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The Continuously Reinforced Concrete Pavement in Northwestern Europe – a proposal for the Netherlands, Belgium and Germany

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The Continuously Reinforced Concrete Pavement in Northwestern Europe – a proposal for the Netherlands, Belgium and Germany

Content

1. Introduction
2. Practical Experiences in Belgium, the Netherlands and Germany
3. Sustainability of CRCP
4. Conclusions and Outlook

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Content

What do we have in common?

The Big Three in Europe:

- **Antwerpen - Zeebrugge**
- **Rotterdam**
- **Hamburg**

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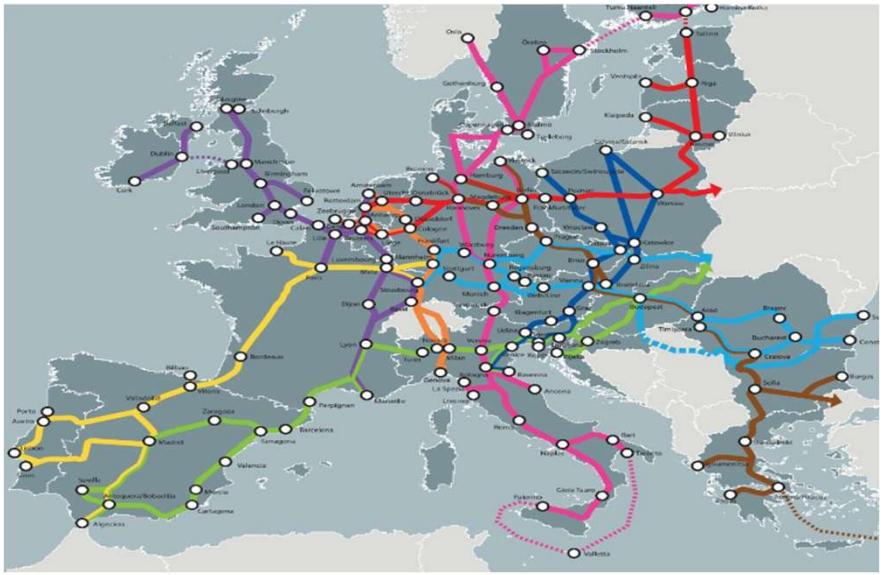
What do we have in common?

- We are centrally located in Europe
- shortage of skilled labor
- Resource scarcity



Development of Continuously Reinforced Concrete Pavement (CRCP) in the USA from 1921 until today

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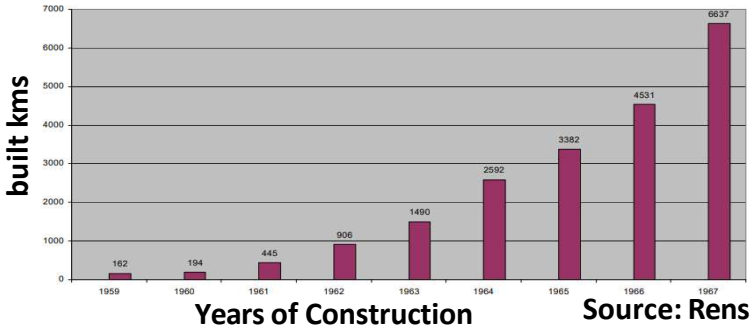
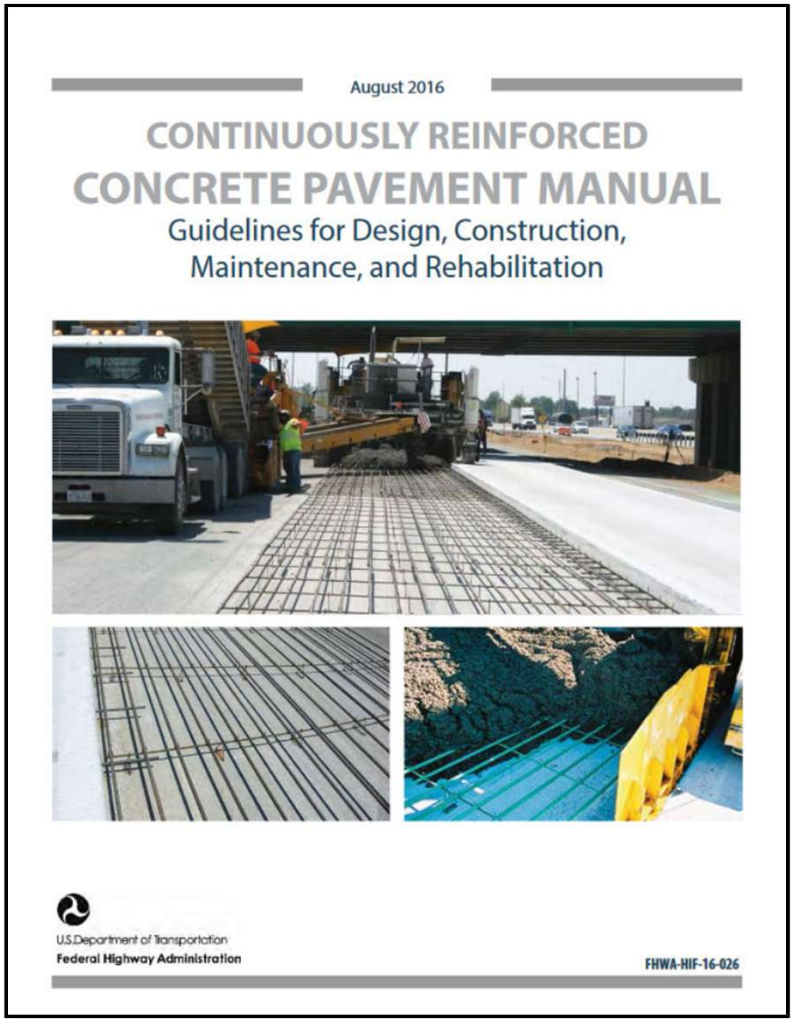
Construction of the Interstate 55 (1972)

