SLOVENSKI STANDARD
SIST EN 1871:2002

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Materiali za označevanje vozišča - Fizikalne lastnosti

Road marking materials - Physical properties

Straßenmarkierungsmaterialien - Physikalische Eigenschaften

Produits de marquage routier - Propriétés physiques

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93.080.20 Materiali za gradnjo cest Road construction materials

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Road marking materials - Physical properties

Produits de marquage routier - Propriétés physiques

Straßenmarkierungsmaterialien - Physikalische Eigenschaften

This European Standard was approved by CEN on 12 November 1999.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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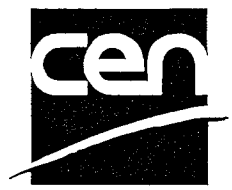

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This European Standard 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of an identical text or by endorsement, at the latest by July 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.

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.

The annexes A, B, C, D, E, F, G, H, J and K of this European Standard are normative.

Introduction

This European Standard gives the physical properties of road marking materials used in horizontal signalization. It includes annexes for test methods. Identification requirements are covered in prEN 12802:1999.

1 Scope

This European Standard specifies the laboratory requirements and test methods for retroreflective and other road marking materials, both permanent and temporary.

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 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.

EN 1436:1997	Road marking materials – Road marking performance for road users
prEN 12802:1999	Road marking materials – Laboratory methods for identification
ISO 787-11:1981	General methods of test for pigments and extenders – Part 11: Determination of tamped volume and apparent density after tamping
ISO 1514:1993	Paints and varnishes - Standard panels for testing
ISO 2814	Paints and varnishes – Comparison of contrast ratio (hiding power) of paints of the same type and colour
ISO 4892	Plastics – Methods of exposure to laboratory light sources Part 1: General guidance Part 2: Xenon-arc sources Part 3: Fluorescent UV lamps
ISO 7724-2	Paints and varnishes – Colorimetry – Part 2 : Colour measurement

3 Definitions

For the purposes of this standard the following definitions apply.

3.1 paint : a liquid product containing solids suspended in an organic solvent or in water. It can be supplied in single or multi-component systems. When applied by brush, roller, spray or any other appropriate method it produces a cohesive film by the process of solvent evaporation and/or by a chemical process.

3.2 thermoplastics : a solvent-free marking substance supplied in block, granular or powder forms. It is heated to a molten state and then applied with an appropriate hand or mechanical applicator. It forms a cohesive film by cooling.

3.3 cold plastics : a marking substance which is supplied in single or multi-component forms. Depending on the type of system the components are mixed together in various ratios and applied with an appropriate applicator. It forms a cohesive film only by a chemical process.

4 Requirements

4.1 Paint

4.1.1 Chromaticity co-ordinates and luminance factor.

The daytime visibility of road marking paint shall be defined by the luminance factor β. The colour shall be defined by x,y chromaticity co-ordinates of the CIE standard system in accordance with EN 1436:1997.

Panels shall be prepared and measurements carried out according to annex A. For the luminance factor the classes in table 1 shall apply. The chromaticity co-ordinates are confined by specified regions in the x,y colour diagram by means of the corner points shown in table 2.

Table 1 : Classes of luminance factor

Colour	Class	Luminance factor β
White	LF5	≥ 0,75
	LF6	≥ 0,80
	LF7	≥ 0,85
Yellow	LF1	≥ 0,40
	LF2	≥ 0,50

Table 2: Chromaticity co-ordinates of white and yellow road marking products

Corner point N°		1	2	3	4
White	x	0,355	0,305	0,285	0,335
	y	0,355	0,305	0,325	0,375
Yellow	x	0,494	0,545	0,465	0,427
	y	0,427	0,455	0,535	0,483

4.1.2 Hiding power

The contrast ratio (hiding power) for white and yellow paints shall be not less than 95 % for white and 90 % for yellow when tested in accordance with ISO 2814 when applied with a doctor blade of 300 μm.

