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Introduction

This draft standard is based on European discussions in which the UK has taken an active part. Your comments on this draft are welcome and will assist in the preparation of the consequent British Standard. Comment is particularly welcome on national, legislative or similar deviations that may be necessary.

Even if this draft standard is not approved by the UK, if it receives the necessary support in Europe, the UK will be obliged to publish the official English Language text unchanged as a British Standard and to withdraw any conflicting standard.

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Please indicate whether you consider the UK should submit a negative (with reasons) or positive vote on this draft.

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1	2	(3)	4	5	(6)	(7)
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/ Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Road marking materials - Paint, thermoplastic and cold plastic materials - Specifications

Produits de marquage routier - Peintures, enduits à froid et à chaud - Spécification

Straßenmarkierungsmaterialien - Markierungsfarben, Heißplastikmassen und Kaltplastikmassen - Spezifikationen

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If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Foreword

This document (FprEN 1871: 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.

This document will supersede EN 1871:2000.

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 EU Directive(s).

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

This European Standard is one of the following package of inter-related European Standards:

- EN 1790, *Road marking materials — Preformed road markings*,
- EN 1824, *Road marking materials — Road trials*,
- EN 1871, *Road marking materials — Paint, thermoplastic and cold plastic materials - Specifications* ,
- EN 12802, *Road marking materials — Laboratory methods and identification*,
- EN 13197, *Road marking materials — Turntable wear simulators*,
- EN 13212, *Road marking materials — Requirements for factory production control*,
- EN 13459, *Road marking materials — Sampling and testing*.

1 Scope

The construction products covered and specified by this European Standard are white and yellow paint, thermoplastic and cold plastic materials, with or without premix glass beads, to be used for permanent and/or temporary road markings in circulation areas. Other products and colours intended for road markings are not covered in this European Standard.

This European Standard gives also specifications for the evaluation of conformity for white and yellow paint, thermoplastic and cold plastic materials to be used for permanent and/or temporary road markings in circulation areas including type testing and factory production control.

This European Standard also includes an Annex ZA with the clauses addressing the provisions of the EU Construction Product Directive, for permanent road markings.

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 1436:2007+A1:2008, *Road marking materials — Road marking performance for road users*

EN 1824:2011, *Road marking materials — Road trials*

EN 12802:2011, *Road marking materials — Laboratory methods and identification*

EN 13197:2011, *Road marking materials — Wear simulator Turntable*

EN 13459, *Road marking materials — Sampling from storage and testing*

EN ISO 787-11:1995, *General methods of test for pigments and extenders — Part 11: Determination of tamped volume and apparent density after tamping (ISO 787-11:1981)*

EN ISO 1514, *Paints and varnishes — Standard panels for testing (ISO 1514)*

EN ISO 2812-1:2007, *Paints and varnishes — Determination of resistance to liquids — Part 1: Immersion in liquids other than water (ISO 2812-1:2007)*

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

EN ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 4892-3)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

paint

liquid product which contains binders, pigments, extenders, solvents and additives, which can be supplied in single or multi-component systems and which, when applied, produces a cohesive film by the process of solvent/water evaporation and/or a chemical reaction

3.2

thermoplastic

solvent-free marking substance which is supplied in block, granular or powder forms, which is heated to a molten state and then applied, and which forms a cohesive film by cooling

3.3**cold plastic**

viscous products supplied in multi-component forms (at least one main component and a hardener system) and free from solvents, the cohesive film being formed after mixing of all components only by a chemical reaction following which the cold plastic becomes a solid

3.4**base road marking material**

paint, thermoplastic or cold plastic with a unique identification complying with the definitions above and which may, or may not, include premix glass beads

3.5**road marking assembly**

base road marking material together with the precise application instructions including the identification of the manufacturer, dosages, types and proportions of drop-on materials and/or premix glass beads needed to build up the applied road markings

Note 1 to entry: Every change to these is a new assembly and it is identified with the name of the base road marking material followed by the word assembly and a correlative number (e.g. Thermo AX – Assembly 1; Thermo AX – assembly 2, etc.).

