ONTWIKKELINGEN IN DE BETONWEGENSECTOR

LESSEN VAN HET 13E INTERNATIONAAL BETONWEGENSYMPOSIUM TE BERLIJN – JUNI 2018

ANNE BEELDENS, *PROF.DR.IR.*

RAADGEVEND INGENIEUR AB-ROADS

GASTPROFESSOR KULEUVEN

A.BEELDENS@AB-ROADS.COM

+32 486 91 35 96

19 - 22 JUNE 2018

13th International Symposium
on Concrete Roads, Berlin, Germany

« CONCRETE CONNECTS »

450 deelnemers uit 30 landen

Voordrachten, posters en technische excursies
met live demonstraties

BERLIN 13th International Symposium on Concrete Roads 2018

Beton

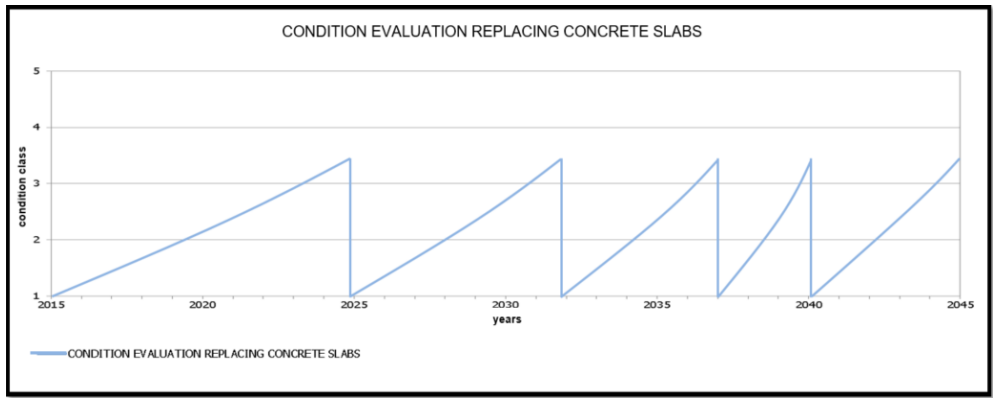
EUPAVE EUROPEAN CONCRETE PAVING ASSOCIATION

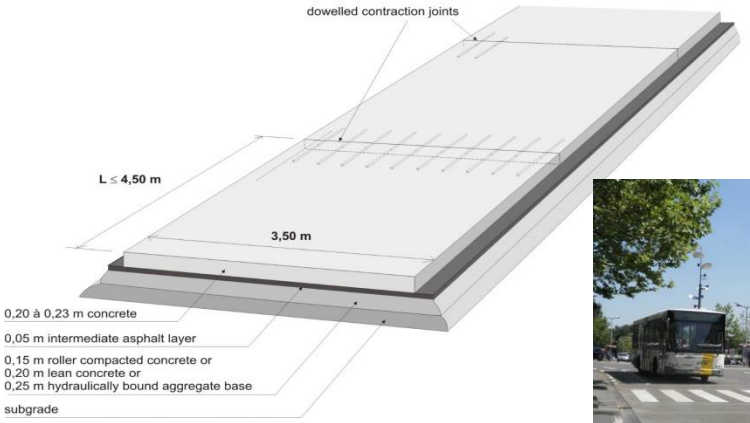
ROADS

“CONCRETE CONNECTS”: 11 VERSCHILLENDE THEMA’S

- Zwaar belaste betonwegen
- Autosnelwegen en zwaar belaste parkeerzones
- Stedelijke en landelijke wegen, kruispunten en rondpunten
- Materialen – beton voor verschillende toepassingen
- Onderhoud en beheer
- Oppervlakeigenschappen en nieuwe uitvoeringsmethodes
- Betonwegen algemeen toegepast
- Kwaliteitscontrole en meetmethodes
- Geprefabriceerd beton
- Big data
- Grondbehandeling

