TERRASYSTEM®

SOIL STABILIZATION TECHNOLOGY

WHY ARE ROADS SO SHORT-LIVED?

influence of water

Temperature fluctuations

Point loads

Natural product and ecologically pure soil stabilization process

FOR ALL STREET CATEGORIES

35 years

on the market

and continuous development of the technology

until 5 years

warranty on base layer of streets,

if the technological process is followed

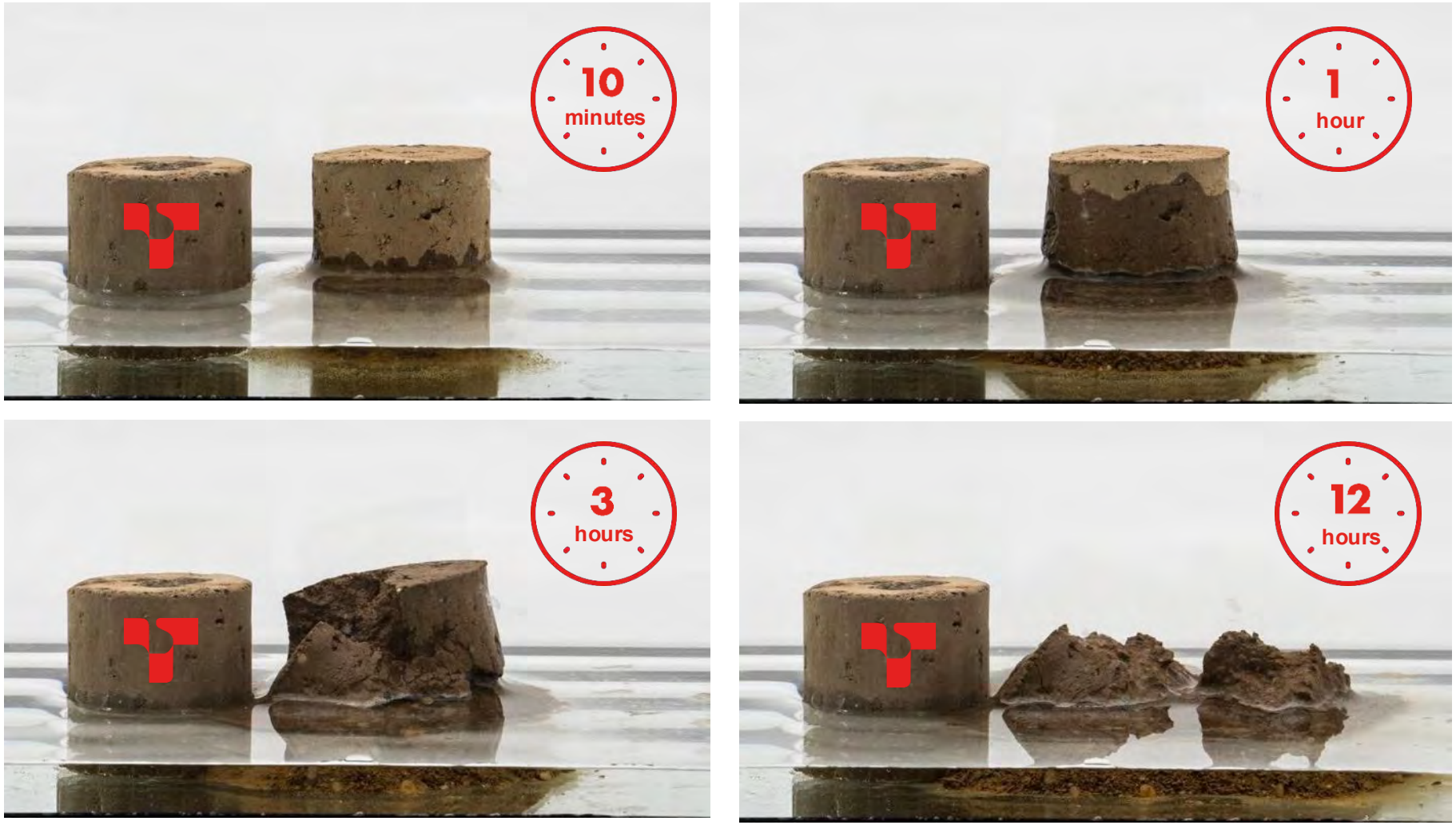
from 30%

savings

compared to conventional road construction methods

WATER IMPERMISSILITY TEST

Comparison of untreated soil and soil treated with TERRA-3000®



UNIVERSAL APPLICATION

for road construction

wetlands

Zones with difficult climatic conditions (including permafrost)

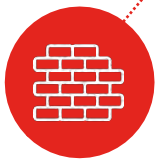
Ecological zones (forests, peatlands)

difficult terrain (mines, quarries)
with the difficult use of heavy equipment

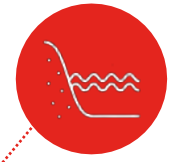
UNIVERSAL APPLICATION

Other applications

Construction of areas for the storage of garbage and toxic waste, as well as municipal cemeteries.



Production of frost-resistant bricks for rural house construction and for building work in regions with low temperatures

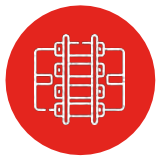


Reinforcement of upper and lower embankments, lining of irrigation canals

Densification of building areas under multi-story buildings

Road construction to mineral extraction areas

Establishment of areas for the storage of manure and waste from poultry farms



Construction of the subgrade for railway ballast/sleepers

Construction of earth dams

Construction of airfields and military sites

PRACTICALLY

SUITABLE FOR ALL SOIL TYPES

ALL SEMI-COHESIVE OR COHESIVE SOILS

with a high proportion of silt or fine clay particles or windblown sand

NON-COHESIVE SOILS (GRAVEL, CRUSH AND SAND)

They can be made cohesive by adding missing fine fractions of clay or aeolian sand.

