

Road marking materials — Drop on materials — Glass beads, antiskid aggregates and mixtures of the two

The European Standard EN 1423:1997, with the incorporation of amendment A1:2003, has the status of a British Standard

ICS 93.080.20

National foreword

This British Standard is the official English language version of EN 1423:1997, including amendment A1:2003, published by the European Committee for Standardization.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] <A1>. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by [A1] <A1>.

The UK participation in its preparation was entrusted by Technical Committee B/509, Road equipment, to Subcommittee B/509/2, Horizontal road markings and road studs, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This standard partially supersedes BS 6088:1981 which will be declared obsolescent on the publication of this standard. The declaration of obsolescence does not affect the current kitemark certification scheme for road marking products.

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Road marking materials — Drop on materials — Glass beads, antiskid aggregates and mixtures of the two

(includes Amendment A1:2003)

Produits de marquage routier — Produits de saupoudrage — Microbilles de verre, granulats antidérapants et mélange de ces deux composants (inclut l'amendement A1:2003)

Straßenmarkierungsmaterialien — Nachstreumittel — Markierungs-Glasperlen, Griffigkeitsmittel und Nachstreugemische (enthält Änderung A1:2003)

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European Committee for Standardization
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Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 226, Road equipment, the Secretariat of which is held by AFNOR.

This document has been prepared under a mandate given to CEN by the European Commission and the Free Trade Association and support essential requirements of EU Directive(s).

For relationship with the Construction Products Directive (89/106/EEC) see informative Annex ZA, which is an integral part of this document.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 1998, and conflicting national standards shall be withdrawn at the latest by February 1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Twelve (12) months after the date of publication of the harmonised part of this European standard (Annex ZA) in the Official Journal of the European Communities (which follows its availability and notification to the European Commission by CEN/CENELEC), compliance with all the provisions of the Construction Products Directive (CE-marking) becomes compulsory for all products falling within the scope of this European standard that are placed on the EEA market.

Foreword to amendment A1

This document (EN 1423:1997/A1:2003) has been prepared by Technical Committee CEN/TC 226, Road equipment, the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2004, and conflicting national standards shall be withdrawn at the latest by April 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This amendment is included in a package with EN 1463-1:1997/prA1 and EN 13212:2001, with a common DOW fixed on 2003-09-30.

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1 Scope

This European Standard specifies the requirements for laboratory tests (production control) and qualification procedures for the following drop on materials used in road markings.

These materials are dropped on to paints, thermoplastics, cold plastics and any other marking product applied in a liquid state, immediately after application to the road surface.

The requirements taken into consideration in this standard are:

- glass beads: granulometry, refractive index of the glass, chemical resistance, quality, surface treatments;
- antiskid aggregates: granulometry, chemical characteristics, friability, colour;
- mixtures of glass beads and antiskid aggregates; and the requirements for both components.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

ISO 7879, *General methods of test for pigments and extenders — Part 9: Determination of pH value of an aqueous suspension*

ISO 25911, *Test sieving — Part 1: Methods using test sieves of woven wire cloth and perforated metal plate*

ISO 77242, *Paints and varnishes — Colorimetry — Part 2: Colour measurement*

ISO/CIE 10526, *CIE Standard colorimetric illuminants*

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1

glass bead

transparent spherical glass particle, used to provide night visibility for the road markings by retroreflecting the incident headlight beams of a vehicle towards the driver

3.2

antiskid aggregate

hard grain of natural or artificial origin, used to provide antiskid qualities for the road markings

3.3

intermediate bulk container (IBC)

container with a capacity of up to 1000 kg, used as an intermediate solution in between bags and tins (25 kg to 50 kg) and bulk transport

4 Requirements for glass beads

4.1 Granulometry

The granulometry of the glass beads shall be described giving the minimum and the maximum percentages by mass of the cumulative retained glass beads on metal wire cloth test sieves: ISO 565 - Sizes R 40/3 using the test sieving procedure defined in ISO 2591-1.

A1 Granulometries shall be described by selecting sieves in accordance with the following rules (see Table 1): **A1**

- the upper safety sieve shall retain less than 0 % to 2 % of the total mass of the glass beads;
- the upper nominal sieve shall retain 0 % to 10 % of the beads;
- if necessary, intermediate sieves shall be added to limit the ratio between the nominal sizes of openings of two successive sieves to a maximum of 1,7 : 1;
- for each of the intermediate sieves, the range by mass between the minimum N_1 % and the maximum N_2 % of the cumulative retained percentages shall be not more than 40 % ($N_2 - N_1 \leq 40$);
- the lower nominal sieve shall retain 95 % to 100 % of the beads.

