Nordic certification system for road marking materials

Results of performance measurements in 2023

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Kort sammanfattning

Det nordiska certifieringssystemet *NordicCert* syftar till att testa och certifiera vägmarkeringsmaterial med avseende på hållbarhet (livslängd). Produktcertifieringen baseras på funktionsmätningar på materialprover som har applicerats på provfält på allmän väg. Materialen certifieras i relation till antalet hjulpassager de klarar med bibehållen funktion.

Certifieringssystemet omfattar vägmarkeringsmaterial för längsgående och tvärgående vägmarkeringar i olika kategorier med avseende på kulör (vit eller gul), typ (typ I, typ II, nedfräst typ II, friktion, handläggning, slitstarka icke-reflekterande samt temporära) och tjocklek (0,4; 0,6; 1,5; 3 och 5 mm).

Föreliggande rapport dokumenterar resultaten från de uppföljande funktionsmätningar som gjordes på NordicCerts provfält 2023, det vill säga ettårsuppföljning av material som lades ut 2022 och tvåårs-uppföljning av material som lades ut 2021. Rapporten redovisar även resultat för funktionsmätningar utförda på material avsedda för temporär vägmarkering som lades ut 2023. Funktionsmätningarna omfattar retroreflexion (R_L) i torrt och vått tillstånd, luminanskoefficient (*Qd*), friktion, kulör i dagsljus och kulör i fordonsbelysning (för gula material).

Av de 42 material som lades ut på det isländsk-norsk-svenska provfältet 2022 var det 26 som klarade funktionskraven i minst en av hjulpassageklasserna P0–P4 efter ett år. Av de 34 material som lades ut 2021 var det 1 som klarade funktionskraven i hjulpassageklass P5 efter två år. Av de 2 material avsedda för temporär vägmarkering som lades ut 2023 var det 1 som klarade funktionskraven i minst en av hjulpassageklasserna T0–T2.

Av de 10 material som lades ut på det danska provfältet 2022 var det 4 som klarade funktionskraven i minst en av hjulpassageklasserna P0–P5 efter ett år. Av de 8 material som lades ut 2021 var det inget som klarade funktionskraven i hjulpassageklass P6 efter två år.

Nyckelord

Vägmarkeringsmaterial, certifiering.

Abstract

The Nordic certification system *NordicCert* aims at testing and certifying road marking materials with respect to the durability of the products. Product certification is based on monitored and documented performance measurements of material samples applied on test fields on public roads. The materials are certified in relation to the number of wheel passages they will stand, with maintained performance.

The certification system includes road marking materials for longitudinal and transverse road markings in categories with respect to colour (white or yellow), type (type I, type II, type II inlaid, antiskid, hand application, non-reflective with enhanced durability, and temporary) and thickness (0.4, 0.6, 1.5, 3 and 5 mm).

The present report documents the follow-up performance measurements that were carried out at the test fields in 2023, i.e., one-year follow-up measurements for materials applied in 2022 and two-years follow-up measurements for materials applied in 2021. The report also includes results of the performance measurement of materials intended for temporary road markings that were applied in 2023. The performance parameters include the coefficient of retroreflected luminance (R_L) under dry and wet conditions, the luminance coefficient under diffuse illumination (*Qd*), the skid resistance, the chromaticity in daylight, and the chromaticity of retroreflected light (yellow materials, only).

Out of the 42 materials applied at the Icelandic-Norwegian-Swedish test site in 2022, 26 fulfilled the performance requirements in at least one roll-over class P0–P4 after one year. Out of the 34 materials applied in 2021, 1 fulfilled the performance requirements in roll-over class P5 after two years. Out of the 2 materials intended for temporary road markings and applied in 2023, 1 fulfilled the performance requirements in at least one roll-over class T0–T2.

Out of the 10 materials applied at the Danish test site in 2022, 4 fulfilled the performance requirements in at least one roll-over class P0–P5 after one year. Out of the 8 materials applied in 2021, none fulfilled the performance requirements in roll-over class P6 after two years.

Keywords

Road marking material, certification.

Preface

A Nordic certification system for road marking materials was introduced in 2015. The certification of products is based on documented performance measurements of material samples applied on test fields on public roads. This report compiles and presents the results of the performance measurements carried out in 2023 on road marking materials applied for certification at the Danish and at the Icelandic-Norwegian-Swedish test site in 2021–2022.

Performance measurements of the coefficient of retroreflected luminance, the luminance coefficient under diffuse illumination, skid resistance and chromaticity coordinates were carried out by operators from Ramboll, supervised by staff from VTI.

The road trials are administered as a joint project – *NordicCert* – between Ramboll and the Swedish National Road and Transport Research Institute (VTI). Representatives from NordicCert and from the Danish Road Directorate, the Icelandic Road and Costal Administration, the Norwegian Public Roads Administration and the Swedish Transport Administration constitute a steering committee for the Nordic certification system.

Drammen, November 2023

Trond Cato Johansen
Project manager

Granskare/Examiner

Hanna Fager, VTI

Contents

1. Introduction

A Nordic certification system for road marking materials, *NordicCert*, was established in 2015. The certification system aims at testing and certifying road marking materials with respect to the durability of the products, which allows for public purchasers of road marking materials to set requirements on product quality in their procurements and contracts. Product certification is based on monitored and documented performance measurements of material samples applied on test fields on public roads. The certification system includes two test sites with different characteristics with respect to climate and winter maintenance: one in Norway, representative of the conditions in Iceland, Norway and Sweden, and one in Denmark, representative of the conditions in Denmark.

A new round of material tests is initiated at the test fields yearly. In short, samples of materials that are to be tested for certification are applied in nine longitudinal lines across the lane, Figure 1. Follow-up measurements of the performance parameters coefficient of retroreflected luminance R_L under dry and wet conditions, luminance coefficient under diffuse illumination *Qd*, chromaticity in daylight, chromaticity of retroreflected light (yellow materials only) and skid resistance are carried out one, two and optionally three years after application.

Materials are certified in relation to the number of wheel passages they will stand. Measurements of the transversal distribution of wheel passages are carried out yearly at the test sites, and roll-over classes (P- or T-classes, defined by EN 1824 (Swedish Standards Institute [SIS], 2018)) are determined for each of the nine lines of road marking materials that were applied in the lane.

The certification procedure includes an identification analysis that verifies the manufacturer's declaration of constituents of the material. From 2020 onwards, the identification analysis is carried out only on materials that fulfil the performance requirements in one or more P-classes.

The certification system is further described in the document *Nordic certification system for road marking materials – Version 9:2022* (Fors, Johansen and Fager, 2022) which is a public report available at www.vti.se/en/publications and at www.nordiccert.com.

Lists of materials with valid certificates are available at www.nordiccert.com.

Figure 1. Materials applied at the Icelandic-Norwegian-Swedish test site. (Photo: Trond Cato Johansen, Ramboll).

1.1. Aim

The aim of this report is to compile and present the results of the follow-up performance measurements carried out in 2023 on the materials applied at the Danish and at Icelandic-Norwegian-Swedish test sites in 2021 (two-years follow-up) and 2022 (one-year follow-up). The report also includes results of follow-up performance measurements of materials intended for temporary markings applied in 2023.

Note: The results presented in this report do not show which materials have received certification. To receive certification, an identification analysis of the material must be carried out, which is done upon request by the manufacturer after the results of the performance measurements have been published.

The report includes results of materials registered as *certification materials*. Results of materials registered as *test materials* will be available only to the specific manufacturer. Result reports for 2016–2022 are available at www.nordiccert.com.

2. The certification procedure

The certification procedure consists of several steps and requirements, which are explained in Figure 2. In year 0, the manufacturer registers the material for the certification procedure and applies the material at the test site. Provided that requirements 1–5 are fulfilled, initial performance measurements are carried out. If the material fulfils the performance requirements, it qualifies for follow-up measurements in year 1.

If the material fulfils the performance requirements in one or more P-classes (see Section 5.2) in year 1, the manufacturer may request an identification analysis of the material. If the result of the analysis agrees with the manufacturer's declaration of constituents, a certificate is issued.

If the manufacturer has registered the material for 2- or 3-years follow-up, additional performance measurements are carried out in year 2 and 3, provided that the material fulfilled the performance requirements in the highest P-class in the year before. If the material fulfils the requirements in a higher P-class, the certificate is updated.

From year 2 onwards, the validity of the certificate is maintained provided that annual audits of the manufacturing process and the factory production control are carried out and approved.

Activities that require actions from the manufacturer are:

- Registration of the material, including paying registration fee and submitting necessary product documents
- Application of the material at the test site
- Requesting identification analysis of the materials the manufacturer wants to certify. To avoid unnecessary administration and costs, the manufacturer is advised to request analysis only of products that have fulfilled the requirements in P-classes that are of relevance for contracts in Denmark, Iceland, Norway, and Sweden.
- Ensuring that annual audits of the manufacturing process and the factory production control are carried out, and to submit a verification of the audit to the administration of NordicCert (requirement from 2022 onwards).

Details about the activities and requirements shown in Figure 2.

