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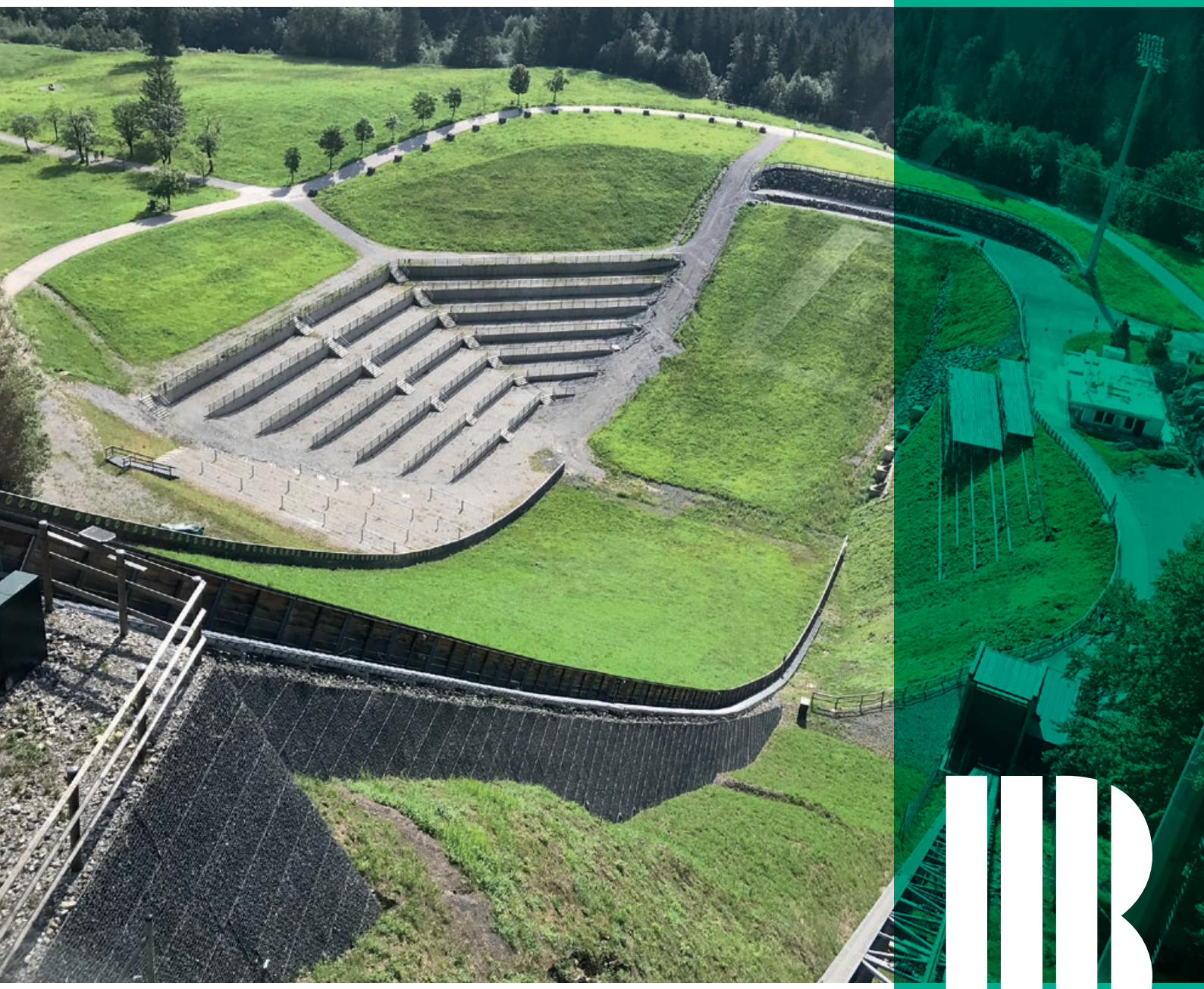

