GERMAN GREENTEC ECOLOGIC

presents:

UNDERBOLD® & PR PLAST S

Solutions for ground stabilization

&

modified asphalt

The intelligent Way

And this speaks for UNDERBOLD®

Environmental compatibility

UNDERBOLD® is a purely organic mixture consisting of waxes and oleine and therefore 100% biologically Eco Friendly.

Environmental sustainability is proven and meets all relevant requirements.

(See also the safety data sheet of the supplier)

And this speaks for UNDERBOLD®

Main effect of UNDERBOLD®

- The treated soil is hydrophobic and agglomerated.
- An enormous compressive strength is additionally obtained through appropriate addition of weight-related bonding agents (cement).
- UNDERBOLD® the mixture increases sustainably the resilience of the treated soils against aggressive influences.
- The water tightness is almost completely obtained with suitable mix composition through a fine distribution of water-repellent particles.
- Damages due to ingress water will substantially reduce.

The usefully life of the base course will fundamentally extend.

And this speaks for UNDERBOLD®

Saving of costs

Cost-saving are:

... no additional construction material such as crushed stones, gravel, bituminous materials and similar

... long journeys for materials are no more needed

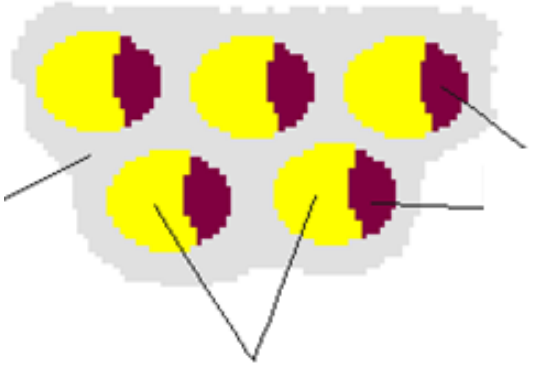
... termination in a shorter time

... completed surface is more durable

Considering all components (material, time and personnel) it is possible to assume a cost reduction of up to 30 % and even more on site.

And this speaks for UNDERBOLD®

Through homogeneously blending the bonding agent settles around and between the earth grains pre-treated with UNDERBOLD® mixture.

