SLOVENSKI STANDARD
oSIST prEN 1790:2009

01-februar-2009

Materiali za oznaļevanje voziġļa - Predoblikovane oznake

Road marking materials - Preformed road markings

Straßenmarkierungsmaterialien - Vorgefertigte Markierungen

Produits de marquage routier - Marquages routiers préfabriqués

Ta slovenski standard je istoveten z: **prEN 1790**

ICS:

93.080.20 Materiali za gradnjo cest Road construction materials

oSIST prEN 1790:2009 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 1790

September 2008

ICS 93.080.20

Will supersede EN 1790:1998

English Version

Road marking materials - Preformed road markings

Produits de marquage routier - Marquages routiers préformés

Straßenmarkierungsmaterialien - Vorgefertigte Markierungen

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Contents

Foreword

This document (prEN 1790:2008) 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 CEN Enquiry.

This document will supersede EN 1790:1998.

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 EC Directive(s).

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

The Annexes A ,B and C of this European Standard are normative.

Introduction

A particular category of road marking materials, used for horizontal signalization, are preformed, i.e. manufactured products in sheet form, ready for use on the road. They can be applied by means of adhesives, pressure or heat, with or without use of a primer. Preformed road marking materials can be linear, in pieces of a certain length or in rolls. They can also be cut out in the form of symbols or signs or parts of them, making it possible to assemble them on the road to achieve the desired shape.

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

Preformed road marking materials can be designed for use as permanent or temporary road markings. When they are used for temporary road markings, and have to be removed afterwards, the specific property of "removability" can be required.

1 Scope

This standard specifies both identification and laboratory requirements for the specific characteristics of new preformed road marking materials intended for permanent and temporary use. It includes annexes for test methods. It is not necessary, unless required, to perform all the tests described.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate place 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.

EN 1436, *Road marking materials - Road marking performance for road users*

EN 1871, *Road marking materials - Physical properties*

EN 1824, *Road marking materials - Road trials*

EN 13212, *Road Marking Materials – Requirements for Factory Production Control*

EN 13459, *Road Marking Materials – Sampling from storage and testing*

EN 12802, *Road Marking Materials – Laboratory methods for identification*

ISO 11358, *Plastics – Thermogravimetry (TG) of polymers – General principles*

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results – Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

3 Terms and definitions

For the purposes of this standard the following terms and definitions applies:
For the scope of this standard, 2 families of “preformed markings” shall be considered :

Family 1 : Fully finished road marking materials which do not change significantly their properties during application. So they do not require drop-on materials during application.
These materials are covered by “Definitions : 3.1.1, 3.1.2 and 3.1.3 A”

Family 2 : Preformed materials that leave the production plant as semi finished products and still require the addition of drop on materials. These materials shall follow the standard EN 1871 where indicated.
These materials are covered by “ Definitions : 3.1.3B”

3.1
preformed road marking
a factory produced road marking system (or product), in sheet or roll form, capable of being applied to the substrate with adhesive, primer, pressure, heat or a combination of them.

NOTE Type II road markings are road markings with special properties meant to enhance the retroreflection in wet or rainy conditions, type I road markings do not necessarily have such special properties.

3.1.1
tape
a preformed multilayer-shaped road marking, capable of adapting itself to the texture of the substrate, which may be precoated with pressure-sensitive adhesive, capable of being stuck to the substrate without heating the material. Photometric, colorimetric and skid resistance characteristics are not significantly modified during application.

3.1.2
preformed cold plastic road marking
a preformed road marking made of cold plastic marking material as defined in EN 1871, applied to the substrate by means of an adhesive. Photometric, colorimetric and skid resistance characteristics are not significantly modified during application.

3.1.3
preformed thermoplastic road marking
a preformed road marking made of thermoplastic marking material as defined in EN 1871, applied to the substrate by heating the material at melting temperature. Preformed thermoplastic road markings are classified as:

- **A** "pre-beaded" thermoplastic road markings (retroreflective and/or anti-skid materials applied during manufacturing) (Belonging to "Family 1" in this standard)
- **B** thermoplastic road markings that require a post application of the drop-on material to form a final assembly (Belonging to "Family 2" in this standard)

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3.2
removable preformed road marking
a preformed road marking capable of being removed, intact or in large pieces, without leaving permanent marks that could confuse the road user during different weather conditions.

3.3
adhesive
a substance used to bond the preformed road marking to the substrate. The application of this substance may require heating.

NOTE Additional materials to those described in 3.1 to 3.3 can include, if recommended by the manufacturer, primers which are liquid products which may contain solids and liquid additives suspended in an organic solvent or in water. The solids comprise inorganic and/or organic fillers, pigments and additives. The content of volatile organic solvents is not limited.

Primers are used to precoat road surfaces before the road marking system is applied. They improve the adhesion of the road marking and protect against disintegration, discolouring etc. caused by incompatible compounds in the road surface.

4 Sampling

Samples representative of each component of the material shall be taken from storage in accordance with EN 13459.

Smaller representative samples, of sufficient quantity to carry out all the tests required, shall be taken from the larger samples.

4.1 Preparation of samples for lab testing

- Family 1 shall be sampled according EN 13459 for preformed road markings.

For preformed materials cut in symbols, legends or other special shapes, where lengths of at least 1 m cannot be sampled, an equivalent area of at least 0,75 m², with a minimum width of 0,15 m and a length suitable for the tests mentioned in 5.2 shall be sampled.

- Family 2 samples taken shall be taken according EN 13459 "Thermoplastic Materials".

