

Hot rolled asphalt for roads and other paved areas —

Part 1: Specification for constituent materials and asphalt mixtures

UDC 625.85: [625.07 + 665.775]

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/510, Road materials, to Subcommittee B/510/1, Coated macadam and hot asphalt, upon which the following bodies were represented:

- British Aggregate Construction Materials Industries
- British Civil Engineering Test Equipment Manufacturers' Association
- County Surveyors' Society
- Department of the Environment (Property Services Agency)
- Department of Transport
- Department of Transport (Transport and Road Research Laboratory)
- Institute of Asphalt Technology
- Institute of Petroleum
- Institution of Civil Engineers
- Institution of Highways and Transportation
- Low Temperature Coal Distillers' Association of Great Britain Ltd.
- Mastic Asphalt Council and Employers' Federation
- Mastic Asphalt Producers' Association
- Refined Bitumen Association Ltd.
- Sand and Gravel Association Limited
- Society of Chemical Industry

This British Standard, having been prepared under the direction of Technical Committee B/510, was published under the authority of the Standards Board and comes into effect on 15 September 1992

© BSI 21 December 2001

First published April 1985
Second edition September 1992

The following BSI references relate to the work on this standard:
Committee reference B/510/1
Draft for comment 90/16196 DC

ISBN 0 580 20928 8

Amendments issued since publication

Amd. No.	Date	Comments
8397	February 1995	
13529	21 December 2001	Indicated by a sideline

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
Section 1. General	
Introduction	1
1.1 Scope	1
1.2 References	1
1.3 Definitions	1
1.4 Sampling and testing	2
Section 2. Constituent materials	
2.1 Binder	3
2.2 Coarse aggregate	3
2.3 Fine aggregate	4
2.4 Added filler	4
Section 3. Rolled asphalt mixtures	
3.1 Group 1. Roadbase, basecourse and regulating course mixtures	5
3.2 Group 2. Wearing course design mixtures	5
3.3 Group 3. Wearing course recipe mixtures	9
3.4 Mixing	10
Section 4. Coated chippings for application to wearing course surfaces	
4.1 Chippings	13
4.2 Binder coating	13
4.3 Quality of binder coating	13
4.4 Size, shape and grading of coated chippings	13
Annex A (informative) Guidance on the selection of materials and mixtures	14
Annex B (informative) Recommendations for the application of design test criteria	16
Annex C (informative) Information to be provided by the purchaser and the supplier	17
Table 1 — Designation of binders and recommended storage temperatures	3
Table 2 — Composition of roadbase, basecourse and regulating course mixtures	7
Table 3 — Composition of design type F wearing course mixtures	8
Table 4 — Composition of design type C wearing course mixtures	8
Table 5 — Composition of design type R wearing course mixtures	9
Table 6 — Composition of recipe type F wearing course mixtures	11
Table 7 — Maximum temperatures of mixed asphalt	12
Table 8 — Gradings of chippings	13
Table B.1 — Criteria for the stability of laboratory design asphalt	16
List of references	18

Foreword

This Part of BS 594 has been prepared under the direction of Technical Committee B/510, Road materials. It is a revision of BS 594-1:1985 which is withdrawn.

BS 594 comprises two Parts:

- *Part 1: Specification for constituent materials and asphalt mixtures;*
- *Part 2: Specification for the transport, laying and compaction of rolled asphalt.*

This Part includes requirements for asphalt mixtures and their constituent materials and for coated chippings applied to the surface of some asphalt wearing courses.

The requirements and recommendations for transporting asphalt and for site work are given in Part 2.

Over the years, a considerable number of rolled asphalt mixture compositions have evolved. During the preparation of this edition, some rationalization of the previous range has been undertaken by omitting some infrequently used mixtures and introducing a limited range of preferred mixes, identified in bold type in Table 2, Table 3 and Table 6. Mixtures suitable for most uses can be selected from this range and it is intended that specifiers should encourage their general use.

However, enriched mixtures, designated type R, have been introduced to provide enhanced fatigue resistance in lightly trafficked, low stiffness pavements and greater durability in areas of the country which are particularly cold and wet.

Further guidance on selection of mixtures, the application of design test criteria, recommendations for stability, related to traffic conditions, and information to be provided by the purchaser and the supplier is given in Annex A, Annex B and Annex C.

