British Standard

BRITISH STANDARD

BS 598-100: 1987

Incorporating Amendment Nos. 1 and 2

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

Part 100: Methods for sampling for analysis

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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Contents

Foreword

This Part of BS 598 has been prepared under the direction of Technical Committee B/510. It is proposed to confirm this Part of this British Standard after publication of amendment No. 2.

Due to the different factors to be considered when sampling and testing mastics for roads 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.

It is recognized that safety during sampling is of great importance. It should be noted that the work of sampling may be subject to the provisions of the Health and Safety at Work etc. Act 1974, the Factories Act 1961 (as amended by the Health and Safety at Work etc. Act 1974) and in particular the Construction Regulations 1961 and 1966.

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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 Scope

This Part of BS 598 describes methods for sampling all types of coated bituminous mixtures including coated chippings, but excluding mastics and slurry seal, used for roads and other paved areas.

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 following definitions apply.

2.1
increment

a portion of the material, taken by a single operation, which may by itself, or in combination with other similar portions, provide a bulk sample

2.2
bulk sample

an increment, or a combination of increments, taken from a mass of material. The mass represented may be a lorry-load, more than one lorry-load, an area of laid material or a quantity of stockpiled material

2.3
laboratory sample

the whole of, or representative part of, the bulk sample forwarded to the laboratory for testing

3 General principles

Samples of bituminous road materials are normally required for one or more of the following three purposes:

a) assessment of the constituent proportions of the material for production quality control;

b) judgement of compliance with the specification for the material;

c) establishment of some property of a particular quantity or area of material.

NOTE 1 Before any sampling is undertaken, the purpose of sampling should be considered and an appropriate sampling procedure chosen. To assist in this choice, a list of advantages and disadvantages is included with each method.

NOTE 2 When a specific property, e.g. moisture content, is to be examined it may be important to seal the containers during transportation and storage.

NOTE 3 Appendix B gives recommendations on the rate of sampling.

4 General apparatus (see **6.4.2 and 7.2.1** for specific apparatus)

4.1 *Sampling pans, shovels and trays,* maintained at all times in a clean and serviceable condition.

NOTE 1 When sampling some bituminous materials it is advantageous to coat the equipment lightly with diesel or similar oil. If this is done the equipment should be drained for at least 30 s before use.

NOTE 2 It is useful to fabricate any special equipment in such a way that cleaning may be assisted by heating.

4.2 *Sampling shovel* as shown in Figure 3.

4.3 *Sampling pan of low carbon steel,* approximately 2 mm thick, and cylindrical in shape with a diameter of 240 ± 10 mm and a depth of 75 ± 5 mm.

NOTE The pan is operated in such a way that it can be passed transversely through the centre part of the curtain of material being discharged directly from a mixer or from a storage hopper.

4.4 *Sample containers,* clean and fabricated from material with properties appropriate for the type of mixture being sampled and for the subsequent treatment of the sample, e.g. transportation and possible reheating.

NOTE Plastics and plastics lined paper bags are not suitable sample containers for hot materials.

4.5 *Sampling scoop* capable of holding at least 2 L.

NOTE A suitable scoop is shown in Figure 1.

5 Minimum mass of bulk samples

For the methods described in clauses **6** and **7**, take bulk samples so that the minimum mass of each bulk sample is greater than or equal to the appropriate value given in Table 1.

Table 1 — Minimum mass of bulk sample for different nominal size of aggregate in materials except coated chippings

Nominal size of aggregate	Minimum mass of bulk sample
mm	kg
> 20	24
≤ 20	16

NOTE The above minimum masses of bulk samples are sufficient to provide a laboratory sample for both the supplier and the customer.

6 Methods of obtaining bulk samples from all materials except coated chippings

6.1 Sampling from a lorry-load of material

Using a sampling shovel (**4.1**), take three increments of 7 ± 0.5 kg each for material containing 20 mm nominal size aggregate or smaller and four increments of 7 ± 0.5 kg each for material containing larger than 20 mm nominal size aggregate from about 100 mm below the surface of the material. Take the increments from different positions as widely spaced as practicable but not closer than 300 mm from the side of the lorry. Remove all the surface material including any coarse material that may fall into the hole.

NOTE 1 An average sampling shovelful weighs approximately 7 kg.
NOTE 2 The advantages of this method are as follows:

a) there is only a small risk to sampler's personal safety;
b) sampling is easy to perform;
c) no special equipment is needed.

The disadvantages of this method are as follows:

1) there is a risk of an unrepresentative sample due to segregation during loading and haulage;
2) there is uncertainty of the precise location of material in the pavement;
3) the sample is taken from a limited quantity of material (possibly only one batch).