Source: britannica.com



Source: Rens



Source: US Department of Transportation

The Continuously Reinforced Concrete Pavement in Northwestern Europe – a proposal for the Netherlands, Belgium and Germany

Content

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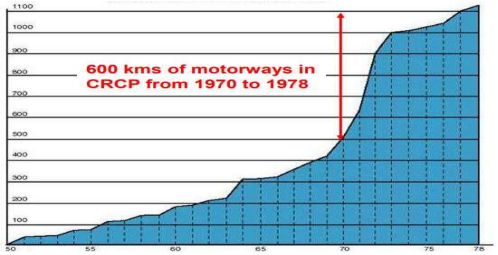
Experiences with Continuously Reinforced Concrete Pavement (CRCP) in Belgium from 1950 until today



from 1948 until today:
More than 18 Mio. m²
CRCP,
Mainly on Motorways,
Partly overlayed with Asphalt

Source: Department Mobiliteit en Openbare Werken

Experiences with Continuously Reinforced Concrete Pavement (CRCP) in Belgium from 1950 until today

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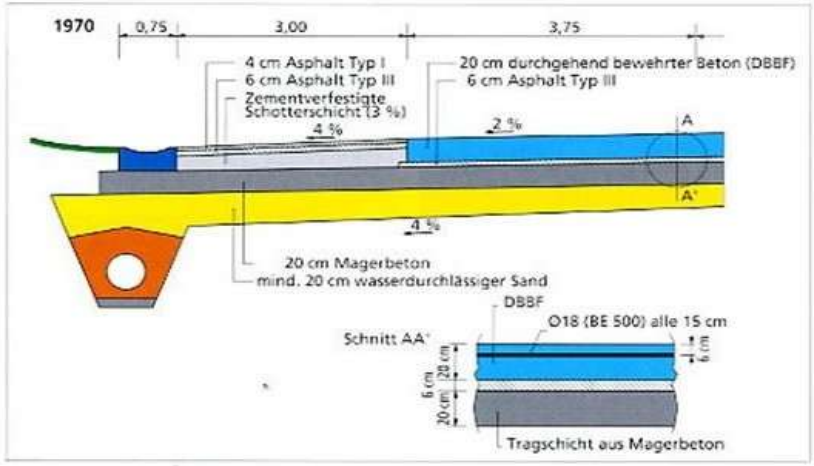
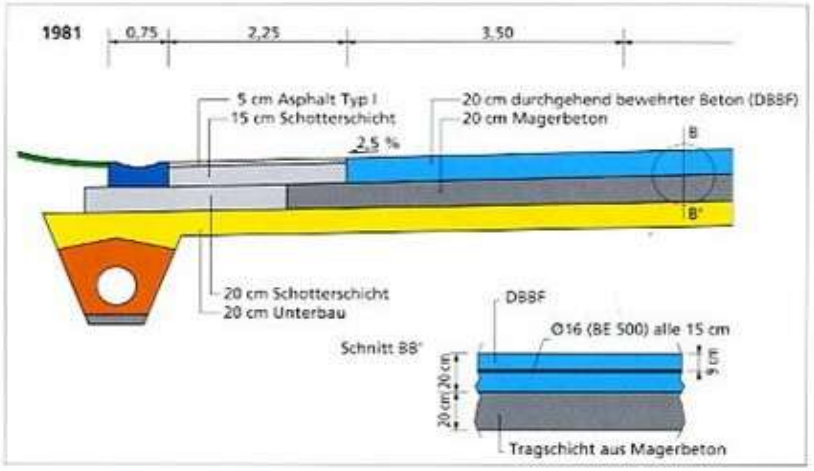
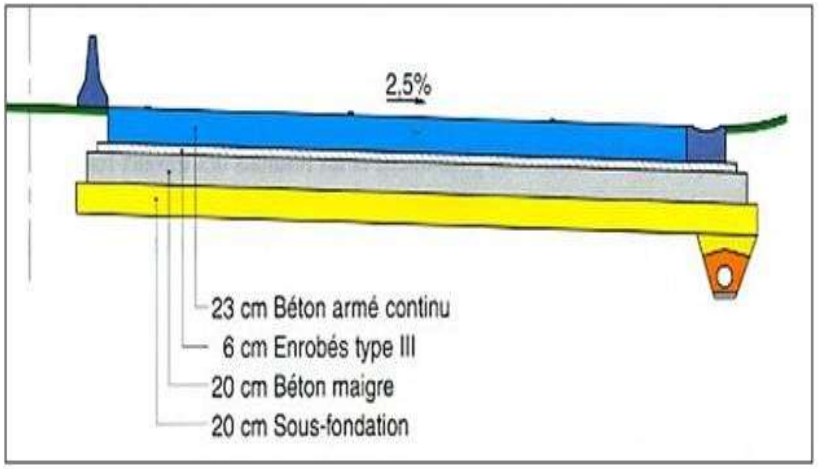
1. Concept - 1970



