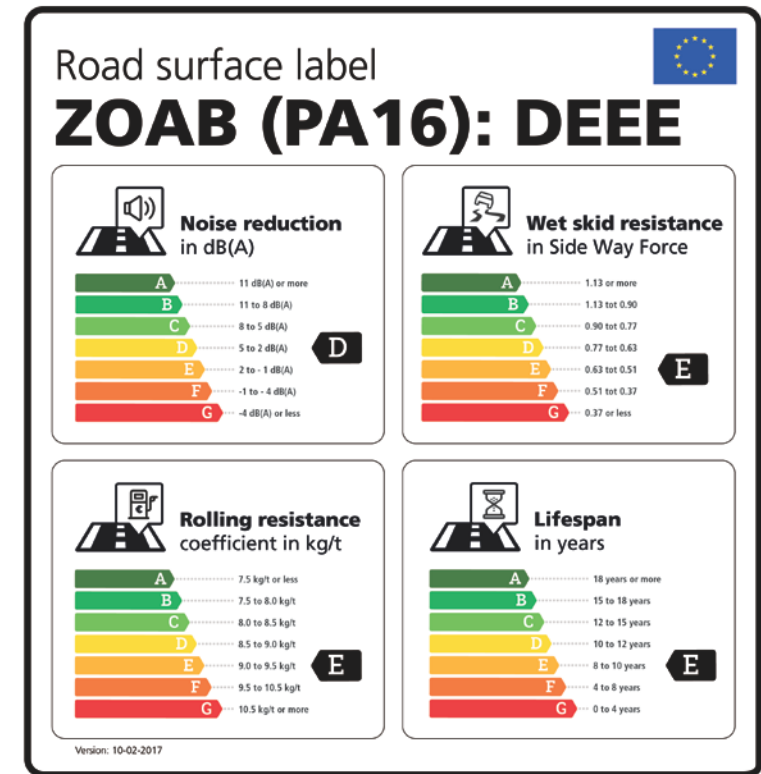


Labelling road surfaces

An initiative from the Netherlands



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UNECE Working Party on Noise (GRB)

5th September 2017, Geneva



Content of the presentation

- Why road surface labels?
- How does it benefit society?
- Boundary conditions
- Methodology and measurement methods
- Implementation of road surface labels
- How to use the road surface label in tenders for roads construction & maintenance?
- Conclusions and recommendations
- How to proceed?

Follow-up on EU research project: Safe and Silent Road Traffic



STIL VEILIG WEGVERKEER



Why road surface labels?

- Recognition for society and politicians
- To acknowledge that a road surface is a product that can industrially be developed, designed, built, maintained and removed
- To facilitate the collaboration between tyre manufacturers and road builders and other relevant industrial partners → shorter innovation cycles (shorter time-to-market)
- It makes the optimisation of tyre-road interaction really possible
- It facilitates the interaction and communication with road users and residents
- Focus on the road surface label, not on changing the existing tyre label





How does it benefit society?



Labelling is a method to encourage progress and stimulates optimisation:

- Safety - Skid resistance;
- Liveability, health - Noise (reduction);
- Sustainability and economics (road user) - Rolling resistance;
- Availability, durability and economics (road owner) - Lifespan.

Line of thought (for each item):

- At present, on average approximately label F/E;
- Short term potentially to label D/C via smart contracts of the client + innovations from the contractor;
- Medium term (5-7 years) label B possible;
- Long term (7-10 years) label A possible.



Benefits – the numbers (NL)

Labelling is a method to encourage progress and stimulates optimisation.