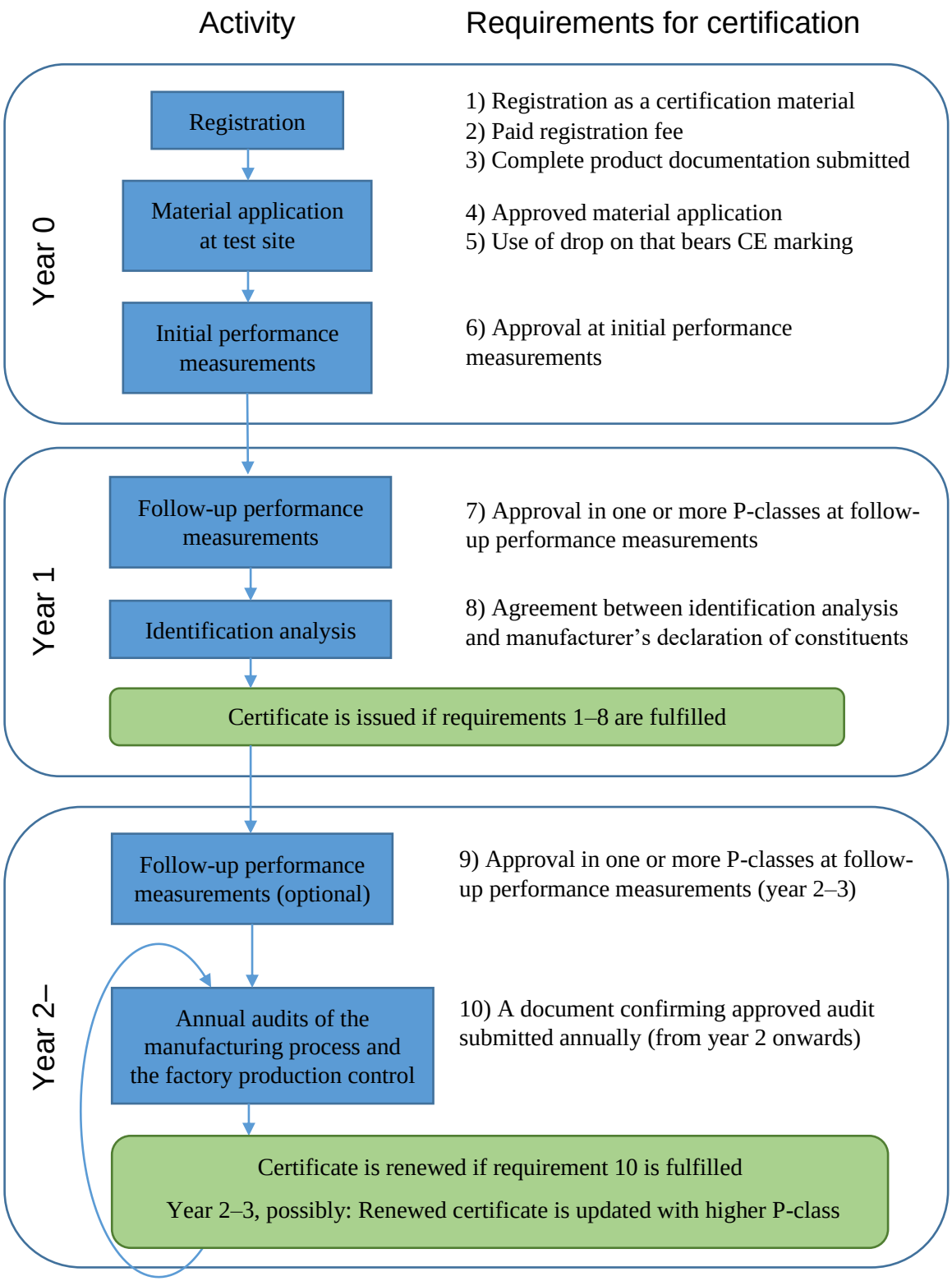

Figure 2. The certification procedure.

3. Test sites

3.1. The Danish test site

3.1.1. General

The Danish test site that was used in 2016–2021 (including follow-up measurements in 2022 and 2023) is located close to Gørlev, Denmark. A description of that test site can be found in Fors and Johansen (2021).

In 2022, a new test site was established close to the village of Havnstrup, approximately 100 km west of Aarhus, Jutland. A description can be found in Fors, Johansen and Fager (2022).

3.1.2. Material application

Each marking material is applied as a row of nine longitudinal lines in the direction of the traffic (nine lines in the lane, no line on the shoulder). The length of the lines is 2.5 m and the width is 0.15 m. The distance between two adjacent rows of lines was at least 2 m. The lines are numbered from right to left in the driving direction, i.e., line 1 is the one next to the edge line and line 9 is the one next to the centre line, see also Figure 5.

3.1.3. Traffic volume and wheel passages

Measurements of wheel passages are carried out yearly, in order to determine roll-over classes (P- or T-classes) for the lines, see also Section 5.2. The number and type of vehicles and their lateral position are registered by a portable traffic analyser based on coaxial cable technique, developed at VTI. Measurements are carried out at one or more empty positions on the test fields (i.e., where no material is applied). Wheel passages are registered for one week on each measurement occasion. In addition, official annual average daily traffic (AADT) data is obtained from the Danish Road Directorate.

Table 1 shows the official AADT and the distribution of passenger cars, heavy vehicles and other vehicles (two-wheelers, working vehicles) obtained from the wheel passage measurements, for 2022.

Table 1. AADT (both lanes) and distribution of passenger cars, heavy vehicles and other vehicles in 2022, at the Danish test site in Havnstrup.

Year	AADT	Passenger cars (%)	Heavy vehicles (%)	Other vehicles (%)
2022	8 750	89.7	10.0	0.3

The roll-over classes for materials applied at the test field in Gørlev in 2021 are based on wheel passage measurements carried out in September 2021, see also Johansen and Fors (2022). The P-classes for materials applied at the test field in Havnstrup in 2022 are based on wheel passage measurements carried out in September 2022, which are presented below.

Figure 3 shows the distribution of wheel passages for the average week for materials applied at the test field in Havnstrup in 2022. The curves are adjusted so that the number of vehicles corresponds to the official AADT, to have results that are representative for the average traffic flow for the entire year.

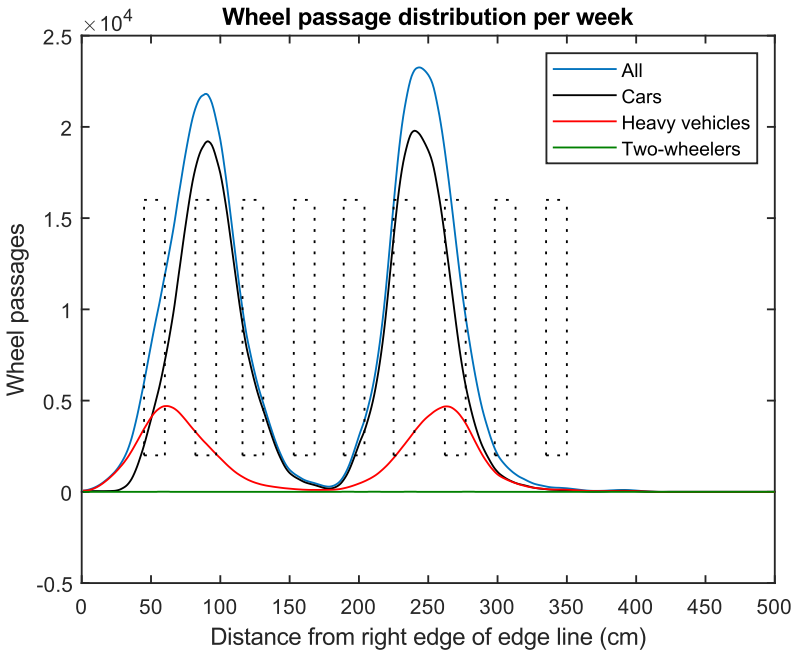

Figure 3. Wheel passages per week for materials applied at the Danish test site in Havnstrup in 2022 (measurement in 2022). The dashed areas correspond to the nine lines (line 1 to the left, line 9 to the right). Please note that the shoulder is to the left in the figure. The number of two-wheelers is too few to be visible in the figure.

Table 2 shows the number of wheel passages per line and week for the test field of 2022.

Table 2. Number of wheel passages per line and week, for materials applied at the Danish test site in Havnstrup in 2022. Line 1 is the one next to the edge line, see also Figure 5.

Line	Line 1	Line 2	Line 3	Line 4	Line 5	Line 6	Line 7	Line 8	Line 9
Number of wheel passages per week	8 821	21 767	7 133	680	2 123	20 537	14 346	1 522	229

3.1.4. Weather conditions

The weather conditions from September 2022 to August 2023 for the test sites in Gørlev and in Havnstrup are shown in Table 3.

Table 3. Weather conditions at the Danish test sites in Gørlev and in Havnstrup, from September 2022 to August 2023.

Weather parameter	**Gørlev**	**Havnstrup**
Annual average temperature	9.6 °C	8.6 °C
Average summer temperature (Apr-Sep)	13.8 °C	12.3 °C
Average winter temperature (Oct-Mar)	5.3 °C	4.9 °C
Highest temperature	30.2 °C	26.2 °C
Lowest temperature	-10.6 °C	-18.0 °C
Annual precipitation	641 mm	1132 mm
Number of sun hours per month	156 h	141 h
Number of weeks with snow or frost	9	10
Number of times the snow plough has operated	8	6
Number of times the road has been salted	53	56

Weather data was retrieved from *the Danish Meteorological Institute* (DMI), at the following places for Gørlev: Flakkebjerg approximately 28 km south of the test site (temperature, sun hours, snow/frost) and Rye close to the test site (precipitation), and at the following places for Havnstrup: Isenvad approximately 23 km east of the test site (temperature, sun hours, snow/frost) and Herning Centralrenseanlæg approximately 7 km east of the test site (precipitation), (DMI, 2023). Information about snow plough operations and salting was obtained from *the Danish Road Directorate*.

3.2. The Icelandic-Norwegian-Swedish test site

3.2.1. General

The present Icelandic-Norwegian-Swedish test site was established in Haslemoen, Norway in 2017. Materials have been applied yearly at this test site in 2017–2023. Further details can be found in Fors, Johansen and Fager (2022).

3.2.2. Material application

Each marking material is applied as a row of ten longitudinal lines in the direction of the traffic (nine lines in the lane, one line on the shoulder). The length of the lines is 2.5 m and the width is 0.15 m. The distance between two adjacent rows of lines is 2 m. The lines are numbered from right to left in the driving direction, i.e., line 1 is the one on the shoulder and line 10 is the one next to the centre line, see also Figure 5.

Regarding inlaid materials, line 2, 3, 9 and 10 are inlaid. Lines 4–8 are applied as non-inlaid lines and they are not included in the evaluation of the material.

3.2.3. Traffic volume and wheel passages

Measurements of wheel passages are carried out yearly, in order to determine roll-over classes (P-classes) for the lines, see also Section 5.2. The number and type of vehicles and their lateral position are registered by a portable traffic analyser based on coaxial cable technique, developed at VTI. Measurements are carried out at one or more empty positions on the test fields (i.e. where no material is applied). Wheel passages are registered for one week on each measurement occasion. In addition, official annual average daily traffic (AADT) data is obtained from the website Trafikkdata, provided by the Norwegian Public Roads Administration (Trafikkdata, 2023).

Table 4 shows the official AADT and the distribution of passenger cars, heavy vehicles, and other vehicles (two-wheelers, working vehicles) obtained from the wheel passage measurements, for 2020–2022.

Table 4. AADT (both lanes) and distribution of passenger cars, heavy vehicles, and other vehicles for 2020–2022, at the Icelandic-Norwegian-Swedish test site.

Year	AADT	Passenger cars (%)	Heavy vehicles (%)	Other vehicles (%)
2020	3 082	85.4	14.3	0.3
2021	3 199	85.5	13.8	0.7
2022	3 223	85.9	13.4	0.7

The results of the wheel passage measurements carried out for materials applied in 2021 can be found in in Johansen and Fors (2022). The roll-over for materials applied in 2022 are based on wheel passage measurements carried out in September 2022 and in September 2023, which are presented below.

Figure 4 shows the distribution of wheel passages for the average week for materials applied in 2022. The curves are adjusted so that the number of vehicles corresponds to the official AADT, to have results that are representative for the average traffic flow for the entire year.

