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Engineering a Better Solution

Maccaferri's motto is **'Engineering a Better Solution'**; We do not merely supply products, but work in partnership with our clients, offering technical expertise to deliver versatile, cost effective and environmentally sound solutions. We aim to build mutually beneficial relationships with clients through the quality of our service and solutions.

GLOBAL ENGINEERS

In the second half of the 19th century, we invented Gabions and dramatically changed the civil engineering landscape. We are still changing today. We work every day to find better solutions for our clients at every degree of latitude and longitude. Our worldwide network grows through innovation and diversification of sectors of activity and through an increasing range of high quality and environmentally friendly products and applications.

OFFICINE MACCAFERRI GROUP PROFILE

Founded in 1879, our Group soon became a worldwide reference in the design and development of advanced solutions, with offices in over 70 countries and 30 factories worldwide.

Our mission is to pursue excellence through continuous improvement, while delivering to customers engineered solutions that are innovative, advanced and environmentally friendly. We are committed to outstanding safety, quality and sustainability, to create value for all stakeholders as well as our communities.

MACCAFERRI APPLICATIONS

- RETAINING WALLS & SOIL REINFORCEMENT
- SOIL STABILISATION & PAVEMENTS
- DRAINAGE OF STRUCTURES
- FENCING & WIRE
- HYDRAULIC WORKS
- BASAL REINFORCEMENT
- SAFETY & NOISE BARRIERS
- AQUACULTURE NETS/CAGES
- ROCKFALL PROTECTION & SNOW BARRIERS
- COASTAL PROTECTION, MARINE STRUCTURES & PIPELINE PROTECTION
- LANDSCAPE & ARCHITECTURE
- ENVIRONMENT, DEWATERING & LANDFILLS
- EROSION CONTROL

MACCAFERRI

MACCAFERRI

EFFICIENT SOLUTIONS FOR RAILWAY WORKS

SUPPORTING RAILWAY INFRASTRUCTURE

The demand upon railways in the UK and Ireland is increasing.

The challenge for civil engineers is to deliver rail infrastructure assets that:

- Are more resilient
- Have superior performance
- Cost less to build and maintain
- Are better for the environment

Whether building a new railway asset or maintaining an existing one, Maccaferri can help clients, designers and contractors achieve these goals.

"Whether building a new railway asset or maintaining an existing one, Maccaferri can help clients, designers and contractors achieve these goals."

OUR SOLUTIONS OUR CAPABILITY

Uniquely, we are a **manufacturer** of construction materials as well as a **designer** and **installer** of engineered solutions. We tailor the extent of our involvement on each project to meet the specific needs of our clients and the project.

We offer:

- Material supply only
- Technical support and advice
- Design service and supply
- Design, supply and install
- BIM capable service

Quality Management and control in our factories and technical support services ensure you receive reliable, robust and safe solutions.

Selecting from a broad portfolio of solutions we endeavour to **"Engineer a better solution"**.

Our experience enables us to combine products in new ways in order to maximise value for our clients and to enable the re-use of site-won materials whenever possible delivering:

- Lower carbon footprint
- Lower consumption of imported materials

Being the manufacturer of our materials, we are able to customise products to reduce wastage and optimise solutions.

Many of our products are BBA certified, CE marked and subject to the rigid process of European Technical Approval (ETA). This provides reassurance of performance.

Visit maccaferri.com/uk/rail for more information: Technical data sheets, case histories and more.

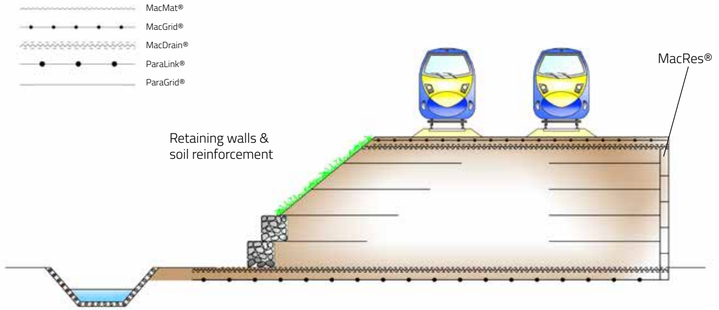
LIMITED SPACE
NARROW CORRIDORS OR WIDENING THE ROUTE

Where a restricted permanent way corridor exists, the use of cost-effective retaining walls and soil reinforcement can reduce compulsory purchase and optimise the developable area.

Reinforcing soils with geogrids enables them to perform better than in an unreinforced state: standing steeper, accomodating higher loads and settling less.

We endeavour to reuse site-won materials as structural backfill whenever possible through the use of soil reinforcement, saving costs and reducing carbon footprint.

Our ParaLink®, ParaGrid®, ParaWeb® and ParaDrain® geogrids are made in Yorkshire, England and are among the most tried and tested geogrids in the world.




