the painting system to the whole surface of one strip of sealant and the adjacent exposed plate. At intervals of time paint further strips of sealant. Allow the paint on each strip to dry in the controlled enclosure and apply successive coats in the manner specified by the paint manufacturer to complete the painting system. Examine the painted surfaces for defects between applications and upon completion. After completion, the test panel shall be left at room temperature (approximately 20 °C) for an appropriate time (not less than 14 days) to observe any defects.

2.6.4 Reporting. Report any defects listed above and the minimum time after applying the sealant for successful application of the paint system.

NOTE It should be appreciated that paint systems may harden and embrittle while some compounds remain flexible for a longer period; the paint film may therefore crack when subject to appreciable movement. It should also be appreciated that there are many types of compound with different constituents which age in different ways. These may affect the paint in different ways both in short term and in long term effects. It may therefore be necessary to examine the painting tests over very long periods in order to determine long term effects.

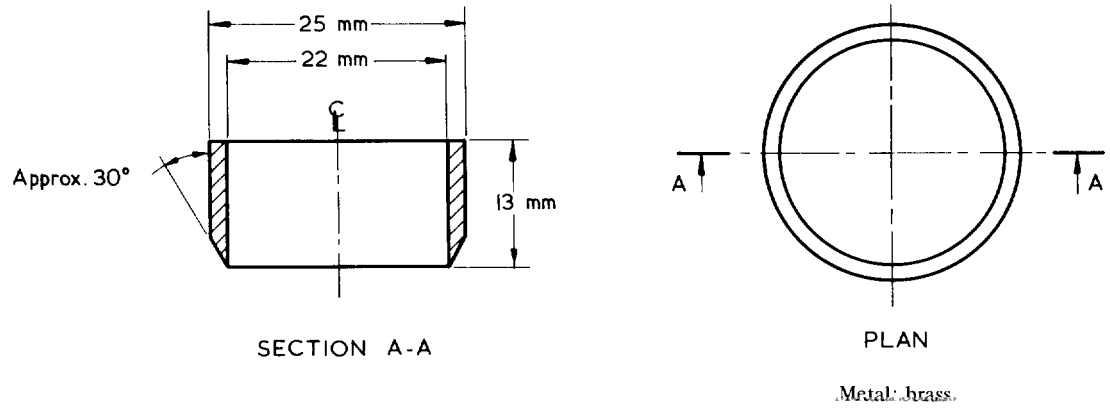

Figure 1 — Seepage test ring

Publications referred to

This standard makes reference to the following British Standards and special publications:

BS 12, *Specification for Portland cements.*

BS 890, *Building limes.*

BS 2648, *Performance requirements for electrically heated laboratory drying ovens.*

BS 2992, *Painters' and decorators' brushes for local authorities and public institutions (excluding quality of fillings).*

BS 3712, *Building and construction sealants.*

BS 3712-1, *Methods of test for homogeneity, relative density and penetration.*

BS 4550, *Methods of testing cement.*

BS 4550-6, *Standard sand for mortar cubes.*

BS EN 27390, *Building construction — Jointing products — Determination of resistance to flow*[2)].

BS EN 28394, *Building construction — Jointing products — Determination of extrudability of one-component sealants*[2)].

BS EN 29046, *Building construction — Sealants — Determination of adhesion/cohesion properties at constant temperature*[2)].

BS EN 29048, *Building construction — Jointing products — Determination of extrudability of sealants using standardized apparatus*[2)].

ISO 9047, *Building construction — Sealants — Determination of adhesion/cohesion properties at variable temperature*[2)].

[2)] Referred to in the foreword only.

BSI Certification Trade Mark

The Kitemark

The British Standards Institution is the owner of a registered certification trade mark. It is usually associated with the words "approved to British Standard" as shown below, the number of the relevant British Standard being added. This mark may be used only by those licensed under the certification mark scheme operated by BSI. The presence of this mark on or in relation to a product is an assurance that the goods have been produced under a system of supervision, control and testing, operated during manufacture and including periodical inspection of the manufacturer's works in accordance with the certification mark scheme of BSI designed to ensure compliance with a British Standard.

Further particulars of the terms of licence may be obtained from the Quality Assurance Department, British Standards Institution, Maylands Avenue, Hemel Hempstead, Herts. HP2 4SQ

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: 020 8996 9000. Fax: 020 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: 020 8996 9001. Fax: 020 8996 7001.

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: 020 8996 7111. Fax: 020 8996 7048.

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: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL