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Stalna vertikalna cestna signalizacija - 6. del: Lastnosti materialov za retroreflektivne znake

Fixed, vertical road traffic signs - Part 6: Performance of retroreflective sign face materials

Ortsfeste, vertikale Straßenverkehrzeichen - Teil 6: Lichttechnische Mindestanforderungen an Reflexstoffe mikroprismatischer Materialien

Signaux fixes de signalisation routière verticale - Partie 6 : Performances des matériaux rétroréfléchissants constituant des faces de panneaux

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Fixed, vertical road traffic signs - Part 6: Performance of retroreflective sign face materials

Signaux fixes de signalisation routière verticale - Partie 6 : Performances des matériaux rétroréfléchissants constituant des faces de panneaux

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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Foreword

This document (FprEN 12899-6:2012) has been prepared by Technical Committee CEN/TC 226 “Road equipment”, the secretariat of which is held by AFNOR.

This document is currently submitted to the Unique Acceptance Procedure.

No existing European Standard is superseded.

This European Standard consists of the following Parts under the general title:

Fixed, vertical road traffic signs —

— Part 1: *Fixed signs*

— Part 2: *Transilluminated traffic bollards (TTB)*

— Part 3: *Delineator posts and retroreflectors*

— Part 4: *Factory production control*

— Part 5: *Initial type testing*

— Part 6: *(This part) Performance of retroreflective sign face materials*

It is based on performance requirements and test methods published in CEN, CENELEC, CIE (International Commission on Illumination) and ISO documents together with standards of the CEN member organizations.

Introduction

The visual performance of retroreflective sign face materials is dependent on their luminance and chromaticity. Retroreflection is the relevant characteristic for the legibility and visibility of road signs during night time driving, while luminance factor and chromaticity are relevant characteristics for the legibility of signs during the daytime (and for illuminated signs at night).

A legend or a symbol on a sign face is presented in one colour against the background of another colour. Bright colours serve generally as signal colours, while dark colours generally serve as contrast colours. A few colours may sometimes serve as signal colours and at other times as contrast colours. The signal colour is considered to be the more important in terms of retroreflective performance.

The situations in which road traffic signs are used are grouped into a number of application classes, and individual signs can be specified using the range of retroreflection performance classes provided. The system of classes is complex - and has to be complex - in order to make good use of retroreflection. A single material cannot supply optimum or even adequate sign legibility in all applications, but some materials can do so in some applications and other materials in other applications.

Test methods for retroreflection are provided in Annex A and for luminance factor and chromaticity in Annex B. Both annexes are of a complex technical nature, as they deal with retroreflective sign face materials of both known technologies - glass beaded and microprismatic - and because the fluorescence of fluorescent sign face materials has been taken into account. These normative annexes are primarily intended to be studied by experts working at test laboratories.

It is a particular feature of retroreflection that it has limitations. Consequently, application and retroreflection performance classes cannot in practice be selected independently of each other. Some guidelines for the selection of application and retroreflection performance classes are offered in the informative annex. These are intended as the basis for forming national policies for retroreflective road traffic signs, in which various interests are weighed against each other in a suitable manner.

1 Scope

This Part 6 of EN 12899 describes the performance requirements for retroreflective sign face materials.

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.

EN ISO 877-2:2010, *Plastics - Methods of exposure to solar radiation — Part 2: Direct weathering and exposure behind window glass (ISO 877-2:2009)*

EN ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance (ISO 4892-1)*

EN ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2)*

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

IEC 60050-845:1987, *International Electrotechnical Vocabulary (IEV) — Chapter 845: Lighting*

NOTE CIE Publication 17.4 International Electrotechnical Vocabulary is identical to IEC 60050-845:1987.

CIE 15:2004, *Colorimetry*

CIE 54.2:2001, *Retroreflection: definition and measurement*

3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the following terms and definitions given in IEC 60050-845:1987 and CIE 54.2:2001 and the following apply.

3.1
signal colour
the brightest colour of the sign face of a retroreflective sign

NOTE The signal colour is white for most signs, but may be yellow, orange, fluorescent yellow, fluorescent yellow/green or fluorescent orange.

