

# User Manual

## TERRA-3000®

Aim of the **TERRA-3000®** development is an alternative construction method which at comparable quality is more economical and can be passed faster to its determination than conventional construction methods.

This affordable method is an adequate alternative to conventional construction methods especially when it comes to construction roads, rural roads, parking lots, outdoor facilities, etc. **TERRA-3000®** can be used to build new roads and to refurbish already existing roads.

### In general:

Basically **TERRA-3000®** can be used for all kinds of soil. This takes effect for cohesive soils with a larger content of fines (<0,063mm) but also all other types of soil (gravel, shingle, sand) can be stabilized permanent with **TERRA-3000®** by adding the missing fine fractions of clay (0,002mm). In the case of heavy clay soils, which usually have a very high swelling and shrinkage potential, it is possible to emaciate the soil by adding non-cohesive material for example sand.

Important for the successful use of **TERRA-3000®** are analysis of the existing soil. According to these analyses the required material can be supplied to achieve the best results.

After the addition of the missing fractions the optimal Proctor-value for the subsequent compaction has to be determined.

The natural moisture has to be measured in regular intervals (for example: every 50 – 100 meters) during the assembly and the moisture content has to be aligned to the Proctor-value (Optimum Moisture value) by adding water to reach a good compaction.

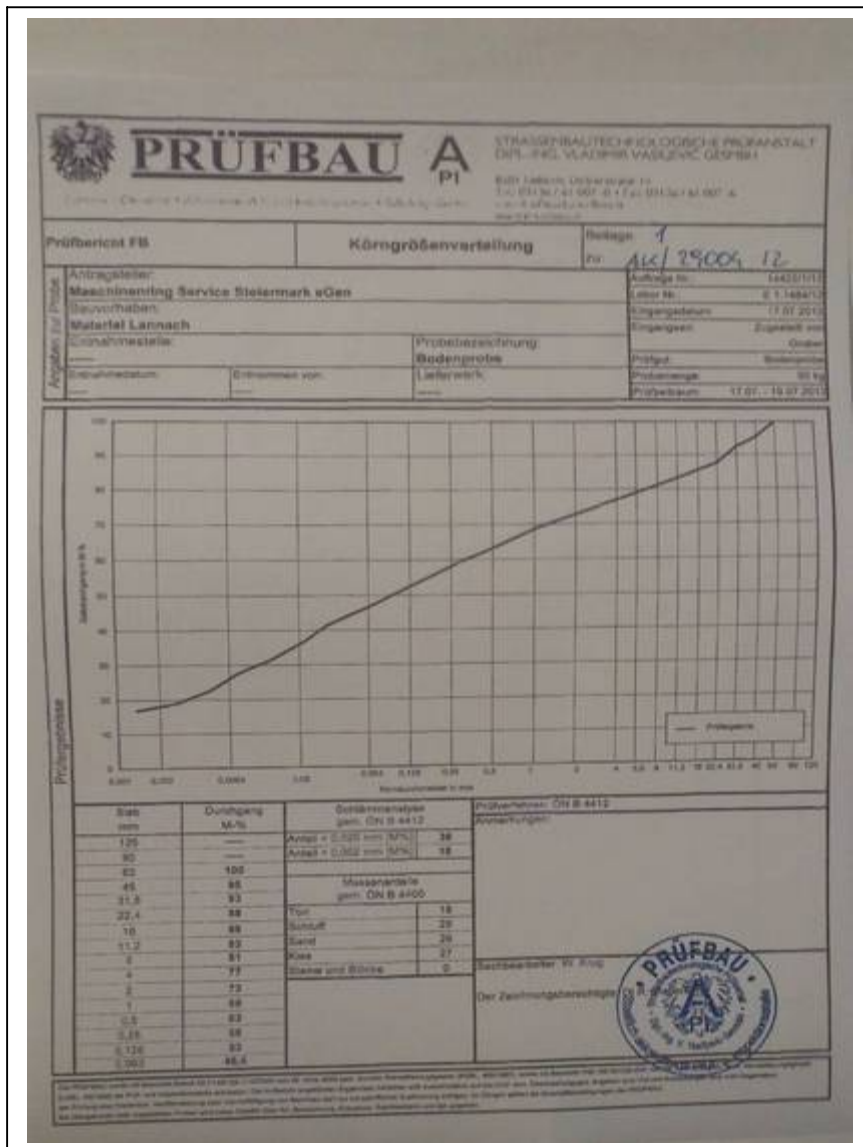
## Necessary soil tests:

Screen analysis: determination of the optimal grain distribution by sieving  
 Sieving area: <0,063 up to 50mm

Hydrometer analysis: determination of the clay quantity (<0,002mm) by use of an Ärometer

Additional analysis: Whether the fine components are really clay: by determining the plasticity (Atterbergsche limits: coasting or yield point) and by determination of the water absorption capacity

Creation of an optimal grading curve (example)



