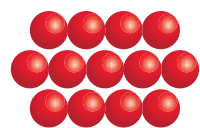


Dams & reservoirs

Reinforced Earth® applications for hydraulic works



REINFORCED EARTH
SUSTAINABLE TECHNOLOGY

Dams are often seen as the ultimate civil engineering structures. The enormous energy of the water they hold can be a vital source of electric power or have a devastating effect on populations and assets downstream. In areas where water is a scarce resource, dams and reservoirs provide storage means and are life supporting structures. Where water can be a hazard due to floods, dams used as water levees provide protection.

Drawing on their global expertise and track record, Reinforced Earth entities around the world can bring solutions and provide support at all stages of the projects for the construction or upgrading of these essential dam and reservoir structures.



Taylor Draw dam on the White River, Colorado, USA

Reinforced Earth® dams



Vallon des Bimes, France

The use of the Reinforced Earth® technique in the construction of earth dams allows the **reduction or elimination of the structures downstream slopes, resulting in considerable project savings.** The Reinforced Earth® method makes it possible to build a dam spillway with its sill at the very crest of the structure, eliminating costly gates and other flood control structures that would otherwise be required in addition to the dam. In the event of high water levels during construction, it is possible to allow a portion of the flow to spill over the unfinished dam. This provides added saving by minimizing the need for temporary diversion of the water course.



Prado dam, California, USA

Water intake and outlet structures



Manapouri second tailrace tunnel, New Zealand



Allard dam, Canada

Key intrinsic characteristics of the Reinforced Earth® technique such as **ease and predictability of construction, strength, draining capacity of the facing** allowing to accept rapid drawdown and, **proven resilience to seismic events in earthquake prone areas** are incentives to use this construction method for complex projects such as approach walls for intake structures or outlet works.



Kromellenboog dam, South Africa

Raising of earth dams



Googong dam, Australia

The Reinforced Earth® technique can also be used to form a double-faced structure allowing to raise the height of an existing earth dam and thus to **increase the spillway capacity and eventually the holding capacity** of the reservoir it impounds. In addition to its cost efficiency, the uniform distribution of the loads throughout the Reinforced Earth® mass and the ability to **increase the stability of existing embankments** make the method well suited for construction on top of earthfill dams.



Dam restoration

Strengthening century old dams built for example of stone and cyclopic concrete masonry concrete **or under designed dams** can be achieved by improving their stability by means of Reinforced Earth® works. High-water spillways of Reinforced Earth® walls with sloped facings abutting the downstream face of the existing structures allow to provide the adequate overflow capacity.

Jamesville dam, New York, USA



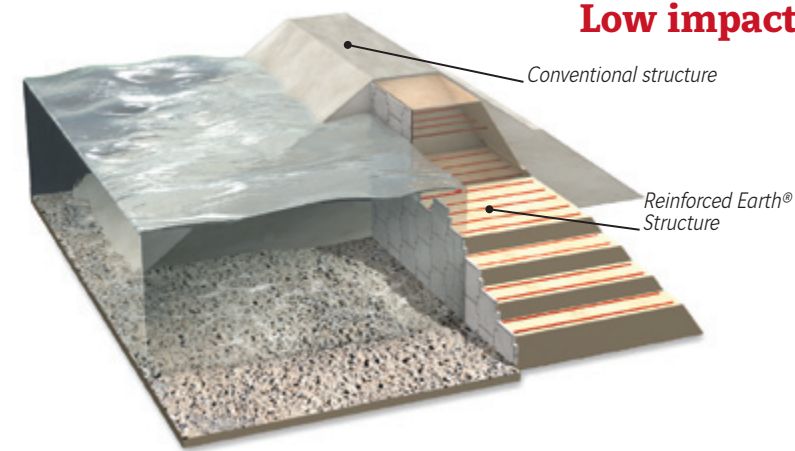
Trekkopje reservoir, Namibia

Reservoirs



Trekkopje reservoir, Namibia

Demonstrating its versatility, the Reinforced Earth® technique has been used for the construction of reservoirs for potable water. Concrete segmental panels were combined with a UV resistant lining to provide water tightness. The GeoMega® system associating fully synthetic connections and reinforcements is well adapted to such structures, especially when chemically aggressive materials are sourced for the backfill. Enhanced durable water tightness can be obtained by fitting a waterproofing membrane on the GeoMega® sleeves at the back of the concrete facing (patent pending).



Low impact water retaining structure

The Reinforced Earth® technique allows to **drastically reduce the quantity of backfilling materials** when compared to traditional sloped earth embankments. Combined with the use of water tightness systems, this makes the Reinforced Earth® method a technically and economically sound solution for water retaining structures such as dams, reservoirs and dykes. In addition vertical or sub vertical facings allow to **reduce the wave run up, damage to lining and evaporation.**



Woodhollow dam, Texas, USA

Blending into the local environment



Lake Lenexa Dam, Kansas, USA

The Reinforced Earth® method is well known to combine strong technical and operational benefits with æsthetical properties while providing substantial cost savings. When architectural considerations are an issue for the construction of dams in sensitive environments, **the Reinforced Earth® solution can provide the right answer to the requirements of the owner and local community.**

Reinforced Earth[®] applications for dams and reservoirs



- **Economy of materials**
- **Compatibility with external and internal waterproofing geomembranes**
- **Structural flexibility on moderately compact or heterogeneous foundation soils**
- **Exceptional response to seismic events**
- **Lower land use and site impact during construction**
- **Lower CO₂ impact than conventional techniques**
- **Use of natural or recycled materials**
- **Suitability of reinforcing materials to environmental and site conditions**
- **Durability**
- **Ease of inspection, maintenance and upgrading**

Reinforced Earth[®], the Value of Experience

When it was invented almost 50 years ago, nobody could foresee the great success of the Reinforced Earth[®] technique. It is now recognized as a major innovation in the field of civil engineering. The Reinforced Earth[®] method has widened its scope of applications to beyond just roads in the last 30 years, demonstrating its advantages in other markets. Reinforced Earth[®] structures have been designed and supplied by companies of the global network of Terre Armée Internationale for marine applications.

Choosing a Reinforced Earth[®] solution allows owners and engineers to benefit from:

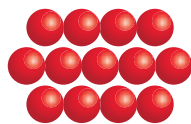
- the longest experience in the field of mechanically stabilized earth structures
- a global network of innovative companies deeply rooted in their markets
- tailored engineered solutions adapted to complex situations
- the widest range of reliable and sustainable materials
- a complete independence from manufacturers of reinforcing materials





Our goal is to create, design and supply innovative techniques to the civil engineering industry with a strong commitment to excellence in design, service and public welfare.

Sustainable Technology



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