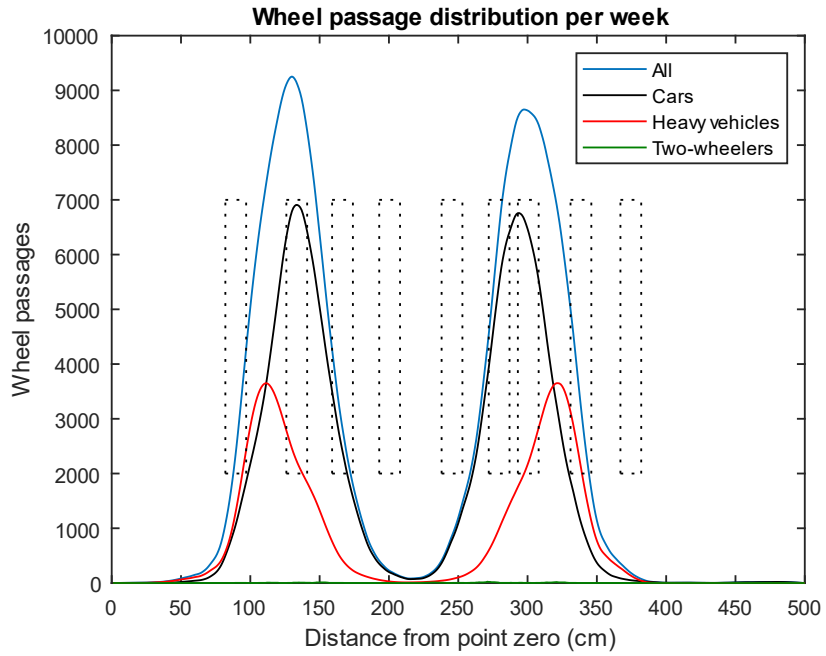

Figure 4. Wheel passages per week for materials applied at the Icelandic-Norwegian-Swedish test site in 2022 (measurement in 2022). The dashed areas correspond to the nine lines in the lane (line 2 to the left, line 10 to the right). Please note that the shoulder is to the left in the figure. The number of two-wheelers is too few to be visible in the figure.

Table 5 shows the number of wheel passages per line and week for the test field of 2022, as averages of the two measurement occasions.

Table 5. Number of wheel passages per line and week, for materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Line 2 is the one next to the edge line, see also Figure 5.

Line	Line 2	Line 3	Line 4	Line 5	Line 6	Line 7	Line 8	Line 9	Line 10
Number of wheel passages per week	2 399	9 276	2 885	206	628	7 059	8 862	3 007	154

3.2.4. Weather conditions

The weather conditions from September 2022 to August 2023 are shown in Table 6.

Table 6. Weather conditions at the Icelandic-Norwegian-Swedish test site in Haslemoen, from September 2022 to August 2023.

Weather parameter	**Value**
Annual average temperature	5.5 °C
Average summer temperature (Apr-Sep)	12.2 °C
Average winter temperature (Oct-Mar)	-1.3 °C
Highest temperature	31.0 °C
Lowest temperature	-24.3 °C
Annual precipitation	527 mm
Number of sun hours per month	n/a
Number of weeks with snow	19
Number of times the snow plough has operated	329
Number of times the road has been salted	168

Weather data was retrieved from Yr, which is a joint weather service from *the Norwegian Meteorological Institute* and *the Norwegian Broadcasting Corporation* (Yr, 2023). Data on temperature, precipitation and snow are from a weather station located approximately 10 km from the test site.

Information about winter snow plough operations and salting was obtained from the contractor for winter maintenance.

4. Performance measurements

4.1. General

Performance measurements were carried out according to EN 1824 (SIS, 2020) and EN 1436 (Swedish Standards Institute [SIS], 2018).

Measurements of all performance parameters were carried out by operators from Ramboll, supervised by an observer from VTI. All measurement equipment was calibrated according to procedures recommended by the respective manufacturer.

Performance measurements were carried out in August–September 2023.

4.2. Methods and measuring instruments

4.2.1. Coefficient of retroreflected luminance R_L and luminance coefficient under diffuse illumination *Qd*

The coefficient of retroreflected luminance, R_L, and the luminance coefficient under diffuse illumination, *Qd*, were measured using an *LTL3500* (Delta, Denmark). Measurements were taken at three points along the centre of each line, Figure 5. The result of an individual line was calculated as the average of the three measurements.

The coefficient of retroreflected luminance, R_L, under wet conditions was measured on type II markings (i.e., road markings with special properties intended to enhance the retroreflection in wet or rainy conditions), with the same instrument and measurement points as described above. Approximately 3 litres of clean water were poured over the measurement area, and measurements were carried out 60 seconds afterwards.

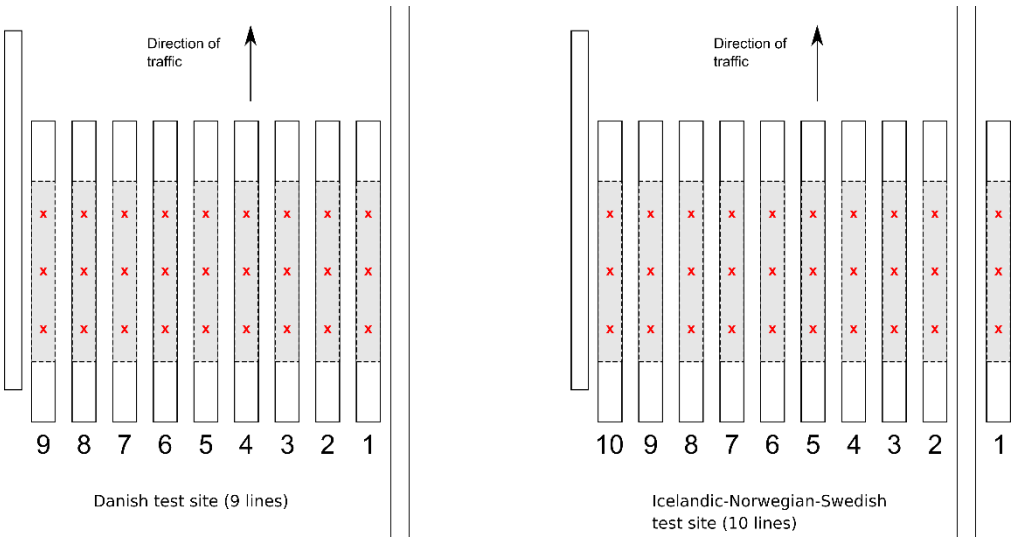

Figure 5. The measurement points (red crosses) for R_L and Qd were placed along the centre of each line within the measurement area (grey) defined by EN 1824 (SIS, 2020). Left: the Danish test site with nine lines. Right: the Icelandic-Norwegian-Swedish test site with ten lines.

The markings were not cleaned before the measurements, but in case a substantial part of the measurement area was abnormally dirty (e.g., oil stain), the instrument was moved in the longitudinal direction to the closest area not affected by abnormal dirt.

Some marking lines were too worn to be measured. If the measurement area of the marking lines were worn in a way that made representative measurements impossible, these single lines were not

measured. However, other marking lines of the same product, that were not equally worn, were measured.

4.2.2. Chromaticity coordinates

Chromaticity (colour) coordinates were measured in one point on each line, located at the centre of the line, Figure 6. A *Spectrophotometer CM-25cG* (Konica Minolta, Japan) was used to measure the colour coordinates. The chromaticity coordinates of yellow materials in retroreflected light (night-time colour) were measured by an *LTL3500* (Delta, Denmark).

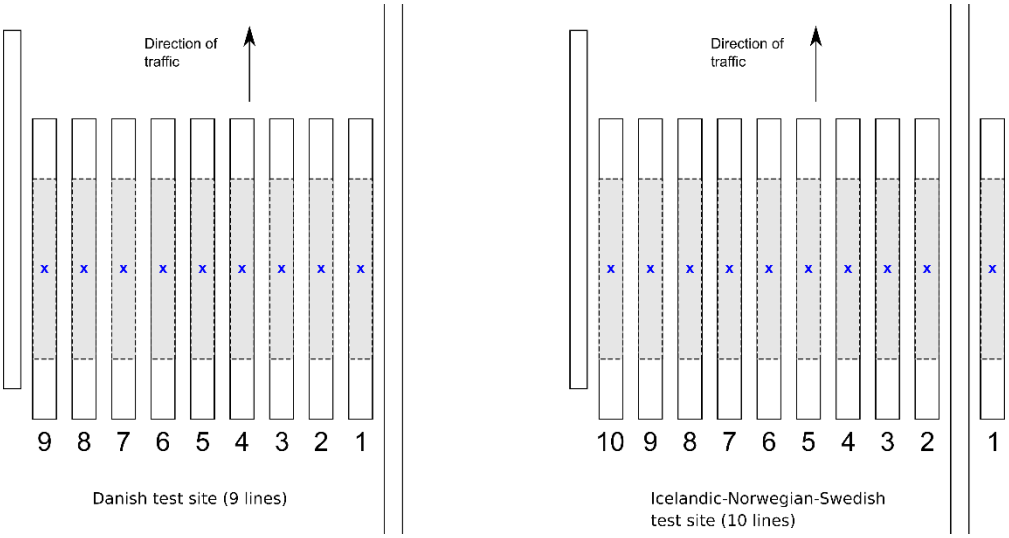

Figure 6. The measurement points (blue crosses) for chromaticity coordinates were placed in the centre of the lines. Left: the Danish test site with nine lines. Right: the Icelandic-Norwegian-Swedish test site with ten lines.

For materials with a high degree of wear, the measurement was taken at an area where the material was intact, if possible. In some cases, several measurement points were selected, to ensure correct chromaticity coordinates. These points had to be located within the grey area in Figure 6.

The markings were not cleaned before the measurements, but in case a substantial part of the measurement area was abnormally dirty (e.g., oil stain), the instrument was moved to the closest area not affected by abnormal dirt.

4.2.3. Skid resistance

Skid resistance measurements were carried out using a *Portable Friction Tester version 4*, PFT (Coralba, Sweden), along the centre of each line, Figure 7. The PFT takes a sample approximately every 1.9 cm and thus, about 70 samples are taken on each line. The result of an individual line is calculated as the average of all samples from that line.

In case there were any notches, joints or other abnormalities on the marking surface, the measurement area/line was either reduced or moved somewhat, so that no samples were taken from the abnormality.

Skid resistance was measured on wet markings. The skid resistance measurements were always carried out after the measurements of the coefficient of retroreflected luminance, R_L, the luminance coefficient under diffuse illumination, *Qd*, and chromaticity coordinates.

The PFT instrument is further described in Wälivaara (2007).