HEAVY CLAY SOILS

It may be possible to add non-cohesive materials to the clay to reduce swelling.

OPTIMAL PARAMETERS OF THE SOIL MATERIAL

AT LEAST 25%
fine grain content (< 0.063 mm) in the soil, and of this volume 15%–25% fractions < 0.002 mm – this is the so-called "soil cement"

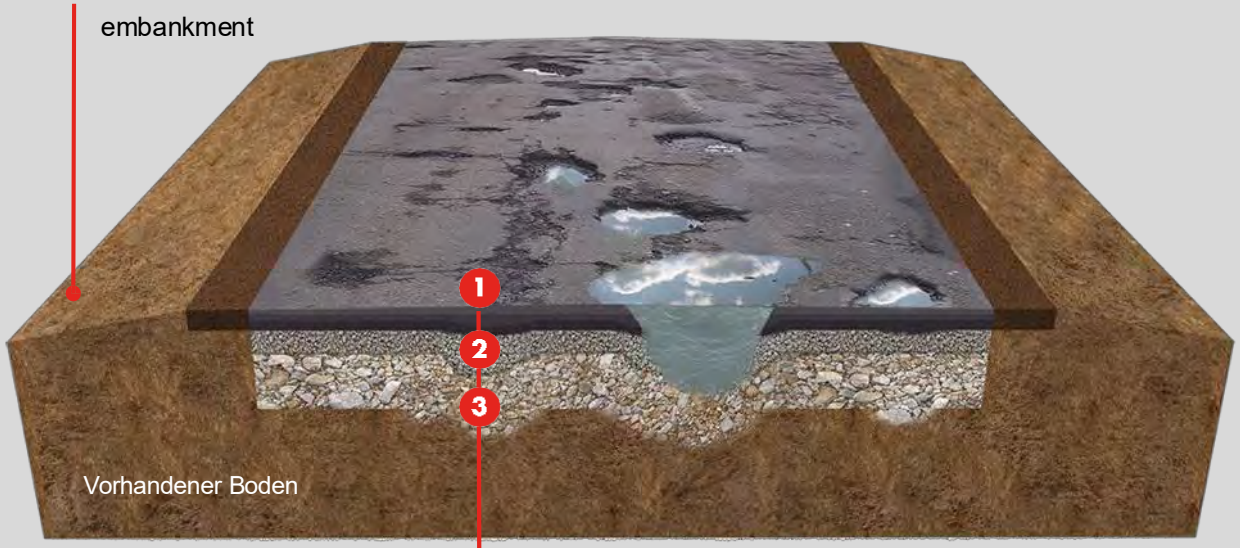
> 1.850 kgf/m³
Proctor's guideline value for the density of the soil to be worked (pd)

The residual moisture content of the soil should be close to the optimal Proctor value. The addition of TERRA-3000® additives ensures optimal density after compaction.

5 – 30%
Plasticity index (Ip)

TRADITIONAL CONSTRUCTION

Road width 6 m with a soil excavation of 60–80 cm down to the frost line.



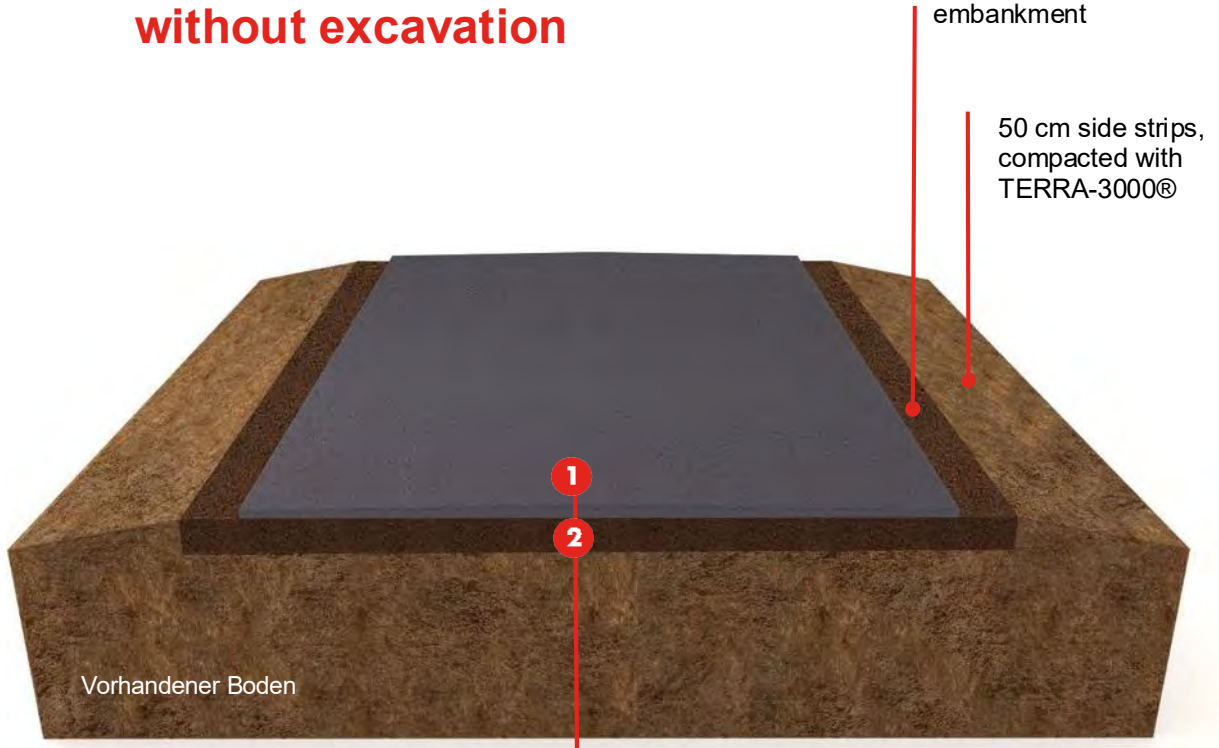
1 Top layer: Road surface
- 4 cm wearing course
- 5 cm asphalt binder
- 9 cm asphalt base course