Table 1 — Selecting sieves for glass beads

Sieves ISO 565 R 40/3	Cumulative retained mass %
Upper safety	0 to 2
Upper nominal	0 to 10
Intermediate	N_1 to N_2
Lower nominal	95 to 100

Examples of the interpretation of the rules to specify the granulometry of glass beads are given in Table 2 and Table 3.

Table 2 — Fine grading

Sieves ISO 565 R 40/3 μm	Cumulative retained mass %
500	0 to 2
425	0 to 10
250	20 to 60
150	60 to 95
90	95 to 100

Table 3 — Medium grading

Sieves ISO 565 R 40/3 μm	Cumulative retained mass %
710	0 to 2
600	0 to 10
355	30 to 70
212	70 to 100
125	95 to 100

The granulometry of the glass beads shall be determined in accordance with ISO 2591-1.

4.2 Refractive index

The refractive index n of the glass beads, when determined in accordance with Annex A, shall conform to the following classes:

Class A: $n \geq 1,5$;

Class B: $n \geq 1,7$;

Class C: $n \geq 1,9$.

4.3 Resistance to water, hydrochloric acid, calcium chloride and sodium sulfide

When tested in accordance with Annex B, glass beads shall not develop any surface haze or dulling when in contact with any of the following: water, hydrochloric acid, calcium chloride and sodium sulfide.

4.4 Quality requirements

A1 When tested in accordance with Annex D (reference method), glass beads with imperfections as described in Annex C, shall be considered defective. **A1**

A1 Using the reference method, and taking **A1** into consideration only one defect per bead, the maximum weighted percentage of defective beads shall be 20 % for beads with a diameter lower than 1 mm and 30 % for beads with a diameter equal to or greater than 1 mm, in both cases including a maximum of 3 % of grains and foreign particles (see Table 4). If a granulometry includes beads with diameters lower than 1 mm and diameters equal to or greater than 1 mm they shall be separated by means of a sieve with nominal sizes of openings of 1 mm and checked separately.

Table 4 — Maximum weighted percentage of defective glass beads

Diameter of glass beads mm	Maximum weighted percentage of defective glass beads ¹⁾ %	Maximum weighted percentage of grains and foreign particles %
<1	20	3
≥ 1	30	3
A1 ¹⁾ When alternative test methods are used as in Annex H (informative) of this European Standard, the correlated values shall be applied. Method described in Annex D (normative) of EN 1423:1997 shall be always considered as the reference test method. A1		

4.5 Surface treatments of the glass beads

Special coatings may be applied to the surface of the glass beads to enhance their properties.

4.5.1 Moisture proof coatings

When the manufacturer states the presence of a moisture proof coating the glass beads shall be tested in accordance with Annex E. When procedure A of Annex E is used, 80 % of the glass beads shall pass the test showing the presence of the moisture proof coating. When procedure B of Annex E is used the glass beads shall pass the test without any flow stoppage. When procedure A fails, procedure B shall be used.

4.5.2 Flootation coatings

When the manufacturer states the presence of a flootation coating the glass beads shall be tested in accordance with Annex F. When it is agreed between the supplier of the glass beads and the specifying authority that Annex F is not applicable, then an alternative test method shall be agreed between them.

4.5.3 Adhesion coating

When the manufacturer states the presence of an adhesion coating it shall be proved by testing the glass beads in accordance with a test method agreed between the supplier of the glass beads and the specifying authority.

4.5.4 Other coatings

When the manufacturer states the presence of a coating other than those in 4.5.1, 4.5.2 and 4.5.3, it shall be proved by testing the glass beads in accordance with a test method agreed between the supplier of the glass beads and the specifying authority.

5 Requirements for antiskid aggregates

5.1 Chemical characteristics

A) When tested in accordance with ISO 787-9, the pH value of the antiskid aggregates shall be not less than 5 and not greater than 9.5. **A1**

5.2 Friability index

The friability index of the antiskid aggregates shall be determined in accordance with Annex G. The value of the friability index shall be indicated in the data sheet of the product.

NOTE Example: for cristobalite the maximum friability index is 20 %.

5.3 Colour co-ordinates and luminance factor

If the antiskid aggregate is not transparent, the chromaticity co-ordinates and the luminance factor shall be determined in accordance with ISO 7724-2. The chromaticity co-ordinates shall lie inside the region defined by the corner points given in Table 5 and the luminance factor β shall be greater than 0,70.

Table 5 — Corner points of the chromaticity regions for non-transparent antiskid aggregates

Corner point No.	1	2	3	4
x	0,355	0,305	0,285	0,335
y	0,355	0,305	0,325	0,375

NOTE Sample preparation; since the grains of the antiskid aggregates are not fine enough to form a tablet when pressed without a binder, as done for the barium sulfate reflectance standard in accordance with ISO 7724-2, the antiskid aggregates are pressed as for the BaSO₄ standard in ISO 7724-2; but after removing the glass the material is kept in the container with the uncovered surface upward in a horizontal position for illumination and observation.

