Nordic certification system for road marking materials: results of performance measurements in 2021

Denmark, Iceland, Norway and Sweden

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Kort sammanfattning

En nordisk certifiering av vägmarkeringsmaterial, benämnd *NordicCert*, introducerades 2015 och omfattar för närvarande Danmark, Island, Norge och Sverige. I dessa länder krävs ett dokumenterat godkännande av vägmarkeringsmaterial som används på vägar som administreras av den statliga väghållaren. Detta godkännande baseras på funktionsmätningar på materialprover som har applicerats på provfält på allmän väg. Materialen godkänns (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 färg (vit, 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 2021, det vill säga ettårsuppföljning av material som lades ut 2020, tvåårs-uppföljning av material som lades ut 2019 och treårsuppföljning av material som lades ut 2018. Funktionsmätningarna omfattar retroreflexion (R_L) i torrt och vått tillstånd, luminanskoefficient (Qd), friktion, färg i dagsljus och färg i fordonsbelysning (för gula material).

Av de 44 material som lades ut på det isländsk-norsk-svenska provfältet 2020 var det 29 som klarade funktionskraven i minst en av hjulpassageklasserna P0–P4 efter ett år. Av de 51 material som lades ut 2019 var det 6 som klarade funktionskraven i hjulpassageklass P5 efter två år. Inget av de 42 material som lades ut 2018 klarade funktionskraven i hjulpassageklass P5.5 efter tre år.

Inga av de 18 material som lades ut på det danska provfältet 2019 klarade funktionskraven i hjulpassageklass P6 efter två år. 2020 skedde ingen utläggning av material.

Nyckelord

Vägmarkeringsmaterial, certifiering

Abstract

A certification system for road marking materials, *NordicCert*, applies to Denmark, Iceland, Norway and Sweden. In these countries, a documented product approval is required to use a road marking material on roads managed by the national road authorities. Product approval is based on monitored and documented performance measurements of material samples applied on test fields on public roads. The materials are approved (certified) in relation to the number of wheel passages they will stand, with preserved performance.

The certification system includes road marking materials for longitudinal and transverse road markings in categories with respect to colour (white, 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 2021, i.e., one-year follow-up measurements for materials applied in 2020, two-years follow-up measurements for materials applied in 2019 and three-years follow-up measurements for materials applied in 2018. The performance parameters include the coefficient of retroreflected luminance (R_L) under dry and wet conditions, the luminance coefficient under diffuse illumination (Qd), the friction, the chromaticity in daylight, and the chromaticity of retroreflected light (yellow materials, only).

Out of the 44 materials applied at the Icelandic-Norwegian-Swedish test site in 2020, 29 fulfilled the performance requirements in at least one roll-over class P0–P4 after one year. Out of the 51 materials applied in 2019, 6 fulfilled the performance requirements in roll-over class P5 after two years. Out of the 42 materials applied in 2018, none fulfilled the performance requirements in roll-over class P5.5 after three years.

None of the 18 materials applied at the Danish test site in 2019 fulfilled the performance requirements in roll-over class P6 after two years. No material application was carried out in 2020.

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 2021 on road marking materials applied for certification at the Danish and at the Icelandic-Norwegian-Swedish test site in 2018–2020.

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

The road trials are administered as a joint project between Ramboll and the Swedish National Road and Transport Research Institute (VTI). Trond Cato Johansen at Ramboll is the project manager and Carina Fors is the project leader at VTI. Michael Ruben Anker Larsen, the Danish Road Directorate, Ásbjörn Ólafsson, the Icelandic Road and Coastal Administration, Bjørn Skaar, the Norwegian Public Roads Administration and Ulf Söderberg, the Swedish Transport Administration constitute a steering committee for the Nordic certification system.

Drammen, November 2021

Trond Cato Johansen
Project manager

Granskare/Examiner

Sara Nygårdhs, VTI.

De slutsatser och rekommendationer som uttrycks är författarens/författarnas egna och speglar inte nödvändigtvis myndigheten VTI:s uppfattning./The conclusions and recommendations in the report are those of the author(s) and do not necessarily reflect the views of VTI as a government agency.

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1. Introduction

A Nordic certification system for road marking materials, *NordicCert*, that applies to the countries of Denmark, Iceland, Norway and Sweden, was introduced in 2015. In these countries, a documented product approval is required in order to use a road marking material on roads managed by the national road authorities. Product approval is based on monitored and documented performance measurements of material samples applied on test fields on public roads. Certification in Iceland, Norway and Sweden is based on the results from a test site in Norway or in Sweden and certification in Denmark is based on the results from a test site 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 friction 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-classes, defined by EN 1824) 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 8:2021* (Fors and Johansen, 2021) which is a public report available at www.vti.se/en/publications and at www.nordiccert.com.

Lists of certified materials from 2015 onwards 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 2021 on the materials applied at the Danish and at Icelandic-Norwegian-Swedish test sites in 2018 (three-years follow-up), 2019 (two-years follow-up) and 2020 (one-year follow-up).

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 2016–2020 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 3 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 have certified. 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).

The audits shall be executed by an accredited laboratory, experienced and specialized in the analyses of road marking products and surveillance of the relevant production process.

Details about the activities and requirements shown in Figure 2 can be found in Fors and Johansen (2021).

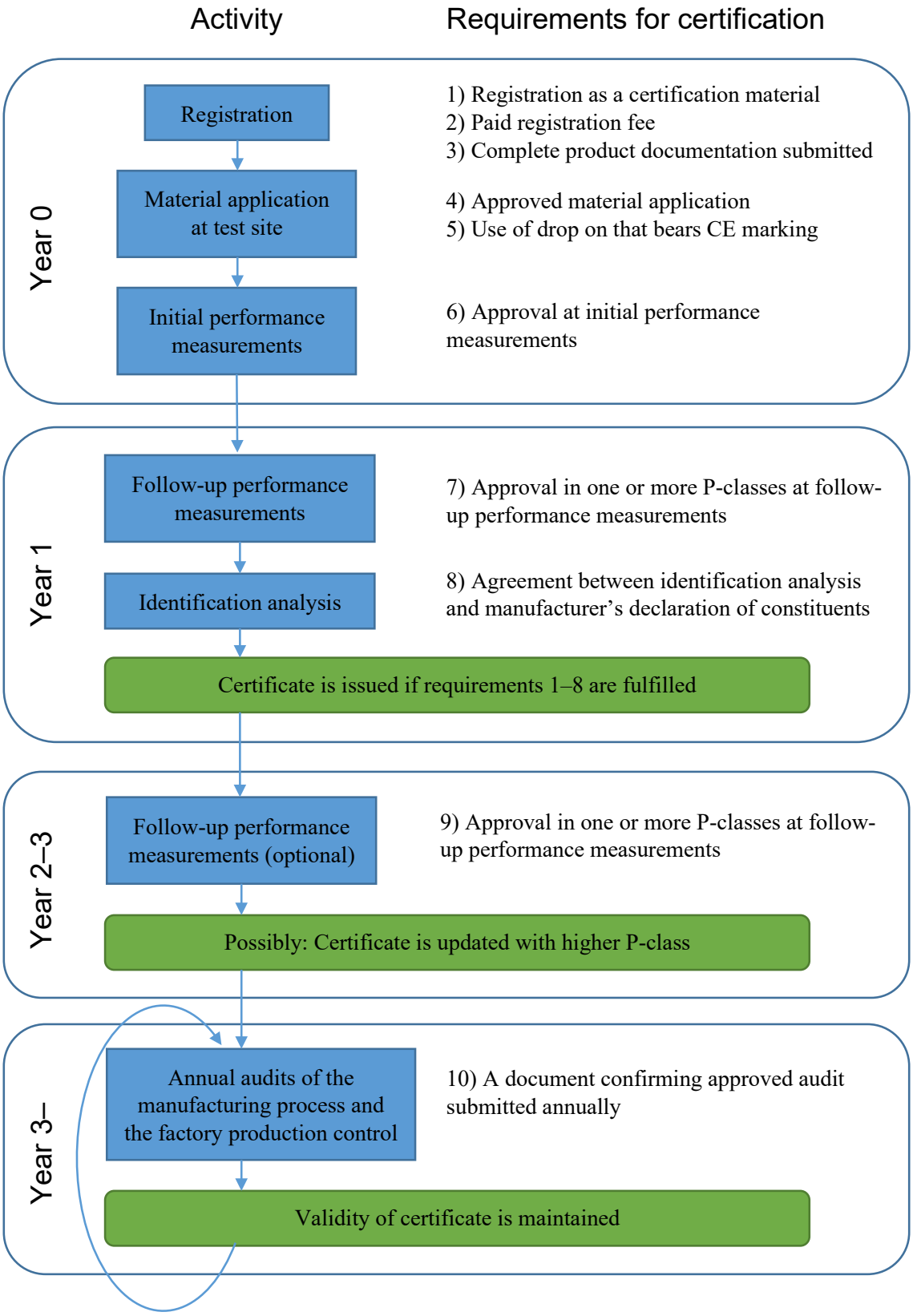

Figure 2. The certification procedure.