# TERRAMESH

## Steep Slope Systems

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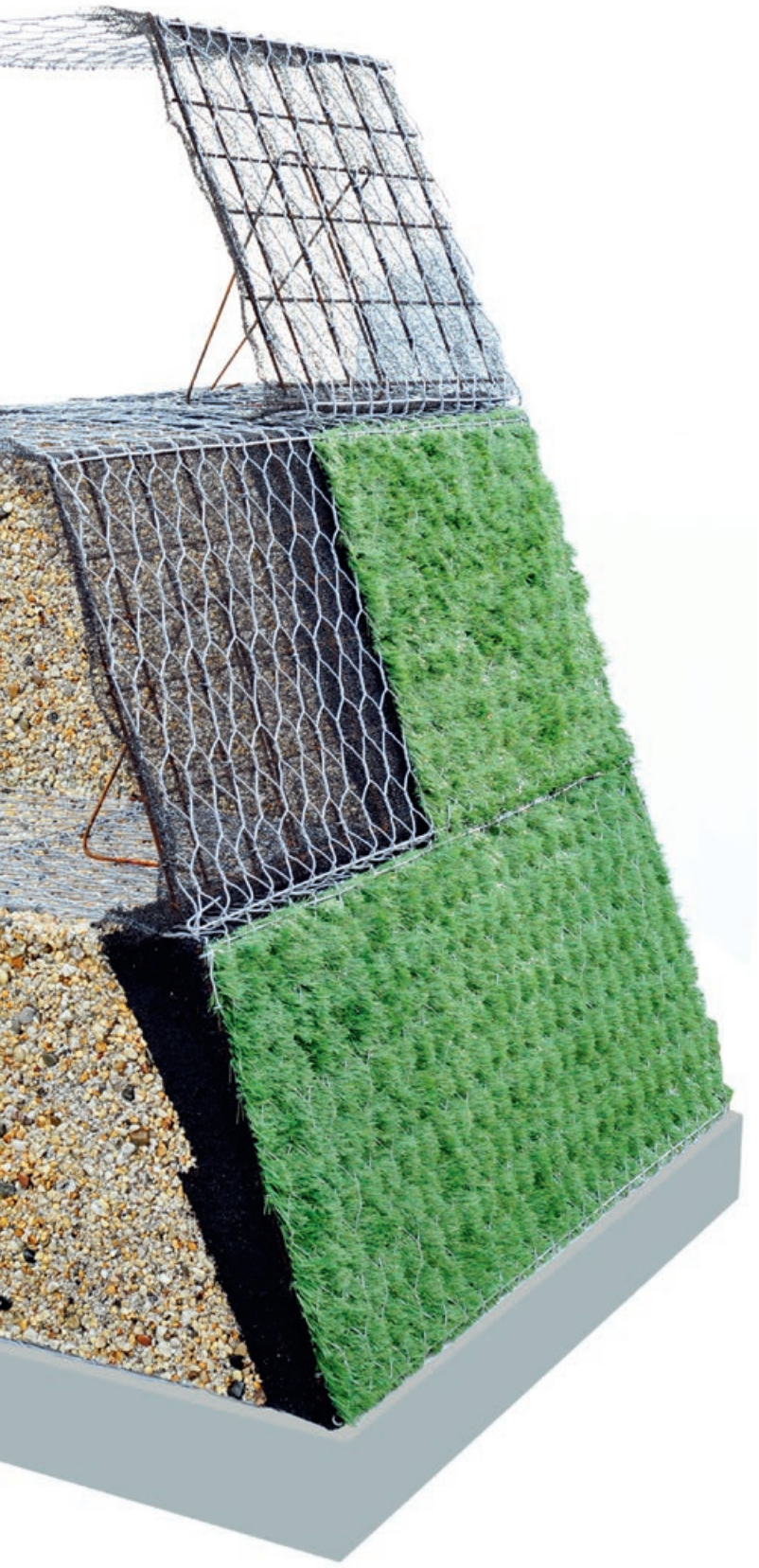
# KEY ADVANTAGES
## at a glance

→ A complete system with a long service life thanks to robust materials

→ Quick and easy installation

→ Minimum workforce and machinery requirements



# TERRAMESH
## Steep Slope Systems

The increasing demand for land for infrastructure and development has become a key factor in construction planning in recent decades. This makes it necessary to find the most space-saving, cost-effective and attractive solutions possible for the construction of steep embankments and wall structures.

