BS 598-1:2011

BSI Standards Publication

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

Part 1: Methods for the measurement of the rate of spread of coated chippings and the temperature of bituminous mixtures using non-contact temperature-measuring devices and for the assessment of the compaction performance of a roller

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Publishing and copyright information

ISBN 978 0 580 71722 2

ICS 93.080.10; 93.080.20

The following BSI references relate to the work on this standard:
Committee reference B/510/1
Draft for comment 11/30228683 DC

Publication history

First published as BS 598-108 September 1990
Second edition as BS 598-108 January 2006
First published as BS 598-109 September 1990
First published as BS 598-1 July 2011

Amendments issued since publication

Date	Text affected

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 8, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 598 is published by BSI and came into effect on 31 July 2011. It was prepared by Technical Committee B/510/1, *Asphalt products*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 598 supersedes BS 598-108:2005 and BS 598-109:1990+A1:2000, which are withdrawn.

Relationship with other publications

BS 598 consists of two parts; the other published part of BS 598 is as follows:

- BS 598-112:2004, *Method for the use of road surface hardness probe* [1)]

This part of BS 598 introduces changes associated with the introduction of the European standards for test methods for hot mix asphalt.

A hot sand test for the adhesivity of binder on precoated chippings for hot rolled asphalt has been published as BS EN 12697-37. The method in BS EN 12697-37 is based on the method described in BS 598-108:2005 for determining the condition of the binder on coated chippings, which is now withdrawn.

A test method for temperature measurement has been published as BS EN 12697-13. The method in BS EN 12697-13 is based on the method described in BS 598-109:1990+A1:2000 for the measurement of the temperature of coated mixtures using a probe thermometer, which is now withdrawn.

Guidance on the use of BS EN 12697-13 and BS EN 12697-37 can be found in PD 6692:2006.

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.

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- two parts of the BS 598 series: parts 108 and 109, for which there are no corresponding European standards, have been combined;
- Figure 1 has been introduced for clarity;
- the results of a review of parts of BS 598, for which there are no corresponding European standards, have been incorporated.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

[1)] B/510/2, *Surface treatments*, is the committee responsible for BS 598-112.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its methods are expressed as a set of instructions, a description, or in sentences in which the principal auxiliary verb is "shall".

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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1 Scope

This part of BS 598 describes a method for measuring the rate of spread of coated chippings, assessing the compaction performance of a roller and gives procedures for measuring the temperature of coated mixtures using non-contact temperature-measuring devices.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 6100-4:2008, *Building and civil engineering – Vocabulary – Part 4: Transport*

BS 594987, *Asphalt for roads and other paved areas – Specification for transport, laying and compaction and type testing protocols*

BS EN 932-1, *Tests for general properties of aggregates – Part 1: Methods of sampling*

BS EN 12697-6:2003, *Bituminous mixtures – Test methods for hot mix asphalt – Part 6: Determination of bulk density of bituminous specimens*

PD 6691, *Guidance on the use of BS EN 13108 Bituminous mixtures – Material specifications*

3 Definitions

For the purposes of this part of BS 598 the definitions given in BS 6100-4:2008 apply.

4 Measurement of the rate of spread of coated chippings

4.1 Principle

This test derives the quantity of chippings needed for (a single layer of) shoulder-to-shoulder cover of an area (see **4.3.1.1**). The mass of chippings per squared metre for shoulder-to-shoulder cover is obtained. The mass of chippings for mechanical chipping spreaders and of those applied by hand is also determined.

NOTE The value for shoulder-to-shoulder cover is needed to establish the criterion from which the specified mass of chippings on the road is calculated. The other values are used to check whether the specified quantity on the road has been achieved.

4.2 Method for establishing the rate of spread of chippings per square metre that gives shoulder-to-shoulder cover

Proceed as follows.

a) Take a sample of chippings in accordance with BS EN 932-1.

b) Riffle a representative sample of the chippings to provide a sub-sample of approximately 1 kg for 14/20 mm sized chippings or approximately 750 g for 8/14 mm sized chippings.

c) Place the chippings from the sub-sample in a tray, which is not smaller than 600 mm × 600 mm with vertical sides approximately 15 mm to 20 mm

high, and individually position the chippings by hand, in a single layer such that there is shoulder-to-shoulder cover.

d) Take further sub-samples and add the chippings to the tray until the area is completely covered.

e) Determine the mass of these chippings to an accuracy of ±5 g and repeat the test three times.

f) Take the mean of the four results, divide it by the area of the tray and obtain the rate of spread of chippings per square metre for shoulder-to-shoulder cover.