3.5.1**structured road marking assembly**

road marking assembly without areas of regular dimensions and flat surfaces, which has flat areas of a maximum width of 75,7 mm, a maximum length of 125 mm at the top of the structure

Note 1 to entry: The areas may be crossed by gaps that take up minimum 25 % of the total surface area and have widths of minimum 5 mm. The areas may have ridges or edges of blocks with a height of minimum 1,2 mm.

3.5.2**non structured road marking assemblies**

road marking assembly with areas of regular dimensions and flat surfaces, which has flat areas of a minimum width of 75,7 mm and a minimum length of 125 mm at the top of the structure

Note 1 to entry: The areas can be crossed by gaps that take up maximum 75 % of the total surface area and have widths of maximum 5 mm. The areas can have ridges or edges of blocks with a height of maximum 1,2 mm.

3.6**batch**

amount of product produced as one complete operation not being part of a continuous process

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**

This clause gives two separate lists of requirements:

- 1) Requirements of the base road marking materials.
- 2) Requirements of road marking assemblies.

4.2 Requirements of the base road marking materials (paint, thermoplastic and cold plastic materials)

4.2.1 Paint

4.2.1.1 Chromaticity co-ordinates and luminance factor: the colour shall be defined by (x,y) chromaticity co-ordinates and luminance factor β of the CIE standard system.

When measured according to 5.2.1.1, the results of the test for the luminance factor shall comply with Table 1a).

Table 1a) — Classes of luminance factor

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

When measured according to 5.2.1.1, the chromaticity co-ordinates shall lie within the regions defined by the corner points given in Table 1b).

Table 1b) — Chromaticity co-ordinates of white and yellow road marking products

Chromaticity co-ordinates		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

4.2.1.2 Hiding power: it is the capacity of the paint to reduce the contrast between a black surface and a white surface over which the paint has been applied and dried.

When measured according to 5.2.1.2, the result, expressed as the contrast ratio, shall comply with Table 2.

Table 2 — Classes of hiding power

Colour	Class	Hiding Power (contrast ratio)
White	HP0	No value requested
	HP2	$\geq 90\%$
	HP3	$\geq 92\%$
	HP4	$\geq 95\%$
Yellow	HP0	No value requested
	HP1	$\geq 88\%$
	HP2	$\geq 90\%$

4.2.1.3 Storage stability: the paint shall be free from skin and settlement that cannot be re-incorporated by stirring. When tested in accordance with 5.2.1.3, the paint shall have a rating equal to or above 4.

4.2.1.4 UV ageing: a film of paint is submitted to cycles of UV radiation and condensation and examined for discolouration.

When tested in accordance with 5.2.1.4, the difference in luminance factor $\Delta\beta$ shall be as in Table 3 (where: $\Delta\beta$ = original luminance factor – luminance factor after test).

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

Colour	Class	$\Delta\beta$
White and Yellow	UV0	No value requested
	UV1	$\leq 0,05$
	UV2	$\leq 0,10$

The chromaticity co-ordinates shall lie within the regions defined by the corner points given in Table 1b).

4.2.1.5 Bleed resistance: this test is only applicable for paint which is intended to be applied directly to asphaltic surfaces. The film of paint applied to a bituminous surface is examined for discolouration.

When tested in accordance with 5.2.1.5, the difference in luminance factor $\Delta\beta$ shall be as in Table 4 (where: $\Delta\beta$ = original luminance factor – luminance factor after test).

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

Colour	Class	$\Delta\beta$
White and Yellow	BR0	No value requested
	BR1	$\leq 0,03$
	BR2	$\leq 0,05$

The chromaticity co-ordinates shall lie within the regions defined by the corner points given in Table 1b).

4.2.1.6 Alkali resistance: this test is only applicable for paint which is intended to be applied directly to hydraulic concrete surfaces. The film of paint is submitted to the effect of a solution of sodium hydroxide and examined for surface deterioration.

When tested in accordance with 5.2.1.6, the paint film shall show no signs of partial or complete film destruction, surface roughening or discolouration.

4.2.2 Thermoplastics

4.2.2.1 General

Thermoplastic materials need to be melted before application so that their characteristics should remain stable after supporting a period of heating. This is the reason why the standard includes requirements before and after a heating cycle.

