Innovative environmental solutions for a changing world - General Solutions
General Solutions

Index

3 Company Overview
4 Architecture & Landscaping
6 Geotechnical Engineering
9 Pavements
10 Hydraulic & Erosion Control
13 Emergency Works
14 Rockfall Protection Systems
16 Shoreline & Offshore Protection
18 Software

Mission Statement
Market Leadership in Environmentally Engineered Solutions, through Professional Service, Technical Expertise and Quality Products.
The first large work was carried out in 1894 at Casalecchio (Italy), to protect the town from frequent flooding by the River Reno. A view of the same site 100 years later.

In South Africa, African Gabions (Pty) Ltd was initially known as River and Sea Gabions, an agency that was formed back in 1957. The agency name was formally changed to African Gabions (Pty) Ltd in 1989, coinciding with the factory launch in Isithebe, and is now located in Westmead, Pinetown. In January 2007, the company was officially renamed to Maccaferri SA (Pty) Ltd in line with the rest of the Maccaferri Worldwide subsidiaries.

In 1894 at Casalecchio (Italy), to protect the town from frequent flooding by the River Reno. A view of the same site 100 years later.

In 2003 alone, the Maccaferri Group was involved in an excess of 20 research projects worldwide at a cost of more than $1 million, aimed at increasing our range of products and field of expertise.

In 1879, Maccaferri in Zola Predosa (Bologna, Italy), undertook the first production of the modern gabion. Since then they have expanded globally with manufacturing facilities, subsidiaries and a vast network of distributors and agents in 5 continents.

Maccaferri SA (Pty) Ltd, known as African Gabions (Pty) Ltd, manufacturers of hexagonal woven steel wire mesh, commonly referred to as double twist mesh, are part of the worldwide industrial group of Maccaferri, with headquarters in Bologna, Italy. Maccaferri is synonymous with researching, designing and developing sophisticated high quality products for solving problems related to the preservation of the environment that we find ourselves in.

In addition to the hexagonal woven steel mesh products, Maccaferri SA (Pty) Ltd offer a vast range of geotextiles, Turf Reinforcement Mats, rolled erosion control blankets and composite drainage systems.

To this end, Maccaferri SA (Pty) Ltd has been certified by BVQi to the ISO 9001:2000 quality management process.
The flexibility and strength of gabions allows the architects to specify them for unusual features such as cladding for walls, around columns and as a replacement for the more traditional structural components in building applications.

Gabions made of woven reeds were first used by the Egyptians 2000 years ago for their aesthetical appearance and natural beauty. Today, many architects and landscapers are rediscovering the beneficial properties of stone filled gabions.

Gabions natural appearance and flexibility are indirectly applied to improve the quality of life and minimise the impacts of a high technology, fast paced society by allowing for a more sedate, serene lifestyle and working environment.
Different coloured rock used for fill creates a visually attractive feature.

The MacWall block system, also available from Maccaferri SA (Pty) Ltd, has numerous architectural benefits, is flexible, durable and can be used for landscaping and retaining walls up to 15m high.

High void ratio of gabions make them ideal noise barriers.

Gabions can be adapted to define boundaries, shape and enhance outdoor living areas. Minor effort is required to change an area with poor aesthetics to one vibrant with colour and interest.
Soils subjected to dynamic or static loading must be stabilised to ensure equilibrium of the surrounding environment. When soil is confined or loaded, disturbing forces are set up that may give rise to sliding, overturning and bearing failures. To counteract these effects, a series of interventions in the form of mass gravity walls, segmental block or mechanically stabilised walls, slope reinforcements or even basal platform reinforcement may be required.

Mechanically stabilised earth (MSE) walls or slopes can have flexible or rigid façades, and the reinforcement is characterised by high strength, low elongation properties. These walls or slopes are incorporated into most environments simply by choosing the most appropriate facing system and reinforcement. They are uncomplicated to construct, adapt easily to changing field conditions and offer significant cost savings over more traditional reinforced concrete structures.

Façades that allow for the establishment of natural vegetation are becoming increasingly popular. In this case, the reinforcement consisting of a single panel of PVC coated woven steel mesh, is extended forward from the front face, wrapped around a rigid steel panel and lined with an erosion control blanket made up of natural coir or polymer filaments. Thereafter the front face is vegetated using different hydroseeding or rooted cuttings techniques. Note that it is very difficult to sustain vegetation of façades steeper than 70 degrees.
High strength reinforcement installed prior to construction of the fill embankment over weak foundation layers, help minimise settlements and bearing stresses. When reinforcement is used in conjunction with drainage geo-composites, consolidation rates are also increased reducing overall project duration and costs.

Terramesh™ System are engineered modular units used for the reinforcement of walls. A single panel of PVC coated woven steel mesh constitutes the reinforcement and gabion box like front face.

11m high Terramesh™ wall. Irish Embassy, Mozambique.

