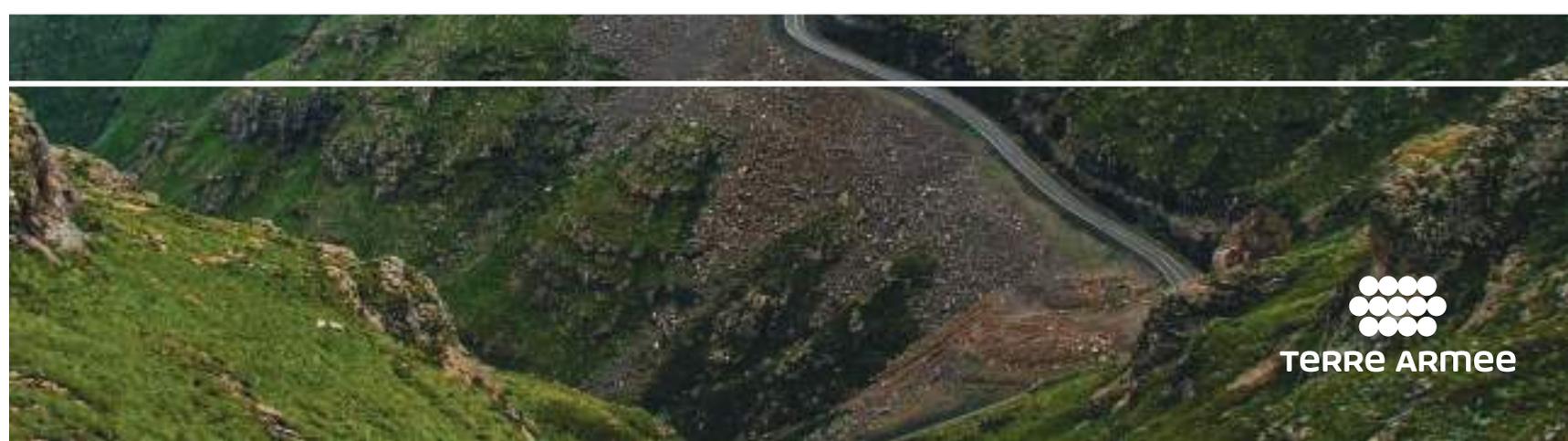


TECHNICAL EXPERTISE IN MOUNTAINOUS AREAS  
ROCKFALL PROTECTION



TERRE ARmee

REINFORCED EARTH®,  
THE VALUE  
OF EXPERIENCE

Reinforced Earth® structures are designed for and installed to mountainous areas around the world. Thanks to their highly technical performance Reinforced Earth® walls are widely used to protect areas at high natural risks such as rockfall and landslides.

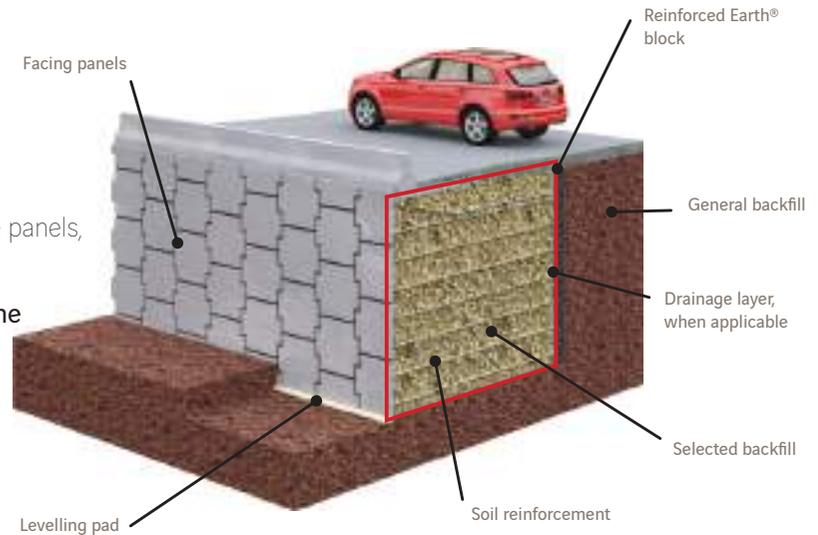


LA RIOJA | ARGENTINA

Reinforced Earth® forms a durable mass gravity retaining structure consisting of:

- steel or geosynthetic tensile reinforcement (generally laid horizontally)
- selected and controlled **granular material** (backfill) forming the body of the structure
- and a modular facing system, generally made of precast concrete panels, welded wire mesh with stone or vegetated **facing panels**.