The requirements for composition of all mixtures are based on testing the constituents and the mixture by methods described in BS 598 and other British Standards. Adjustment values for soluble binder content and material passing the 75 μm test sieve, previously given in BS 594-1:1985, are now given in BS 598-102. Methods of test to determine the condition of the binder on coated chippings and their rate of spread, the texture of finished surfaces, the density of cores drilled from asphalt surfacing and a method for assessing the compaction performance of other rollers by comparison with the performance of a non-vibrating 8 t roller are included in other Parts of BS 598.

It has been assumed in the drafting of this Part of BS 594 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.

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 19 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

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

Section 1. General

Introduction

This Part of BS 594 specifies the properties of materials used to make rolled asphalt and of the mixtures manufactured from those materials.

Roadbase, basecourse and regulating course mixtures are specified by conventional recipe methods in 3.1.

Wearing course mixtures are specified in two ways. In 3.2 design mixtures are specified, based on the mechanical testing of the asphalt mixture to estimate a “design” binder content. This binder content is normally a good guide to the amount necessary to give satisfactory mixtures and is of particular value when dealing with aggregates of previously unknown performance. The design method uses laboratory facilities and techniques additional to those required for routine compliance testing purposes. Design mixtures are recommended for heavily trafficked roads.

The recipe type of wearing course mixture specified in 3.3 is the conventional mixture which has proved satisfactory except under heavy traffic for most applications for many years. Purchasers having satisfactory experience with recipe mixtures may wish to continue using them.

Where rolled asphalt wearing course mixtures, of nominal 40 % coarse aggregate content or less, are used in trafficked areas it is usual to apply coated chippings to provide a suitable level of skidding resistance to the finished road. The properties of such chippings and the requirements for their manufacture are specified in Section 4.

1.1 Scope

This Part of BS 594 specifies requirements for mixtures of hot rolled asphalt to be laid as wearing course, regulating course, basecourse or roadbase on roads and other paved areas, excluding heavy duty airfield pavements.

It also specifies requirements for coated chippings, but excludes requirements for site-specific properties such as polished stone values and abrasion values of aggregates.

Guidance on selection of asphalt mixtures and their constituent materials is also included in Annex A.

1.2 References

1.2.1 Normative references

This Part of BS 594 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 page 18. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 594 only when incorporated in it by updating or revision.

1.2.2 Informative references

This Part of BS 594 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.

1.3 Definitions

For the purposes of this Part of BS 594 the definitions given in BS 6100 apply together with the following.

1.3.1

stability

the maximum resistance to deformation, in kilonewtons, of a moulded asphalt specimen made and tested in accordance with BS 598-107:1990

1.3.2

flow

the deformation of moulded asphalt specimen in millimetres at the point of maximum resistance, when made and tested in accordance with the requirements of BS 598-107:1990

1.3.3

design binder content

the binder content of a wearing course design mixture determined in accordance with the procedure described in BS 598-107:1990

1.3.4**target binder content**

the nominal soluble binder content of a wearing course design mixture specified in **3.2**, and which is equal to or greater than the design binder content and the specific requirements given in Table 3, Table 4 or Table 5

1.3.5**added filler**

material, a substantial proportion of which passes a 75 μm test sieve, added to the mixture in excess of that present in the proportioned coarse and fine aggregates

1.3.6**test sieve**

a sieve conforming to BS 410

1.4 Sampling and testing

NOTE The tolerances and ranges specified in this Part of BS 594 are intended to provide for errors in sampling and testing when carried out by a skilled operator as well as for variations in the asphalt due to plant variations and fluctuations in gradings of aggregates. Attention is drawn to the difficulties inherent in obtaining representative samples of asphalt for analysis and to the further (usually smaller) errors in the reduction of the sample and its analysis in the laboratory. It should be realized that, whenever any sampling and testing procedure is used, complete compliance with the specification may not always be achieved with every sample tested even when the material is satisfactory (see BS 598-102).

1.4.1 Binders

Penetration grade bitumens and lake asphalt-bitumen blends shall be sampled and tested in accordance with BS EN 12591:2000 and BS 3690-3:1990 respectively.

1.4.2 Aggregates and fillers

Coarse and fine aggregates and fillers shall be sampled and tested in accordance with the appropriate Parts of BS 812.

1.4.3 Asphalt mixtures

Asphalt mixtures shall be sampled and tested in accordance with BS 598-100:1987, BS 598-101:1987 and BS 598-102:1989.

NOTE The grading of the mineral aggregate fraction of the mixture is determined by means of wet sieving. The passing 75 μm fraction as obtained by this method should be reported without wet/dry correction.