2 20 cm unbound base course of crushed stone 0/22

3 30–60 cm unbound base course of sand-gravel mixture

TERRASYSTEM®

Road width 6 m
without excavation



1 Top layer: 6–8 cm asphalt pavement or thin coating based on a bitumen emulsion

2 20 cm soil layer, compacted with TERRA-3000®, 7 m wide

OPERATIONAL CHARACTERISTICS OF THE COMPACTED LAYER

Traditional method		TERRA-3000®
Street climate zone II — **60 MPa**	Calculated modulus of elasticity	Minimum value **70 MPa**
Street climate zone III — **50 MPa**		Maximum value **150 MPa**
Street climate zone IV — **45 MPa**		under certain conditions **180 MPa**

70%	Residual deformations in road substructures	**5% - 7%**

1. SOIL ANALYSIS

- Determination of the particle size distribution of the soil to be compacted – sieve analysis, slurry analysis.
- Determination of the OMC – “optimum moisture content” in % of the base course to be compacted
- Determination of the NMC – “natural moisture content” in % of the soil to be treated
- Calculation of the quantity of fractions required (sand, gravel) according to grain size distribution
- Calculation of the working solution required = TERRA-3000(R) + water

2. APPLICATION OF TERRA-3000®

- Preparation of the TERRA-3000® working solution
- The solution is worked into the soil using a milling machine or a sprayer.
- Thorough mixing of the solution with the soil using a milling machine
- Intensive compaction of the subgrade with rubber wheel rollers weighing at least 20 tons without vibration