3. Test sites

3.1. The Danish test site

The present Danish test site, located close to Gørlev, Denmark, was established in 2016. Materials have been applied at this test site in 2016, 2017, 2018, 2019 and 2021.

3.1.1. General

The road used for the test site is a two-lane rural road surrounded by an open landscape, Figure 3. The road is relatively straight and flat and without any major junctions. It has an annual average daily traffic (AADT) of around 8 100 vehicles/day and the posted speed limit is 80 km/h. The width of the road is 7.1 m and each lane is 3.30 m wide. The road surface consists of asphalt of type SMA8 that was applied in 2015. The averaged mean texture depth (MTD) is approximately 0.67 mm, i.e., the roughness class is RG2.

Figure 3. The road used for the Danish test site in Gørlev (photo: Trond Cato Johansen, Ramboll).

The Köppen (climatic) classification of the test site is Cfb, based on data for the period 1951–2000 (Kottek, Grieser, Beck, Rudolf and Rubel, 2006). The climatic class of the Danish test site according to the European Standard EN 1824 is C3, i.e. Cfb with winter maintenance. The extent of winter maintenance may vary a lot between years.

Studded tyres are permitted in Denmark from 1 November to 15 April. However, the percentage of cars with studded tyres is low (estimation: about 5 %).

Further details can be found in Fors and Johansen (2021).

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.

3.1.3. 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 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 2018–2020.

Table 1. AADT (both lanes) and distribution of passenger cars, heavy vehicles and other vehicles for 2018–2020, at the Danish test site.

Year	AADT	Passenger cars (%)	Heavy vehicles (%)	Other vehicles (%)
2018	7 737	91.5	8.0	0.5
2019	7 848	91.3	8.4	0.3
2020	7 761	-	-	-

No materials were applied at the Danish test site in 2020 and thus no wheel passage measurements were carried out that year. The results of the wheel passage measurements carried out on the test fields established in 2018 and in 2019 can be found in Johansen and Fors (2019a) and in Johansen and Fors (2020a), respectively.

3.1.4. Weather conditions

The weather conditions from September 2020 to August 2021 are shown in Table 2.

Table 2. Weather conditions at the Danish test site in Gørlev, from September 2020 to August 2021.

Weather parameter	Value
Annual average temperature	9.2 °C
Average summer temperature (Apr-Sep)	13.8 °C
Average winter temperature (Oct-Mar)	4.6 °C
Highest temperature	30.2 °C
Lowest temperature	-11.7 °C
Annual precipitation	586 mm
Number of sun hours per month	140 h
Number of weeks with snow or frost	10
Number of times the snow plough has operated	25
Number of times the road has been salted	73

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

3.2. The Icelandic-Norwegian-Swedish test site

The present Icelandic-Norwegian-Swedish test site was established in Haslemoen, Norway in 2017. Materials have been applied at this test site in 2017, 2018, 2019, 2020 and 2021.

3.2.1. General

The road used for the test site is a two-lane rural road located in Hedmark, close to Haslemoen in eastern Norway, approximately 180 km northeast of Oslo, Figure 4. The road is straight and relatively flat and without any major junctions. The annual average daily traffic (AADT) is 3 100 vehicles/day (measured in 2020, retrieved from Trafikkdata[1]) and the posted speed limit is 90 km/h. The width of the road is 9 m and each lane is 3.15 m from the edge of milling track in the middle to the edge of milling at the edge line.

Figure 4. The road used for the Icelandic-Norwegian-Swedish test site. (Photo: Trond Cato Johansen, Ramboll).

For materials applied in 2017–2019 (northbound direction), the road surface consists of a stone matrix asphalt (SKA) that was installed in 2016. The roughness class is RG2 i.e., the averaged measured texture depth (MTD) is in the range of 0.60–0.90 mm (see Table 2 in EN 1824). For materials applied 2020 onwards (southbound direction), the road surface consists of a stone matrix asphalt (SMA) of type SKA 11 that was installed in 2019. The roughness class is RG2 i.e., MTD is in the range of 0.60–0.90 mm

The Köppen classification of the test site is Dfc, close to the boundary of the Dfb climate zone, based on data for the period 1951–2000 (Kottek, Grieser, Beck, Rudolf and Rubel, 2006). The climatic class according to EN 1824 is C3.

[1] http://www.trafikkdata.no

Studded tyres are permitted in Norway from 1 November to the first Sunday after Easter. The estimated percentage of cars with studded tyres is 50–55%.

Further details can be found in Fors and Johansen (2021).

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.

Regarding inlaid materials, line 2, 3, 9 and 10 are inlaid. Line 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[2], provided by the Norwegian Public Roads Administration.

Table 3 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 2018–2020.

Table 3. AADT (both lanes) and distribution of passenger cars, heavy vehicles, and other vehicles for 2018–2020, at the Icelandic-Norwegian-Swedish test site.

Year	AADT	Passenger cars (%)	Heavy vehicles (%)	Other vehicles (%)
2018	3 334	84.5	15.0	0.5
2019	3 311	84.6	15.0	0.4
2020	3 082	85.4	14.3	0.3

The P-classes for the test field established in 2020 are based on wheel passage measurements carried out in September 2020 and in September 2021, which are presented below. The results of the wheel passage measurements carried out on the test fields established in 2018 and in 2019 can be found in Johansen and Fors (2019b) and in Johansen and Fors (2020b), respectively.

Figure 5 shows the distribution of wheel passages for the average week at the test field established in 2020. 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.

[2] http://www.trafikkdata.no, measurement point Haslemosletta, Rv 2, Hp 11, 4175

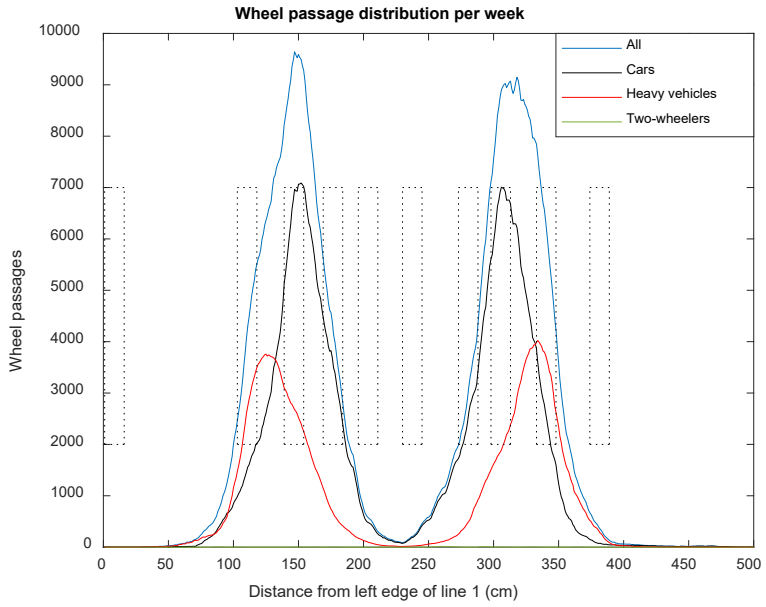

Figure 5. Wheel passages per week at the test field established at the Icelandic-Norwegian-Swedish test site in 2020 (measurement in 2020). The dashed areas correspond to the ten lines (line 1 to the left, line 10 to the right). Please note that the shoulder is to the left in the figure. The number of two-wheelers is too few to be visible in the figure.

Table 4 shows the number of wheel passages per line and week for the test field of 2020, as averages for the 15 cm wide lines (corresponding to the measurement area, see Figure 6–Figure 8) and of the two measurement occasions.

Table 4. Number of wheel passages per line and week, at the test field established at the Icelandic-Norwegian-Swedish test site in 2020. Line 2 is the one next to the edge line, see also Figure 6.

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	3 964	9 464	4 215	636	165	3 053	9 068	5 852	320

3.2.4. Weather conditions

The weather conditions from September 2020 to August 2021 are shown in Table 5.

Table 5. Weather conditions at the Icelandic-Norwegian-Swedish test site in Haslemoen, from September 2020 to August 2021.