- Skid resistance – risk of accidents 3x smaller at a proper skid resistance (road accidents cost NL approximately €8 billion annually).
- Noise (reduction) – 9 dB(A) noise reduction seems possible by optimum tyre-road combination (EU-project ‘Safe and Silent Road Traffic’)
- Rolling resistance – 10-30% reduction rolling resistance → 2-6% fuel savings → saving 488 mln. litres and 1000 kton CO₂ (NL)
- Lifespan – from 9 years to 10-12 years (i.e. for porous asphalt)

* Benefits determined for the Netherlands; still to be determined for Europe



Boundary conditions and assumptions

- Relate to the existing labels for tyres (same properties or performance indicators)
- Suitable for current and future vehicle fleet
- Covers the essential road surface functionalities for existing and new roads
- Should provide opportunities for innovations
- Label is based on in-situ properties, based on advanced laboratory research tests, predictive models and previous in-situ experience
- Product development not on the road (high risks and time consuming), but preferably using (advanced) laboratory methods and modelling
- Self-regulating and an independent authority that validates the self-regulation
- Label-requirements will be determined per project and thoroughly underpinned
- Used by professional road authorities and contractors
- Label directly after construction, but possibly also requirements over time (end of life)

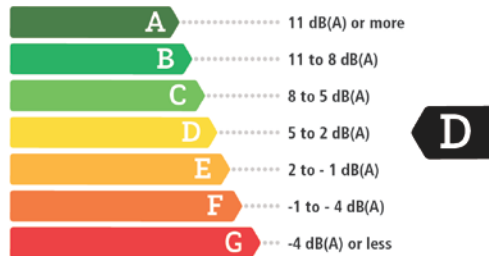
Road surface label



ZOAB (PA16): DEEE



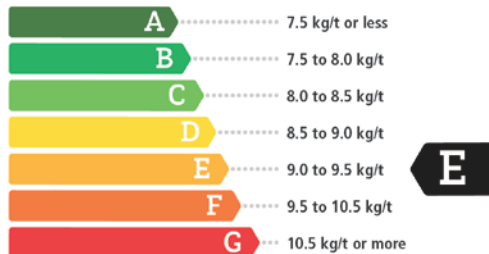
Noise reduction
in dB(A)



Wet skid resistance
in Side Way Force



Rolling resistance
coefficient in kg/t



Lifespan
in years



Noise reduction

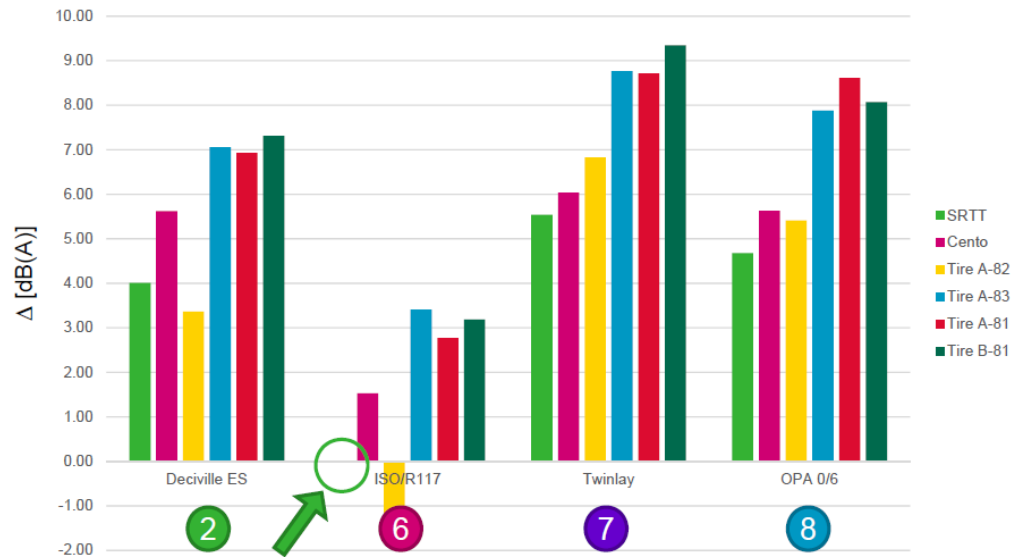
Noise reduction in dB(A)

