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BSI Standards Publication

Road marking materials – Road marking performance for road users and test methods

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National foreword

This British Standard is the UK implementation of EN 1436:2018. It supersedes BS EN 1436:2007+A1:2008, which is withdrawn.

The UK committee draws users' attention to National Annex NA, which contains recommended values that are suitable for the majority of roads in the UK.

The UK participation in its preparation was entrusted to Technical Committee B/509/2, Horizontal road markings and road studs.

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

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

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EN 1436

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English Version

Road marking materials - Road marking performance for road users and test methods

Produits de marque routier - Performances des marquages appliqués sur la route

Straßenmarkierungsmaterialien - Anforderungen an Markierungen auf Straßen und Messmethoden

This European Standard was approved by CEN on 22 October 2017.

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European foreword

This document (EN 1436:2018) 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of an identical text or by endorsement, at the latest by July 2018 and conflicting national standards shall be withdrawn at the latest by July 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1436:2007+A1:2008.

The main changes in this revision to EN 1436 are as follows:

— the title is extended with "*and test methods*" in order to stress that test methods are provided;

— in the Scope, the sentence "*Furthermore the standard specifies test methods*" is added in order to stress that test methods are provided;

— in the Introduction, two paragraphs are added at the end to clarify a few issues;

— in the Normative references, EN 13036-4 is inserted, while references to ISO 48 and ISO 4662 are deleted. Additionally, the normative reference to ISO 10526 is replaced by a normative reference to ISO 11664-2;

— in 3.6, the definition of structured road marking is simplified;

— in 3.7, the definition of type I and II road markings is split into two separate definitions in 3.7 and 3.8;

— in 3.9, a definition of chromaticity coordinates x,y is inserted as 3.9;

— in Table 1, an option for class Q5 is added for white road markings on asphaltic road surfaces;

— in Table 3, an option for class R5 is added for permanent yellow road markings;

— in 4.2.1 *General*, the reference to 3.6 is deleted in view of the simplification of this definition;

— in 4.4 *Colour*, this clause is split into subclause 4.4.1 with existing classes for chromaticity in daylight and a new subclause 4.4.2 with classes for chromaticity of retroreflected light of yellow road markings;

— in 4.5 *Skid resistance*, the reference to 3.6 is deleted in view of the simplification of this definition and precautions for when this test is valid are added;

— in A.3 *Standard measuring condition of measuring equipment*, a new paragraph is inserted at the end regarding permissible side angles;

— in A.4 *Practical applications of measuring equipment*, the words "*For fixed aim instruments*" in the 7th paragraph are deleted as all instruments available on the market have fixed aim. Additionally, a paragraph regarding allowances for vehicle mounted equipment is added at the end;

— in B.2 *Spectral match of measuring equipment*, a new paragraph is inserted after the 6th paragraph describing an alternative and more simple test of the spectral match for vehicle mounted instruments;

— in B.3 *Standard measuring condition of measuring equipment*, a new paragraph is inserted after the 6th paragraph regarding permissible side angles;

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— in B.4 *Practical applications of measuring equipment*, subclauses B.4.1, B.4.2 and B.4.3 are introduced for respectively general considerations, portable instruments and vehicle mounted instruments in order to provide additional information on vehicle mounted instruments. Further, for clarity, B.4.2 and B.4.3 are themselves split into subclauses;

— in C.1, the title is changed to *"Standard measuring condition for the measurement of the luminance factor and the chromaticity co-ordinates x and y in daylight"* in order to make the content clear. Further, the reference to ISO 10526 is replaced by a reference to ISO 11664-2;

— in C.2 *Standard measuring condition for the measurement of the chromaticity coordinates x and y of retroreflected light*, this new clause is inserted in view of the new subclause 4.4.2. The clauses thereafter are renumbered accordingly;

— in C.3 *Measuring equipment* (previously C.2), the words "*of the luminance factor and the chromaticity co-ordinates x, y*" at the end of the 1st paragraph are deleted. Additionally, a Note 2 regarding equipment for the measurement of the x, y chromaticity co-ordinates of retroreflected light has been inserted;

— the Annex D (normative) *Measuring method for skid resistance* has been deleted, being essentially replaced by a reference to EN 13036-4 in subclause 4.5.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

Road markings together with road studs form the means for horizontal signalization.

