

Cold applied joint sealant systems for concrete pavements —

Part 3: Methods of test

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- Association of Consulting Scientists
- British Adhesives and Sealants Association
- British Airports Authority
- British Tar Industry Association
- County Surveyors' Society
- Department of the Environment (Property Services Agency)
- Department of Transport
- Department of Transport (Transport and Road Research Laboratory)
- Institution of Civil Engineers
- Institution of Highways and Transportation
- Coopted members

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Foreword

This Part of BS 5212 has been prepared under the direction of the Road Engineering Standards Policy Committee. BS 5212:1975 has been revised in three Parts, namely:

- *Part 1: Specification for joint sealants;*
- *Part 2: Code of practice for the application and use of joint sealants;*
- *Part 3: Methods of test.*

BS 5212-1, BS 5212-2 and BS 5212-3 supersede BS 5212:1975 which is withdrawn.

The tests have been, as far as possible, related to practical conditions, and for this reason concrete test blocks are specified for the extension test rather than mortar blocks. Because of the many variables and the limited data available on the effects of 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.

Hot applied joint sealants are specified in BS 2499.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately 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 Appendix B.

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 16, 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 5212 describes methods of test for cold applied joint sealants for use in joints in roads, airfields and other exposed concrete pavements.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 5212, the definitions given in BS 5212-1 apply.

3 Determination of minimum application life

3.1 Principle

The ability of cold hand applied sealants to flow is determined after the mixed sample has been stored for a period at least as long as the minimum application life.

3.2 Sealant components

The test shall be carried out on base and curing components supplied in closed containers capable of being stored at $23 \pm 2^\circ\text{C}$.

3.3 Apparatus

3.3.1 *A laboratory balance*, capable of weighing up to 400 g of sample to an accuracy of 0.1 g.

3.3.2 *An environment*, capable of maintaining the samples and apparatus at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ r.h.

3.3.3 *A flat bladed mixing spatula*

3.3.4 *A mixing vessel*, such as a cylindrical container approximately 75 mm in diameter and 70 mm in height.

3.4 Conditioning

Store supplies of base component and curing component (approximately 250 mL total) in closed containers, together with the mixing spatula and mixing vessel at $23 \pm 2^\circ\text{C}$ for at least 16 h.

3.5 Mixing of hand applied sealant

Weigh out appropriate quantities of base component and curing component in a ratio by mass specified by the manufacturer to an accuracy of 1 % into the mixing vessel to give a batch volume of approximately 250 mL of material, and mix the two components for 10 min using the spatula. Ensure that the final mix is completely homogeneous and take particular care during the process to avoid or eliminate all air bubbles.

3.6 Procedure

3.6.1 Store the mixed sample uncovered at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ r.h.

3.6.2 Not less than 0.5 h after completion of mixing determine the ability to flow of the sealant in accordance with the method described in 5.3, but with the test carried out at a temperature of $23 \pm 2^\circ\text{C}$.

3.7 Expression of results

Record whether the application life is greater than 0.5 h.

3.8 Test report

A test report shall be completed in accordance with clause 12.

4 Determination of tack-free condition

4.1 Principle

The tack-free condition of a prepared sample is determined using polyethylene film.

4.2 Sealant components

The test shall be carried out on base and curing components supplied in closed containers capable of being stored at $23 \pm 2^\circ\text{C}$.

4.3 Apparatus

4.3.1 *A laboratory balance*, capable of weighing up to 400 g of sample to an accuracy of 0.1 g.

4.3.2 *An environment*, capable of maintaining the samples and apparatus at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ r.h.

4.3.3 *A flat bladed mixing spatula*

4.3.4 *A mixing vessel*, such as a cylindrical container approximately 75 mm in diameter and 70 mm in height.

4.3.5 *A metal or polyethylene frame*, measuring internally $125 \pm 1\text{ mm} \times 38 \pm 1\text{ mm} \times 6 \pm 0.5\text{ mm}$.

4.3.6 *A metal base plate*, measuring $150\text{ mm} \times 75\text{ mm} \times 1 \pm 0.5\text{ mm}$ thick.