4.2.2.2 Tests before heat stability

4.2.2.2.1 Chromaticity co-ordinates and luminance factor: the colour shall be defined by (x,y) chromaticity co-ordinates and luminance factor β of the CIE standard system.

When measured according to 5.2.2.2.1, the results of the test for the luminance factor shall comply with Table 5.

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

Colour	Class	Luminance factor β
White	LF3	$\geq 0,65$
	LF4	$\geq 0,70$
	LF5	$\geq 0,75$
	LF6	$\geq 0,80$
Yellow	LF1	$\geq 0,40$
	LF2	$\geq 0,50$

The chromaticity co-ordinates shall lie within the regions defined by the corner points given in Table 1b).

4.2.2.2.2 Softening point: it is the temperature at which a given layer of thermoplastic material experiences a given deformation under the action of a steel ball.

When measured in accordance with 5.2.2.2.2, the softening point of the thermoplastic material shall comply with Table 6.

Table 6 — Classes of softening point for thermoplastics

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

4.2.2.2.3 Alkali resistance: this test is only applicable for thermoplastic which is intended to be applied directly to hydraulic concrete surfaces. The thermoplastic is submitted to the effect of a solution of sodium hydroxide and examined for surface deterioration.

When tested in accordance with 5.2.2.2.3, the thermoplastic film shall show no signs of partial or complete film destruction, surface roughening or discolouration.

4.2.2.2.4 Cold impact resistance: this test measures the resistance of thermoplastic material, at cold temperature, to the impact of a falling steel ball.

When tested in accordance with 5.2.2.2.4 the number of specimens passing the test shall comply with Table 7.

Table 7 — Classes for cold impact resistance

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

4.2.2.2.5 UV ageing: a film of thermoplastic is submitted to cycles of UV radiation and condensation and examined for discolouration.

When tested in accordance with 5.2.2.2.5, 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 lie within the regions defined by the corner points given in Table 1b).

4.2.2.3 Tests after heat stability

4.2.2.3.1 Chromaticity co-ordinates and luminance factor: when tested in accordance with 5.2.2.3.1, 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 1b).

4.2.2.3.2 Softening point: when tested in accordance with 5.2.2.3.2, the difference in softening point ΔSP (where: ΔSP = original softening point – softening point after heating) shall not be more than ± 10 °C.

4.2.2.3.3 Indentation: it is the time required for a standardised cylinder to sink 10 mm into the thermoplastic at a given temperature.

When tested in accordance with 5.2.2.3.3, the mean value for the indentation time shall comply with Table 8.

Table 8 — Classes for indentation

Class	Indentation time
IN0	No value requested
IN1	5 s to 45 s
IN2	46 s to 2 min
IN3	2 min 1 s to 5 min
IN4	5 min 1 s to 20 min
IN5	> 20 min

4.2.2.3.4 Tröger wear: the principle of the method is the determination of the wear resistance of thermoplastics road marking materials at low temperature (-10 °C). Wear is produced by a needle gun. This test is to be repeated after UV ageing in Xenon-arc.

When tested in accordance with 5.2.2.3.4, the mean value for volume loss shall comply with 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 value requested
TW1	< 2,5	-
TW2	2,5 to 5	-
TW3	-	< 1,5
TW4	-	1,5 to 3

4.2.2.3.5 Tröger wear UV ageing (Xenon-arc): a film of thermoplastic is submitted to cycles of UV radiation (Xenon-arc) and condensation and examined for discolouration.

When tested in accordance with 5.2.2.3.5, the difference in luminance factor $\Delta\beta$ shall comply with Table 3.

The chromaticity co-ordinates shall lie within the regions defined by the corner points given in Table 1b).

4.2.2.3.6 Tröger wear after UV ageing: when tested in accordance with 5.2.2.3.6, the mean values for the difference in volume loss shall comply with Table 10.

Table 10 — Classes for Tröger wear after UV ageing

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

4.2.3 Cold plastics

4.2.3.1 Chromaticity co-ordinates and luminance factor: the colour shall be defined by (x,y) chromaticity co-ordinates and luminance factor β of the CIE standard system.