Road markings include longitudinal markings, arrows, transverse markings, text and symbols on the surface of the highway, etc. Longitudinal road markings serve among else to delineate the roads, to separate opposing traffic streams and to divide the total road area into sub-areas for different road users. Other road markings serve a range of purposes, among else to indicate the use of driving lanes, full stop and give way, to mark pedestrian crossings and to provide information.

Road markings can be provided by the application of paint, thermoplastic materials or reactive materials, pre-formed lines and symbols or by other means.

Most road markings are white or yellow, but in special cases other colours are used.

Road markings are either permanent or temporary. The functional life of temporary road markings is limited by the duration of the road works. For permanent road markings it is best for reasons of safety to have a functional life that is as long as possible, as limited by the gradual deterioration of performance and the level of service to be provided for the road users.

Road markings can be applied with or without the addition of glass beads/anti-skid materials. With glass beads the retroreflection of the marking is achieved when the marking is illuminated by vehicle headlamps. Anti-skid material improves the skid resistance of the marking.

The retroreflection of a marking, in wet or rainy conditions, can also be enhanced by special properties. The properties can be produced by surface texture (as with structured markings), large glass beads or other means. In the case of surface texture, the passage of wheels can produce acoustic or vibration effects.

The value of a parameter for a particular road marking location is dependant of the surface condition of the road marking, which is influenced by the local conditions, time of the year, traffic 'history', weather and other factors. It should be taken into account that the value measured on a particular occasion is not necessarily the average or typical value of that road marking.

This standard cannot be used directly as tender specifications nor test instructions, but needs to be supported by additional papers for such applications. Acceptance criteria in view of measuring uncertainty should be part of such additional papers.

A newly applied road marking may not show its true performance because of excess drop-on materials, an oily water repelling surface or other causes. Measurements of the performance should not take place until the actual performance has been developed, which may take from a couple of days to a couple of weeks depending on the type of road surface, the performance characteristics to be measured and the conditions regarding traffic and weather.

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1 Scope

This European Standard specifies the performance for road users of white and yellow road markings, as expressed by their reflection in daylight or under road lighting, retroreflection in vehicle headlamp illumination, colour and skid resistance. Furthermore, the standard specifies test methods and conditions.

2 Normative references

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

EN 13036-4, *Road and airfield surface characteristics - Test methods - Part 4: Method for measurement of slip/skid resistance of a surface: The pendulum test*

IEC 60050-845:1987, *International Electrotechnical Vocabulary - Chapter 845: Lighting*[1)]

ISO 11664-2:2007, *Colorimetry - Part 2: CIE standard illuminants*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-845:1987 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
<road marking> luminance coefficient under diffuse illumination
Qd
quotient of the luminance of a field of the road marking in a given direction by the illuminance on the field (unit: $mcd \cdot m^{-2} \cdot lx^{-1}$)

3.2
<road marking> luminance factor
β
ratio of the luminance of a field of the road marking in a given direction to that of a perfect reflecting diffuser identically illuminated

3.3
<road marking> coefficient of retroreflected luminance
R_L
quotient of the luminance L of a field of the road marking in a direction of observation by the illuminance $E_\perp$ at the field perpendicular to the direction of the incident light (unit: $mcd \cdot m^{-2} \cdot lx^{-1}$)

1) CIE Publication 17.4 International Electrotechnical Vocabulary is identical to IEC 60050-845.

