BRITISH STANDARD

BS 3262-2: 1989

Incorporating Amendment Nos. 1, 2 and 3 and implementing Amendment No. 4, not issued separately

Hot-applied thermoplastic road marking materials —

Part 2: Specification for road performance

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Road Engineering Standards Policy Committee (RDB/-) to Technical Committee RDB/25, upon which the following bodies were represented:

British Resin Manufacturers' Association
Chemical Industries Association
County Surveyors' Society
Department of Transport
Department of Transport (Transport and Road Research Laboratory)
Glass Manufacturers' Federation
Institution of Civil Engineers
Institution of Highways and Transportation
Oil and Colour Chemists' Association
Road Markings Manufacturers' and Contractors' Association
Society of Chemical Industry

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New edition September 1989

The following BSI references relate to the work on this standard:
Committee reference RDB/25
Draft for comment 87/15709 DC

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Amendments issued since publication

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Contents

Foreword

This British Standard has been prepared under the direction of the Road Engineering Standards Policy Committee. It is published in three Parts:

— *Part 1: Specification for constituent materials and mixtures;*

— *Part 2: Specification for road performance;*

— *Part 3: Specification for application of material to road surfaces.*

This Part of BS 3262 replaces BS 3262-2:1987 which is withdrawn.

There have been many changes in materials and methods of laying since the first issue of this standard in 1960 and the basis of the standard has been changed to include performance requirements. Part 1 specifies the composition and quality control requirements of mixtures. Part 2 specifies the performance requirements for type approval of hot-applied thermoplastic road marking materials when they have been applied to the road surface. Part 3 specifies the requirements for the application of material to the road surfaces.

This edition introduces technical changes to bring the standard up-to-date but it does not reflect a full review of the standard, which will be undertaken in due course.

In this new edition, requirements for black thermoplastic material are now included and the chemical description of the binder should be included in the information supplied for the road trial certificate.

Purchasers may request to be supplied with material which meets the requirements of this Part as well as those of BS 3262-1.

The procedures for the control of the testing at the trial site are carried out under the direction of the supervising authority nominated by the Department of Transport. The trials are carried out on white materials meeting the requirements of BS 3262-1, though under specified conditions the results can be extended to yellow or black materials.

Applicants who wish their materials to be included in the road performance trials are referred to appendix A where details of the procedures adopted by the supervising authority are given.

The only supervising authority nominated by the Department of Transport at the time of publication of this revision is the Quality Assurance Division of BSI to which all enquiries and applications to participate in the road assessment trials should be referred.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

This standard was confirmed in November 1995 on publication of amendment No. 3. The changes incorporated did not reflect a full review of the standard, but were those felt necessary to maintain its currency for the forseeable future pending its withdrawal and supersession by European Standards currently in preparation.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, 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 3262 specifies the performance requirements for type approval of white thermoplastic materials complying with BS 3262-1, which have been melted and applied hot to road surfaces using screeding or sprayed application, as thin superimposed markings for centre lines, edge lines, pedestrian crossing stripes and the like. It does not apply to thermoplastic materials intended to be inset into road surfaces.

Provision is made for the results obtained on the white material to be applicable to both yellow and black materials where the composition of these materials is the same as for the white material except for the pigment of the thermoplastic material. Provision is also made for the performance of the materials to be tested with the addition of solid glass beads.

Appendix A lists the preconditions for road performance trials.

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 3262 the definitions given in BS 3262-1 apply.

3 Designations

Road marking materials whose properties remain in accordance with **4.2** for a minimum of 2 years after laying shall be designated class A materials; those whose properties remain in accordance with **4.2** for a minimum of 1 year but less than 2 years after laying shall be designated class B materials.

4 Performance requirements

4.1 Materials

4.1.1 *White materials.* The white marking material and its constituents shall comply with BS 3262-1.

When the material is applied to a road surface in accordance with appendix B and, where appropriate, tested in accordance with appendices C and D, it shall comply with **4.2**.

4.1.2 *Yellow and black materials.* Materials differing only in respect of pigmenting ingredient from a white material complying with this Part of BS 3262 shall be deemed to comply with this Part of BS 3262 and shall be of the same designation as that of white material.

