SLOVENSKI STANDARD
SIST EN 1436:2007+A1:2009

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Materiali za označevanje vozišča - Lastnosti označb

Road marking materials - Road marking performance for road users

Straßenmarkierungsmaterialien - Anforderungen an Markierungen auf Straßen

Produits de marquage routier - Performances des marquages routiers pour les usagers de la route

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Road marking materials - Road marking performance for road users

Produits de marquage routier - Performances des marquages routiers pour les usagers de la route

Straßenmarkierungsmaterialien - Anforderungen an Markierungen auf Straßen

This European Standard was approved by CEN on 21 June 2007 and includes Amendment 1 approved by CEN on 14 August 2008.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This document (EN 1436:2007+A1:2008) 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of an identical text or by endorsement, at the latest by April 2009, and conflicting national standards shall be withdrawn at the latest by April 2009.

This document includes Amendment 1, approved by CEN on 2008-08-14.

This document supersedes ⟨A1⟩ EN 1436:2007 ⟨A1⟩.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟨A1⟩ ⟨A1⟩.

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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.

Road markings can be provided by the application of paint, thermoplastic materials or cold hardening 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.

Road markings can be applied with or without the addition of glass beads. With glass beads the retroreflection of the marking is achieved when the marking is illuminated by vehicle headlamps.

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.

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.

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.

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

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 4662, *Rubber — Determination of rebound resilience of vulcanizates*

[A1⟩ ISO 10526 ⟨A1], *CIE standard illuminants for colorimetry*

3 Terms and definitions

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

3.1
luminance coefficient under diffuse illumination (of a field of a road marking) Qd (mcd·m^{-2}·lx^{-1})
quotient of the luminance of the field of the road marking in the given direction by the illuminance on the field

3.2
luminance factor (of a field of a road marking, in a given direction, under specified conditions of illumination) β (unit: 1)
ratio of the luminance of the field of the road marking in the given direction to that of a perfect reflecting diffuser identically illuminated

NOTE This definition is slightly adapted as compared to the definition of IEC 60050-845.

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

3.4
skid resistance tester value (of a road marking)
skid resistance quality of a wet surface measured by the friction at low speed of a rubber slider upon this surface. The abbreviation SRT applies

3.5
functional life (of a road marking)
period during which the road marking fulfils all the performance requirements of the classes initially specified by the road authority

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

3.6
structured road marking (in the sense of not allowing measurement of the luminance factor β and/or the SRT value)
road marking with a structured surface that does not have areas of road marking of regular dimensions and planeness. This may be by the formation of patterns, profiles, random texture or other features

NOTE 1 At least some commercially available instruments allow measurement of the luminance factor β on approximately flat areas with a diameter of minimum 10 mm at the top of the structure, or a somewhat larger size deeper in the structure to allow contact of the instruments. The areas may curve with a radius of curvature of minimum 50 mm.

NOTE 2 The slider used to measure the SRT value requires approximately flat areas of a width of minimum the width of the slider (76,2 ± 0,5 mm) and a length of minimum the sliding length of the slider (126 ± 1 mm) at the top of the structure, or somewhat longer for areas deeper in the structure, in order to allow for the free swing of the slider. The areas may be crossed by gaps that take up maximum 75 % of the total surface area and have widths of maximum 5 mm. The areas may have ridges or edges of blocks with a height of maximum 1,2 mm.

3.7
type I and type II road markings
type II road markings are road markings with special properties intended to enhance the retroreflection in wet or rainy conditions, type I road markings do not necessarily have such special properties

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.

Further, 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’.

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 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.

For some structured road markings, the measured value of the luminance factor β is not reliable, refer to 3.6. 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 performance determined
		Q2	Qd ≥ 100
		Q3	Qd ≥ 130
		Q4	Qd ≥ 160
	Cement concrete	Q0	No performance determined
		Q3	Qd ≥ 130
		Q4	Qd ≥ 160
		Q5	Qd ≥ 200
Yellow		Q0	No performance determined
		Q1	Qd ≥ 80
		Q2	Qd ≥ 100
		Q3	Qd ≥ 130
The class Q0 is for when daytime visibility is achieved through the value of the luminance factor β, see 4.2.3.			

