Bridge deck construction
Experience, quality, future

06th September 2018

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Gussasphalt Symposium Gdansk – 06th September 2018

Washington, USA

Economizing on quality leads to serious consequential costs.

Montréal, Canada

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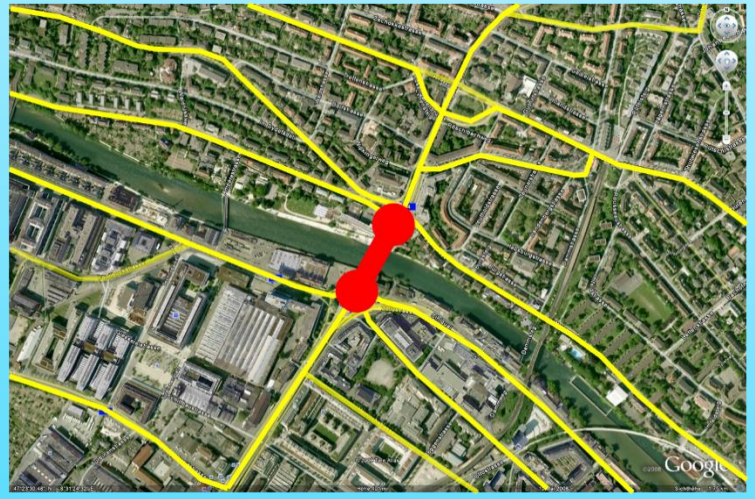
90 to 95% of damage to bridge surfacings are a result of system deficiencies when planning and implementing.

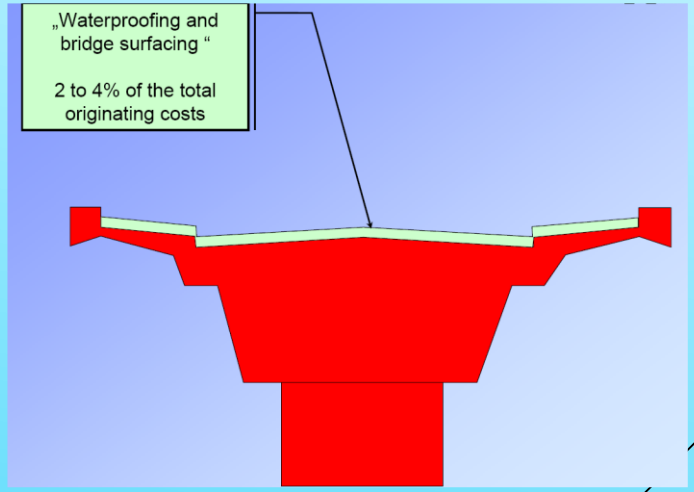
Resultant causes are:

- Formation of blisters in the surfacing body
- Deformation of bridge surfacings
- Fissures in the surfacing / surface disintegration and break outs
- Uneven bridge surfacings subject the supporting structure to additional loads and strain
- Reduced driving safety

Surfacing constructions (waterproofing and surfacing) make up approx. 2 to 4% of total bridge construction costs. Improved bridge surfacing constructions conforming to international standards, require an additional 1,5 to 2,5%. With the additional investment, the service life of the surfacing can be extended by three to five times and protection of the bridge's supporting structure is longer lasting.

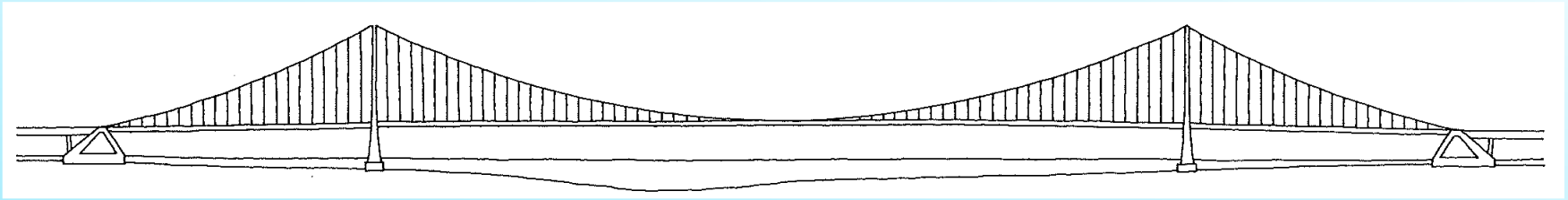
Extended service life of the bridge surfacing construction with reduced need for maintenance and renovation, results in improved availability of the bridge.