6.2 Sampling during discharge from a mixing plant

6.2.1 *General procedure.* Position the sampling pan of low carbon steel (**4.3**) prior to discharge to one side of where the curtain of material will fall. During discharge pass the pan through the falling material at a rate that just prevents any surcharge from building up above the sides of the pan. Discard the increments if a surcharge does build up.

NOTE Appendix A describes a typical sampling equipment arrangement.

6.2.2 *Discharge from a batch-type mixer.* Take an increment approximately midway through the period of the discharge of a batch. Repeat on further batches until the total number of increments taken is as given in Table 2 for the appropriate nominal size of aggregate.

6.2.3 *Discharge from a continuous mixer or storage hopper.* Take the number of increments of material as given in Table 2 for the appropriate nominal size of aggregate, during a period of continuous discharge from the continuous mixer or storage hopper. Avoid sampling the first and last material discharged unless the purpose of sampling is to examine this particular part of the discharge.

Table 2 — Number of increments when sampling during discharge from a mixing plant

Nominal size of aggregate in the material	Number of increments
mm	
> 20	4
≤ 20	3

NOTE 1 An average panful weighs approximately 8 kg.
NOTE 2 With high rate discharge hoppers the rate should be adjusted to allow sampling to be carried out safely and properly.
NOTE 3 The advantages of this method are as follows:

a) an individual batch can be sampled;
b) material is immediately available for testing for control of plant;
c) observation of material can detect gross errors.

The disadvantages of this method are as follows:

1) special equipment is required;
2) there is uncertainty of the precise location of the material in the pavement;
3) there is risk to the sampler's personal safety.

6.3 Sampling from the material around the augers of the paver

Take two increments from each side of the paver using a sampling shovel (**4.1**). Take increments only when augers are charged throughout their length. Take the increment by pushing the shovel into the charge of material directly in front of the auger and removing it when full.

NOTE 1 Where easy access is obstructed by structural members of the paver, a sampling shovel blade fitted with a suitable handle approximately 2 m long may be used.
NOTE 2 The advantages of this method are as follows:

a) there is certainty of the location of the material in the pavement;
b) there is no interruption to paving operations;
c) sampling is easy to perform;
d) no special equipment is needed.

The disadvantages of this method are as follows:

1) there is risk of segregation at the ends of the paver augers;
2) there is risk of segregation if the auger box is not correctly filled;
3) there is risk to the sampler's personal safety;
4) the method is only applicable when the material is accessible from both sides of the paver.

6.4 Sampling from the laid-but-not-rolled material

6.4.1 *General.* This method is not advisable in the following circumstances:

a) for wearing course material;
b) for mixtures in which the difference between the nominal size of aggregate in the material and the thickness being laid is less than 20 mm.

6.4.2 ***Apparatus***

6.4.2.1 *Sampling trays of steel,* nominally 375 ± 25 mm square, 3.25 ± 0.25 mm thick and not more than 10 mm deep. A steel multistrand wire at least 3 m long is attached to one corner of each tray. The wire attachment is designed to withstand effectively the forces exerted during the passage of the paver over the tray.

NOTE A wire of 9 mm circumference and 4.5 kN breaking load has been found satisfactory. Welded wire attachments have been found unsatisfactory.

6.4.3 *Procedure.* Place two sampling trays (**6.4.2.1**) just ahead of the paver, one on each side of the centre line of the strip to be laid by the paver. Place the trays not more than 10 m apart in the direction parallel to the movement of the paver and so positioned that the trays are not damaged by the paver.

Lay the wires connected to the trays as flat as possible on the surface to be covered, with the free ends of the wires outside the area to be covered. Prevent the wires from being entangled with the paver. After the material has been laid raise the wires to locate the trays. Lift the corners of the trays by the wires and ease the trays across the laid material. Combine the two increments so obtained to form the bulk sample.

NOTE The advantages of this method are as follows:

a) there is certainty of the location of the material in the pavement;

b) there is a minimal risk of segregation;

c) there is no interruption to paving operations;

d) there is little risk to the sampler's personal safety.

The disadvantages of this method are as follows:

1) there is a possibility of affecting the finished surface;

2) labour requirements are increased;

3) special equipment is required;

4) there is some possibility of the trays being displaced.

7 Other methods of obtaining bulk samples

7.1 Sampling of workable material in heaps

Using a sampling shovel (**4.1**), take three increments of 7 ± 0.5 kg each for material containing 20 mm nominal size aggregate or smaller and four increments of 7 ± 0.5 kg each for material containing larger than 20 mm nominal size aggregate from different positions, at least 100 mm from the outer surface of the heap. Remove all the surface material including any coarse material that may fall into the hole.

