



GEOQUEST

ArmaStone® ArmaGreen®

REINFORCED EARTH® SLOPES



ArmaStone® & ArmaGreen®

Reinforced Soil Slopes

Reinforced soil slopes (RSS) are essentially an **extension of the Reinforced Earth® technique** which is the foundation of Geoquest's success and global acclaim. RSS structures are designed and built to retain engineered reinforced soil fill with a face inclination of between 45° and 76°.

Building steep RSS structures requires a unique approach in design, material specifications and installation procedures for mechanically stabilized earth structures (MSE). Engineered materials for building Geoquest RSS structures come in a **versatile range of selections for engineers and builders to choose from.**

Geoquest will generally offer provisions for the finished facade to be either vegetated with **ArmaGreen®**, or a mineral facade with **ArmaStone®**.

Face-forming elements primarily consist of **an engineered welded wire mesh system** to which alternating layers of geostrips, geogrids, or steel strips are attached to function within the engineered fill for tensile strength and pullout resistance.

ArmaStone®

ArmaStone® is an engineered solution for reinforced soil slopes which require an **attractive mineral look**, either to mimic the surrounding **natural environment** or simply to provide **pleasing aesthetics for urban and peri-urban infrastructure.**

ArmaGreen®

ArmaGreen® is an engineered solution for reinforced soil slopes that require **promotion of natural vegetation**. This sustainable solution provides optimized **"green" integration in natural or urban and peri-urban landscapes.**