- The sample shall include relevant quantities of primer and/or adhesive, as necessary to allow for the samples to be made in the laboratory in accordance with the manufacturer's instructions.

- The laboratory shall manufacture three samples on aluminium plates at least 3 mm thick and free from contaminants. Linear samples shall be of 1 m x 0,15 m; other samples shall approximate as closely as possible to these dimensions. The application shall be done in accordance with the instructions given by the manufacturer.

-The samples used for the skid resistance testing shall not be used for further testing.

5 Requirements

5.1 General

Only for Family 1 : The requirements defined in 5.2 to 5.7 are valid for testing in the laboratory (performance of the product prior to application) of all types of white and yellow preformed materials, unless stated otherwise in the text.

Only for Family 2 : the requirements given in clause 4.2 1(Thermoplastics – Tests before heat stability) of EN 1871 shall apply.

5.2 Luminance under diffuse illumination (Qd)

The performance of preformed materials in daylight or road lighting conditions shall be in accordance with EN 1436.

5.3 Reflection in car headlight illumination

Measured on samples in the laboratory, in accordance with EN 1436, the requirements for preformed materials shall be as given in table 1.

Table 1.1 - Classes of coefficient of retroreflected luminance R_L in dry conditions for preformed product following definitions 3.1.1 and 3.1.2

Type and colour	Class (as defined in EN 1436)	Minimum R_L $mcd \cdot m^{-2} \cdot lx^{-1}$
Permanent		
White and yellow	R0	No performance determined
White	R5	300
Yellow	R4	200
Temporary		
White and yellow	R0	No performance determined
White and yellow	R5	300
NOTE The class R0 is intended for conditions where night visibility of the road marking is not required or achieved without retroreflection in car headlight illumination.		

Table 1.2 - Classes of coefficient of retroreflected luminance R_L in dry conditions for preformed product following definitions 3.1.3A

Type and colour	Classes (as defined in EN 1436)	Minimum R_L $mcd \cdot m^{-2} \cdot lx^{-1}$
Permanent	R0	No performance determined
White	R5	300
	R4	200
	R3	150
	R2	100
Permanent	R0	No performance determined
Yellow	R4	200
	R3	150
	R1	80
NOTE The class R0 is intended for conditions where night visibility of the road marking is not required or achieved without retroreflection in car headlight illumination.		

5.4 Luminance factor and colour

5.4.1 Measured on samples in the laboratory, in accordance with EN 1436, the requirements for preformed materials shall be as given in table 2.

Table 2 - Classes of luminance factor β in dry conditions

Type and colour	Class (as defined in EN 1436)	Minimum luminance factor β
Permanent		
White and yellow	B0	No performance determined
White	B5	0,60
Yellow	B3	0,40
Temporary		
White and yellow	B0	No performance determined
White	B6	0,70
Yellow	B3	0,40
NOTE The class B0 is intended for conditions where verification of the visibility of the road marking is achieved by measurement of luminance coefficient under diffuse illumination, Qd.		

5.4.2 The chromaticity regions for preformed materials shall be in accordance with EN 1436, with the use of class Y2 for yellow.

5.5 Skid resistance

Measured on samples in the laboratory, with the exception of preformed thermoplastic materials (see note), the skid resistance of preformed materials shall be in accordance with EN 1436.

NOTE This measurement is not relevant for preformed thermoplastic materials because the application can change the performance of the preformed material.

5.6 Removability

Removable preformed road markings shall be entirely removable without leaving permanent marks that could confuse the road user during the different weather conditions.

The removability of temporary preformed road markings cannot be determined in the laboratory and shall therefore be tested on the road, in accordance with Annex F of EN 1824.

5.7 UV ageing for preformed road markings applied without heat

UV ageing shall be checked in accordance with EN 1871. The luminance factor β shall be determined before and after the UV ageing.

The preformed materials shall be classified in accordance with table 3, where $\Delta\beta$ is the difference between the luminance factor before and after testing.

Table 3 - Classes of UV ageing

Colour	Class	$\Delta\beta$
White and yellow	UV0	No performance determined
White and yellow	UV2	≤ 0,10

6 Identification test methods

6.1 General

Since preformed road marking materials consist of a complex multi-layer structure, usual laboratory methods cannot be applied, unless allowing wide tolerances and using a combination of different methods.
The composition can be determined better by means of fingerprinting.

For Family 1 the identification shall be done according to the standard methods listed in 6.2 to 6.4 and the corresponding tolerances defined in Table 4.
For Family 2 the identification shall be done according to EN 12802 clause 5.3. Thermoplastics.

Alternative test methods may be used providing that:

- The resulting values are comparable to those obtained using the standard methods; and
- The repeatability of alternative methods, determined in accordance with ISO 5725-2, can be shown to be not less than that of the methods given in this standard.

6.2 Ash content

The ash content shall be determined using either the method described in Annex H of EN 12802, or an alternative method complying with 6.1.

Table 4 - Tolerances

Parameter	Maximum relative deviation	Maximum absolute deviation
Ash content	-	3%

6.3 Fingerprinting

Fingerprinting consists of different qualitative pieces of information deriving from physical analysis.
As preformed products are multilayer constructions and may have structured surfaces, it is essential to perform fingerprinting on as many representative number of samples as possible.

6.3.1. Thermogravimetric analysis (TGA)

Test shall be executed as qualitative analysis referring to ISO 11358.
Under the same test conditions, the thermogravimetric curve of the sample to be examined shall match the thermogravimetric curve of the reference samples, as in the following example below :