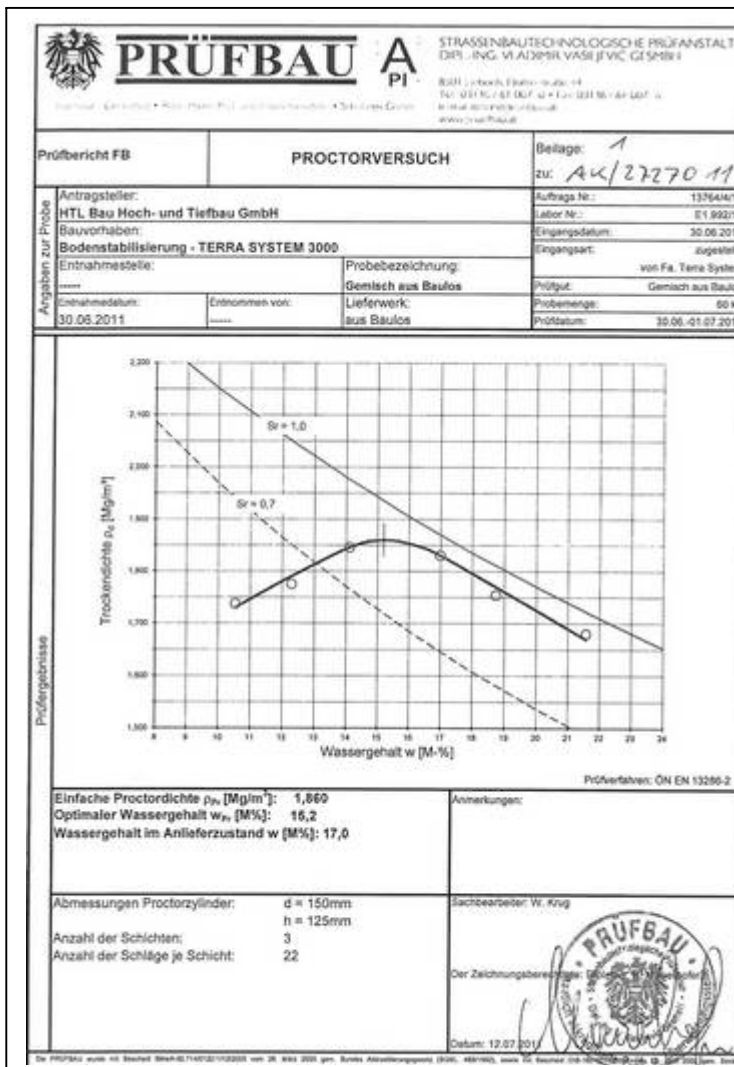
**Optimal grain distribution for the use of TERRA-3000®**

- 1/3 fines (0,063mm)
- 1/3 sand (0,063 – 2mm)
- 1/3 gravel (2 – 50mm)

**absolutely necessary**  
 clay (<0,002mm)  
 more than 15 %

## Determination of the optimal moisture (OMC)

Optimal moisture (Proctor-value) is the percentage value at which the material (soil) can be best compacted.



Proctor - TEST



## Determination of the natural moisture (NMC)

CM Moisture meter / Carbid

Complete-Set for fast and reliable determination of moisture content in building materials, locally and without additional aids

Set-contents:

Precision spring scale up to 100 g; cradle cups 2 piece; complete tool set for sample preparation;

Ball set of 4 steel balls; 20 piece Carbidampulla;

3 test ampulla for leak testing; 3 replacement seals for manometers and pressure bottle, spoon and cleaning brush; clear instructions plus quick-use-index; metal case

Technical Features:

Accuracy of the pressure gauge: 1.6

Measuring range: 0 – 1,6 bar

max. Error (mbar)  $\pm$  25.4

Direct reading of the CM%-Moisture: 20/50/100 g



## Calculation of the amount of water:

The amount of water that has to be added to the ground together with **TERRA-3000®** has to be adapted in the case of deviations of the natural water content, for example after heavy rain or extreme drought.

However the amount of **TERRA-3000®** is maintained.

Example: OMC (optimal moisture content) 10, 3%

NMC (naturel moisture content) 8,3 %

Difference 2 % Moisture of the weight of the soil

Volume calculation :  $1\text{m}^2/30\text{cm strong} = 0,3\text{m}^3 \times 2 \% = 0,006 \text{ m}^3 = 6 \text{ lit. water}$

### Amount **TERRA-3000®** :

at optimum water content: 0,05 lit. **TERRA-3000®** are mixed 1:20 with water per  $\text{m}^2$  at a working depth of 30cm

that means: a 25 Liter Can **TERRA-3000®** suffices for  $500\text{m}^2/30 \text{ cm strong}$ .

## Determination of organic content:

If large quantities of wood and other organic materials can be seen, please determine the organic content by loss of ignition.  
Organic content has to be <5 %.

## Necessary Equipment:

- Graders with scarifiers
- Special milling machine for the incorporation of **TERRA-3000®**
- pad foot roller or wheel roller for coarse compaction of cohesive soils
- Smooth-drum-rollers for fine compaction

## Working Steps:

Humus layer is removed, rough planning with height level is established;  
Surface drainage by sufficient longitudinal and transverse slope on the subgrade;  
Drainage of the roadbed on both sides by drainage ditches or troughs;  
Permanent water drainage at the low points of the trenches and troughs is protected; Stability of the slopes at the cuts and embankments is guaranteed;

## TERRA-3000® mixed with water

make a mixture of **TERRA-3000®** and the calculated amount of water, mix well!!!



blend the **TERRA-3000®** - mixture in the subgrade using a special milling machine

- \* **IMPORTANT – MIX WELL** \*

if necessary perform 2. maybe even 3. milling operations

## Fine Planum

Produce fine planum using grader, sufficient cross slope to drain the surface water, roll subgrade with roller

## Compact

Compact Planum using a pad foot roller or a wheel roller with a total weight of more than 20 tons

### Do not shake or vibrate!

Several rolling procedures are needed for static compaction



## Control of the compaction:

Determining the achieved bearing capacity of the subgrade, using the static or dynamic plate load test, capacities are measured with the dynamic load disk device > 100MN/m<sup>2</sup> are achievable.



## Wearing Surface

After a drying time which depends on the weather (about 2 to 5 days), the ready built and compacted earth roads have to be provided with a wearing layer (bitumen sprayed ceiling, asphalt layer) in order to avoid mechanical abrasion of said layer and the formation of dust.

Since the treated layer has a very good carrying capacity, the wearing layer can be kept much thinner and conveniently which results in massive savings.