7.2 Sampling of finished material

7.2.1 *Apparatus*

7.2.1.1 *Core-cutting machine,* capable of removing cores of at least 140 mm in diameter to the full depth of the course to be sampled.

NOTE Other equipment suitable for cutting samples of at least 300 mm square to the full depth of the course to be sampled may be used as an alternative.

7.2.2 *Procedure.* To obtain a representative sample of the finished material, cut a minimum of three cores or squares to the full depth of the course being sampled from positions evenly spaced along a diagonal line across the course width. Cut sufficient cores or squares to ensure that the combined mass of the bulk sample is in accordance with Table 1 for the appropriate nominal size of aggregate.

Furthermore, cut the cores so that they are not less than 140 mm in diameter and cut the squares so that they are not less than 300 mm square. Send the whole of the sample to the laboratory in suitable sealed containers.

NOTE 1 A different pattern of cores may be necessary when it is required to establish the properties of discrete areas. The pattern should be agreed between purchaser and supplier.

NOTE 2 The advantage of this method is that there is certainty of the location of the material in the pavement.

The disadvantages of this material are as follows:

a) there is a possibility of affecting the finished surface;

b) special equipment is required;

c) cutting operations will affect the grading of the mineral aggregate;

d) the sample may be contaminated by extraneous material.

8 Sampling coated chippings from stockpiles

Using a sampling shovel (**4.2**) or a sampling scoop (**4.5**), take 10 increments of a combined mass of 25 kg from different positions, at least 100 mm from the outer surface of the heap. Remove all the surface material including any material that may fall into the hole.

9 Sample-size reduction of bulk sample

If it is required to reduce the size of the bulk sample, proceed as described in either (a) or (b).

a) Use a sample divider (riffle box) that is based on the design illustrated in Figure 2 of BS 812-102:1984 and that has rectangular chutes of dimensions such that the material flows freely through the divider.

NOTE It may be found advantageous to use a heated sample divider, especially for sticky materials.

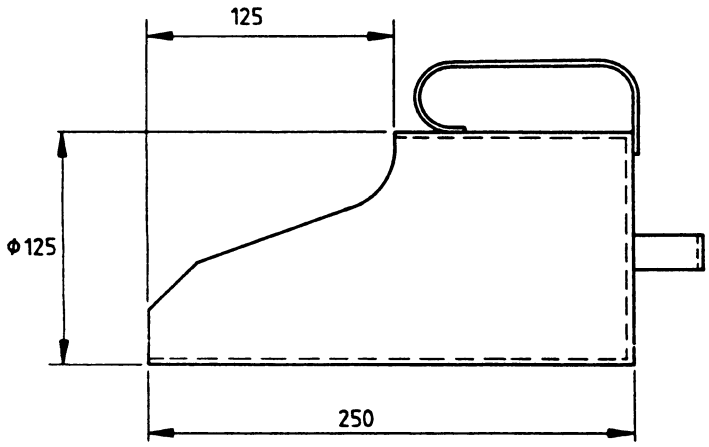
b) Use reduction by quartering as described in BS 598-101.

10 Certificate of sampling

At the time of sampling, record the information described in appendix C and keep a copy with each laboratory sample.

Appendix A Typical sampling equipment

A typical sampling scoop for coated chippings is shown in Figure 1 and typical sampling equipment is shown in Figure 2.



Dimensions are in millimetres and are nominal.