BUSBANEN – PAULI, GROSSMANN, SILFWERBRAND





THIN WHITE TOPPING OP EEN RONDPUNT - CARRASCON

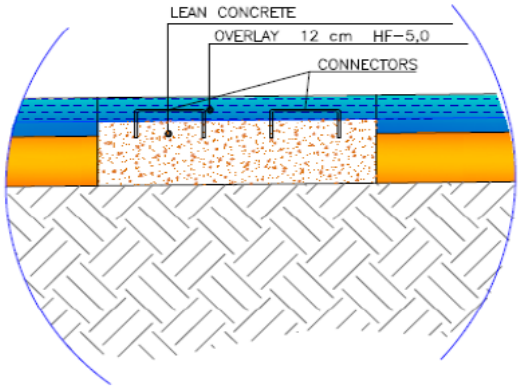




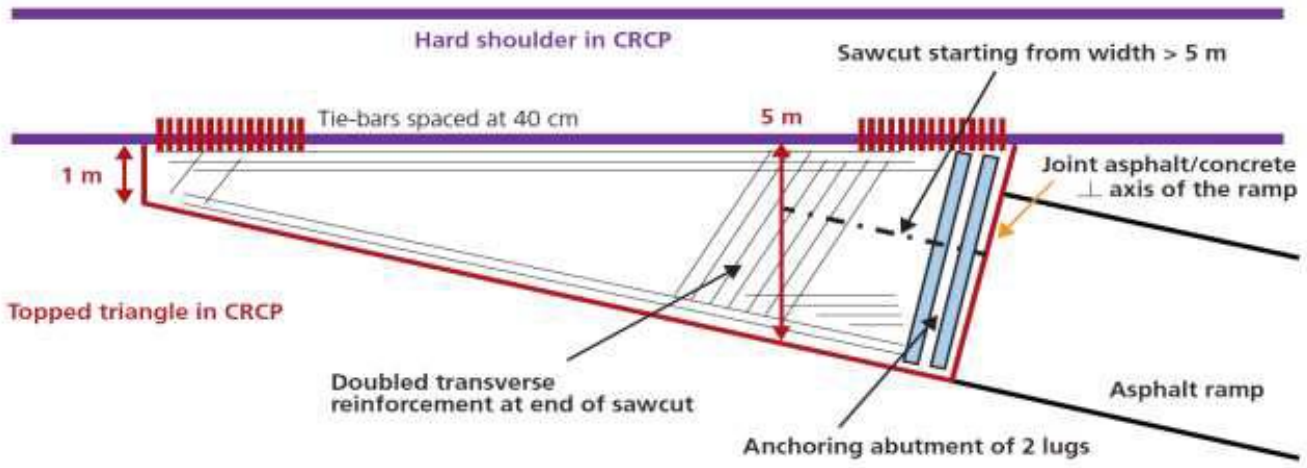




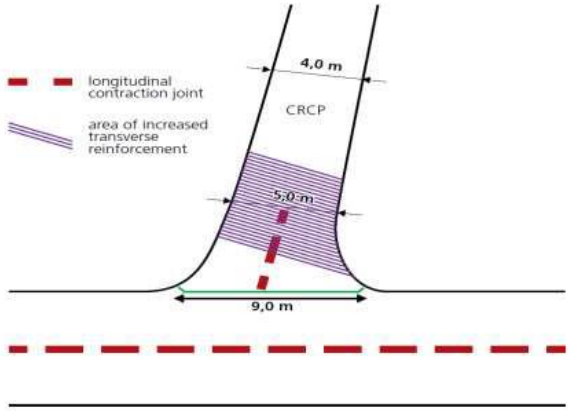
RUT REPLACEMENT

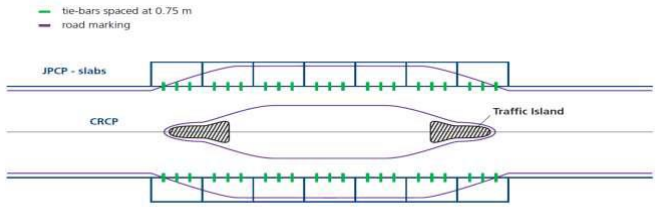


DOORGAAND GEWAPEND BETON – DETAILS RENS - BELGIË



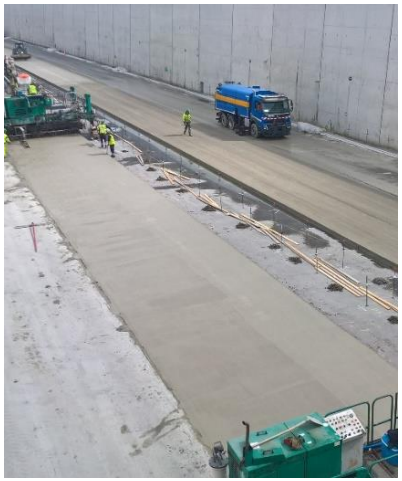
DOORGAAND GEWAPEND BETON – DETAILS
LUC RENS - BELGIË

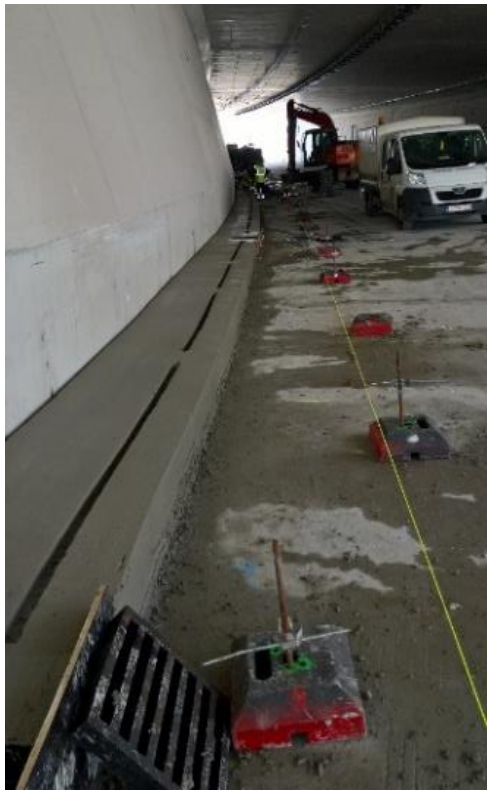


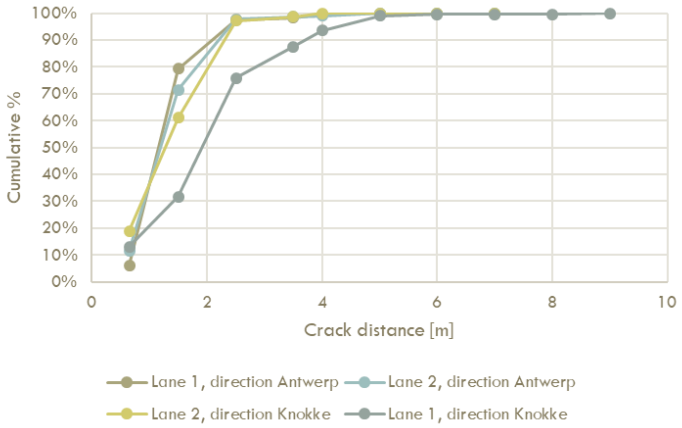


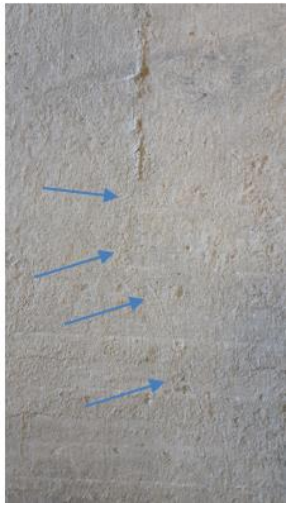
AB ROADS

A11 EN E420 – TWEE RECENTE TOEPASSINGEN IN BELGIË VAN TWEELAAGS DGB MET SCHEURAANZETTEN – BALFROID









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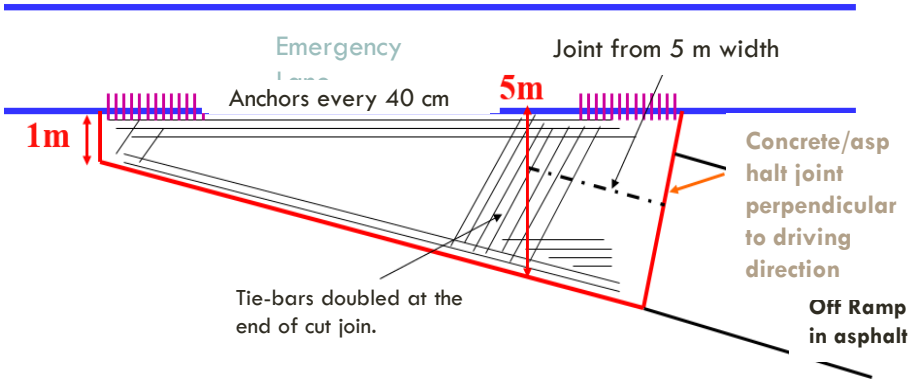
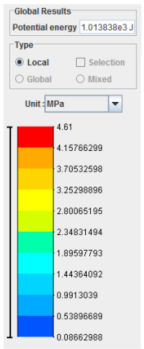




@Pieter De Winne

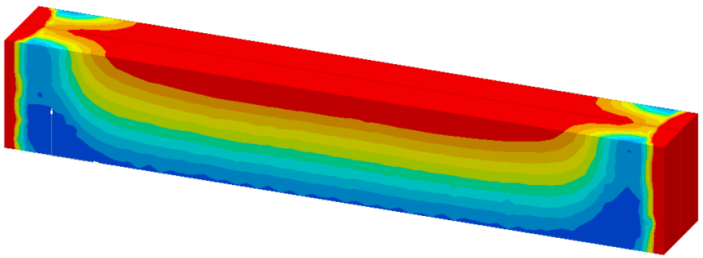
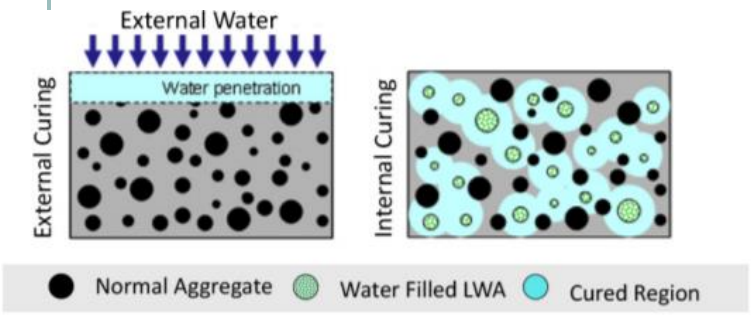


Figure 50: First principal stresses in the element with a total length of 1.4 m

ROADS

CRCP EN INTERNE CURING – DAHAL, ROESLER E.A.