4.3.7 *Polyethylene film*, measuring $150\text{ mm} \times 25\text{ mm} \times 100 \pm 10\text{ }\mu\text{m}$ thick.

4.3.8 *A metal plate*, measuring approximately $40\text{ mm} \times 30\text{ mm}$ and weighing $30.5 \pm 0.5\text{ g}$.

4.4 Conditioning

Store supplies of base component and curing component (approximately 100 mL total) in closed containers for at least 16 h at $23 \pm 2^\circ\text{C}$.

4.5 Mixing

4.5.1 *Mixing of hand applied sealant*

Weigh out appropriate quantities of base component and curing component in a ratio by mass specified by the manufacturer to an accuracy of 1 % into the mixing vessel and mix the two components for 10 min using the spatula. Ensure that the final mix is completely homogeneous and take particular care during the process to avoid or eliminate all air bubbles.

4.5.2 *Mixing of machine applied sealant*

Prepare a sample from conditioned base and curing components in accordance with and in the equipment specified in the manufacturer's instructions.

4.6 Procedure

4.6.1 Pour or extrude the mixed sealant into the frame mounted on its base plate, and strike off level with a spatula.

4.6.2 Transfer the assembly into the controlled environment at 23 ± 2 °C and leave it there for 3 ± 0.1 h if a machine applied sealant or for 16 ± 0.1 h if a hand applied sealant.

4.6.3 At the end of this time place the polyethylene film on the upper surface of the specimen and immediately cover it with the metal plate.

4.6.4 Remove the metal plate after 30 ± 3 s, then peel off the polyethylene film uniformly and progressively at right angles to the surface of the sealant within 3 s.

4.7 Expression of results

Examine the polyethylene film for signs of adhesion of the sealant and report accordingly.

NOTE Staining or similar markings on the polyethylene film are not relevant.

Report the tack-free time of the sealant.

4.8 Test report

A test report shall be completed in accordance with clause 12.

5 Determination of rheological properties

5.1 Principle

The flow characteristics of cold applied sealant are determined using moulds in the flat and inclined positions.

5.2 Sealant component

The test shall be carried out on base and curing components supplied in closed containers capable of being stored at 5 ± 2 °C.

5.3 Determination of ability to flow using a horizontal mould at 5 °C

5.3.1 Apparatus

5.3.1.1 A laboratory balance, capable of weighing up to 400 g of sample to an accuracy of 0.1 g.

5.3.1.2 An environment, capable of maintaining the samples and apparatus at 5 ± 2 °C.

5.3.1.3 A flat bladed mixing spatula

5.3.1.4 A mixing vessel, such as a cylindrical container approximately 75 mm in diameter and 70 mm in height.

5.3.1.5 A mould, consisting of a channel having both ends closed and inside dimensions of 20 ± 0.2 mm $\times$ 25 ± 1 mm deep $\times$ 300 ± 1 mm long. The channel shall be made of not less than 3 mm thick aluminium, steel or plastics. Means for positioning the base of the mould in a horizontal plane, using a spirit level, are also required.

5.3.1.6 A penetrometer, complying with BS 2000-49 and fitted with a blunt needle or rounded rod, to be used for measuring differences in depth below a given datum.

NOTE Other means of measuring this difference in depth are acceptable as long as they are of equal accuracy.

5.3.2 Conditioning

5.3.2.1 Clean the mould with a detergent solution, followed by a suitable non-residue solvent.

5.3.2.2 Condition the mould positioned in the horizontal plane, mixing vessel, spatula, and supplies of base and curing components (approximately 250 mL total) in closed containers in the enclosure at 5 ± 2 °C for at least 16 h.

5.3.3 *Mixing and application of hand and machine¹⁾ applied sealants*

Prepare a mix of sealant as described in 4.5 and immediately pour the sealant into the mould in one continuous pour within 30 s along the axis of the mould at a height not less than 70 mm and not greater than 100 mm. Allow the material to flow freely to within 5 mm of the top of the mould.

Transfer the mould immediately after filling, without vibration, to the refrigerated environment at 5 ± 2 °C and position it in a horizontal plane.