NOTE The repeatability and reproducibility of the results of the test are 5% and 8%, respectively.

4.3 Measurement of the rate of spread of chippings for mechanical chipping spreaders

4.3.1 Apparatus

4.3.1.1 *Ten aluminium trays*, shallow, 300 mm square, secured by four short lengths of chain to a metal disc surmounted by a hook and a calibrated spring balance.

4.3.1.2 *Spring balance*, calibrated in kg/m^2 with a range of 4 kg/m^2 to 16 kg/m^2. All trays for use with one spring balance shall be of equal mass.

4.3.2 Calibration

Proceed as follows.

a) Check the calibration of the spring balance on each day of use or more frequently if an error is suspected.

b) Carry this out by placing masses of chippings on the tray equivalent to the masses of chippings giving a low and high rate of spread, e.g. 7.5 kg/m^2 and 15 kg/m^2.

c) Check that the calibration of the spring balance is correct at these two rates.

4.3.3 Procedure

Proceed as follows.

a) Lay out five metal trays in front of each half width of the chipping spreader as shown in Figure 1 and when the machine has passed over them, hook each tray with its quota of chippings onto the spring balance and lift it, then note the rate of spread.

b) Immediately empty all of the chippings on the tray to the vacant area on the road before the roller traverses that area.

c) Repeat this to get 10 readings for each half width of chipping spreader and report the mean of these 10 readings as the rate of spread for each half width.

d) Repeat the measurements of the mass:

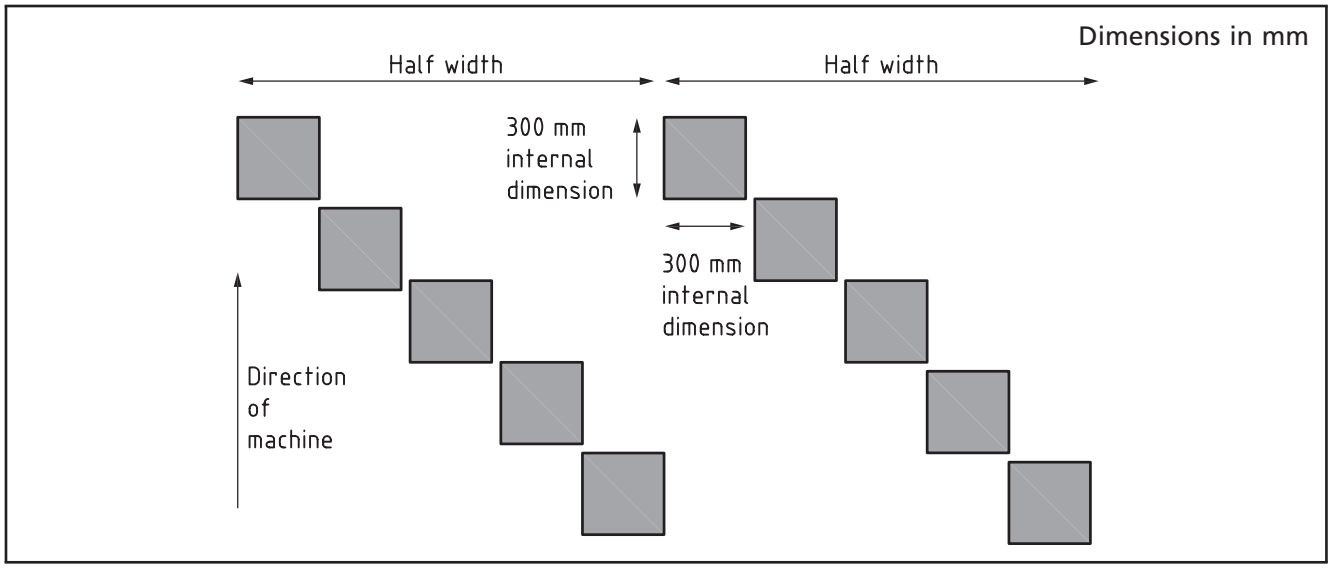
1) for each new batch of chippings;

2) if visual observation indicates a change in the quantity;

3) if the machine is changed; or appropropriately

4) at the discretion of the purchaser or their representative.

Figure 1 **Layout of metal trays in front of chipping spreader**



4.3.4 Reporting of results

Report the rate of spread of chippings as the average of each group of 10 results.

4.4 Rate of spread of chippings applied by hand

Determine the quantity of chippings from the mass of chippings used and the area of the road covered by these chippings.