4.1.3 Storage stability

The paint shall be free from skin and settlement that cannot be re-incorporated by stirring. The paint shall have a rating equal to or above 4 when tested in accordance with annex B.

The components of multicomponent paint shall each be tested separately in different containers.

4.1.4. UV ageing

4.1.4.1 General

The paint shall be applied as in A.3 to panels as described in A.2 and tested in accordance with ISO 4892-3 by either of the two test procedures described in 4.1.4.2 and 4.1.4.3. The difference in luminance factor $\Delta\beta$ shall be as in table 3 (where $\Delta\beta$ = original luminance factor – luminance factor after test). The chromaticity co-ordinates shall be as given in table 2.

4.1.4.2 UVA ageing

The specimens shall be tested in accordance with ISO 4892-3 for 480 h under lamp type I (UVA - 340) in cycles of 8 h of radiation at 60 °C ± 2 °C and 4 h of condensation at 50 °C ± 2 °C.

4.1.4.3 UVB ageing

The specimens shall be tested in accordance with ISO 4892-3 for 168 h under lamp type II (UVB - 313) in cycles of 8 h of radiation at 60 °C ± 2 °C and 4 h of condensation at 50 °C ± 2 °C.

Table 3: Classes of difference in luminance factor after UV ageing

Colour	Class	$\Delta\beta$
White and Yellow	UV0	No requirement
	UV1	≤ 0,05

4.1.5 Bleed resistance

When tested in accordance with annex C the difference in luminance factor $\Delta\beta$ shall be as in table 4. The chromaticity co-ordinates shall be as in table 2.

NOTE: This test is only applicable for paint which is to be applied directly to asphaltic surfaces.

Table 4: Classes of difference in luminance factor after bleed resistance test

Colour	Class	$\Delta\beta$
White and Yellow	BR0 BR1 BR2	No requirement ≤ 0,03 ≤ 0,05

4.1.6 Alkali resistance

When tested in accordance with annex D the paint film shall show no deterioration of the surface.

NOTE :This test is only applicable for paint which is to be applied directly to hydraulic concrete surfaces.

4.2 Thermoplastics

4.2.1 Tests before heat stability test

4.2.1.1 Chromaticity co-ordinates and luminance factor

When tested in accordance with annex E the luminance factor shall be given as in table 5 and the chromaticity co-ordinates as in table 2.

Table 5: Classes of luminance factor for thermoplastics and cold plastics

Colour	Class	Luminance factor β
White	LF3 LF4 LF6	≥ 0,65 ≥ 0,70 ≥ 0,80
Yellow	LF1 LF2	≥ 0,40 ≥ 0,50

4.2.1.2 Softening point

When tested in accordance with annex F the softening point of the material shall comply with the classes as given in table 6.

Table 6: Classes of softening point for thermoplastics

Class	Softening point in °C
SP0	No requirement
SP1	≥ 65
SP2	≥ 80
SP3	≥ 95
SP4	≥ 110

4.2.1.3 Alkali resistance

When tested in accordance with annex D the specimen shall show no deterioration of the surface.

NOTE : This test is only applicable for thermoplastics which are to be applied directly to hydraulic concrete surfaces.

4.2.1.4 Cold impact

When tested in accordance with annex H the number of specimens passing the test shall comply with the classes as given in table 7.

Table 7 : Classes for cold impact

Class	Temperature of test in °C	Ball	Number of specimens passing
Cl 0	No requirement	-	No requirement
Cl 1	0	a	6
Cl 2	-10 ± 3	a	6
Cl 3	-10 ± 3	b	6

4.2.1.5 UV ageing

The material shall be applied at the manufacturer's stated thickness to panels as described in A.2 and tested in accordance with ISO 4892-3 and as described in either 4.1.4.2 or 4.1.4.3. The difference in luminance factor $\Delta\beta$ shall comply with the classes as in table 3. The chromaticity co-ordinates shall be as given in table 2.

4.2.2 Heat stability

The heat stability of the product shall be tested in accordance with annex G and the tests specified in 4.2.3 shall be subsequently carried out.