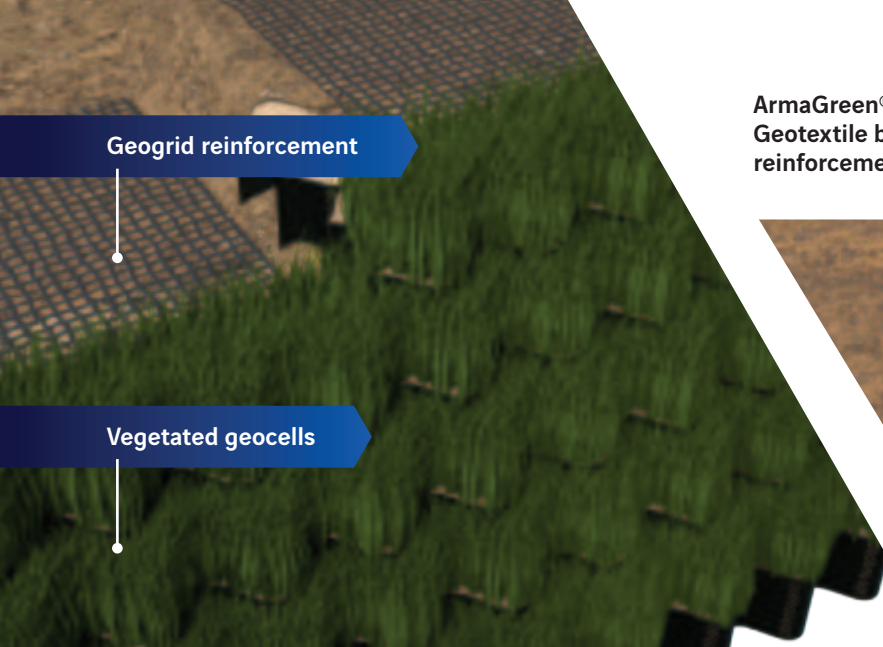
Steel mesh facing



ArmaStone® mineral facing



ArmaGreen® vegetated facing



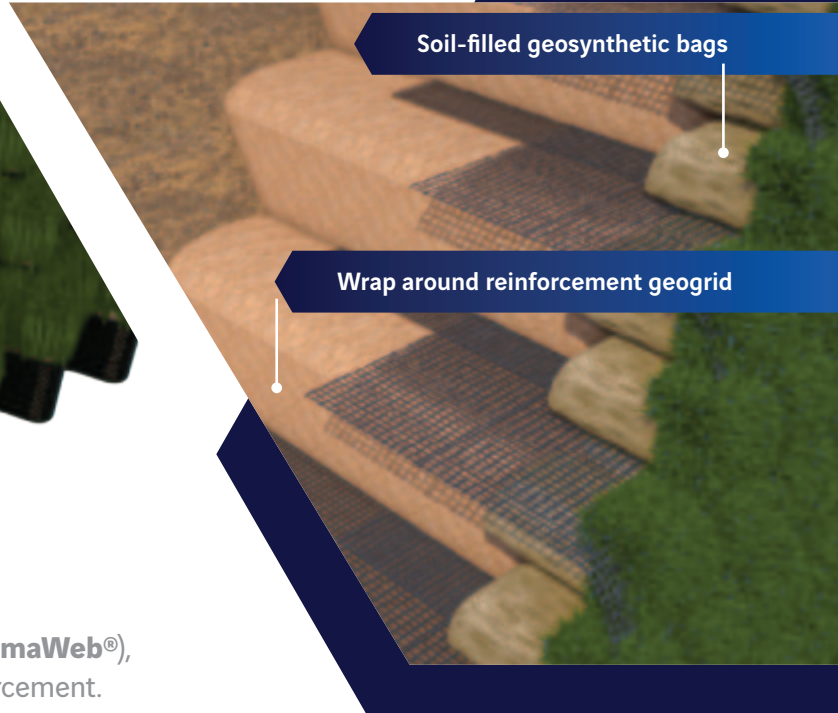
Geogrid reinforcement

Vegetated geocells

ArmaGreen®
Geocell facing with geogrid reinforcement.

Alternative face-forming elements include geocells (**ArmaWeb®**), as well as soil-filled bags with wrapped geogrid reinforcement.

ArmaGreen®
Geotextile bag facing with wrapped geogrid reinforcement.