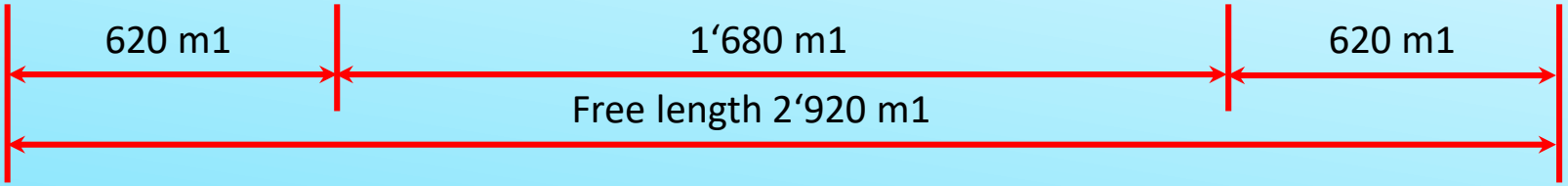




Storebælt Bridge, Denmark

Thermal expansion





Longitudinal change summer/winter 2.30 m

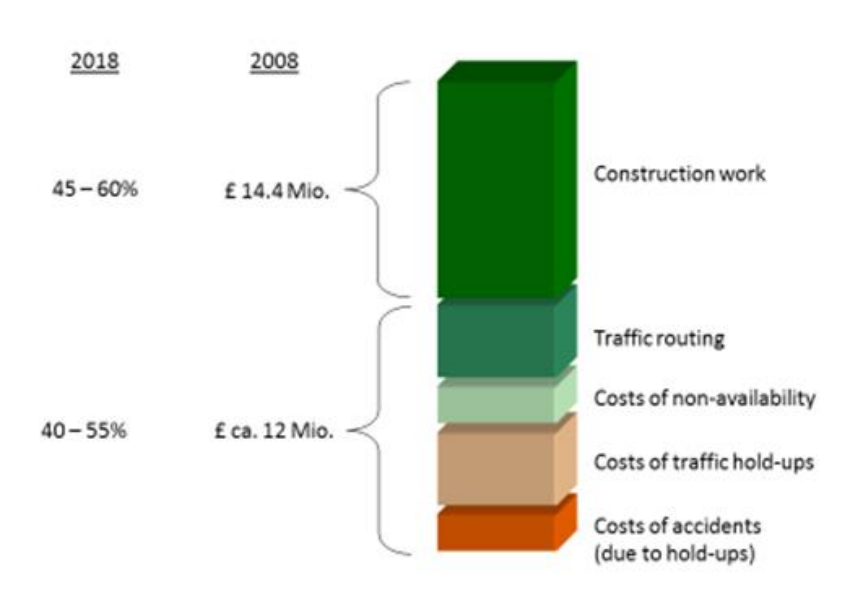
Longitudinal change day/night 70 cm

- Maximum deflection of the bridge
- Oscillations/vibrations of the bridge structure
- Maximum summer temperature
- Minimum winter temperature
- Maximum change in length of the bridge summer to winter from dilatation joint to dilatation joint
- Axle load limit
- Road traffic frequency per day
- Percentage share of heavy vehicles
- Possibility of exposure to hold-ups
- «Stop and go» traffic

TRAFFIC DELAY COSTS

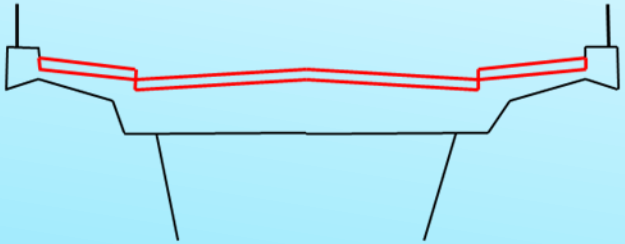
For a 2 lane dual carriageway with 50,000 ADT and 20% HGVs, one primary and one secondary lane in contra flow, Table 40 gives a value of £ 72,000 / day over the minimum traffic management length of 1,0 km.

- Traffic management
- Costs of traffic hold-ups
- Costs of rear-end collisions etc. due to hold-ups