A	11 dB(A) or more
B	11 to 8 dB(A)
C	8 to 5 dB(A)
D	5 to 2 dB(A)
E	2 to - 1 dB(A)
F	-1 to - 4 dB(A)
G	-4 dB(A) or less

Noise reduction

Silent and safe road traffic:
test sections at airport Twente
(PhD research M. Bezemer,
University of Twente)

Up to 9 dB(A) seems possible with
optimal tyre-road combination
compared to ref. tyre and ref. road
(SRTT, ISOR117, CPX 80 km/h)



Rolling resistance



Rolling resistance coefficient in kg/t

A	7.5 kg/t or less
B	7.5 to 8.0 kg/t
C	8.0 to 8.5 kg/t
D	8.5 to 9.0 kg/t
E	9.0 to 9.5 kg/t
F	9.5 to 10.5 kg/t
G	10.5 kg/t or more

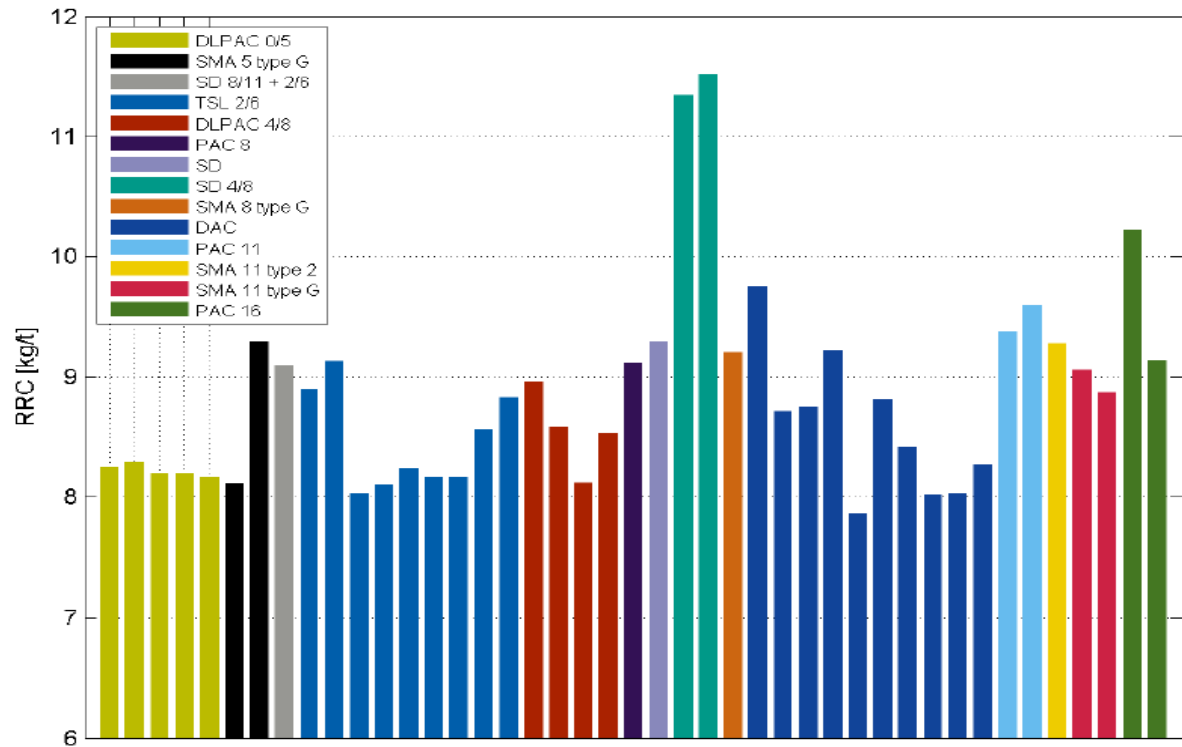


Rolling resistance

10-30 % reduction of the rolling resistance possible.

This leads to app. 2-6 % fuel savings.

NL: 488 mln. litres and 1000 kton CO₂ annually.