2. Concept - 1981



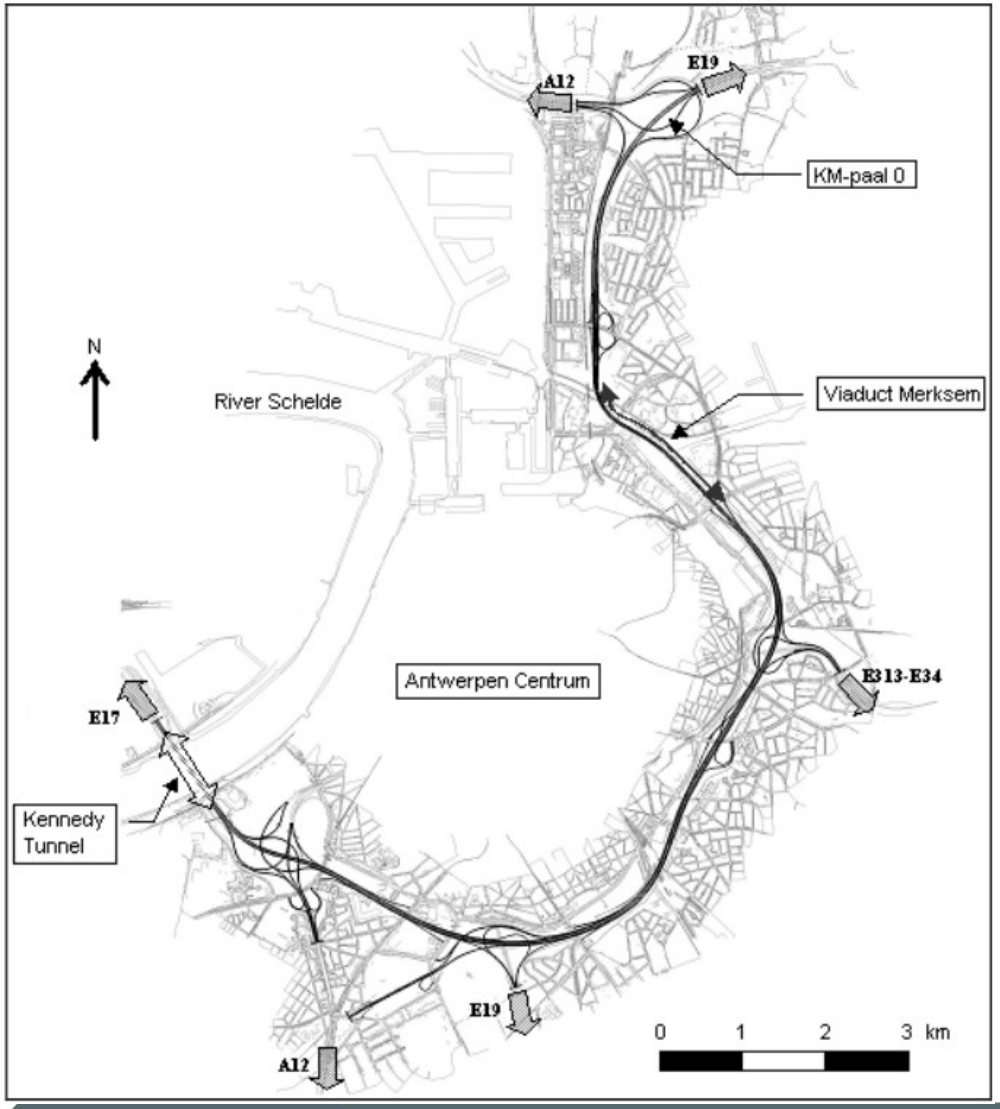
Up to date Concept

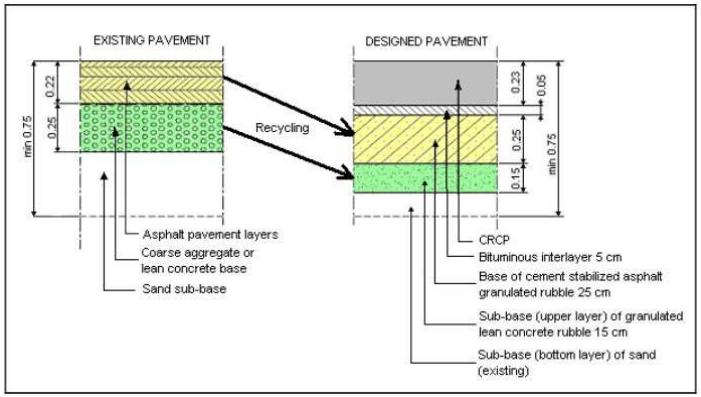


<u>Requirements</u>

Concrete Pavement Thickness 24 cm
Longitudinal an Transversal Reinforcement percentage0,75 %
Lean Concrete
Asphalt-Interlayer
CEM III / A 42,5

Experiences with Continuously Reinforced Concrete Pavement (CRCP) in Belgium from 1950 until today





Experiences with Continuously Reinforced Concrete Pavement (CRCP) in the Netherlands from 2003 until today

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A50 Oss 2003

CRCP with Overlay of Porous Asphalt

- during Construction -

Experiences with Continuously Reinforced Concrete Pavement (CRCP) in the Netherlands from 2003 until today

