

Methods of

Sampling and testing mastic asphalt used in building and civil engineering

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Committees responsible for this British Standard

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- Bitumen Modifiers Association
- Department of the Environment (Building Research Establishment)
- Department of the Environment (Property Services Agency)
- Federation of Civil Engineering Contractors
- Low Temperature Coal Distillers Association of Great Britain Ltd.
- Mastic Asphalt Council and Employers Federation
- Mastic Asphalt Producers Association
- Royal Institute of British Architects
- Society of Chemical Industry

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 References	1
3 Definitions	1
4 Methods of sampling	1
5 Preparatory laboratory treatment of sample	3
6 Hardness number test	3
7 Determination of binder content and grading of mineral aggregate	4
8 Recovery of bituminous binders	13
Annex A (informative) Safety	17
Annex B (informative) Recommendations for equipment control and calibration	17
Figure 1 — A type of apparatus suitable for hardness testing	4
Figure 2 — Filtration apparatus	6
Figure 3 — Porous filter thimble	6
Figure 4 — Recovery apparatus showing necessary features	8
Figure 5 — Sieving extractor	10
Figure 6 — Distillation apparatus used for the recovery of soluble bitumen	15
Figure 7 — Glass link stirrer	16
Table 1 — Minimum mass of laboratory samples	2
Table 2 — Size of sample, sieves and minimum volume of solvent to be used for analysis	5
Table 3 — Limits for repeatability and reproducibility of a sample obtained from the same bulk sample	13
List of references	Inside back cover

Foreword

This British Standard has been prepared under the direction of Technical Committee B/546, Flexible sheets for water and water vapour control, and gives methods for sampling and testing of mastic asphalt used in building. It supersedes BS 5284:1976 which is withdrawn.

In this edition reference to pitch mastic has been deleted as this material is no longer in general use. The method for determination of water content and the funnel method for binder content and grading of mineral aggregate have been omitted. Where practicable, the methods have been aligned with those of Parts 100, 101 and 102 of BS 598 which deals with sampling and testing of bituminous materials for roads and other paved areas. Some mastic asphalts are used for both road and building applications. In such cases, whilst the methods of sampling may vary, it is not intended that different test methods should be specified.

WARNING. The methods described in this British Standard require the use of dichloromethane. This solvent is hazardous to health and is subject to occupational exposure limits as detailed in the latest edition of Guidance Note EH/40 [1] published by the Health and Safety Executive. Exposure levels are related to both handling procedures and ventilation provision and it is emphasized that adequate training should be given to staff employed in the usage of this substance.

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 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 British Standard specifies methods for sampling and testing mastic asphalt used in building and civil engineering.

NOTE Attention is drawn to the safety recommendations given in Annex A.

2 References

2.1 Normative references

This British Standard 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 standard only when incorporated in it by updating or revision.

2.2 Informative references

This British Standard 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 latest editions.

3 Definitions

For the purposes of this British Standard the following definitions apply.

3.1 increment

portion of material taken by a single operation

3.2 bulk sample

combination of increments taken from a mass of material which the bulk sample is intended to represent

3.3 laboratory sample

whole or representative part of a bulk sample that is sent to a laboratory for testing

3.4 repeatability

quantitative expression of the random error associated with a single test operator in a given laboratory obtaining successive results with the same apparatus under constant operating conditions on identical test material. It is defined as that difference between two such single results as would be exceeded in the long run in only one case in twenty in the normal and correct operation of the test method

3.5 reproducibility

quantitative expression of the random error associated with test operators working in different laboratories, each obtaining single results on identical test material when applying the same method. It is defined as that difference between two such single and independent results as would be exceeded in the long run in only one case in twenty in the normal and correct operation of the test method

4 Methods of sampling

4.1 General principles

NOTE 1 Samples of mastic asphalt are normally required for one or more of the following three purposes.

- Assessment of the constituent proportions of the material for quality control.
- Judgement of conformance to the specification for the material.
- Establishment of a specific property of a defined quantity or area of material.

Before any sampling is undertaken, the purpose shall be considered and an appropriate sampling procedure chosen.

If requested, all parties having a direct interest in the results of the tests on materials taken on site shall be informed when and where samples are to be taken so as to afford them the opportunity of witnessing the procedure. Samples shall be made available for the manufacturer's own testing.