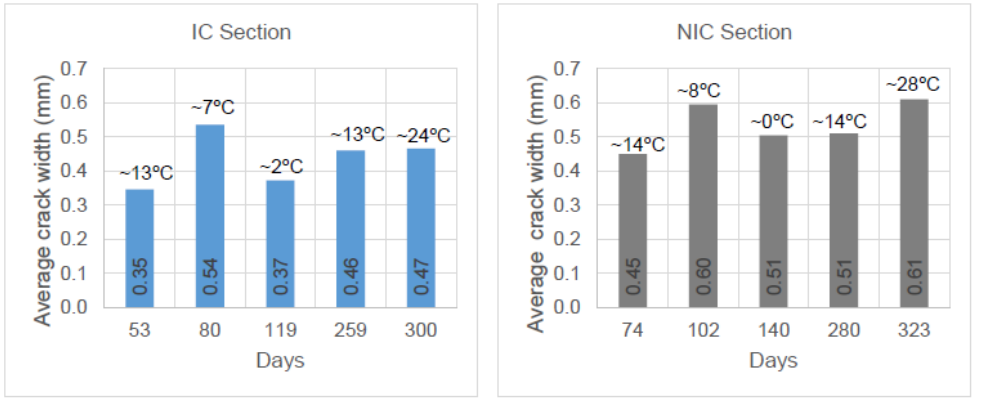


Figure 7 – Average crack width (in mm) and air temperature for different ages of IC (left) and NIC section (right).

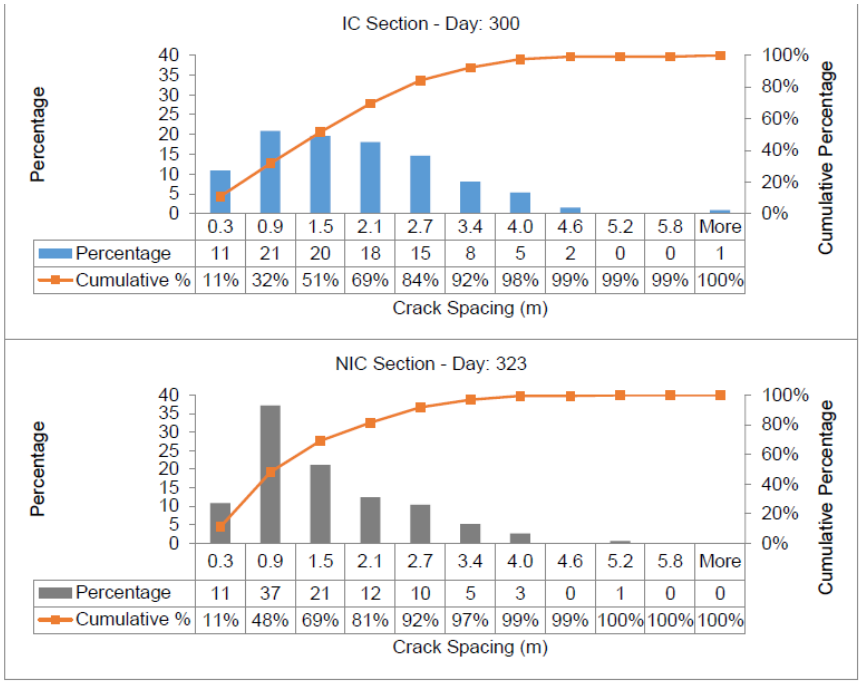
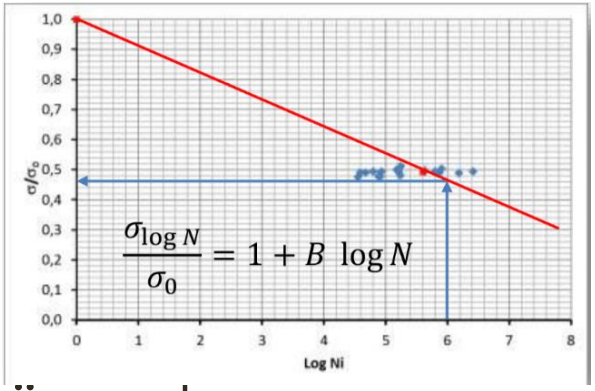


Figure 5 – Crack spacing distribution of IC section on day 300 (top) and of NIC section on day 323 (bottom).

RECYCLEREN VAN BETON IN BETON – SEDRAN - MARTINEZ

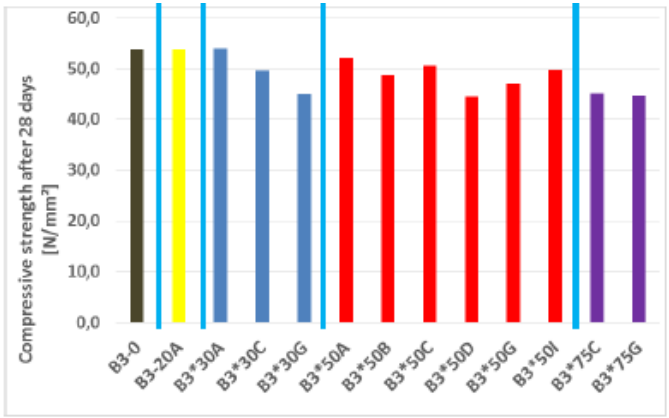
Mix (kg/m³)	C-0S-0G	C-50S-100G	C-100S-100G
Added water	179.5	245	271
Efficient water	169.1	167.5	176.7
Cement CEMII/A-L 42,5 N	308	385	443
Limestone filler	45	50	63
Natural sand 0/4	747	337	
Natural gravel 4/10	256		
Natural gravel 6.3/20	785		
Recycled sand 0/4		337	653
Recycled gravel 4/10		229	296
Recycled gravel 10/20		615	430
Retarder		2.7	3.6
Superplasticizer	0.7	2.3	3.5