5 Assessment of the compaction performance of a roller

5.1 Principle

The procedure is used to obtain an indication of the compaction performance of any type of roller (referred to as the alternative roller) compared with the minimum 8 t roller traditionally specified for compacting rolled asphalt. The procedure takes the form of pilot-scale compaction trials and can be used to determine whether a particular roller can achieve an acceptable level of compaction compared with an 8 t roller. Where a roller manufacturer can show that such a procedure has been carried out with a particular make and model of roller, it is not normally necessary for further assessment trials to be carried out (see also BS 594987), providing that information is supplied that makes it possible for the same type and mode of operation to be followed.

5.2 Test conditions

Ensure that the conditions of the trial are such that the ease of compacting the material is equal to or less than that for the conditions of the contract, e.g. the trial material is of the same composition as that to be laid in the contract (or is known to be at least as difficult to compact) and the temperatures of rolling in the trial are no higher than those of the contract. Use a structure of realistic stiffness to compact the material on.

5.3 Procedure

Proceed as follows.

a) Operate the alternative roller and conventional 8 t roller side by side over

the trial material, laid by a paving machine, in one pass. Do not move the rollers laterally between successive passes as in typical site work.

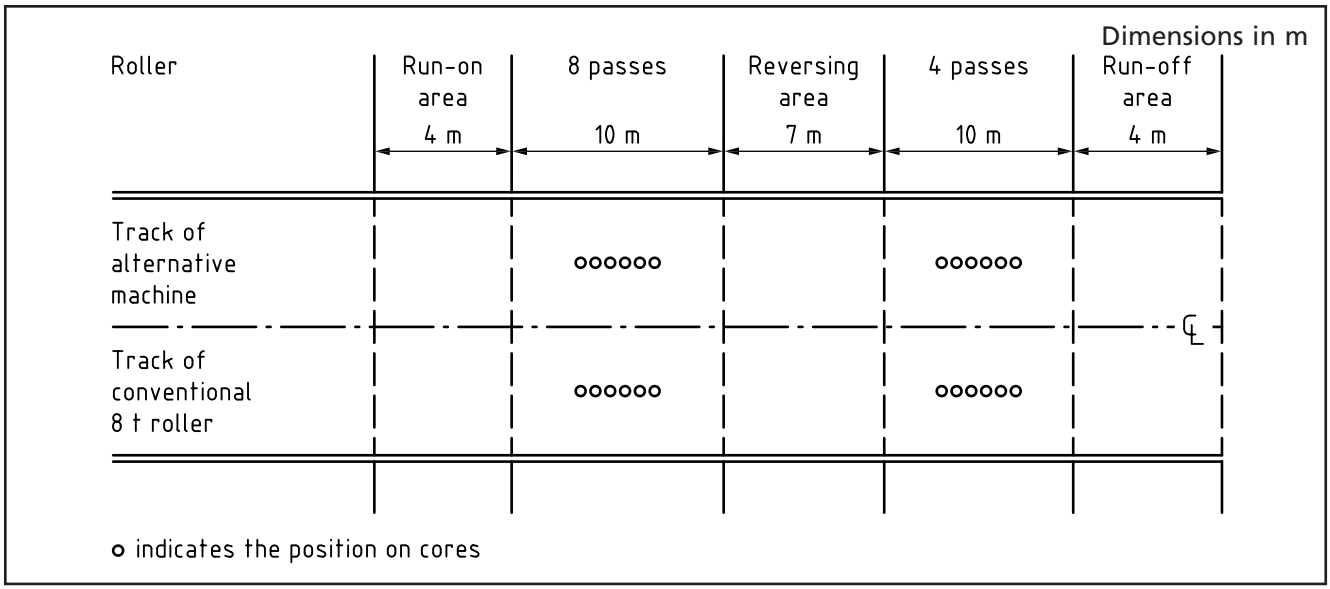
NOTE 1 The effects of variations in temperature and mix composition that might occur in the longitudinal direction along the laid asphalt are thus eliminated as the effectiveness of both rollers are equally affected.

b) Ensure that the layout of the trial is as shown in Figure 2, and carry out four and eight roller passes for the trials.

NOTE 2 The standard 8 t roller should preferably be a tandem machine to facilitate counting passes; each pass consists of one front and one rear wheel coverage of the machine.

c) Determine the mean density of each trial area by removing cores from each area as shown in the experimental layout in Figure 2 and measuring their densities in accordance with BS EN 12697-6:2003, Clause **9**, then record the results.

Figure 2 **Typical experimental layout to access the effectiveness of an alternative roller**



5.4 Expression of results

Compare the roller machines, taking into account their respective covering capacities. The product of the width of the alternative roller and its speed in the trial gives the relative rates of compaction compared with that provided by the conventional roller. Report the mean density for each trial area.