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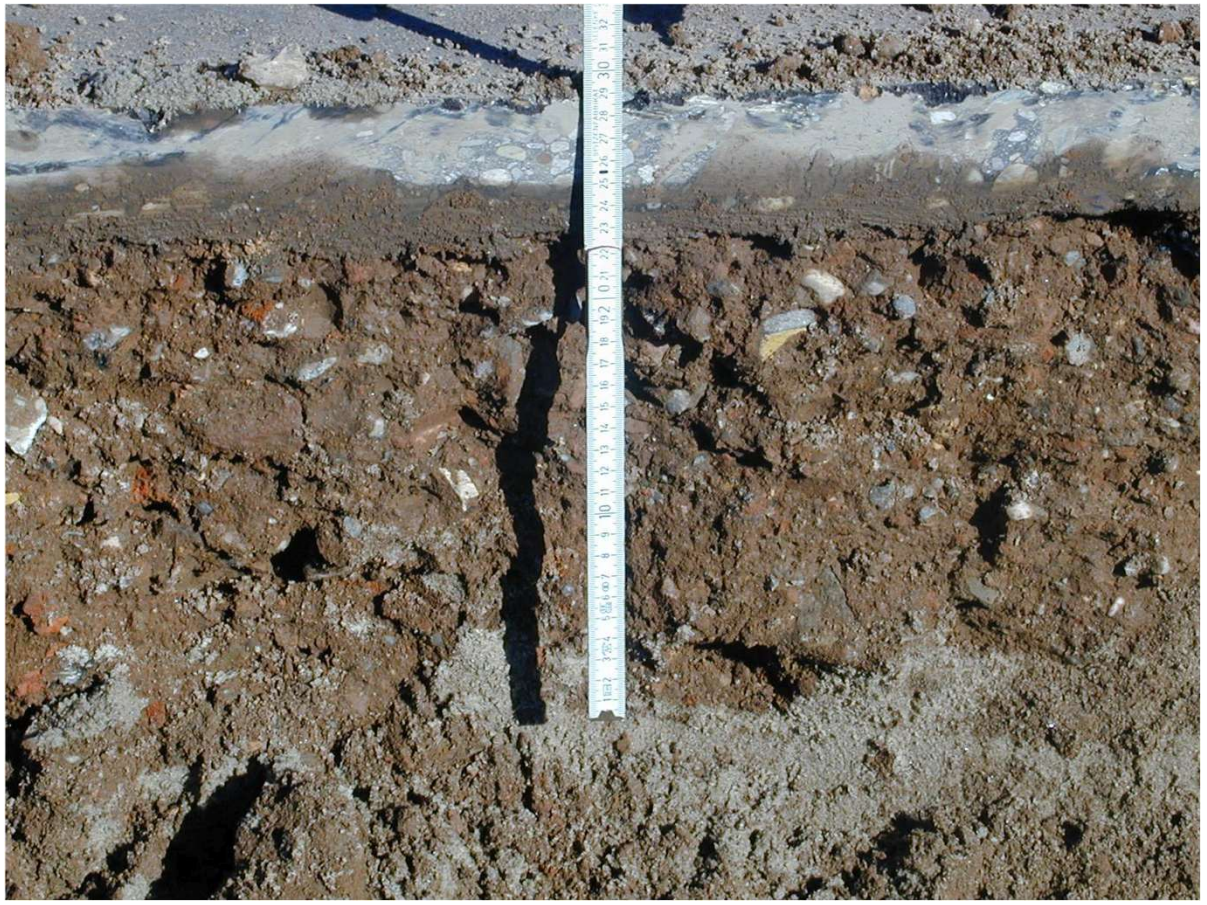

Asphalt-Interlayer

Onbonded Base Course

Sand

Experiences with Continuously Reinforced Concrete Pavement (CRCP) in the Netherlands from 2003 until today

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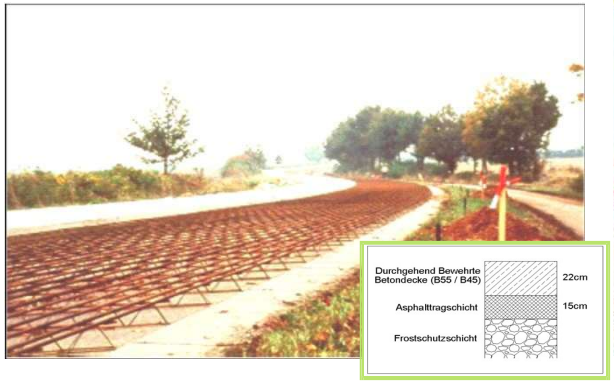
CRCP with Overlay of Porous Asphalt

- under traffic in 2024 -

Experiences with Continuously Reinforced Concrete Pavement (CRCP) in Germany from 1997 until today

Federal Road B56 near Düren / NRW (1997)