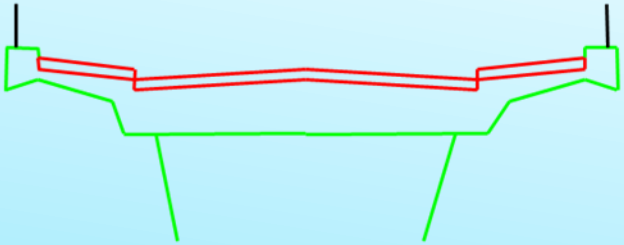


Brückenoberbau Nutzungsdauer

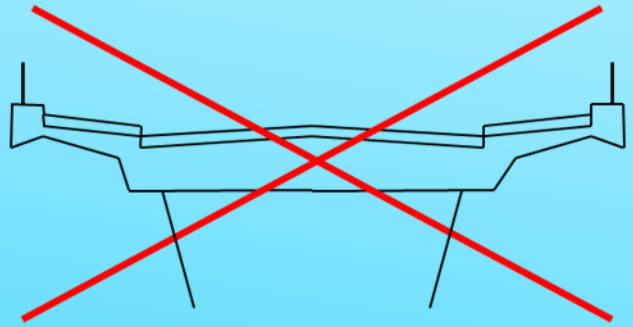
Belagsersatz nach 20-30 Jahren



Betoninstandsetzung nach 50-60 Jahren
inkl. Belagsersatz



Totalersatz nach 100-120 Jahren



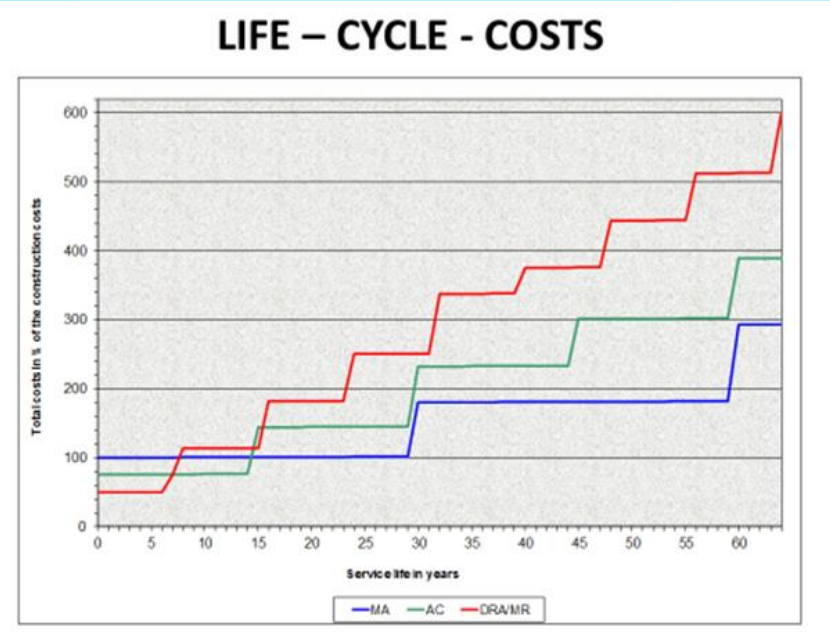
Nationalstrassen Switzerland

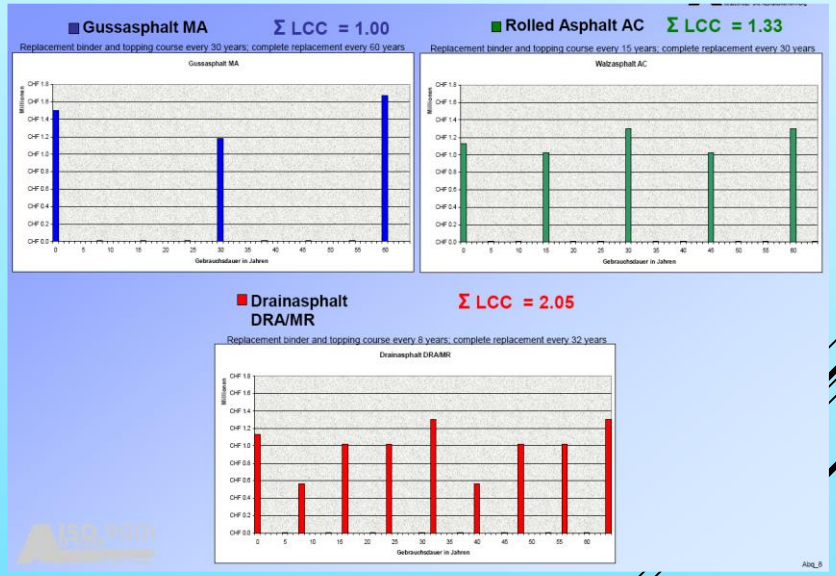
	Nutzungszeit			
	15 Jahre	25 Jahre	35 Jahre	45 Jahre
3’000 Brücken	200 *	120 *	86 *	67 *
250 Tunnel	17 *	10 *	7 *	6 *

* Anzahl Instandsetzungen Brückenbelag pro Jahr

The bridge surfacing construction should already be watertight at the surface. A dense Gussasphalt topping course does not allow any water to infiltrate into the surfacing. For this reason destruction of the surfacing by seepage of water (in winter, salt water) with the consequent pumping effect, is impossible. The service life of the surfacing construction can thereby be extended by three to five times.

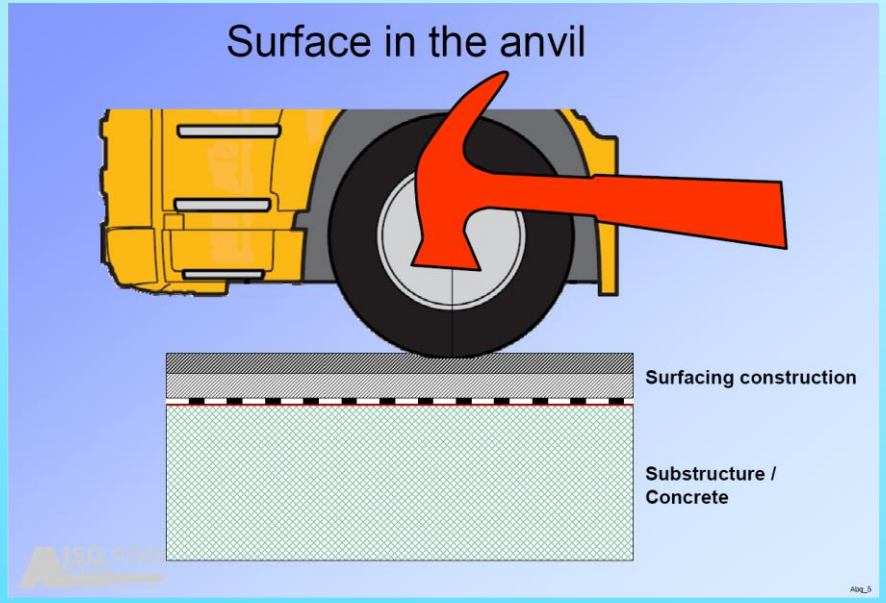
Through better quality, ensure that less maintenance is necessary. In the long-term view (Life Cycle-Costs) calculated over a period of 60 years, cost savings of up to 300% can be achieved.

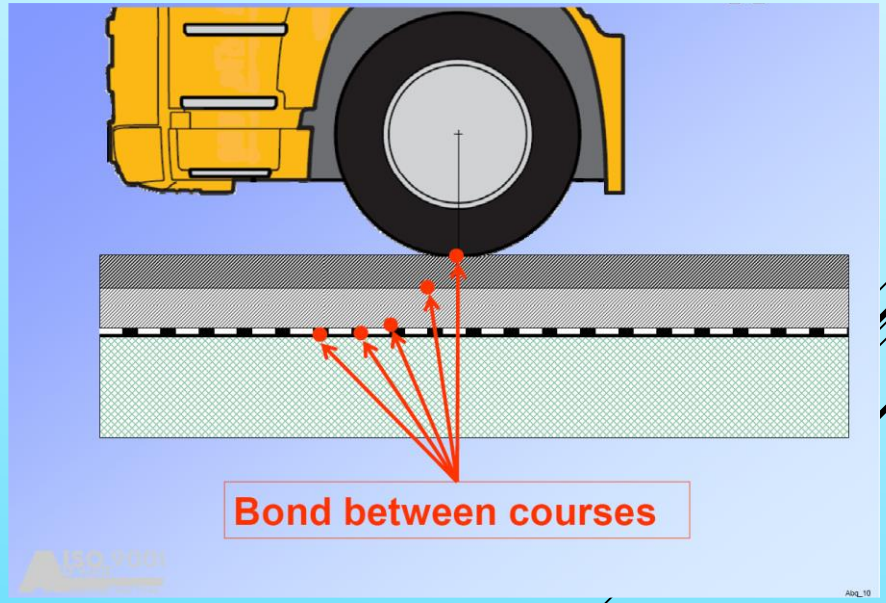




For open routes a surfacing thickness of 25 to 30 cm is usually specified. As long as there is bonding of the courses, the build up of the surfacing itself is stable and perfectly able to distribute the forces onto the plane.