Weather parameter	**Value**
Annual average temperature	5.8 °C
Average summer temperature (Apr-Sep)	12.4 °C
Average winter temperature (Oct-Mar)	-0.8 °C
Highest temperature	29.2 °C
Lowest temperature	-23.7 °C
Annual precipitation	650 mm
Number of sun hours per month	n/a
Number of weeks with snow	14
Number of times the snow plough has operated	n/a
Number of times the road has been salted	n/a

Weather data was retrieved from Yr[3], which is a joint weather service from *the Norwegian Meteorological Institute* and *the Norwegian Broadcasting Corporation.* Data on temperature, precipitation and snow are from a weather station located approximately 10 km from the test site.

Information about winter maintenance was not available for the 2020–2021 season.

[3] https://www.yr.no/

4. Performance measurements

4.1. General

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 2021.

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 line, Figure 6. 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.

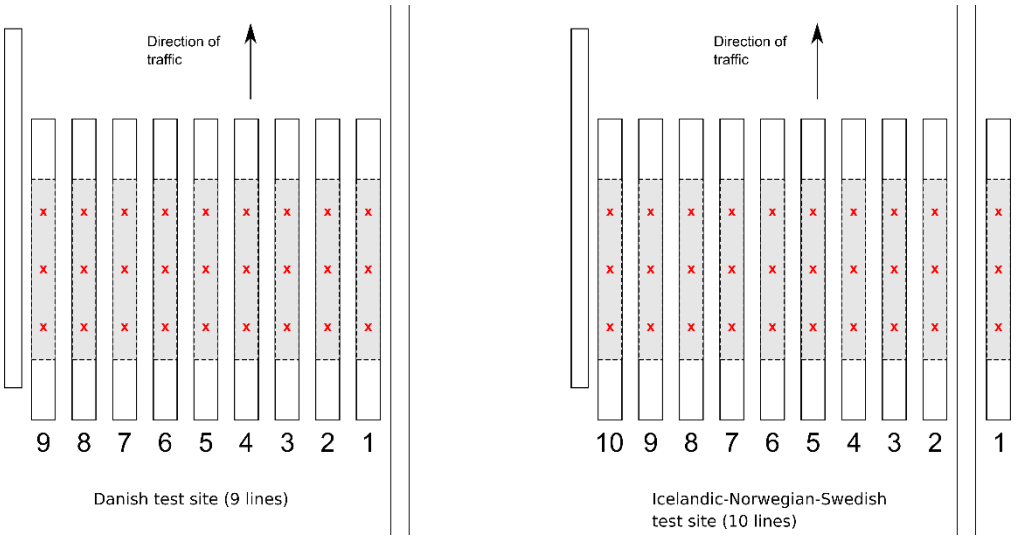

Figure 6. The measurement points (red crosses) for R_L and Qd were placed along the centre line within the measurement area (grey) defined by EN 1824. Left: the Danish test site with nine lines. Right: the Icelandic-Norwegian-Swedish test site with ten lines.

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 7. 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).

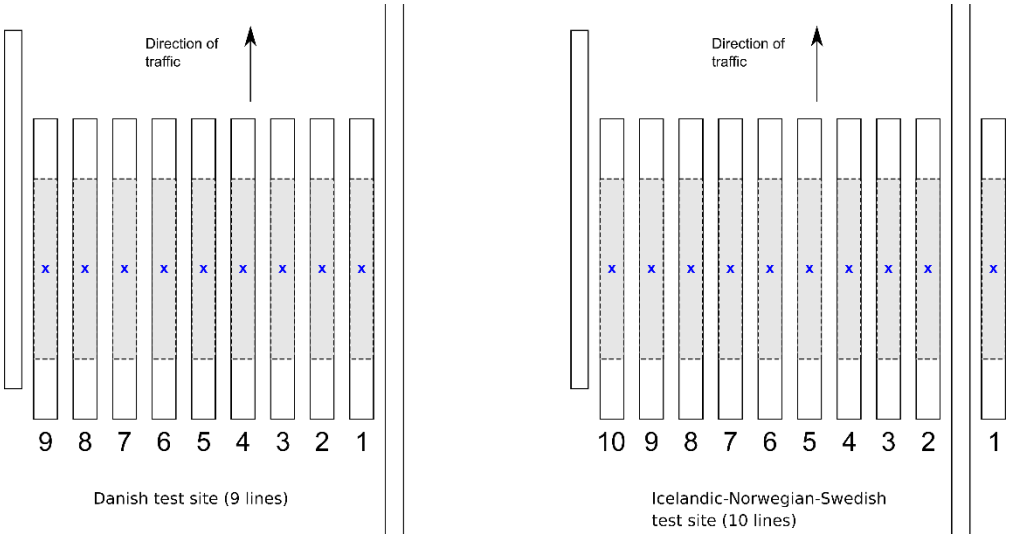

Figure 7. The measurement points (blue crosses) for chromaticity coordinates were placed in the centre of the lines. Left: the Danish test site with nine lines. Right: the Icelandic-Norwegian-Swedish test site with ten lines.

For materials with a high degree of wear, the measurement was taken at an area where the material was intact, if possible. For materials that had a very non-homogenous surface (due to unevenly distributed drop-on), an area that appeared to represent the average surface of the material was selected as measurement point. 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 4.

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. Friction

Friction measurements were carried out using a *Portable Friction Tester version 4,* PFT (Coralba, Sweden), along the centre of each line, Figure 8. 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.

Friction was measured on wet markings. The friction 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).

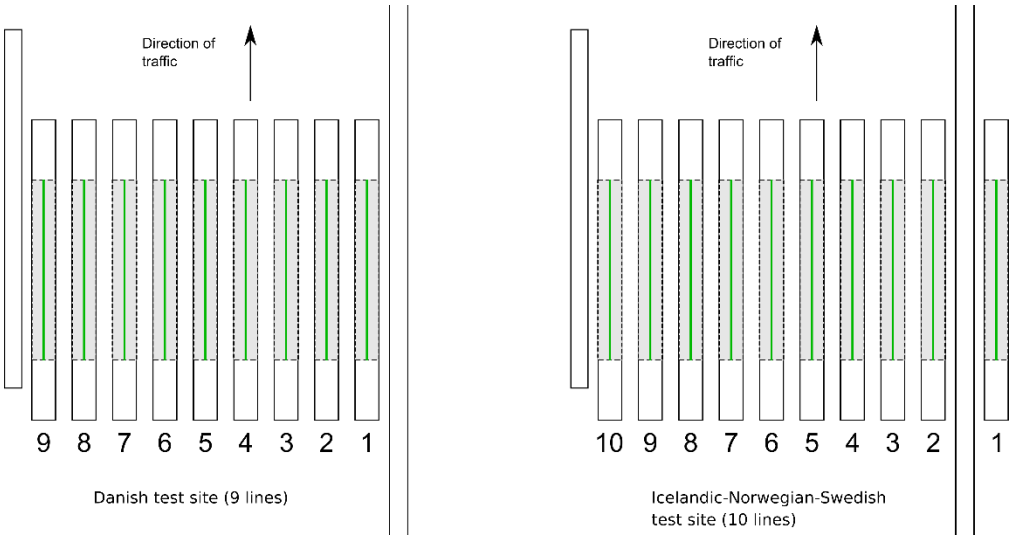

Figure 8. The measurement areas (green lines) for friction. Left: the Danish test site with nine lines. Right: the Icelandic-Norwegian-Swedish test site with ten lines.

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. The air temperature was approximately 20–25˚ C (day/evening). The road surface temperature was approximately 20–29˚ C. The measurements in Denmark in week 38 had mostly sunny conditions, with air temperatures at 16-22˚ C. The road surface temperature was approximately 22–25˚ 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[4] and five parameters for type II markings[5] which are given in Table 6. These requirements apply also to inlaid markings. Table 7 shows the requirements for materials for hand applications and Table 8 shows the performance requirements for materials with enhanced durability and for temporary markings. Table 9 shows the performance requirements for antiskid materials.

Table 6. 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
Friction, [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.
**) 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.

Table 7. 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
Friction, [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.
**) 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.

[4] Type I refers to flat markings.

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

Table 8. 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
Friction, [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.
**) 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.
***) Temporary markings, yellow – Chromaticity coordinates, x, y – Includes both daytime (class Y2) and night-time colour (class RC1), according to EN 1436:2018.

Table 9. 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
Friction, [PFT units]	≥ 0.71
Chromaticity coordinates, x, y	*

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

Regarding friction, a PFT value of 0.52 corresponds to an SRT value of 50 (class S2 in EN 1436), 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 friction

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 P-classes

Materials are certified in relation to the number of wheel passages they will stand. 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, Table 10.

Materials are thus certified for a certain roll-over class (P-class). To get approval in a certain P-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 is given based on the follow-up measurements one and two (and optional three) years 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 P-classes are selected for the follow-up measurements (see Section 5.2.1). One line is selected for each P-class and the results of the performance measurements on that line constitute the result for that material and P-class. All roll-over classes in Table 10 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 10. Roll-over classes, EN 1824.

