

## TERRA-4000®-TREATED EARTH

The building material of the future  
ecological - saving resources, energy and CO2

Earth has been used as a building material for almost 10,000 years; across the world, different peoples and cultures have used unbaked earth to create a plethora of buildings – not just homes and dwellings, but fortresses, palaces and temples that have stood the test of time.

### Guideline in the development of TERRA-4000®

Based on the millennia of using clayey soils in construction, also in infrastructure construction, the idea of clay-containing loam was used worldwide.

The main problem for the use of cohesive soil material is the swelling and shrinking of the soil material caused by water, as well as the transition from a stable material to a liquid pulp.

There have been a wide variety of attempts to use the locally occurring soil material as to use inexpensive building materials.

In decades of development, TERRA-SYSTEM has succeeded in creating, a solution to this problem and thus developed a soil stabilizer for construction sites on site, as well an additive for the production of an environmentally friendly, CO2-friendly, inexpensive building material.

TERRA-4000® is a liquid catalyst concentrate that, when used as specified, helps to produce a valuable and relatively inexpensive building material from locally cohesive soil (clay / loam) - also for brick production without the bricks having to be burned - (weatherproof and water-resistant).

Locally occurring soil material offers an inexpensive alternative to create better quality of life for the population through infrastructure.



## How is TERRA-4000-treated earth a better alternative to concrete?

Climate polluter concrete - a building material is looking for a successor. People are currently building more with concrete than ever before. The raw material sand is already becoming scarce. Above all, however, cement is responsible for almost every tenth ton of CO<sub>2</sub> that humans emit.

TERRA-4000-treated earth is highly sustainable as it has a high thermal mass and a 40<sup>th</sup> of the carbon footprint of concrete which is composed of 20% cement. It is also completely recyclable and has low transport emissions as the main material is already on site.

Rammed-earth buildings need to have walls that are considerably thicker than their concrete counterparts, but they are fire-proof, termite-proof, breathable and have insulating properties as they can absorb heat during the daytime and release it at night. This makes them popular in the developing world and in countries with extreme climates.

Concrete has a range of texture applications like wire brushing, carving and mould impressions. These aren't an option for TERRA-4000-treated earth as it dries too quickly, but it doesn't need any adornment as its natural patina is so beautiful and full of character. Planners also love the fact that it is pertinent to the context and reflects the local environment.

Why is TERRA-4000-treated earth in times of climate protection goals not by architects or construction companies taken over?

Architects have been researching low-carbon building for 50 years and have developed very complex, worthy solutions such as the passive house.

Simple structures can be built using complex and sophisticated techniques, but we have to move away from modernity, which dictates that buildings must always look like new. This has resulted in insane maintenance and cleaning costs, and we need to rethink our relationship with buildings and how we interact with them.

TERRA-4000-treated earth buildings could be part of the high density low carbon living solution, but they have their own characteristics, variations, textures and colors and a different kind of purity.



## DESCRIPTION OF TERRA-4000

TERRA-4000® is a chemical product that reduces the surface tension of the water around the soil particles so that the barrier film surrounding the particles is dispersed in order for the surfaces of the particles to associate to each other.

This causes an agglomeration of fines (mainly the minus 0,06mm fraction). TERRA-4000® is not a binding compound, but improves certain soil characteristics through the waterproofing effect.

TERRA-4000 is moderately acidic (pH = 6), has an ammonia odour.

The process is permanent and irreversible once dried. The material (soil) treated with TERRA-4000 has the following properties compared to untreated material:

## PROPERTIES

- Reduced resistance to compaction due to the loss of pore water.
- Reduced rising of capillary water.
- Reduced permeability.
- The optimum moisture content is lower and the density is higher for treated material. In such cases where density and optimum moisture content are the same as in the untreated material it has shown that the voids in the treated material have increased due to the agglomerating effect of TERRA-4000.
- Continued process of the agglomeration of fines with time.
- Reduced water sensitivity (higher water resistance).
- Larger increase in dry density by after-compaction, even if compacted at a high moisture content.
- Lower water penetration (better waterproofing).
- Reduced plasticity and swell.

## Use:

There are 2 types of house construction with soil treated with TERRA-4000:

## TERRASYSTEM - Brick construction

the material is poured into brick molds after mixing and then pressed by means of a hydraulic press (minimum pressure 10 tons) - there is also the possibility of producing "interlocked bricks" - these bricks are easier to work with and are also relatively earthquake-resistant.



Brick – building house

Wall with interlocked bricks

## TERRASYSTEM - BRICKS

### Pressed and unburned water-resistant bricks

The **TERRASYSTEM®** replaces burned bricks and mortar by the use of TERRA-4000 manufactured bricks, which are bonded to each other with the same soil material diluted with water and liquid TERRA-4000 catalyst.

The **TERRASYSTEM® 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-BRICKS**

- water resistant, no capillary action, remains dimensionally stable in case of moisture,
- high breaking strength of the bricks  $> 12\text{N/mm}^2 = 12\text{ MPA}$
- energy saving, no burning, no time-consuming and costly transportation, locally available clayey loam soil is the main raw material
- 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, CO<sub>2</sub> – neutral,
- simple processing, also possible by unskilled staff

### Energy saving:

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

### Material Savings:

- no mortar or cement required to be used for binding bricks in a wall
- Specially formed profile bricks using an interlocking system fixed by diluting with the same catalyst material and water for bonding.
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## TERRASYSTEM® - Rammed earth

a millennia-old building material modified by  
TERRA-4000 for the next millennium

Is made by naturally occurring soil material, through adjustment of the grading curve (grain size), the optimal moisture and the addition of a water-soluble catalyst - TERRA-4000 - a modern, inexpensive, ecological building material, which can easily be processed by untrained staff, can be processed - also suitable for the production of unfired bricks - made in simple presses in various shapes.

**TERRASYSTEM®** rammed earth not only conserves resources (sand and gravel - on-site-material is processed - lower transport costs), does not require any cement - these savings prevent CO2 emissions.

For seismic zones, steel reinforcement is added according to the technical specifications, creating earthquake-proof buildings.

**TERRASYSTEM®** rammed earth houses are special because of their thermal mass (Outer walls are typically 2 feet thick) particularly suitable for regions with extreme climatic applications.

Combining modern construction methods, quality control and beauty creates the ultimate masonry system.

Advantages of the **TERRASYSTEM®** rammed earth construction:

- Natural beauty of the rammed earth material
- Uses local materials for walls
- load-bearing walls with great bearing capacity
- High sound resistance - inside and outside
- Good insulation, lowers heating costs
- Good indoor climate
- Frost-proof, water-resistant
- No maintenance, fireproof
- Designed for earthquakes
- Protects against electromagnetic fields and radiation
- Rodent-proof, insect repellent - termites, carpenter ants, etc ...
- Free from fungicides and pesticides
- Sustainable for 1000+ years.
- Green building for the health of future generations