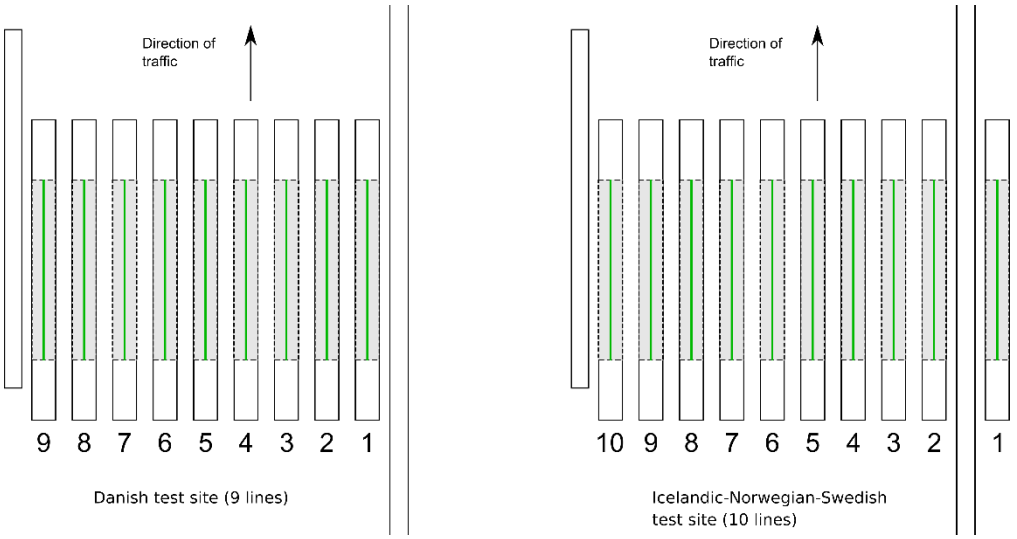

Figure 7. The measurement areas (green lines) for skid resistance. Left: the Danish test site with nine lines. Right: the Icelandic-Norwegian-Swedish test site with ten lines.

4.2.4. Measurement values that do not fulfil the performance requirements

In case a measured value was just below the performance requirement (see Section 5.1), extra measurements were taken to assure a correct result. If the new measurement values fulfilled the requirements, this was regarded as the final result and the material was thus approved with respect to that parameter. If the new measurements did not fulfil the requirements, the original measurement was regarded as the final result, i.e., the material was not approved.

4.3. Weather conditions at the time of measurements

During the measurements in Norway in week 35, it was mostly sunny with scattered clouds. The air temperature was approximately 16–18˚ C (day/evening). The road surface temperature was approximately 18–20˚ C. The measurements in Denmark in week 39 had mostly cloudy conditions, with air temperatures at 16–20˚ C. The road surface temperature was approximately 18–24˚ C. All performance measurements of $R_{L,dry}$, *Qd* and chromaticity coordinates were carried out on absolutely dry markings.

5. Performance requirements

5.1. Performance parameters

The performance requirements include four parameters for type I markings[1] and five parameters for type II markings[2] which are given in Table 7. These requirements apply also to inlaid markings. Table 8 shows the requirements for materials for hand applications and Table 9 shows the performance requirements for materials with enhanced durability and for temporary markings. Table 10 shows the performance requirements for antiskid materials.

Table 7. Performance requirements for type 1 and type II markings, including inlaid markings.

Performance parameter	**Type I, white**	**Type I, yellow**	**Type II, white**	**Type II, yellow**
Coefficient of retroreflected luminance, R_L dry [mcd/m^2/lx]	≥ 150	≥ 100	≥ 150	≥ 100
Coefficient of retroreflected luminance, R_L wet [mcd/m^2/lx]	-	-	≥ 35	≥ 35
Luminance coefficient under diffuse illumination, *Qd* [mcd/m^2/lx]	≥ 130	≥ 100	≥ 130	≥ 100
Skid resistance, [PFT units]	≥ 0.52	≥ 0.52	≥ 0.52	≥ 0.52
Chromaticity coordinates, x, y	*	**	*	**

*) Type I and II white – Chromaticity coordinates, x, y – According to EN 1436:2018 (SIS, 2018).
**) Type I and II yellow – Chromaticity coordinates, x, y – Includes both daytime (class Y1) and night-time colour (class RC1), according to EN 1436:2018 (SIS, 2018).

Table 8. Performance requirements for materials for hand application.

Performance parameter	**Materials for hand application, retroreflective, white**	**Materials for hand application, retroreflective, yellow**	**Materials for hand application, non-retroreflective, white**	**Materials for hand application, non-retroreflective, yellow**
Coefficient of retroreflected luminance, R_L dry [mcd/m^2/lx]	≥100	≥ 100	-	-
Coefficient of retroreflected luminance, R_L wet [mcd/m^2/lx]	-	-	-	-
Luminance coefficient under diffuse illumination, *Qd* [mcd/m^2/lx]	≥ 130	≥ 100	≥ 130	≥ 100
Skid resistance, [PFT units]	≥ 0.65	≥ 0.65	≥ 0.71	≥ 0.71
Chromaticity coordinates, x, y	*	**	*	**

*) Materials for hand application, retroreflective and non-retroreflective, white – Chromaticity coordinates, x, y – According to EN 1436:2018 (SIS, 2018).
**) Materials for hand application, retroreflective and non-retroreflective, yellow – Chromaticity coordinates, x, y – Includes both daytime (class Y1) and night-time colour (class RC1), according to EN 1436:2018 (SIS, 2018).

[1] Type I refers to flat markings.

[2] Type II refers to markings with special properties intended to enhance the retroreflection in wet or rainy conditions.

Table 9. Performance requirements for materials with enhanced durability and for temporary markings.

Performance parameter	Materials with enhanced durability, white	Materials with enhanced durability, yellow	Temporary markings, white	Temporary markings, yellow
Coefficient of retroreflected luminance, R_L dry [mcd/m^2/lx]	-	-	≥ 150	≥ 200
Coefficient of retroreflected luminance, R_L wet [mcd/m^2/lx]	-	-	-	-
Luminance coefficient under diffuse illumination, *Qd* [mcd/m^2/lx]	≥ 130	≥ 100	≥ 130	≥ 130
Skid resistance, [PFT units]	≥ 0.52	≥ 0.52	≥ 0.52	≥ 0.52
Chromaticity coordinates, x, y	*	**	*	***

*) Materials with enhanced durability and temporary markings, white – Chromaticity coordinates, x, y – According to EN 1436:2018 (SIS, 2018).
**) Material with enhanced durability, yellow – Chromaticity coordinates, x, y – Includes both daytime (class Y1) and night-time colour (class RC1), according to EN 1436:2018 (SIS, 2018).
***) Temporary markings, yellow – Chromaticity coordinates, x, y – Includes both daytime (class Y2) and night-time colour (class RC1), according to EN 1436:2018 (SIS, 2018).

Table 10. Performance requirements for antiskid materials.

Performance parameter	Antiskid materials, white
Coefficient of retroreflected luminance, R_L dry [mcd/m^2/lx]	-
Coefficient of retroreflected luminance, R_L wet [mcd/m^2/lx]	-
Luminance coefficient under diffuse illumination, *Qd* [mcd/m^2/lx]	≥ 130
Skid resistance, [PFT units]	≥ 0.71
Chromaticity coordinates, x, y	*

*) Antiskid materials, white – Chromaticity coordinates, x, y – According to EN 1436:2018 (SIS, 2018).

Regarding skid resistance, a PFT value of 0.52 corresponds to an SRT value of 50 (class S2 in EN 1436 (SIS, 2018)), whereas a PFT value of 0.65 corresponds to an SRT value of 60 (S4). A PFT value of 0.71 corresponds to an SRT value of 65 (S5). See also Section 5.1.1.

5.1.1. Special considerations regarding skid resistance

A PFT value of 0.52 corresponds to a *Skid Resistance Tester* (SRT) value of 50. The translation from PFT units into SRT units and vice versa results in an uncertainty of approximately 10% (Wälivaara, 2007). Consequently, there is a risk that a reading of a value just below 0.52 PFT units, in fact has 50 SRT units and therefore should fulfil the requirement.

In order to minimize the risk that materials are rejected because of the uncertainty when translating PFT units into SRT units, the required limit for approval was lowered by approximately 10% or 0.05 PFT units, from 0.52 to 0.47 for type I and type II markings, from 0.65 to 0.60 for retroreflective

materials for hand application, and from 0.71 to 0.66 for antiskid materials and for non-retroreflective materials for hand application.

5.2. Certification in relation to roll-over classes

Materials are certified in relation to the number of wheel passages they will withstand. The nine lines within the driving lane are exposed to different numbers of wheel passages, which means that different roll-over classes are reached on different lines at different times.

Roll-over classes according to EN 1824 are determined from the measurements of wheel passages for each line in the lane (SIS, 2020). Separate classes are defined for permanent (P) and temporary (T) road markings, Table 11–Table 12. Materials are thus certified for a certain roll-over class, i.e. a P-class or a T-class. To get approval in a certain roll-over class (see also requirements 7 and 9 in Figure 2), all relevant performance requirements (see Section 5.1) must be fulfilled for that particular class.

Certification of materials intended for permanent road markings is given based on the follow-up measurements one and two (and optional three) years after application, while certification of materials intended for temporary road markings is given based on follow-up measurements approximately three months after application. No certification is given based on the initial measurements that are carried out a few weeks after application (the initial measurements must however be approved for the material to qualify for follow-up measurements).

Based on the wheel passage measurements, the lines that are the most representative of the respective roll-over classes are selected for the follow-up measurements (see Section 0). One line is selected for each roll-over class and the results of the performance measurements on that line constitute the result for that material and roll-over class. All roll-over classes in Table 11–Table 12 might not be available at the test sites.

The materials must fulfil the performance requirements for all classes lower than that it is to be certified for, provided that the lower classes exist on the test field. Example: For a material to be certified in roll-over class P3, the performance requirements must be fulfilled also for classes P0, P1 and P2.

If a material has been certified for a certain P-class after one year (i.e., based on the one-year follow-up measurement), this certification is valid irrespective of the results of the measurements after two years. The two-year follow-up measurements are merely used to evaluate whether the material fulfils the requirement for a higher P-class than what it is already certified for.

Table 11. Roll-over classes for materials intended for permanent road markings, EN 1824 (SIS, 2020).

Roll-over class	**Number of wheel passages**
P0	≤ 50 000
P1	Between 50 000 and 60 000
P2	100 000 ± 20 000
P3	200 000 ± 40 000
P4	500 000 ± 100 000
P5	1 000 000 ± 200 000
P5.5	1 500 000 ± 150 000
P6	2 000 000 ± 200 000
P7	4 000 000 ± 400 000

Table 12. Roll-over classes för materials intended for temporary road markings, EN 1824 (SIS, 2020).

Roll-over class	Number of wheel passages
T0	≤ 50 000
T1	Between 50 000 and 60 000
T2	100 000 ± 20 000

5.2.1. P-classes at the Danish test sites in 2023

For materials applied in 2021, P-classes P0, P3, P4 and P5 were reached in 2022 and P-class P6 was reached in 2023. For materials applied in 2022, P-classes P0, P2, P4 and P5 were reached in 2023. All P-classes were represented by one line, Table 13–Table 16.

Table 13. P-classes at the Danish test site, materials applied in 2021.