4.1.3 Surface applied glass beads. Where required surface applied glass beads shall comply with the class B requirements of BS 6088 and shall be applied at a suitable rate to provide the specified retroreflectivity.

NOTE 1 For products where improved wet night visibility is required, glass beads of size 1 mm to 5 mm but otherwise complying with the requirements of BS 6088 may be specified and substituted for part or all of the total surface applied glass beads.

NOTE 2 The specifier should state the retroreflectivity level required for wet markings.

4.2 Requirements for the laid material

4.2.1 *Luminance factor.* The luminance factor for the test area on each non-surface beaded stripe shall be not less than 50 on the day of application of the material after a period of not less than 1 h, and shall be not less than 40 at each of the regular inspection intervals thereafter.

NOTE 1 No requirements is specified for the luminance of surface beaded stripes.

NOTE 2 If a manufacturer submits mixtures differing only in the amount of titanium dioxide, then only the mixture with the lowest level of luminance need be tested.

4.2.2 *Degree of erosion.* The total wear index for the test area on each stripe shall not exceed 35 at each of the regular inspection intervals.

4.2.3 *Spread of markings.* The width of each stripe, measured between 600 mm and 900 mm from the nearside kerb, shall not have increased, at each of the regular inspection intervals, by more than 10 % of its initial value.

4.2.4 *Retroreflectivity.* The retroreflectivity for the test area on each surface beaded stripe shall be not less than 100 mcd $\cdot$lx^{-1} $\cdot$m^{-2} on the day of application of the material after a period of not less than 1 h and shall be not less than 100 mcd $\cdot$lx^{-1} m^{-2} at each of the inspection intervals thereafter.

Retroreflectivity shall be measured using a portable retrometer according to the geometry and procedure described in BS 7396.

NOTE This method of measurement is based on a 50 m viewing geometry. Future methods may be based on a 30 m geometry.

4.2.5 *Skid resistance.* The skid resistance for the test area on each surface beaded stripe for reflectorized materials and each stripe for non-reflectorized materials measured at a distance of 650 mm ± 50 mm from the nearside kerb shall be not less than 45 on the day of application of the material after a period of not less than 1 h and shall be not less than 45 at each of the regular inspection intervals thereafter.

Skid resistance shall be measured using the portable Skid Resistance Tester described in BS 3262-1.

Appendix A. Preconditions for road performance trials

A.1 Frequency

Road performance trials are not carried out more frequently than once annually. If, in any year, the number of samples that are submitted and accepted for testing is insufficient to justify the road trial and the concomitant disruption of traffic at the test site, the trial may be postponed.

NOTE The number of samples to be submitted and that are accepted for testing is the decision of the Department of Transport.

A.2 Duration

The road performance trial is carried out for a period of 12 months or 24 months.

A.3 Location

The site for road performance trials is on the A1(T) at St Neots near Cambridge and this is a bituminous surface.

A.4 Applicants

Applicants wishing to submit samples for testing in the road performance trials should formally notify the supervising authority not later than 1 October preceding the next period of trial. The notification requires statement of the number of materials being submitted to the trial.

A.5 Sampling and testing

The supervising authority will verify that the material to be laid complies with Part 1 of BS 3262. The supervising authority will select sufficient quantities of material from the pre-heater and solid glass beads being laid on the trial sites to enable all necessary future tests to be carried out and for reference samples. The sample will be sealed and retained for the duration of the certificate.

NOTE Analysis of the retained sample will only be made on request.

A.6 Conditions of application

The period for application of the materials to the road surfaces is 1 April to 30 June inclusive.

NOTE At the completion of each road performance trial, and if required to do so by the local highway authority, the supervising authority should arrange for the markings to be removed without damage to the carriageway surface and to the satisfaction of the highway authority.

A.7 Test report and certificate

A.7.1 *Report*

At the completion of the road performance trial, the supervising authority will prepare a test report for each material tested which will include the date of issue of the report together with the following information:

a) the type and identification of the product tested;

b) the location of the test site;

c) the pattern of markings;

d) the road surface, i.e. bituminous;

e) the conditions at time of application:

1) air and road surface temperature;

2) weather;

3) humidity;

f) the method of application and the thickness of the application;

g) the date of application and duration of the test;

h) the performance of the material with reference to the requirements specified in clause **4** at each of the inspection visits.