NOTE 2 If all the details of the specified sampling procedure are not carried out, the results of the test may not be accepted as being representative of the material being sampled.

The size of the bulk sample shall be not less than that stated in the procedures given in 4.2 to 4.6 and, if so required, shall be large enough to provide laboratory samples for each of the interested parties.

4.2 Sampling during discharge at the manufacturing plant

Use a clean, rigid metal container for sampling the molten material. The container shall be of dimensions capable of receiving a 2 kg increment.

Take at least three increments.

Take each increment by placing the empty container in the stream of material being discharged from the mixer. Discard the increment if the container becomes surcharged during this procedure. Record the temperature of the mastic asphalt.

In the case of batch mixers, carry out the sampling while the mixer contains between one-third and two-thirds of the original charge. Thoroughly mix the increments together in a clean container while still molten to form a bulk sample of sufficient mass to provide laboratory samples having a mass not less than that given in Table 1.

4.3 Sampling of block material

Select at random and break not less than six blocks for every 10 t of material or part thereof.

Unless contamination is the subject of investigation, take increments of approximately equal size from the inner part of each block and combine to form a bulk sample of sufficient mass to provide laboratory samples having a mass not less than that given in Table 1.

Table 1 — Minimum mass of laboratory samples

Maximum size of coarse aggregate specified	Minimum number of increments	Minimum mass of each increment kg	Minimum mass of laboratory sample kg
Passing 3.35 mm sieve conforming to BS 410:1986	3	1	3
Passing 14.0 mm sieve conforming to BS 410:1986	3	2	6

If contamination is the subject of investigation, submit the whole block for examination.

4.4 Sampling from site remelting equipment and mobile mixers

Preferably carry out the sampling while the mixer contains between one-third and two-thirds of the original charge and the hand-stirred cauldron approximately one-half of the original charge.

However, if this is not possible, record with the sample identification, the actual conditions, how much of the original charge remained and if fresh block material had been added prior to sampling.

Use a clean, rigid metal container for sampling the molten material. The container shall be of dimensions capable of receiving an increment of at least 2 kg.

Take at least three increments. Where sampling from a mixer, take each increment by placing the empty container in the stream of material being discharged. Discard the increment if the container becomes surcharged during this procedure. When taking the increment from the cauldrons, thoroughly stir the molten material immediately beforehand.

Thoroughly mix the increments together in a clean container while still molten to form a bulk sample of sufficient mass to provide laboratory samples having a mass not less than that given in Table 1.

4.5 Sampling from laid and finished material

Obtain an individual sample from laid and finished mastic using one of the following procedures.

- Warm the perimeter of the sample area by application of molten mastic asphalt.

NOTE 1 The supply of molten mastic asphalt, prepared to restore the surface once the sample has been removed, may be used for this purpose.

With a knife or similar tool, cut through the total thickness of the material and carefully extract the sample.

NOTE 2 This method reduces damage to both the sample and the surrounding material to a minimum.

- Cut out the sample using a mechanical cutting disc.

Do not use a blow torch for warming the material or cut the material cold by using a hammer and chisel as this could cause fracture of surrounding material.

When cutting out the sample note any factors which might influence the investigation.

NOTE 3 Such factors include surface finishes and blemishes, underlays, vent pipes and surface contamination.

An individual sample shall be of not less than 300 mm × 300 mm and, within this, a minimum area of 200 mm × 200 mm shall remain free from the molten mastic asphalt. Such a sample shall be regarded as representing only a limited area of the material.

For representative sampling of laid and finished mastic asphalt, select individual samples at the rate of not less than one for each 50 m² and part thereof of the area concerned, but in no case take less than three samples, distributed approximately equally over the area and not less than 0.5 m from a joint or the edge of a bay.

For the investigation of suspected faults or irregularities in material or workmanship take specific samples from the area(s) in question. Such samples shall be regarded as separate from those that have been selected for any sample intended to be representative of the work as a whole.

4.6 Size of sample

The bulk sample(s) taken in accordance with 4.2, 4.3 or 4.4 shall be of sufficient mass to provide the required number of laboratory samples.

NOTE The minimum mass of laboratory samples is dependent on the maximum size of coarse aggregate specified for the mastic asphalt (see Table 1).