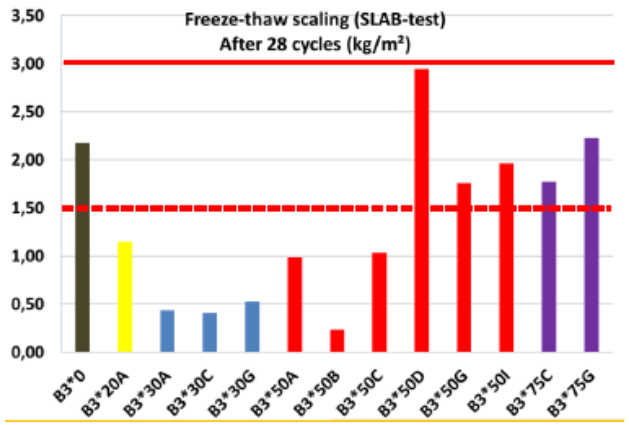


Groot verschil indien zelfde sterkte of zelfde vermoeiingsgedrag gevraagd wordt – vermoeiingsgedrag verandert zeer weinig door vervanging van grof en fijn granulaat – sterkte wel, vooralbij toevoeging van betonzand

HOOGWAARDIG BETONGRANULAAT IN BELGIË – ELIA BOONEN

RCA type	Fines content	Particle density	Water absorption	LA	MDE	Flakiness index
	[%]	[kg/m³]	[%]	[%]	[%]	[%]
A-1	1.7	2500	2.9	25	18	6
B-1	1.6	2320	5.3	30	23	7
C-1	2.1	2280	6.6	36	24	9
D-1	2.0	2400	4.3	25	18	7
G-1	2.3	2320	5.8	31	29	5
I-1	4.4	2310	5.7	31	21	5
Requirements prNBN B 15-001	***≤ 1.5***	***≥ 2200***	***≤ 10***	***≤ 35***	-	***≤ 20***





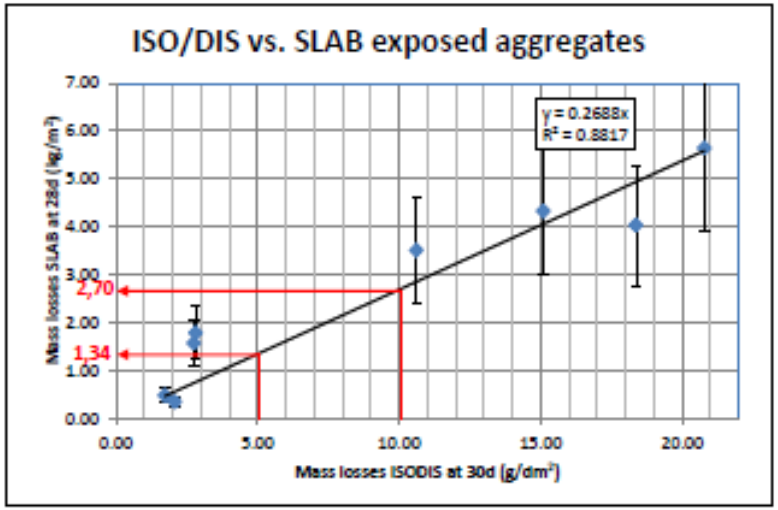
- d ≥ 4 mm en D ≥ 10 mm;
- Minimaal Rc_{90}, Rcu_{95}, Ra_1, $XRg_{0,5}$, FL_{2-}
- Minimaal Fl_{20}, $f_{1,5}$, LA_{35}, $SS_{0,2}$, A_{40}
- Volumieke massa ≥ 2200 kg/m³,
- Waterabsorptie ≤ 10%, met max. variatie van +/- 2% ten opzichte van de gedeclareerde waarde.

Partner institutes
(Financial) Support

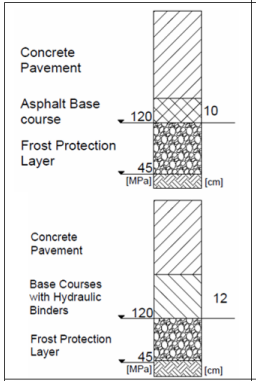
WEERSTAND TEGEN AFSCHILFERING: VERGELIJKING VAN TWEE TEST METHODES – SYLVIE SMETS

	Slab-test RNR06 (based on CEN/TS 12390-9)	ISO/DIS 4846.2
Test surface	cast side of a cube (also on extracted cores) CEN/TS 12390-9: sawn surface	Upper side of core extracted from the road (finished surface)
Number of cycles	28 (24h each) CEN/TS 12390-9: 56 cycles	30 (24h each)
De-Icing salt	3% NaCl	3% $CaCl_2$
Isolation of sample	yes 	no 
Collecting scaled material	Rinsing bottle CEN/TS 12390-9: brush	Rinsing bottle
Result unit	kg/m^2	g/dm^2

Specification	Test method	Number of cycles	Unit	Traffic class	
				B1-B5/RI	B6-B10, BF/ RII,RIII
Qualiroutes	ISO/DIS 4846.2 (“CME 53”)	30	g/dm^2	≤5	≤ 10
CCT2015	ISO/DIS 4846.2	30	g/dm^2	≤ 5	≤ 10
SB 250	CEN/TS 12390-9	28	kg/m^2	≤1.500	≤3.000



ZWAAR BELASTE INDUSTRIËLE BELASTINGEN FREUDENSTEIN EN BOLLIN



	Load Category	A	B	C	D	E	F	G	H
	Thickness of concrete layer [cm] on bonded base layer	27	31	36	42	45	48	52	60

•Determination of the **load category** for loads out of **mobile cargo-handling vehicle / truck**:

Maximum Axle Load [Ton]	< 40	40 - 80	80 - 120	120 - 140
Load Category	A	C	E	F

•Determination of the load category for loads out of **container arrangement**:

	Stacking Height	*	*	**	**
Series Lineup		1-fold	2-fold	3-fold	4-fold
One Lineup	Container 1 / Container 2	A	C	D	G
Several Lineup	Container 1 / Container 2 / Container 3 / Container 4 / Container 5 / Container 6	B	E	G	H