A.7.2 *Certificate*

A certificate will be issued containing the information given in appendix E. The certificate will be valid for not more than 5 years, after which the material should be resubmitted for a road trial.

In the case of products which are essentially unchanged since first submission, a further 5 year certificate shall be granted to the manufacturer if he can demonstrate that the product has not changed. This shall be by third party testing of the product to show that the essential composition is the same as that of the product when originally submitted for road trials. Tests shall be carried out on samples taken in accordance with BS 3262-1 as listed in Table 1a. Otherwise recertification after 5 years is not allowable.

Table 1a — Tests to be used to identity road marking

Test	Method
Infrared analysis of extracted binder	**C.3** of BS 3262-1:1989 for binder extraction followed by infrared analysis to ASTM D2621
Ash content at 550 °C	**5.3** of BS 2782-4: Method 470A:1991
Ash content at 900 °C	**5.3** of BS 2782-4: Method 470A:1991
Acid insolubles on ash	**4.5.4.1** of BS 3900-B4:1986
Pigment levels and type	Titanium dioxide content in accordance with BS 1851:1978
Gradation of aggregate, glass beads, pigment and filler	Appendix D of BS 3262-1:1981

Appendix B. Laying and examination of material

NOTE 1 The supervising authority will superintend the application of the material and will carry out the evaluation of each duplicate stripe in accordance with **B.1** and **B.2**. A panel of five assessors will be appointed by the supervising authority and will verify that the material is applied as described in **B.1** and **B.2**.

NOTE 2 The width of the stripe is subject to the agreement of the Department of Transport.

NOTE 3 The work carried out in relation to the application of the materials should be to the satisfaction of the local highway authority.

B.1 Conditions for application of marking materials

Apply the marking material in stripes 100 ± 10 mm wide in accordance with **B.2** to a road surface that is free from moisture and loose particles and at the following conditions of temperature and humidity:

air temperature: 10 °C to 25 °C;

relative humidity: not greater than 85 %;

road surface temperature: not more than 40 °C.

Apply the stripes in a single pattern on the left-hand lane of the carriageway transverse to its length.

B.2 Procedure

NOTE 1 For **B.2.1** and **B.2.4** one of the two test stripes is to be reserved for evaluation if in the opinion of the assessors the other test stripe has been damaged by external agencies, other than natural ageing or wear, to an extent which precludes its fair assessment.

NOTE 2 The test site should not be accessible to traffic until all the treated surfaces have dried and all initial tests have been carried out.

B.2.1 Apply two stripes of the material to the surface using commercial striping equipment to give a stripe having a thickness as follows:

for synthetic resin binders:

for screeded and extruded lines: 2.5 ± 0.5 mm

for sprayed lines: 2.0 ± 0.5 mm

for products containing gum or wood resin binders: 3.0 ± 0.5 mm.

B.2.2 Place metal sheets complying with **B.2.1** of BS 3262-3:1989 on the road surface, one at the beginning of the run and the other at the end. Apply material to the sheets during each pass of the equipment and immediately verify the thickness of the material in accordance with appendices B and C of BS 3262-3:1989. Alternatively with the agreement of the assessors and the manufacturer, polyethylene sheeting may be used instead of metal sheets.

B.2.3 Measure the width of each stripe to an accuracy of ± 2 mm at five points equally placed along the stripe and calculate the mean value.

B.2.4 Determine the luminance factor in accordance with appendix C.

B.2.5 Apply two stripes of each material that is to be surface beaded to the road surface. Before the material dries, apply solid glass beads evenly to each stripe. Determine the rate of application and distribution of the glass beads in accordance with appendix A of BS 3262-3:1989. Determine the thickness of each stripe in accordance with **B.2.2** and measure the width of each stripe in accordance with **B.2.3** of his Part of BS 3262.

NOTE The beads should normally be applied by machine.

B.2.6 After periods of 6 months and 12 months from the date on which the initial tests were conducted, retest the stripes in accordance with **B.2.3** and appendix C as appropriate. Determine the degree of erosion in accordance with appendix D. For materials being assessed for compliance with class A, carry out the tests additionally after periods of 18 months and 24 months.