4.7 Information to be supplied with samples

Ensure that the sample is adequately identified with provision for reference to a schedule giving information on the appropriate items from the following:

- location of mixing plant or site where laid;

- b) name and address of authority giving instructions for the examination to be carried out;
- c) sample identification;
- d) type of material;
- e) specification with which the material is intended to comply;
- f) date of mixing or laying;
- g) date of sampling (see note);
- h) positions from which sample of laid material was taken;
- i) number and nominal thicknesses of courses;
- j) nature and condition of base;
- k) nature of surface treatment (if any);
- l) test to be made, or information sought;
- m) name of sampler (in block capitals), signature and name of sampling organization.

To facilitate the testing procedure and the interpretation of test results give as much information as possible to the laboratory. Include site observations such as those noted when sampling laid and finished material in 4.5.

NOTE Sampling should be within 24 h of laying for determinations intended to be recorded as the hardness number at the time of laying.

5 Preparatory laboratory treatment of sample

5.1 Preliminary inspection

Inspect the sample as soon as possible after receipt and note its condition.

5.2 Sample reduction and preparation

Unless the sample has been received at a temperature sufficient to enable the material to be broken down to an appropriate size for analysis, i.e. not larger than 20 mm, place the remainder of the sample in an oven at a temperature not exceeding 180 °C and, as soon as it is softened just sufficiently to be broken, remove it from the oven. Avoid prolonged heating.

Break the sample into small pieces and obtain a representative portion by taking pieces at random.

5.3 Preparation for hardness number test

Reconstitute a further representative portion of the sample by careful heating for the shortest possible time at a temperature not exceeding 205 °C.

Cast the molten material into duplicate hardness number test moulds and float finish. Avoid excessive floating as this can influence the hardness number.

The hardness number test mould shall be not less than 100 mm in diameter and not less than 25 mm in depth.

6 Hardness number test

NOTE The hardness number test should be used as follows.

- a) *At the place of manufacture.* For quality control purposes as required by the appropriate standard.
- b) *At the remelting and laying stage.* For quality control purposes as required by the appropriate standard.
- c) *Laid material.* Laid material is contaminated with surfacing and underlay materials and there is no provision for the application of this test other than at the manufacturing and laying stages.

The stability of mastic asphalt increases with time so, depending on the age of the asphalt, hardness numbers on samples taken at a later date may therefore be significantly lower than at the time of laying. Most of the process is completed in the first year, and extensive investigations of this characteristic show that this can be equal to a 40 % reduction of the hardness number from that at the time of laying.

6.1 Principle

A flat-ended indenter pin in the form of a steel rod 6.35 mm in diameter is allowed to indent the mastic under a force of 311 N applied for 60 s whilst the mastic is maintained at the temperature specified in the appropriate standard. The depth of indentation is measured.

6.2 Apparatus

The apparatus, of which a suitable form is illustrated in Figure 1, and with which the force is conveniently applied by means of a lever giving a mechanical advantage, shall be capable of realizing the principle given in 6.1.

6.3 Method

Cool the hardness number test piece, prepared in accordance with 5.3, in air for not less than 3 h or in cold water for not less than 1 h.

Immerse the test piece in water, maintained to within ± 0.1 °C of the specified test temperature, for not less than 1 h prior to testing. Transfer the test piece to the test apparatus (see Figure 1) where it shall be again immersed in water, maintained to within ± 0.1 °C of the specified test temperature, throughout the test period.

Adjust the indenter pin so that it is lightly but firmly in contact with the sample, the pressure being no greater than is necessary to prevent lateral movement of the test piece.

Apply the specified force for 60 s and record the depth of the indentation at the end of this period to an accuracy of 0.1 mm.

Take at least five readings at test points not less than 25 mm apart and not less than 25 mm from the edge of each test piece.