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

5.2.1. P-classes at the Danish test site in 2021

For materials applied in 2019, P-classes P0, P3, P4 and P5 were reached in 2020 and P-class P6 was reached in 2021. All P-classes were represented by one line, Table 11.

Table 11. P-classes at the Danish test site, materials applied in 2019.

Roll-over class	Lines	Measured
P0	Line 9	August 2020
P1	-	-
P2	-	-
P3	Line 1	August 2020
P4	Line 3	August 2020
P5	Line 2	August 2020
P5.5	-	-
P6	Line 2	September 2021

No materials were applied at the Danish test site in 2020.

5.2.2. P-classes at the Icelandic-Norwegian-Swedish test site in 2021

For materials applied at the test site in Haslemoen in 2018, P-classes P0, P1, P2 and P4 were reached in 2019 (inlaid markings: P0, P1 and P4), P-class P5 was reached in 2020, and P-class P5.5 was reached in 2021. For materials applied in 2019, P-classes P0, P2 and P4 (inlaid markings: P2 and P4) were reached in 2020 and P-class P5 was reached in 2021. For materials applied in 2020, P-classes P0, P2, P3 and P4 were reached in 2021 (inlaid markings: P0, P3, P4). All P-classes were represented by one line, Table 12–Table 13.

Table 12. P-classes at the Icelandic-Norwegian-Swedish test site, materials applied in 2018.

Roll-over class	Lines, not inlaid	Lines, inlaid	Measured
P0	Line 6	Line 2	August-September 2019
P1	Line 10	Line 10	August-September 2019
P2	Line 7	-	August-September 2019
P3	-	-	-
P4	Line 3	Line 3	August-September 2019
P5	Line 4	Line 3	September 2020
P5.5	Line 4	-	August 2021

Table 13. P-classes at the Icelandic-Norwegian-Swedish test site, materials applied in 2019.

Roll-over class	**Lines, not inlaid**	**Lines, inlaid**	**Measured**
P0	Line 6	-	September 2020
P1	-	-	-
P2	Line 5	Line 10	September 2020
P3	-	-	-
P4	Line 8	Line 3	September 2020
P5	Line 8	Line 3	August 2021

Table 14. P-classes at the Icelandic-Norwegian-Swedish test site, materials applied in 2020.

Roll-over class	**Lines, not inlaid**	**Lines, inlaid**	**Measured**
P0	Line 6	Line 10	August 2021
P1	-	-	-
P2	Line 7	-	August 2021
P3	Line 4	Line 2	August 2021
P4	Line 3	Line 3	August 2021
P5	-	-	Summer 2022 (expected)

6. Results

This section contains an overview of the results of the performance measurements carried out in 2021 on materials applied at the test sites in 2018, 2019 and 2020 (the results tables for materials applied in 2018 and 2019 also include the results from the previous performance measurements, see Section 5.2). **A** means that the material fulfils the requirement on all relevant performance parameters, in that P-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 P-class.

At the Danish test site, the highest P-class possible (P6) is usually reached after two years. Therefore, there are no result to report in 2021 for materials applied in 2018.

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-, two-, or three-years follow-up.

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 2022), see Chapter 2.

Detailed measurement results can be found in Appendix 1.

6.1. Materials applied at the Danish test site in 2019

6.1.1. White road markings

Type I

Material thickness 3 mm

Table 15. Results of the performance measurements of materials applied at the Danish test site in 2019. Roll-over classes P0, P3, P4, P5 and P6. White type I materials, 3 mm.

Manufacturer *Material*	**P0**	**P3**	**P4**	**P5**	**P6**
Ennis Flint Lifeline D2019.1	**A**	**A**	**A**	**NA**	
Ennis Flint Lifeline D2019.2	**A**	**NA**			
Ennis Flint Lifeline D2019.3	**A**	**A**	**A**	**NA**	
Geveko Markings ViaTherm DK3-65E	**NA**				
Geveko Markings ViaTherm DK4 AW	**NA**				
Promax DK19WI	**A**	**A**	**NA**		

Type II

Material thickness 5 mm

Table 16. Results of the performance measurements of materials applied at the Danish test site in 2019. Roll-over classes P0, P3, P4, P5 and P6. White type II materials, 5 mm.

Manufacturer *Material*	**P0**	**P3**	**P4**	**P5**	**P6**
Ennis Flint D2019.4 *Profile/pattern:* Longdot	**A**	**NA**			
Ennis Flint D2019.5 *Profile/pattern:* Longdot	**A**	**NA**			
Ennis Flint Longflex D2019.6 *Profile/pattern:* Longflex	**A**	**NA**			
Ennis Flint Longflex D2019.7 *Profile/pattern:* Longflex	**A**	**NA**			
Ennis Flint Multidot D2019.8 *Profile/pattern:* Dots	**A**	**A**	**A**	**NA**	
Ennis Flint Multidot D2019.9 *Profile/pattern:* Dots	**A**	**A**	**A**	**A**	**NA**
Geveko Markings ViaTherm DK1 LongDot *Profile/pattern:* LongDot	**A**	**A**	**A**	**NA**	
Geveko Markings ViaTherm DK1 LongFlex *Profile/pattern:* LongFlex	**NA**				
Geveko Markings ViaTherm DK2 LongDot *Profile/pattern:* LongDot	**A**	**NA**			
Geveko Markings ViaTherm DK2 LongFlex *Profile/pattern:* LongFlex	**A**	**NA**			
Geveko Markings ViaTherm DK2 ViziSpot *Profile/pattern:* ViziSpot	**A**	**NA**			
Promax DK19WII *Profile/pattern:* Rullad	**A**	**A**	**A**	**NA**	

6.2. Materials applied at the Danish test site in 2020

No materials were applied in Denmark in 2020.

6.3. Materials applied at the Icelandic-Norwegian-Swedish test site in 2018

6.3.1. White road markings

Type I

Material thickness 3 mm

Table 17. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2018. Roll-over classes P0, P1, P2, P4, P5 and P5.5. White type I materials, 3 mm.

Manufacturer *Material*	**P0**	**P1**	**P2**	**P4**	**P5**	**P5.5**
Svevia X 1810	**A**	**A**	**A**	**A**	**A**	**NA**

6.4. Materials applied at the Icelandic-Norwegian-Swedish test site in 2019

6.4.1. White road markings

Type I

Material thickness 1.5 mm

Table 18. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P0, P2, P4 and P5. White type I materials, 1.5 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Kelly Bros White Spray Briteline (NE)	**A**	**NA**		
Kestrel Thermoplastics Eurolux SC White Spray 0023	**A**	**A**	**A**	**NA**
Svevia X1950	**A**	**A**	**NA**	
Svevia X1951	**A**	**A**	**A**	**NA**

Material thickness 3 mm

Table 19. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P0, P2, P4 and P5. White type I materials, 3 mm.

Manufacturer *Material*	P0	P2	P4	P5
Ennis Flint Crystalex W2019.1	A	A	A	NA
Ennis Flint Crystalex W2019.2	NA			
Geveko Markings ViaTherm® EXP 18 71 EP	A	A	A	NA
Kelly Bros White Flexi Cold Plastic (NE)	NA			
Kestrel Thermoplastics Eurolux SC White 0021	A	A	A	A
Kestrel Thermoplastics Eurolux SC White 0022	A	A	A	NA
Promax SNI19WI	A	A	A	A
Scandinavian Road Paint SRP T19	A	A	NA	
Svevia X1910	A	A	A	A
Svevia X1920	A	A	A	NA
Svevia X1930	A	A	A	A

Type II

Material thickness 5 mm

Table 20. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P0, P2, P4 and P5. White type II materials, 5 mm.

Manufacturer *Material*	P0	P2	P4	P5
Hot Mix Hotmix 3000 Type II *Profile/pattern:* Roll	A	NA		
Promax SNI19WTII *Profile/pattern:* Rullad	A	A	NA	
Svevia X1911 [type II] *Profile/pattern:* Rolled	A	A	NA	
Svevia X1921 *Profile/pattern:* Rolled	A	A	NA	
Svevia X1931 *Profile/pattern:* Rolled	A	A	NA	

Inlaid type II

Material thickness 5 mm

Table 21. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P2, P4 and P5. White inlaid type II materials, 5 mm.