Roll-over class	Lines	Measured
P0	Line 5	September 2022
P1	-	-
P2	-	-
P3	Line 6	September 2022
P4	Line 8	September 2022
P5	Line 3	September 2022
P5.5	-	-
P6	Line 3	September 2023

Table 14. P-classes at the Danish test site, materials applied in 2022.

Roll-over class	Lines	Measured
P0	Line 4	September 2023
P1	-	-
P2	Line 5	September 2023
P3	-	-
P4	Line 1	September 2023
P5	Line 6	September 2023
P5.5	-	Summer 2024 (expected)
P6	-	Summer 2024 (expected)

5.2.2. P-classes at the Icelandic-Norwegian-Swedish test site in 2023

For materials applied in 2021, P-classes P0, P2, P3 and P4 (inlaid markings: P0, P2, P4) were reached in 2022 and P-class P5 was reached in 2023. For materials applied in 2022, P-classes P0, P2, P3 and P4 were reached in 2023 (inlaid markings: P0, P2, P3, P4). For materials intended for temporary road markings applied in 2023, T-classes T0 and T2 were reached in 2023. All P-classes were represented by one line, Table 15–Table 17.

Table 15. P-classes at the Icelandic-Norwegian-Swedish test site, materials applied in 2021.

Roll-over class	**Lines, not inlaid**	**Lines, inlaid**	**Measured**
P0	Line 6	Line 10	September 2022
P1	-	-	-
P2	Line 9	Line 9	September 2022
P3	Line 7	-	September 2022
P4	Line 3	Line 3	September 2022
P5	Line 3	Line 3	August 2023

Table 16. P-classes at the Icelandic-Norwegian-Swedish test site, materials applied in 2022.

Roll-over class	**Lines, not inlaid**	**Lines, inlaid**	**Measured**
P0	Line 5	Line 10	August 2023
P1	-	-	-
P2	Line 2	Line 2	August 2023
P3	Line 9	Line 9	August 2023
P4	Line 3	Line 3	August 2023
P5	-	-	Summer 2024 (expected)

Table 17. T-classes at the Icelandic-Norwegian-Swedish test site, materials applied in 2023.

Roll-over class	**Lines**	**Measured**
T0	Line 4	August 2023
T1	-	August 2023
T2	Line 3	August 2023

6. Results

This section contains an overview of the results of the performance measurements carried out in 2023 on materials intended for permanent road markings applied at the test sites in 2021 and 2022 (the results tables for materials applied in 2021 also include the results from the performance measurements in 2022, see Section 5.2) and on materials intended for temporary road markings applied in 2023. **A** means that the material fulfils the requirement on all relevant performance parameters, in that roll-over class (Approved). **NA** means that the material did not fulfil one or more of the performance requirements (Not approved). Empty cells imply that the material was not approved in a lower roll-over class.

Only materials that were approved at the initial measurements and that participate as *certification materials* are included in the tables below (see also Chapter 2). Results are presented for the time period the material was registered for, i.e., one- or two-years follow-up.

No manufacturer has requested three-years follow-up measurements of materials applied in 2020.

Note that the results do *not* show which materials have received certification. To receive certification, also certification requirement 8 must be fulfilled, and to maintain the validity of a certificate the certification requirement 10 must be fulfilled annually (from 2023), see Chapter 2.

Detailed measurement results can be found in Appendix 1.

6.1. Materials applied at the Danish test site in 2021

6.1.1. White road markings

Type I

Material thickness 3 mm

Table 18. Results of the performance measurements of materials applied at the Danish test site in 2021. Roll-over classes P0, P3, P4, P5 and P6. White type I materials, 3 mm.

Manufacturer *Material*	**P0**	**P3**	**P4**	**P5**	**P6**
Geveko Markings TP21-DK4	**A**	**A**	**A**	**A**	**NA**
Geveko Markings TP21-DK6	**A**	**A**	**NA**		
Saferoad Grawil DKTI21-01	**NA**				

Type II

Material thickness 5 mm

Table 19. Results of the performance measurements of materials applied at the Danish test site in 2021. Roll-over classes P0, P3, P4, P5 and P6. White type II materials, 5 mm.

Manufacturer *Material*	**P0**	**P3**	**P4**	**P5**	**P6**
Geveko Markings TP21-DK1 *Profile/pattern:* LongDot	**A**	**A**	**A**	**A**	**NA**
Geveko Markings TP21-DK2 *Profile/pattern:* ViziSpot	**A**	**A**	**A**	**A**	**NA**
Geveko Markings TP21-DK3 *Profile/pattern:* LongFlex	**NA**				
Saferoad Grawil DKTII21-01 *Profile/pattern:* Longdot	**NA**				

Antiskid materials

Material thickness 3 mm

Table 20. Results of the performance measurements of materials applied at the Danish test site in 2021. Roll-over classes P0, P3, P4, P5 and P6. White antiskid materials, 3 mm.

Manufacturer *Material*	**P0**	**P3**	**P4**	**P5**	**P6**
Geveko Markings TP21-DK5	**A**	**A**	**A**	**NA**	

6.2. Materials applied at the Danish test site in 2022

6.2.1. White road markings

Type I

Material thickness 0.6 mm

Table 21. Results of the performance measurements of materials applied at the Danish test site in 2022. Roll-over classes P0, P2, P4 and P5. White type I materials, 0.6 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Team Segnal Luxspray 2K	**NA**			

Material thickness 3 mm

Table 22. Results of the performance measurements of materials applied at the Danish test site in 2022. Roll-over classes P0, P2, P4 and P5. White type I materials, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Geveko Markings TP22-DK3	**A**	**A**	**A**	**NA**
Geveko Markings TP22-DK4	**A**	**A**	**NA**	

Type II

Material thickness 5 mm

Table 23. Results of the performance measurements of materials applied at the Danish test site in 2022. Roll-over classes P0, P2, P4 and P5. White type II materials, 5 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Geveko Markings TP22-DK1 *Profile/pattern:* ViziSpot	**A**	**A**	**NA**	
Geveko Markings TP22-DK2 *Profile/pattern:* ViziSpot	**A**	**A**	**A**	**NA**
Promax DK22EWII *Profile/pattern:* Dots	**NA**			
Promax DK22EWIIR *Profile/pattern:* Rilled	**NA**			

6.3. Materials applied at the Icelandic-Norwegian-Swedish test site in 2021

6.3.1. White road markings

Type I

Material thickness 1.5 mm

Table 24. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. White type I markings, 1.5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**	**P5**
Svevia X 2120	**A**	**NA**			

Material thickness 3 mm

Table 25. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. White type I markings, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**	**P5**
Hot Mix Hotmix EE10-921W [type I]	**A**	**A**	**A**	**A**	**NA**
Hot Mix Hotmix EE921W [type I]	**A**	**A**	**A**	**NA**	
Hot Mix Hotmix POE1021W [type I-1]	**A**	**A**	**A**	**A**	**NA**
Hot Mix Hotmix POE1021W [type I-2]	**A**	**A**	**A**	**A**	**NA**
Hot Mix Hotmix POE1721W [type I-1]	**A**	**A**	**A**	**NA**	
Hot Mix Hotmix POE1721W [type I-2]	**A**	**A**	**A**	**NA**	
Promax SNI21WI1	**NA**				
Svevia X 2110	**A**	**A**	**A**	**A**	**NA**

Type II

Material thickness 3 mm

Table 26. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. White type II markings, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**	**P5**
3M Stamark A380ESD *Profile/pattern:* Preformed plateaus	**A**	**NA**			

Material thickness 5 mm

Table 27. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. White type II markings, 5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**	**P5**
Geveko Markings EXP 21 TP – 4 *Profile/pattern:* Rilled	**A**	**A**	**A**	**NA**	
Hot Mix Hotmix EE10-921W [type II] *Profile/pattern:* Roll	**A**	**NA**			
Hot Mix Hotmix EE921W [type II] *Profile/pattern:* Roll	**A**	**NA**			

Inlaid type II

Material thickness 5 mm

Table 28. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. White inlaid type II markings, 5 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Geveko Markings EXP 21 TP – 6 *Profile/pattern:* Drops	**A**	**A**	**NA**	

Materials for hand application, retroreflective

Material thickness 3 mm

Table 29. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. White materials for hand application, retroreflective, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**	**P5**
Geveko Markings EXP 21 TP – 1	**A**	**A**	**A**	**A**	**A**
Svevia X 2130	**A**	**A**	**A**	**A**	**NA**

Materials for hand application, non-retroreflective

Material thickness 3 mm

Table 30. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. White materials for hand application, non-retroreflective, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**	**P5**
Geveko Markings EXP 21 TP - 2	**A**	**A**	**A**	**A**	**NA**

6.3.2. Yellow road markings

Type I

Material thickness 1.5 mm

Table 31. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. Yellow type I markings, 1.5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**	**P5**
Svevia Y 2120	**A**	**A**	**NA**		

Material thickness 3 mm

Table 32. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over classes P0, P2, P3, P4 and P5. Yellow type I markings, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**	**P5**
Hot Mix Hotmix EE921Y [type I]	**A**	**A**	**NA**		
Hot Mix Hotmix POE1721Y [extr]	**A**	**NA**			
Svevia Y 2110	**A**	**A**	**A**	**NA**	

6.4. Materials applied at the Icelandic-Norwegian-Swedish test site in 2022

6.4.1. White road markings

Type I

Material thickness 0.4 mm

Table 33. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White type I materials, 0.4 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings EXP 2022 AQ1	**NA**			
Geveko Markings EXP 2022 AQ2	**NA**			
Geveko Markings EXP 2022 AQ3	**NA**			
Geveko Markings EXP 2022 AQ4	**NA**			
Visafo HVIT VISA 31 [0.4 mm]	**NA**			
Visafo HVIT VISA 41 [0.4 mm]	**NA**			
Visafo HVIT VISA 43 [0.4 mm]	**A**	**NA**		

Material thickness 0.6 mm

Table 34. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White type I materials, 0.6 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Swarco Limburger Lackf. Aqualine W13S [type I]	**NA**			
Visafo HVIT VISA 41 [0.6 mm]	**NA**			
Visafo HVIT VISA 43 [0.6 mm]	**A**	**NA**		

Material thickness 1.5 mm

Table 35. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White type I materials, 1.5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings EXP 2022 TP11	**A**	**A**	**A**	**A**
Geveko Markings EXP 2022 TP12	**A**	**A**	**A**	**A**
Kelly Bros White Spray G	**A**	**NA**		
Svevia S22150	**A**	**A**	**NA**	

Material thickness 3 mm

Table 36. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White type I materials, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings EXP 2022 TP4	**A**	**A**	**A**	**A**
Geveko Markings EXP 2022 TP5	**A**	**A**	**A**	**NA**
Kelly Bros White Ext/Scd A	**A**	**A**	**A**	**NA**
Kelly Bros White Ext/Scd B	**A**	**A**	**A**	**NA**
Kelly Bros White Ext/Scd C	**A**	**NA**		
Kelly Bros White Ext/Scd D	**A**	**NA**		
Kelly Bros White Ext/Scd H	**NA**			
Svevia X22150	**A**	**A**	**A**	**A**