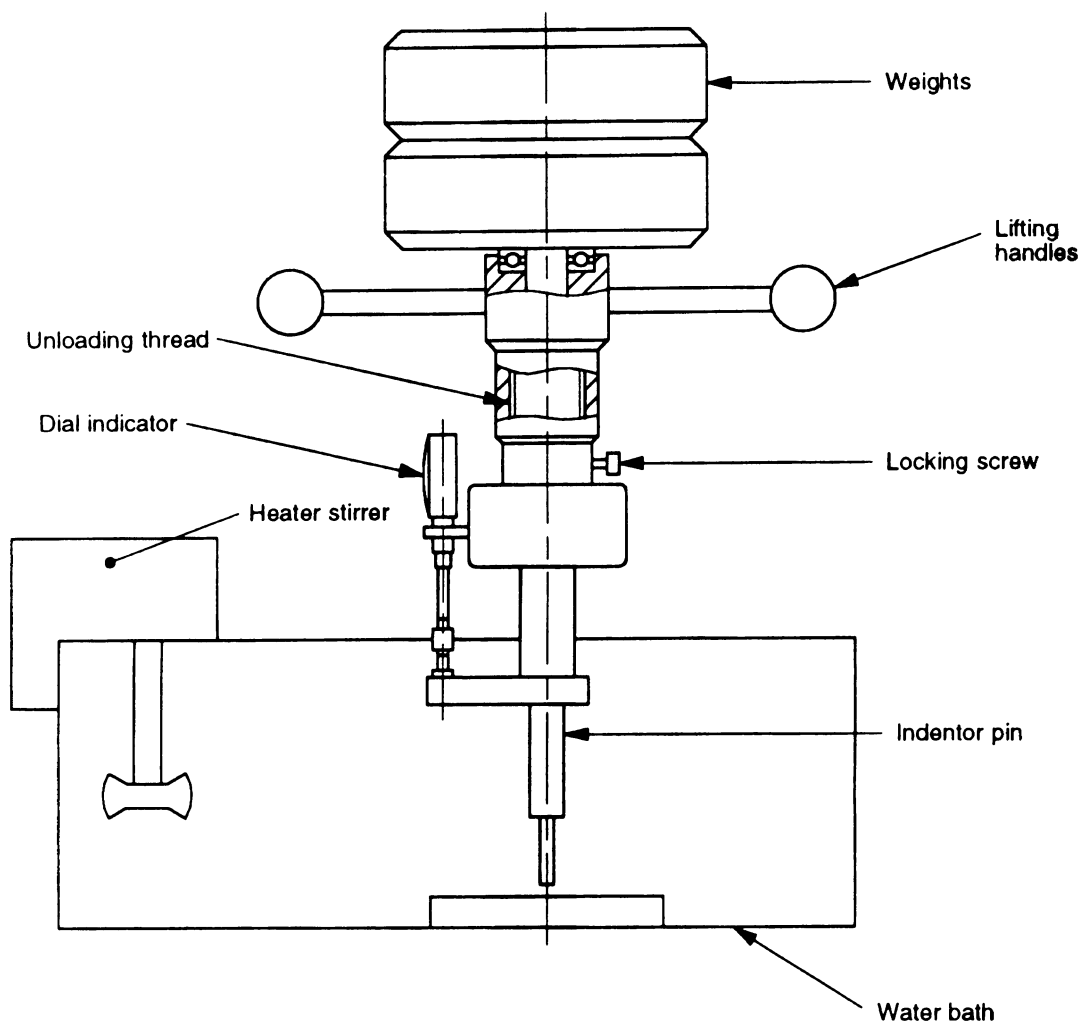


Figure 1 — A type of apparatus suitable for hardness testing

6.4 Expression of results

6.4.1 Results

Calculate the mean of the five test results and compare with the individual results. Reject any result that differs from the calculated mean by more than 2 hardness units (0.2 mm) or 15 % of the mean, whichever is the greater. If more than one result is rejected discard the specimen and test the duplicate specimen. If the test on the duplicate specimen fails to provide four acceptable results repeat the test on freshly cast specimens.

6.4.2 Reporting of results

Report the mean of the acceptable test results (to the nearest 0.1 mm).

7 Determination of binder content and grading of mineral aggregate

7.1 General

The binder content and grading of mineral aggregate shall be determined by one of the following methods:

- a) the extraction bottle method (binder directly determined) in accordance with 7.2;
- b) the sieving extractor method in accordance with 7.3.

NOTE The advantages and disadvantages of these methods depend on the circumstances of a particular case, and the choice of method is a matter for individual assessment. Nevertheless both methods, when carried out by a skilled operator, will produce comparable test results in all materials submitted for investigation provided that:

- a) strict attention is paid to the details of the test procedure;