* Load Approach 33 t/Container
** Load Approach 80% out of 33 t/Container

Top View

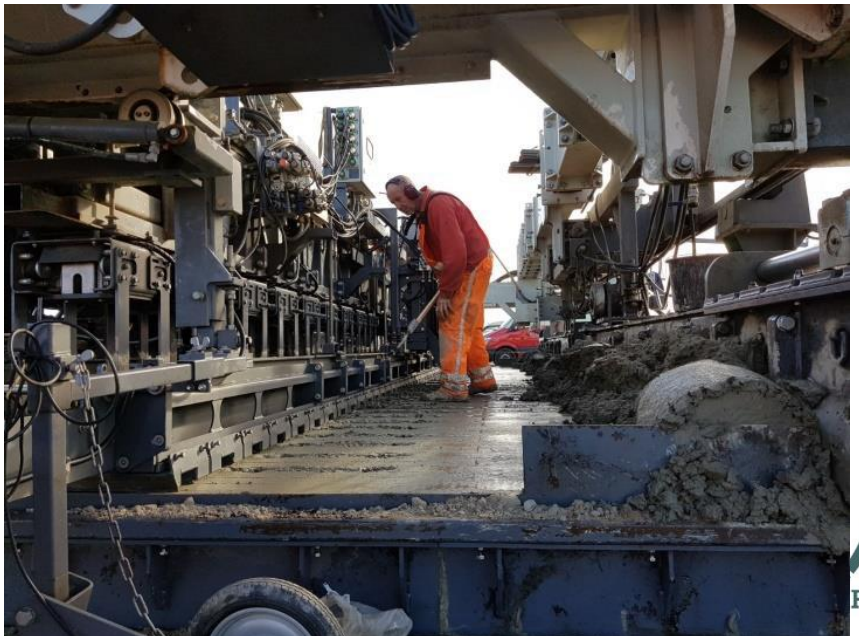
Container 1	Container 2
Container 3	Container 4
Container 5	Container 6

Load Point

Forschungsgesellschaft für Straßen- und Verkehrswesen e.V.