1.4.4 Coated chippings

Coated chippings shall be sampled in accordance with BS 598-100:1987, when their temperature is below 130 °C, and tested in accordance with BS 598-102:1989.

Flakiness index shall be determined in accordance with the method given in BS 812-105.1:1989. The condition of the binder on the chippings shall be determined in accordance with clause **3** of BS 598-108:1990.

Section 2. Constituent materials

2.1 Binder

The binder shall be one of those designated in Table 1. Penetration grade bitumen shall conform to BS EN 12591:2000. Lake asphalt-bitumen mixtures shall conform to BS 3690-3:1990.

NOTE Guidance on the selection and use of different grades of binder is given in Annex A.

Table 1 — Designation of binders and recommended storage temperatures

Binder number	Type	Grade	Recommended storage temperature °C
1	Bitumen	30/45	170
2	Lake asphalt-bitumen	35 pen	175
3	Bitumen	40/60	165
4	Lake asphalt-bitumen	50 pen	170
5	Bitumen	70/100	160
6	Lake asphalt-bitumen	70 pen	165
7	Bitumen	100/150	150

NOTE Prolonged storage of binders at elevated temperatures may result in hardening. To reduce this risk, binders should be delivered to coating plants at temperatures below 200 °C and prolonged subsequent storage above the temperatures given in this table should be avoided. (It should be recognized that binder deliveries may result in short-term storage temperatures above those recommended in this table.)

2.2 Coarse aggregate

2.2.1 Type of coarse aggregate

Coarse aggregate shall be material substantially retained on a 2.36 mm test sieve and shall consist of one of the following.

- a) Crushed rock of one or more of the following groups:
basalt, gabbro, granite, gritstone, hornfels, limestone, porphyry or quartzite.
- b) Gravel of one or more of the groups in item a) or flint.
- c) Blastfurnace slag conforming to BS 1047:1983.
- d) Steel slag, either electric-arc furnace or basic oxygen slag, which shall be weathered until it is no longer susceptible to falling. The compacted bulk density shall be between 1 700 kg/m³ and 1 900 kg/m³ when tested in accordance with BS 1047:1983.

NOTE 1 Other slag may be suitable aggregates for rolled asphalt but are outside the scope of this standard.

NOTE 2 This standard does not include requirements for site-specific properties of aggregates, such as the polished stone value or the aggregate abrasion value, that may be required to assist skid-resistance, or the 10 % fines value which indicates aggregate strength.

2.2.2 Particle shape

Flakiness index shall not exceed 45 % for crushed rock and crushed gravels or 50 % for uncrushed gravels when tested in accordance with BS 812-105.1:1989.

2.2.3 Fraction passing 75 µm sieve

When determined by the washing and sieving method given in BS 812-103.1:1985, the fraction of material passing a 75 µm test sieve shall not exceed 6 % (*m/m*) of coarse aggregate for crushed rocks and slags and 4 % (*m/m*) for gravels.

NOTE There is no acceptable method for determining clay content of coarse aggregate but an indication of quantity is given by using the sedimentation test described in BS 812-103.2.

2.3 Fine aggregate

2.3.1 Type of fine aggregate

Fine aggregate shall substantially pass a 2.36 mm test sieve and shall consist of one of the following:

- a) sand;
- b) fines produced by crushing coarse aggregate conforming to **2.2.1**;
- c) a blend of item a) and item b).

NOTE Advice on the selection of asphalt mixtures containing various types of fine aggregate is given in Annex A.

2.3.2 Fraction passing 75 µm sieve

When determined by the washing and sieving method given in BS 812-103.1:1985, the fraction of material passing a 75 µm test sieve shall not exceed the appropriate limit given in **3.1.1.2**, **3.2.2.2** or **3.3.2.2**.

NOTE There is no acceptable method for determining clay content of fine aggregate but an indication of quantity is given by using the sedimentation test described in BS 812-103.2.

2.4 Added filler

2.4.1 Added filler shall be limestone or Portland cement, and shall have a bulk density in toluene of not less than 0.5 g/ml and not more than 0.9 g/ml.

2.4.2 If readily available, an added filler containing not less than 85 % (*m/m*) of particles passing a 75 µm test sieve when determined in accordance with the procedure for dry sieving in BS 812-103.1:1985 shall be used (see also **A.2**). Otherwise, an added filler containing not less than 75 % (*m/m*) passing a 75 µm test sieve shall be used, subject to the approval of the purchaser.