Here, geosynthetic-reinforced earth systems provide an ecological and economic option for the construction of embankments with attractive facings. The main purpose of geosynthetic-reinforced earth is to ensure the stability of steep constructions by introducing tension bands.

In recent years, the use of particularly robust reinforcing materials such as steel has proven effective, in combination with a high degree of pre-assembly of the individual elements.

With the TERRAMESH system solution, the reinforcement is positioned and the face of the structure formed in one continuous construction process. The defining parameters, such as the inclination or the appearance of the slope face, can be tailored to suit the individual structure.

# PRODUCT DETAILS
## and properties

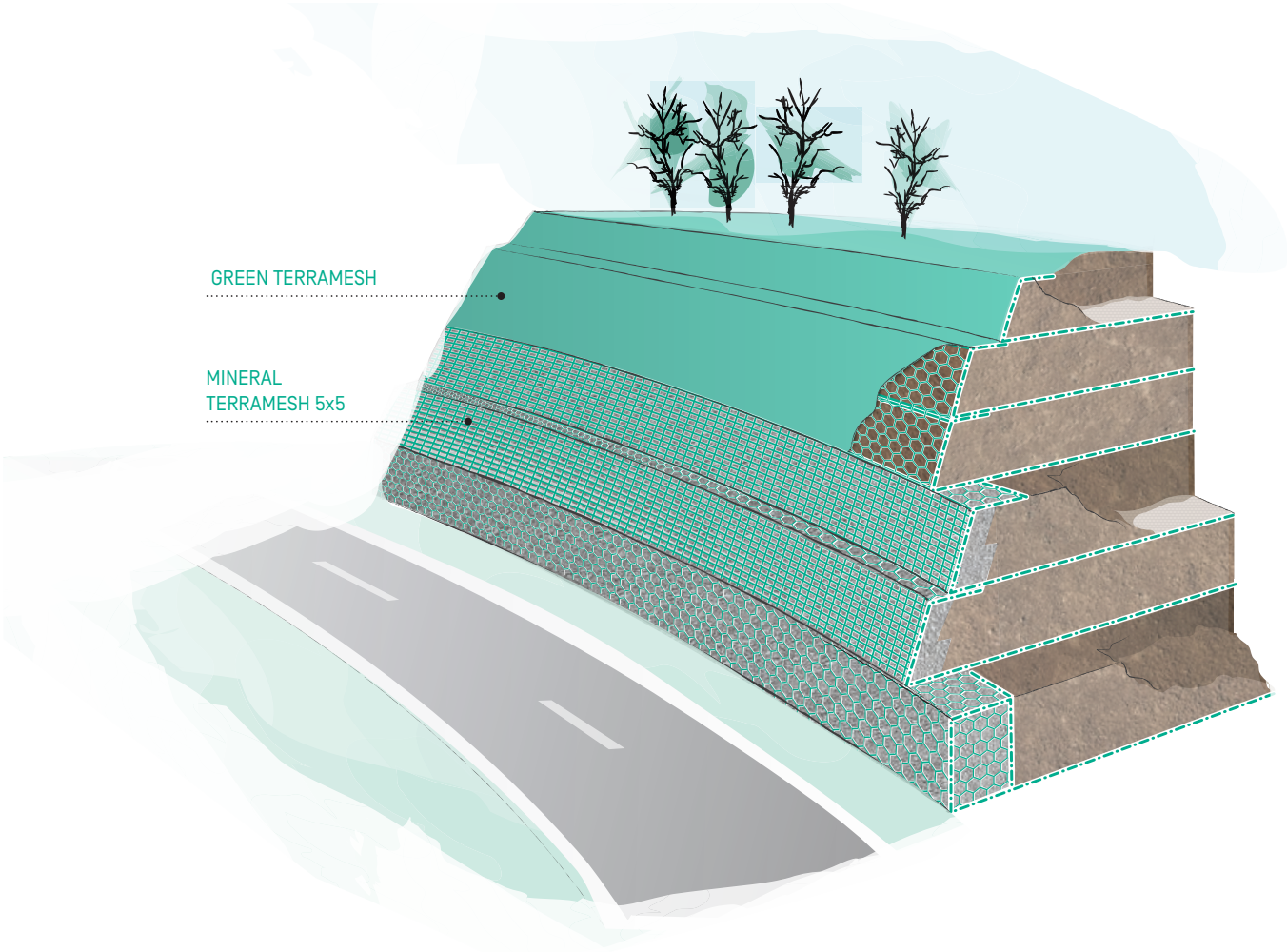
Thanks to pre-assembly in the factory, TERRAMESH system solutions offer a range of benefits in comparison to other reinforced earth construction methods:

– **Easy handling on site:** The elements are supplied with the required type of facing and are folded and placed flat onto pallets for delivery. On site, they can be carried manually to the installation location and easily positioned.

– **Quick installation of the system*:** At the installation location, the elements are unfolded and the pre-assembled facing is folded up. The pre-assembled inclination triangles act as a construction aid so that the facing can be easily set at the correct angle. Neighbouring elements are clamped together at the horizontal and vertical joints to create a strong form-fit bond.

– **Extremely reliable handling on site:** Because the parts are pre-assembled, there is no need for manual jointing or cutting of the individual components on site. Assembly errors on site are practically ruled out thanks to the simple folding technique used for the pre-assembled elements and the easy attachment of the bracing hooks in accordance with the installation instructions.

*A detailed description of the structure can be found in our installation instructions.




There are four different TERRAMESH systems:

**GREEN TERRAMESH** – the steep slope reinforcement system that is suitable for planting: The system is installed using the wrap around principle. The steel wire mesh encases the layer of soil laid on top of it. For inclinations up to 70°.

**MINERAL TERRAMESH 5x5** – the steep slope reinforcement system with a stone backfill behind the front. For inclinations up to 85°.

**TERRAMESH DUO** – the system solution that has fold-up facing elements on both sides and is laid in layers to create a wall. For inclinations up to 80°.

**TERRAMESH SYSTEM** – back-anchored gabions: Here, the steel wire mesh forms the rear-anchored tail, the base, facing and lid of the gabions. For inclinations up to 90°.

Because the system is pre-assembled, rapid progress is made on site, even with minimal deployment of personnel and machinery. The reduction in construction time is reflected not only in the costs, but above all in the reduced impact on people and nature. Furthermore, the elements are so easy to handle that they can be installed easily and cost-effectively even in locations where access is difficult.

# GREEN TERRAMESH – the steep slope reinforcement system that is suitable for planting

GREEN TERRAMESH is a prefabricated modular system made of hexagonal double-twisted wire mesh with duplex protection. The system components comprise a wire mesh with a welded steel grid mat as permanent formwork, pre-bent inclination triangles made of round steel, bracing hooks made of round steel, and an erosion control mat. All essential components are pre-assembled in the factory and can be simply positioned on site, fixed in place and then filled with layers of suitable soil.

**Product versions**

Two different types* of erosion control mat are available as standard:

– The EARTH version has an erosion control mat made of brownish-coloured fabric.
– The WATER version features a rot-proof, synthetic, non-woven mat.