Figure 1 — Typical sampling scoop for coated chippings

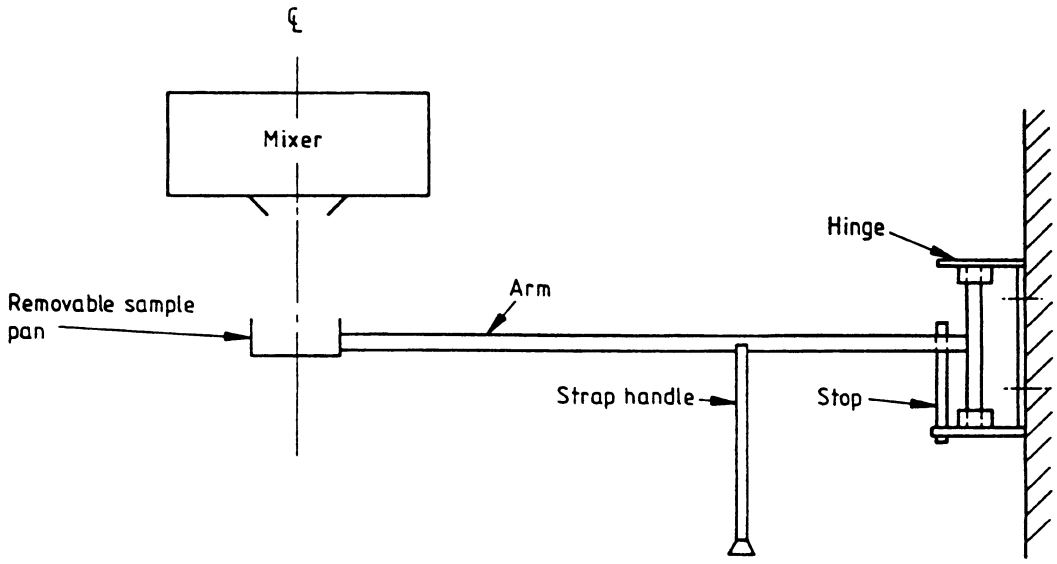
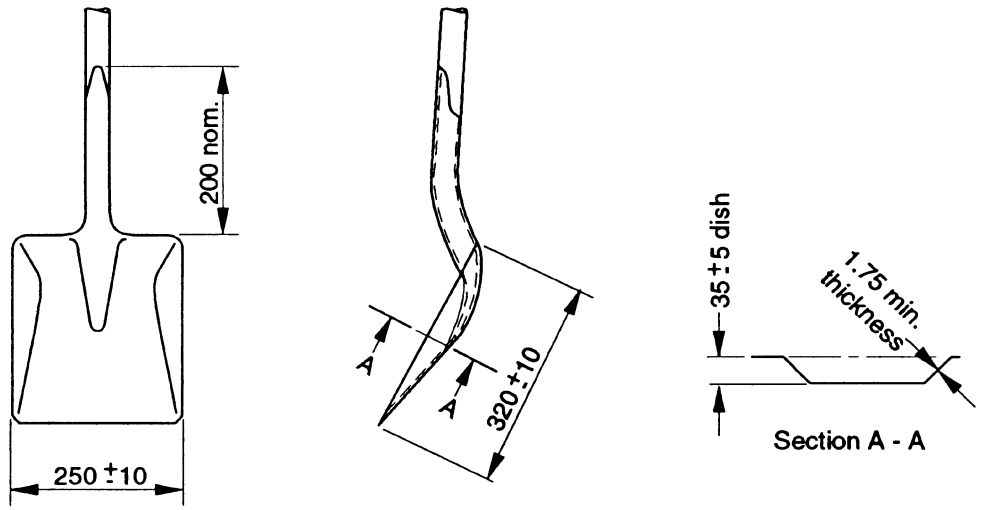


Figure 2 — Sampling equipment



NOTE. The shovel shown complies with the essential requirements for a square mouth open socket shovel, size 2, to BS 3388 : 1973.

Dimensions in mm.

Figure 3 — Sampling shovel

The device is mounted on the plant structure (see Figure 2) in such a position that the sample pan passes through the centre line of the mixer discharge when the arm is swung.

The stop is adjusted with the sample pan pushed back out of the mixer discharge and a sample is obtained by pulling the arm and sample pan through the falling material by means of the strap handle.

The length of the arm is dependent on the arrangement of the plant structure.

Appendix B Recommendations on the rate of sampling

The rate of sampling for any job should be related to the overall economics of the supply and acceptance of materials. Realistic indications of the overall quality of a supply require tests on samples for every 100 t of paving material and 25 t of coated chippings. If the quality is doubtful, extra test results are necessary in order to make accurate assessments of the quality of the material. If the quality is well within the specified tolerances, the risks involved in reducing the rate of testing to one test in every 200 t are small. If no well established statistical system for the examination of the test results is available, the rate of sampling should vary with the indicated quality.

Appendix C Typical certificate of sampling

The following information should be given on the certificate:

a) the contract or job;

b) the supplier and location of mixing plant;

c) the delivery ticket number, if available;

d) the sample identification number;

e) the sample location (e.g. precise chainage);

f) the date and time of sampling;

g) the method of sampling;

h) the reason for sampling;

i) the specification as ordered;

j) any remarks;

k) the signature of the sampler;

l) the name of the sampler in block capitals.

NOTE In cases of dispute or failure it is recommended that a detailed report be made.

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Publications referred to

BS 598, *Sampling and examination of bituminous mixtures for roads and other paved areas.*
BS 598-2, *Methods for analytical testing*[1)].
BS 598-3, *Methods for design and physical testing*[1)].
BS 598-101, *Methods for preparatory treatment of samples for analysis.*
BS 812, *Testing aggregates.*
BS 598-102, *Methods for sampling.*
BS 3388, *Specification for forks, shovels and spades.*
BS 5284, *Methods. Sampling and testing mastic asphalt and pitchmastic used in building*[1)].

[1)] Referred to in the foreword only.

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