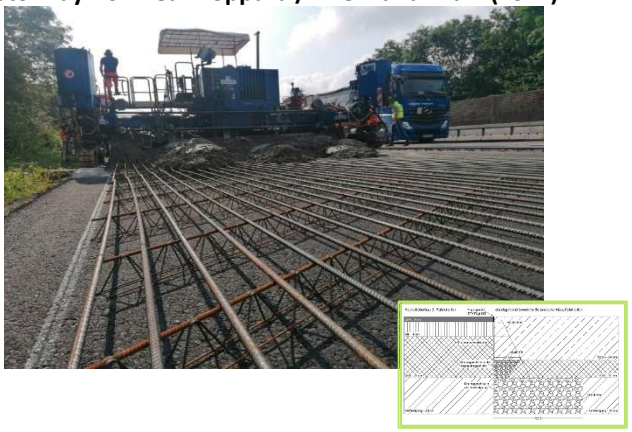
Private Road near Geseke / NRW (2009)

Motorway A5 near Bruchsal / BaWü (2015)

Motorway A5 near Darmstadt / Hessen (2004)

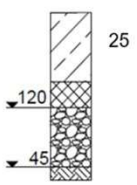
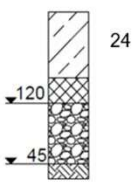
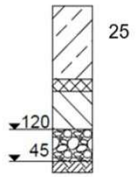
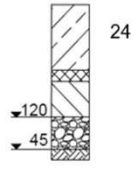
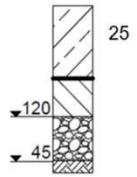
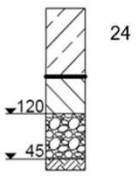
Motorway A94 near Forstinning / Bayern (2009)

Motorway A61 near Boppard / Rheinland-Pfalz (2021)



Experiences with Continuously Reinforced Concrete Pavement (CRCP) in Germany from 1997 until today

(Dickenangaben in cm; ▼ E_{v2}-Mindestwerte in MPa)

Zeile	Belastungsklasse	Bk100	Bk32
1	**Asphalttragschicht auf Frostschutzschicht** Betondecke DBB Asphalttragschicht Frostschutzschicht		
2	**Tragschicht mit hydraulischen Bindemitteln / HVT auf Frostschutzschicht bzw. Schicht aus frostunempfindlichem Material** Betondecke DBB Asphaltzwischenschicht Hydraulisch gebundene Tragschicht (HGT) / HVT Frostschutzschicht		
3	**Tragschicht mit hydraulischen Bindemitteln / HVT auf Frostschutzschicht bzw. Schicht aus frostunempfindlichem Material** Betondecke DBB Vliesstoff Hydraulisch gebundene Tragschicht (HGT) / HVT Frostschutzschicht		

Basis: Findings from the research project FE 08.0248/2018/CGB "(Asphalt surface course on) continuously reinforced concrete pavement; scientific monitoring of the test sections during the operational phase"

- Load classes Bk100 and Bk32 based on the RStO
- Base and frost protection courses analogous to the RStO
- Load classes Bk10 to Bk0.3 technically possible, but currently uneconomical
- A variant with DBB, Asphalt-Interlayer and onbond base course is seen as having potential. However, there is currently no national experience, therefore not presented here.

Experiences with Continuously Reinforced Concrete Pavement (CRCP) in Germany from 1997 until today

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FGSV – Working Group 8.3.4
„ Continuously Reinforced Concrete Pavement (CRCP) “

Motivation and description of the construction method

Requirements for materials (concrete, reinforcing steel, etc.)

Possible base layers

End anchors

Construction execution

Possible superstructures

Quality assurance

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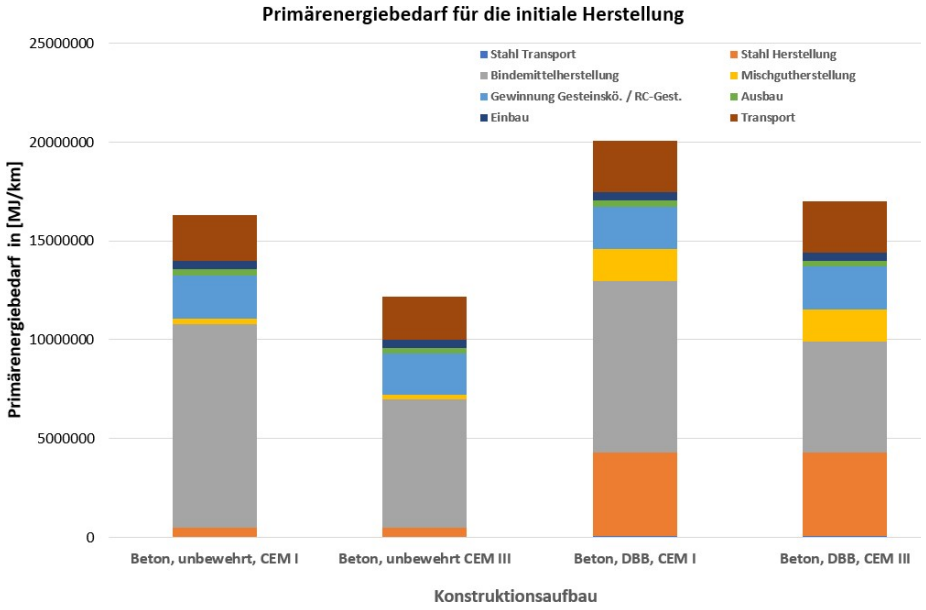
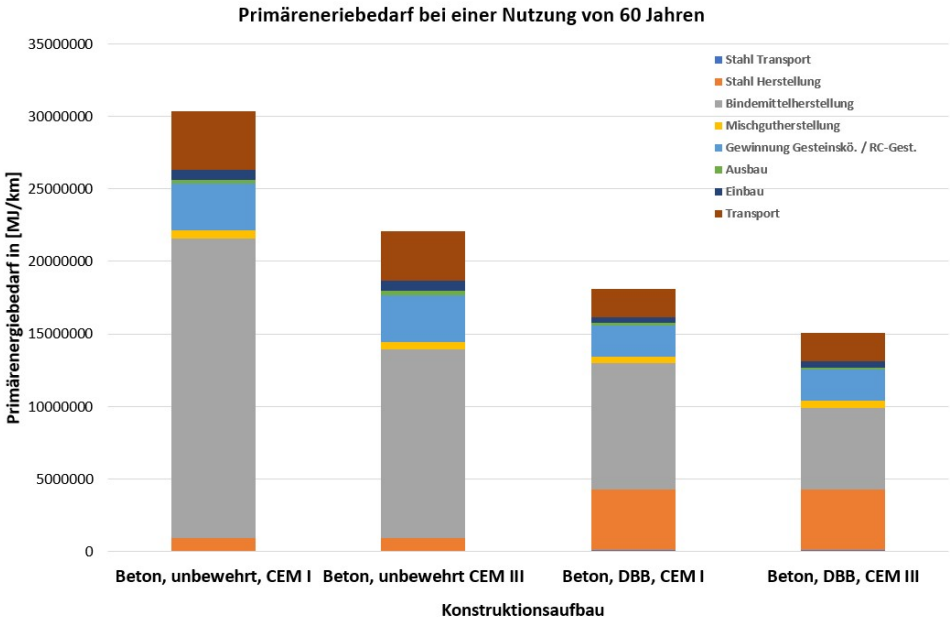
Content