When tested in accordance with 5.2.3.1, for the luminance factor, the results of the test shall comply with Table 5.

The chromaticity co-ordinates shall lie within the regions defined by the corner points given in Table 1b).

4.2.3.2 Storage stability: the products shall be free from skin and settlement that cannot be re-incorporated by stirring.

When tested in accordance with 5.2.3.2, the product shall have a rating equal to or above 3.

NOTE See C.3.2 for components containing peroxides.

4.2.3.3 UV ageing: a film of cold plastic is submitted to cycles of UV radiation and condensation and examined for discolouration.

When tested in accordance with 5.2.3.3, 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 lie within the regions defined by the corner points given in Table 1b).

4.2.3.4 Alkali resistance: this test is only applicable for cold plastic which is intended to be applied directly to hydraulic concrete surfaces. A film of cold plastic is submitted to the effect of a solution of sodium hydroxide and examined for surface deterioration.

When tested in accordance with 5.2.3.4, the cold plastic film shall show no signs of partial or complete film destruction, surface roughening or discolouration.

4.2.3.5 Tröger wear: the principle of the method is the determination of the wear resistance of cold plastic road marking materials at low temperature (-10 °C). Wear is produced by a needle gun.

When tested in accordance with 5.2.3.5, the mean value for volume loss shall comply with Table 9.

4.2.3.6 Tröger wear after UV ageing: when tested in accordance with 5.2.3.6, the mean value for the difference in volume loss shall comply with Table 10.

4.3 Requirements of the road marking assembly

4.3.1 General

The composition and application process of the road marking assembly affect the performances of the road marking.

The same base road marking material, having the same physical properties, may be used in a number of different road marking assemblies with different results on their essential characteristics. The essential characteristics described in this clause are intended to provide information about night-time visibility, under all weather conditions; day-time visibility and skid resistance of a given road marking assembly, by making reference to the appropriate clauses in EN 1436.

4.3.2 Night-time visibility (retroreflection under vehicle headlamp illumination)

It represents the brightness of a road marking as seen by driver's vehicles under the illumination by the driver's own headlamp. The result is expressed by the coefficient of retroreflected luminance in $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$.

The coefficient of retroreflected luminance on dry conditions changes during wetness or during rain. Retroreflected luminance during wetness or during rain only applies for road markings type II

- a) When road marking assembly is tested on dry conditions, in accordance with 5.3.2 a), the coefficient of the retro reflected luminance R_L shall comply with the following classes of EN 1436:2007+A1:2008, Table 3:
 - 1) classes R2 to R5 for white road marking assembly;
 - 2) classes R1; R3; R4 for yellow road marking assembly.
- b) When road marking assembly is tested during wetness in accordance with 5.3.2 b), the coefficient of the retro reflected luminance R_L shall comply with classes RW1 to RW6 of EN 1436:2007+A1:2008, Table 4.
- c) When road marking assembly is tested during rain in accordance with 5.3.2 c), the coefficient of the retro reflected luminance R_L shall comply with classes RR1 to RR6 of EN 1436:2007+A1:2008, Table 5.

4.3.3 Day-time visibility (reflection in daylight or under road lighting)

It represents the brightness of a road marking as seen by driver's vehicles in typical or average daylight or under road lighting. It shall be measured either by the coefficient of luminance under diffuse illumination (Q_d), expressed in $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$ or/and by the luminance factor (β). The main difference lies in the illumination and in the observation angles.

- a) When luminance coefficient under diffuse illumination Q_d is measured, the road marking assembly is tested in accordance with 5.3.3 a), and shall comply with the following classes of EN 1436:2007+A1:2008, Table 1:
 - 1) classes Q2 to Q5 for white road marking assembly;
 - 2) classes Q1 to Q3 for yellow road marking assembly.
- b) When luminance factor β is measured, the road marking assembly is tested in accordance with 5.3.3 b) and shall comply with the following classes of EN 1436:2007+A1:2008, Table 2:
 - 1) classes B2 to B5 for white road marking assembly;
 - 2) classes B1 to B3 for yellow road marking assembly.