In order to provide the most cost-effective solution possible, two types of steel wire mesh are available, with different tensile strengths:

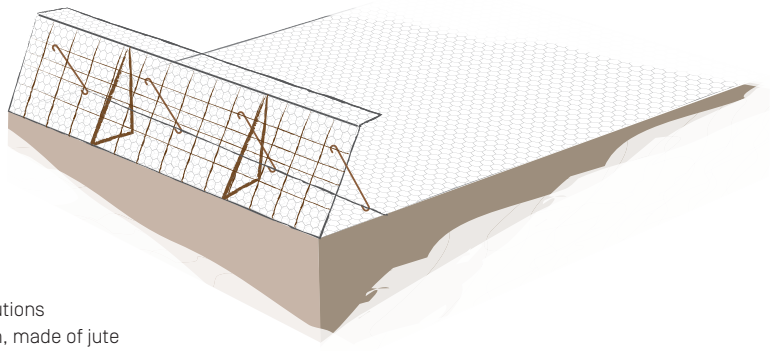
– The short-term tensile strength is at least 35 kN/m in the case of the LIGHT version
– and at least 50 kN/m in the case of the REINFORCED version.

**Greening**

For the planting, the space behind the permanent formwork of the facing must be filled with vegetative soil. For example, a gravel lawn mix 0/22 pre-mixed with seed that can grow in low-nutrient habitats would be suitable here.

All GREEN TERRAMESH systems can be used for a wide range of support structures with a slope face suitable for planting and a resulting inclination of up to 70°. A stepped structure with berms can be constructed to create whatever inclination is required.

– Suitable for planting
– Includes erosion protection
– Structural steel bracing
– Inclinations up to 70°



*Depending on the project, solutions with natural erosion protection, made of jute or coconut fibre, are possible.

# MINERAL TERRAMESH 5x5 – steep slope reinforcement system with stone facing

Like the GREEN TERRAMESH, the MINERAL TERRAMESH system comes ready assembled and its main components also include a double twisted steel mesh with duplex protection, galvanised steel gabion mats (mesh size 5 x 5 cm) as permanent formwork, inclination triangles, and bracing hooks.

In contrast to the GREEN TERRAMESH, however, the MINERAL TERRAMESH does not require an erosion control net on the front face, since the coarse stone fill material (grain size > 80 mm) and the durable steel wire mesh protect the facing against erosion.

**Product versions**

In order to provide the most cost-effective solution possible, two types of steel wire mesh are available, with different tensile strengths:

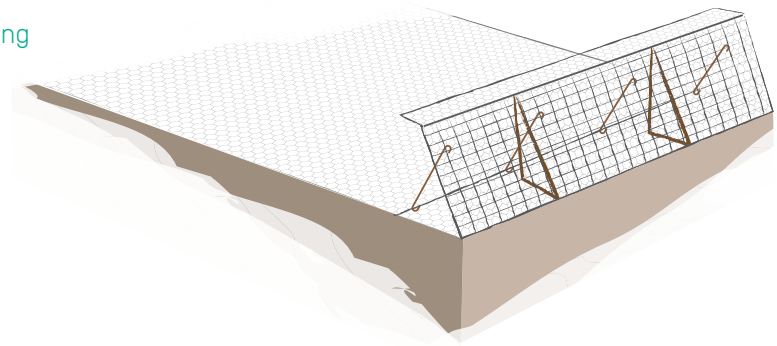
– The short-term tensile strength is at least 35 kN/m in the case of the LIGHT version
– and at least 50 kN/m in the case of the REINFORCED version.

**Stone fill**

As with the GREEN TERRAMESH, the space behind the facing needs to be filled with a different material. To achieve a gabion look, frost-resistant facing stone with a minimum grain size of 80 mm is used, with a non-woven filter fabric (such as BONTEC NW 26) behind it to hold back fine particles and prevent clogging.

All MINERAL TERRAMESH systems can be used for a wide range of support structures with a gabion appearance and a resulting inclination of up to 85°. A stepped structure with berms can be constructed to create whatever inclination is required.

– Stone facing
– Gabion steel bracing
– Inclinations up to 85°



# TERRAMESH DUO – the versatile protection wall system

Like the GREEN TERRAMESH, the TERRAMESH DUO system comes ready assembled and its main components also include a double twisted steel mesh with duplex protection, welded steel grid mats with inclination triangles and bracing hooks as permanent formwork, and an erosion control fabric.