Sustainability – Ecology

Here: Primary energy requirements



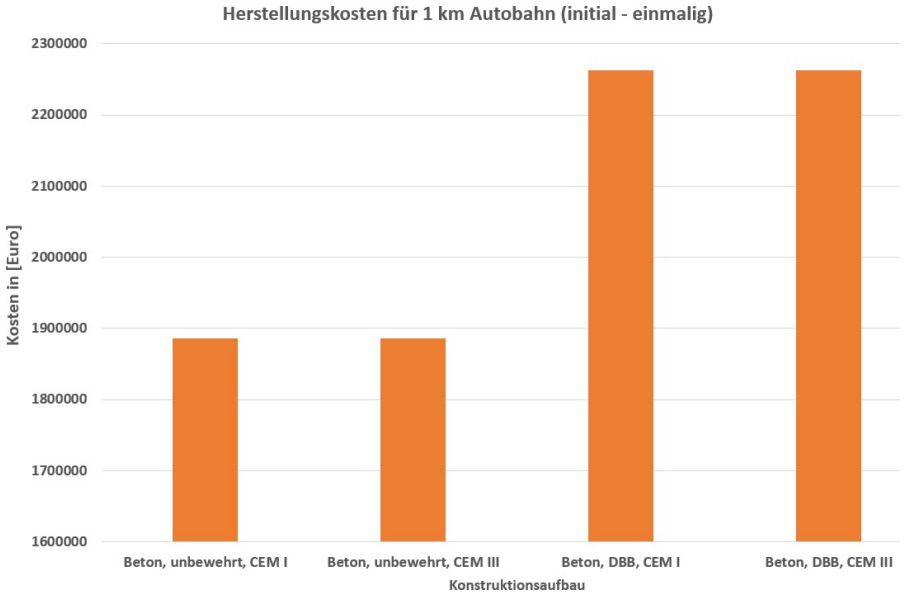


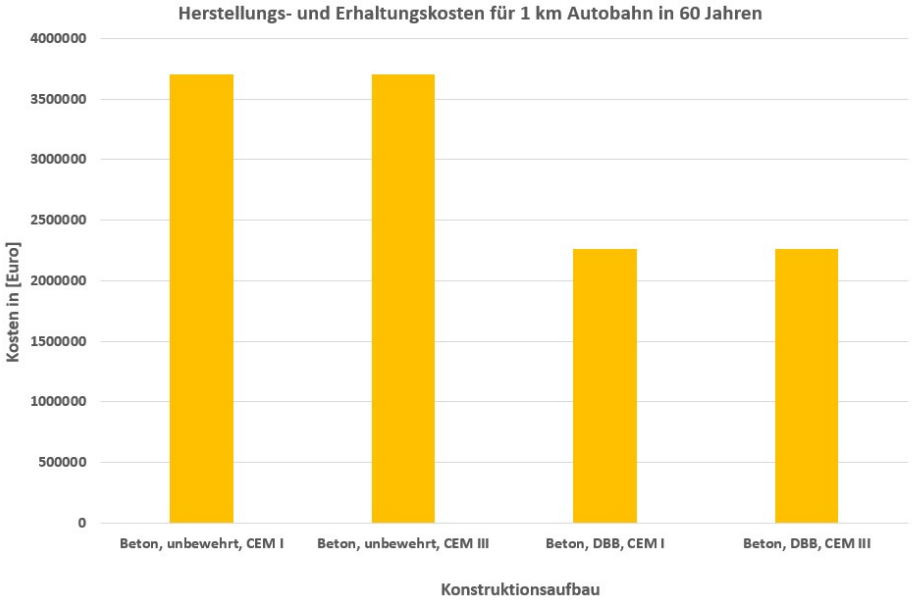
The diagram was created based on data from [1] and extended to include the part “continuously reinforced concrete“.