4.3.4 Day-time visibility (Chromaticity co-ordinates x,y)

The colour shall be defined by (x,y) chromaticity co-ordinates

When a white road marking assembly is tested in accordance with 5.3.4, the (x, y) chromaticity co-ordinates shall lie within the region defined by the corner points given in EN 1436:2007+A1:2008, Table 6, for white road markings.

When a yellow road marking assembly is tested in accordance with 5.3.4, the x, y chromaticity co-ordinates shall lie within the region defined by the corner points given in EN 1436:2007+A1:2008, Table 6, for yellow road markings.

4.3.5 Skid resistance SRT value (only for non-structured RMA)

It represents the energy loss caused by the friction of a rubber slider over a specified length of a road marking surface in wet conditions. The result is expressed in SRT (Skid Resistance Tester) units.

When a road marking assembly is tested in accordance with 5.3.5, the SRT value shall comply with EN 1436:2007+A1:2008, Table 7, classes S1 to S5, except for structured road marking assemblies.

4.4 Durability

4.4.1 General

Durability represents the capability of the road marking assembly to achieve a certain level of performance for each requirement after being submitted to road trials and/or wear simulator.

The information corresponding to the durability method (Road trials or Wear Simulator) shall include the specific test conditions applicable to the test.

The following performance characteristics of the road marking assemblies are tested by road trial or wear simulator.

a) Retroreflection under vehicle headlamp illumination (see 4.3.2)

- 1) Coefficient of retroreflected luminance R_L expressed as class R for dry conditions (only for retroreflective road marking assemblies RMA);
- 2) Coefficient of retroreflected luminance R_L expressed as class RW during wetness (only for Type II RMA) and/or;
- 3) Coefficient of retroreflected luminance R_L expressed as class RR during rain (only for Type II RMA, if RR required).

b) Reflection in daylight or under road lighting (see 4.3.3, 4.3.4)

- 1) Luminance coefficient under diffuse illumination (Q_d) or luminance factor (β);
- 2) Chromaticity co-ordinates (x,y).

c) Skid Resistance (SRT value) (only for non-structured road markings) (see 4.3.5).

4.4.2 Durability on road trials

Road marking assembly for use as permanent road marking when tested according to 5.4.1, the RMA shall be exposed to at least minimum level of roll-over class P1 of EN 1824:2011, Table 3. In the case of road trial with studded tyres class P0 applies and the actual value of wheel passages (to the nearest thousand wheel passages) shall be stated in the test report.

Road marking assembly for use as temporary road marking when tested according to 5.4.1, the RMA shall be exposed to roll-over classes T0; T1 or T2 of EN 1824:2011, Table 3.

For the requirements of the road marking assembly specified in 4.3, the results are expressed in terms of a class (with the exception of the colour for which pass/fail criteria is used) for the corresponding roll-over class (P) and studded tyres (Yes/No).

4.4.3 Durability on wear simulator turntable

Road marking assembly for use as permanent road marking when tested according to 5.4.2, the RMA shall be exposed to at least, with traffic-class P4 of EN 13197:2011, Table 3.

Road marking assembly for use as temporary road marking when tested according to 5.4.2, the RMA shall be exposed to at least with traffic-classes P1 of EN 13197:2011, Table 4.

For the requirements of the road marking assembly specified in 4.3, the results are expressed in terms of a class (with the exception of the colour for which pass/fail criteria is used) for the corresponding roll-over class (P).

5 Test methods

5.1 General

This clause gives two separate lists of test methods.

- a) Test methods for the base road marking materials requirements. For these requirements, alternative test methods may be used providing that:
 - 1) The resulting values are comparable to those obtained using the standard methods, and
 - 2) The repeatability of the alternative methods, determined in accordance with ISO 5725-2:1994, can be shown to be not less than that of the methods given in this standard.
- b) Test methods for the road marking assembly requirements. For these requirements, alternative test methods are not allowed.

If not specified in the relevant test method sampling shall be made according to EN 13459.

5.2 Test methods for base road marking materials requirements (paint, thermoplastic and cold plastic materials)

5.2.1 Paint

5.2.1.1 Chromaticity co-ordinates and luminance factor

The x,y chromaticity co-ordinates and luminance factor β shall be measured as specified in Annex A.

