

Hot-applied joint sealant systems for concrete pavements —

Part 3: Methods of test

Committees responsible for this British Standard

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- BAA plc
- British Adhesives' and Sealants' Association
- British Aggregate Construction Materials' Industries
- British Cement Association
- Concrete Society
- County Surveyors' Society
- Department of the Environment (Property Services Agency)
- Department of Transport
- Federation of Civil Engineering Contractors
- Hot Extruded Sealant Association
- Institution of Civil Engineers
- Institution of Highways and Transportation
- Coopted members

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Foreword

This Part of BS 2499 has been prepared under the direction of Technical Committee B/510, Road Materials. It supersedes the methods of test described in BS 2499:1973. Together with BS 2499-1:1993 and BS 2499-2:1992 it supersedes BS 2499:1973, which is withdrawn.

The specification for joint sealants is given in BS 2499-1:1993, and BS 2499-2:1992 is a code of practice for the application and use of joint sealants. The tests are, as far as possible, related to practical conditions, and for this reason concrete test blocks, rather than mortar blocks, are specified for the extension test. Because of the many variables and the limited data available on the effects on adhesion of using different aggregates, a single coarse aggregate is specified for the blocks.

Exposure to excessive heat (e.g. jet blast) can have deleterious effects on all sealants but knowledge of this effect is very limited. Because of this the test method included in this standard is indicative of a minimum performance level only.

Requirements for cold-applied joint sealants are specified in BS 5212.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Information on precision and traceability is given in Annex A.

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 18, 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 Scope

This Part of BS 2499 describes methods of test for hot-applied joint sealants for use in joints in roads, airfields and other concrete pavements.

2 References

2.1 Normative references

This Part of BS 2499 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 2499 only when incorporated in it by updating or revision.

2.2 Informative references

This Part of BS 2499 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 2499, the definitions given in BS 2499-1:1993 apply.

4 Preparation for testing

4.1 General

Precautions shall be taken during all the following operations to prevent local overheating of the sample and contamination by oil or other substances.

4.2 Apparatus

An oil bath employing a high flash point oil as the transfer medium shall be used for heating the joint sealant before pouring into test moulds. It shall have an inner container. The oil shall have a flash point of not less than 285 °C when measured in accordance with BS 6664-5:1990.

The inner container shall be made of metal, not thicker than approximately 1 mm and preferably formed by spinning or pressing. The joints, if any, shall be welded or brazed, and shall be leakproof. The container shall be approximately 100 mm in diameter and 150 mm deep. It may have a handle and shall be provided with a loose-fitting lid with facilities for allowing the admission of a stirrer and thermometer. A suitable design is shown in Figure 1a) and Figure 1b).

The oil bath, preferably constructed of sheet copper not thicker than 1.5 mm, shall have either a cylindrical recess into which the inner container fits loosely, or the inner container shall be suspended in the oil. The oil shall be free to circulate round the bottom and sides of the cylindrical recess, or the bottom and sides of the container, according to the design of apparatus adopted, to at least the same level as the level of the sealant.

If the inner container is suspended in the oil, no oil shall be allowed to come into contact with the sealant, when pouring the sealant.

Means for stirring continuously both the oil and the joint sealant being heated shall be provided. A suitable stirrer for stirring the sealant is shown in Figure 2.

4.3 Sample

For testing, obtain a sample of approximately 1 kg by taking, so far as is possible, equal and representative portions of each increment cut by means of a heated knife into about 50 pieces.

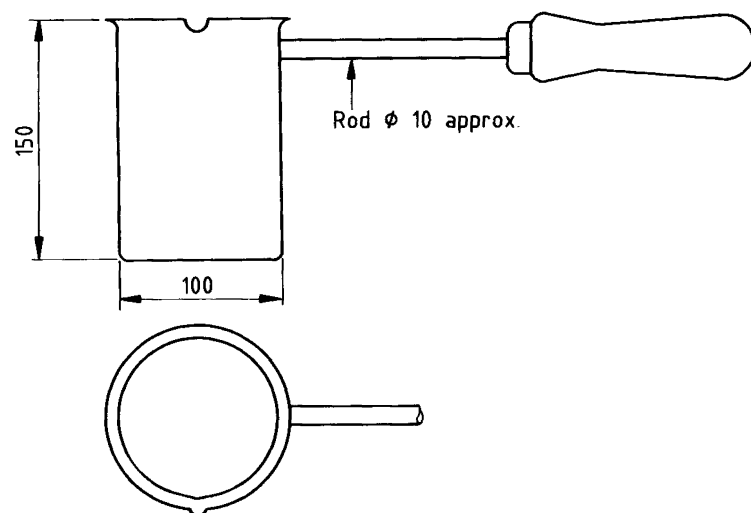
4.4 Procedure

Carry out the following procedure, except where stated otherwise in the individual tests.