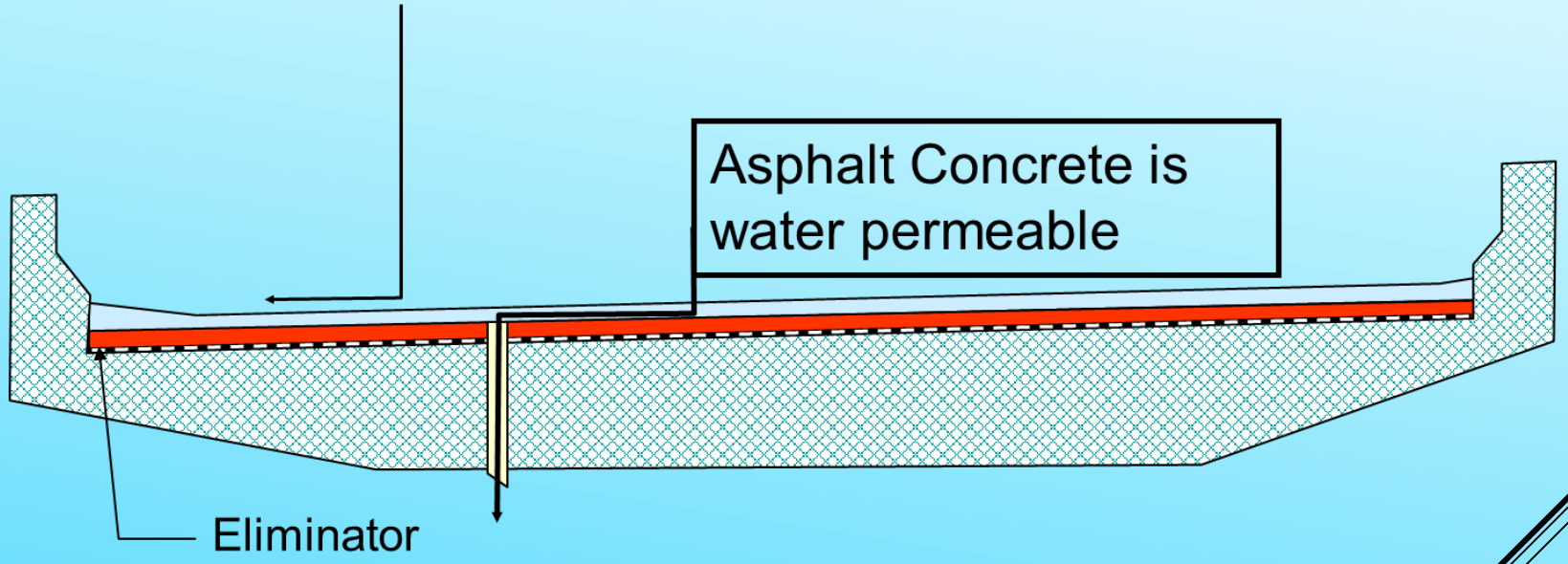
Bridge surfacing constructions are designed to be thinner in order to save weight, and are approx. ¼ of the total thickness of road surfacings. As a result, the surfacing courses are extremely stressed and it is of the utmost importance that the bonding between all courses is permanent and not just at the time of construction.





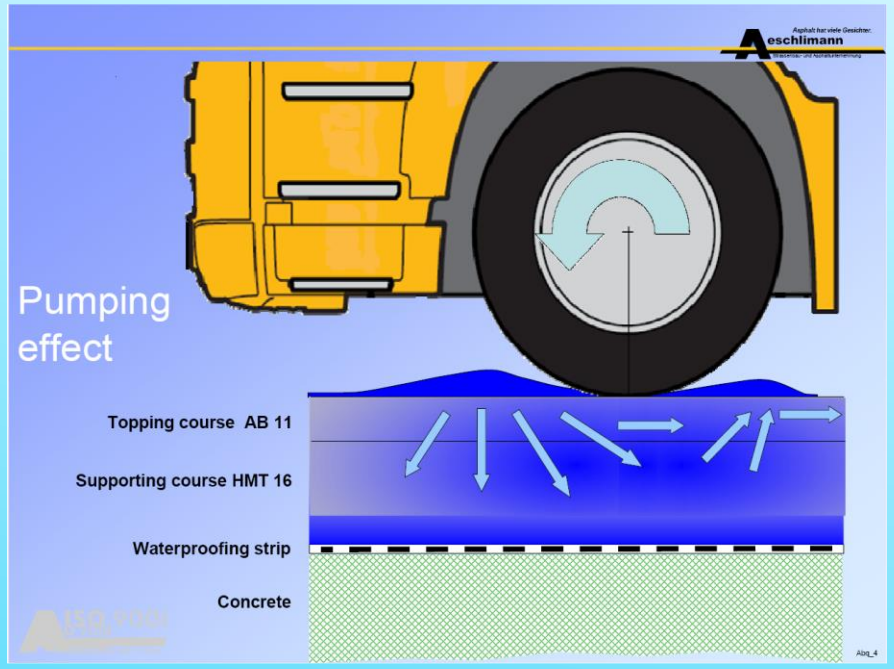
Bridge construction with Asphalt Concrete