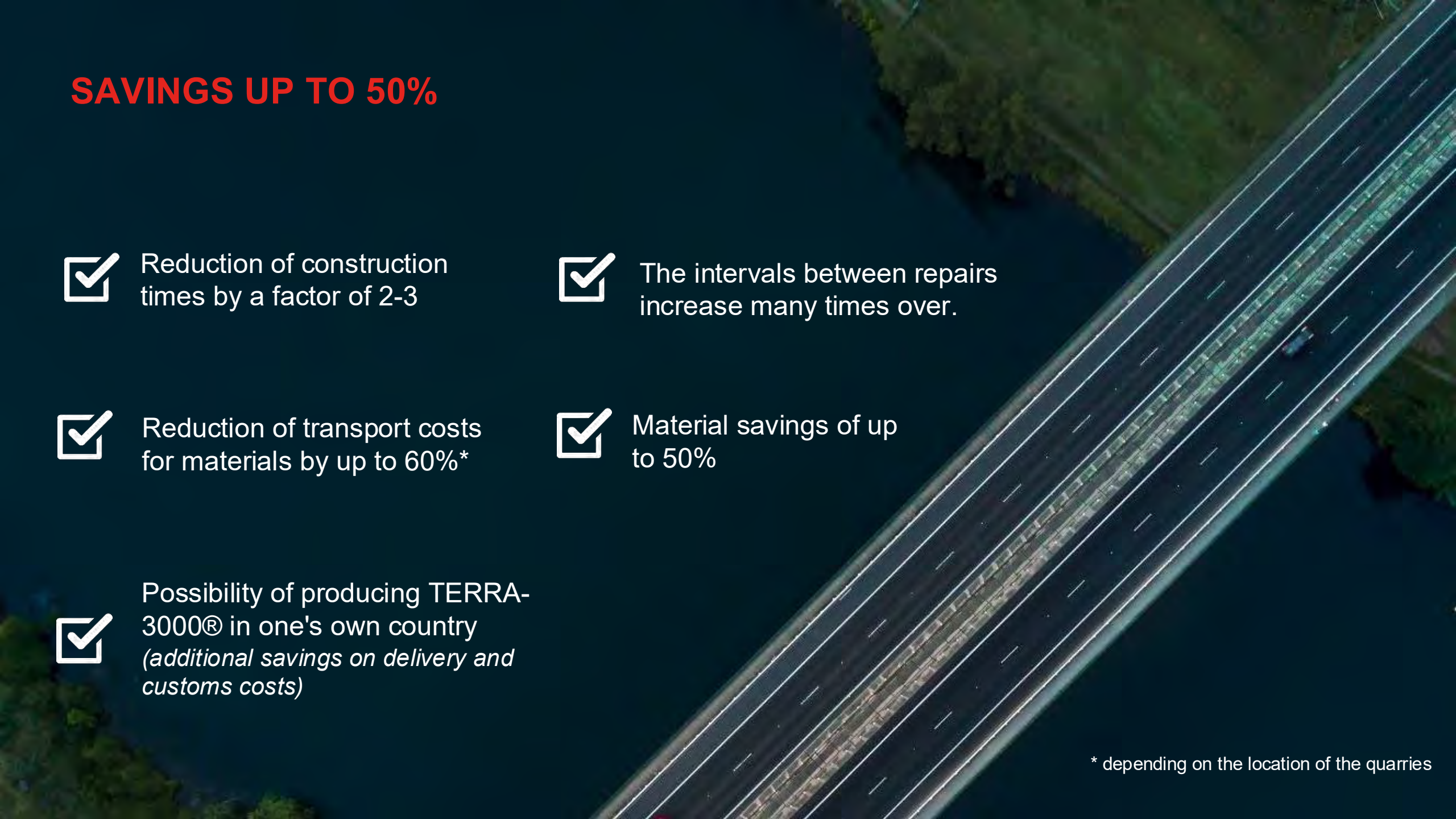
3. APPLYING THE PROTECTIVE LAYER

The protective layer is applied before the final rolling pass, once the road profile has been fully formed.

Various materials can be used as a protective layer: milled asphalt, screened rock, or gravel. Depending on the purpose of the road, either asphalt can be applied to the reinforcement or a simple layer of bitumen and gravel can be used.

SAVINGS UP TO 50%

- Reduction of construction times by a factor of 2-3
- The intervals between repairs increase many times over.
- Reduction of transport costs for materials by up to 60%*
- Material savings of up to 50%
- Possibility of producing TERRA-3000® in one's own country *(additional savings on delivery and customs costs)*



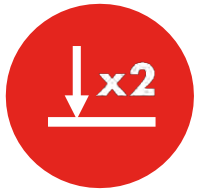
* depending on the location of the quarries

ADVANTAGES OF TERRA-3000® TECHNOLOGY

Neutralizes the effects of water and frost

The only technology that does not depend on weather conditions (rain, wind)

Works exclusively with natural materials (rock screenings, slag, etc. can be used for grain grading of the base course)



The permissible load exceeds the level required for ordinary roads by more than double.

The base layer becomes denser every year.

Completely environmentally safe – does not affect groundwater

The product/solution is non-flammable and requires no special storage.

REQUIRED TECHNOLOGY

Grader with ripper

Tank truck with spraying device and circulation pump

Road soil milling machines (or soil stabilization milling machines)

Paddle foot roller (sheep foot roller) for coarse compaction of cohesive soils, weight at least 20 tons

