Road works
Problems and solutions
Gravity earth retaining structures

MACCAFERRI
Gabion earth retaining structures

Technical manuals define a retaining structure as any structure capable of resisting an applied soil pressure. Retaining walls are permanent structures typically constructed at the toe of a slope or to retain backfill. The planning and implementation of these structures must take careful account of several structural and functional considerations:

- Geomorphological conditions
- Analysis of the static and dynamic (seismic) forces present
- Presence of phreatic surfaces
- Costs of the completed structure

"Functionality" must include not only the overall environmental impact of the structure, but also the various local environmental mitigations and improvements that the entire road works should provide.

The variety of gabion applications, combined with the testimonial of existing gabion structures built since 1894, represents the reliability and reassurance that Maccaferri offers its clients. Over time, design standards and approaches have changed. What has not altered is the ability of Maccaferri gabions to perform as designed; fundamentally the structural stability and integrity, but in addition the capability to establish vegetation on the external facing.

The key to the longevity of these structures is obviously based upon the quality of the steel wire, but mainly due to the original idea of gabions. To combine the passive function (soil retention) with the active function (the creation of a new local environmental equilibrium), Gabion structures were, perhaps unconsciously in the beginning, the first historical examples of "environmental insertion" of an artificial structure.
Advantages and characteristics

- Robust •
- Flexible •
- Permeable •
- Durable •
- Versatile
- Good environmental and aesthetic impact

The assembly and installation of gabions is extremely simple in any environment without the aid of specialised equipment or personnel. A structure with outstanding characteristics is the result.
Reinforced structures

Gabion structures are capable of resisting any type of stress, in particular bending, tensile and shear.
Flexible structures

Gabion structures are capable of accommodating large differential settlements and unpredictable loads. These characteristics do not reduce the structural integrity, but improve it by promoting the interaction of the entire structure.
Permeable structures

The drainage capability of gabions is created by the voids in the gabion stone fill, which collect and transport water away from the structure, eliminating one of the main causes of soil instability: water logged backfills and/or foundation. Also, without formal drainage, the total cost for the structure is reduced.
Structure with long durability

The durability of the structure is dependent upon:
- Good natural integration with the backfill and retained slope
- Advanced technical characteristics of the steel wire and its Galfan (Zn-5% Al-MM) coating with an optional polymeric sheathing, all in accordance with the most stringent international Standards
- The use of hexagonal woven double twisted wire mesh which avoids any unravelling or unzipping of the mesh

These characteristics optimise the longevity of the structure, which has been certified by independent international bodies to offer a design life of over 60 years.
Versatile structures

- Ease of installation in any environment, without the aid of specialised equipment or personnel, reducing costs
- Future modification of the structure is straightforward; e.g. new layers can be installed to increase the height of the structure, (provided structural stability is verified)
- Immediate performance following installation
- Ease of maintenance

These benefits allow Maccaferri gabions to be used for most retaining structures alongside roads, railways and buildings where reliability and safety is paramount.
Good environmental and aesthetic impact

The opportunity to combine live plants with a high sound absorption capability, make gabion structures ideal solutions to balance engineering and environmental needs in the construction of roads and railways. The structural flexibility of Maccaferri gabions allows several interesting architectural possibilities for residential and commercial areas.
Design software

Laboratory and full scale tests carried out in partnership with the University of Bologna, have proved and calibrated the stability analyses of the Maccaferri Gawac design software. The software takes into consideration geometry, loads and other factors associated with the design of Maccaferri gabion structures in a wide variety of conditions. Gawac graphically displays cross sections of the structure, the retained material, foundation, phreatic surfaces and external loads.