Water runoff with Asphalt Concrete surfacing

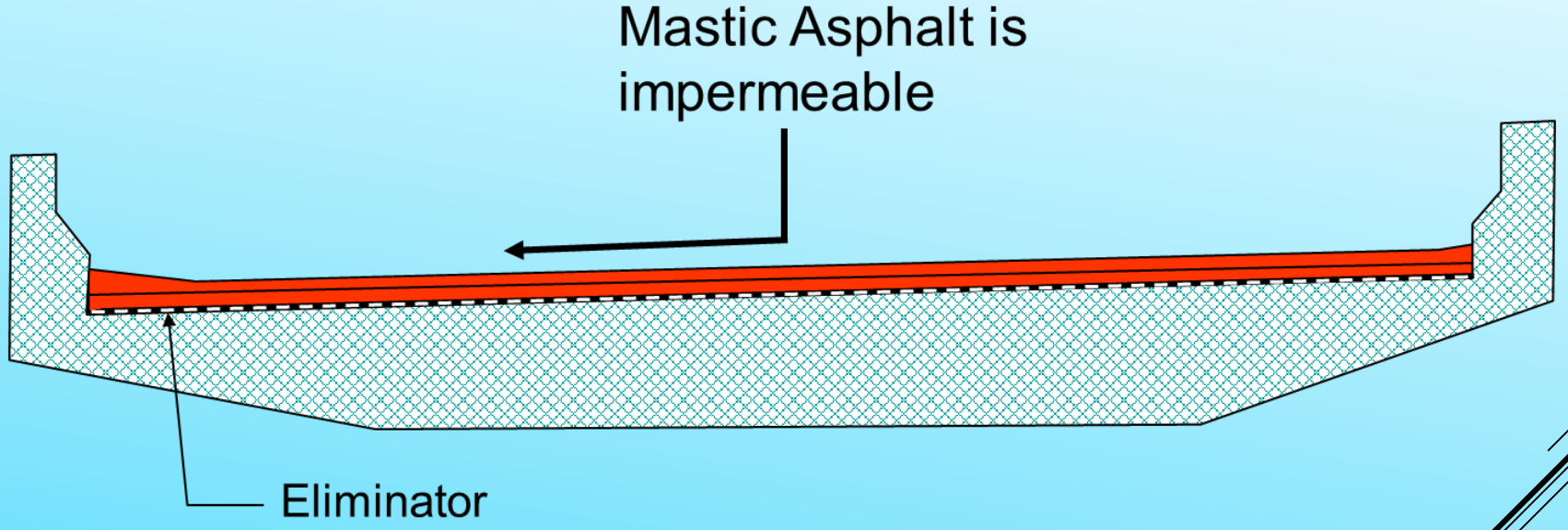


Infiltrating water has a washing effect; the water being pressed in and sucked out again, damages the binder on the stone granules.

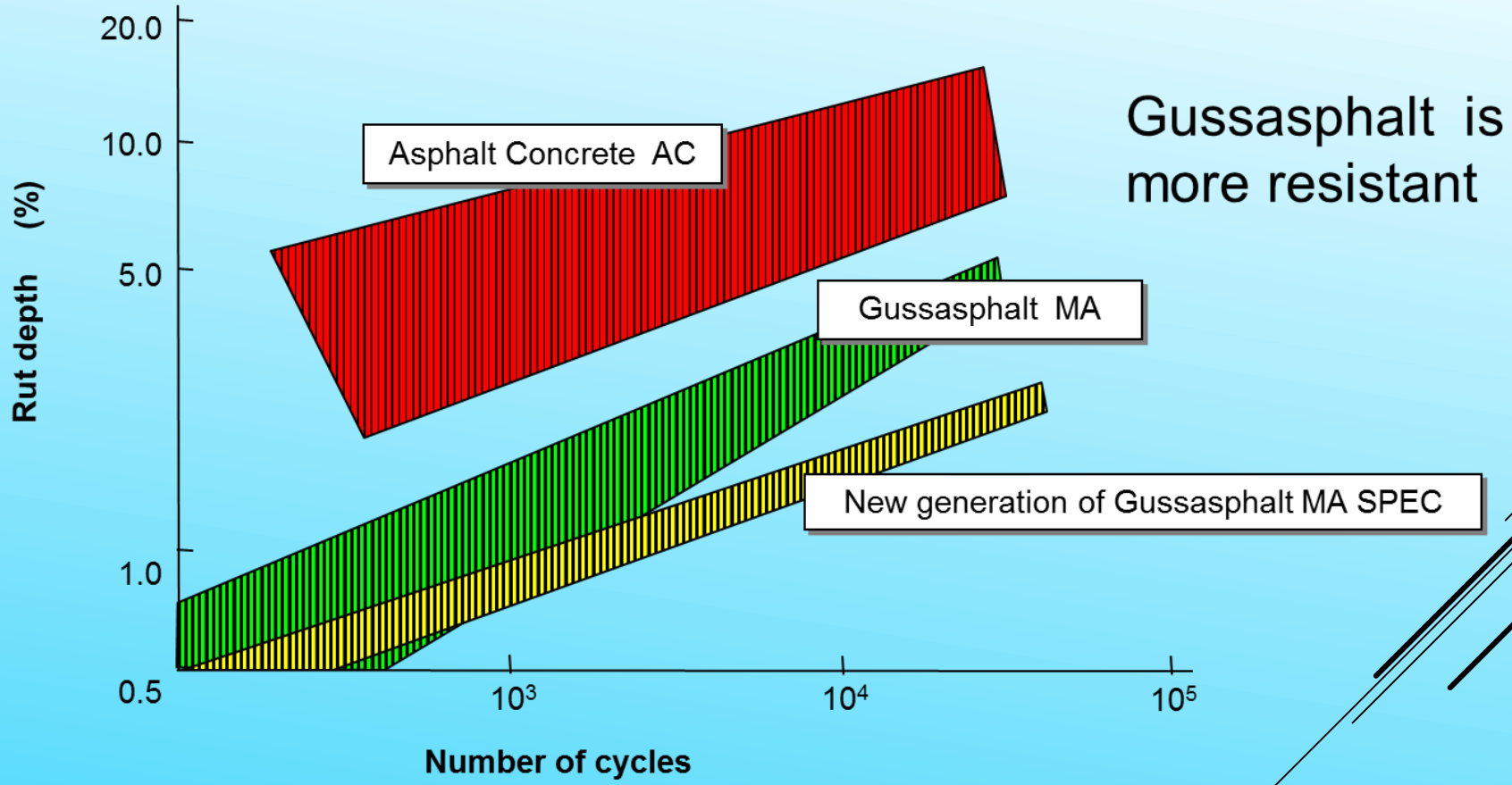
Backwater in the surfacing above the waterproofing leads to damage in winter frost conditions.



Bridge construction with Mastic Asphalt



Formation of ruts in traffic simulator at 60°C



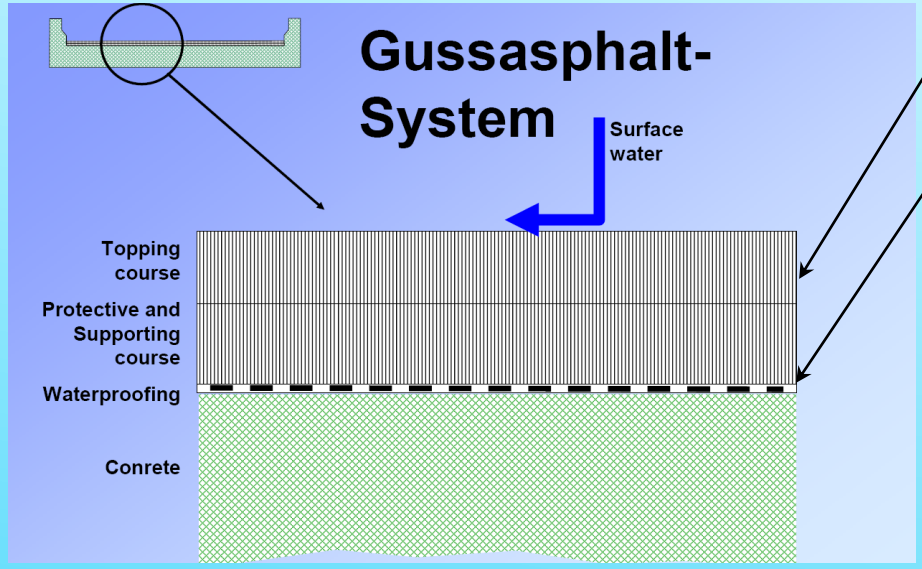
Gussasphalt is more resistant

Structures of bridge surfacing construction systems, conforming to international standards.

