Nordic certification of road marking materials

Results of initial performance measurements at the Icelandic-Norwegian-Swedish test site 2019

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Preface

A Nordic certification system for road marking materials, that applies to the countries of Denmark, Iceland (from 2019) 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.

Test fields have been established in Denmark and in Norway/Sweden. The Norwegian-Swedish test field, which from 2019 is called the Icelandic-Norwegian-Swedish test field, is the basis for approval of road marking products in Norway, Iceland and Sweden. Since 2017, the Icelandic-Norwegian-Swedish test site has been located on road Rv2 close to Haslemoen in Norway. In August 2019, 52 materials were applied at this test site. The present report documents the results of the initial measurements taken shortly after application of these materials. The results show whether the materials qualify for continued participation in the road trials.

Certification of road marking materials are based on performance measurements carried out one and two years after application. Results from these measurements are published in the VTI report series annually.

The road trials are administered by Trond Cato Johansen at Ramböll and Carina Fors at VTI. Contact persons at the national road authorities are Bjørn Skaar, the Norwegian Public Roads Administration, Ásbjörn Ólafsson, the Icelandic Road and Coastal Administration and Ulf Söderberg, the Swedish Transport Administration.

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Abstract

Nordic certification of road marking materials – Results of initial performance measurements at the Icelandic-Norwegian-Swedish test site 2019

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This report documents the results of the initial performance measurements at the Icelandic-Norwegian-Swedish test site in 2019. In total, 52 materials were applied at the test field. 51 materials participated as *certification materials*, i.e. with the purpose of being certified for use on roads managed by the public roads administration of Norway and Sweden. One material was a *test material*.

Performance measurements of coefficient of retroreflected luminance R_L under dry and wet conditions, luminance coefficient under diffuse illumination *Qd*, chromaticity coordinates and friction were carried out approximately two weeks after application. The aim of these initial measurements was to determine whether the materials qualify for continued participation in the road trials.

Out of the 51 certification materials, 43 were approved for continued participation. Three materials were disqualified because the requirement on friction was not fulfilled, two materials were disqualified because the requirement on $R_{L,dry}$ was not fulfilled, two materials were disqualified because the requirement on colour was not fulfilled and one material was disqualified because neither the requirement on $R_{L,dry}$ nor the requirement on colour were fulfilled.

1. Introduction

A Nordic certification system for road marking materials, that applies to the countries of Denmark, Iceland (from 2019) 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. The certification system includes two test sites: one in Norway or Sweden (for product approval in Iceland, Norway and Sweden) and one in Denmark (for product approval in Denmark). At present, the Norwegian-Swedish test site, which from 2019 is called the Icelandic-Norwegian-Swedish test site, is located on road Rv2 close to Haslemoen in Norway.

A fifth round of tests in Norway/Sweden started in August 2019 with initial performance measurements two weeks later. In total, 52 materials were applied. 51 materials participated as *certification materials*, i.e. they participated with the purpose of being certified for use on roads managed by the public roads administration of Iceland, Norway and Sweden. One material participated as a *test material*, i.e. for the manufacturer's internal test. The present report documents the results of the application and of the initial performance measurements.

The aim of the initial examination and measurements was to determine whether the materials qualify for continued participation in the road trials. Follow-up measurements will be carried out and reported on materials that are approved at the initial measurements.

No material certification will be given based on the initial measurements (i.e. the results presented in this report). Certification will be given based on the results at the follow-up measurements in 2020 and 2021.

The report includes results of materials registered as *certification materials*. Results of materials registered as *test materials* will be available only to the participant.

The certification system is further described in the document *Nordic certification system for road marking materials – Version 6:2019* (Fors and Johansen, 2019) which is freely available at www.vti.se/en/publications and at www.nordiccert.com.

2. Measurements

2.1. General

The performance measurements of coefficient of retroreflected luminance R_L under dry and wet conditions, luminance coefficient under diffuse illumination *Qd*, chromaticity coordinates, and friction were carried out approximately two weeks after application.

All measurements were carried out by operators from Ramböll, supervised by an observer from VTI.