Appendix C. Determination of luminance factor

To determine the luminance factor, use the procedure described in appendix F of BS 3262-1:1989 with the following modifications.

a) Clean an area of each non-surface beaded marking stripe at one location at a distance of 500 ± 75 mm from the nearside kerb using the method described in **D.2.1** of this Part of BS 3262.

b) Taking precautions to shield the photoelectric cell from stray incident light measure the luminance factor of the surface and record the value obtained.

c) Repeat the measurement at a further four approximately equally spaced orientations of the photocell around the cleaned area and record the values obtained.

Appendix D. Determination of degree of erosion

D.1 Principle

Erosion of the surface of each of the material stripes is assessed by reference to a rating system from which a wear index is determined.

D.2 Procedure

D.2.1 ***Preparation of test area***

D.2.1.1 Mark on each of the stripes the extremes of the test area, at a distance of 650 ± 50 mm and 1350 ± 50 mm, from the nearside white edge line.

D.2.1.2 Thoroughly wet the test area with 1 L of clean water and, using a type 3/1A brush complying with BS 2992, brush the area evenly to dislodge superficial dirt.

D.2.1.3 Rinse the test area with a further 1 L of clean water and remove surface water with a soft sponge.

D.2.2 ***Assessment of wear***

D.2.2.1 Immediately after preparing each test area, position the test grid as shown in Figure 1.

D.2.2.2 Assess the degree of erosion of each of the 20 grid squares according to the ratings as defined in Table 1 and record the number of squares in each grade.

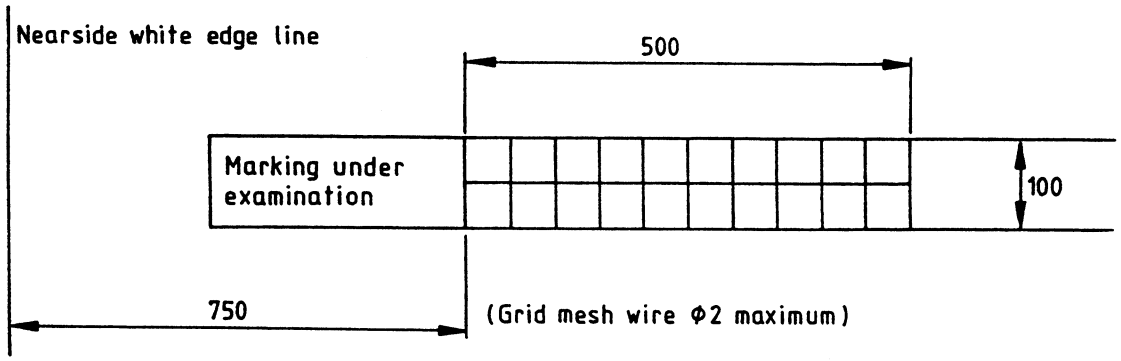
NOTE The tabular form shown in Figure 2 is recommended.

D.2.2.3 Calculate the wear index by multiplying the number of squares in each grade by the respective weighting factor as given in Table 1 for that grade and add together the four subtotals to give the total wear index.

Table 1 — Assessment of rating of grid squares

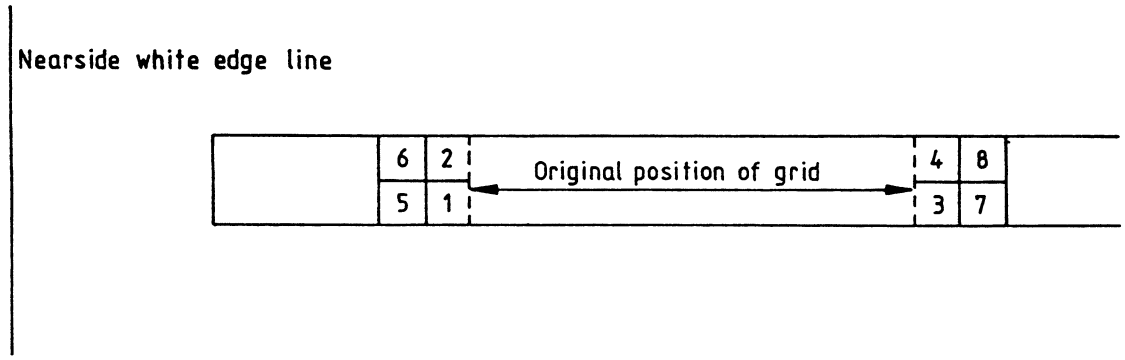
Grade	Area of thermoplastic remaining	Weighting factor
a	Greater than or equal to 75 %	× 1
b	Greater than or equal to 50 % and less than 75 %	× 2
c	Greater than or equal to 25 % and less than 50 %	× 3
d	Less than 25 %	× 4