Complete structure waterproof
- Perfect bonding of all courses
- Stable surfacing structure
- Waterproofing matched to the system

result in a bridge surfacing construction which protects the engineered structure and provides high road safety with practically no maintenance for 25 to 35 years.

No infiltration of water into the surfacing structure



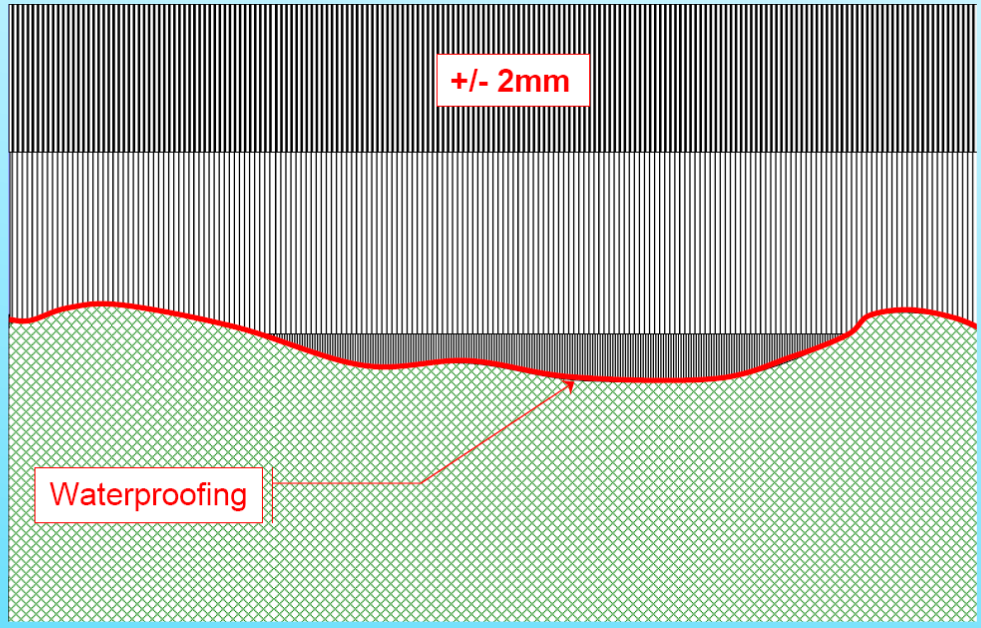
Waterproof and stable

Bond between waterproofing and surfacing courses
> 0.6 N/mm²

Dense, long-lasting bridge surfacing structures with Gussasphalt, guarantee that

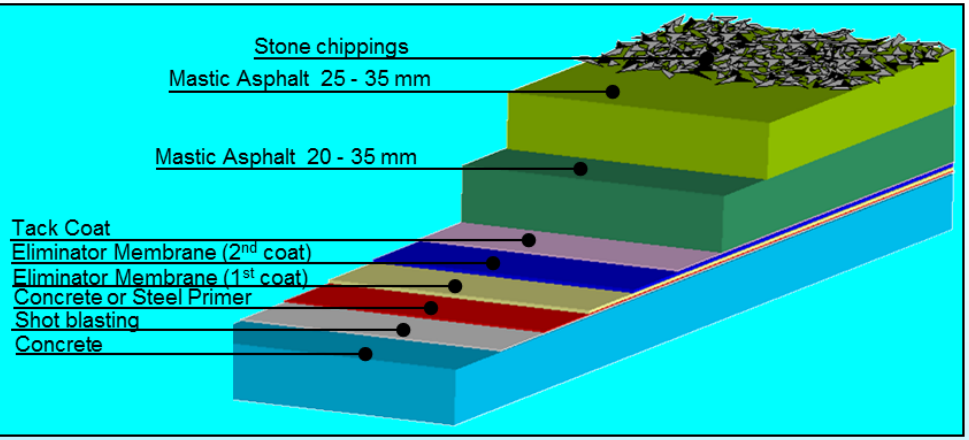
- no water is able to infiltrate the surfacing structure,
- the concrete supporting structure does not have any unevenness.

System-matched waterproofing and perfect bonding of all courses, ensure a long service life with no maintenance of the waterproofing and bridge surfacing.



Waterproofing with ELIMINATOR and Gussasphalt surfacing

SYSTEM CONSTRUCTION



Advantages

+ Bonding concrete base / waterproofing layer / surfacing construction
+ Sealing of complicated edging
+ No extreme effect of heat and cold on concrete construction
+ Bond strength over total area
+ Simple edging details
+ No surface drainage necessary
+ High laydown rate
+ Durability – Resistant to site damage
+ Tolerant of high temperature and high humidity