22.5m high Terramesh™ wall. Marikana Platinum Mine, North West Province.
Wrap-around systems are susceptible to high deformations and should be used with care. The system shown above was used at Magoebaskloof for stabilisation of the cut section of the down slope portion of the road using a combination of wrap-around mesh anchored into the slope and an erosion control blanket to protect the face from erosion. Vegetation of the face occurred shortly afterwards.

Gabion walls utilise their purpose built weight to contain and resist lateral pressures arising from soils, water or imposed loading. These walls are durable, flexible, permeable and can easily be constructed using mechanically or labour intensive methods.

Wrap-around Green Terramesh™ structure at Eagle Canyon, Johannesburg, prior to vegetation of the front face.

MacWall segmental block walls are engineered systems used for the reinforcement of walls where the slope exceeds 70 degrees to the vertical. High strength pins connect the reinforcement to the block. MacWall blocks are easy to install, come in a variety of colours, patterns and shapes.
Road Pavements

Failure of road pavements arise from distress of the deep base layers or from eventual fatigue of the upper wearing course. As good road building materials are becoming increasingly scarce and costly, designers are incorporating reinforcement into the layerworks to assist and improve rut resistance, asphalt fatigue and crack reflection propagation.

With time, the layerwork materials degrade and their performance decrease. Concurrently, traffic volumes may increase resulting in high deflections, rutting and cracking of the asphalt. By incorporating woven mesh, transversely reinforced with steel rods into the thin asphalt overlay (50mm), the designer is able to extend the life of the asphalt pavement and reduce the problem of rutting, cracking reflection and asphalt fatigue by up to 42%.

Where the base layerworks have failed, deep milling and stabilisation of the material is often the preferred option of rehabilitation. By incorporating metallic woven mesh reinforcement with a pre-attached geotextile in the base layers, the whole pavement structure is reinforced, improving the bearing capacity, and the possibility of contamination of the upper layers by the poorer founding material is eliminated.
Hydraulic & Erosion control

Hydraulic engineering is the study of the behaviour of fluids, typically water. Water has the gift to sustain all life, but also the potential to maim, damage and destroy if not managed correctly. Management of catchment areas requires protection and stabilisation of riverbanks, reducing erosion of slopes, conveyance of water around infrastructure in a controlled manner and the protection of human settlements from the impact of floods.

Erosion at the foot of the bridge foundations is a serious problem in road engineering. Bridge abutments and bridge piers often collapse as a consequence of scour around and under the foundation from the erosive power of flowing water. Gabions and mattresses provide the ideal protection to the foundation of the piers and abutments and the terrain around the bridge structure. In remote places, gabions themselves are used to support the bridge deck structure.

Constructed parallel to a watercourse, longitudinal protection structures correct and control the flow of water preventing flooding of towns and cities, and erosion of stream beds and edges of banks. These structures can be classified as light, when simply protecting already stable edges merely from erosion aspects, and heavy when it is necessary to contain the banks.
Gabion groynes are purpose built structures used for the protection and recouping of eroded banks by deflecting the flow in a watercourse away from the bank. Groynes, constructed some distance into the watercourse perpendicular to the direction of flow, create and form a series of backwater zones that allow for the deposition of the sediment. Anchored into the bank, gabions and mattresses are ideal products for these type of structures where construction is in phases and, in most cases, in water.

Some 15 giant groynes were used to protect the city of Tulear in Madagascar from flooding.

Installing drop structures or stepped weirs across a stream or river is an efficient means of dissipating water energy over a short distance. The riverbed slope is modified as the flow velocity is reduced allowing suspended solids to settle creating a flatter riverbed slope. Weirs are used as spillways on dams, allowing water to discharge in a controlled manner.

Protection of entry and exits points to culverts provided by a combination of gabions head and wing walls with Reno mattresses scour protection.
Channel linings are necessary to protect and stabilise the edges of natural and artificial watercourses from erosion. Channel linings take many forms. Gabions, mattresses and erosion control blankets (ECB’s) made of either coir or polymer fibre, integrate quickly with the environment. Their permeable and flexible nature can assist in controlling floods, increasing outflow from catchment areas and maintaining and improving ecosystems. These versatile products are easily installed in the presence of water.

When slopes are stable from a global aspect, but require protection from superficial erosion, a combination of high resistance woven steel mesh nets, geomats and biodegradable mats are available to mitigate such degradation.

Bio-filters constructed of gabions are economical alternatives to the more traditional trickling filters found at waste water treatment facilities.

By positioning an impermeable plastic liner or clay layer on the upstream face of the gabions, the structure can be made watertight. In earth dam type applications, the use of gabions can be used to quickly and effectively increase the storage capacity of the dam.
Emergency works

Rapid response is required when there is a danger to human life and property. Emergency interventions call for decisive, effective solutions that instil confidence.

Reinforced lidless gabions, pre-lined with a geotextile, allow for rapid installation and ease of construction in times of floods. Local materials and relatively unskilled labour can be used to assemble these structures even in the presence of water and traffic. If time is a critical factor mechanised filling equipment can be used.