Soil-filled geosynthetic bags

Wrap around reinforcement geogrid

Reinforcements



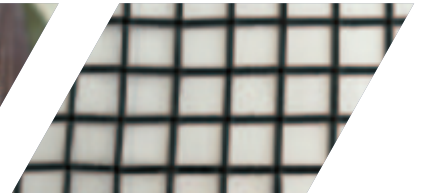
Steel strips reinforcement



Steel ladder reinforcement

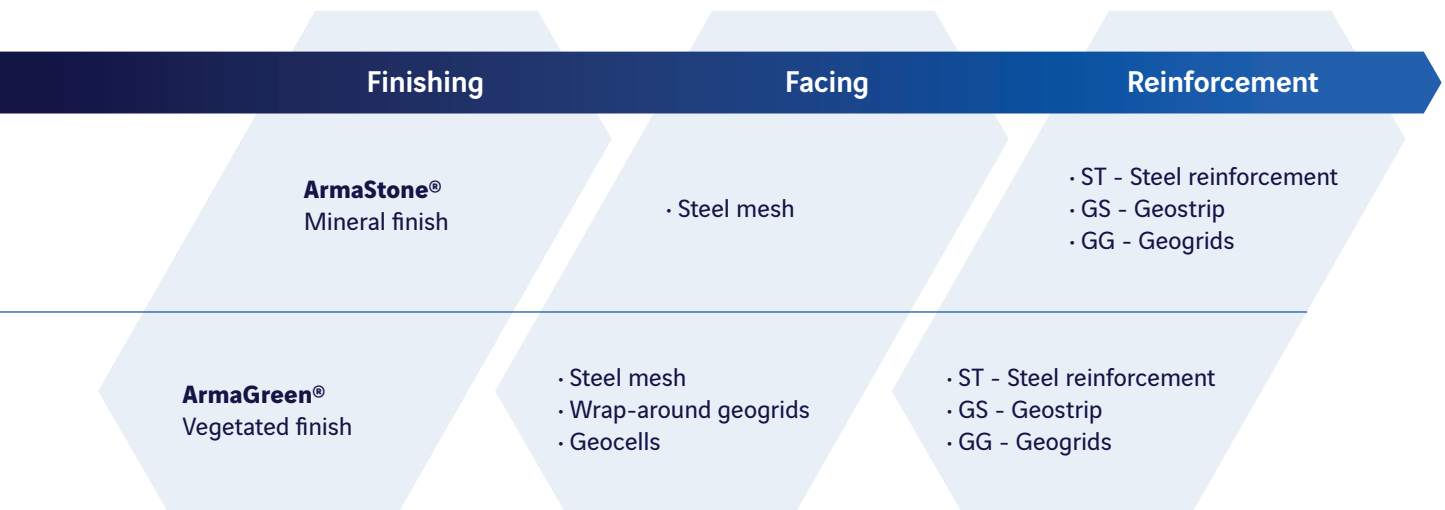


Geostrip reinforcement



Geogrid reinforcement

Possible combinations of facings and reinforcements:



ArmaStone® & ArmaGreen®

Applications

We differentiate ourselves from alternative Reinforced soil slopes (RSS) sources for services and supply.

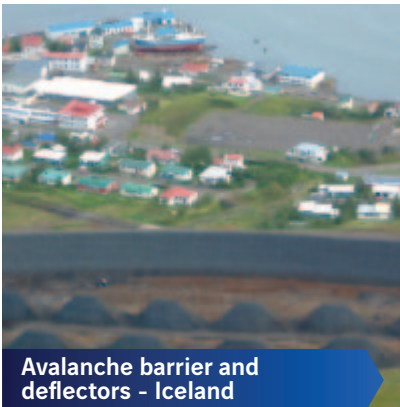
Our internal technical teams offer the combination of **60 years of soil-structure interaction expertise** with sophisticated numerical modeling design tools to analyze soil and terrain conditions for designing RSS structures that satisfy sustainable service life and enduring functional requirements.

We closely match our design expertise with a dependable internal supply chain for your RSS materials. This, together with our support throughout the installation process assures confidence in our comprehensive RSS solutions.

Geoquest's RSS structures are widely built as functional structures to support transportation infrastructure, industrial sites, landscape development, protective structures, landfills and hydraulic structures.

Applications include:

- Retaining structures
- Platform support
- Slope rehabilitation
- Gravitational risk protection (rockfall, slides, avalanches)
- Industrial protection (blasts, noise, assault)
- Dikes, berms, levees
- Landfill extension



Avalanche barrier and deflectors - Iceland



Tunnel head slopes - Italy



Biathlon stadium - France



Riverbank protection - France

Benefits

Global experience and references

As the inventors of MSE technology, our enduring strength lies in designing and supplying materials for building RSS structures. Our references span the globe, and we are **technically equipped to address any RSS application challenge**, regardless of size, complexity, purpose or location.

Lower carbon footprint

Our design approach always considers the **environmental impacts of our solutions**. Our teams are driven to offer **lighter, eco-friendly alternatives**. While these solutions are robust in terms of performance and durability, **our techniques minimize consumption of concrete, steel and aggregates**.