Pneumatic roller for spot compaction, weight at least 20 tons

+ all other road construction machines

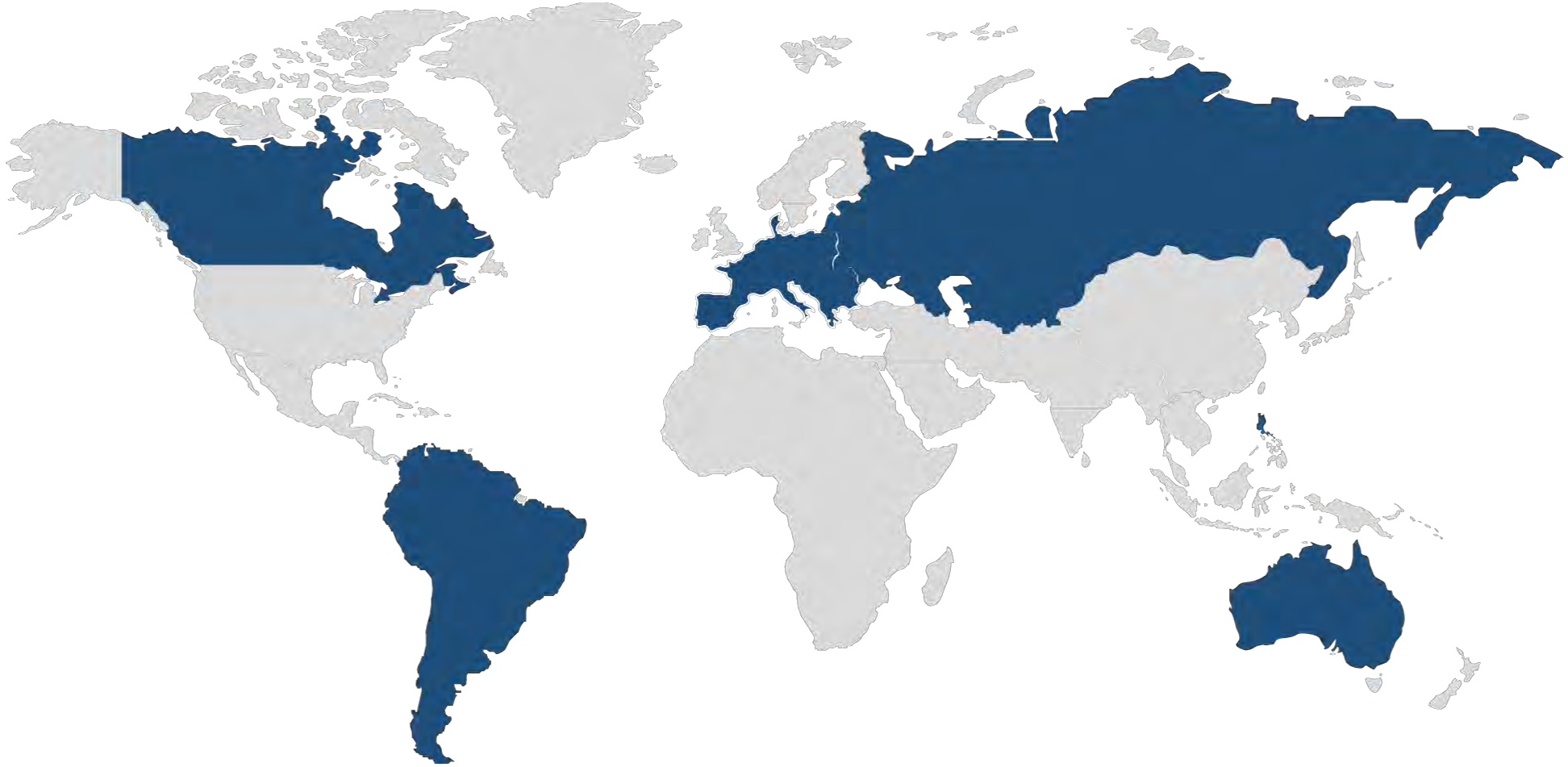
IMPLEMENTED PROJECTS

100+

Projects

18

Countries



EU CERTIFICATE

MAPAG
Baustoffuntersuchungen und Umweltanalytik
Staatlich akkreditierte Prüf- und Überwachungsstelle

Firma
TERRA SYSTEM
Bodenstabilisierung Betriebsges.m.b.H.
zH Herrn Richard Pachler
Untergroßau 178
8261 Sinabelkirchen

Gumpoldskirchen, 1.8.2008
Labor Nr.: **2951.2/2008** MS

PRÜFBERICHT

Untersuchung einer Produktprobe „TERRA-3000"

Am 28.7.2008 wurde der MAPAG die o.a. Probe übermittelt.

Untersuchungsergebnisse

Die Probe wurde auftragsgemäß untersucht.
Die Analysenmethoden und Untersuchungsergebnisse sind in der Beilage 1 zusammengestellt.

Beurteilung

Auf Grund der empfohlenen Aufwandsmenge von ca. 0,8-1 Liter TERRA-3000 pro m³ Erdmaterial (entsprechend einer Verdünnung von ca. 1:2000) sind negative Auswirkungen auf das Eluatverhalten bezüglich der untersuchten Parameter nicht zu erwarten.

Verteiler:
2 x Terra Systems

2951.2 / 2008
Dieser Bericht umfasst 1 Seite und 1 Beilage.

MAPAG

Beilage / zu 2951.2/2008

Parameter	Methode	Dim.	Messwert
pH-Wert	DIN 38404, Teil 5	---	4,7
Leitfähigkeit	ÖN EN 27888	mS/m	292
Antimon	ÖN EN ISO 11885	mg/l	< 0,01
Arsen	ÖN EN ISO 11885	mg/l	< 0,01
Blei	ÖN EN ISO 11885	mg/l	< 0,01
Cadmium	ÖN EN ISO 11885	mg/l	0,0011
Chrom gesamt	ÖN EN ISO 11885	mg/l	< 0,01
Cobalt	ÖN EN ISO 11885	mg/l	< 0,01
Kupfer	ÖN EN ISO 11885	mg/l	0,04
Molybdän	ÖN EN ISO 11885	mg/l	< 0,01
Nickel	ÖN EN ISO 11885	mg/l	0,02
Quecksilber	ÖN EN 1483	mg/l	< 0,0002
Selen	ÖN EN ISO 11885	mg/l	0,04
Zink	ÖN EN ISO 11885	mg/l	0,08
Zinn	ÖN EN ISO 11885	mg/l	< 0,01
Ammonium (als N)	DIN 38406, Teil 5	mg/l	17,0
Chlorid	ÖN EN ISO 10304	mg/l	472
Fluorid	ÖN EN ISO 10304	mg/l	< 2
Nitrat (als N)	ÖN EN ISO 10304	mg/l	1,9
Nitrit (als N)	ÖN EN 26777	mg/l	3,4
Sulfat	ÖN EN ISO 10304	mg/l	16,8
TOC (als C)	ÖN EN 1484	mg/l	103
Phenole	DIN 38409, Teil 16	mg/l	< 0,1
Kohlenwasserstoffe	ÖNORM EN ISO 9377-2	mg/l	39

MAPAG

FURTHER CERTIFICATES

ROMÂNIA

CONSILIUL TEHNIC PERMANENT PENTRU CONSTRUCTII

AVIZ TEHNIC

În baza procesului verbal nr. **1-71**, din data de **15.12.2005** al Comisiei de avizare nr. 1 a agrementelor tehnice în construcţii:

CONSILIUL TEHNIC PERMANENT PENTRU CONSTRUCTII

AVIZEAZĂ FAVORABIL:

agrementul tehnic nr. **001-01/308-2005**, elaborat de **INCERC BUCURESTI**, pentru **PROCEDEU DE IMBUNATATIRE A CARACTERISTICILOR TERENULUI – TERRA SYSTEM**, al cărui producător este **TERRA-SYSTEM BETRIEBS GmbH AUSTRIA.**

Prezentul **AVIZ TEHNIC** este valabil până la data de **15.12.2007** şi se poate prelungi în situaţia în care titularul face dovada menţinerii aptitudinii de utilizare a obiectului agrementului tehnic, conform prevederilor menţionate la cap. „condiţii" din agrementul tehnic.

Agrementul tehnic este valabil până la data de **20.12.2008**, pentru titular, producător şi distribuitorii din anexa la agrementul tehnic şi nu ţine loc de certificat de calitate.