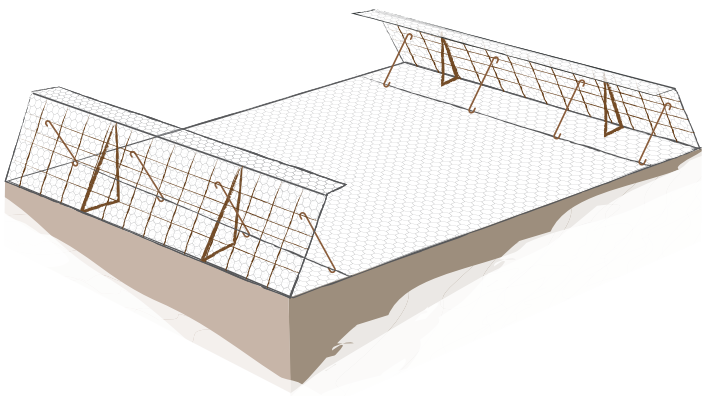
The TERRAMESH DUO, however, has fold-up facing elements, at inclinations of 60°, 70° or 80°, on both sides. The individual elements are dimensioned such that they create a prismatic wall structure when installed in layers.

As a wall to protect against rock falls, debris flows, avalanches and mudflows, TERRAMESH DUO is particularly reliable. Due to its capacity to absorb energy, the TERRAMESH DUO system even offers effective protection against multiple, very heavy impacts without sustaining any structural damage.

As a noise protection wall, TERRAMESH DUO ensures excellent noise reduction thanks to its earth-filled structure and full-surface greening. In contrast to conventional noise protection walls, TERRAMESH DUO has a comparatively smaller contact surface, while still ensuring a natural and attractive appearance. As a noise protection structure, TERAMESH DUO is allocated in accordance with DIN-EN 1793 to the classification A3/B3.

As with the other TERRAMESH systems, TERRAMESH DUO protection walls are easy and cost-effective to install. Even high walls can be constructed with structural stability using this system.

- For planting or with stone facing
- Structural or gabion steel as reinforcement
- Inclinations up to 80°

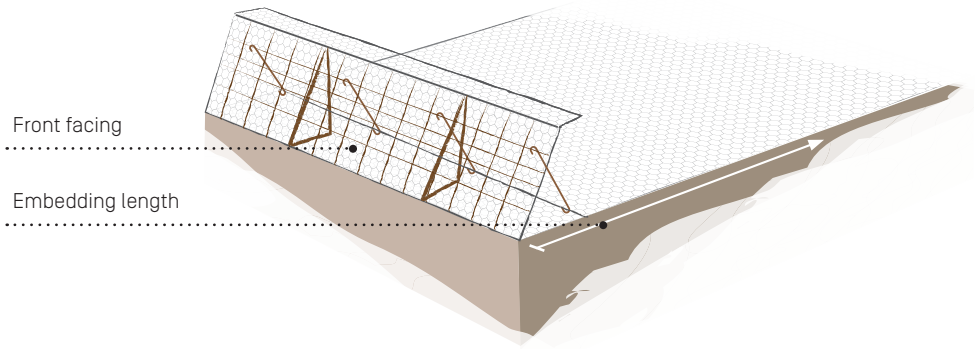


TERRAMESH DUO is a versatile protection wall system based on the GREEN TERRAMESH technology for steep slope systems. The earth-filled walls meet the requirements for many different types of protection, including rockfall protection, collision protection, noise protection and avalanche protection.