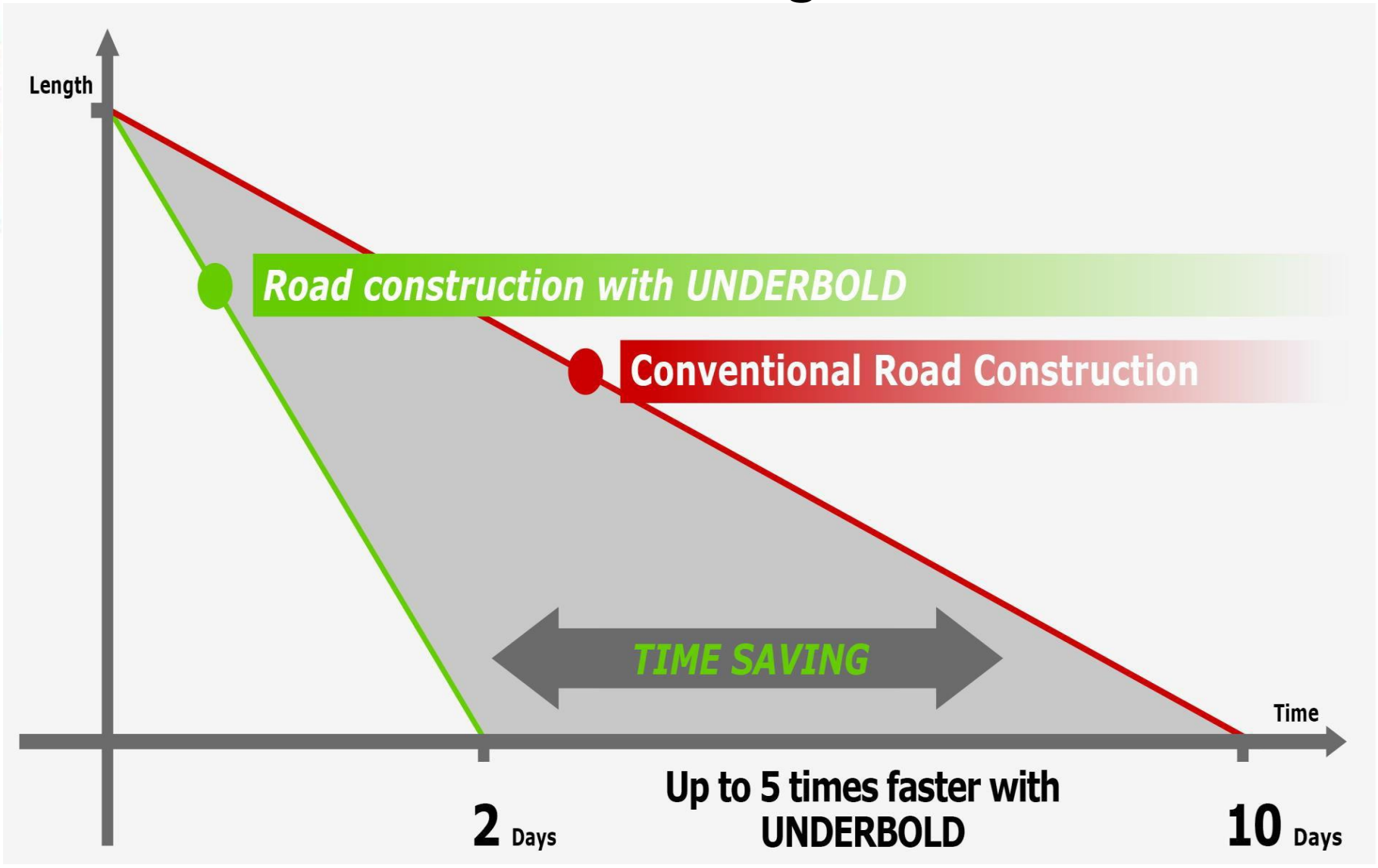


bonding agent **earth grains**

Underbold®-mixture

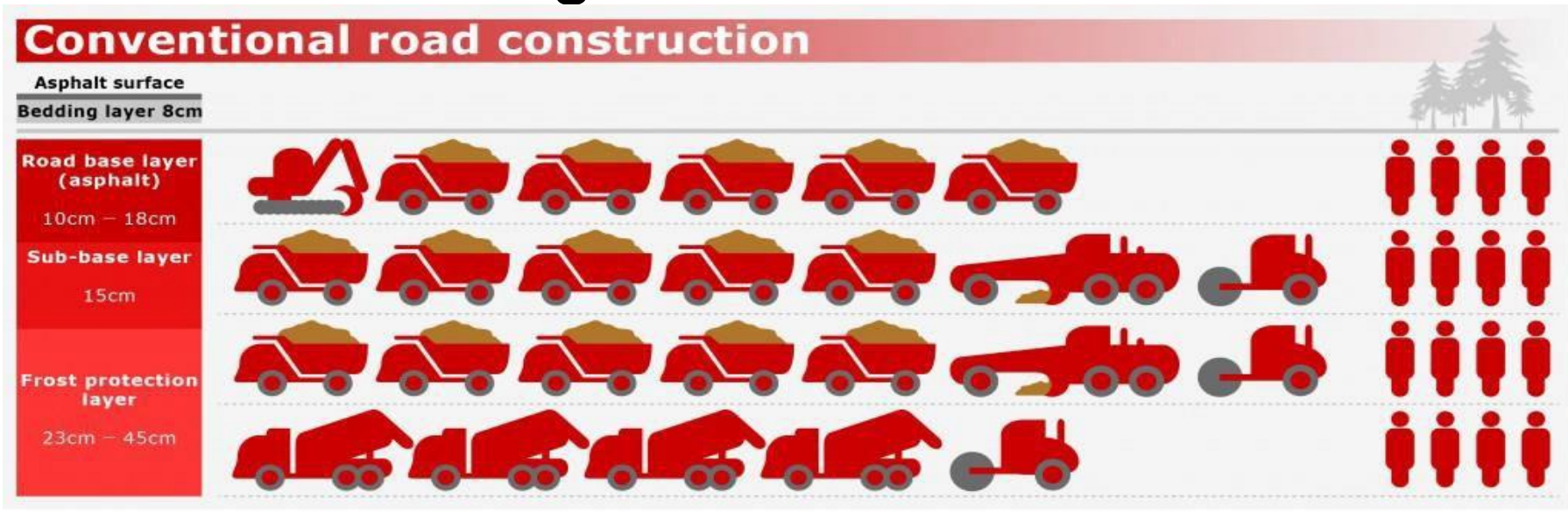
And this speaks for UNDERBOLD®

Time saving



And this speaks for UNDERBOLD®

Cost saving + environmental effects



And this speaks for UNDERBOLD®

Pavement Structure in Cross-Section

Road construction in cross-section

Conventional

5 cm Asphalt – wearing course

7,5 cm Asphalt – base course

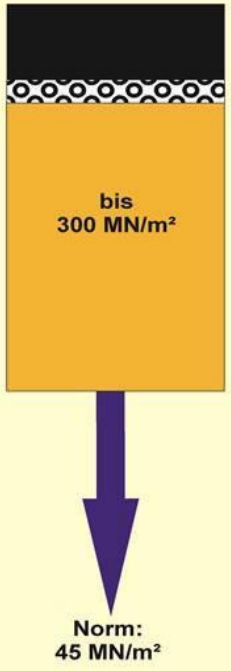
7,5 cm Asphalt – base course

15 cm (Sub base)
Road base Type "A"