Rapid access across poor soils provided by FlexMesh™ (woven mesh pre-attached with a non-woven geotextile).

Gabions used to construct temporary platform for excavator.

MacMat™ R anchored into slope and shot-creted, used as emergency support before construction of mechanically stabilised earth wall commenced.

Temporary vehicle access across culvert provided by Green Terramesh™ wrap-around retaining system.
Rockfall protection systems are a key element in the design and maintenance of infrastructure and have a direct impact on safety. To engineer solutions in this field, the designer must be familiar with rockfall initiation, trajectories and the impact of the solid mass of rock on the infrastructure below. Instability of the rock mass stems from external and internal factors such as temperature variations, scour by wind and water, the action of ice, erosion at the toe of the slope and residual geological stresses within the rock.

Solutions adopted to suit a particular situation can be either passive, by hindering or controlling rockfalls, or active. Active systems work to inhibit the initiation of rock movement.

Mesh drapery consisting either of steel cable panels or woven wire mesh or a combination of both, such as the steel grid, hinders the movement of dislodged rocks. The drapery is secured and anchored at the top of the slope before being unrolled down the face of the slope.
When the need arises to block falling rocks, passive defence measures such as catch fences may be considered. These catch fences, available from 250kJ to 3000kJ energy classes, consist of steel cable grids overlain with woven wire mesh and suspended between two steel posts.

Patent high strength joint ensures efficient stress absorption and load transfer.

Wall barriers are different kinds of passive systems.
Coastal engineering encompasses amongst other, the study of on and offshore currents, wave energies and behaviour, the deposition and erosion of coastal zones, beachfront protection and the protection of underwater structures. As the population density along coastal zones intensifies, protection and maintenance of beachfront property, small ports, marinas and service infrastructure, such as underwater outfall pipelines, increases.

The flexibility, permeability and ease of construction offered by woven mesh products make them ideal choices in these circumstances, where construction is mainly in phases and in the presence of water.

Marinas, moorings and small ports demand well thought out construction processes due to the presence of continual flow and wave action. Pre-filled gabions and mattresses, which are easily placed in the presence of water, constitute an excellent solution when compared to the more traditional approach, as they are able to function immediately upon placement. Moreover, they are able to accommodate changing field conditions, differential settlements and consolidation without cracking.

Groynes are a series of structures purpose built perpendicular to the beach to protect and recoup the eroded shore. These structures, anchored into the bank are constructed some distance into the sea, transversely to the current direction.

The recovery and protection of coastal zones and beaches necessitate versatile structures that are easily constructed and able to resist the constant dynamic forces resulting from wave action. Longitudinal structures in the form of gabions and mattresses are perfectly suited to these conditions.
Offshore protections in the form of geotubes, Reno mattresses or gabions, whether partially or totally submerged, are structures built parallel to the shoreline to protect and recoup the eroded beach, and to protect the sea floor from scouring forces. They create and form a series of barriers against which deposition of the sediment occurs during backwash from currents or waves.

The resulting action of storms, waves and currents expose sewer outfalls and pipelines. Reno mattresses can be specifically designed and installed, as shown in the photograph above, to provide the ideal anchorage and protection from damage of high cost pipelines and cables.

Integration of the product into the environment is an important aspect of any solution adopted. The above photos show the encrusting of marine life around the woven mesh and the establishment of salt marshes.
Software

Design software is available to users in South Africa, Angola, DRC, Madagascar, Malawi, Mauritius, Mozambique, Seychelles, Zambia and Zimbabwe only. For clients outside these territories, please visit www.maccaferri.com to identify the subsidiary closest to you.

GawacWin™

The GawacWin™ program was developed to provide designers with a quick and reliable way to analyse and verify mass gravity gabion walls through a user-friendly Window™ graphics interface.

The program takes into account the mechanical characteristics of gabions manufactured by the Maccaferri Group.

MacStars 2000™

MacStars 2000™ provides wall designers with a reliable way to execute the correct analysis for the stability verification of reinforced soil walls and slopes, using the Limit Equilibrium Methods of Bishop and Janbu.
Soil bioengineering training manual

This manual has been written for the benefit of engineers, landscape architects, biologists, soil conservationists and anyone who is concerned and interested in the protection and mitigation of ecosystems. It illustrates the compatibility of incorporating environmentally sound concepts into the design of engineering solutions.

Macra 1™ - Bank protection

Through a user-friendly Windows™ graphics interface, Macra 1™ conducts the stability analysis of water course cross-sections, with respect to water flow by checking the hydraulic stability of different bank protection linings given an allowable shear stress and roughness coefficient for that material.

Macra 2™ - Weirs

Macra 2™ was developed to provide engineers with a rapid and efficient tool with which to conduct the hydraulic and static analysis of different type of gabion weirs. The software operates through a user-friendly Windows™ graphics interface.