PREŞEDINTE,
Marin CRISTEA

PRELUNGIT până la data de.....	**PREŞEDINTE**	
PRELUNGIT până la data de.....	**PREŞEDINTE**	

ORIGINAL

CONSILIUL TEHNIC PERMANENT PENTRU CONSTRUCŢII

Agrement Tehnic
001 - 01/308 - 2005

PROCEDEU DE ÎMBUNĂTĂŢIRE A CARACTERISTICILOR TERENULUI - TERRA SYSTEM
PROCEDURE TECHNIQUE POUR AMÉLIORATION DE CARACTERISTIQUES DE SOL - TERRA SYSTEM
TECHNICAL PROCEDURE FOR SOIL CHARACTERISTICS IMPROVEMENT - TERRA SYSTEM
TECHNISCHES VERFAHREN FÜR BODENEIGENSCHAFTSVERBESSERUNG - TERRA SYSTEM

PRODUCATOR: ***TERRA-SYSTEM BETRIEBS Gmbh***
Untergrossau 178
Tel. 0043-3118-5110, Fax. 0043-3118-5110-4, E-mail:
AUSTRIA

TITULAR AGREMENT TEHNIC: **S.C. REIDOM S.R.L.**
Str. Ioan Corvin, BLC13, ap.3, BISTRA, judeţul Caraş-Severin, ROMANIA, cod poştal 320070
Tel. 0255-217.469, Fax. 0255-217.469, E-mail:

ELABORATOR AGREMENT TEHNIC:

Institutul National de Cercetare - Dezvoltare in Constructii si Economia Constructiilor
Sos. Pantelimon 266, sector 2, Bucuresti, Cod Postal 021652, Tel 40-021-255 2250, Fax 40-021-255 0063, E-mail:

Membru în:
UEAtc, Uniunea Europeana pentru Agrementare Tehnica în Construcţii;
EOTA, Organizatia Europeana pentru Agremente Tehnice (membru obs.);
ENBRI, Reteaua Europeană a Institutelor de Cercetări în Construcţii;
WITAO, Organizaţia Mondială pentru Agremente Tehnice.

Grupa specializata nr. 1: "Elemente structurale – Fundatii"

Prezentul agrement tehnic este valabil până la data de 20.12.2008 numai însoţit de AVIZUL TEHNIC al Consiliului Tehnic Permanent pentru Constructii si nu tine loc de certificat de calitate

FURTHER CERTIFICATES

СИСТЕМА СЕРТИФИКАЦИИ ГОСТ Р

ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ТЕХНИЧЕСКОМУ РЕГУЛИРОВАНИЮ И МЕТРОЛОГИИ

Добровольная сертификация

СЕРТИФИКАТ СООТВЕТСТВИЯ

№ РОСС AT.HB27.H00681

Срок действия с 06.08.2020 по 05.08.2023

№ 0563345

ОРГАН ПО СЕРТИФИКАЦИИ рег. № RA.RU.11HB27

продукции Общества с ограниченной ответственностью "АбсолютСертПлюс". Место нахождения: 198095, РОССИЯ, ГОРОД САНКТ-ПЕТЕРБУРГ, УЛИЦА МАРШАЛА ГОВОРОВА, ДОМ 49, ЛИТЕРА А, ОФИС 604.1, фактический адрес: 198095, РОССИЯ, г. Санкт-Петербург, ул. Маршала Говорова, дом 49 литер А, помещение 604.1, телефон: +79161840048, электронная почта: absolut.cert.plus@gmail.com. Аттестат аккредитации № RA.RU.11HB27, выдан 17.06.2019 года

ПРОДУКЦИЯ

Гидрофобизирующий поверхностно активный органический материал TERRA-3000 для стабилизации грунта и создания грунтовых смесей.
Серийный выпуск

код ОК 23.20.13

СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ НОРМАТИВНЫХ ДОКУМЕНТОВ

ГОСТ 10834-76 "Жидкость гидрофобизирующая 136-41. Технические условия"

код ТН ВЭД 3816000000

ИЗГОТОВИТЕЛЬ

TERRA SYSTEM Betriebs G.m.b.h., Место нахождения и адрес места осуществления деятельности: A-8261 Sinabelkirchen, Untergrossau 178, Австрия

СЕРТИФИКАТ ВЫДАН

Общество с ограниченной ответственностью "ТЕРРА СИСТЕМ РУС". Основной государственный регистрационный номер: 5177746251623, место нахождения: Российская Федерация, Москва, 108811, Московский поселение, улица Татьянин Парк, дом 15, корпус 1, помещение IX Ком. 3, телефон: +74956033255, электронная почта: info@terra-3000.ru

НА ОСНОВАНИИ

Протокола испытаний № MRFIP-AM от 06.08.2020 года, выданного Испытательной Лабораторией «ПродЛаб» (ИЛ «ПродЛаб») Общества с ограниченной ответственностью «СОФАРТ», аттестат аккредитации РОСС RU.32093.04КСЕ0-003