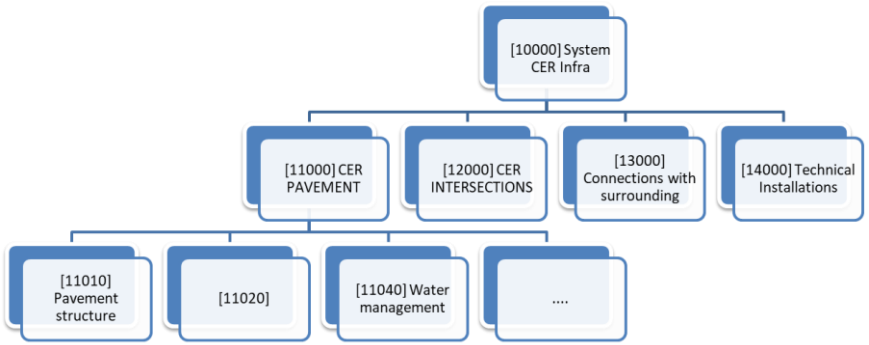
ROADS

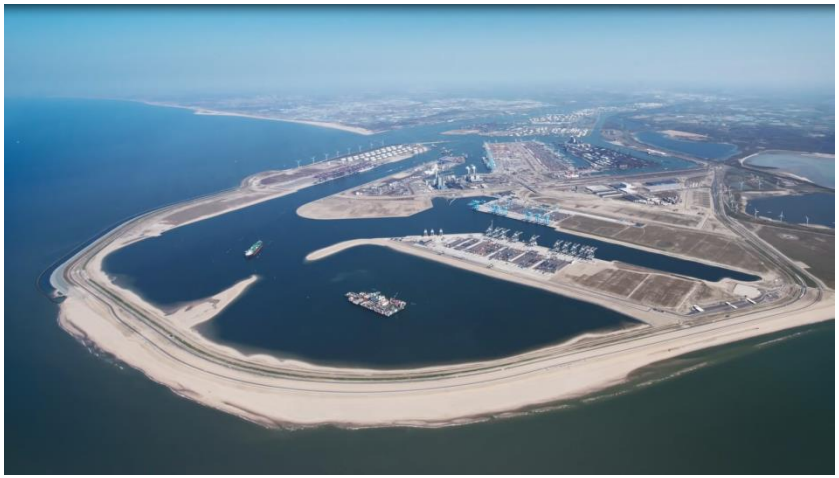
UITBREIDING VAN DE LUCHTHAVEN VAN LELYSTAD – JURRIAANS

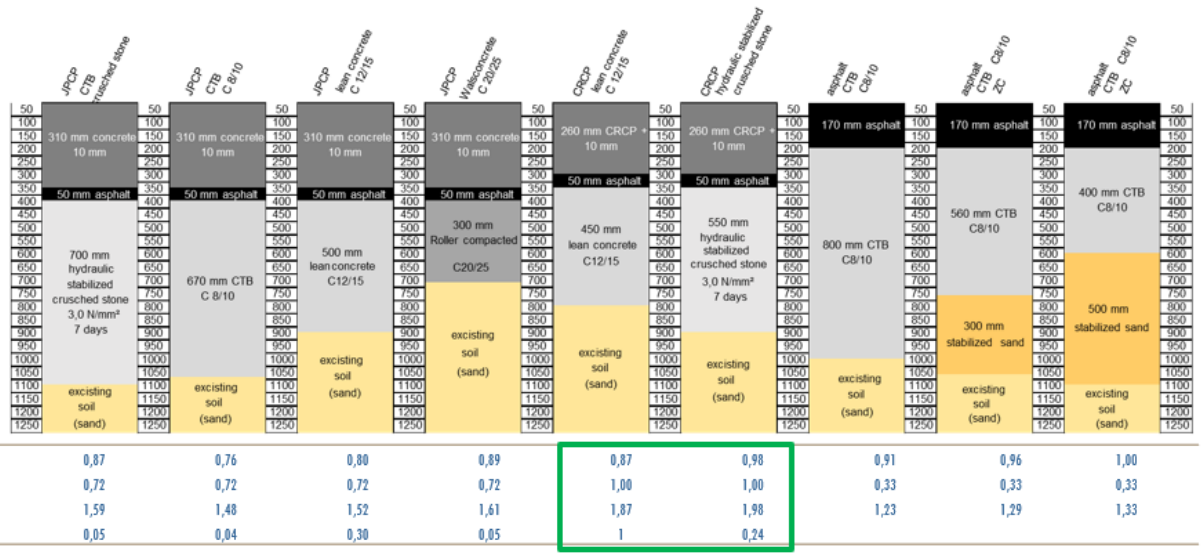


ROADS

CER – CONTAINER EXCHANGE ROUTE IN HAVEN VAN ROTTERDAM – BEELDENS





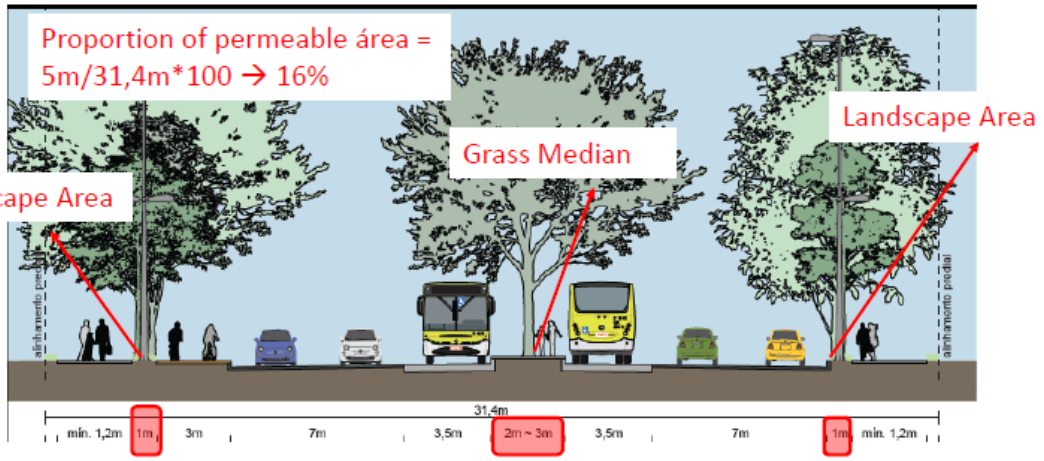


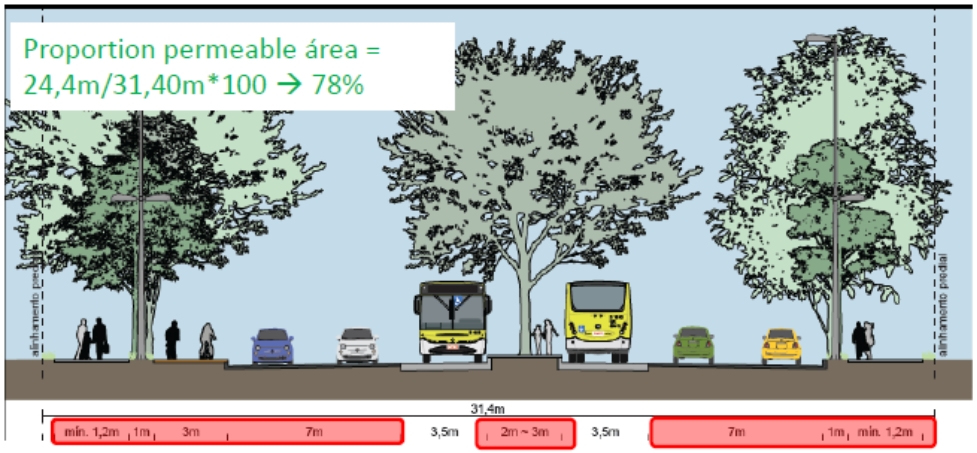
Construction	0,87	0,76	0,80	0,89	0,87	0,98	0,91	0,96	1,00
Maintenance	0,72	0,72	0,72	0,72	1,00	1,00	0,33	0,33	0,33
Total	1,59	1,48	1,52	1,61	1,87	1,98	1,23	1,29	1,33
Robustness index	0,05	0,04	0,30	0,05	1	0,24			

POREUS BETON – EEN WATERDOORLATENDE VERHARDING – DUITSE ERVARING – ROBERT BACHMANN

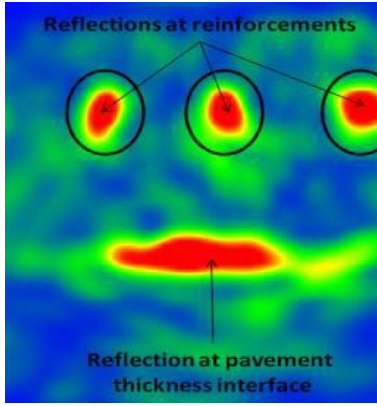
- Toegepast als fundering, drainagelaag, toplaag, verharding, versterking van de boorden

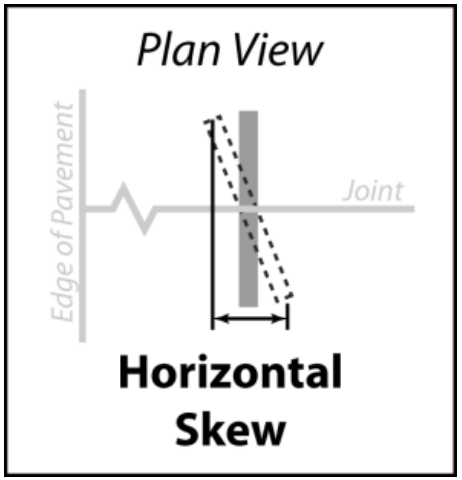
POREUS BETON – EEN WATERDOORLATENDE VERHARDING – BRAZILIAANSE ERVARING – RAFAEL BATEZINI

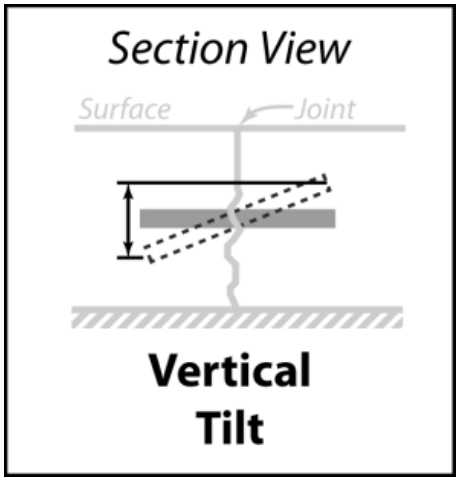




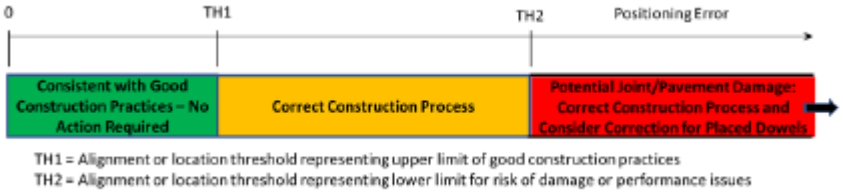
PRAKTISCH ONTWERPEN – VOEGVULLING
GERALD VOIGT/ DEUVELS MARK SNYDER



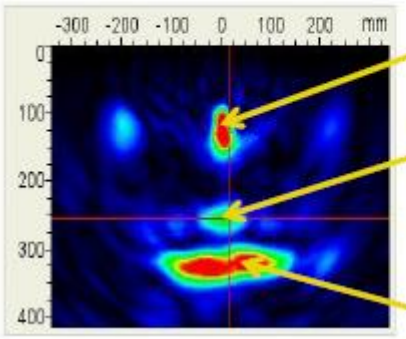


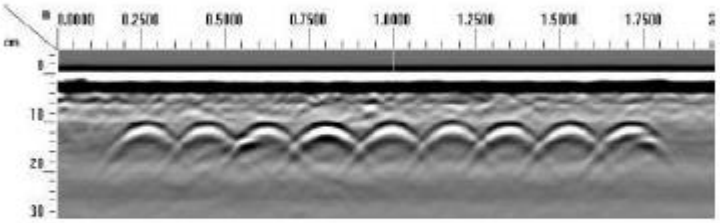


$$PF_{dowels} = PF_{CM} + PF_{SIDESHIFT} + PF_{DEPTH} - 2.00$$

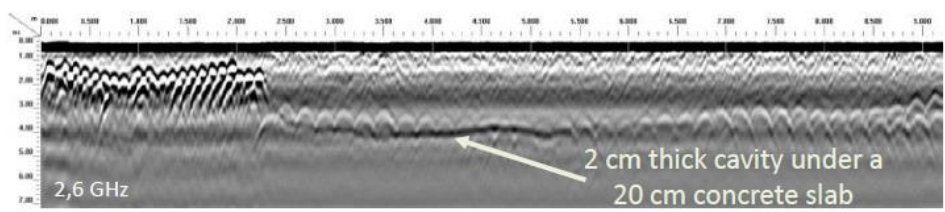


NIET DESTRUCTIEF TESTEN – AUDREY VAN DER WIELEN





Rebars ➔ Hyperbolas



HERSTELLING VAN DGB – MOON WON

- Volledige of halve diepte (met wapening) herstellingen

HERSTELMETHODE DOOR OVERLAYS – ROLF BREITENBÜCHER

- Vervanging van bovenste 6 tot 10 cm
- Hechting cruciaal, maar invloed van primer is beperkt (en zelfs negatief indien te lang gewacht wordt)