[1] Eco-Profile for Asphalt and Concrete Road Construction Methods, Durth Roos Consulting GmbH on behalf of the German Asphalt Association (DAV), Dr.-Ing. Christian Holldorb, Karlsruhe, November 2003

Sustainability – Economy

here: construction costs





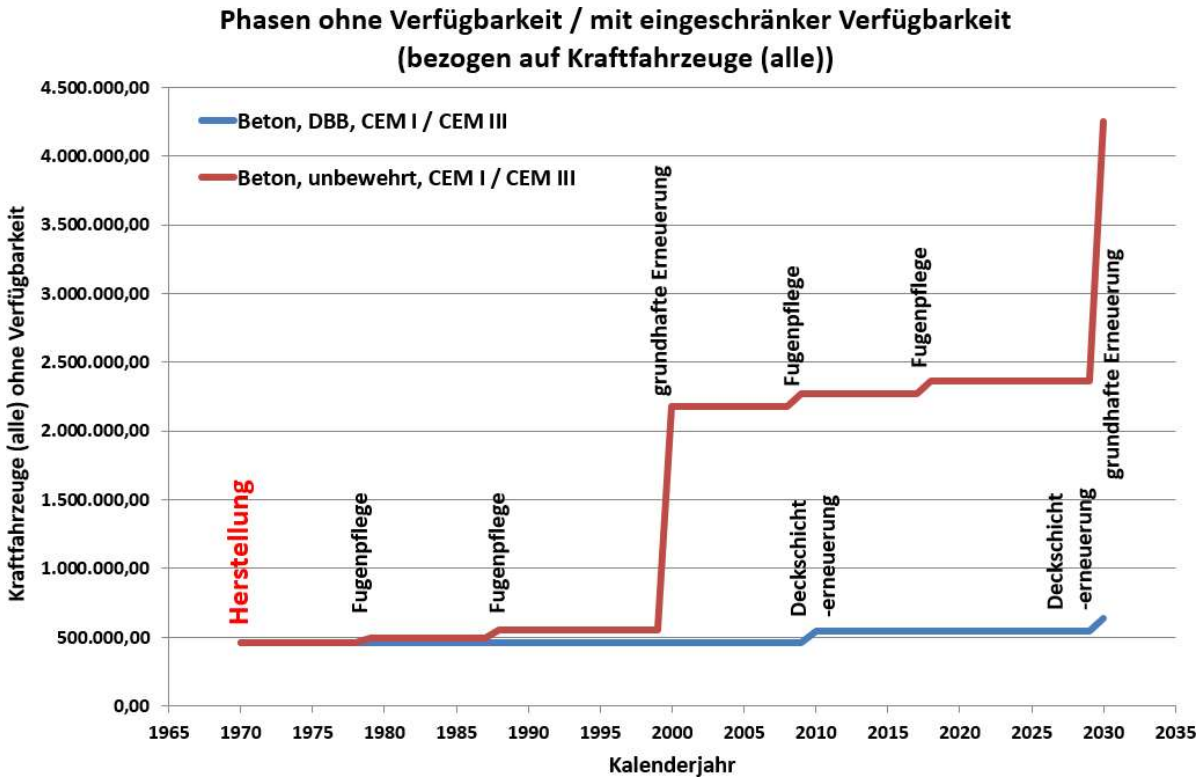
The diagram was created based on data from [2] and [3].

2 **Life cycle cost analysis of continuously reinforced concrete pavement, AB Roads, commissioned by the Institute for Steel Reinforcement (ISB), Prof. Anne-Beeldens, Brussels, Düsseldorf 2022**

3 **Thin asphalt pavements on concrete pavement (DAB), sustainable construction for the future Betonmarketing West GmbH, Beton trade journal, Rolf Kampen, Dipl.-Ing., Düsseldorf, November 2010**

Sustainability – Social

here: availability



The diagram was created based on data from [4] – [6].

4 Guidelines for the Standardization of the Superstructure of Traffic Areas (RStO), FGSV Cologne, 2012
5 Code of Practice for the Structural Maintenance of Concrete Traffic Areas (M BEB), FGSV Cologne, 2009
6 Guidelines for Continuously Reinforced Concrete Road Surfaces (H DBB), FGSV Cologne, 2020

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Conclusions

- **Many challenges for road infrastructure in the coming years**

- **Diverse and long-term national experiences with CRCP in Belgium, the Netherlands and Germany**