Type II

Material thickness 0.6 mm

Table 37. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White type II materials, 0.6 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Swarco Limburger Lackf. Aqualine W13S [type II] *Profile/pattern:* Flat	**NA**			

Material thickness 5 mm

Table 38. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White type II materials, 5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings EXP 2022 TP6 *Profile/pattern:* Rilled	**A**	**NA**		
Geveko Markings EXP 2022 TP7 *Profile/pattern:* Rilled	**A**	**NA**		
Geveko Markings EXP 2022 TP8 *Profile/pattern:* Stairs	**A**	**NA**		
Svevia E22150 *Profile/pattern:* Rolled	**A**	**A**	**A**	**NA**

Inlaid type II

Material thickness 3 mm

Table 39. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White inlaid type II materials, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
3M Stamark A380ESDc *Profile/pattern:* Diamond shape	**A**	**NA**		

Material thickness 5 mm

Table 40. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White inlaid type II materials, 5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings EXP 2022 TP9 *Profile/pattern:* Drops	**A**	**NA**		

Materials for hand application, retroreflective

Material thickness 3 mm

Table 41. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White materials for hand application, retroreflective, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Svevia H2250	**A**	**A**	**A**	**NA**

Materials for hand application, non-retroreflective

Material thickness 3 mm

Table 42. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. White materials for hand application, non-retroreflective, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings EXP 2022 TP2	**A**	**A**	**A**	**A**

6.4.2. Yellow road markings

Type I

Material thickness 1.5 mm

Table 43. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. Yellow type I materials, 1.5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Svevia S22100-Y	**A**	**A**	**NA**	

Material thickness 3 mm

Table 44. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over classes P0, P2, P3, P4. Yellow type I materials, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings EXP 2022 TP10	**A**	**A**	**A**	**A**
Kelly Bros Yellow Ext/Scd E	**A**	**NA**		
Kelly Bros Yellow Ext/Scd F	**A**	**NA**		
Svevia E22100-Y	**A**	**A**	**A**	**NA**

6.5. Materials applied at the Icelandic-Norwegian-Swedish test site in 2023

Note: the results of follow-up performance measurements of materials intended for permanent road markings applied on the test field in 2023 will be published in next year's result report.

6.5.1. White road markings

Temporary markings

Material thickness 3 mm

Table 45. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2023. Roll-over classes T0, T2. White materials intended for temporary markings, 3 mm.

Manufacturer *Material*	**T0**	**T2**
3M Stamark A710	**A**	**A**

7. Overview of performance measurement results in 2015–2023

This chapter presents an overview of the results of the follow-up performance measurements of materials applied at the test sites since the establishment of NordicCert in 2015. Only materials registered as *certification materials* are included.

Note that the overview does *not* present the number of certified materials. To receive certification, also certification requirement 8 (see Figure 2) must be fulfilled, and to maintain the validity of a certificate the certification requirement 10 must be fulfilled annually (from 2023).

Lists of products with valid certificates are available at www.nordiccert.com.

7.1. Denmark

7.1.1. White road markings

Table 46 shows the number of materials that have fulfilled the performance requirements in respective P-class since 2015, per material category.

Table 46. The total number of materials that have fulfilled the performance requirements at the Danish test site since 2015, per category and P-class. White materials.

Material category	No P-class	P0	P1	P2	P3	P4	P5	P5.5	P6
Type I, 0.4 mm	2	-	-	-	-	-	-	-	-
Type I, 0.6 mm	1	-	-	-	-	-	-	-	-
Type I, 1.5 mm	-	3	3	3	1	1	-	-	-
Type I, 3 mm	19	52	50	46	38	28	11	5	4
Type II, 0.4 mm	-	1	-	-	-	-	-	-	-
Type II, 3 mm	1	-	-	-	-	-	-	-	-
Type II, 4–5 mm*	9	22	15	15	14	13	7	1	-
Antiskid materials, 3 mm	-	3	3	3	3	3	2	2	2
Antiskid materials, 4 mm	-	1	1	1	1	1	1	1	1
Total	*32*	*82*	*72*	*68*	*57*	*46*	*21*	*9*	*7*

*) Type II, 4–5 mm – 4 mm in 2016–2017, 5 mm from 2018 onwards.

7.2. Iceland, Norway and Sweden

7.2.1. White road markings

Materials intended for permanent road markings

Table 47 shows the number of materials that have fulfilled the performance requirements in respective P-class since 2015, per material category.

Table 47. The total number of materials that have fulfilled the performance requirements at the Icelandic-Norwegian-Swedish test site since 2015, per category and P-class. White materials.

Material category	No P-class	P0	P1	P2	P3	P4	P5
Type I, 0.4 mm	45	3	-	-	-	-	-
Type I, 0.6 mm	12	3	-	-	-	-	-
Type I, 1.5 mm	11	35	28	26	15	7	1
Type I, 3 mm	40	84	79	73	54	34	13
Type II, 0.6 mm	4	-	-	-	-	-	-
Type II, 3 mm	7	1	-	-	-	-	-
Type II, 4–5 mm*	13	31	16	16	3	-	-
Inlaid type II, 0.6 mm	2	-	-	-	-	-	-
Inlaid type II, 3 mm	-	1	-	-	-	-	-
Inlaid type II, 5 mm	2	11	6	5	1	1	-
Materials for hand application, retroreflective, 3 mm	5	6	6	6	6	5	2
Materials for hand application, non-retroreflective, 3 mm	-	4	4	4	4	4	1
Materials with enhanced durability, 3 mm	-	2	2	2	1	1	-
Antiskid materials, 4 mm	-	2	2	2	2	2	2
Total	*141*	*183*	*143*	*134*	*86*	*54*	*19*

*) Type II, 4–5 mm – 4 mm in 2016–2017, 5 mm from 2018 onwards.

Materials intended for temporary road markings

Table 48 shows the number of materials that have fulfilled the performance requirements in respective T-class since 2015, per material category.

Table 48. The total number of materials that have fulfilled the performance requirements at the Icelandic-Norwegian-Swedish test site since 2015, per category and T-class. White materials.

Material category	No T-class	T0	T1	T2
Temporary markings, 3 mm	-	1	1	1
Total	-	*1*	*1*	*1*

7.2.2. Yellow road markings

Materials intended for permanent road markings

Table 49 shows the number of materials that have fulfilled the performance requirements in respective P-class since 2015, per material category.

Table 49. The total number of materials that have fulfilled the performance requirements at the Icelandic-Norwegian-Swedish test site since 2015, per category and P-class. Yellow materials.

Material category	No P-class	P0	P1	P2	P3	P4	P5
Type I, 0.4 mm	3	-	-	-	-	-	-
Type I, 0.6 mm	1	-	-	-	-	-	-
Type I, 1.5 mm	16	11	8	8	4	2	-
Type I, 3 mm	39	28	23	19	10	4	-
Type II, 3 mm	2	-	-	-	-	-	-
Type II, 4–5 mm*	2	1	-	-	-	-	-
Materials for hand application, retroreflective, 3 mm	2	-	-	-	-	-	-
Total	*65*	*40*	*31*	*27*	*14*	*6*	-

*) Type II, 4–5 mm – 4 mm in 2016–2017, 5 mm from 2018 onwards.

Materials intended for temporary road markings

Table 50 shows the number of materials that have fulfilled the performance requirements in respective T-class since 2015, per material category.

Table 50. The total number of materials that have fulfilled the performance requirements at the Icelandic-Norwegian-Swedish test site since 2015, per category and T-class. Yellow materials.

Material category	**No T-class**	**T0**	**T1**	**T2**
Temporary markings, 3 mm	3	-	-	-
Total	*3*	-	-	-

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Appendix 1 – Results of the performance measurements

Table 52–Table 54 show the results for roll-over class P6 for materials applied at the Danish test site in 2021. Table 55–Table 66 show the results for roll-over classes P0, P2, P4 and P5 for materials applied at the Danish test site in 2022. Table 67–Table 75 show the results for roll-over class P5 for materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Table 76–Table 123 show the results for roll-over classes P0, P2, P3 and P4 for materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Table 124–Table 125 show the results for roll-over classes T0 and T2 for materials applied at the Icelandic-Norwegian-Swedish test site in 2023.

Two-years follow-up measurements were carried out only on materials that fulfilled the requirements for the highest roll-over class in year one. Three-years follow-up measurements were carried out only upon request by the manufacturer (no such request was made in 2023).

Table 51 explains the denotations in the result tables.

Table 51. Explanation of the denotations in the result tables.

$R_{L,dry}$	Mean value of the coefficient of retroreflected luminance for dry road marking, $R_{L,dry}$ [mcd/m^2/lx]
$R_{L,wet}$	Mean value of the coefficient of retroreflected luminance for wet road marking, $R_{L,wet}$ [mcd/m^2/lx]
Qd	Mean value of luminance coefficient under diffuse illumination, *Qd* [mcd/m^2/lx]
μ_{PFT}	Mean value of skid resistance [PFT units]
Colour	“OK”, when colour coordinates are inside the colour box (daylight colour)
NTY	“OK”, when colour coordinates are inside the colour box (night-time colour)
Appr.	Approved (**A**) or Not Approved (**NA**) in the P-class referred to
worn	No measurements could be carried out, because the material was too worn.
n.m.	Not measured (if there was a high degree of wear and the material did not fulfil the requirements for one or more of the other parameters or, for two-years follow-up measurements, the material did not fulfil the requirements for the highest roll-over in the one-year follow-up measurement).
d	Disqualified (e.g. due to missing documentation or because the line was too thick).
-	The parameter does not apply to the material.

Values that do not fulfil the performance requirements are indicated in orange.

Rows marked in grey indicate that the material has not fulfilled the requirements in a lower P-class. It can thus not be approved in the present P-class.

Materials applied at the Danish test site in 2021

Roll-over class P6

Table 52. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2021. Roll-over class P6. White materials, type I, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP21-DK4	135	-	163	0.72	OK	**NA**
Geveko Markings TP21-DK6	n.m.	-	n.m.	n.m.	n.m.	**NA**
Saferoad Grawil DKTI21-01	n.m.	-	n.m.	n.m.	n.m.	**NA**

Table 53. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2021. Roll-over class P6. White materials, type II, 5 mm. Alphabetical order by manufacturer.

Type II, 5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP21-DK1 *Profile/pattern:* LongDot	139	35	150	0.66	OK	**NA**
Geveko Markings TP21-DK2 *Profile/pattern:* ViziSpot	143	46	137	0.65	OK	**NA**
Geveko Markings TP21-DK3 *Profile/pattern:* LongFlex	n.m.	-	n.m.	n.m.	n.m.	**NA**
Saferoad Grawil DKTII21-01 *Profile/pattern:* Longdot	n.m.	-	n.m.	n.m.	n.m.	**NA**

Table 54. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2021. Roll-over class P6. White antiskid materials, 3 mm. Alphabetical order by manufacturer.