30 cm (Sub base)
Hard Fill Type "B" Desert Fill
or
Dredged Sand

(Sub base)
existing or Dredged Sand

with UNDERBOLD



5 - 10 cm toplayer with PR-Plast

1 - 2 cm primer and split

40 cm
UNDERBOLD

savings through
UNDERBOLD
time and material

And this speaks for UNDERBOLD®

Step 1 - Preparation of the to-be-treated surface

Provide a rough and fine formation level

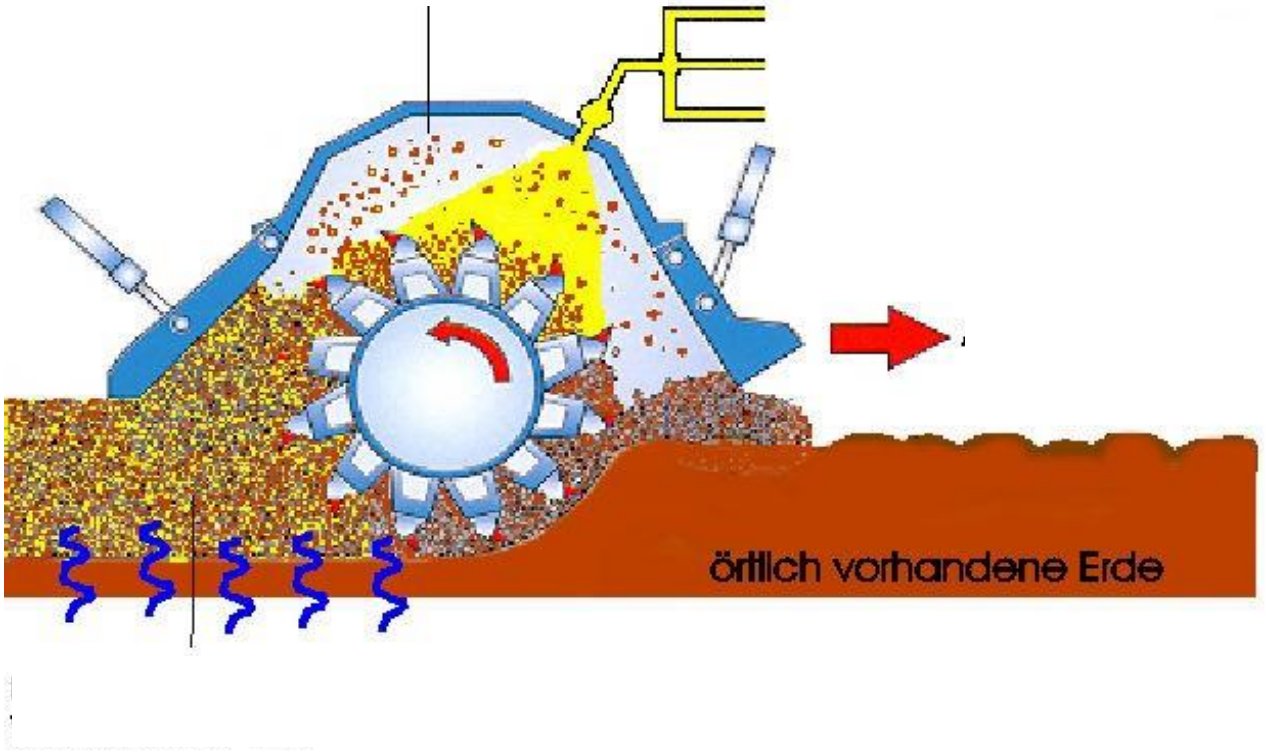
And this speaks for UNDERBOLD®

Step 2 - Milling machine Wirtgen WR240

And this speaks for UNDERBOLD®

Operating Principle

Blending the homogeneous Underbold® -mixture into the soil

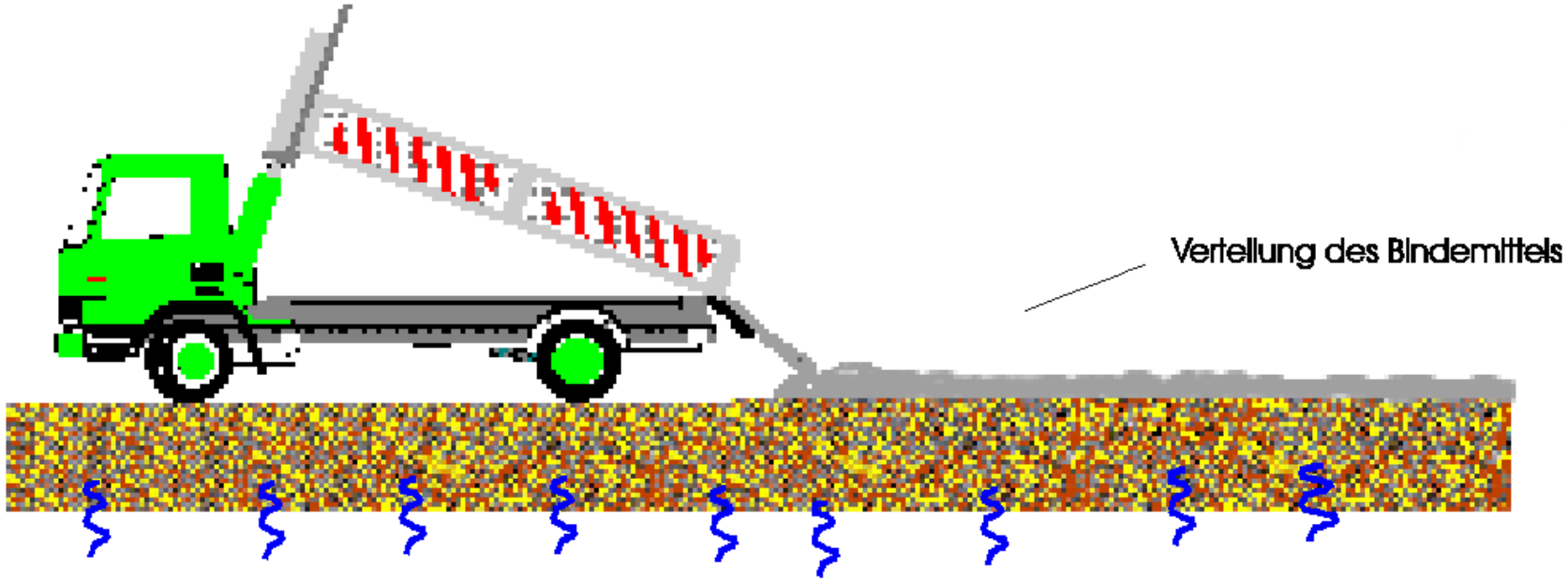


And this speaks for UNDERBOLD®

Step 3 - Cement spreader

And this speaks for UNDERBOLD®

Distribution of the bonding agent



The water used as means of transport for the Underbold®-mixture, seeps into the soil.