All measurement equipment was calibrated according to procedures recommended by the respective manufacturer.

2.2. Methods and measuring instruments

2.2.1. Thickness measurements

The thickness of the material was measured immediately after application. When applying the lines, material was also applied on steel plates that were placed in the end of two of the ten lines. One of the plates was applied with drop on material, and the other without any drop on. The plates were weighed before and after application. The thickness was measured from the plate without drop on, and also controlled by the weight of the material on the plate.

2.2.2. Retroreflection R_L and luminance coefficient *Qd*

The coefficient of retroreflected luminance, R_L, under dry conditions, and the luminance coefficient under diffuse illumination, *Qd*, were measured using an *LTL-XL* (Delta, Denmark). Measurements were taken at three points in a row within the measurement area defined by EN 1824, Figure 1. 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, with the same instrument and measurement points as described above. Approximately 3 litres of clean water was poured over the measurement area, and measurements were carried out 60 s afterwards.

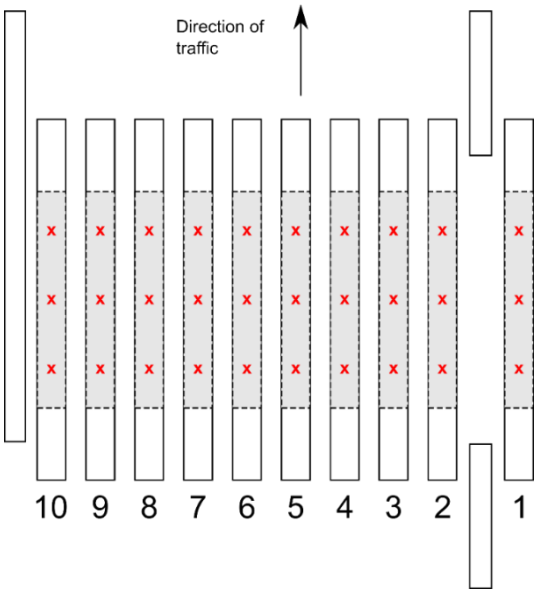

Figure 1. The measurement points (red crosses) for R_L and Qd were placed in a row within the measurement area (grey) defined by EN 1824.

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 or blackening from tyres), the instrument was moved in the longitudinal direction to the closest area not affected by abnormal dirt.

2.2.3. Chromaticity coordinates

Chromaticity coordinates were measured in one point on each line, located at the centre of the line, see Figure 2. A *Spectrophotometer CM-2500c* and a *Spectrophotometer CM-25cG* (Konica Minolta, Japan) were used to measure the colour coordinates of white materials and the daytime colour coordinates of yellow materials. Night-time colour coordinates of yellow materials were measured using an *LTL-2000Y* (Delta, Denmark).

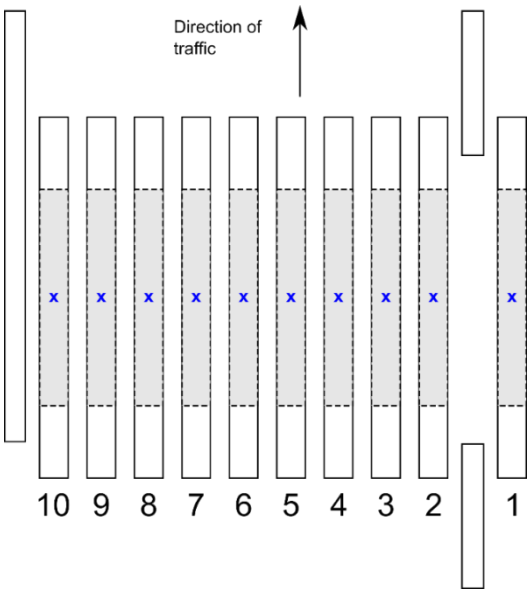

Figure 2. The measurement points (blue crosses) for chromaticity coordinates were placed in the centre of the lines.

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 a measurement point. This point had to be located within the grey area in Figure 2.

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 or blackening from tyres), the instrument was moved to the closest area not affected by abnormal dirt.