Antiskid, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP21-DK5	n.m.*	-	n.m.	n.m.	n.m.	**NA**

*) No requirement

Materials applied at the Danish test site in 2022

Roll-over class P0

Table 55. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P0. White type I materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Team Segnal Luxspray 2K	135	-	109	0.52	outside	**NA**

Table 56. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P0. White type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP22-DK3	198	-	153	0.57	OK	**A**
Geveko Markings TP22-DK4	216	-	150	0.58	OK	**A**

Table 57. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P0. White type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP22-DK1 *Profile/pattern:* ViziSpot	170	51	151	0.68	OK	**A**
Geveko Markings TP22-DK2 *Profile/pattern:* ViziSpot	206	54	143	0.64	OK	**A**
Promax DK22EWII *Profile/pattern:* Dots	142	44	130	0.77	OK	**NA**
Promax DK22EWIIR *Profile/pattern:* Rilled	137	35	166	0.80	OK	**NA**

Roll-over class P2

Table 58. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P2. White type I materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Team Segnal Luxspray 2K	130	-	108	0.59	OK	**NA**

Table 59. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P2. White type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP22-DK3	172	-	139	0.57	OK	**A**
Geveko Markings TP22-DK4	170	-	136	0.62	OK	**A**

Table 60. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P2. White type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP22-DK1 *Profile/pattern:* ViziSpot	155	50	143	0.70	OK	**A**
Geveko Markings TP22-DK2 *Profile/pattern:* ViziSpot	174	65	148	0.64	OK	**A**
Promax DK22EWII *Profile/pattern:* Dots	140	42	118	0.73	OK	**NA**
Promax DK22EWIIR *Profile/pattern:* Rilled	132	52	145	0.70	OK	**NA**

Roll-over class P4

Table 61. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P4. White type I materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Team Segnal Luxspray 2K	15	-	83	0.71	OK	**NA**

Table 62. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P4. White type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP22-DK3	153	-	152	0.64	OK	**A**
Geveko Markings TP22-DK4	130	-	156	0.69	OK	**NA**

Table 63. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P4. White type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP22-DK1 *Profile/pattern:* ViziSpot	123	36	148	0.73	OK	**NA**
Geveko Markings TP22-DK2 *Profile/pattern:* ViziSpot	151	45	140	0.66	OK	**A**
Promax DK22EWII *Profile/pattern:* Dots	104	34	106	0.74	OK	**NA**
Promax DK22EWIIR *Profile/pattern:* Rilled	82	38	157	0.83	OK	**NA**

Roll-over class P5

Table 64. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P5. White type I materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Team Segnal Luxspray 2K	16	-	85	0.66	OK	**NA**

Table 65. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P5. White type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP22-DK3	135	-	147	0.62	OK	**NA**
Geveko Markings TP22-DK4	113	-	156	0.69	OK	**NA**

Table 66. Results of the performance measurements in 2023 of materials applied at the Danish test site in 2022. Roll-over class P5. White type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings TP22-DK1 *Profile/pattern:* ViziSpot	125	54	149	0.67	OK	**NA**
Geveko Markings TP22-DK2 *Profile/pattern:* ViziSpot	135	43	119	0.66	OK	**NA**
Promax DK22EWII *Profile/pattern:* Dots	129	38	121	0.69	OK	**NA**
Promax DK22EWIIR *Profile/pattern:* Rilled	104	61	152	0.73	OK	**NA**

Materials applied at the Icelandic-Norwegian-Swedish test site in 2021

Roll-over class P5

Table 67. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. White materials, type I, 1.5 mm. Alphabetical order by manufacturer.

Type I, 1.5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	Appr.
Svevia X 2120	n.m.	-	n.m.	n.m.	n.m.	NA

Table 68. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. White materials, type I, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	Appr.
Hot Mix Hotmix EE10-921W [type I]	worn	-	worn	worn	worn	NA
Hot Mix Hotmix EE921W [type I]	n.m.	-	n.m.	n.m.	n.m.	NA
Hot Mix Hotmix POE1021W [type I-1]	worn	-	worn	worn	worn	NA
Hot Mix Hotmix POE1021W [type I-2]	worn	-	worn	worn	worn	NA
Hot Mix Hotmix POE1721W [type I-1]	n.m.	-	n.m.	n.m.	n.m.	NA
Hot Mix Hotmix POE1721W [type I-2]	n.m.	-	n.m.	n.m.	n.m.	NA
Promax SNI21WI1	n.m.	-	n.m.	n.m.	n.m.	NA
Svevia X 2110	worn	-	worn	worn	worn	NA

Table 69. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. White materials, type II, 3 mm. Alphabetical order by manufacturer.

Type II, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	Appr.
3M Stamark A380ESD *Profile/pattern:* Preformed plateaus	n.m.	n.m.	n.m.	n.m.	n.m.	NA

Table 70. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. White materials, type II, 5 mm. Alphabetical order by manufacturer.

Type II, 5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	Appr.
Geveko Markings EXP 21 TP – 4 *Profile/pattern:* Rilled	n.m.	n.m.	n.m.	n.m.	n.m.	NA
Hot Mix Hotmix EE10-921W [type II] *Profile/pattern:* Roll	n.m.	n.m.	n.m.	n.m.	n.m.	NA
Hot Mix Hotmix EE921W [type II] *Profile/pattern:* Roll	n.m.	n.m.	n.m.	n.m.	n.m.	NA

Table 71. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. White inlaid materials, type II, 5 mm. Alphabetical order by manufacturer.

Inlaid type II, 5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	Appr.
Geveko Markings EXP 21 TP – 6 *Profile/pattern:* Drops	n.m.	n.m.	n.m.	n.m.	n.m.	NA

Table 72. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. White materials for hand application, retroreflective, 3 mm. Alphabetical order by manufacturer.

Materials for hand application, retroreflective, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	Appr.
Geveko Markings EXP 21 TP – 1	115	-	165	0.82	OK	**A**
Svevia X 2130	61	-	118	0.83	OK	NA

Table 73. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. White materials for hand application, non-retroreflective, 3 mm. Alphabetical order by manufacturer.

Materials for hand application, non-retroreflective, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	Appr.
Geveko Markings EXP 21 TP - 2	(71)*	-	123	0.86	OK	NA

*) No requirement

Table 74. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. Yellow materials, type I, 1.5 mm. Alphabetical order by manufacturer.

Type I, 1.5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	NTY	Appr.
Svevia Y 2120	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**

Table 75. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2021. Roll-over class P5. Yellow materials, type I, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	μ_{PFT}	Colour	NTY	Appr.
Hot Mix Hotmix EE921Y [type I]	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**
Hot Mix Hotmix POE1721Y [extr]	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**
Svevia Y 2110	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**

Materials applied at the Icelandic-Norwegian-Swedish test site in 2022

Roll-over class P0

Table 76. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White type I materials, 0.4 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 AQ1	87	-	132	0.84	OK	**NA**
Geveko Markings EXP 2022 AQ2	71	-	146	0.86	OK	**NA**
Geveko Markings EXP 2022 AQ3	59	-	130	0.84	OK	**NA**
Geveko Markings EXP 2022 AQ4	73	-	131	0.86	OK	**NA**
Visafo HVIT VISA 31 [0.4 mm]	114	-	115	0.81	OK	**NA**
Visafo HVIT VISA 41 [0.4 mm]	143	-	133	0.81	OK	**NA**
Visafo HVIT VISA 43 [0.4 mm]	159	-	146	0.78	OK	**A**

Table 77. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White type I materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Swarco Limburger Lackf. Aqualine W13S [type I]	73	-	109	0.85	OK	**NA**
Visafo HVIT VISA 41 [0.6 mm]	130	-	136	0.82	OK	**NA**
Visafo HVIT VISA 43 [0.6 mm]	152	-	143	0.80	OK	**A**

Table 78. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White type I materials, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP11	189	-	200	0.75	OK	**A**
Geveko Markings EXP 2022 TP12	229	-	189	0.70	OK	**A**
Kelly Bros White Spray G	197	-	184	0.74	OK	**A**
Svevia S22150	244	-	173	0.66	OK	**A**

Table 79. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP4	268	-	178	0.65	OK	**A**
Geveko Markings EXP 2022 TP5	207	-	181	0.71	OK	**A**
Kelly Bros White Ext/Scd A	267	-	170	0.71	OK	**A**
Kelly Bros White Ext/Scd B	217	-	173	0.75	OK	**A**
Kelly Bros White Ext/Scd C	208	-	185	0.75	OK	**A**
Kelly Bros White Ext/Scd D	167	-	169	0.79	OK	**A**
Kelly Bros White Ext/Scd H	133	-	159	0.78	OK	**NA**
Svevia X22150	224	-	198	0.65	OK	**A**

Table 80. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White type II materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Swarco Limburger Lackf. Aqualine W13S [type II] *Profile/pattern:* Flat	58	17	117	0.87	OK	**NA**

Table 81. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP6 *Profile/pattern:* Rilled	231	59	179	0.76	OK	**A**
Geveko Markings EXP 2022 TP7 *Profile/pattern:* Rilled	186	48	181	0.79	OK	**A**
Geveko Markings EXP 2022 TP8 *Profile/pattern:* Stairs	206	53	138	0.67	OK	**A**
Svevia E22150 *Profile/pattern:* Rolled	217	95	167	0.77	OK	**A**

Table 82. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White inlaid type II materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
3M Stamark A380ESDc *Profile/pattern:* Diamond shape	490	89	199	0.76	OK	**A**

Table 83. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White inlaid type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP9 *Profile/pattern:* Drops	268	53	185	0.59	OK	**A**

Table 84. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White materials for hand application, retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Svevia H2250	215	-	191	0.68	OK	**A**

Table 85. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. White materials for hand application, non-retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP2	(171)*	-	197	0.71	OK	**A**

*) No requirement

Table 86. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. Yellow type I materials, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*NTY*	*Appr.*
Svevia S22100-Y	145	-	139	0.71	OK	OK	**A**

Table 87. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P0. Yellow type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*NTY*	*Appr.*
Geveko Markings EXP 2022 TP10	122	-	137	0.70	OK	OK	**A**
Kelly Bros Yellow Ext/Scd E	116	-	139	0.78	OK	OK	**A**
Kelly Bros Yellow Ext/Scd F	100	-	153	0.83	OK	OK	**A**
Svevia E22100-Y	143	-	151	0.70	OK	OK	**A**

Roll-over class P2

Table 88. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White type I materials, 0.4 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 AQ1	worn	-	worn	worn	worn	NA
Geveko Markings EXP 2022 AQ2	worn	-	worn	worn	worn	NA
Geveko Markings EXP 2022 AQ3	worn	-	worn	worn	worn	NA
Geveko Markings EXP 2022 AQ4	worn	-	worn	worn	worn	NA
Visafo HVIT VISA 31 [0.4 mm]	worn	-	worn	worn	worn	NA
Visafo HVIT VISA 41 [0.4 mm]	worn	-	worn	worn	worn	NA
Visafo HVIT VISA 43 [0.4 mm]	worn	-	worn	worn	worn	NA