Skid resistance (wet)

Wet skid resistance in Side Way Force

A

1.13 or more

B

1.13 to 0.90

C

0.90 to 0.77

D

0.77 to 0.63

E

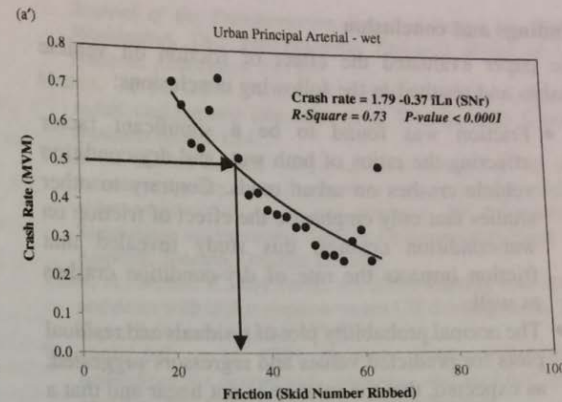
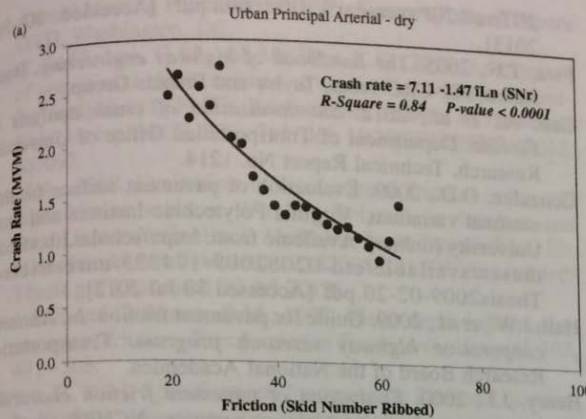
0.63 to 0.51

F

0.51 to 0.37

G

0.37 or less

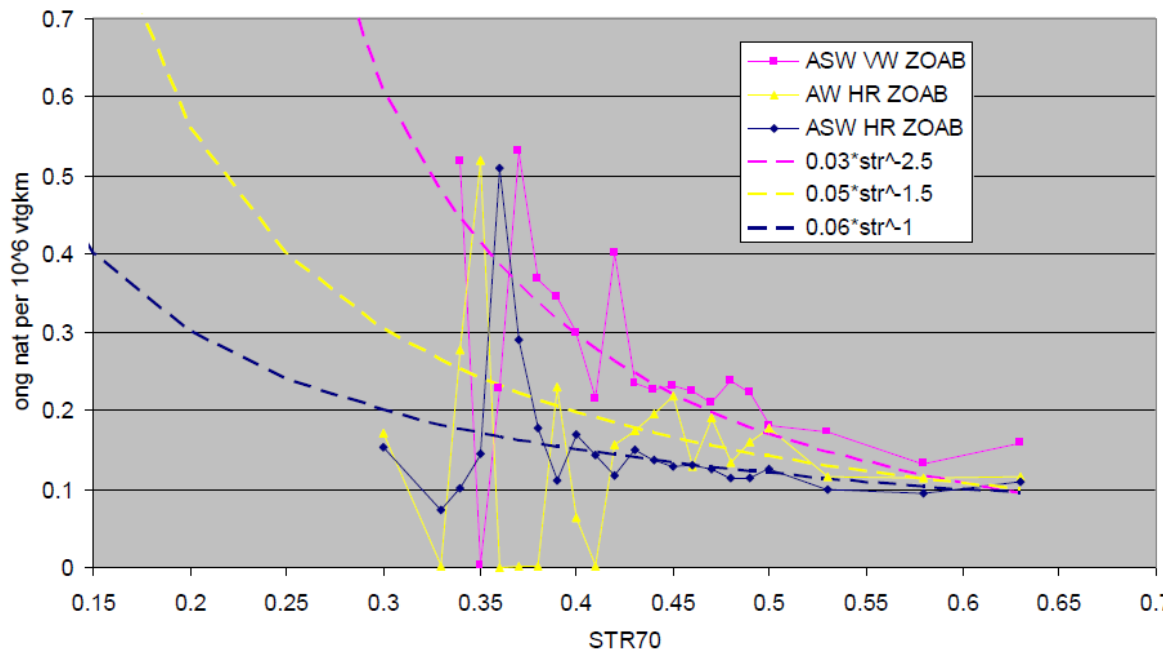


Skid resistance (wet)

Risk of accidents app. 3x smaller at a proper skid resistance.