Milling of the old concrete

Placement of the new concrete overlay by a conventional paver

Successfully applied overlays

- A14 Rheintal motorway (Austria)
- A1 motorway at Salzburg (Austria)

Current age: 8 to 9 years – no damages known

Thin concrete overlay

PREFAB HERSTELLING VAN PLATENBETON – SAM TYSON/SHIRAZ TAYABJI

9 pm

11 pm

Midnight – Place panels

15 to 20 repairs per night

4 am – Dowel slot grout

6 am – Open to traffic

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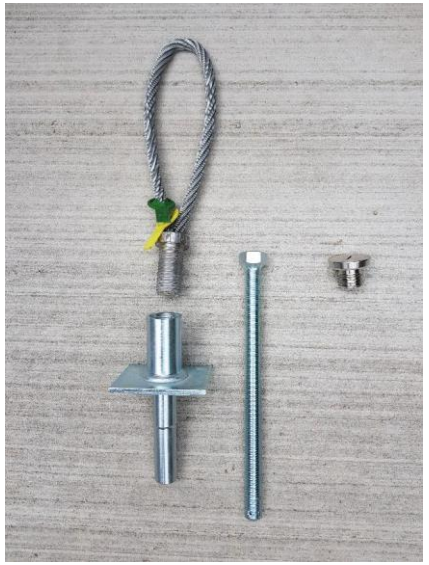
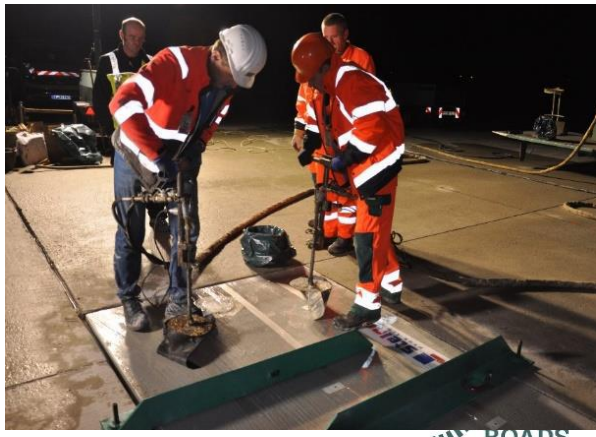
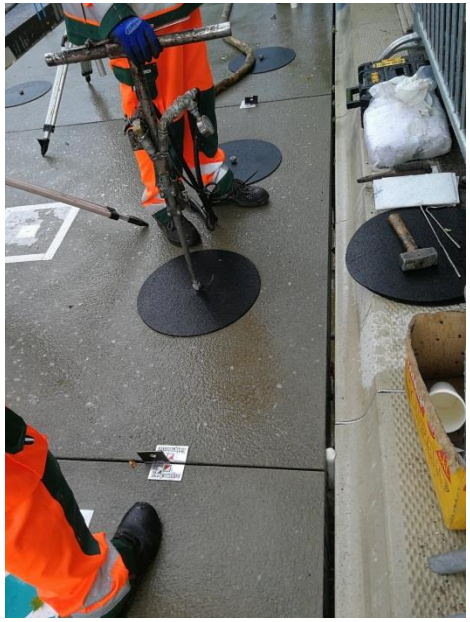
PREFAB HERSTELLINGEN IN DUITSLAND – TIM ALTE-TEIGELER/STEPHAN VILLARET



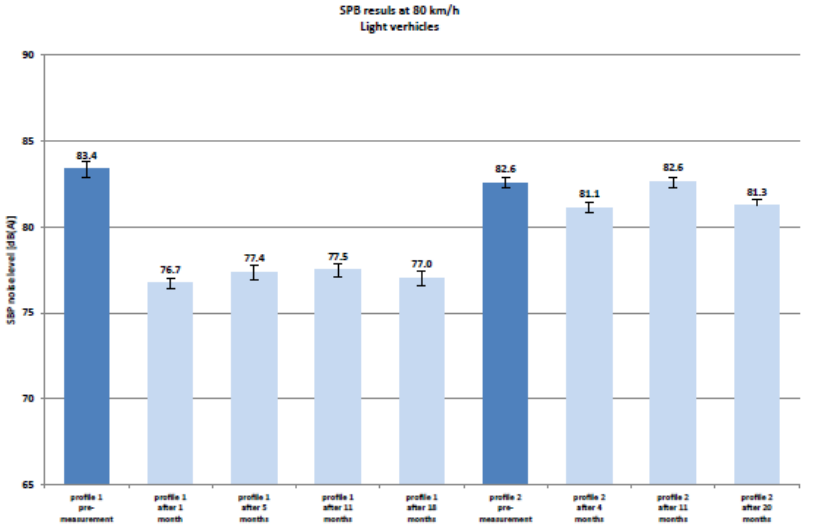


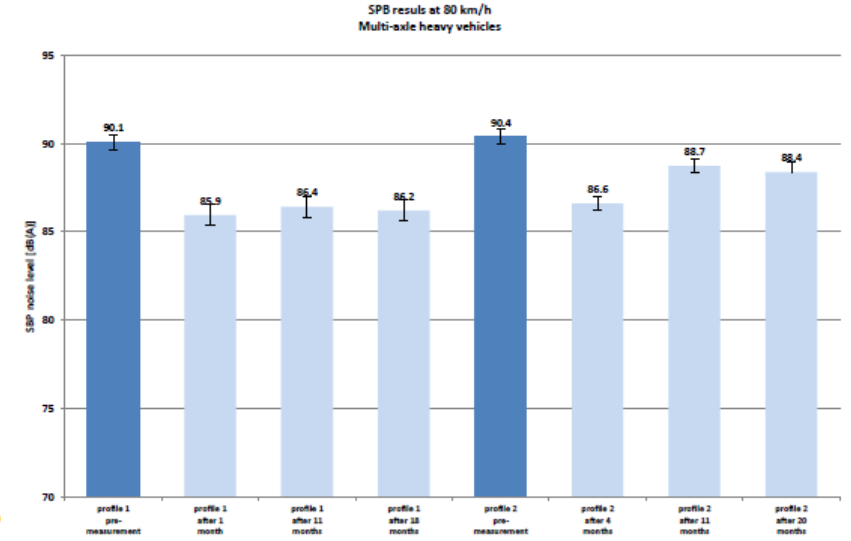
ROADS

PREFAB HERSTELLINGEN IN DUITSLAND – TIM ALTE-TEIGELER/STEPHAN VILLARET (WERFBEZOEK)