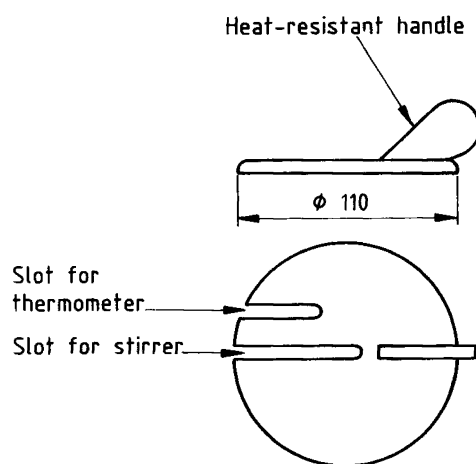
- a) Heat the oil bath, with the inner container fixed in position, until the oil is at a temperature approximately 30 °C above the manufacturer's minimum recommended pouring temperature for the sealant, or at the safe heating temperature for the sealant, whichever is the lower, and maintain it at this temperature until the requirements of d) below are met.
- b) Place pieces of the sample in the inner container one at a time at approximately half-minute intervals starting when the temperature of the oil has reached at least the manufacturer's minimum recommended pouring temperature.
- c) With the lid in position stir continuously both the oil and the material in the inner container.
- d) Heat the sample until it reaches 5 °C above the lower limit of the manufacturer's recommended pouring temperature. The time taken shall not exceed 1.5 h.

NOTE Time taken should normally be about 1 h.

- e) Pour the test specimens into test moulds as soon as possible, in any case within 10 min of reaching the above temperature, taking care to avoid any contamination. Record the actual temperature at the end of pouring.



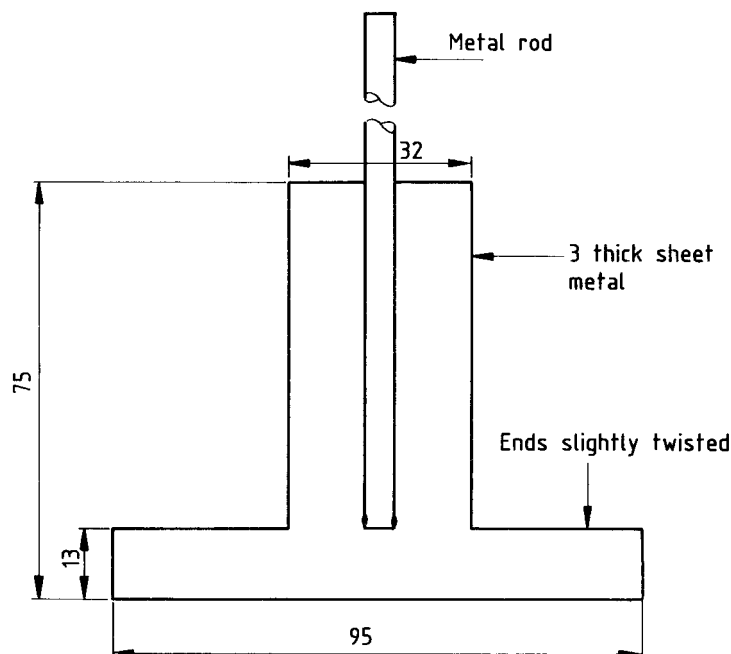
a) Inner container in which sample is heated for pouring of test specimens



All dimensions are in millimetres.

b) Lid for inner container

Figure 1 — Inner container



All dimensions are in millimetres.

Figure 2 — Suitable stirrer for stirring the sealant

5 Conditioning

Laboratory conditions, hereafter referred to as standard conditions, shall be at a temperature of $(23 \pm 2)^\circ\text{C}$, and $(50 \pm 10)\%$ relative humidity.

6 Determination of flow resistance

6.1 Principle

The purpose of this test is to determine the resistance of joint sealants to flow in hot weather.

6.2 Apparatus

6.2.1 Oven, conforming to BS 2648:1955, capable of maintaining the specimen and apparatus at the test temperature of $(60 \pm 2.5)^\circ\text{C}$ for N2 and F2 type sealants or $(70 \pm 2.5)^\circ\text{C}$ for N1 and F1 type sealants.

6.2.2 Metal frame, with internal dimensions (40 ± 1) mm wide $\times$ (60 ± 1) mm long $\times$ (3 ± 0.1) mm deep.

6.2.3 Aluminium plate, not less than 60 mm wide $\times$ 80 mm long $\times$ 1.5 mm thick.

6.2.4 Metal frame, so designed to allow the aluminium plate containing the specimen to be mounted so that the longitudinal axis of the specimen is at an angle of $(75 \pm 2)^\circ$ with horizontal and the transverse axis is horizontal.

6.2.5 Stiff spatula.

6.3 Preparation of sample

6.3.1 Prepare the sample of joint sealant as described in clause 4.

6.3.2 Place the metal frame (6.2.2) on the aluminium plate (6.2.3) and fill the metal frame (6.2.2) with an excess of material.