5.4 Granulometry

In order to be effective, the fraction of the particles smaller than 90 μm shall be less than 1 % by mass. The granulometry of the antiskid aggregates shall be described giving the minimum and the maximum percentages, by mass, of the cumulative retained particles on metal wire cloth test sieves ISO 565 – sizes R 40/3 – using the test sieving procedure defined in ISO 2591-1.

A) For a period of 5 years after the date of publication of this European standard existing national standard granulometries can be used, even if they use sieves other than those defined in ISO 565 – sizes R 40. Thereafter, granulometries shall be described by selecting sieves in accordance with the following rules (also see Table 1): **A1**

- the upper safety sieve shall retain less than 2 % of the total mass of the antiskid aggregates;
- the upper nominal sieve shall retain 0 % to 10 % of the aggregates;
- if necessary, intermediate sieves shall be added to limit the ratio between the nominal sizes of openings of two successive sieves to a maximum of 1,7 to 1;
- for each of the intermediate sieves, the range by mass between the minimum N_1 % and the maximum N_2 % of the cumulative retained percentages shall be not more than 40 % ($N_2 - N_1 \leq 40$);
- the lower nominal sieve shall retain 95 % to 100 % of the aggregates;
- the lower safety sieve shall retain 99 % to 100 % of the aggregates.

Table 6 — Selecting sieves for aggregates

Sieves ISO 565 R 40/3	Cumulative retained mass %
Upper safety	0 to 2
Upper nominal	0 to 10
Intermediate	N_1 to N_2
Lower nominal	95 to 100
Lower safety	99 to 100

Examples of the interpretation of the rules to specify the granulometry of the antiskid aggregates are given in Table 7 and Table 8.

Table 7 — Fine grading

Sieves ISO 565 R 40/3 µm	Cumulative retained mass %
1 000	0 to 2
710	0 to 10
425	0 to 25
250	40 to 80
150	95 to 100
90	99 to 100

Table 8 — Medium grading

Sieves ISO 565 R 40/3 µm	Cumulative retained mass %
1 180	0 to 2
1 000	0 to 10
600	10 to 50
355	50 to 80
212	85 to 100
150	95 to 100
90	99 to 100

6 Mixture of glass beads and antiskid aggregate

In a mixture of glass beads and antiskid aggregates the glass beads shall conform to Clause 4 and the antiskid aggregates shall conform to Clause 5. The tests on the glass beads and the antiskid aggregates to be incorporated in mixtures shall be conducted separately before mixing.

7 Sampling

In order to test glass beads, antiskid aggregates and mixtures of them, a representative sample of the material to be tested shall be taken as follows.

The drop on material sample shall be taken from at least three bags or one Intermediate Bulk Container (IBC).

When M , in kilograms, is the mass of the drop on material to be tested, at least 1,5 kg of the material shall be taken by inserting an appropriate probe in the full height of a certain number 'S' of bags, or inserting the probe S times in the whole height of an IBC. The probe shall be driven to the bottom of the bags, in an upright position, or into the IBC containing the material to be tested.

S is calculated by the formula:

$$S = \sqrt{M/150};$$

and it shall be rounded up to the next higher unit.

A representative sample shall be obtained by mixing the material taken with the S insertions of the probe in the bags. The representative sample shall be split by means of a 1/1 splitter in the number of samples necessary for the tests.

NOTE A test probe can be constructed from a tube of 28 mm to 34 mm diameter and 1 000 mm to 1 200 mm in length. The end of the probe which reaches the bottom of the bag should be fitted with a plugging system. After penetration of the probe to the full depth of the bag, the plug is inserted and the probe removed. The contents of the probe represent a single sample of the material to be tested.

[A1] Text deleted **[A1]**

Annex A (normative)

Test method to determine the refractive index of the glass beads

The method used to determine the refractive index of glass beads is immersion with oblique illumination.