NOTE : This test is not applicable for heat applied preformed thermoplastics.

4.2.3 Tests after heat stability test

4.2.3.1 Chromaticity co-ordinates and luminance factor

When tested in accordance with annex E the difference in luminance factor $\Delta\beta$ shall be no more than 0,10 for both white and yellow. The chromaticity co-ordinates shall be as given in table 2.

4.2.3.2 Softening point

When tested in accordance with annex F the difference in softening point ΔSP shall not be more than ± 10 °C.

4.2.3.3 Indentation

When tested in accordance with annex J the mean value for the indentation time shall comply with the classes as given in table 8.

Table 8: Classes for indentation

Class	Indentation time
IN0	No requirement
IN1	5 s to 45 s
IN2	46 s to 5 min
IN3	2 min to 5 min
IN4	6 min to 20 min
IN5	> 20 min

4.2.2.4 Tröger wear

When tested in accordance with annex K the mean value for volume loss shall comply with the classes as given in table 9.

Table 9: Classes for Tröger wear

Class	Volume loss in cm^3 3 mm thick/16 periods	Volume loss in cm^3 1,5 mm thick/5 periods
TW0	No requirement	No requirement
TW1	< 2,5	-
TW2	2,5 to 5	-
TW3	-	< 1,5
TW4	-	1,5 to 3

4.2.3.5 UV ageing (Xenon arc)

The material shall be applied at the manufacturer's stated thickness to panels as described in A.2 or Marshall specimens as described in K.3.2 and tested in accordance with ISO 4892-2. The difference in luminance factor $\Delta\beta$ shall comply with the classes as given in table 3. The chromaticity co-ordinates shall be as given in table 2.

The UV test is performed for 1 000 h in either sprayed or flooded cycles of 18 min duration and with dry intervals of 102 min. Relative humidity shall be 50 %, black standard temperature 45 °C, and irradiation (between 290 nm and 800 nm) 550 W/m^2. The Marshall test specimens shall be placed horizontally in the equipment.

NOTE : Equipment that can be used for the UV test on Marshall test specimens are Xeno test 250, Sun test or Sun test CPS+.

4.2.3.6 Tröger wear (after UV ageing)

When tested in accordance with ISO 4892-2 and annex K the mean values for the difference in volume loss shall comply with the classes as given in table 10.

Table 10: Classes for Tröger wear after UV ageing

Class	Difference in volume loss in cm^3
TWU0	No requirement
TWU1	0 to < 0,5
TWU2	0,5 to 2,5

4.3 Cold plastics

4.3.1 General

For each of the tests at least 500 g of material shall be prepared in the specified manner.

4.3.2 Chromaticity co-ordinates and luminance factor

When applied at the manufacturer's stated thickness and tested in accordance with annex A the luminance factor shall be as given in table 5 and the chromaticity co-ordinates as in table 2.

4.3.3 Storage stability

The material shall be free from skin and settlement that cannot be incorporated by stirring. The cold plastics shall have a rating equal to or above 3 when tested in accordance with annex B. The components of cold plastics shall each be tested separately in different containers.

NOTE : See B.3.2 for components containing peroxides.

4.3.4 UV ageing

The material shall be applied at the manufacturer's stated thickness to panels as described in A.2 and tested in accordance with ISO 4892-3 as described in either 4.1.4.2 or 4.1.4.3. The difference in luminance factor $\Delta\beta$ shall comply with the classes as given in table 3. The chromaticity co-ordinates shall be as given in table 2.

4.3.5 Alkali resistance

When tested in accordance with annex D the specimen shall show no deterioration of the surface.

NOTE : This test is only applicable for cold plastics which are to be applied directly to hydraulic concrete surfaces.

4.3.6 Tröger wear

When tested in accordance with annex K the mean value for volume loss shall comply with the classes as given in table 9.

4.3.7 Tröger wear after UV ageing

When tested in accordance with ISO 4892-2 and annex K the mean value for the difference in volume loss shall comply with the classes as given in table 10.