British Standard

BRITISH STANDARD

BS 598-101: 1987

Incorporating Amendment No. 1

Sampling and examination of bituminous mixtures for roads and other paved areas —

Part 101: Methods for preparatory treatment of samples for analysis

ICS 75.140; 93.080.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Road Engineering Standards Committee (RDB/-) to Technical Committee RDB/36 upon which the following bodies were represented:

British Aggregate Construction Materials Industries
British Civil Engineering Test Equipment Manufacturers' Association
British Tar Industry Association
County Surveyor's Society
Department of the Environment (Property Services Agency)
Department of Transport (Highways)
Department of Transport (Transport and Road Research Laboratory)
Institute of Asphalt Technology
Institute of Petroleum
Institution of Civil Engineers
Institution of Highways and Transportation
Mastic Asphalt Council and Employers' Federation
Mastic Asphalt Producers' Association
Refined Bitumen Association Ltd.
Sand and Gravel Association Ltd.
Society of Chemical Industry
Coopted members

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The following BSI references relate to the work on this standard:
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Contents

Foreword

This Part of BS 598 has been prepared under the direction of the Road Engineering Standards Committee. It is a revision of clause **2** of BS 598-2:1974 which is deleted by amendment. The remainder of Part 2 and BS 598-3 are also being revised and it is the intention to publish each of the tests or collection of related tests in these Parts as a separate Part of BS 598. The complete revision of BS 598 will eventually comprise the following Parts:

— *Part 100: Methods for sampling for analysis;*

— *Part 101: Methods for preparatory treatment of samples for analysis;*

— *Part 102: Analytical test methods*[1)];

— *Part 103: Methods for the recovery of soluble bitumen for examination*[1)];

— *Part 104: Methods of test for the determination of density and compaction*[1)];

— *Part 105: Methods of test for the determination of the condition of the binder on coated chippings and the determination of texture depth*[1)];

— *Part 106: Methods of test for the determination of the stability index of pitch bitumen binders*[1)];

— *Part 107: Methods of test for the determination of the target composition of wearing course rolled asphalt*[1)].

Due to the different factors to be considered when sampling and testing mastics for road and other paved areas it has been decided to continue publishing the requirements for mastics as a separate British Standard, i.e. BS 5284.

It has been assumed in the drafting of this Part of BS 598 that the execution of its provisions is entrusted to appropriately qualified and experienced people.

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii pages 1 to 4, an inside back cover and a back cover.

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Sidelining in this document indicates the most recent changes by amendment.

[1)] In preparation.

1 Scope

This Part of BS 598 describes the methods for preparatory treatment necessary to provide test samples of bituminous mixtures and coated chippings, but excluding mastics and slurry seal, that have been delivered in bulk to the testing laboratory for analysis.

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 598, the definitions given in BS 598-100 apply.

3 Preparatory treatment of samples of bituminous mixtures

3.1 Preliminary inspection and storage

On receipt inspect the sample and record its condition and mass.

If a sample consisting of a slab or a core cut from compacted material is to be stored prior to examination or separation of courses, take care so as to minimize deformation or deterioration of the sample. Store slabs on a clean, hard, flat surface with the final rolled surface at the bottom, preferably in a cool place.

NOTE Cores of well compacted materials made with high viscosity binders will normally keep well standing vertically upside down on a clean bench in a cool room, but cores cut from less stable materials may require refrigeration.

3.2 Sample for water content

If it is desired to determine an accurate water content, for any necessary heat treatment before sample reduction use only the minimum of heat that is needed to facilitate the breaking up of the sample.

3.3 Samples taken after laying

3.3.1 *General.* If possible record the average thickness (or thicknesses if there is more than one course) and the presence of any extraneous material. Then remove all extraneous material. If complete removal is not possible report this.

3.3.2 *Coated chippings*. If possible remove chippings by hand before starting the tests. If removal is not possible (e.g. due to deep embedment) report this and proceed with the tests.

NOTE 1 Coated chippings may normally be removed with a suitable tool after warming the sample. For this purpose a temperature approximately 40 °C below the appropriate maximum temperature given in Table 1 is suitable.

NOTE 2 It may be possible to identify and remove the chippings after extraction of the binder and if this is done an allowance for the mass of the chippings should be made in the test and the fact recorded on the test report.