3.2
contrast colour
any colour of the sign face of a retroreflective sign (including non-retroreflective black) that is not the signal colour

3.3
coefficient of retroreflection (of a plane retroreflecting surface), symbol R_A
ratio of the luminous intensity of a plane retroreflecting surface in the direction of observation to the illuminance at the retroreflecting surface measured on a plane perpendicular to the direction of the incident light in proportion to the area of the retroreflecting surface

NOTE The value of the coefficient of retroreflection depends in principle on four angles, this being the number of angles needed to describe the directions of observation and incident light relative to the retroreflecting surface. Refer to CIE 54.2 for the definition of such angles and their combination into angular systems. R_A is expressed in $cd.lx^{-1}m^{-2}$ units.

3.4
$R_{A,C}(\alpha,\beta)$ value
a calculated value of the coefficient of retroreflection R_A for a combination of the observation angle α and the entrance angle β

Definitions of the observation angle α and entrance angle β are provided in CIE 54.2.

NOTE 1 A value of the observation angle α relates, among other things, to the distance to a road sign, and a value of the entrance angle β relates to the obliqueness at which the sign is illuminated.

NOTE 2 The $R_{A,C}(\alpha,\beta)$ value is calculated from various R_A measurements in which two additional angles have been varied.

One additional angle relates to the location of a headlamp on a vehicle relative to the driver, for instance directly below the driver, below to the right and below to the left. The other additional angle relates to the location of a sign relative to the vehicle, for instance to the right, above or to the left of the vehicle.

The calculation of the $R_{A,C}(\alpha,\beta)$ value is carried out in two steps:

I: R_A values are averaged for three different headlamp locations.

II: the smallest of these values for some relevant locations of a road sign relative to the vehicle is selected to be the $R_{A,C}(\alpha,\beta)$ value.

This calculation ensures that the $R_{A,C}(\alpha,\beta)$ value is a reasonable representation of the coefficient of retroreflection R_A taking account of variation in vehicle type and sign location.

3.5
application class
a class defining the geometrical circumstances in which a road sign is to be read, comprising a set of combinations of observation angles α and entrance angles β

NOTE The application class which is the most suitable for drivers of small vehicles may be less suitable for drivers of large vehicles.

3.6
R_A index
an index providing a single measure of the general level of retroreflective performance of a sign face material for the geometrical circumstances of an application class

NOTE The R_A index value is obtained in three steps. These are numbered III, IV and V in continuation of two steps I and II used to derive $R_{A,C}(\alpha,\beta)$ values above:

III: The proportions between the $R_{A,C}(\alpha,\beta)$ values of a sign face material and a set of $R_{A,R}(\alpha,\beta)$ reference values are calculated.

IV: For each of the entrance angle values included within the application class, the harmonic average of the above-mentioned proportions are calculated for those cases of the observation angles that are included within the application class.

V: The smallest of the harmonic averages is selected to be the R_A index.

The $R_{A,R}(\alpha,\beta)$ reference values correspond to a constant sign luminance of 1 cd/m^2.

3.7
retroflection performance class
a classification based on the R_A index value of a signal colour for a given application class

3.8
mounting axis
a direction relative to a retroreflective sign face material indicating the orientation with which the sheeting is to be mounted on a road sign so that the mounting axis is pointed upwards

NOTE 1 A mounting axis can be indicated by a datum mark on the material or can be the direction of the roll of the material or can be indicated in other ways and should be declared by the manufacturer of the sheeting.

NOTE 2 If the manufacturer declares more than one mounting axis, one mounting axis is distinguished as the primary mounting axis while the others are secondary mounting axes.

3.9
family of retroreflective sign face materials
a family of retroreflective sign face materials consists of sheetings in various colours (including non-retroreflective black) with identical optical design and similar manufacturing processes and raw materials (except dyes or pigment) and includes materials with process colour or coloured overlay film and with clear overlay film

3.10
fluorescence
fluorescence is primarily a daylight appearance attribute based on absorption of light at shorter wavelengths and emission at longer wavelengths