BYPASS COUVIN

CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS (CRCP) TWO-LIFT CRCP

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Thanks to Anne Beeldens and Luc Rens

CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS (CRCP)

- CRCP Principle
- Concrete Composition
- CRCP Structure
- Active Crack Control



CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS (CRCP)

Belgium is pioneer ! RN 8 – Leuze en Hainaut 1950





CRCP PRINCIPLE

Shrinkage of concrete is controlled by reinforcement bars





- Crack opening is minimal
- Cracks distribution is as uniform
 - as possible
- -> Visible cracks



CRCP PRINCIPLE

- CRCPs are characterized by :
 - Absence of sawn transversal joints every 5 m
 - Longitudinal bending joint (sawn and constructed)
 - Shrinkage controlled by longitudinal reinforcement
 - 0.60 to 0.85 %
 - In Belgium today : 0.75 %
 - Network of fine cracks
 - Ideal distance between cracks 0.60 to 2.4 m
 - Crack width limited to 0.50 mm
 - One lift or two lift pavement
- Avantage :
 - minimise as much as possible the problems generated by transverse joints (maintenance, etc.)



CRCP REINFORCEMENT





Transverse bars at an angle of 60°

CRCP REINFORCEMENT



2016





CRCP REINFORCEMENT



Site "Qualité & Construction": http://qc.spw.wallonie.be



2016

La tolérance sur les écarts entre armatures est de 20 mm.

Le diamètre nominal des armatures longitudinales et transversales, ainsi que l'écartement et leur position sont fixés comme suit:

Epaisseur du revêtement (mm)	200	230	250
Diamètre nominal des armatures longitudinales (mm)	16	20	20
Diamètre nominal des armatures transversales (mm)	12 ou 14	12 ou 14	12 ou 14
Ecartement (e) des axes des armatures longitudinales (mm)	130	180	170
Distance entre le nu supérieur des barres longitudinales et la surface du revêtement fini (mm)	70 à 90	80 à 100	80 à 100

Les documents de marché précisent le diamètre des armatures. A défaut, le choix est laissé à l'adjudicataire.



CONCRETE COMPOSITION

Following requirements of CCT-Qualiroutes

- Prescription on composition
- Requirements on hardened concrete (Rc, Wa, etc.)



	D _{max}	Cmin	W/C	Air content	Average Compression Strength	
Bottom layer	31,5 mm	375 kg/m³	≤ 0,45	-	≥ 60 MPa on cylinders (Ø113 mm, h 100 mm) à 90 days	Certification WBR01
Top layer	6,3 mm	425 kg/m³	≤ 0,42	5 ≤ v ≤ 8	≥ 40 MPa on cubes (150 mm) at 28 days	

• 2 compositions -> 2 plants (+ 1 back-up) or one mobile plant



CONCRETE COMPOSITION

Following requirements of CCT-Qualiroutes

• Discontinous grading curve with more 4-8 mm size aggregates for acoustical reasons









ACOUSTICAL PERFORMANCES

A8 - Froyennes – Lamain



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2017

SPW

Wallonie infrastructures

CRCP STRUCTURE

- Asphalt Sandwich Layer
 - Prevents erosion of the lean concrete base
 - Reduces water infiltration
 - Creates adherence between concrete pavement and base layer
 - Quality platform for positioning of reinforcement bars







CRCP STRUCTURE

ONE OR TWO LIFT









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Geometrical Characteristics

- On the edge of the pavement
- 40 cm length
- 4 cm deep
- Every 1,20 m

Timing !







- Faster crack development
- Cracks more straight and regular
- Risk of grouped cracks greatly reduced







Measurements on E17 and E313



- Comparison of cumulative crack spacing distribution at the test sections on E17 and E313 after about 20 months, including 2 winters;
- the arrows represent the percentage of the crack spacings in the preferred range 0.6 – 2.4 m (Belgium)



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Mesurements on A11



- Lane 1 direction
 Knokke : cuts 20h after
 pouring
- Other lanes : cuts 16h after pouring







Measurements on A11

	Lane 1 – direction Knokke	Lane 2 – direction Knokke	Lane 1 – direction Antwerp	Lane 2 – direction Antwerp
Number of saw cuts inspected	828	773	322	317
Amount of cracks	426	611	283	278
Perc. Working crack initiators	36%	65%	75%	68%
Perc. Cracks at saw cut	69%	83%	86%	77%
Average distance between cracks				
- In tunnel	2,26 m	1,58 m	1,37 m	1,37 m
- In open trench	2,59 m	1,89 m	2,17 m	1,67 m
	2,16 m	1,45 m	1,34 m	1,40 m



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Thank you !