Table 89. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White type I materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Swarco Limburger Lackf. Aqualine W13S [type I]	worn	-	worn	worn	worn	NA
Visafo HVIT VISA 41 [0.6 mm]	worn	-	worn	worn	worn	NA
Visafo HVIT VISA 43 [0.6 mm]	worn	-	worn	worn	worn	NA

Table 90. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White type I materials, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP11	164	-	185	0.71	OK	**A**
Geveko Markings EXP 2022 TP12	162	-	192	0.73	OK	**A**
Kelly Bros White Spray G	85	-	122	0.86	OK	NA
Svevia S22150	155	-	176	0.75	OK	**A**

Table 91. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP4	207	-	180	0.67	OK	**A**
Geveko Markings EXP 2022 TP5	155	-	190	0.70	OK	**A**
Kelly Bros White Ext/Scd A	162	-	168	0.75	OK	**A**
Kelly Bros White Ext/Scd B	150	-	172	0.79	OK	**A**
Kelly Bros White Ext/Scd C	126	-	164	0.81	OK	**NA**
Kelly Bros White Ext/Scd D	123	-	163	0.83	OK	**NA**
Kelly Bros White Ext/Scd H	105	-	174	0.84	OK	**NA**
Svevia X22150	167	-	181	0.69	OK	**A**

Table 92. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White type II materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Swarco Limburger Lackf. Aqualine W13S [type II] *Profile/pattern:* Flat	worn	worn	worn	worn	worn	**NA**

Table 93. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP6 *Profile/pattern:* Rilled	176	22	174	0.71	OK	**NA**
Geveko Markings EXP 2022 TP7 *Profile/pattern:* Rilled	120	20	176	0.77	OK	**NA**
Geveko Markings EXP 2022 TP8 *Profile/pattern:* Stairs	120	37	122	0.71	OK	**NA**
Svevia E22150 *Profile/pattern:* Rolled	153	67	177	0.75	OK	**A**

Table 94. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White inlaid type II materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
3M Stamark A380ESDc *Profile/pattern:* Diamond shape	123	4	174	0.76	OK	**NA**

Table 95. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White inlaid type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP9 *Profile/pattern:* Drops	163	27	156	0.71	OK	**NA**

Table 96. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White materials for hand application, retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Svevia H2250	170	-	191	0.70	OK	**A**

Table 97. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. White materials for hand application, non-retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP2	(160)*	-	168	0.67	OK	**A**

*) No requirement

Table 98. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. Yellow type I materials, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*NTY*	*Appr.*
Svevia S22100-Y	104	-	138	0.76	OK	OK	**A**

Table 99. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P2. Yellow type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*NTY*	*Appr.*
Geveko Markings EXP 2022 TP10	102	-	135	0.68	OK	OK	**A**
Kelly Bros Yellow Ext/Scd E	77	-	129	0.82	OK	OK	**NA**
Kelly Bros Yellow Ext/Scd F	70	-	127	0.85	OK	OK	**NA**
Svevia E22100-Y	106	-	147	0.73	OK	OK	**A**

Roll-over class P3

Table 100. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White type I materials, 0.4 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 AQ1	36	-	97	0.93	OK	**NA**
Geveko Markings EXP 2022 AQ2	28	-	93	0.90	OK	**NA**
Geveko Markings EXP 2022 AQ3	35	-	104	0.91	OK	**NA**
Geveko Markings EXP 2022 AQ4	35	-	94	0.88	OK	**NA**
Visafo HVIT VISA 31 [0.4 mm]	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 41 [0.4 mm]	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 43 [0.4 mm]	worn	-	worn	worn	worn	**NA**

Table 101. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White type I materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Swarco Limburger Lackf. Aqualine W13S [type I]	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 41 [0.6 mm]	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 43 [0.6 mm]	worn	-	worn	worn	worn	**NA**

Table 102. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White type I materials, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP11	165	-	182	0.75	OK	**A**
Geveko Markings EXP 2022 TP12	188	-	183	0.70	OK	**A**
Kelly Bros White Spray G	154	-	174	0.86	OK	**NA**
Svevia S22150	143	-	153	0.79	OK	**NA**

Table 103. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP4	218	-	184	0.69	OK	**A**
Geveko Markings EXP 2022 TP5	174	-	185	0.72	OK	**A**
Kelly Bros White Ext/Scd A	207	-	164	0.78	OK	**A**
Kelly Bros White Ext/Scd B	178	-	181	0.80	OK	**A**
Kelly Bros White Ext/Scd C	157	-	173	0.83	OK	**NA**
Kelly Bros White Ext/Scd D	142	-	189	0.82	OK	**NA**
Kelly Bros White Ext/Scd H	124	-	171	0.83	OK	**NA**
Svevia X22150	191	-	177	0.64	OK	**A**

Table 104. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White type II materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Swarco Limburger Lackf. Aqualine W13S [type II] *Profile/pattern:* Flat	worn	worn	worn	worn	worn	**NA**

Table 105. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP6 *Profile/pattern:* Rilled	192	47	177	0.75	OK	**NA**
Geveko Markings EXP 2022 TP7 *Profile/pattern:* Rilled	151	25	184	0.77	OK	**NA**
Geveko Markings EXP 2022 TP8 *Profile/pattern:* Stairs	152	32	133	0.78	OK	**NA**
Svevia E22150 *Profile/pattern:* Rolled	168	65	175	0.74	OK	**A**

Table 106. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White inlaid type II materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
3M Stamark A380ESDc *Profile/pattern:* Diamond shape	151	10	183	0.67	OK	**NA**

Table 107. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White inlaid type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP9 *Profile/pattern:* Drops	233	40	198	0.68	OK	**NA**

Table 108. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White materials for hand application, retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Svevia H2250	176	-	186	0.71	OK	**A**

Table 109. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. White materials for hand application, non-retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP2	(151)*	-	174	0.72	OK	**A**

*) No requirement

Table 110. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. Yellow type I materials, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*NTY*	*Appr.*
Svevia S22100-Y	62	-	79	0.87	OK	OK	**NA**

Table 111. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P3. Yellow type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*NTY*	*Appr.*
Geveko Markings EXP 2022 TP10	110	-	140	0.71	OK	OK	**A**
Kelly Bros Yellow Ext/Scd E	94	-	138	0.83	OK	OK	**NA**
Kelly Bros Yellow Ext/Scd F	80	-	138	0.83	OK	OK	**NA**
Svevia E22100-Y	122	-	140	0.71	OK	OK	**A**

Roll-over class P4

Table 112. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White type I materials, 0.4 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 AQ1	worn	-	worn	worn	worn	**NA**
Geveko Markings EXP 2022 AQ2	worn	-	worn	worn	worn	**NA**
Geveko Markings EXP 2022 AQ3	worn	-	worn	worn	worn	**NA**
Geveko Markings EXP 2022 AQ4	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 31 [0.4 mm]	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 41 [0.4 mm]	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 43 [0.4 mm]	worn	-	worn	worn	worn	**NA**

Table 113. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White type I materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Swarco Limburger Lackf. Aqualine W13S [type I]	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 41 [0.6 mm]	worn	-	worn	worn	worn	**NA**
Visafo HVIT VISA 43 [0.6 mm]	worn	-	worn	worn	worn	**NA**

Table 114. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White type I materials, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP11	151	-	204	0.76	OK	**A**
Geveko Markings EXP 2022 TP12	153	-	193	0.76	OK	**A**
Kelly Bros White Spray G	worn	-	worn	worn	worn	**NA**
Svevia S22150	worn	-	worn	worn	worn	**NA**

Table 115. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP4	170	-	174	0.70	OK	**A**
Geveko Markings EXP 2022 TP5	120	-	186	0.78	OK	**NA**
Kelly Bros White Ext/Scd A	worn	-	worn	worn	worn	**NA**
Kelly Bros White Ext/Scd B	worn	-	worn	worn	worn	**NA**
Kelly Bros White Ext/Scd C	worn	-	worn	worn	worn	**NA**
Kelly Bros White Ext/Scd D	worn	-	worn	worn	worn	**NA**
Kelly Bros White Ext/Scd H	worn	-	worn	worn	worn	**NA**
Svevia X22150	164	-	183	0.70	OK	**A**

Table 116. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White type II materials, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Swarco Limburger Lackf. Aqualine W13S [type II] *Profile/pattern:* Flat	worn	worn	worn	worn	worn	**NA**

Table 117. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP6 *Profile/pattern:* Rilled	173	6	175	0.73	OK	**NA**
Geveko Markings EXP 2022 TP7 *Profile/pattern:* Rilled	worn	worn	worn	worn	worn	**NA**
Geveko Markings EXP 2022 TP8 *Profile/pattern:* Stairs	103	15	138	0.80	OK	**NA**
Svevia E22150 *Profile/pattern:* Rolled	142	22	174	0.76	OK	**NA**

Table 118. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White inlaid type II materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
3M Stamark A380ESDc *Profile/pattern:* Diamond shape	worn	worn	worn	worn	worn	NA

Table 119. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White inlaid type II materials, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP9 *Profile/pattern:* Drops	88	6	108	0.83	OK	NA

Table 120. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White materials for hand application, retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Svevia H2250	worn	-	worn	worn	worn	NA

Table 121. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. White materials for hand application, non-retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
Geveko Markings EXP 2022 TP2	(124)*	-	178	0.76	OK	**A**

*) No requirement

Table 122. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. Yellow type I materials, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*NTY*	*Appr.*
Svevia S22100-Y	worn	-	worn	worn	worn	worn	NA

Table 123. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2022. Roll-over class P4. Yellow type I materials, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*NTY*	*Appr.*
Geveko Markings EXP 2022 TP10	101	-	144	0.71	OK	OK	**A**
Kelly Bros Yellow Ext/Scd E	worn	-	worn	worn	worn	worn	**NA**
Kelly Bros Yellow Ext/Scd F	worn	-	worn	worn	worn	worn	**NA**
Svevia E22100-Y	59	-	114	0.87	OK	OK	**NA**

Materials applied at the Icelandic-Norwegian-Swedish test site in 2023

Roll-over class T0

Table 124. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2023. Roll-over class T0. White materials intended for temporary road markings, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
3M Stamark A710	738	(416)*	159	0.65	OK	**A**

*) No requirement

Roll-over class T2

Table 125. Results of the performance measurements in 2023 of materials applied at the Icelandic-Norwegian-Swedish test site in 2023. Roll-over class T2. White materials intended for temporary road markings, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	μ_{PFT}	*Colour*	*Appr.*
3M Stamark A710	550	(228)*	149	0.71	OK	**A**

*) No requirement

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