Manufacturer *Material*	**P2**	**P4**	**P5**
Geveko Markings ViaTherm® EXP 19 35 E RW2 *Profile/pattern:* Drops	**A**	**NA**	
Kestrel Thermoplastics Eurodot SC White 0026 *Profile/pattern:* Dots	**A**	**NA**	
Svevia X1911 [type II inlaid] *Profile/pattern:* Rolled	**A**	**NA**	

Materials for hand application, retroreflective

Material thickness 3 mm

Table 22. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P0, P2, P4 and P5. White materials for hand application, retroreflective, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Geveko Markings ViaTherm® EXP 19 73 H	**A**	**A**	**A**	**A**
Svevia X1940	**A**	**A**	**A**	**NA**

Materials for hand application, non-retroreflective

Material thickness 3 mm

Table 23. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P0, P2, P4 and P5. White materials for hand application, non-retroreflective, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Geveko Markings ViaTherm® EXP 19 73 HF R2 [non-r]	**A**	**A**	**A**	**A**

Materials with enhanced durability

Material thickness 3 mm

Table 24. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P0, P2, P4 and P5. White materials with enhanced durability, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Geveko Markings ViaTherm® EXP 19 57 R0	**A**	**A**	**NA**	

6.4.2. Yellow Road Markings

Type I

Material thickness 1.5 mm

Table 25. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P0, P2, P4 and P5. Yellow type I materials, 1.5 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Geveko Markings ViaTherm® EXP 19 NTY 73S A	**NA**			

Material thickness 3 mm

Table 26. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over classes P0, P2, P4 and P5. Yellow type I materials, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P4**	**P5**
Ennis Flint Crystalex Y2019.3	**NA**			
Ennis Flint Crystalex Y2019.4	**NA**			
Geveko Markings ViaTherm® EXP 19 NTY 73E A	**A**	**A**	**A**	**NA**
Kelly Bros Yellow Extr. / Scr. Briteline (NE)	**NA**			
Promax SNI19YI	**A**	**A**	**NA**	

6.5. Materials applied at the Icelandic-Norwegian-Swedish test site in 2020

6.5.1. White road markings

Type I

Material thickness 0.4 mm

Table 27. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. White type I materials, 0.4 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings AquaRoute EXP 1	**NA**			
Geveko Markings AquaRoute EXP 2	**NA**			
Geveko Markings AquaRoute EXP 3	**NA**			
Geveko Markings AquaRoute EXP 4	**NA**			
Visafo VIT VISA 38 [0.4 mm]	**NA**			
Visafo VIT VISA 39 [0.4 mm]	**NA**			

Material thickness 0.6 mm

Table 28. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. White type I materials, 0.6 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Visafo VIT VISA 38 [0.6 mm]	**NA**			
Visafo VIT VISA 39 [0.6 mm]	**NA**			

Material thickness 1.5 mm

Table 29. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. White type I materials, 1.5 mm.

Manufacturer *Material*	P0	P2	P3	P4
Promax SSNI20WI1	A	A	NA	
Promax SSNI20WI2	A	NA		
Svevia X 2050	A	NA		
Svevia X 2051	A	NA		

Material thickness 3 mm

Table 30. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. White type I materials, 3 mm.

Manufacturer *Material*	P0	P2	P3	P4
Kestrel Thermoplastics Eurolux SC White 0029	A	A	A	A
Kestrel Thermoplastics Eurolux SC White 0030	A	A	A	A
Kestrel Thermoplastics Eurolux SC White 0031 (Type I)	A	A	A	NA
Promax ESNI20WI	A	A	A	NA*
Promax SNI20WI1	A	A	A	NA
Promax SNI20WI2	A	A	A	NA
Svevia X 2010	A	NA		
Svevia X 2020	A	NA		
Svevia X 2030	A	A	A	NA

*) P4 – Promax ESNI20WI – Line 3 was disqualified at application (too thick).

Type II

Material thickness 5 mm

Table 31. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. White type II materials, 5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings ViaTherm® EXP 18 71EP [rilled] *Profile/pattern:* Rilled	**A**	**NA**		
Geveko Markings ViaTherm® EXP 18 71EP [stairs] *Profile/pattern:* Stairs	**NA**			
Geveko Markings ViaTherm® EXP 20 35E [rilled] *Profile/pattern:* Rilled	**A**	**NA**		
Geveko Markings ViaTherm® EXP 20 35E [stairs] *Profile/pattern:* Stairs	**A**	**NA**		
Promax SNI20WII1 *Profile/pattern:* Rullad	**A**	**NA**		
Promax SNI20WII2 *Profile/pattern:* Rullad	**NA***			
Svevia X 2011 *Profile/pattern:* Rolled	**NA**			
Svevia X 2021 *Profile/pattern:* Rolled	**NA**			
Svevia X 2031 *Profile/pattern:* Rolled	**A**	**A**	**A**	**NA**

*) P0 – Promax SNI20WII2 – No result due to missing documentation.

Inlaid type II

Material thickness 5 mm

Table 32. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P3 and P4. White inlaid type II materials, 5 mm.

Manufacturer *Material*	**P0**	**P3**	**P4**
Geveko Markings ViaTherm® EXP 20 35E [inl., drops] *Profile/pattern:* Drops	**A**	**NA**	
Kestrel Thermoplastics Eurolux SC White 0031 (Type II) *Profile/pattern:* Dots	**A**	**NA**	
Promax SNI20WII3 *Profile/pattern:* Rullad	**NA***		

*) P0 – Promax SNI20WII3 – No result due to missing documentation.

Materials for hand application, retroreflective

Material thickness 3 mm

Table 33. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. White materials for hand application, retroreflective, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings ViaTherm® EXP 20 71HF [r]	**A**	**A**	**A**	**A**

Materials for hand application, non-retroreflective

Material thickness 3 mm

Table 34. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. White materials for hand application, non-retroreflective, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings ViaTherm® EXP 20 71HF [non-r]	**A**	**A**	**A**	**A**

Materials with enhanced durability

Material thickness 3 mm

Table 35. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. White materials with enhanced durability, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings ViaTherm® EXP 20 57E	**A**	**A**	**A**	**A**

6.5.2. Yellow Road Markings

Type I

Material thickness 1.5 mm

Table 36. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. Yellow type I materials, 1.5 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings ViaTherm® EXP 20 NTY 71S	**A**	**A**	**A**	**A**
Promax SSNI20YI1	**NA**			
Promax SSNI20YI2	**A**	**NA**		

Material thickness 3 mm

Table 37. Results of the performance measurements of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over classes P0, P2, P3 and P4. Yellow type I materials, 3 mm.

Manufacturer *Material*	**P0**	**P2**	**P3**	**P4**
Geveko Markings ViaTherm® EXP 20 NTY 71E	**A**	**A**	**A**	**NA**
Kestrel Thermoplastics Eurolux SC Yellow 0027	**A**	**NA**		
Kestrel Thermoplastics Eurolux SC Yellow 0028	**A**	**A**	**A**	**NA**
Promax SNI20YI1	**A**	**A**	**A**	**A**

7. Overview of performance measurement results in 2015–2021

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 2022).

Lists of products with valid certificates are available at www.nordiccert.com. The lists are updated continuously.

7.1. Denmark

7.1.1. White road markings

Table 38 shows the number of materials that have fulfilled the performance requirements in respective P-class since 2015, per material category.

Table 38. 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, 1.5 mm	-	3	3	3	1	1	-	-	-
Type I, 3 mm	15	48	46	42	35	26	10	5	4
Type II, 0.4 mm	-	1	-	-	-	-	-	-	-
Type II, 3 mm	1	-	-	-	-	-	-	-	-
Type II, 4–5 mm*	5	18	11	11	11	10	5	1	-
Antiskid materials, 3 mm	-	2	2	2	2	2	2	2	2
Antiskid materials, 4 mm	-	1	1	1	1	1	1	1	1
Total	*23*	*73*	*63*	*59*	*50*	*40*	*18*	*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

Table 39 shows the number of materials that have fulfilled the performance requirements in respective P-class since 2015, per material category.

Table 39. 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	37	2	-	-	-	-	-
Type I, 0.6 mm	9	2	-	-	-	-	-
Type I, 1.5 mm	9	25	20	18	9	5	1
Type I, 3 mm	36	70	67	61	42	28	11
Type II, 0.6 mm	3	-	-	-	-	-	-
Type II, 3 mm	7	-	-	-	-	-	-
Type II, 4–5 mm*	13	24	14	14	1	-	-
Inlaid type II, 0.6 mm	2	-	-	-	-	-	-
Inlaid type II, 5 mm	2	9	5	4	1	1	-
Materials for hand application, retroreflective, 3 mm	3	3	3	3	3	3	1
Materials for hand application, non-retroreflective, 3 mm	-	2	2	2	2	2	1
Materials with enhanced durability, 3 mm	-	2	2	2	1	1	-
Antiskid materials, 4 mm	-	2	2	2	2	2	2
Total	*121*	*141*	*115*	*106*	*61*	*42*	*16*

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

7.2.2. Yellow road markings

Table 40 shows the number of materials that have fulfilled the performance requirements in respective P-class since 2015, per material category.