3.3.3 *Surface dressings*. Remove any surface dressing if possible. Report the presence of any visible penetration of the surface dressing binder into the sample.

3.3.4 *Tack coat or blinding grit*. Report the presence of any tack coat or blinding grit.

3.3.5 *Fractured aggregate*. Report the presence of any fractured aggregate caused by sampling but do not remove such aggregate.

3.3.6 *Multicourse sample*. If possible, use a circular stone cutting saw to separate courses, particularly within core samples. In situations where this approach and other physical methods of cold separation are impractical, adopt the following procedure.

Lay the sample upside down on a clean sheet metal tray and warm sufficiently in a conventional oven just to soften the material so that the courses may be separated.

NOTE 1 In some cases insertion at the interface of the courses of a paint stripping knife with a wide blade, or similar tool, will assist in the separation.

NOTE 2 Only in cases of extreme necessity should the separation of the courses of a sample that has broken be attempted. In such cases if separation by hand picking is attempted, test results will be unreliable and this should be clearly stated in the test report.

3.3.7 *Free water*. If free water is visible on the sample, or if the sample feels wet to the touch or if there is any reason to suppose that the sample may contain water that is unevenly dispersed, break the sample into pieces, by warming if necessary, of such a size that the water can readily evaporate. Leave the broken sample exposed in a thin layer on a clean, hard surface, in a warm laboratory for at least 24 h. Then treat the sample as described in **3.4** or **3.5**, as appropriate.

NOTE This process is not suitable if the determination of water content is required (see **3.2**).

3.3.8 *Binder drainage*. Report if any binder drainage has occurred and collect and weigh the drained material. When the sample has been reduced to a suitable size for testing (see **3.4**), add a proportionate representative weighed fraction of the drained material to the portion to be tested. Record if the drained material cannot be collected.

3.4 Heat treatment before sample reduction

3.4.1 Heat samples that cannot be remixed by hand in accordance with **3.4.2** or **3.4.3**.

Table 1 — Temperatures of the oven for reheating samples prior to sample reduction

Type of binder in sample	Nominal grade of binder in sample	Maximum temperature of oven
		°C
Tar[a]	Less than 40° e.v.t.[b]	60
	40° to 50° e.v.t.	70
	50° to 60° e.v.t.	90
	More than 60° e.v.t.	100
Bitumen and cut-back bitumen[c]	Less than 200 s at 40 °C	60
	200 s to 500 s at 40 °C	70
	300 to 450 penetration at 25 °C	80
	200 penetration at 25 °C	100
	70 to 100 penetration at 25 °C	120
	25 to 55 penetration at 25 °C	140
	Less than 25 penetration at 25 °C	160

NOTE If modified binders are used the temperatures for reheating samples should be in accordance with supplier's recommendations.

[a] See BS 76 for explanation of terms.

[b] See BS 2000-49 for explanation of terms.

[c] Equiviscous temperature.

3.4.2 Heat the entire sample or separated course in a suitable conventional oven at a temperature not exceeding the appropriate value given in Table 1 until it is just sufficiently soft to be readily mixed and divided. Do not leave the sample in the oven for more than 4 h.

NOTE The temperature constraint is to minimize loss of the volatile constituents of the binder.

3.4.3 Heat the sample in increments in a suitable microwave oven and at no time allow the temperature of the oven to exceed the appropriate value given in Table 1.

WARNING. Do not place any metal objects, e.g. containers or trays, in a microwave oven.

Keep the heating time to a minimum (5 min is usually sufficient).

NOTE 1 Care should be exercised when using this microwave method as large aggregate particles may split.
NOTE 2 After heating in the microwave oven the increments awaiting bulking may be held in a conventional oven, subject to the time and temperature constraints given in **3.4.2**.
NOTE 3 This microwave method is not suitable if the determination of water content is required (see **3.2**).

3.5 Sample reduction for the determination of water content, binder content and grading

3.5.1 Weigh the whole of the sample, or each portion representing the separate courses, and place on a clean hard surface, e.g. a sheet metal tray. Mix the sample thoroughly and reduce it to the quantity required for test, as given in Table 2 or Table 3 as appropriate, either by using a riffle box, which may be heated or slightly oiled, in accordance with **6.2** of BS 812-102:1984 or by quartering as described in **3.5.2** to **3.5.4**.