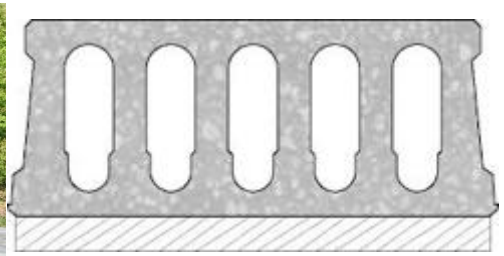
NGCS – PROEFVAK OP DE N44 – BARBARA VAN HOOREWEDER – EN IN NEDERLAND EN IN DUITSLAND



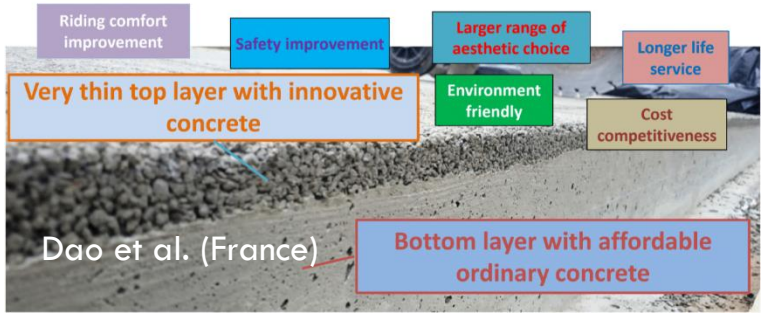


NOISE REDUCTION & NGCS – VAN KEULEN/ALTE-TEIGLER

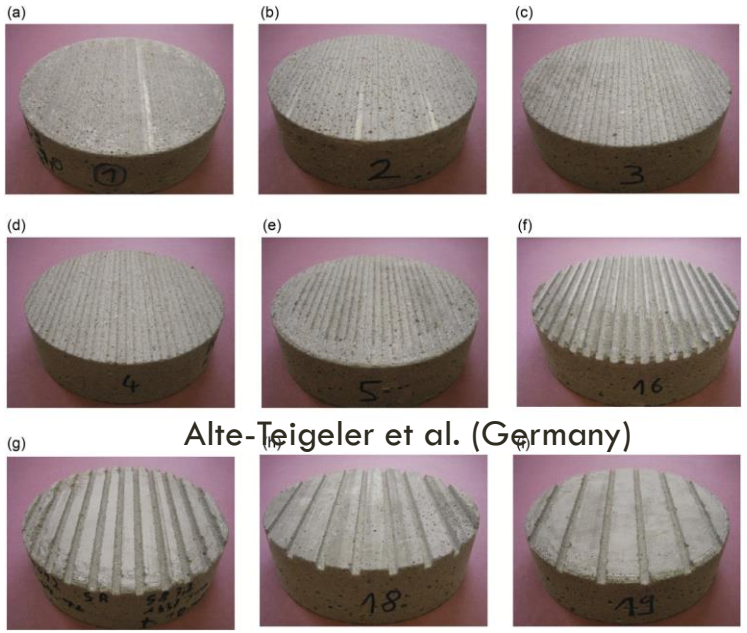
- *Research in Germany, Netherlands, France & Belgium for increased and durable noise reduction of concrete roads*



Van Keulen et al. (NL)



Dao et al. (France)



Alte-Teigeler et al. (Germany)

WELKE HEBBEN DE 'CUT' NIET GEHAALD…

- Pavement-vehicle interaction related research at MIT
- Low carbon footprint pavement
- Interne curing
- Magnetizeerbaar beton voor dynamisch laden
- Walsbeton
- Snelle herstellingen op grote schaal op vliegvelden
- Betonwegen in Polen
- Keuze voor betonnen of stalen veiligheidsstootbanden en belang van standaardisering in Nederland
- Innovatieve coating (3cm) op betonwegen

AB ROADS

Interlayer Friction Model

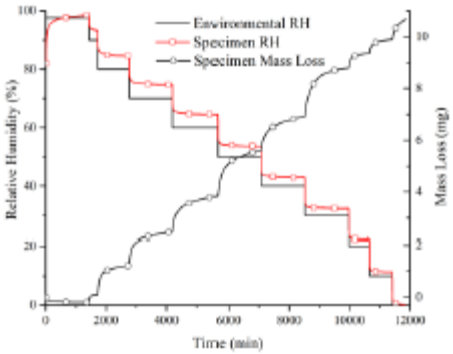
$$f_e = (x_b)[f_a] + f_F(1 - \%E)$$

$$x_b = \frac{h_e - h_u}{h_b - h_u} = \text{prob of slab / base separation}$$

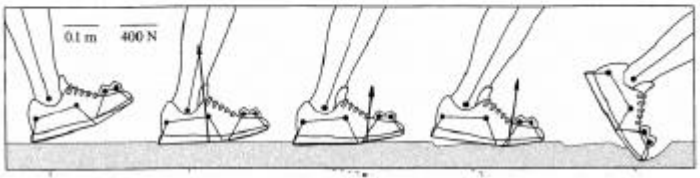
$$= (1 - P(\sigma_n > 0))$$

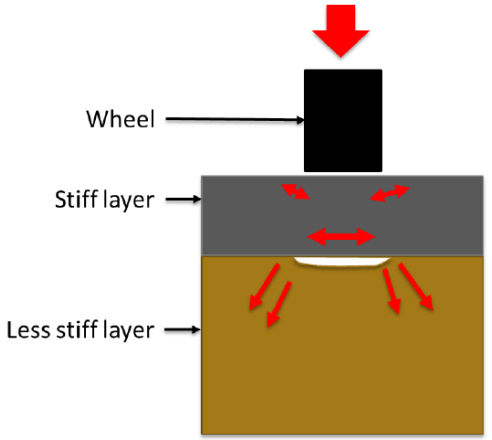
$$\sigma_n = \sigma_0 - f_t;\ \sigma_0 = \frac{3w}{S^2}(1_e - 1)k1_e$$

$$\%E = \frac{f_t}{f_0} = e^{-\left(\frac{e}{p_1}\right)^a} \qquad h_{e-p} = \frac{h_{e-u}}{2}(1 - x_e) + (x_e)h_{e-b}$$



CONCRETE ROADS IN POLAND (2018)





HARTELIJK DANK VOOR UW AANDACHT

BINNEN 4 JAAR HEBT U EEN NIEUWE KANS OP EEN EUROPEES BETONWEGENSYMPOSIUM!

AB ROADS