

Sample Specification for a Generic 14mm Stone Mastic Asphalt Wearing Course (SMA)

PREFIX

Before you read this you must be aware that this generic specification was produced in the mid nineteen nineties with reference to the guidance that was then available from the TRL and other independent sources. This document being used until, at least, late 2006.

The purpose being to produced a nominal 14mm. bituminous mixture as similar as possible to the proven durable SMA surface course that had been used in Germany for many years.

However there are aspects to this specification that I believe resulted in an authority not experiencing any problems with "early life skid resistance" as reported in some parts of the UK.

BS EN Specifications has superseded the relevance of this document, providing that you specify to the new documents in the correct manner.

E.g. BS EN 13108-5 : 2006:Bituminous mixtures. Material specifications - Stone mastic asphalt
(Unfortunately, in my opinion, this new BS EN specification allows the specifying of mixtures that bear no resemblance to "genuine" stone mastic asphalts, but which will quite correctly carry the name stone mastic asphalt. It can be very confusing.)

In my opinion the beauty of a document such as this, included in a contract, quite simply and precisely defined what the Highways Engineer wanted the supplier to provide, allowing the supplier the scope within the aggregate grading parameters to produce an aggregate skeleton that will successfully accommodate the specified binder content

And I quote from, *TRL Report 314:Road trials of Stone Mastic Asphalt and other thin surfacings*
"The process of designing a SMA mixture involves adjusting the grading to accommodate the required binder and void content rather than the more familiar process of adjusting the binder content to suit the aggregate grading."

1. General

14mm Stone Mastic Asphalt wearing course shall comply with the requirements of BS 4987 for coated macadam, the Specification for Highway Works and the clauses of this Appendix.
It shall be laid at a 45mm nominal thickness.

2. Material

Aggregates and Filler

- a) the coarse aggregate shall be crushed rock with a minimum 55 PSV, unless a higher PSV is required as stated in the contract.
- b) the fine aggregate shall comply with the Specification for Highway Works clause 901 and shall comprise crushed rock with a minimum PSV of 55, which may be blended with up to 50% natural sand;
- c) the added filler shall be hydrated lime, crushed limestone or Portland cement, in accordance with the requirements of BS 594: Part 1 and shall be at least 2% by mass of total aggregate.

Binder

Bitumen shall comply with BS 3690: Part 1 and shall have a nominal penetration of 50 pen.

Stabilising Additive or Modified Binder

A stabilising additive consisting of dry organic fibres containing at least 70% cellulose shall be used.
The amount of additive shall be 0.3% by mass of the total mixture.

Alternatively, mineral fibres or a bitumen modifier may be used as the stabilising additive subject to the mixture meeting all the other requirements of this specification and the approval of the Engineer.

3. Mixture

- a) The **target** aggregate grading and **target** binder content shall fall within the envelope in Table 1

TABLE 1	
Aggregate Grading and Binder Content	
BS Sieve Size mm	Percentage by mass of total aggregate passing
20	100
14	90 - 100
10	35 - 60
6.3	23 - 35
2.36	18 - 30
75 micron	8 - 13
Binder	6.5 - 7.5

- b) The properties of the proposed mixture shall be demonstrated, at the **target** composition by preparing the loose mixture and compacted specimens in accordance with the general requirements of BS 598: Part 107.

The loose mixture and compacted specimens shall comply with the requirements of 3 (c) and (e) below.

- c) When tested at the **target** composition, the loose mixture shall demonstrate not more than 0.3% binder drainage, by total mass of mixture, at a temperature of 175°C. The test shall be carried out using the apparatus and general principles stated in the Specification for Highway Works Clause 939.
- d) Three compacted specimens shall be manufactured at the **target** composition and the air void content shall be measured by the procedure described in ASTM D3203, using:
- the maximum density of the mixture, obtained using the maximum specific gravity of the loose mixture, determined in accordance with ASTM D2041 and converted to density using the appropriate factor.
 - the bulk density of the specimen, determined in accordance with BS 598: Part 104, as the bulk density required by ASTM D3202, except the specimens shall not be coated in wax.
- e) The air void content of the mixture, at the target composition, shall be within the range 2 - 5%.

4. Mixing

Stone Mastic Asphalt wearing course shall be mixed in accordance with the requirements of BS 4987: Part 1, such that a homogeneous mixture of aggregate, filler, bitumen and additive is produced at a temperature of 150 - 190°C. The coarse aggregate shall be in a surface dry condition at the time of mixing.

5. Transportation

Stone Mastic Asphalt wearing course shall be transported to site in double sheeted or tented and sealed ridge sheeted insulated vehicles.

6. Surface Preparation

Existing surfaces shall be cleaned using steel brooms and suction sweeping or other appropriate means. The surface may be moist but not wet; standing water shall not be present.

A tack coat of K1-40 cationic emulsion complying with BS 434: Part 1 shall be laid in accordance with the requirements of BS 594:Part 2

7. Laying

Stone Mastic Asphalt wearing course shall be laid and compacted in accordance with the requirements of the Specification for Highway Works Clause 901, and to a minimum thickness of 40mm.

This document is the copyright of www.highwaysmaintenance.com and shall not be reproduced in any form other than in its entirety, with its source acknowledged. It is only intended as a discussion item.

8. Compaction

Stone mastic asphalt wearing course macadam shall be compacted immediately, to practical refusal using at least two steel-wheeled rollers, with a minimum mass of 6 tonnes, per paver. One roller shall be a tandem drum roller.

9. Compliance of the Mixture

- a) When tested in accordance with the procedures of BS 598: Parts 100, 101 and 102, the aggregate grading limits for compliance purposes shall be those obtained by applying the tolerances given in TABLE 2 to the **target** grading of the agreed mixture.
- b) When tested in accordance with the methods of BS 598, the sampling and testing tolerance for binder content shall be $\pm 0.6\%$.

BS Sieve Size mm.	Tolerances for aggregate grading in percent by mass of aggregate passing BS test sieve
14	± 5
10	± 10
6.3	± 8
2.36	± 7
75 micron	± 2

10. The Agreed Mixture

The agreed mixture is that obtained after the Contractor or his Supplier demonstrates a mixture which complies with the above requirements, and then proposes the mixture to the Engineer for agreement, and receives approval from the Engineer for the proposed mixture.

11. Surface Texture

The surface texture for the first twelve months shall be a minimum of 1.2mm when tested by Sand Patch in accordance with the method stated in BS 598:Part 105.

SUFFIX

The above grading flexibility resulted in a target composition as indicated in the table below which became the agreed composition/specification.

The specification shown being the most popular composition, with some minor modifications, for a generic 14mm. stone mastic asphalt that had a Target Binder Content of 6.5% +/- 0.6% (by mass), and supplied to contracts in the area that I worked.

This being for suppliers in the Charnwood Forest/ Hartshill Ridge area of the Midlands.

BS Sieve Size	Percentage by mass of total aggregate passing
20mm.	100
14mm.	90 - 100
10mm.	35 - 55
6.3mm.	21 - 37
2.36mm.	18 - 32
75 micron	8 - 12
Binder	5.9 – 7.1

Even within this defined specification there is scope for a considerable variation in the bituminous mixture, and the purchaser relies on production control to provide a uniform material to create a uniform and satisfactory road surface.

Local knowledge indicates that bituminous mixtures complying with this specification have proved durable, without any initial problems.