2.2.4. Friction

Friction measurements were carried out using a *Portable Friction Tester version 4* (PFT), along the centre of each line, Figure 3. 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 wetted 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).

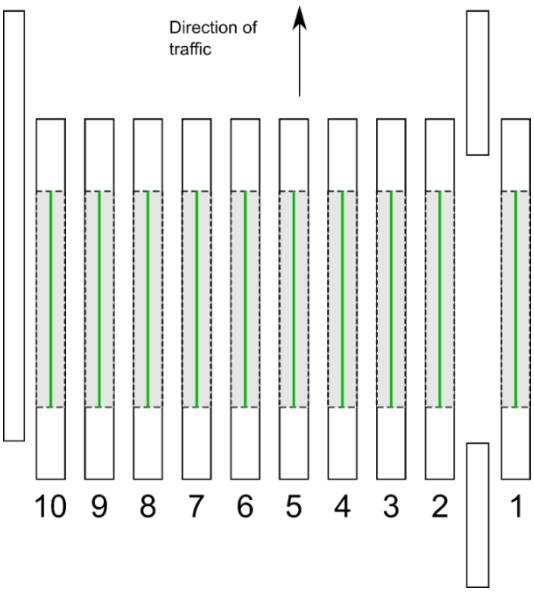

Figure 3. The measurement areas (green lines) for friction.

2.2.5. Measurement values that do not fulfil the performance requirements

In case a measured value was just below the performance requirement (see Chapter 3), 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.

2.3. Weather conditions

During the measurements, the weather was cloudy or partly cloudy. The air temperature was approximately 12˚ C (morning) – 18˚ C (day/evening), and the road surface temperature was approximately 12–19 ˚ C. All performance measurements of $R_{L,dry}$, *Qd* and chromaticity coordinates were carried out on absolutely dry markings. Due to a light sprinkle of rain, the markings were slightly wet when the measurements of friction were carried out (as the markings are wetted anyway when friction is measured, moisture will not affect the result). For $R_{L,wet}$, the markings were dry when water was poured over the measurement area.

3. Performance requirements

The performance requirements include four parameters for type I markings and five parameters for type II markings which are given in **Fel! Hittar inte referenskälla.**. These requirements apply also to inlaid markings. Table 2 shows the requirements for materials for hand applications and Table 3 shows the performance requirements for materials with enhanced durability and for temporary markings and antiskid materials.

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

Performance parameter	**Type I and type II**		**Applies to marking type**
	White	**Yellow**	
Coefficient of retroreflected luminance, R_L dry [mcd/m^2/lx]	≥ 150	≥ 100	I, II
Coefficient of retroreflected luminance, R_L wet [mcd/m^2/lx]	≥ 35	≥ 35	II
Luminance coefficient under diffuse illumination, *Qd* [mcd/m^2/lx]	≥ 130	≥ 100	I, II
Friction, [PFT units]	≥ 0.52	≥ 0.52	I, II
Chromaticity coordinates, x, y	*	**	I, II

*) According to EN 1436

**) Includes both daytime (class Y1) and night-time colour (class RC1), according to EN 1436:2018.

Table 2. Performance requirements for materials for hand application.

Performance parameter	**Materials for hand application, retroreflective**		**Materials for hand application, non-retroreflective**	
	White	**Yellow**	**White**	**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	*	**	*	**

*) According to EN 1436

**) Includes both daytime (class Y1) and night-time colour (class RC1), according to EN 1436:2018.

Table 3. Performance requirements for materials with enhanced durability and antiskid materials.

Performance parameter	Materials with enhanced durability		Antiskid materials
	White	Yellow	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	≥ 100	≥ 130
Friction, [PFT units]	≥ 0.52	≥ 0.52	≥ 0.71
Chromaticity coordinates, x, y	*	**	*

*) According to EN 1436
**) Includes both daytime (class Y1) and night-time colour (class RC1), according to EN 1436:2018.

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 3.1.