Accidents costs NL app. €8 bn. annually.

Estimated saving due to labelling: 1.25% = 100 mln



Lifespan

Lifespan in years

A

18 years or more

B

15 to 18 years

C

12 to 15 years

D

10 to 12 years

E

8 to 10 years

F

4 to 8 years

G

0 to 4 years

Lifespan

- Ravelling
- Rutting
- Cracking





Measurement methods in-situ: Noise reduction

- Noise reduction based on Noise Directive 2015/996/EC for $m=1$ (light motor vehicles) and A-weighted over all octave bands
- Reference road surface: Reference conditions of Noise Directive 2015/996/EC measured according to ISO 11819-1:1997 SPB-method
- In-situ monitoring: CPX-method (ISO 11819-2:2017)
- Label scale: Noise reduction at 80 km/hr, light motor vehicles
- CEN-TC227/WG 5 (Road materials, pavement surface characteristics): Harmonising noise measurement methods, still under development. Possible to use this in the future



Measurement methods in-situ: Wet Skid Resistance

- Wet sideway force skid resistance coefficient at 80 km/hr using German SKM (CEN/TS 15901-8), according to TP Griff-StB 07 (SKM)
- German SKM and British SCRIM (CEN/TS 15901-8 and -6) are similar, but procedures still differ
- Possible to work with conversion tables in the future
- Measurement method for tyre label not possible because deceleration (from 80 to 20 km/hr) not applicable in in-traffic conditions
- Label scale: Wet skid resistance after 3-6 months of traffic (can fluctuate significantly directly after construction)
- Prediction: Friction After Polishing (NEN-EN 12697-49:2014) and SR-ITD machine developed in EU-project SKIDSAFE
- European harmonisation is being worked on by CEN, but not yet achieved.



Measurement methods in-situ: Rolling resistance

- Rolling resistance coefficient: Ratio horizontal force over vertical force (N/N or kg/ton)
- Direct measurement: TU Gdansk trailer measuring rolling resistance
- Indirect: Macrotexture of the road, MPD (mean profile depth) according to ISO 13473-1:1997 and ISO 13473-2:2002 + MPD-RR model [M+P.PGEL.17.06.1]



Measurement methods in-situ: Lifespan

The lifespan encompasses all types of distress:

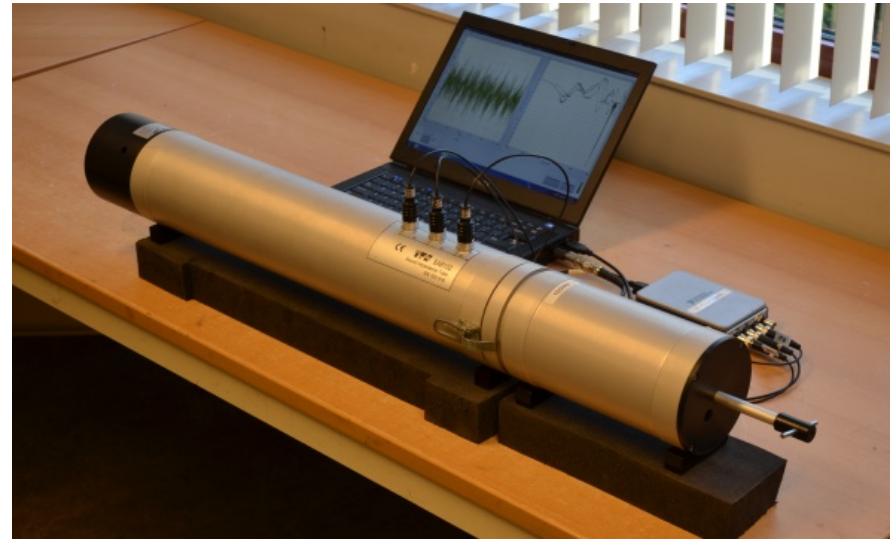
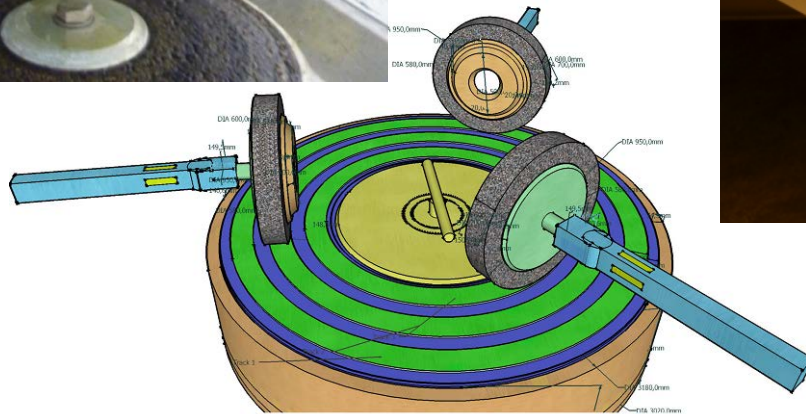
- Unevenness
- Cracking
- Ravelling

Type of distress that first reaches the serviceability limit values (defined in contract or in national or international regulations) defines the ultimate lifespan

Laboratory (indicative) tests: NEN-EN 12697 (test methods for hot mix asphalt)



Measurements methods in the laboratory

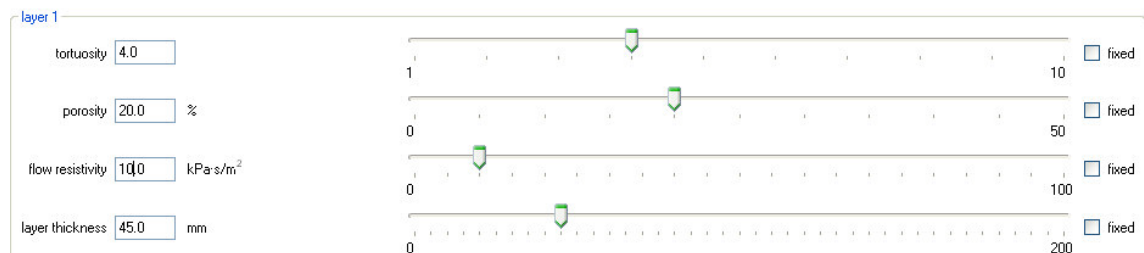
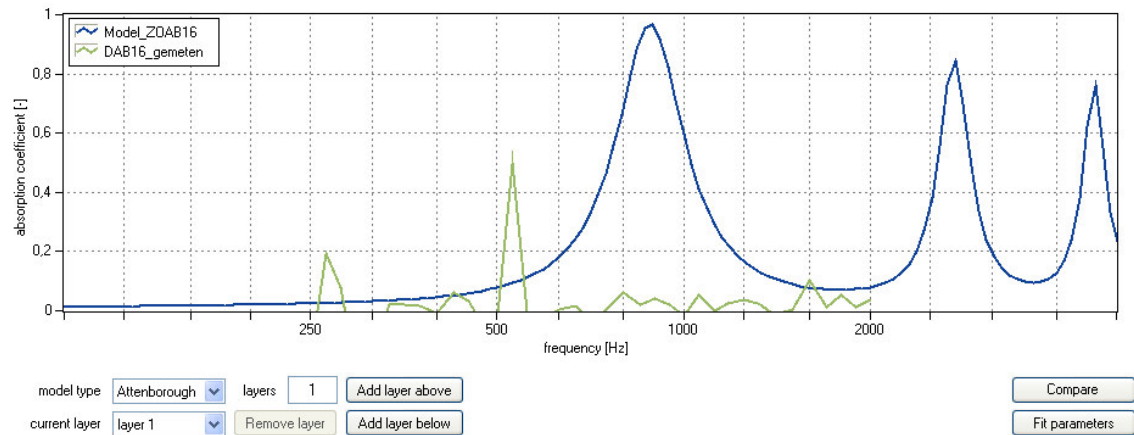