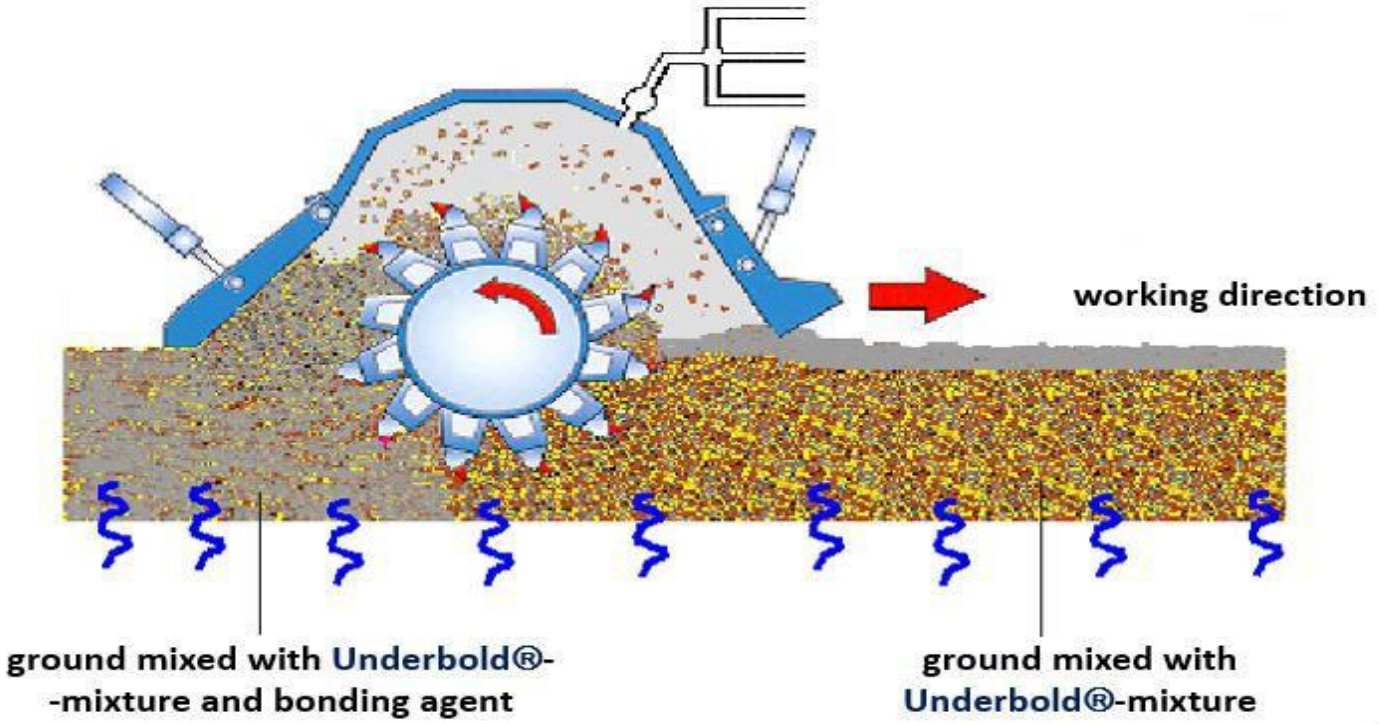
The water still remaining in the ground is needed as a source for the bonding agent.

And this speaks for UNDERBOLD®

Step 4 - Millingcement

And this speaks for UNDERBOLD®

Blending homogeneously the bonding agent into the soil



And this speaks for UNDERBOLD®

Step 5 – Compression

Optimal (sufficient) compression of the treated surface

And this speaks for UNDERBOLD®

After the compression process the remaining humidity is delivered into the air and soil (hydrophobicity)

compressed ground **uncompressed ground**

And this speaks for UNDERBOLD®

References: Mercedes Benz area near Stuttgart

Finished Subgrade

Finished plan

And this speaks for UNDERBOLD®

Subgrade is finished and ready for asphalt

And this speaks for UNDERBOLD®

Milling machine and Underbold® in recycling progress with asphalt

And this speaks for UNDERBOLD®

TÜV GERMANY

Test report **BBV1113096 / SAP 69627373** **Date: 25.08.2011**

Customer: Global Underbold System GmbH
Seckenheimer Hauptstraße 197a
68239 Mannheim

Order from: 29.06.2011

Contents of order: Sampling, carrying out of field and laboratory experiments and production of a test report for the field test with 3% binder-Underbold-soil mixture

Sampling material: see appendices

Sampling: TR LGA Bautechnik GmbH

Sample receipt: see appendices

Sampling designation: see appendices

This test report includes 2 document classes.

The test results are only based on the sample material stated in the test report. The test period corresponds to the period between receipt date and the findings date.

This test report may only be publicised in its original wording. Publication of any shortened version or extract requires prior permission from TÜV Rheinland LGA Bautechnik GmbH.

We have saved essential data and your address in order to process the order. Data protection is guaranteed.