⇒ **Pooling knowledge**

⇒ **working together**

⇒ **Save costs**

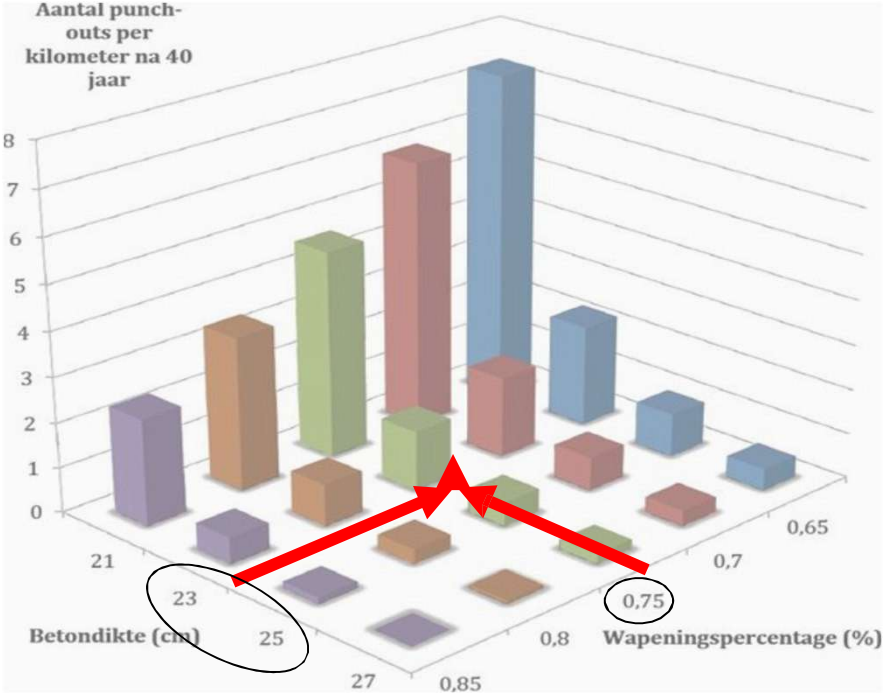
⇒ **Shaping the infrastructure of the future**

Possible joint activities:

Sustainability assessment of construction materials and construction methods

Possible joint activities:

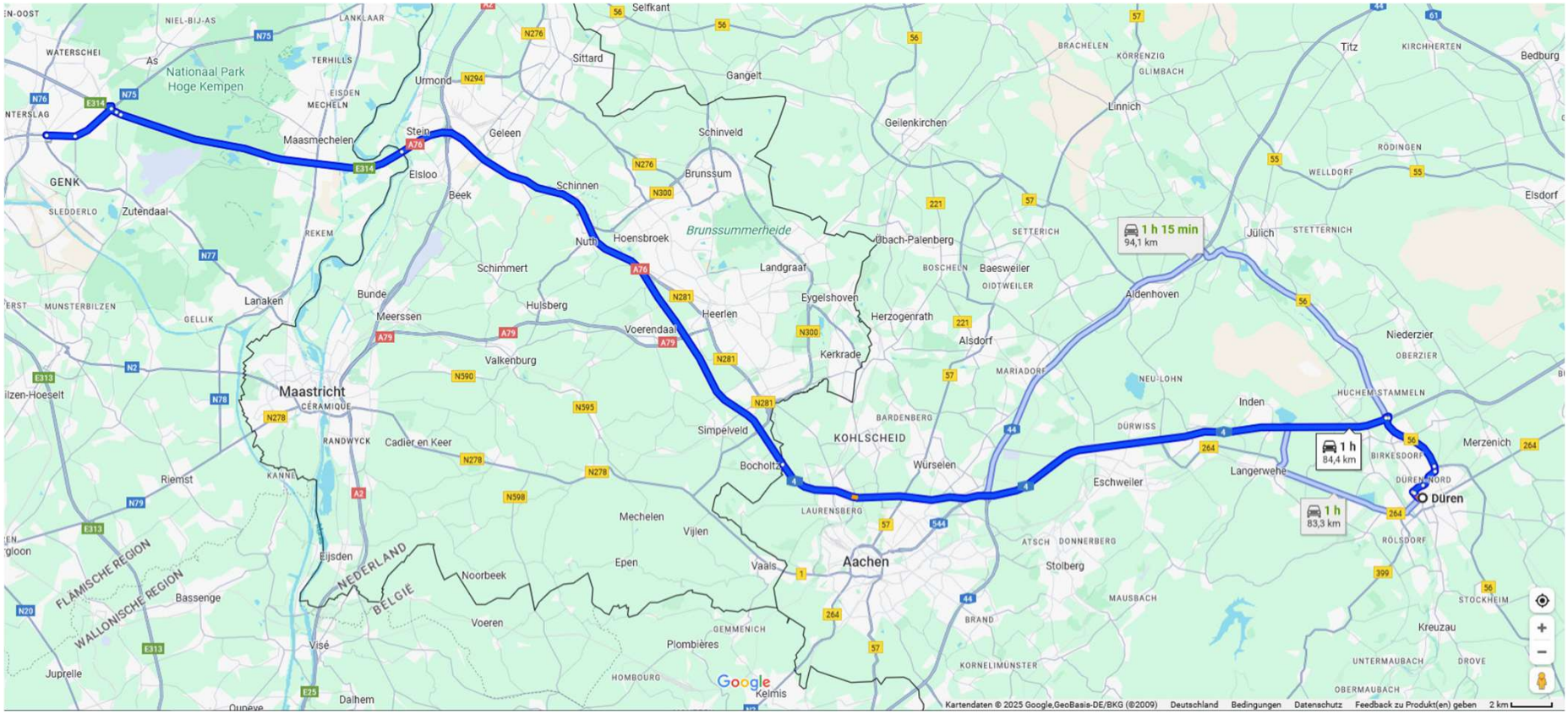
Quantifying CRCP‘s
Maintenance measures



Ground Penetration Radar of BASt

Possible joint activities:

Trial-Side with CRCP
Genk (E 314)– Maastricht (A 76) – Aachen / Düren (A4)



Thank you for Your attention!

We look forward to working with you!

Oberregierungsrat Dipl.-Ing. Stefan Höller
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