Table 40. 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	6	4	4	3	1	-
Type I, 3 mm	39	21	19	15	7	3	-
Type II, 3 mm	2	-	-	-	-	-	-
Type II, 4–5 mm*	2	1	-	-	-	-	-
Total	*63*	*28*	*23*	*19*	*10*	*4*	-

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

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Appendix 1 – Results of the performance measurements

Table 42–Table 43 show the results for roll-over class P6 for materials applied at the Danish test site in 2019. Table 44 shows the result for roll-over class P5.5 for materials applied at the Icelandic-Norwegian-Swedish test site in 2018. Table 45–Table 53 show the results for roll-over class P5 for materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Table 54–Table 96 show the results for roll-over classes P0, P2, P3 and P4 for materials applied at the Icelandic-Norwegian-Swedish test site in 2020.

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.

Table 41 explains the denotations in the result tables.

Table 41. 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]
Frict.	Mean value of friction [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 2019

Roll-over class P6

Table 42. Results of the performance measurements in 2021 of materials applied at the Danish test site in 2019. 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*	*Frict.*	*Colour*	*Appr.*
Ennis Flint Lifeline D2019.1	n.m.	-	n.m.	n.m.	n.m.	**NA**
Ennis Flint Lifeline D2019.2	n.m.	-	n.m.	n.m.	n.m.	**NA**
Ennis Flint Lifeline D2019.3	n.m.	-	n.m.	n.m.	n.m.	**NA**
Geveko Markings ViaTherm DK3-65E	n.m.	-	n.m.	n.m.	n.m.	**NA**
Geveko Markings ViaTherm DK4 AW	n.m.	-	n.m.	n.m.	n.m.	**NA**
Promax DK19WI	n.m.	-	n.m.	n.m.	n.m.	**NA**

Table 43. Results of the performance measurements in 2021 of materials applied at the Danish test site in 2019. 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	Frict.	Colour	Appr.
Ennis Flint D2019.4	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Ennis Flint D2019.5	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Ennis Flint Longflex D2019.6	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Ennis Flint Longflex D2019.7	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Ennis Flint Multidot D2019.8	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Ennis Flint Multidot D2019.9	85	13	120	0.74	OK	**NA**
Geveko Markings ViaTherm DK1 LongDot	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Geveko Markings ViaTherm DK1 LongFlex	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Geveko Markings ViaTherm DK2 LongDot	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Geveko Markings ViaTherm DK2 LongFlex	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Geveko Markings ViaTherm DK2 ViziSpot	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Promax DK19WII	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**

Materials applied at the Icelandic-Norwegian-Swedish test site in 2018

Roll-over class P5.5

Table 44. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2018. Roll-over class P5.5. White materials, type I, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***Appr.***
Svevia X 1810	worn	-	worn	worn	worn	**NA**

Materials applied at the Icelandic-Norwegian-Swedish test site in 2019

Roll-over class P5

Table 45. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. 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*	*Frict.*	*Colour*	*Appr.*
Kelly Bros White Spray Briteline (NE)	n.m.	-	n.m.	n.m.	n.m.	**NA**
Kestrel Thermoplastics Eurolux SC White Spray 0023	worn	-	worn	worn	worn	**NA**
Svevia X1950	n.m.	-	n.m.	n.m.	n.m.	**NA**
Svevia X1951	worn	-	worn	worn	worn	**NA**

Table 46. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. 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*	*Frict.*	*Colour*	*Appr.*
Ennis Flint Crystalex W2019.1	worn	-	worn	worn	worn	**NA**
Ennis Flint Crystalex W2019.2	n.m.	-	n.m.	n.m.	n.m.	**NA**
Geveko Markings ViaTherm® EXP 18 71 EP	145	-	133	0.68	OK	**NA**
Kelly Bros White Flexi Cold Plastic (NE)	n.m.	-	n.m.	n.m.	n.m.	**NA**
Kestrel Thermoplastics Eurolux SC White 0021	168	-	174	0.66	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0022	99	-	149	0.71	OK	**NA**
Promax SNI19WI	182	-	180	0.56	OK	**A**
Scandinavian Road Paint SRP T19	n.m.	-	n.m.	n.m.	n.m.	**NA**
Svevia X1910	152	-	189	0.63	OK	**A**
Svevia X1920	136	-	196	0.67	OK	**NA**
Svevia X1930	153	-	184	0.64	OK	**A**

Table 47. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. 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	Frict.	Colour	Appr.
Hot Mix Hotmix 3000 Type II	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Promax SNI19WTII	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Svevia X1911 [type II]	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Svevia X1921	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Svevia X1931	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**

Table 48. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. 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	Frict.	Colour	Appr.
Geveko Markings ViaTherm® EXP 19 35 E RW2	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Kestrel Thermoplastics Eurodot SC White 0026	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**
Svevia X1911 [type II inlaid]	n.m.	n.m.	n.m.	n.m.	n.m.	**NA**

Table 49. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. 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	Frict.	Colour	Appr.
Geveko Markings ViaTherm® EXP 19 73 H	101	-	159	0.70	OK	**A**
Svevia X1940	worn	-	worn	worn	worn	**NA**

Table 50. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. 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	Frict.	Colour	Appr.
Geveko Markings ViaTherm® EXP 19 73 HF R2 [non-r]	(87)*	-	166	0.72	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 51. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Roll-over class P5. White materials with enhanced durability, 3 mm. Alphabetical order by manufacturer.

Materials with enhanced durability, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	Frict.	Colour	Appr.
Geveko Markings ViaTherm® EXP 19 57 R0	(n.m.)*	-	n.m.	n.m.	n.m.	**NA**

*) $R_{L,dry}$ – No requirement

Table 52. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. 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	Frict.	Colour	NTY	Appr.
Geveko Markings ViaTherm® EXP 19 NTY 73S A	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**

Table 53. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2019. 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*	*Frict.*	*Colour*	*NTY*	*Appr.*
Ennis Flint Crystalex Y2019.3	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**
Ennis Flint Crystalex Y2019.4	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**
Geveko Markings ViaTherm® EXP 19 NTY 73E A	worn	-	worn	worn	worn	worn	**NA**
Kelly Bros Yellow Extr. / Scr. Briteline (NE)	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**
Promax SNI19YI	n.m.	-	n.m.	n.m.	n.m.	n.m.	**NA**

Materials applied at the Icelandic-Norwegian-Swedish test site in 2020

Roll-over class P0

Table 54. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. White materials, type I, 0.4 mm. Alphabetical order by manufacturer.

Type I, 0.4 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings AquaRoute EXP 1	69	-	91	0.85	OK	**NA**
Geveko Markings AquaRoute EXP 2	72	-	105	0.85	OK	**NA**
Geveko Markings AquaRoute EXP 3	60	-	99	0.87	OK	**NA**
Geveko Markings AquaRoute EXP 4	116	-	116	0.85	OK	**NA**
Visafo VIT VISA 38 [0.4 mm]	134	-	114	0.76	OK	**NA**
Visafo VIT VISA 39 [0.4 mm]	106	-	103	0.79	OK	**NA**

Table 55. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. White materials, type I, 0.6 mm. Alphabetical order by manufacturer.

Type I, 0.6 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Visafo VIT VISA 38 [0.6 mm]	141	-	119	0.74	OK	**NA**
Visafo VIT VISA 39 [0.6 mm]	170	-	116	0.75	OK	**NA**

Table 56. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. 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*	*Frict.*	*Colour*	*Appr.*
Promax SSNI20WI1	220	-	195	0.69	OK	**A**
Promax SSNI20WI2	223	-	181	0.66	OK	**A**
Svevia X 2050	175	-	195	0.75	OK	**A**
Svevia X 2051	159	-	186	0.79	OK	**A**

Table 57. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. White materials, type I, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Kestrel Thermoplastics Eurolux SC White 0029	230	-	193	0.57	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0030	244	-	193	0.57	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0031 (Type I)	228	-	180	0.64	OK	**A**
Promax ESNI20WI	235	-	178	0.63	OK	**A**
Promax SNI20WI1	213	-	193	0.68	OK	**A**
Promax SNI20WI2	244	-	192	0.67	OK	**A**
Svevia X 2010	151	-	188	0.76	OK	**A**
Svevia X 2020	166	-	182	0.76	OK	**A**
Svevia X 2030	215	-	197	0.72	OK	**A**

Table 58. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. White materials, type II, 5 mm. Alphabetical order by manufacturer.