5.2.1.2 Hiding power: it shall be tested in accordance with Annex B applying the paint at a ratio of 200g/m² or the equivalent thickness.

5.2.1.3 Storage stability: each of the components of paint shall be tested separately in different containers. It shall be tested in accordance with Annex C.

5.2.1.4 UV ageing: the paint shall be applied as in A.3 to panels as described in A.2. The specimens shall be tested in accordance with EN 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.

5.2.1.5 Bleed resistance: it shall be tested in accordance with Annex D.

5.2.1.6 Alkali resistance: it shall be tested in accordance with Annex E.

5.2.2 Thermoplastics

5.2.2.1 General: the thermoplastics shall be melted according to the manufacturers recommendations. If nothing is stated, follow Annex H.

5.2.2.2 Tests before heat stability test.

5.2.2.2.1 Chromaticity co-ordinates and luminance factor: the x,y chromaticity co-ordinates and luminance factor β shall be measured as specified in Annex F.

5.2.2.2.2 Softening point: it shall be tested in accordance with Annex G.

5.2.2.2.3 Alkali resistance: it shall be tested in accordance with Annex E.

5.2.2.2.4 Cold impact resistance: it shall be tested in accordance with Annex I.

5.2.2.2.5 UV ageing: the thermoplastic shall be applied at the manufacturer's stated thickness to panels as described in A.2 and tested in accordance with EN ISO 4892-3 for 168 h under lamp type II (UVB - 313) in cycles of 8 h of radiation at $60\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and 4 h of condensation at $50\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

5.2.2.3 Tests after heat stability

It shall be carried out after submitting the thermoplastic to heat stability according to Annex H.

5.2.2.3.1 Chromaticity co-ordinates and luminance factor: the x,y chromaticity co-ordinates and luminance factor β shall be measured as specified in Annex F.

5.2.2.3.2 Softening point: it shall be tested in accordance with Annex G.

5.2.2.3.3 Indentation: it shall be tested in accordance with Annex J.

5.2.2.3.4 Tröger wear: it shall be tested in accordance with Annex K.

5.2.2.3.5 Tröger wear UV ageing (Xenon-arc): the thermoplastic shall be applied at the manufacturer's stated thickness to panels as described in A.2 or Marshall specimens as described in Annex K and tested in accordance with EN ISO 4892-2.

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 $45\text{ }^{\circ}\text{C}$, 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 Xenon test 250, Sun test or Sun test CPS+.

5.2.2.3.6 Tröger wear after UV ageing: the test shall be carried out in accordance with EN ISO 4892-2 and Annex K.

5.2.3 Cold plastics

5.2.3.1 Chromaticity co-ordinates and luminance factor: the x,y chromaticity co-ordinates and luminance factor β shall be measured as specified in Annex A.

5.2.3.2 Storage stability: the components of cold plastics shall each be tested separately in different containers. They shall be tested in accordance with Annex C.

5.2.3.3 UV ageing: the cold plastic shall be applied at the manufacturer's stated thickness to test panels as described in A.2 and tested in accordance with EN ISO 4892-3 for 168 h under lamp type II (UVB - 313) in cycles of 8 h of radiation at $60\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and 4 h of condensation at $50\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

5.2.3.4 Alkali resistance: it shall be tested in accordance with Annex E.

5.2.3.5 Tröger wear: it shall be tested in accordance with Annex K.

5.2.3.6 Tröger wear after UV ageing: the test shall be carried out in accordance with EN ISO 4892-2 and Annex K.

5.3 Test methods for the road marking assembly requirements

5.3.1 General

Tests shall be carried out on samples of road markings assemblies applied following the application instructions defined for each particular road marking assembly, in accordance with EN 1824:2011, Table 4 for initial

measurements column or after 10 000 wheel passages according to EN 13197:2011. Performance testing of road markings assemblies shall use test methods as described in EN 1436.

Results indicate the performances of the road marking assembly measured after a short period following subsequent to its application. They shall be understood as the initial performances of the road marking assembly.