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90431 Nürnberg

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And this speaks for UNDERBOLD®

TÜV Rheinland LGA Bautechnik GmbH
Traffic route construction

4.2 CBR tests

CBR - testing is used to determine the relationship between force and depth of penetration when a cylindrical plunger is pressed at a specified penetration speed into a test piece inside a mould.

Testing is carried out according to DIN EN 13286-47 standard on the following laboratory samples and drill cores.
The drill cores were adjusted to fit the CBR test pots and cast in so that a force of adhesion with the test pot existed.

The test pieces that were made in the laboratory were left until testing was carried out and stored in a climatically controlled cabinet.

The CBR test results are complied in the following table:

Table 6: CBR test results

Area	Binder	Designation	Test date	CBR value [%]		Comment
				2.5 mm	5 mm	
1	3% cement + Underbold	Sample 1.1	28.07.11	241.4	208.6	
		Sample 1.2	28.07.11	285.7	360.8	
		Sample 1.3	28.07.11	187.1	221.1	
Laboratory	3% cement + Underbold	Sample L1	18.08.11	1201	1137	

Records of CBR test results are given in **Appendix 2**.

PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

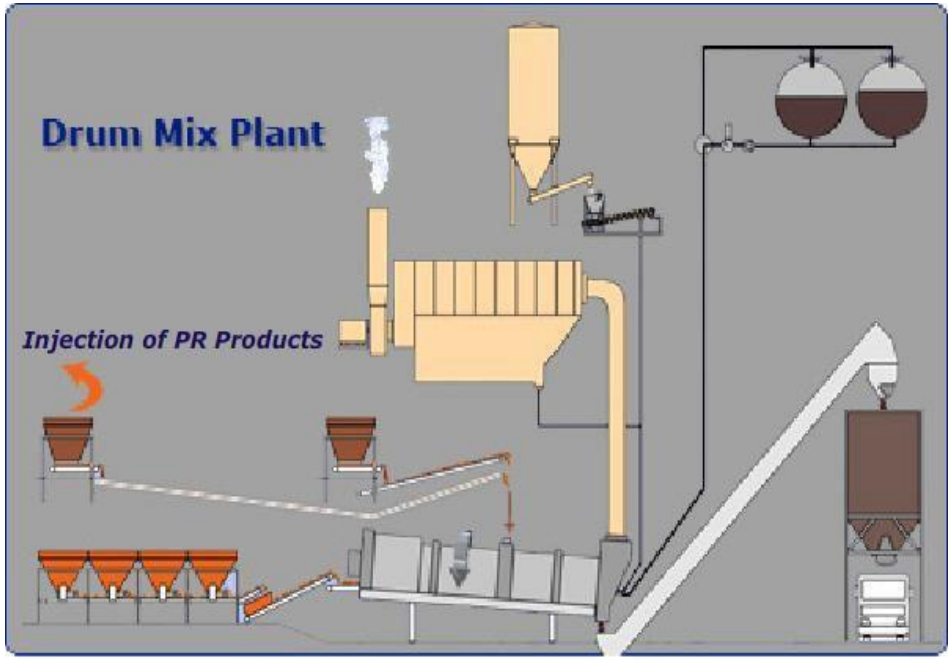
PR PLAST S®		
	**Form**	Pellets
	Size	2 - 4 mm
	Colour	Black
	Composition	**Polymer compound pre-blended with a special bitumen and treated with anti-shrinkage agent**

PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

Injection of the additive

IN THE DRUM MIX PLANT:

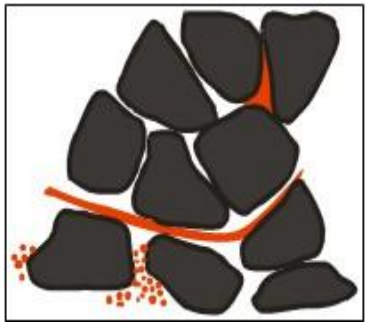


PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

Main effects of our additive

- Direct introduction in the asphalt plant mixer
- Improves bonding between aggregates and binder, aggregate coating
- Improves water sensitivity (i/C ratio)
- Structural effect on mineral skeleton of asphalt mix



PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

Advantages of additive

CONCLUSION : TECHNOLOGICAL ADVANTAGES (1):

- **Significantly improves the resistance to rutting of asphalt concrete mixes:**