The interplacing of soil and reinforcements develops friction at the points of contact between the two.



## A SIMPLE CONSTRUCTION METHODOLOGY

During the **basic design** phase, our design teams work with the **client** and the **consultants** responsible for engineering the protective structure. Then, in collaboration with the General Contractor, Terre Armée **provides a detailed design of the Reinforced Earth® structure and supplies the material required to build it**.

The Reinforced Earth® solution offers public and private sector clients as well as design offices the following advantages:

- Engineered solutions suitable for complex structures
- Unrivalled experience in Reinforced Earth® solutions
- A global network of innovative subsidiaries well rooted in their markets
- An unparalleled range of reliable and durable materials
- A complete manufacturer independence

FULL SCALE EXPERIMENTATION | BRON, FRANCE



CAIRNMUIR | NEW ZEALAND

# REINFORCED EARTH® PROTECTIVE EMBANKMENTS\*

When rock impact exceeds 5000 kJ, fences and rockfall barriers rapidly become insufficient. Embankment-type structures are recommended to intercept falling blocks.

Reinforced Earth® can be used to build narrow protective embankments with a limited footprint and a very high energy absorption capacity.

- The embankment slope can be steepened up to 90°;
- The slope can be faced with rock or vegetation to blend with the landscape;
- Construction is possible even for structures with a narrowness ratio of up to 0.5 x h
- No height limitation.

With a high absorption capacity and a rapid construction time, our TerraTrel® and GeoTrel® solutions are particularly suitable in these conditions.



## EMERGENCY REPAIR KIT

Terre Armée has designed a technical solution to rapidly and durably repair the protective embankment following rockfall impact and restore the initial technical characteristics.

*\*patents pending.*

## A TURNKEY AVALANCHE PROTECTION EMBANKMENT SOLUTION

Resilient and flexible Reinforced Earth® structures are widely used to protect against avalanches. TerraTrel® and GeoTrel® solutions offer greater flexibility while facilitating logistics and construction in remote areas and sites that are difficult to access.



MBABANE | SWAZILAND



A89 | FRANCE



VALTREARA | ITALY



SKM | SOUTH KOREA



NUENO CONGOSTO | SPAIN



STRIKICI | CROATIA



A3 SALERNO - REGGIO CALABRIA | ITALY

# PASSIVE ROCKFALL PROTECTION: TECHSPAN® AND TECHBOX® SOLUTIONS

► **TechSpan®**, a precast arch system, is used to mitigate the risk of rockfall and slope failure at tunnel entrances and exits. It can also be used to protect an endangered road section. TechSpan® arches are designed to fit the shape of the tunnel and can be installed without traffic disruption.

The TechSpan® system is straightforward: precast concrete half arch units are supported by footings and then keyed to form a funicular curve. These structures, made of precast concrete and delivered on site as precast segments, are ready for installation to meet the works schedule. The length of the structure can be limited by building Reinforced Earth® wing and head walls during the backfill is placed.



## ADVANTAGES OF TECHSPAN® ARCHES

- Rapid and simple construction
- Low manpower requirement
- Bespoke design
- Quality via precasting
- Possible reproduction of the shape of an existing structure in need of use extension.

► **TechBox®** consists of precast “box” structures. Terre Armée has developed its expertise in optimizing soil-structure interaction to minimize section sizes and allow rapid on-site installation with precast units for buried “box” structures. TechBox® is made of special precast concrete components, including one-piece walls and over bridging units. The features and advantages of the solution are similar to those of TechSpan® arches.



LANGENI | SOUTH AFRICA

# TERRALINK™: THE REINFORCED EARTH® SOLUTION FOR LIMITED SPACES

- ▶ The TerraLink™ solution completes the construction of a Reinforced Earth® wall when the width to height ratio does not allow for a standard mechanically stabilized earth wall to be used. In this case, it is built on an existing structure and connected to it using metallic or geosynthetic reinforcements. The solution is particularly suitable for confined environments with a limited right of way available, such as mountainous areas.



## ADVANTAGES OF TERRALINK™

- Adaptable solution to a wide range of environments: steepened slopes, mountainous, coastal and urban areas
- Ensures reliability and safety of the existing structure
- Minimizes the costs and construction times
- Broad range of facings: stone, architectural concrete, etc.
- Durable materials used
- Substantial gains in worksite operations: less excavation, less spoil, reuse of excavated materials, limited use of worksite machinery, small worksite team required
- Reduced carbon footprint.



**TERRE ARMEE**  
SUSTAINABLE TECHNOLOGY



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