5.3.2 Night-time visibility (retroreflection under vehicle headlamp illumination)

The preparation of samples and the test methods, for:

- a) the coefficient of the retro reflected luminance R_L on dry (R),
- b) the coefficient of the retro reflected luminance R_L during wetness (RW),
- c) the coefficient of the retro reflected luminance R_L during rain (RR)

shall be in accordance with EN 1824:2011 or EN 13197:2011.

5.3.3 Day-time visibility (reflection in daylight or under road lighting)

The preparation of samples and the test methods for:

- a) the luminance coefficient under diffuse illumination Q_d ;
- b) the luminance factor β ;

shall be in accordance with EN 1824: 2011 or EN 13197:2011.

5.3.4 Day-time visibility (Chromaticity co-ordinates x, y)

The preparation of samples and the test methods, for chromaticity co-ordinates (x, y) shall be in accordance with EN 1824:2011 or EN 13197:2011.

5.3.5 Skid resistance SRT value (only for non-structured RMA)

The preparation of samples and the test methods for skid resistance shall be in accordance with EN 1824:2011 or EN 13197:2011.

5.4 Durability

5.4.1 General

Test methods for determining the following performance characteristics of the road marking assemblies are stated in 5.4.1 and 5.4.2 below:

a) Retroreflection under vehicle headlamp illumination (see 4.3.2)

- 1) coefficient of retroreflected luminance R_L expressed as class R for dry conditions (only for retroreflective road marking assemblies RMA);
- 2) coefficient of retroreflected luminance R_L expressed as class RW during wetness (only for Type II RMA) and/or;
- 3) coefficient of retroreflected luminance R_L expressed as class RR during rain (only for Type II RMA, if RR required).

b) Reflection in daylight or under road lighting (see 4.3.3, 4.3.4)

- 1) luminance coefficient under diffuse illumination (Q_d) or luminance factor (β);

- 2) chromaticity co-ordinates (x,y).

c) Skid Resistance (SRT vale) (only for non-structured road markings) (see 4.3.5).

5.4.2 Durability on road trials

It shall be tested in accordance with EN 1824:2011. Testing conditions shall be reported as in EN 1824:2011, Clause 8, for the required roll-over classes (P). For studded tyres roll-over class P0 the report shall include the actual value of wheel passages (to the nearest thousand wheel passages).

5.4.3 Durability on wear simulator: turntable

It shall be tested in accordance with EN 13197:2011. Testing conditions shall be reported as in EN 13197:2011, Clause 9, for the required traffic classes (P).

6 Evaluation of conformity

6.1 General

The compliance of paint, thermoplastic and cold plastic materials to the requirements of this standard and with the stated values (including classes) shall be demonstrated by:

- initial type testing and type testing,
- factory production control by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the product.

6.2 Initial type testing and Type Testing

6.2.1 General

Initial type testing and type testing shall be performed to demonstrate compliance with this European Standard.

All essential characteristics, for which the manufacturer declares performances, are subject to Initial Type Testing. In addition, the need to perform Type Tests applies to all other characteristics included in a standard when the manufacturer claims compliance, unless the standard gives provisions (e.g. use of previously existing data, CWFT (classified without further testing) and conventionally accepted performance) for declaring performances without performing tests.

Tests previously performed in accordance with the provisions of this standard may be taken into account provided that they were made to the same or a more rigorous test method, under the same system of attestation of conformity on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

NOTE Same system of attestation of conformity means testing by an independent third party under the responsibility of a product certification body.

For the purposes of testing, the manufacturer's products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for those same characteristics for all products within that same family.

Products may be in different families for different characteristics.

Reference to the test method standards should be made to allow the selection of a suitable representative sample.

Therefore Type Tests or Initial Type Testing shall be performed, including identification according to EN 12802, for all characteristics included in the standard for which the manufacturer declares performances:

- at the beginning of the production of a new or modified paint, thermoplastic and cold plastic materials design;
or
- at the beginning of a new or modified method of production (where this may affect the stated properties);
or
- they shall be repeated for the appropriate characteristic(s), whenever a change occurs in the paint, thermoplastic and cold plastic materials design, in the raw material or in the supplier of the components, or in the production process (subject to the definition of a family), which would affect significantly one or more of the characteristics.