→ **Average : rutting divided by factor 3 to 4**

- **Higher resistance to deformation at high pavement temperature.**
- **Increased stiffness modulus in order to achieve performances of the BBME (wearing and binder course High-Modulus Asphaltic Concrete).**

→ **Average : stiffness modulus increase by +25%**

- **Lower susceptibility to temperature variation.**

PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

Advantages of additive

CONCLUSION : TECHNOLOGICAL ADVANTAGES (2):

- **Improved resistance to cracking and reflective cracking.**
- **Better age resistance properties – Higher fatigue life of mixes.**
- **Better adhesion between aggregates and the binder.**
- **Easy to transport and store – unlimited storage time.**
- **Easy to use – no need for binder modification plant**

PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

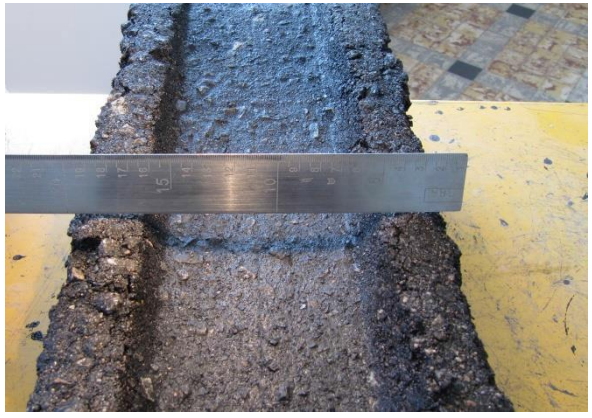
Sector 1 80/100	Sector 2 Modified Bitumen 4%	Sector 3 60/70	Sector 4 PR PLAST S +80/100
Rutting = 27 mm	Rutting = 12mm	Rutting = 18 mm	Rutting = 5 mm

Heating 60°C, Rut depth after 100 000 cycles

PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

Product	Dosage %	50/70 Bitumen Dosage	Rut Depth NF EN 12697-22			
			1000 cycles	3000 cycles	10000 cycles	30000 cycles
Sample	0	6%	3,5%	6,9%	10.4%	14.0%
PR PLAST.S	0,40%	6%	2,1%	2,8%	3.5%	4,1%



WITHOUT ADDITIVE

WITH 0,4% PR PLAST S

Heating 60°C, Rut depth after 100 000 cycles

PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

B27 Germany Expressway

Highway A73 Germany

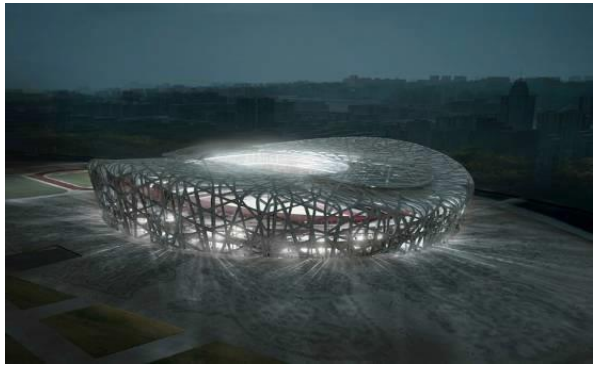
Expressway Nederland

Expressway Germany B 10

PR PLAST S & UNDERBOLD®

Solution for better asphalt and underground stabilization

A432 Highway, France

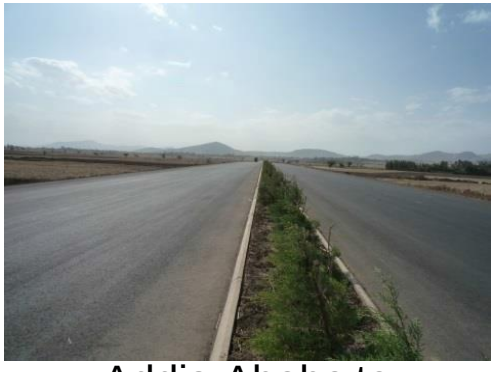


Bird's Nest Olympic stadium access lanes, Beijing, China

Misurata to Sirte Coastal Road, Libya

Kourou rocket launch pad – French Guyana

A40 Highway deceleration lanes, France



Addis-Ababa to Nazret Expressway, Ethiopia

We cordially thank you for your attention!

GERMAN GREENTEC ECOLOGIC

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