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

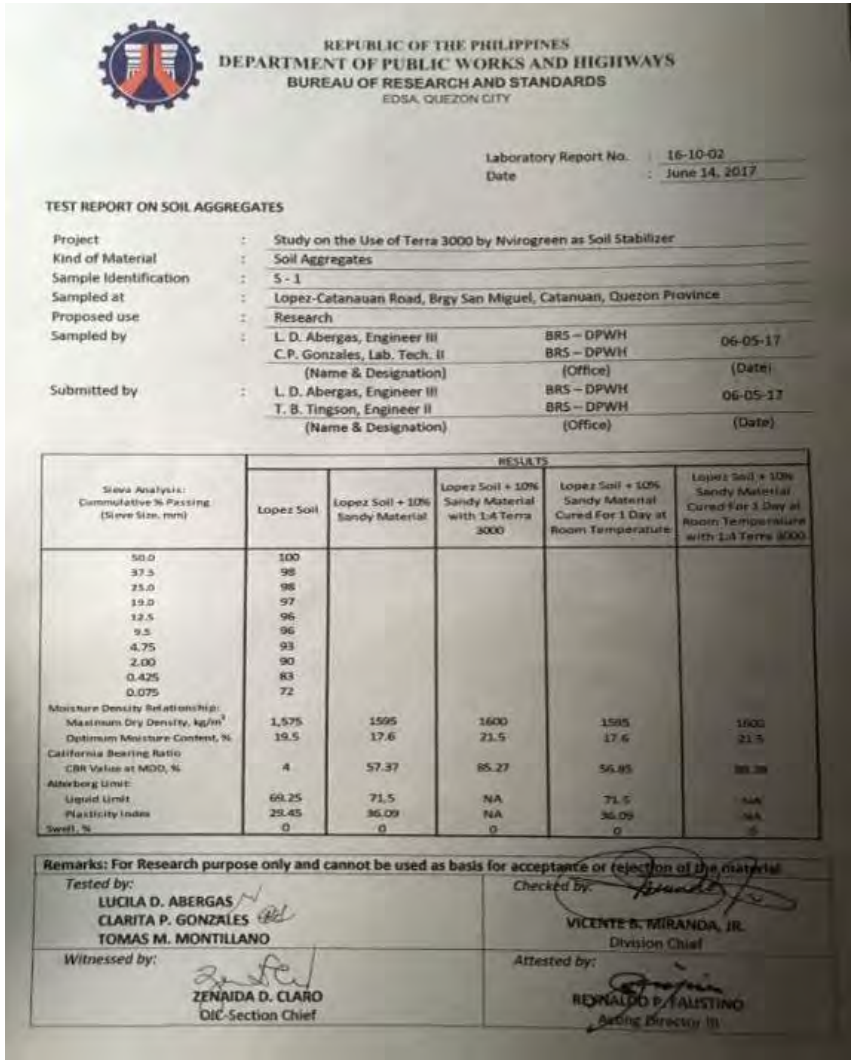
Схема сертификации: 3с

М.П.

Руководитель органа — Смольянникова Оксана Сергеевна

Эксперт — Азарян Армен Альбертович

Сертификат не применяется при обязательной сертификации



REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
BUREAU OF RESEARCH AND STANDARDS
EDSA, QUEZON CITY

Laboratory Report No. : 16-10-02
Date : June 14, 2017

TEST REPORT ON SOIL AGGREGATES

Project	:	Study on the Use of Terra 3000 by Nvirogreen as Soil Stabilizer		
Kind of Material	:	Soil Aggregates		
Sample Identification	:	S - 1		
Sampled at	:	Lopez-Catanauan Road, Brgy San Miguel, Catanuan, Quezon Province		
Proposed use	:	Research		
Sampled by	:	L. D. Abergas, Engineer III	BRS – DPWH	06-05-17
		C.P. Gonzales, Lab. Tech. II	BRS – DPWH	
		(Name & Designation)	(Office)	(Date)
Submitted by	:	L. D. Abergas, Engineer III	BRS – DPWH	06-05-17
		T. B. Tingson, Engineer II	BRS – DPWH	
		(Name & Designation)	(Office)	(Date)

Sieve Analysis: Cummulative % Passing (Sieve Size, mm)	RESULTS: Lopez Soil	Lopez Soil + 10% Sandy Material	Lopez Soil + 10% Sandy Material with 1:4 Terra 3000	Lopez Soil + 10% Sandy Material Cured For 1 Day at Room Temperature	Lopez Soil + 10% Sandy Material Cured For 3 Day at Room Temperature with 1:4 Terra 3000
50.0	100				
37.5	98				
25.0	98				
19.0	97				
12.5	96				
9.5	96				
4.75	93				
2.00	90				
0.425	83				
0.075	72				
Moisture Density Relationship:					
Maximum Dry Density, kg/m³	1,575	1595	1600	1595	1600
Optimum Moisture Content, %	19.5	17.6	21.5	17.6	21.5
California Bearing Ratio					
CBR Value at MDD, %	4	57.37	85.27	56.85	88.39
Atterberg Limit:					
Liquid Limit	69.25	71.5	NA	71.5	NA
Plasticity Index	29.45	36.09	NA	36.09	NA
Swell, %	0	0	0	0	0

Remarks: For Research purpose only and cannot be used as basis for acceptance or rejection of the material

Tested by:
LUCILA D. ABERGAS
CLARITA P. GONZALES
TOMAS M. MONTILLANO

Checked by:
VICENTE B. MIRANDA, JR.
Division Chief

Witnessed by:
ZENAIDA D. CLARO
OIC-Section Chief

Attested by:
REYNALDO P. TALISTINO
Acting Director III

Contact

We look forward
to hearing from you!