The measurement results from the nine lines in the lane or, for inlaid markings, from the four inlaid lines, were averaged and compared to the performance requirements in **Fel! Hittar inte referenskälla.**–Table 3. In order for a material to be approved for continued participation, all relevant performance parameters must fulfil the requirements.

Materials can be applied in five thicknesses. Maximum allowed thicknesses at application are given in Table 4.

Table 4. Maximum allowed thicknesses at application.

Thickness (and type of material)	Maximum thickness at application [mm]
0.4 mm wet (paint)	0.45 mm wet
0.6 mm wet (paint)	0.65 mm wet
1.5 mm (example: spray plastic)	2.0 mm
3.0 mm (example: extruded thermoplastic)	3.5 mm
5.0 mm (structured/profiled type II markings and friction materials with a very coarse surface, example: thermoplastic and cold plastic)	5.5 mm

Regarding the requirements on thickness and geometry, individual lines were disqualified if they didn't fulfil the requirements.

The reason for evaluating R_L, *Qd*, friction and chromaticity coordinates based on the average of the nine lines, but evaluating thickness and geometry for individual lines is that the four former represent the properties of the material and the most representative data on these properties is the average of all measurements taken. But for thickness and geometry, all individual lines must fulfil the requirement, since at the follow-up measurement the performance is evaluated for different P classes, where one line represent a certain P class. The performance of a single line will then have a large impact on the

result, and in case it was too thick at application, this will give unfair results. This however implies that, for materials where one or more lines were disqualified because they didn't fulfil the requirements on thickness and geometry, there is a risk that these materials cannot be evaluated and certified for certain P-classes.

3.1. Special considerations regarding friction

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 fulfill 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 and for materials with enhanced durability, 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.

4. Results

Table 5–Table 15 show the results of the initial measurements of coefficient of retroreflected luminance R_L under dry and wet conditions, luminance coefficient under diffuse illumination *Qd*, friction, chromaticity coordinates, and thickness for all 51 materials registered and applied as *certification materials* at the Icelandic-Norwegian-Swedish test site in Haslemoen 2019.

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)
Thick.	Material thickness [mm]
Appr.	Approved (**A**) or Not Approved (**NA**) for continued participation. **A*** = one or more lines are disqualified.

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

Note: the performance requirement on friction was lowered from 0.52 to 0.47 PFT units for type I and type II markings and for materials with enhanced durability, from 0.65 to 0.60 for retroreflective materials for hand application and from 0.71 to 0.66 PFT units for antiskid materials and for non-retroreflective materials for hand application in order to minimize the risk that materials are rejected because of an uncertainty in the translation from PFT units into SRT units.

4.1. White road markings

4.1.1. Type I

4.1.1.1. Material thickness 0.4 mm

Table 5. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White type I markings, 0.4 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	***Qd***	***Frict.***	***Colour***	***Thick.***	***Appr.***
Geveko Markings EXP19 60xx A [0.4 mm]	397	-	176	0.71	OK	0.40	**A**
Geveko Markings EXP19 60xx B [0.4 mm]	430	-	173	0.66	OK	0.40	**A**
Geveko Markings EXP19 60xx C [0.4 mm]	339	-	192	0.68	OK	0.40	**A**
Visafo VIT VISA 36 [0.4 mm]	461	-	191	0.48	OK	0.40	**A**
Visafo VIT VISA 37 [0.4 mm]	447	-	194	0.49	OK	0.40	**A**

4.1.1.2. Material thickness 0.6 mm

Table 6. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White type I markings, 0.6 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	***Qd***	***Frict.***	***Colour***	***Thick.***	***Appr.***
Geveko Markings EXP19 60xx A [0.6 mm]	597	-	173	0.60	OK	0.60	**A**
Geveko Markings EXP19 60xx B [0.6 mm]	564	-	174	0.55	OK	0.55	**A**
Geveko Markings EXP19 60xx C [0.6 mm]	343	-	194	0.58	OK	0.60	**A**
Visafo VIT VISA 36 [0.6 mm]	563	-	192	0.44	OK	0.55	**NA**
Visafo VIT VISA 37 [0.6 mm]	599	-	199	0.47	OK	0.60	**A**