NOTE 1 The use of a riffle box for nominal sizes of 20 mm and larger is likely to be quicker and will provide a sample of accuracy equal to or greater than that obtained by quartering.
NOTE 2 By assuming equal subdivision of the sample after each quartering process it is possible, by weighing the original sample, to estimate whether the mass remaining after quartering will be within the appropriate range given in Table 2 or Table 3. If the estimated mass is above the upper limit of the appropriate range given in Table 2 or Table 3 the mass of the original sample may be reduced by one quarter. This should be done by quartering twice, rejecting two opposite quarters from the second quartering process, combining the remainder from the second quartering process with the material put aside from the first quartering process and then carrying out the procedure described in **3.5.2** to **3.5.3**.

3.5.2 Mix the sample thoroughly by heaping it into a cone and turning it over to form a new cone three times as described as follows.

Form a conical heap by depositing each shovelful of the material on the apex of the cone. Distribute any material that rolls down the sides as evenly as possible, so that the centre of the cone is not displaced. Push back to the edge of the heap any larger pieces of aggregate that may scatter round the base.

Table 2 — Mass of material for each determination (excluding sieving extractor method)

Type of material	Nominal size of aggregate in material	Mass of sample for each determination
	mm	g
Bituminous mixture	50	3 000 to 5 000
	40	2 500 to 4 000
	28	2 000 to 3 000
	20	1 000 to 2 000
	14	800 to 1 600
	10	500 to 1 000
	6	300 to 600
	3	200 to 500
Coated chippings	All sizes	2 000 to 3 000

3.5.3 Flatten the third cone formed from the mixed sample by repeated vertical insertions of the edge of a shovel or board, commencing about the centre and working progressively round the cone, lifting the shovel or board clear of the material after each insertion.

Ensure that the heap thus formed is reasonably uniform in thickness and diameter and that its centre coincides with the centre of the cone from which it was produced.

3.5.4 Quarter the heap along two diameters that intersect at right angles. Combine one pair of diagonally opposite quarters and discard the remainder.

3.5.5 Repeat **3.5.2** to **3.5.4** until the mass remaining is about four times the mass of the sample required for the test. Then, repeat **3.5.2** to **3.5.4** once more and set aside for the estimations of water content the quarters that would otherwise be discarded. However, if the water content is to be calculated using the hot extractor method discard these quarters.

NOTE 1 The use of a quartering cross of wood or sheet metal, which can be forced through the heap, often facilitates quartering in cases where the material tends to segregate.

NOTE 2 If drained binder was collected during the earlier treatment of the sample (see **3.3.8**), a proportionate amount of binder should be added to the samples taken for test.

Table 3 — Mass of material for each determination (sieving extractor method)

Nominal size of aggregate	Type of material	Mass of sample for each determination
mm		g
40	Coated macadams	2 500 to 3 750
	Rolled asphalt	2 500 to 3 750
28	Coated macadams	1 500 to 2 250
	Rolled asphalt	1 500 to 2 250
20	Coated macadams	1 000 to 1 500
	Dense tar surfacing	1 000 to 1 500
	Rolled asphalt	1 000 to 1 500
	Coated chippings	2 000 to 3 000
14	Coated macadams	800 to 1 200
	Dense tar surfacing	800 to 1 200
	Rolled asphalt	800 to 1 200
	Coated chippings	2 000 to 3 000
10 and smaller	Coated macadams	700 to 1 100
	10 mm fine graded wearing course	600 to 900
	3 mm fine graded wearing course	600 to 900
	Rolled asphalt	700 to 1 100
	Coated chippings	2 000 to 3 000

Publications referred to

BS 76, *Specification for tars for road processes.*
BS 598, *Sampling and examination of bituminous mixtures for roads and other paved areas.*
BS 598-2, *Methods for analytical testing*[2)].
BS 598-3, *Methods for design and physical testing*[2)].
BS 598-100, *Methods for sampling for analysis.*
BS 812, *Testing aggregates.*
BS 812-102, *Methods for sampling.*
BS 2000, *Methods of test for petroleum and its products.*
BS 2000-49, *Penetration of bituminous materials.*
BS 5284, *Methods. Sampling and testing mastic asphalt and pitchmastic used in building*[2)].

[2)] Referred to in the foreword only.

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