D.2.2.4 If skid marks or other non-erosion characteristics make it difficult to obtain an assessment of a grid square, ignore the affected square and, after recording the results of those squares that can be assessed, move the grid to include new squares in order to bring the total number up to 20. Use up to eight new squares in the position and sequence given in Figure 1(b), but only assess one new square for each square that cannot be assessed with the grid in the original position.



All dimensions are in millimetres.

(a) The location of the test grid on a road marking (each grid square is approximately 50 mm X 50 mm)



NOTE. Additional squares are to be used in the sequence given.

(b) The location of additional grid squares

Figure 1 — Positioning of test grid of assessment of degree of erosion

D.2.2.5 If the total wear index is found to exceed the maximum specified in **4.2.2**, photograph the test area with grid in position with a 35 mm camera using a 50 mm lens and monochromatic film. Hold the camera on a tripod at a distance between 750 mm and 800 mm above the test area.

Enlarge to half actual size the photograph of the test area of the marking. Assess the area of marking remaining within each of the 20 grid squares as depicted in the enlarged photograph with area analysis equipment which is based on the magneto scription technique[1)]. Trace with the stylus of the equipment around each area of eroded marking, that is, those areas which are not substantially white, within each of the 20 grid squares. Express as a percentage the area of marking eroded within each grid square. Calculate the percentage of marking remaining within each grid square via the relationship 100 minus the percentage eroded. Grade each of the grid squares as defined in Table 1 and record the number of squares in each grade. (The tabular form shown in Figure 2 is recommended.) Calculate the revised wear index as described in **D.2.2.3**.

Grade	Number of squares	Weighting factor	Wear index
a		× 1	
b		× 2	
c		× 3	
d		× 4	
	Total: 20		Total:

Figure 2 — Specimen wear index table

[1)] For information on the availability of suitable apparatus apply to Enquiries Section, BSI, Linford Wood, Milton Keynes MK 14 6LE enclosing a stamped addressed envelope for reply.

Appendix E. Example of a road trial certificate

BS 3262 : PART 2 ROAD TRIAL CERTIFICATE

NAME OF PRODUCT: .....

MATERIAL TYPE: .....

MANUFACTURER: .....

DATE OF TEST: .....

EXPIRY DATE: .....

TEST LOCATION: .....

ROAD SURFACE TYPE: .....

LINE NUMBER REFERENCE: .....

LINE THICKNESS: .....

BINDER TYPE: .....
(Chemical desription and type of resin)

OTHER COMMENTS: .....

.....

.....

I hereby certify that the above product has been tested and complies as a class *material of BS 3262 : Part 2

For and on behalf of ..... Supervising Authority

* Enter appropriate class.

blank

Publications referred to

BS 1851, *Specification for titanium dioxide pigments for paints.*

BS 2782, *Methods of testing plastics.*

BS 2782-4, *Chemical properties.*

BS 2782, *Method 470A Determination of ash (general methods).*

BS 2992, *Specification for painters' and decorators' brushes for local authorities and public institutions (excluding quality of fillings).*

BS 3262, *Hot-applied thermoplastic road marking materials.*

BS 3262-1, *Specification for constituent materials and mixtures.*

BS 3262-2, *Specification for road performance.*

BS 3262-3, *Specification for application of material to road surfaces.*

BS 3900, *Methods of test for paints.*

BS 3900-B4, *Determination of total lead in paints and similar materials.*

BS 6088, *Specification for solid glass beads for use with road marking compounds and for other industrial uses.*

BS 7396, *Specification for permanent preformed road markings.*

ASTM D2621-87, *Infrared identification of vehicle solids from solvent-reducible paints.*

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