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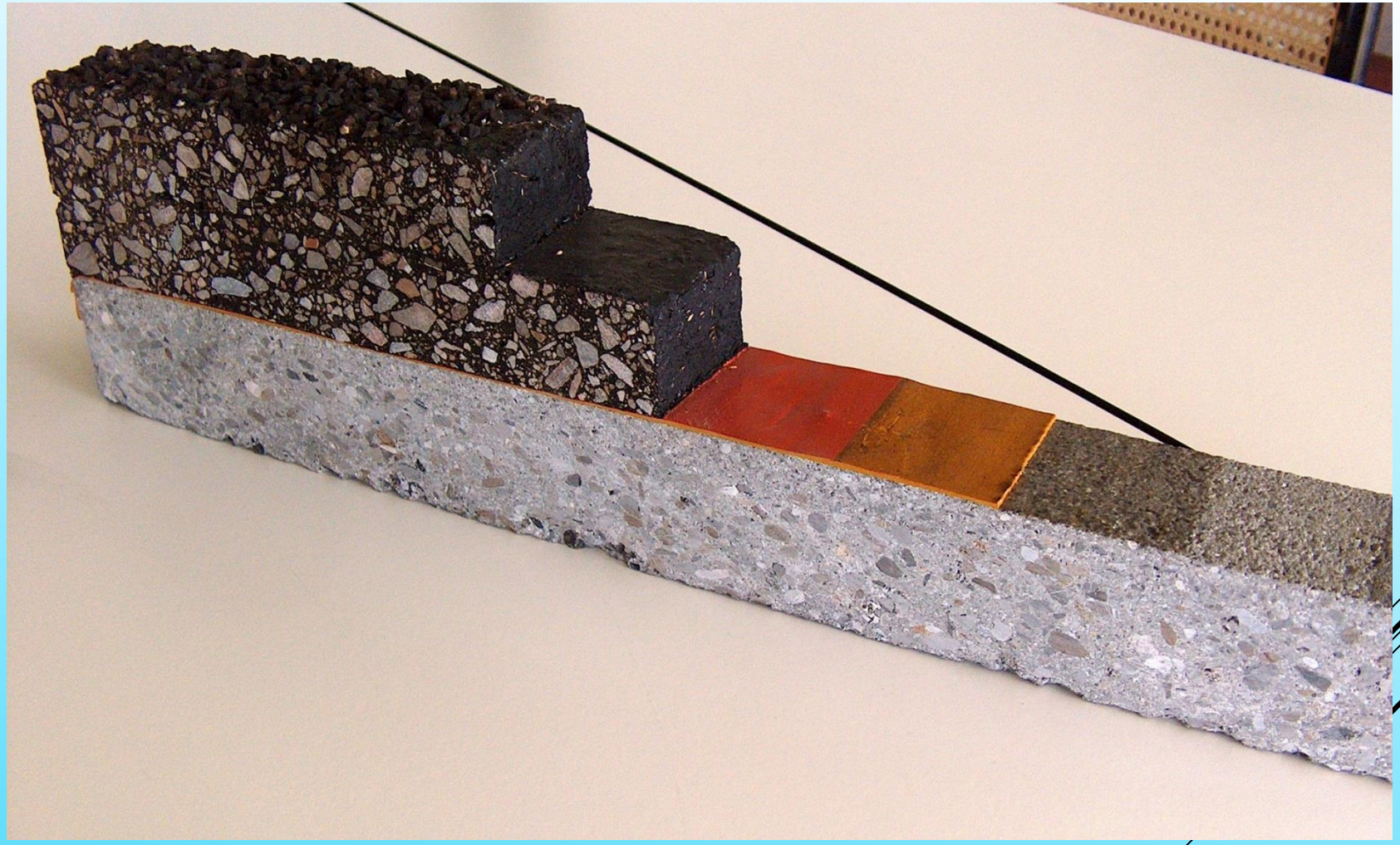

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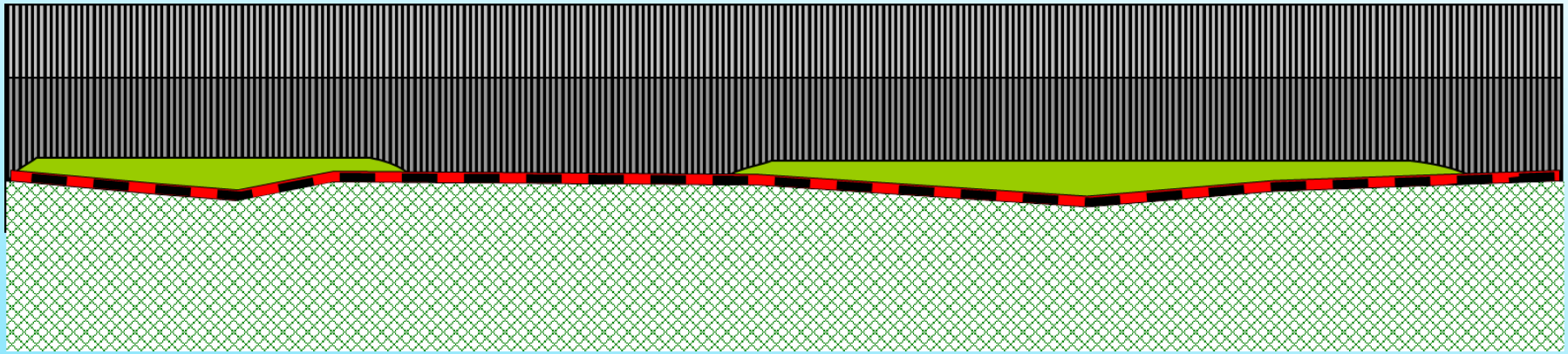

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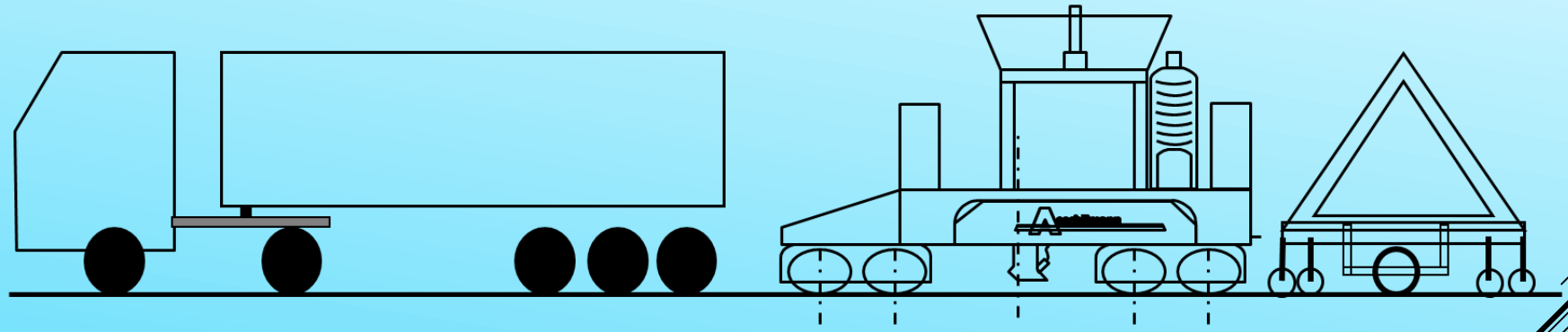
Gussasphalt laying machine with lorry and roller