NOTE The results of this test method may be used to ascertain the effectiveness of the alternative roller by comparing the mean density achieved at each pass level investigated with the result obtained with the conventional 8 t roller. The respective rates of compaction may also be used as a means of assessing its effectiveness.

6 Measurement of the temperature of coated mixtures using non-contact temperature-measuring devices

6.1 Principle

This procedure is used to obtain the temperature of bitumen coated mixtures without making contact with the measuring device. The temperatures of the mixed materials are specified in PD 6691:2010, Tables B.17, C.4 and D.3, and BS 594987:2010, **9.2.2** and Table A.1. The procedure set out in this clause is for guidance on the instrument and the method that are to be used in measuring these temperatures.

NOTE Advice on the use of probe thermometers is given in BS EN 12697-13.

6.2 Apparatus

6.2.1 *Thermocouple*.

6.2.2 *Platinum resistance or reference mercury-in-glass thermometer*.

6.2.3 *Infra-red thermometer*, with UKAS calibration certificate.

6.2.4 *Calibrated electrical source*.

6.3 Calibration

6.3.1 Infra-red thermometers shall be checked against a reference thermocouple, platinum resistance or reference mercury-in-glass thermometer or calibrated electrical source approximately every 6 months.

NOTE The thermometer should have an accuracy of ±2 °C.

6.3.2 Reference thermocouples, platinum resistance thermometers or electrical sources shall be re-calibrated approximately once every 2 years and reference mercury-in-glass thermometers approximately once every 5 years.

6.4 Measurement by hand-held infra-red thermometer

*COMMENTARY ON **6.4***

This type of thermometer has the advantage of being very portable and of providing many readings in a short period of time. However, because it depends on heat radiation and not contact, as with other thermometer types, it is less suitable for certain applications.

6.4.1 The infra-red thermometer shall be set to the emissivity range appropriate for bitumen coated mixtures as detailed in the manufacturer's instructions.

6.4.2 When measuring the temperature of moving material, e.g. discharge from a hopper or lorry or in the augers of a paver, the temperature reading shall be taken by pointing the thermometer at the material from a distance of approximately 0.75 m, unless otherwise recommended by the manufacturer.

6.4.3 When measuring the temperature of material: in a lorry, in the hopper of a paver, in a heap or as a paved layer, the thermometer shall be held at the distance from the material recommended by the manufacturer. When

appropriate, the top 50 mm to 100 mm layer of material shall be removed and the temperature taken immediately with the thermometer.

6.4.4 If only the temperature at the surface is required, the thermometer shall be held at the distance from the surface recommended by the manufacturer and the temperature taken.

6.5 Procedure for temperature measuring

*COMMENTARY ON **6.5***

The temperature can be expected to vary throughout the material being measured.

6.5.1 For measurements of temperature in a lorry, take at least four, and preferably six, measurements at evenly spaced intervals from each side of the lorry and at least 500 mm from any edge. Average the results.

6.5.2 For laid material, take at least four, and preferably six, measurements and quote their average.

6.6 Expression of results

Give the temperature as the average for each group of four (or six) measurements taken.

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 598-108:2005, *Sampling and examination of bituminous mixtures for roads and other paved areas – Part 108: Methods for determination of the condition of the binder on coated chippings and for measurement of the rate of spread of coated chippings*

BS 598-109:1990+A1:2000, *Sampling and examination of bituminous mixtures for roads and other paved areas – Part 109: Methods for the assessment of the compaction performance of a roller and recommended procedures for the measurement of the temperature of bituminous mixtures*

BS 598-112:2004, *Sampling and examination of bituminous mixtures for roads and other paved areas – Part 112: Method for the use of road surface hardness probe*

BS 5284:1993, *Methods of sampling and testing mastic asphalt used in building and civil engineering*

BS EN 12697-13, *Test methods for hot mix asphalt – Part 13: Temperature measurement*

BS EN 12697-37, *Bituminous mixtures – Test methods for hot mix asphalt – Part 37: Hot sand test for the adhesivity of binder on precoated chippings for HRA*

PD 6692:2006, *Asphalt – Guidance on the use of BS EN 12697 'Bituminous mixtures – Test methods for hot mix asphalt'*

Other documents

[1] GREAT BRITAIN. Health and Safety at Work etc. Act 1974. London: The Stationery Office.

[2] GREAT BRITAIN. The Factories Act 1961. London: The Stationery Office.

[3] GREAT BRITAIN. The Construction Regulations 1961. London: The Stationery Office.

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