# TECHNICAL DETAILS
at a glance

## Standard dimensions

**GREEN TERRAMESH / MINERAL TERRAMESH 5x5**



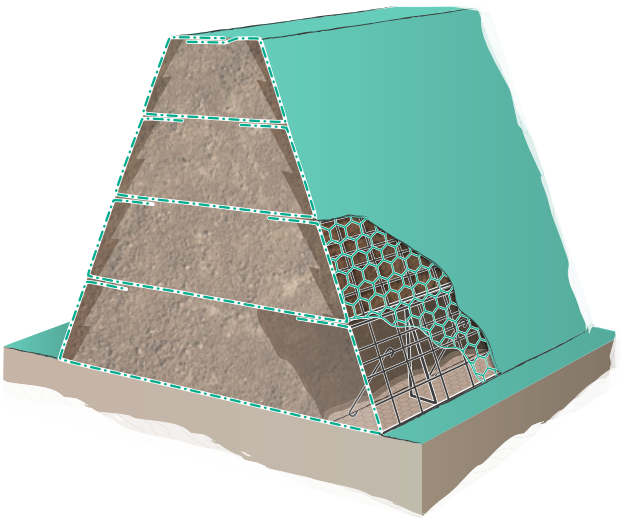

| Embedding length* | Face width | Vertical height / Vertical face area |
|---|---|---|
| 2.0 m | 3.0 m | 0.70 m for 60° inclination angle / 2.10 $m^2$ |
| 3.0 m | 3.0 m | 0.73 m for 65° inclination angle / 2.19 $m^2$ |
| 4.0 m | 3.0 m | 0.76 m for 70° inclination angle / 2.28 $m^2$ |
| 5.0 m | 3.0 m | 0.78 m for 80° inclination angle / 2.34 $m^{2**}$ |
| 6.0 m | 3.0 m | 0.79 m for 85° inclination angle / 2.37 $m^{2**}$ |

*Different embedding lengths possible by arrangement.

**Not suitable for planting

**TERRAMESH DUO installation instructions**

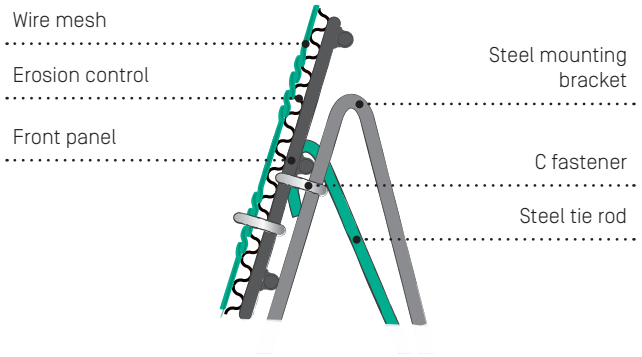
TERRAMESH DUO front inclination 70° on both sides. Front inclinations of 60°, 65° and 80° and further heights available on request.



| Number of layers | Height in m | Footprint width in m | Crown width in m | Volume of soil, in $m^3$, per linear meter |
|---|---|---|---|---|
| 1 | 0.76 | 1.99 | 1.43 | 1.30 |
| 2 | 1.52 | 2.54 | 1.43 | 3.02 |
| 3 | 2.28 | 3.09 | 1.43 | 5.16 |
| 4 | 3.04 | 3.65 | 1.43 | 7.72 |
| 5 | 3.80 | 4.20 | 1.43 | 10.70 |
| 6 | 4.56 | 4.75 | 1.43 | 14.10 |
| 7 | 5.32 | 5.31 | 1.43 | 17.92 |

Further layers are constructed with two individual elements in each case and an embedding length as specified by the structural design

# Technical Parameters




**GREEN TERRAMESH / MINERAL TERRAMESH 5x5**

| | GREEN TERRAMESH | MINERAL TERRAMESH 5x5 |
|---|---|---|
| Front design | greenable | stone facia |
| Wire | double twisted steel wire mesh | |
| Wire-coating | heavily galvanized with Galmac (Zn-Al5% alloy), and polymer coated | |
| Wire diameters | LIGHT<br>2.2 mm / 3.2 mm with coating<br>REINFORCED<br>2.7 mm / 3.7 mm with coating | LIGHT<br>2.2 mm / 3.2 mm with coating<br>REINFORCED<br>2.7 mm / 3.7 mm with coating |
| Mesh width | ca. 8 x 10 cm | ca. 8 x 10 cm |
| Front panel | round steel with 8,0 mm diameter | galvanized steel with 5,0 mm diameter |
| Steel mounting brackets | round steel with 8,0 mm diameter | round steel with 8,0 mm diameter |
| Steel tie rods | round steel with 6,0 mm diameter | galvanized steel with 6,0 mm diameter |
| Erosion control | Geosynthetic three-dimensional geomat or woven fabric inchain mesh with weft insertion | – |
| Inclination | up to 70° | up to 85° |

Are you still looking for the right solution or do you have questions regarding the application and installation? Our technical experts will be happy to assist you.