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3.4
<road marking> skid resistance tester value
SRT
skid resistance quality of a wet surface measured by the friction at low speed of a rubber slider upon this surface

3.5
<road marking> functional life
period during which the road marking fulfils all the performance requirements of the classes initially specified by the road authority

3.6
structured road marking
road marking with a structured surface that does not have areas of road marking of regular dimensions and planeness

Note 1 to entry: Structures may be formed by patterns, profiles, random texture or other features.

3.7
type I road marking
road marking that do not necessarily have special properties intended to enhance the retroreflection in wet or rainy conditions

3.8
type II road marking
road marking with special properties intended to enhance the retroreflection in wet or rainy conditions

3.9
Chromaticity coordinates x,y
coordinates in the CIE 1931 color space chromaticity diagram

4 Requirements

4.1 General

The requirements specified relate to the performance of road markings during their functional life. The requirements are expressed by several parameters representing different aspects of the performance of road markings and for some of these in terms of classes of increasing performance.

NOTE 1 The length of the functional life depends on whether the road marking is of short or long durability, on whether the road marking is run on by traffic (e.g. symbols on the carriageway compared to continuous edge lines), on the traffic density, on the roughness of the road surface and on matters relating to local conditions like the use of studded tyres in some countries.

NOTE 2 The classes enable different priorities to be given to the different aspects of performance of road markings depending on particular circumstances.

Classes of high performance cannot always be achieved for two or more of these parameters simultaneously. As an example, a road marking may have drop-on glass beads or drop-on anti-skid aggregates, aiming at high classes of either retroreflection (R_L) or skid resistance (SRT). In general, high classes of retroreflection and slip/skid resistance cannot be obtained together.

Furthermore, the selection of performance classes implies a compromise between the needs of the drivers and the cost of supplying the performance. The needs of drivers have been studied in COST Action 331, 'Requirements for horizontal road markings'.

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For skid resistance, emphasis is sometimes placed on those road markings, which occupy a large percentage of the trafficked areas such as zebra crossings, arrows, transverse markings, text and symbols.

Therefore, the choice of performance classes should be fixed in national tender specifications or other national provisions after due consideration of all aspects.

In some countries the performance classes cannot be maintained during a limited time period of the year during which the probability of lower performance of the road markings is high, due to the presence of water, dust, mud, etc.

4.2 Reflection in daylight or under road lighting

4.2.1 General

Reflection in daylight or under road lighting is measured either

— by the luminance coefficient under diffuse illumination Qd measured in accordance with Annex A in the direction of traffic and expressed in $mcd \cdot m^{-2} \cdot lx^{-1}$, or

— by the luminance factor β measured in accordance with Annex C.

NOTE Both of the above-mentioned parameters measure the brightness of a road marking as seen in typical or average daylight or under road lighting. The main difference lies in the viewing directions, which for the luminance coefficient under diffuse illumination Qd corresponds to a fairly long viewing distance and for the luminance factor β to viewing at close range.

To assess the visibility in daylight or under road lighting for such road markings, the measurement of Qd may be a more suitable method of test.

4.2.2 Luminance coefficient under diffuse illumination Qd

The luminance coefficient under diffuse illumination Qd shall conform to Table 1 for road markings in dry conditions.

Table 1 — Classes of Qd for dry road markings

Road marking Colour	Road surface Type	Class	Minimum luminance coefficient under diffuse illumination Qd in $mcd \cdot m^{-2} \cdot lx^{-1}$
White	Asphaltic	Q0	No value requested
		Q2	Qd ≥ 100
		Q3	Qd ≥ 130
		Q4	Qd ≥ 160
		Q5	Qd ≥ 200
	Cement concrete	Q0	No value requested
		Q3	Qd ≥ 130
		Q4	Qd ≥ 160
		Q5	Qd ≥ 200
Yellow		Q0	No value requested
		Q1	Qd ≥ 80
		Q2	Qd ≥ 100
		Q3	Qd ≥ 130

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