MacRes® & ParaWeb® at Reading Viaduct


MacWall® for London Underground

SOLUTION PORTFOLIO

Terramesh® and Green Terramesh® combine the benefits of a modular, rapid to construct system with the resilience of soil reinforcement. Structures up to 75m high have been constructed using our technology.

For lower height structures, gabion walls are amongst the most cost-effective retaining structures to build. State-of-the-art protective coatings to the wire mesh ensure long design life, even in adverse conditions.

A variety of face-finishes and slope angles are available to suit all project demands.

Our MacRes® vertical faced concrete panel structures and MacWall® concrete block walls both feature soil reinforcement geogrids attached to their facing elements.

A softer vegetated slope aesthetic is available with Green Terramesh®. Native species can be planted on the slope.


Gabion walls on Borders Rail


Green Terramesh® used for bridge abutment


Green Terramesh® supporting a railway line


Terramesh® System

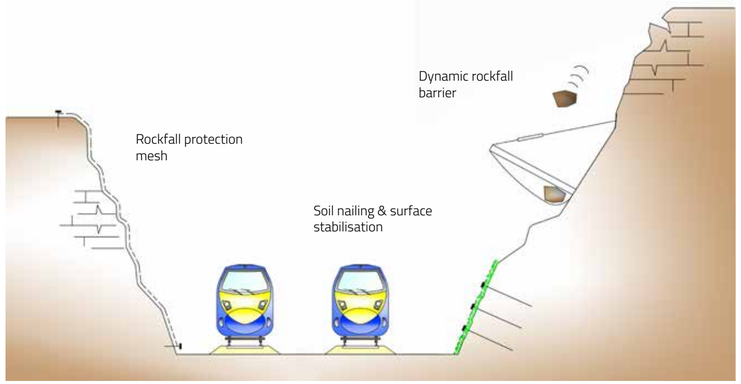
CUTTINGS
LIMITING THE EFFECTS OF NATURAL HAZARDS

Mitigating and limiting the effects of natural hazards reduces risks to rail users and expensive line closures.

To suit the wide variety of soil, rock and cutting types across the UK and Ireland, we offer a range of rockfall mitigation meshes. In this way we can optimise the performance of the solution.

Our Dynamic Rockfall Barriers, available up to 8,600kJ energy absorption capacity are certified and CE marked in accordance with ETAG 027.

We even offer digital monitoring systems which trigger alarms in the event of a rockfall barrier or mesh system being impacted. This can assist **inspection** and **maintenance** responsibilities and regimes.




120 year life rockfall drapery mesh


Steelgrid® HR high strength mesh

Our high-strength/low-strain drapery meshes capture and contain falling rocks; the mesh stiffness minimises deflection under load to keep the kinetic envelope open. Our meshes offer tensile strengths from 50kN/m to 250kN/m, and offer punching resistance up to 400kN with very low deflection.

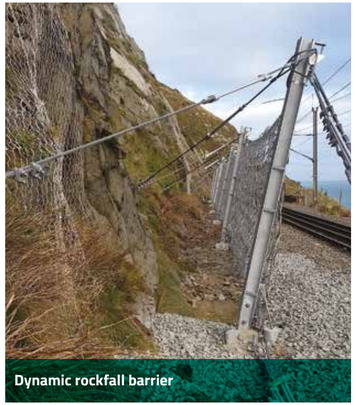
In the vicinity of the coast, or in exposed locations the use of a polymer protective coating on the rockfall mesh is necessary to deliver long-term reliability.

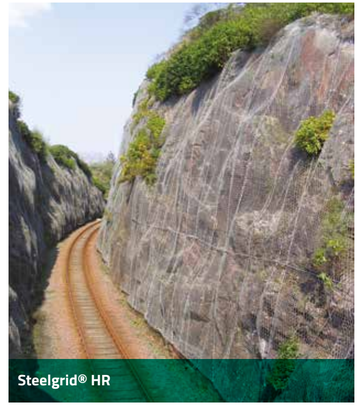
Erosion control and slope stabilisation

Controlling erosion caused by weathering is important before it causes structural instability of the slope.

MacMat® geomats, often in conjunction with soil nails, provide immediate erosion protection and the ability to revegetate the slope.

We offer a graded range of products to suit the erosion risk on the project, from biodegradable mats up to high strength long term geomats.


Dynamic rockfall barrier


Steelgrid® HR


MacMat® R erosion control

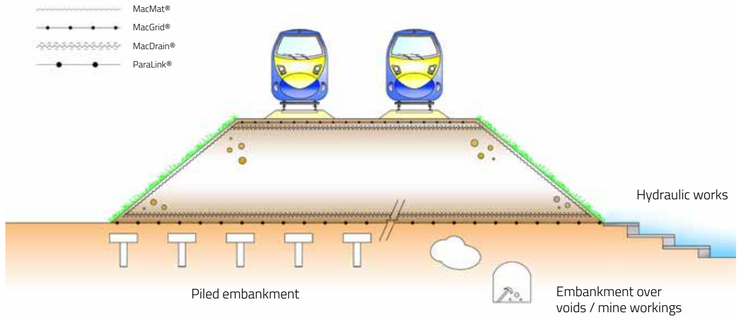

MacMat® R with soil nails

UNSTABLE & SOFT GROUND
POOR GROUND AND THE EFFECTS OF WATER

Inevitably, railways have to traverse poor ground conditions. Overcoming these difficulties cost-effectively is a challenge.