4.1.1.3. Material thickness 1.5 mm

Table 7. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White type I markings, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***Thick.***	***Appr.***
Hot Mix Hotmix 3000 Type I Spray	133	-	220	0.76	OK	1.1	**NA**
Kelly Bros White Spray Briteline (NE)	202	-	205	0.59	OK	1.3	**A**
Kestrel Thermoplastics Eurolux SC White Spray 0023	251	-	215	0.60	OK	1.5	**A**
Promax SSNI19WI	269	-	195	0.57	OK	1.1	**A**
Svevia X1950	306	-	213	0.61	OK	1.0	**A**
Svevia X1951	246	-	208	0.60	OK	1.2	**A**

4.1.1.4. Material thickness 3 mm

Table 8. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White type I markings, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Thick.*	*Appr.*
Ennis Flint Crystalex W2019.1	566	-	194	0.48	OK	2.7	**A**
Ennis Flint Crystalex W2019.2	422	-	200	0.50	OK	2.7	**A**
Geveko Markings ViaTherm® EXP 18 71 EP	375	-	196	0.50	OK	3.4	**A**
Hot Mix Hotmix 3000 Type I Extruder	49	-	239	0.74	OK	1.5	**NA**
Kelly Bros White Flexi Cold Plastic (NE)	184	-	170	0.57	OK	1.8	**A**
Kestrel Thermoplastics Eurolux SC White 0021	322	-	212	0.56	OK	3.4	**A**
Kestrel Thermoplastics Eurolux SC White 0022	309	-	211	0.58	OK	3.2	**A**
Promax SNI19WI	194	-	203	0.54	OK	3.5	**A**
Scandinavian Road Paint SRP T19	219	-	192	0.66	OK	2.5	**A**
Svevia X1910	340	-	205	0.60	OK	3.1	**A**
Svevia X1920	324	-	203	0.62	OK	2.9	**A**
Svevia X1930	272	-	206	0.66	OK	3.1	**A**

4.1.2. Type II

4.1.2.1. Material thickness 5 mm

Table 9. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White type II markings, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***Thick.***	***Appr.***
Hot Mix Hotmix 3000 Type II *Profile/pattern:* Roll	175	77	186	0.86	OK	3.8	**A**
Promax SNI19WTII *Profile/pattern:* Rullad	200	83	177	0.79	OK	4.4	**A**
Svevia X1911 [type II] *Profile/pattern:* Rolled	202	94	193	0.87	OK	4.6	**A**
Svevia X1921 *Profile/pattern:* Rolled	190	85	193	0.88	OK	5.1	**A**
Svevia X1931 *Profile/pattern:* Rolled	214	94	194	0.77	OK	4.6	**A**

4.1.3. Inlaid type II

4.1.3.1. Material thickness 5 mm

Table 10. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White inlaid type II markings, 5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***Thick.***	***Appr.***
Geveko Markings ViaTherm® EXP 19 35 E RW2 *Profile/pattern:* Drops	161	39	181	0.70	OK	4.7	**A**
Kestrel Thermoplastics Eurodot SC White 0026 *Profile/pattern:* Dots	274	54	154	0.62	OK	4.7	**A**
Svevia X1911 [type II inlaid] *Profile/pattern:* Rolled	210	105	183	0.81	OK	4.7	**A**

4.1.4. Materials for hand application, retroreflective

4.1.4.1. Material thickness 3 mm

Table 11. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White materials for hand application, retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Thick.*	*Appr.*
Geveko Markings ViaTherm® EXP 19 35 H	227	-	205	0.59	OK	3.2	NA
Geveko Markings ViaTherm® EXP 19 73 H	162	-	218	0.71	OK	3.4	A
Geveko Markings ViaTherm® EXP 19 73 HF R2 [r]	272	-	213	0.53	OK	3.5	NA
Svevia X1940	323	-	201	0.62	OK	3.3	A

4.1.5. Materials for hand application, non-retroreflective

4.1.5.1. Material thickness 3 mm

Table 12. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White materials for hand application, non-retroreflective, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Thick.*	*Appr.*
Geveko Markings ViaTherm® EXP 19 73 HF R2 [non-r]	(40)*	-	207	0.80	OK	3.1	A