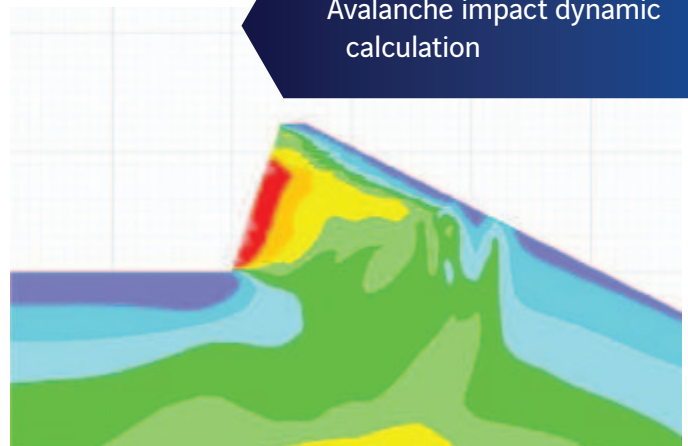
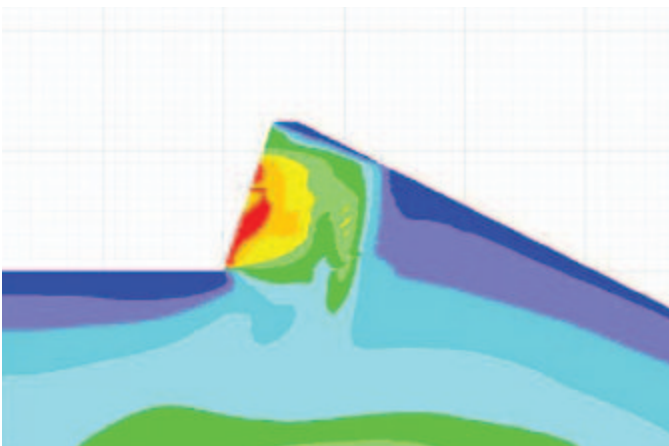
Engineering excellence

Each of our RSS solutions are designed with **safety and durability as top priorities**. Our project engineering workflow follows an established **step-by-step approach that verifies each structure layer and segment stability over the entire service life cycle**.

Whenever requested, Geoquest's engineering team can perform specific modelling and analysis to anticipate the behavior of our structures under certain conditions. This capability demonstrates **the strong in-house engineering and design expertise developed over the years** and the ability to work with our partners from inception to completion to deliver durable and sustainable structures.

For recent RSS protective structures in Norway, Geoquest was required to verify our **RSS internal stability** under the effects of avalanche impact through **dynamic calculation**. Our experience using **numerical modeling analysis** was leveraged to best represent the **behavior of our RSS structures exposed to such extreme influences**. This allowed us to better anticipate the real behavior of the structure and to avoid over-dimensioning issues that traditional methods (pseudo-static) often imply.

Avalanche impact dynamic calculation



ArmaStone® & ArmaGreen®

References



Mont Blanc Tunnel, Italy



Solan, India



Vegetated steep slope, Japan



Z-Morh tunnel, India



Parc de la Courneuve, France



Roma G.R.A. Quad. North-Ouest, Italy

About Us



1968

established since



293 M€

2023 revenue



80

countries



70 million m²

of Reinforced Earth®
walls



+100.000

structures around
the world



102,8 m

tallest structure

As global specialist we operate as **designer** and **supplier** of civil engineering solutions that **Retain, Cross, Protect and Strengthen**. As the **inventor of the Reinforced Earth® solution**, our strength is the result of an **unrivalled combination of expertise with over 60 years of experience** in the fields of **soil-structure interaction** and **engineered backfills**.

Geoquest delivers **its leading technologies** to serve clients' projects, from the simplest to the most extraordinary. Guided by our focus on **innovation** and our **culture of excellence in client care**, we offer **durable solutions**. We build on our **global expertise**, which is applied by our **local companies** to develop new applications to address challenges and ensure sustainability of our solutions.

**Watch our Retain, Cross,
Protect, Strengthen video.**



**Engineering expertise,
innovation and excellence
in client care to deliver
sustainable solutions.**



To contact us and learn more about Geoquest products and services
please visit geoquest.ca/contact



Geoquest | 5090 Explorer Drive, Suite 400, Mississauga, ON L4W 4T9 | Tel: +1 (905) 564-0896

©2022 Soletanche Freyssinet – The text, photos and other information contained in this catalogue are the property of the Soletanche Freyssinet Group.

Any reproduction, display or other use without the prior consent of Soletanche Freyssinet is prohibited.

Soletanche Freyssinet promotes the use of paper pulp from sustainably managed forests. If provided in print format by Geoquest, the paper used in this catalogue is certified in accordance with the stringent rules of the PEFC (Program for the Endorsement of Forest Certification).

Publication: January 2025