Where components are used whose characteristics have already been determined, by the component manufacturer, on the basis of compliance with other product standards, these characteristics need not be re-assessed. The specifications of these components shall be documented, as shall be included in the inspection scheme for ensuring their compliance.

Products marked in accordance with appropriate harmonised European specifications may be presumed to have the performances stated with that marking, although this does not replace the responsibility of road marking designer to ensure that the paint, thermoplastic and cold plastic as a whole assembly is correctly designed and its component products have the necessary performance values to meet the design.

6.2.2 Test samples, testing and compliance criteria

The number of samples of paint, thermoplastic and cold plastic materials to be tested/assessed for Initial type testing and type testing shall be in accordance with Table 11.

Table 11 —Number of samples to be tested and compliance criteria

Characteristic			Requirement and compliance criteria	Assessment method	No. of samples		
Characteristics of the base road marking material	PAINT	Chromaticity co-ordinates (x,y) and luminance factor β		4.2.1.1	5.2.1.1	1	
		Hiding power		4.2.1.2	5.2.1.2	1	
		Storage stability		4.2.1.3	5.2.1.3	1	
		UV ageing		4.2.1.4	5.2.1.4	1	
		Bleed resistance		4.2.1.5	5.2.1.5	1	
		Alkali resistance		4.2.1.6	5.2.1.6	1	
	THERMOPLASTIC	Before heating	Chromaticity co-ordinates (x,y) and luminance factor β		4.2.2.2.1	5.2.2.2.1	1
			Softening point		4.2.2.2.2	5.2.2.2.2	1
			Alkali resistance		4.2.2.2.3	5.2.2.2.3	1
			Cold impact resistance		4.2.2.2.4	5.2.2.2.4	1
			UV ageing		4.2.2.2.5	5.2.2.2.5	1
		After heating	Chromaticity co-ordinates (x,y) and luminance factor β		4.2.2.3.1	5.2.2.3.1	1
			Softening point		4.2.2.3.2	5.2.2.3.2	1
			Indentation		4.2.2.3.3	5.2.2.3.3	1
			Troger wear		4.2.2.3.4	5.2.2.3.4	1
			Troger UV ageing (Xe arc)		4.2.2.3.5	5.2.2.3.5	1
			Troger wear after Xe arc		4.2.2.3.6	5.2.2.3.6	1
			COLD PLASTIC	Chromaticity co-ordinates (x,y) and luminance factor β		4.2.3.1	5.2.3.1
	Storage stability			4.2.3.2	5.2.3.2	1	
	UV ageing			4.2.3.3	5.2.3.3	1	
	Alkali resistance			4.2.3.4	5.2.3.4	1	
	Tröger wear			4.2.3.5	5.2.3.5	1	
	Tröger wear after UV ageing			4.2.3.6	5.2.3.6	1	
Characteristics of the road marking assembly	Night-time visibility	Retroreflection under headlamp illumination	Coefficient of retroreflected luminance R_L on dry		4.3.2.a	5.3.2.a	1
			Coefficient of retroreflected luminance R_L during wetness		4.3.2.b	5.3.2.b	1
			Coefficient of retroreflected luminance R_L during rain		4.3.2.c	5.3.2.c	1
	Daytime visibility	Reflection in daylight or under road lighting:	Coefficient under diffuse illumination Q_d		4.3.3.a	5.3.3.a	1
			Luminance factor β		4.3.3.b	5.3.3.b	1
			Chromaticity co-ordinates (x,y)		4.3.4	5.3.4	1
	Skid Resistance		SRT units	4.3.5	5.3.5	1	
	Durability	Road trials: (Roll over class)		4.4.2	5.4.1	1	
		Wear simulator: turntable (Traffic class)		4.4.3	5.4.2	1	

6.2.3 Test reports

All Type Tests, Initial Type Tests and their results shall be documented in test reports. All test reports shall be retained by the manufacturer for at least 10 years after the last date of production of the paint, thermoplastic and cold plastic materials to which they relate.