Type II, 5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 18 71EP [rilled] *Profile/pattern:* Rilled	285	68	175	0.69	OK	**A**
Geveko Markings ViaTherm® EXP 18 71EP [stairs] *Profile/pattern:* Stairs	worn	worn	worn	worn	worn	**NA**
Geveko Markings ViaTherm® EXP 20 35E [rilled] *Profile/pattern:* Rilled	269	62	176	0.72	OK	**A**
Geveko Markings ViaTherm® EXP 20 35E [stairs] *Profile/pattern:* Stairs	246	52	155	0.70	OK	**A**
Promax SNI20WII1 *Profile/pattern:* Rullad	156	66	146	0.87	OK	**A**
Promax SNI20WII2 *Profile/pattern:* Rullad	d	d	d	d	d	**NA**
Svevia X 2011 *Profile/pattern:* Rolled	140	45	176	0.83	OK	**NA**
Svevia X 2021 *Profile/pattern:* Rolled	137	37	179	0.86	OK	**NA**
Svevia X 2031 *Profile/pattern:* Rolled	172	54	191	0.83	OK	**A**

Table 59. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 35E [inl., drops] *Profile/pattern:* Drops	301	59	185	0.58	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0031 (Type II) *Profile/pattern:* Dots	176	53	148	0.84	OK	**A**
Promax SNI20WII3 *Profile/pattern:* Rullad	d	d	d	d	d	**NA**

Table 60. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 71HF [r]	217	-	186	0.69	OK	**A**

Table 61. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 71HF [non-r]	(221)*	-	183	0.68	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 62. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. White materials with enhanced durability, 3 mm. Alphabetical order by manufacturer.

Materials with enhanced durability, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 57E	(133)*	-	173	0.70	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 63. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. Yellow type I markings, 1.5 mm. Alphabetical order by manufacturer.

Type I, 1.5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*NTY*	*Appr.*
Geveko Markings ViaTherm® EXP 20 NTY 71S	162	-	147	0.68	OK	OK	**A**
Promax SSNI20YI1	150	-	128	0.67	OK	outside	**NA**
Promax SSNI20YI2	152	-	126	0.72	OK	OK	**A**

Table 64. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P0. Yellow type I markings, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***NTY***	***Appr.***
Geveko Markings ViaTherm® EXP 20 NTY 71E	132	-	141	0.70	OK	OK	**A**
Kestrel Thermoplastics Eurolux SC Yellow 0027	136	-	151	0.70	OK	OK	**A**
Kestrel Thermoplastics Eurolux SC Yellow 0028	145	-	147	0.63	OK	OK	**A**
Promax SNI20YI1	175	-	134	0.62	OK	OK	**A**

Roll-over class P2

Table 65. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. White materials, type I, 0.4 mm. Alphabetical order by manufacturer.

Type I, 0.4 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings AquaRoute EXP 1	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 2	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 3	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 4	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 38 [0.4 mm]	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 39 [0.4 mm]	worn	-	worn	worn	worn	**NA**

Table 66. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. White materials, type I, 0.6 mm. Alphabetical order by manufacturer.

Type I, 0.6 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Visafo VIT VISA 38 [0.6 mm]	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 39 [0.6 mm]	worn	-	worn	worn	worn	**NA**

Table 67. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. 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*	*Frict.*	*Colour*	*Appr.*
Promax SSNI20WI1	153	-	181	0.70	OK	**A**
Promax SSNI20WI2	114	-	184	0.76	OK	**NA**
Svevia X 2050	138	-	179	0.75	OK	**NA**
Svevia X 2051	125	-	193	0.77	OK	**NA**

Table 68. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. White materials, type I, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Kestrel Thermoplastics Eurolux SC White 0029	187	-	191	0.61	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0030	196	-	186	0.58	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0031 (Type I)	151	-	169	0.65	OK	**A**
Promax ESNI20WI	205	-	173	0.62	OK	**A**
Promax SNI20WI1	162	-	178	0.69	OK	**A**
Promax SNI20WI2	159	-	180	0.70	OK	**A**
Svevia X 2010	128	-	182	0.74	OK	**NA**
Svevia X 2020	134	-	185	0.73	OK	**NA**
Svevia X 2030	180	-	182	0.68	OK	**A**

Table 69. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. White materials, type II, 5 mm. Alphabetical order by manufacturer.

Type II, 5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 18 71EP [rilled] *Profile/pattern:* Rilled	259	23	185	0.65	OK	**NA**
Geveko Markings ViaTherm® EXP 18 71EP [stairs] *Profile/pattern:* Stairs	worn	worn	worn	worn	worn	**NA**
Geveko Markings ViaTherm® EXP 20 35E [rilled] *Profile/pattern:* Rilled	210	20	175	0.67	OK	**NA**
Geveko Markings ViaTherm® EXP 20 35E [stairs] *Profile/pattern:* Stairs	140	19	119	0.73	OK	**NA**
Promax SNI20WII1 *Profile/pattern:* Rullad	119	30	165	0.74	OK	**NA**
Promax SNI20WII2 *Profile/pattern:* Rullad	d	d	d	d	d	**NA**
Svevia X 2011 *Profile/pattern:* Rolled	123	33	184	0.74	OK	**NA**
Svevia X 2021 *Profile/pattern:* Rolled	117	34	183	0.76	OK	**NA**
Svevia X 2031 *Profile/pattern:* Rolled	154	45	167	0.76	OK	**A**

Table 70. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 71HF [r]	169	-	172	0.68	OK	**A**

Table 71. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. 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***	***Frict.***	***Colour***	***Appr.***
Geveko Markings ViaTherm® EXP 20 71HF [non-r]	(172)*	-	169	0.67	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 72. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. White materials with enhanced durability, 3 mm. Alphabetical order by manufacturer.

Materials with enhanced durability, 3 mm ***Manufacturer*** *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***Appr.***
Geveko Markings ViaTherm® EXP 20 57E	(94)*	-	169	0.75	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 73. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. Yellow type I markings, 1.5 mm. Alphabetical order by manufacturer.

Type I, 1.5 mm ***Manufacturer*** *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***NTY***	***Appr.***
Geveko Markings ViaTherm® EXP 20 NTY 71S	148	-	133	0.64	OK	OK	**A**
Promax SSNI20YI1	86	-	122	0.77	OK	outside	**NA**
Promax SSNI20YI2	101	-	118	0.69	OK	outside	**NA**

Table 74. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P2. Yellow type I markings, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*NTY*	*Appr.*
Geveko Markings ViaTherm® EXP 20 NTY 71E	101	-	139	0.68	OK	OK	**A**
Kestrel Thermoplastics Eurolux SC Yellow 0027	84	-	127	0.72	OK	OK	**NA**
Kestrel Thermoplastics Eurolux SC Yellow 0028	103	-	141	0.65	OK	OK	**A**
Promax SNI20YI1	124	-	133	0.62	OK	OK	**A**

Roll-over class P3

Table 75. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. White materials, type I, 0.4 mm. Alphabetical order by manufacturer.

Type I, 0.4 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings AquaRoute EXP 1	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 2	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 3	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 4	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 38 [0.4 mm]	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 39 [0.4 mm]	worn	-	worn	worn	worn	**NA**

Table 76. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. White materials, type I, 0.6 mm. Alphabetical order by manufacturer.

Type I, 0.6 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Visafo VIT VISA 38 [0.6 mm]	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 39 [0.6 mm]	worn	-	worn	worn	worn	**NA**

Table 77. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. 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*	*Frict.*	*Colour*	*Appr.*
Promax SSNI20WI1	138	-	175	0.73	OK	**NA**
Promax SSNI20WI2	103	-	181	0.76	OK	**NA**
Svevia X 2050	134	-	184	0.76	OK	**NA**
Svevia X 2051	115	-	171	0.78	OK	**NA**

Table 78. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. White materials, type I, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Kestrel Thermoplastics Eurolux SC White 0029	199	-	193	0.61	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0030	210	-	192	0.58	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0031 (Type I)	167	-	172	0.66	OK	**A**
Promax ESNI20WI	200	-	166	0.61	OK	**A**
Promax SNI20WI1	164	-	183	0.67	OK	**A**
Promax SNI20WI2	150	-	189	0.70	OK	**A**
Svevia X 2010	131	-	187	0.66	OK	**NA**
Svevia X 2020	133	-	193	0.72	OK	**NA**
Svevia X 2030	176	-	183	0.68	OK	**A**

Table 79. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. White materials, type II, 5 mm. Alphabetical order by manufacturer.