TERRA-SYSTEM
Bdstb.Betriebs.GmbH.

www.terra-3000.com

terra.system@aon.at

Annex 1

Full report – TERRA-3000® soil stabilization system

Techno-economic assessment for infrastructure projects
Based on the Hollands Lane Trial Study (Bland Shire Council, NSW Government, 2021)

1. Introduction

TERRA-3000® is a highly advanced chemical soil stabilizer that permanently improves the natural properties of fine-grained soils. The system enables the construction of roads and infrastructure projects that are **more cost-effective, load-bearing, durable, and resistant** to moisture and flooding.

The most important independent reference for TERRA-3000® is:

Hollands Lane Trial Study (2021)

Conducted by **Bland Shire Council, NSW, Australia**
Funded by **NSW Government and Local Government NSW**

This study provides verifiable performance data under real-world extreme conditions.

2. How TERRA-3000® works

TERRA-3000® is **not a traditional binder** like cement or lime.
It is a **catalytic ion exchanger** that:

- **reduces the surface tension** of the soil water,
- dissolves the water layer around the soil particles,
- creates **stronger compaction** and **higher load-bearing capacity**,
- drastically reduces the water sensitivity of the soil.

Ideally suited for soils with **15–30% fine particles** (clay/silt).

According to the study, the process is **permanent and irreversible**.

3. Proof of performance: Hollands Lane Trial (2021)

The TERRA-3000® trail was subjected to extreme conditions:

- Four floods, each lasting up to seven days,
- heavy rainfall, fluctuating humidity, dry periods,
- vehicle traffic throughout the entire test period.

The documented images and measurement data are from 2021.

3.1 Test results

Outstanding performance under flooding

“Minimal fines loss and no significant deformation, even after repeated inundation.”

This means:

- No structural damage
- No soil softening
- No rutting
- High material bonding
- Extreme water resistance

Outstanding durability

The ground remained permanently stable and load-bearing, even without surface sealing.

Superior performance in product comparison

Among 9 products tested, TERRA-3000® was among the best solutions, especially in:

- Water resistance
- Stability
- Deformation resistance
- Long-term performance

4. Economic evaluation

4.1 Cost comparison per km

(**International average values, 6 m road width**)

Construction	Cost per km	Lifespan	Notes
Conventional + Otta-Seal	€ ~140,000	10–15 years	Gravel import required
Conventional + Asphalt	**€ 230,000–350,000**	20–30 years	most expensive construction, highest amount of material
TERRA-3000® unsealed	€ ~40,000	8–15 years	extremely economical
TERRA-3000® + Otta-Seal	€ ~90,000	15–25 years	best value for money
TERRA-3000® + Asphalt	**€ 150,000–200,000**	25–40 years	Premium solution, 40–50% cheaper than conventional asphalt construction

Key message:

TERRA-3000® significantly reduces material, transport and construction costs. Especially in comparison to classic asphalt construction, TERRA-3000® in combination with asphalt is the most **economical premium solution**.

5. Lifespan comparison

Structure	Lifespan	Maintenance	Area of application
Conventional unsealed street	3–7 years	high	Low-Traffic
TERRA-3000® unsealed	8–15 years	low	Agriculture, private roads
TERRA-3000® + Otta-Seal	**15–25+ years**	very low	Municipal roads, tropical regions
TERRA-3000® + Asphalt	**25–40+ years**	minimal	Cities, industry, main traffic

6. Otta-Seal & Asphalt

6.1 Otta-Seal

A flexible, cost-effective bituminous surface coating.

Advantages:

- Highly economical
- High water resistance
- Easy to install
- Ideal for developing regions
- Extremely durable and warp-free when combined with TERRA-3000®

Otta-Seal + TERRA-3000® => **Very durable road on a low budget**

6.2 Asphalt

The world's most important premium surface for heavily trafficked roads.

Advantages:

- Highest load capacity
- durable
- excellent handling
- ideal for truck traffic

Asphalt + TERRA-3000® =
➞ **Maximum lifespan, 40–50% cheaper than conventional asphalt construction.**
➞ Reason: The expensive gravel substructure is eliminated or significantly reduced.

7. Recommended applications by project type

Project type	Recommendation
Municipal roads	TERRA-3000® + Otta-Seal
Tropical / humid regions	TERRA-3000® + Otta-Seal
High-traffic / Industrial	TERRA-3000® + Asphalt
Resort / Tourism	TERRA-3000® + Asphalt
Rural paths	TERRA-3000® unsealed
Flood zones	TERRA-3000® (with optional seal)

8. Construction process

1. Mill/loosen the soil (15–25 cm)
2. Apply TERRA-3000® + water
3. Mix homogeneously
4. Compact to optimal density
5. Allow to cure
6. Optional: Apply Otta-Seal or asphalt

TERRA-3000® requires no complicated machine technology.

9. References

Hollands Lane Trial Study (2021)

- Bland Shire Council
- NSW Government
- Local Government NSW

Key Findings:

- Extreme stability under flooding
- No significant deformation
- High durability

10. Executive Summary

- TERRA-3000® is a **highly effective, modern soil stabilizer** that permanently improves fine-grained soils.
- An independent government study (2021) demonstrates **superior stability in flood and wet conditions.**
- TERRA-3000® enables **significant cost savings** by eliminating the need for gravel imports and reducing construction time.
- In combination with **Otta-Seal,** it creates a cost-effective, long-lasting road solution (15–25+ years).
- In combination with **asphalt**, it creates a premium road with a **25–40+ year lifespan** that is significantly more economical than conventional asphalt construction.
- TERRA-3000® is ideal for **government agencies, construction companies, investors, and project developers** who require robust, economical, and climate-resilient infrastructure.