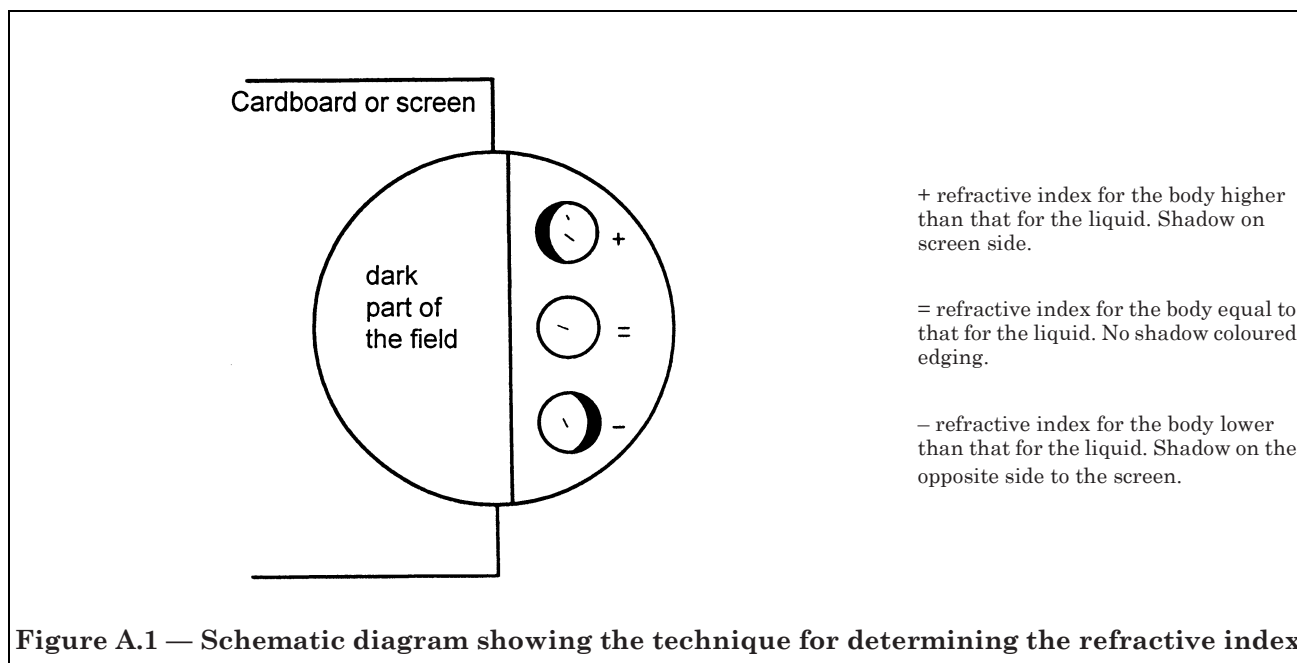
This technique, known as the Shröber van der Kolk method, only applies to isotropic or to monorefracting bodies, as is the case where glass beads are concerned.

A.1 Principle

Viewed under the microscope, transparent solids which are immersed in a liquid give an image bounded by dark or luminous bands. The appearance will vary, depending upon the difference between the refractive indices of the two bodies, according to their dispersing capacity and illumination.

Under axial lighting conditions index differences are perceptible; but they become considerably more pronounced under oblique lighting, due to the fact that under such conditions the bands become sharper on one side than on the other. Their position is determined by the direction of the incident beam and by the difference between the index of the solid under examination and that of the liquid in which it is immersed.

Figure A.1 provides an illustration of the technique used for determination of the refractive index by immersion with oblique illumination.



A.2.1 Microscope

The microscope used in this procedure should be of a conventional type, of a design which affords the user access to the area between the light source and the condenser.

The microscope shall be fitted with a 10× or 15× magnification lens and with a 6× or 8× magnification eye piece.

The phenomena do not appear clearly unless the condenser is turned to the maximum setting with the iris at full aperture and using an average magnification (20× diameter).

A.2.2 Liquids with known refractive index

In order to obtain liquid scales graduate indices, either pure bodies with known constants may be used or, alternatively, mixtures.

— Vaseline oil	1,470
— 1-iodopropane	1,505
— cedar oil	1,510
— methyl salicylate	1,530
— bromobenzene	1,560
— diphenylethylene	1,610
— monobromonaphthalene	1,658
— diiodomethane	1,755
— methylene iodide	1,800
— arsenic tribromide	2,000

Refractive indices may be checked by the use of an Abbe refractometer, with the temperature corrected to 23 °C.

A.3 Procedure

Take the glass beads and place them on the concave slide, then immerse them in a liquid with a known refractive index:

- place the concave slide in the specimen holder of the microscope;
- turn the condenser to the maximum setting;
- open the iris to the full aperture;
- light the specimen from below;
- slip the board with the straight edges in below the condenser, so as to obscure half of the field visible through the eye piece, which will give angled illumination of the remaining visible part of the field;
- observe the glass beads in the illuminated area of the field in view through the eye piece;
- compare observations with the diagram in Figure A.1;
- depending upon the conclusions reached, repeat the above procedure and continue to repeat this procedure, using liquids with different refractive indices, until a liquid is found with a refractive index identical to that of the glass beads; or until two liquids are found with close refractive indices, as listed in A.2.2, which sandwich the index for the glass beads.

A.4 Expression of the results

Show the index found, or the indices for the two liquids on either side of the index for the test subjects, specifying the temperature at which the test was carried out and quoting references for the glass beads which have been examined.