6.3.3 After cooling for 1 h in air at standard laboratory conditions, trim the excess material in the frame (6.2.2) with a warmed spatula (6.2.5).

6.3.4 Remove the frame (6.2.2) and mark the existing profile of the sealant on the aluminium plate with an index line drawn parallel to and along the lower transverse edge of the test specimen.

6.4 Procedure

6.4.1 Place the other metal frame (6.2.4) in the oven (6.2.1) set at the required test temperature for 30 min before beginning the test.

6.4.2 Place the aluminium plate (6.2.3) containing the specimen on the metal frame (6.2.4), mounted so that the longitudinal axis of the specimen is at an angle of $(75 \pm 2)^\circ$ with the horizontal and the transverse axis is horizontal. Maintain the temperature according to sealant type for $5 \text{ h} \pm 3 \text{ min}$.

6.4.3 After $5\text{ h} \pm 3\text{ min}$ remove the assembly from the oven (6.2.1) and measure the movement of the lower transverse edge of the test specimen below the index line to the nearest 0.5 mm.

6.5 Expression of results

Express the results to the nearest 0.5 mm and report as the flow.

6.6 Test report

A test report, shall be completed in accordance with clause 18 of this standard.

7 Determination of flow resistance after heat degradation

7.1 Principle

The purpose of this test is to verify that the sealant still conforms to the requirements of this standard after extended heating.

7.2 Apparatus

The apparatus shall be as described in clause 6.

7.3 Preparation of sample

7.3.1 Prepare a sample in accordance with clause 4 except that the heating period shall be extended to 6 h at the manufacturer's maximum recommended safe heating temperature.

7.3.2 Pour and condition and otherwise prepare the specimen in accordance with 6.3.2, 6.3.3 and 6.3.4.

7.4 Procedure

Test the specimen in accordance with 6.4 and 6.5 and report the results as the flow.

7.5 Test report

A test report shall be completed in accordance with clause 18 of this standard.

8 Determination of penetration

8.1 Principle

The test for penetration of the sealant is based upon BS 2000-50. The purpose of this test is to determine the penetration and recovery of hot-applied sealants.

8.2 Apparatus

8.2.1 *Metal container*, in which the specimen is tested, cylindrical in shape and having a flat bottom with a nominal capacity of 100 g. Its inside dimensions are nominally 56 mm in diameter and 35 mm in depth.

To facilitate pouring the right amount, a mark is made at a depth of 30 mm.

8.2.2 *Penetration cone*, constructed of stainless steel or brass and conforming to the dimensions shown in either Figure 3a or Figure 3b. Both types of cone have a smooth polished finish to the outside surface and the tip. The total moving mass of the cone and attachments is $(150 \pm 0.1)\text{ g}$.

8.2.3 *Water bath*, maintained at a temperature of $(25 \pm 0.1)\text{ }^{\circ}\text{C}$, containing not less than 10 l of water and with a perforated shelf not less than 50 mm from the bottom of the bath. The specimen is immersed so that there is a depth of not less than 50 mm of water above it, when it is supported on the shelf.

8.2.4 *Penetration apparatus*, which will allow the cone to penetrate without appreciable friction, and which is accurately calibrated to measure the distance that the cone will penetrate vertically into the specimen of material at $25\text{ }^{\circ}\text{C}$ in 5 s. The penetration is measured in millimetres.

NOTE A penetrometer conforming to BS 2000-50 has been found to be suitable.

8.2.5 *Transfer dish*, for the container, being a glass or metal cylinder with a flat bottom provided with means to ensure a firm bearing and prevent rocking of the container. The dish has a minimum inside diameter of 90 mm and a minimum depth above the bottom bearing of 56 mm.

8.2.6 *Two cleaning cloths*.

8.3 Preparation of sample

8.3.1 Prepare the sample in accordance with clause 4.

8.3.2 Pour a subsample into the metal container (8.2.1) to a depth of at least 30 mm.

8.3.3 Loosely cover the container (8.2.1) and its contents as a protection against dust and allow to cool in air at a temperature of $(23 \pm 2)\text{ }^{\circ}\text{C}$ for $(1.75 \pm 0.25)\text{ h}$.

8.3.4 Place the container of subsample in the water bath (8.2.3) along with the transfer dish (8.2.5) and allow it to remain immersed for $(1.75 \pm 0.25)\text{ h}$.

8.4 Procedure

8.4.1 After the period of immersion in the water bath (8.2.3), place the specimen in the transfer dish (8.2.5) filled with water from the water bath (8.2.3) to sufficient depth to cover the metal container (8.2.1) completely.

8.4.2 Take the transfer dish (8.2.5) containing the specimen out of the water bath (8.2.3), place it on the stand of the penetration apparatus (8.2.4) and test within 1 min.