(schematic drawing)



Gussasphalt laying machine

In transport position

Surfacing Application

Gavan Bridge, Kiev

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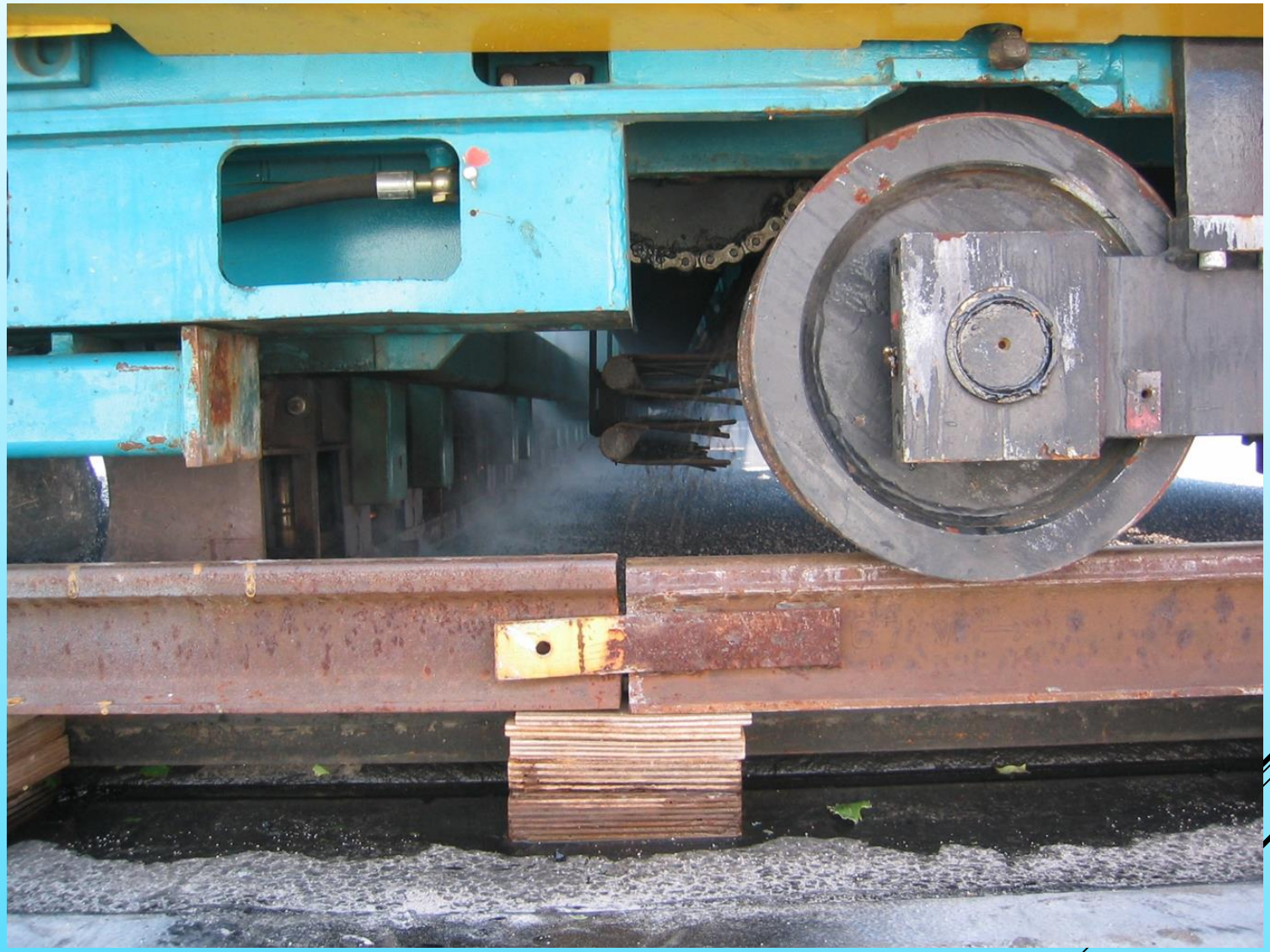

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AESCHLIMANN
ASPHALT ENGINEERING

Gubrist Tunnel, Zurich

Tunnel pavement subject to extreme loading and still no maintenance of waterproof sealing and pavement required after 36 years!

STRABAG Torun

Tsing Ma Bridge, Hong Kong

Darnetskij Bridge, Kiev

Inner-city roads in Paris

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Zusammenfassung

1. Brückenbelagskonstruktionen müssen zwingend als Einheit betrachtet werden. Die einzelnen Schichten: Traggrund, Abdichtung, Schutz- und Deckschicht müssen sich gegenseitig verbinden und müssen auch auf die Dauer verbunden bleiben.

2. Jährlich werden tausende von Brücken instand gestellt. Die dabei gewonnen Erfahrungen müssen erfasst und entsprechend bei neuen Projekten implementiert werden.

3. Brückenbeläge werden anders als Trasseebeläge beansprucht. Entsprechend braucht es einen differenzierten Belagsaufbau mit dichtem und standfestem Belagsgefüge.

4. Die Life Cycle Cost Betrachtung ist vor allem für Brücken- und Tunnelobjekte von grösster Bedeutung. Entsprechend ist mehr Qualität zu fordern und Zusatzkosten von 1 – 2 % der Brückengesamtkosten sind im Interesse der Langzeitqualität.

5. Durch die Zusammenarbeit zwischen China, Asien und Westländern haben sich in den letzten Jahren die Brückenbelagskonstruktionen gut entwickelt und sollten weiter gefördert werden.