

Brick production description for self-help

Our guiding principle during the development of **TERRA 3000®**

From the basic idea for the inexpensive production of unburnt bricks from loam for the Third World, is developed an innovation for soil stabilization of cohesive soil material.

The idea was from clayey loam, which globally occurs very frequently and is generally cheap available, to turn into a useful building material for brick production without needing to burn the bricks for weather- and water resistance.

To offer, with locally occurring loam material, a low cost alternative to create better quality of life for the population.

From this developed a pioneering innovative way for soil stabilization of all types with the involvement of clayey soils and **TERRA 3000®**.

TERRA 3000® is multiple applicable, while helping people in many areas, such as infrastructure, residential construction, construction of water reservoirs and various other required applications.

TERRA 3000® is a liquid catalyst concentrate which helps when used correctly, to produce from the locally cohesive soil (clay / loam) a valuable and relatively inexpensive construction material.



Picture above: clayey laterite in Africa

Loam / clay is a proven building material for thousands of years and around 2 thirds of earth's population lives in clayey loam buildings.

Unfortunately, the burning of bricks got a high energy requirement and a high calorific technical effort, especially in developing countries, which is for the most people not affordable.

Of necessity, therefore, unfired bricks are used – which unfortunately are not water resistant - and cannot withstand very long the destruction, caused by ever-increasing vagaries of the weather and rain fronts. In many cases has to be dispensed of unfired bricks, then the clay material is applied "pure" in wooden fencing.



Picture above: loam hut in Africa

Our thought on this subject is to help people in developing countries, but not with money or finished products. We want to give them the opportunity, with the locally available soil material, with their own labor force and relatively easy to mediated "know-how" as well as the necessary equipment, to help themselves for the elemental basic need of a domicile and thereby to have a base to an perspective in a better future.

We believe that these infrastructure improvements is or may be also an important step in the direction of the current refugee situation. Because if people have an activity to help themselves for a stable, affordable and pleasant accommodation, which can be a basis for economic self-help and are not forced to leave their home by hopelessness and lack of perspectives.

Technologie - TERRASYSTEM®

pressed and unburned water-resistant bricks

The **TERRA 3000® SYSTEM** replaces burned bricks and mortar by the use of TERRA 3000® manufactured bricks, which are bonded to each other with the same soil material diluted with water and liquid **TERRA 3000® catalyst**.

The **TERRA 3000® SYSTEM** is a unique technology which allows relatively easy, upcoming locally available soil, enhance in an acceptable raw material for the brick production.

The water sensitivity of such unburned bricks is brought under control and even up to the complete impermeability (by adding missing grain fractions - clay or sand).



Benefits of TERRASYSTEM®

- water resistant, no capillary action, remains dimensionally stable in case of moisture,
- high breaking strength of the bricks > 12N/mm²
- energy saving, no burning, no time-consuming and costly transportation,
- Excellent thermal features, excellent thermal capacity, almost twice as efficient as burned adobe bricks,
- Environment friendly, TERRASYSTEM® acts as a catalyst, very low application rate, environmentally certified,
- simple processing, also possible by unskilled staff

ECO SOLUTION CONSULT LTD

Unit no. 604-605, 6F Opal Tower, Business Bay, P.O. Box 128846
Dubai – UAE

Benefits of TERRA SYSTEM® in detail:

Significant cost savings

Transport cost savings : Brick Production on site.

Locally available clayey loam soil is the main raw material;

Limitations: no humus like organic content of roots, leaves, etc.,
(topsoil about 20 - 30 cm deep).
Minimum percentage of clay (grainsize <0,002mm) higher 20%.
By means of laboratory test (combined sieve and sedimentation test) or by means of finger test detected (see description finger test).

Energy saving: no expensive and complicated burning, brick is pressed hydraulically or mechanically, no high energy costs, no energy consumption through long transports.