5.3.4 Procedure

5.3.4.1 After curing the specimen for 48 h at 5 ± 2 °C transfer the mould to the platform of the levelled penetrometer.

5.3.4.2 Set the probe at a convenient height above the sealant in the channel and set the dial to zero.

¹⁾ Since machines usually preheat the sealant, machine applied grades should be mixed by hand for this test procedure.

5.3.4.3 Measure the depth of the sealant surface below the zero datum midway between the sides of the channel to an accuracy of ± 0.2 mm at the centre point of the mould and at points 25, 50, 75, 100 and 125 mm on either side of the centre point.

5.3.4.4 Subtract the highest reading from the lowest reading and record this difference.

5.3.5 Expression of results

Express the result to the nearest 0.5 mm.

5.3.6 Test report

A test report shall be completed in accordance with clause 12.

5.4 Determination of resistance to flow using a mould inclined at 2.5 % slope at 23 ± 2 °C

5.4.1 Apparatus

5.4.1.1 A laboratory balance, capable of weighing up to 400 g of sample to an accuracy of 0.1 g.

5.4.1.2 An environment, capable of maintaining the samples and apparatus at 23 ± 2 °C.

5.4.1.3 A flat bladed mixing spatula

5.4.1.4 A mixing vessel, such as a cylindrical container approximately 75 mm in diameter and 70 mm in height.

5.4.1.5 A mould, consisting of a channel as described in 5.3.1.5 but with inside dimensions of 20 ± 0.2 mm wide $\times$ 20 ± 0.2 mm deep $\times$ 300 ± 1 mm long. Means for positioning the mould so that the longitudinal axis of the channel is at a slope of 2.5 ± 0.25 % to the horizontal, and the transverse axis is horizontal, are also required.

5.4.1.6 A penetrometer, as specified in 5.3.1.6.

5.4.2 Conditioning

5.4.2.1 Clean the mould as described in 5.3.2.1.

5.4.2.2 Condition the mould, mixing vessel, spatula, and supplies of base and curing component (approximately 250 mL total) in closed containers at 23 ± 2 °C for at least 16 h.

5.4.3 Mixing and application

5.4.3.1 *Mixing and application of hand applied sealants*

Mix the sealants as described in 4.5.1.

Position the mould conditioned to 23 ± 2 °C horizontally on any suitable surface.

Apply the mixed material to the mould as described in 5.3.3, but in this case overfill the mould and strike off the surplus material level to the mould edges using a spatula or knife.

5.4.3.2 *Mixing and application of machine applied sealants*

Mix the sealant as described in 4.5.2. Position the mould, conditioned to 23 ± 2 °C, horizontally on a suitable surface. Overfill the mould using a single pass of the nozzle at a speed which will not envelop the nozzle in the mould with sealant.

5.4.4 Procedure

5.4.4.1 Within 60 s after filling, and with a minimum of vibration, reposition the mould in the environment at 23 ± 2 °C at the 2.5 % slope.

5.4.4.2 Leave to cure for 24 h at 23 ± 2 °C and 50 ± 5 % r.h.

5.4.5 Measurement

5.4.5.1 Measure as described in 5.3.4 the depth below an arbitrary datum at two points 20 mm from either end of the mould, each measurement midway between the channel sides.

5.4.5.2 Record the difference between these two measurements.

5.4.6 Expression of results

Express the result to the nearest 0.5 mm.

5.4.7 Test report

A test report shall be completed in accordance with clause 12.

6 Determination of resistance to plastic flow

6.1 Principle

The resistance to plastic flow of the cured sealant is determined using a mould inclined at an angle of 75° at 60 ± 2.5 °C.

6.2 Sealant components

The test shall be carried out on base and curing components supplied in closed containers capable of being stored at 23 ± 2 °C.

6.3 Apparatus

6.3.1 A laboratory balance, capable of weighing up to 400 g of sample to an accuracy of 0.1 g.

6.3.2 An environment, capable of maintaining the sample and apparatus at 23 ± 2 °C.

6.3.3 An oven, complying with BS 2648 capable of maintaining the apparatus at 60 ± 2 °C.

6.3.4 A flat bladed mixing spatula

6.3.5 A mixing vessel, such as a cylindrical container approximately 75 mm in diameter and 70 mm in height.

6.3.6 A thin bladed knife