Type II, 5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 18 71EP [rilled] *Profile/pattern:* Rilled	268	18	168	0.65	OK	NA
Geveko Markings ViaTherm® EXP 18 71EP [stairs] *Profile/pattern:* Stairs	worn	worn	worn	worn	worn	NA
Geveko Markings ViaTherm® EXP 20 35E [rilled] *Profile/pattern:* Rilled	247	22	178	0.64	OK	NA
Geveko Markings ViaTherm® EXP 20 35E [stairs] *Profile/pattern:* Stairs	109	14	116	0.77	OK	NA
Promax SNI20WII1 *Profile/pattern:* Rullad	121	34	164	0.73	OK	NA
Promax SNI20WII2 *Profile/pattern:* Rullad	d	d	d	d	d	NA
Svevia X 2011 *Profile/pattern:* Rolled	127	38	194	0.74	OK	NA
Svevia X 2021 *Profile/pattern:* Rolled	121	37	193	0.77	OK	NA
Svevia X 2031 *Profile/pattern:* Rolled	151	44	202	0.74	OK	**A**

Table 80. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 35E [inl., drops] *Profile/pattern:* Drops	147	27	109	0.77	OK	NA
Kestrel Thermoplastics Eurolux SC White 0031 (Type II) *Profile/pattern:* Dots	55	7	75	0.84	OK	NA
Promax SNI20WII3 *Profile/pattern:* Rullad	d	d	d	d	d	NA

Table 81. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 71HF [r]	174	-	194	0.69	OK	**A**

Table 82. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 71HF [non-r]	(188)*	-	178	0.66	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 83. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. White materials with enhanced durability, 3 mm. Alphabetical order by manufacturer.

Materials with enhanced durability, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 57E	(100)*	-	169	0.75	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 84. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. Yellow type I markings, 1.5 mm. Alphabetical order by manufacturer.

Type I, 1.5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*NTY*	*Appr.*
Geveko Markings ViaTherm® EXP 20 NTY 71S	147	-	143	0.63	OK	OK	**A**
Promax SSNI20YI1	worn	-	worn	worn	worn	worn	**NA**
Promax SSNI20YI2	worn	-	worn	worn	worn	worn	**NA**

Table 85. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P3. Yellow type I markings, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*NTY*	*Appr.*
Geveko Markings ViaTherm® EXP 20 NTY 71E	100	-	131	0.67	OK	OK	**A**
Kestrel Thermoplastics Eurolux SC Yellow 0027	86	-	146	0.70	OK	OK	**NA**
Kestrel Thermoplastics Eurolux SC Yellow 0028	108	-	146	0.65	OK	OK	**A**
Promax SNI20YI1	131	-	127	0.63	OK	OK	**A**

Roll-over class P4

Table 86. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. White materials, type I, 0.4 mm. Alphabetical order by manufacturer.

Type I, 0.4 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	Frict.	Colour	Appr.
Geveko Markings AquaRoute EXP 1	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 2	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 3	worn	-	worn	worn	worn	**NA**
Geveko Markings AquaRoute EXP 4	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 38 [0.4 mm]	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 39 [0.4 mm]	worn	-	worn	worn	worn	**NA**

Table 87. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. White materials, type I, 0.6 mm. Alphabetical order by manufacturer.

Type I, 0.6 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	Qd	Frict.	Colour	Appr.
Visafo VIT VISA 38 [0.6 mm]	worn	-	worn	worn	worn	**NA**
Visafo VIT VISA 39 [0.6 mm]	worn	-	worn	worn	worn	**NA**

Table 88. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. 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	Frict.	Colour	Appr.
Promax SSNI20WI1	113	-	153	0.73	OK	**NA**
Promax SSNI20WI2	85	-	165	0.72	OK	**NA**
Svevia X 2050	100	-	160	0.75	OK	**NA**
Svevia X 2051	92	-	155	0.77	OK	**NA**

Table 89. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. White materials, type I, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Kestrel Thermoplastics Eurolux SC White 0029	163	-	179	0.63	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0030	185	-	175	0.58	OK	**A**
Kestrel Thermoplastics Eurolux SC White 0031 (Type I)	137	-	155	0.65	OK	**NA**
Promax ESNI20WI	d	-	d	d	d	**NA**
Promax SNI20WI1	143	-	175	0.68	OK	**NA**
Promax SNI20WI2	122	-	168	0.70	OK	**NA**
Svevia X 2010	107	-	159	0.70	OK	**NA**
Svevia X 2020	108	-	173	0.72	OK	**NA**
Svevia X 2030	145	-	174	0.70	OK	**NA**

Table 90. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. White materials, type II, 5 mm. Alphabetical order by manufacturer.

Type II, 5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 18 71EP [rilled] *Profile/pattern:* Rilled	122	9	121	0.74	OK	**NA**
Geveko Markings ViaTherm® EXP 18 71EP [stairs] *Profile/pattern:* Stairs	worn	worn	worn	worn	worn	**NA**
Geveko Markings ViaTherm® EXP 20 35E [rilled] *Profile/pattern:* Rilled	126	9	129	0.69	OK	**NA**
Geveko Markings ViaTherm® EXP 20 35E [stairs] *Profile/pattern:* Stairs	33	5	88	0.79	OK	**NA**
Promax SNI20WII1 *Profile/pattern:* Rullad	90	33	158	0.72	OK	**NA**
Promax SNI20WII2 *Profile/pattern:* Rullad	d	d	d	d	d	**NA**
Svevia X 2011 *Profile/pattern:* Rolled	108	24	173	0.74	OK	**NA**
Svevia X 2021 *Profile/pattern:* Rolled	106	32	168	0.76	OK	**NA**
Svevia X 2031 *Profile/pattern:* Rolled	128	37	173	0.75	OK	**NA**

Table 91. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 35E [inl., drops] *Profile/pattern:* Drops	worn	worn	worn	worn	worn	**NA**
Kestrel Thermoplastics Eurolux SC White 0031 (Type II) *Profile/pattern:* Dots	worn	worn	worn	worn	worn	**NA**
Promax SNI20WII3 *Profile/pattern:* Rullad	d	d	d	d	d	**NA**

Table 92. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 71HF [r]	144	-	165	0.69	OK	**A**

Table 93. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. 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*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 71HF [non-r]	(147)*	-	170	0.68	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 94. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. White materials with enhanced durability, 3 mm. Alphabetical order by manufacturer.

Materials with enhanced durability, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Appr.*
Geveko Markings ViaTherm® EXP 20 57E	(79)*	-	168	0.74	OK	**A**

*) $R_{L,dry}$ – No requirement

Table 95. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. Yellow type I markings, 1.5 mm. Alphabetical order by manufacturer.

Type I, 1.5 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*NTY*	*Appr.*
Geveko Markings ViaTherm® EXP 20 NTY 71S	138	-	129	0.63	OK	OK	**A**
Promax SSNI20YI1	worn	-	worn	worn	worn	worn	**NA**
Promax SSNI20YI2	worn	-	worn	worn	worn	worn	**NA**

Table 96. Results of the performance measurements in 2021 of materials applied at the Icelandic-Norwegian-Swedish test site in 2020. Roll-over class P4. Yellow type I markings, 3 mm. Alphabetical order by manufacturer.

Type I, 3 mm ***Manufacturer*** *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*NTY*	*Appr.*
Geveko Markings ViaTherm® EXP 20 NTY 71E	87	-	124	0.63	OK	OK	**NA**
Kestrel Thermoplastics Eurolux SC Yellow 0027	79	-	134	0.68	OK	OK	**NA**
Kestrel Thermoplastics Eurolux SC Yellow 0028	90	-	136	0.63	OK	OK	**NA**
Promax SNI20YI1	104	-	114	0.64	OK	OK	**A**

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The Swedish National Road and Transport Research Institute (VTI), is an independent and internationally prominent research institute in the transport sector. Our principal task is to conduct research and development related to infrastructure, traffic and transport. We are dedicated to the continuous development of knowledge pertaining to the transport sector, and in this way contribute actively to the attainment of the goals of Swedish transport policy.

Our operations cover all modes of transport, and the subjects of pavement technology, infrastructure maintenance, vehicle technology, traffic safety, traffic analysis, users of the transport system, the environment, the planning and decision making processes, transport economics and transport systems. Knowledge that the institute develops provides a basis for decisions made by stakeholders in the transport sector. In many cases our findings lead to direct applications in both national and international transport policies.

VTI conducts commissioned research in an interdisciplinary organisation. Employees also conduct investigations, provide counseling and perform various services in measurement and testing. The institute has a wide range of advanced research equipment and world-class driving simulators. There are also laboratories for road material testing and crash safety testing.

In Sweden VTI cooperates with universities engaged in related research and education. We also participate continuously in international research projects, networks and alliances.

The Institute is an assignment-based authority under the Ministry of Infrastructure. The Institute holds the quality management systems certificate ISO 9001 and the environmental management systems certificate ISO 14001. Certain test methods used in our labs for crash safety testing and road materials testing are also certified by Swedac.

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