4.2.3 Luminance factor β

The luminance factor β shall conform to Table 2 for road markings in dry conditions.

Table 2 — Classes of luminance factor β for dry road markings

Road marking colour	Road surface type	Class	Minimum luminance factor β
White	Asphaltic	B0 B2 B3 B4 B5	No performance determined $\beta \geq 0,30$ $\beta \geq 0,40$ $\beta \geq 0,50$ $\beta \geq 0,60$
	Cement concrete	B0 B3 B4 B5	No performance determined $\beta \geq 0,40$ $\beta \geq 0,50$ $\beta \geq 0,60$
Yellow		B0 B1 B2 B3	No performance determined $\beta \geq 0,20$ $\beta \geq 0,30$ $\beta \geq 0,40$
The class B0 is for when daytime visibility is achieved through the value of the luminance coefficient under diffuse illumination Qd, see 4.2.2.			

4.3 Retroreflection under vehicle headlamp illumination

For the measurement of reflection under vehicle headlamp illumination, the coefficient of retroreflected luminance R_L is used. It shall be measured in accordance with Annex B and is expressed in $mcd \cdot m^{-2} \cdot lx^{-1}$.

Road markings in the dry condition shall conform to Table 3; and shall conform to Table 4 during wetness and to Table 5 during rain.

NOTE The coefficient of retroreflected luminance represents the brightness of a road marking as seen by drivers of vehicles under the illumination by the driver's own headlamps.

Table 3 — Classes of R_L for dry road markings

Road marking type and colour		Class	Minimum coefficient of retroreflected luminance R_L in $mcd \cdot m^{-2} \cdot lx^{-1}$
Permanent	White	R0 R2 R3 R4 R5	No performance determined $R_L \geq 100$ $R_L \geq 150$ $R_L \geq 200$ $R_L \geq 300$
	Yellow	R0 R1 R3 R4	No performance determined $R_L \geq 80$ $R_L \geq 150$ $R_L \geq 200$
Temporary		R0 R3 R5	No performance determined $R_L \geq 150$ $R_L \geq 300$
The class R0 is intended for conditions, where visibility of the road marking is achieved without retroreflection under vehicle headlamp illumination.			

Table 4 — Classes of R_L for road markings during wetness

Conditions of wetness	Class	Minimum coefficient of retroreflected luminance R_L in $mcd \cdot m^{-2} \cdot lx^{-1}$
As obtained 1 min after flooding the surface in accordance with B.6	RW0	No performance determined
	RW1	$R_L \geq 25$
	RW2	$R_L \geq 35$
	RW3	$R_L \geq 50$
	RW4	$R_L \geq 75$
	RW5	$R_L \geq 100$
	RW6	$R_L \geq 150$
Class RW0 is intended for cases where this type of retroreflection is not required for economic or technological reasons.		

Table 5 — Classes of R_L for road markings during rain

Conditions of rain	Class	Minimum coefficient of retroreflected luminance R_L in $mcd \cdot m^{-2} \cdot lx^{-1}$
As obtained after at least 5 min exposure in accordance with B.7 during uniform rainfall of 20 mm/h	RR0	No performance determined
	RR1	$R_L \geq 25$
	RR2	$R_L \geq 35$
	RR3	$R_L \geq 50$
	RR4	$R_L \geq 75$
	RR5	$R_L \geq 100$
	RR6	$R_L \geq 150$
Class RR0 is intended for cases where this type of retroreflection is not required for economic or technological reasons.		

4.4 Colour

The x, y chromaticity co-ordinates for dry road markings shall be measured in accordance with Annex C and shall lie within the regions defined by the corner points given in Table 6 and illustrated in Figure 1.

Table 6 — Corner points of chromaticity regions for white and yellow road markings

Corner point No.		1	2	3	4
White road markings	x	0,355	0,305	0,285	0,335
	y	0,355	0,305	0,325	0,375
Yellow road markings class Y1	x	0,443	0,545	0,465	0,389
	y	0,399	0,455	0,535	0,431
Yellow road markings class Y2	x	0,494	0,545	0,465	0,427
	y	0,427	0,455	0,535	0,483
The classes Y1 and Y2 for yellow road markings are intended for permanent and temporary road markings respectively.					