Equipment costs: favorable Equipment (hydraulic press, compulsory mixer, grinder), mounted onto a trailer can be brought quickly from site to site, by diesel engine or generator power independently.

Extraneous material: no mortar or cement required by means of:

1. specially formed profile bricks - engaged
2. is diluted with the same catalyst material and water for bonding.

Processing :

Easy operation: 1 trained operator and 3 - 6 untrained workers.

Quick application: bricks can be used immediately after pressing by the special Brick mold (locking system), simple but precise installation, it always arise straight walls, even with inexperienced personnel. Attractive brick surfaces can be achieved through natural color of the soil, the walls may also be sealed with plaster as well deleted with paint.

Necessary material:

TERRA 3000® – Concentrate

surface active agent in monomeric and polymeric mixture, solvents, wetting agents and catalysts,
customs tariff number Nr: 38.24.90.15

Soils :

Suitable soils: All soils with a clay fine fraction of <0.002 mm grain size of at least 20%.
If the clay content is greater than 40%, the base material can easily be emaciated by adding sand in the ratio.

If there is not enough clay (<0,002mm) in the soil, the lack of clay content should be added to achieve the necessary clay content of 20%.

Water :

Necessary machinery and equipment:

1. **Grain optimization of the soil:**

a) manually: sieve



b) mechanical: crusher mill



2. **Suitable mixers:**

Compulsory mixer
with integrated sieve



b) Twin-Shaft Mixer



3. **Press - important, as much pressure as possible!**

a) mechanical hand press :



b) mobile hydraulic press with hydraulic compulsory mixer



b) stationary semi or fully automatic brick plant



Useful additional equipment:

1. mechanical brick cutting machine:



2. mechanical testing device for break load:



3. moisture measurement – set, according carbide method



brick molds:

Generally a wide range of molds are possible.

Standard form with interlock:
can be used without mortar in the dry method
or with liquid TERRA 3000®-soil mixture.

brick dimensions: width 220 mm
height 115 mm
length 50 mm to 240mm

breaking load: $> 12\text{N/mm}^2 = 12\text{MPa}$
about 3 times higher than
untreated loam brick



Average weight, depending on the type of soil: ca. 9 - 10 kg

Approximately 200 bricks (220 x 200 x 115 mm) per m³ of stabilized soil.

These bricks are very easy to process, no previous knowledge required,
very stable, good heat and sound insulating, water-resistant.

For the floor or bottom plate, the treated TERRA 3000® soil material can also be stomped. The result is a very good insulating and water-impermeable layer – where you can lay directly floor coverings or tiles after good drying – for the entire house, hardly or rather no cement is required.

The quality of TERRA 3000®-bricks depends on several factors:

1. From the existing soil respectively from the preparation of the soil,
means: from the clay content of the grain size distribution, moisture content,
the preparation (sieving, grinding, etc.)
2. From the optimal processing, means: good mixing and then well compacting.
3. An important factor is the choice of appropriate equipment. Often various
causes leads to, that non-optimal equipment is available, what then lowering
the result but never leads to a failure in the result.

Some possible reasons for a lack of equipment:
lack of energy (electricity), in difficult terrain or very simple –
lack of financial resources.

Due to our extensive experience, we recommend the following packages, leading in any case to an success:

1. Minimum package: 1 large sieve, some shovel for hand mixing, a mechanical hand press (possibly with hydraulic) carried out all the work by hand, more staff – more bricks, 500-600 bricks / 8 hour

2. Standard package: 1 large sieve, a mobile brick press on a trailer with its own diesel engine integrated with a hydraulic compulsory mixer :
(ca. $\frac{3}{4}$ m³) 1 or 2 hydraulic presses: 3 - 6 of unskilled helpers and 1 trained machine operator
1500 bricks / 8 hour

3. Optimal package : 1 mill respectively crusher for the soil material, a double shaft mixer and fully automatic press,
3 man staff, important is enough energy (electricity) on site, 3000 brick / 8 hour