*) No requirement

4.1.6. Materials with enhanced durability

4.1.6.1. Material thickness 3 mm

Table 13. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. White materials with enhanced durability, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	$R_{L,dry}$	$R_{L,wet}$	*Qd*	*Frict.*	*Colour*	*Thick.*	*Appr.*
Geveko Markings ViaTherm® EXP 19 57 R0	(226)*	-	187	0.52	OK	3.5	A

*) No requirement

4.2. Yellow Road Markings

4.2.1. Type I

4.2.1.1. Material thickness 1.5 mm

Table 14. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. Yellow type I markings, 1.5 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***NTY***	***Thick.***	***Appr.***
Geveko Markings ViaTherm® EXP 19 NTY 73S A	148	-	132	0.57	OK	OK	1.9	**A**

4.2.1.2. Material thickness 3 mm

Table 15. Results of the initial measurements at the Icelandic-Norwegian-Swedish test site in 2019. Yellow type I markings, 3 mm. Alphabetical order by manufacturer.

Manufacturer *Material*	***$R_{L,dry}$***	***$R_{L,wet}$***	***Qd***	***Frict.***	***Colour***	***NTY***	***Thick.***	***Appr.***
Ennis Flint Crystalex Y2019.3	356	-	129	0.49	OK	OK	3.3	**A**
Ennis Flint Crystalex Y2019.4	319	-	126	0.48	OK	OK	3.1	**A**
Geveko Markings ViaTherm® EXP 19 NTY 73E A	167	-	141	0.59	OK	OK	3.3	**A**
Hot Mix Hotmix 3000 Type I Yellow	65	-	134	0.76	outside	OK	1.9	**NA**
Kelly Bros Yellow Extr. / Scr. Briteline (NE)	142	-	154	0.51	OK	OK	2.6	**A**
Kestrel Thermoplastics Eurolux SC Yellow 0024	190	-	133	0.48	outside	OK	2.7	**NA**
Kestrel Thermoplastics Eurolux SC Yellow 0025	211	-	120	0.52	outside	OK	2.6	**NA**
Promax SNI19YI	187	-	110	0.53	OK	OK	3.5	**A**

4.3. Summary of the results

In total, 51 materials, whereof 42 are white and 9 yellow, participated as *certification materials*. Out of the 51 materials, 43 were approved for continued participation. The number of approved and not approved materials per material category is shown in Table 16–Table 18.

Table 16. Summary of the results of the initial measurements for white type I and type II materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Number of approved and not approved materials per material category.

	White						
	Type I				Type II	Inlaid type II	
Result	0.4 mm	0.6 mm	1.5 mm	3 mm	5 mm	5 mm	*Total*
Approved	5	4	5	11	5	3	*33*
Not approved	-	1	1	1	-	-	*3*
Total	*5*	*5*	*6*	*12*	*5*	*3*	*36*

Table 17. Summary of the results of the initial measurements for white materials for hand application and materials with enhanced durability applied at the Icelandic-Norwegian-Swedish test site in 2019. Number of approved and not approved materials per material category.

	White			
	Materials for hand application, retroreflective	Materials for hand application, non-retroreflective	Materials with enhanced durability	
Result	3 mm	3 mm	3 mm	*Total*
Approved	2	1	1	*4*
Not approved	2	-	-	*2*
Total	*4*	*1*	*1*	*6*

Table 18. Summary of the results of the initial measurements for yellow materials applied at the Icelandic-Norwegian-Swedish test site in 2019. Number of approved and not approved materials per material category.

	Yellow		
	Type I		
Result	1.5 mm	3 mm	*Total*
Approved	1	5	*6*
Not approved	-	3	*3*
Total	*1*	*8*	*9*

References

Fors, C. and Johansen, T.C. (2019). *Nordic certification system for road marking materials – Version 6:2019.* VTI notat 10A-2019. Swedish National Road and Transport Research Institute, Linköping, Sweden.

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