The innovative use of ultra-high performance ParaLink® to provide basal reinforcement of rail embankments is increasingly used by forward-thinking clients.

Management of water in the vicinity of the permanent way is an important technique to limit its detrimental effects. Hydraulic works including channelling and river bank protection are common problems we solve with our range of hydraulic works solutions.




ParaLink® over piles


ParaLink® basal reinforcement over soft soil

Embankment stabilisation

ParaLink® geogrids have the toughest protective sheathing, enabling their use in the most challenging geotechnical conditions including:

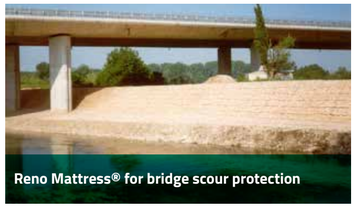
- Soft ground stabilisation
- Construction over voids, solution features or old mine-workings
- Piled embankments - ParaLink® can enable the pile spacings to be increased saving cost and time

ParaLink® is simple and rapid to install increasing construction efficiency and solving large site problems quickly.

MacDrain® drainage geocomposites placed beneath the embankment or track bed serve to remove water from the soil, improving its characteristics.

In contrast to traditional gravel drains, MacDrain® performance is lab-tested, providing long term reliable drainage capability. It also removes the need for quarrying and importation of drainage gravels, improving the environmental impact of the solution.


Gabion culvert walls


Reno Mattress® for bridge scour protection


Gabion and Reno Mattress® weirs

Water management

Controlling the effects of water and reducing the impact of flooding, relies on effective design and robust solutions.

Our Reno Mattresses® and gabions made from flexible double twist hexagonal mesh are important solutions to protect against the erosion of river banks, bridge abutments and water courses.

The dynamic hydraulic environment demands a flexible mesh as well as a long-lasting, abrasion resistant polymeric coating to the mesh.

Gabions and Reno Mattresses® are used extensively to construct weirs and culverts to convey water courses beneath and around railway infrastructure.

ASSISTING CONSTRUCTION
ENABLING A BETTER NETWORK

Access to remote sites

Access tracks to remote construction areas and haul roads often traverse soft ground. Our MacGrid® geogrids and MacTex® geotextiles stabilise these soft soils. Reinforcement within the granular construction layers reduce rutting and maintenance of haul roads.

Similar techniques are employed in the creation of working and piling platforms, enabling the access and use of heavy construction equipment.

Stabilising and containing ballast

Large aperture MacGrid® geogrids interlock with track ballast, limiting its movement under cyclical loads.

Further improvements are realised when MacDrain® drainage geocomposites, placed beneath the ballast are used to collect and remove unwanted water from the track construction (or embankment) layers.

Non-woven MacTex® geotextiles are used to provide seperation and filtration functions below the ballast, preventing material contamination.

Access over soft soil & haul roads

Crane & piling platforms

Acoustic, visual & safety barriers

Safety and noise barriers

Our DUNA double-faced reinforced soil structures are used as both safety and noise barriers where the line is adjacent to buildings or other infrastructure.

Safety barriers with almost limitless impact energy absorption capacity are possible.

Our soil reinforcement technology enables the soil to stand far steeper than normal, reducing the required footprint ("land take") of the barrier.

Railway station structures

Gabion retaining walls, architectural cladding and soil reinforcement are regularly used within the construction of station facilities, car parks and access ways. Our asphalt reinforcement meshes, Road Mesh® and MacGrid® AR, also increase the fatigue life of car parks and turning areas.

Speed of construction

Our Cubiroc units are pre-filled gabions. They are lifted into the works to rapidly form retaining walls, hydraulic works structures, or for emergency repairs.

Pre-filled off-site and transported into the works, Cubiroc adds speed of construction to the traditional benefits of gabions, increasing productivity during track possessions.

Cubiroc prefilled gabions

Burrowing animal damage

Badgers, rabbits and other burrowing animals can quickly damage embankments or cuttings. Our flexible steel meshes and our MacMat® R secure slopes and provide long term prevention against these problems.

System resilience

Excess and sudden wind loading can destabilise rolling stock. Our ParaFence® wind fencing reduces wind loading by up to 90% and can be deployed in critical locations to enhance safety.

Traditional structure performance

Drainage of water, from behind or adjacent to structures (concrete, masonry or tunnels), traditionally uses gravel drains. MacDrain® drainage geocomposites replace these gravels reducing cost yet improving performance. MacDrain® is lab tested to offer long-term drainage function and does not become clogged with fine soils. Finally, less quarrying and transportation of gravels reduces the environmental impact of the solution.

ParaFence® at Channel Tunnel

Badger & rabbit protection mesh

Station infrastructure retaining walls