



Never too late for dowels or tie-bars

the techniques of dowel bar retrofitting and cross stitching

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Dowel bar retrofit

Insertion of dowels in an existing pavement for load transfer Most common in a transverse joint or crack









Dowel bar retrofit

Insertion of dowels in an existing pavement for load transfer

New developed roads

Stabilisation of cracked parts of a slab

Life extention of older roads



Dowel bar retrofitting at regional road N44 in Aalter



- Old JPCP built in 1958
- BRRC: Measurement of slab faulting and load transfer at joints
- Slab stabilisation by injection with a cement mortar

Dowel bar retrofitting at regional road N44 in Aalter



PRINCIPLE

- Insertion of 3 dowels per wheel track (2x3 dowels per lane)
- All dowels must be positioned horizontally and parallel for free joint movement
- The depth of the slot is half the slab thickness + 2 to 3 cm.

Dowel bar retrofitting at regional road N44 Aalter



- Every dowel bar must be equiped with a air cap in order to allow horizontal movement
- Avoid mortar to enter the joint in order to allow horizontal movement
- Use a high quality hydraulic or synthetic mortar with low shrinkage
- Gluing mortar with the concrete is essential

Dowel bar retrofit



CONCLUSION

- Dowel bar retrofit gives you a possible life time extension of 10 to 20 years
- But…
- the operation is delicate, so experience and best practices are expected from the contractor



Cross stitching

- Situations:
 - Longitudinal joints were tie bars are missing or not functioning
 - Cracks randomly crossing a longitudinal and/or transversal joint



Case: E34 Antwerp-Knokke between Kaprijke and Assenede

2005:

- CRCP placed in two phases:
 - Emergency shoulder and right-hand ("slow") lanes
 - Left-hand ("fast") lane
- Connected by tie bars
 - Partly hooked reinforcement bars inserted at the slipform paver
 - Partly drilled and glued



Case: E34 Antwerp-Knokke between Kaprijke and Assenede

Construction joint: Widening up to 40mm.







Case: E34 Antwerp-Knokke between Kaprijke and Assenede

Longitudinal cracks along the joint



Case: E34 Antwerp-Knokke Options for repair



Case: E34 Antwerp-Knokke Execution



Removal of all debris

Filling the open joint with a PU dot





Drilling the holes

Presence of longitudinal reinforcement bar near to the edge made it difficult to drill the hole



Drilling the holes



<u>Solution</u>: Drilling only from 1 side

Injecting the resin, entering the rebar, finishing at the surface



Pull-out test of tie bar



In specifications: min. 50 kN tensile force
Up to 100 kN – no rupture



Joint filling

- EPDM extruded joint filling material in different sizes



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Joint filling







Conclusions:

- Complex case with lots of challenges:
 - Unexpected reinforcement bars close to joint
 - Open gap (joint) in middle of the anchor
 - Extreme wide joint forced us to apply an original approach of joint filling
- But...after 10 years
 - Joint movement is stabalised
 - No futher damage occured
- So, I agree with Luc:

It's never to late for dowels or tie-bars



Thank you !

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