We support you in your construction project during the design and tendering phase, and assist with briefings, with explaining the construction procedures, and with supervision of the installation on site. The preparation of verifiable structural analyses is just as much a part of our service as the on-site support we provide in order to meet the individual requirements of your construction project.

We are happy to supply current data sheets, specifications, certificates and technical verifications on request.

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# APPLICATION
## in practice

Top: GREEN TERRAMESH makes it possible to construct a new, taller replacement embankment on an area no larger than that of the existing structure's footprint. Bottom left: First layer of GREEN TERRAMESH. Bottom right: Multi-layer structure of the steep slopesystem with berms.

## OA29 extension, Blaichach/Burgberg

The bridge over the Iller and the B19 (the OA 29 county road between Blaichach and Burgberg in the Oberallgäu district) was in need of refurbishment. A replacement bridge was planned as well as the renewal and widening of the road, and the addition of a footpath and cycle path. The widening of the embankment for the bridge was to be carried out using reinforced earth construction methods, since the footprint of the embankment could not be increased.

One challenge to be considered in the project was the parallel construction of the bridge. The bridge was to be constructed using the incremental launch method, starting from the eastern embankment. This required the construction of a fabrication station at an intermediate level of the embankment. The second phase of construction subsequently raised the embankment to its final height.

The GREEN TERRAMESH system was ideal for this purpose and no additional construction aids were required.

# Braunsbach: Refurbishment after flash flooding

Due to a stationary squall line, which led to heavy precipitation, flash floods occurred in the Orlacher Bach and the Schlossbach streams on 29 May 2016, causing severe damage to the entire course of the streams and to the centre of Braunsbach.

For the refurbishment of the embankment along the L 1036, the metallic GREEN TERRAMESH geosynthetic system was chosen, since it offers a high degree of pre-assembly and material robustness.

The construction of the wall began at the lowest point in the western part of the stream bed, from where berms were constructed that fanned out to the east. The precise earthworks carried out by the contractor made it possible to quickly create a reinforced embankment that looked good even in the construction phase.

At its highest point, the wall consisted of 20 layers of GREEN TERRAMESH, with a front slope of 70°.

Top: The completed structure, tied into the slope of the original terrain via berms.
Bottom left: The V-shaped valley before clearing.
Bottom right: Side connection to the original slope.

# Ebersdorf carriageway widening

The B 303 federal highway was to be extended by one lane along a section approximately 120 m long. This required the construction of a 70° steep reinforced earth structure, so that no further land would need to be acquired for the footprint of the embankment.

The fully galvanised front elements made of gabion steel, with a mesh width of 5 cm, were to be backfilled with coarse, broken stone.

Due to the deep drainage required for the embankment, the steep embankment structure also needed a foundation layer extending one metre below the surface of the public dirt track. Thanks to the high degree of factory pre-assembly of the TERRAMESH system, the construction process progressed rapidly.

The robustness of the steel wire mesh reinforcement layers proved a major advantage as construction progressed, since these could be driven over immediately by wheeled vehicles for backfilling and compaction purposes, and no laborious end-tipping was necessary.

Top: Acceleration lane in the direction of Ebersdorf. Bottom: View towards the motorway.

# ADVANTAGES
## TERRAMESH
## Steep Slope Systems

- → Long-lasting system
- → Robust materials
- → Complete load transfer without any special connection techniques
- → Safe and reliably encased overall system
- → Quick and easy installation
- → Minimum workforce and machinery requirements
- → Cost-effective construction method

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