Modelling: Acoustic Optimization Tool

Calibrated noise prediction model based on:

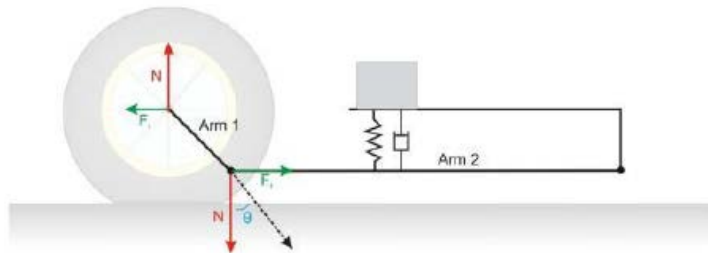
- Tortuosity
- Porosity
- Flow resistivity
- Layer thickness



Different measurement methods road and tyre industry



figuur 1 De TU Gdansk trailer voor het uitvoeren van rolweerstandmetingen. De gedetailleerde foto laat de bevestiging van de meetband zien



Examples different (Dutch) road surface labels

Currently best available:

- DCDC (focus on lifespan and noise)
- CCDD (focus on rolling resistance and noise)

Road surface	Rolling resistance	Noise	Skid resistance	Lifespan	Label
AC 11 surf	C	E	D	C	CEDC
Surface dressing	G	F	E	F	GFEF
PA 16	E	D	E	D	EDED
2L-PA 8	D	C	E	E	DCEE
OPA8-Plus	D	C	D	C	DCDC
Novachip 5	C	C	D	D	CCDD



Example of using the Road Surface Label in tenders

Criterion	Value		
Price (road construction)	40 %	* most economically advantageous tender (MEAT)	
Road Surface Label	60 %		
	Minimum	1 label category higher	2 label categories higher
Wet skid resistance	E (0.38-0.45)	D: 10%	C: 15%
Noise reduction	D (2-5 dB(A))	C: 20%	B: 20 %
Rolling resistance	E (8.5-9.0 kg/ton)	D: 10%	C: 15 %
Lifespan	E (8-10 years)	D: 20%	C: 35%
Degree of reliability / evidence	For each indicator 1x evidence	For each indicator 2x evidence: 5 %	For each indicator 3x evidence: 10 %



Conclusions and recommendations

- A road surface label would be a step forward towards professionalising and industrialising the road construction industry
- The described methodology and labels are a first step based on existing practical experience and the latest scientific knowledge – possibly upgrade in i.e. 5 years
- Enormous steps forward seem to be possible regarding improved skid resistance, noise reduction, rolling resistance and lifespan
- Possible to practically use it in tenders for roads and underpin it with existing (national) measurement methods



How to proceed?

- First pilot Province of Gelderland, the Netherlands (demonstration) in 2017
- Input on our proposal (Informal document) → working document → [WP 29](#)
- Format and methodology available for everyone
- No normative legislation desired, but voluntarily use and apply the road surface label
- Include European working groups, i.e. CEN-TC227/WG5 and Rosanne EU-project
- Optimisation pavement-tyre interaction: Discuss with the automotive and tyre industry



For more information

Informal document:

<http://www.unece.org/fileadmin/DAM/trans/doc/2017/wp29grb/GRB-66-05e.pdf>

Questions:

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