

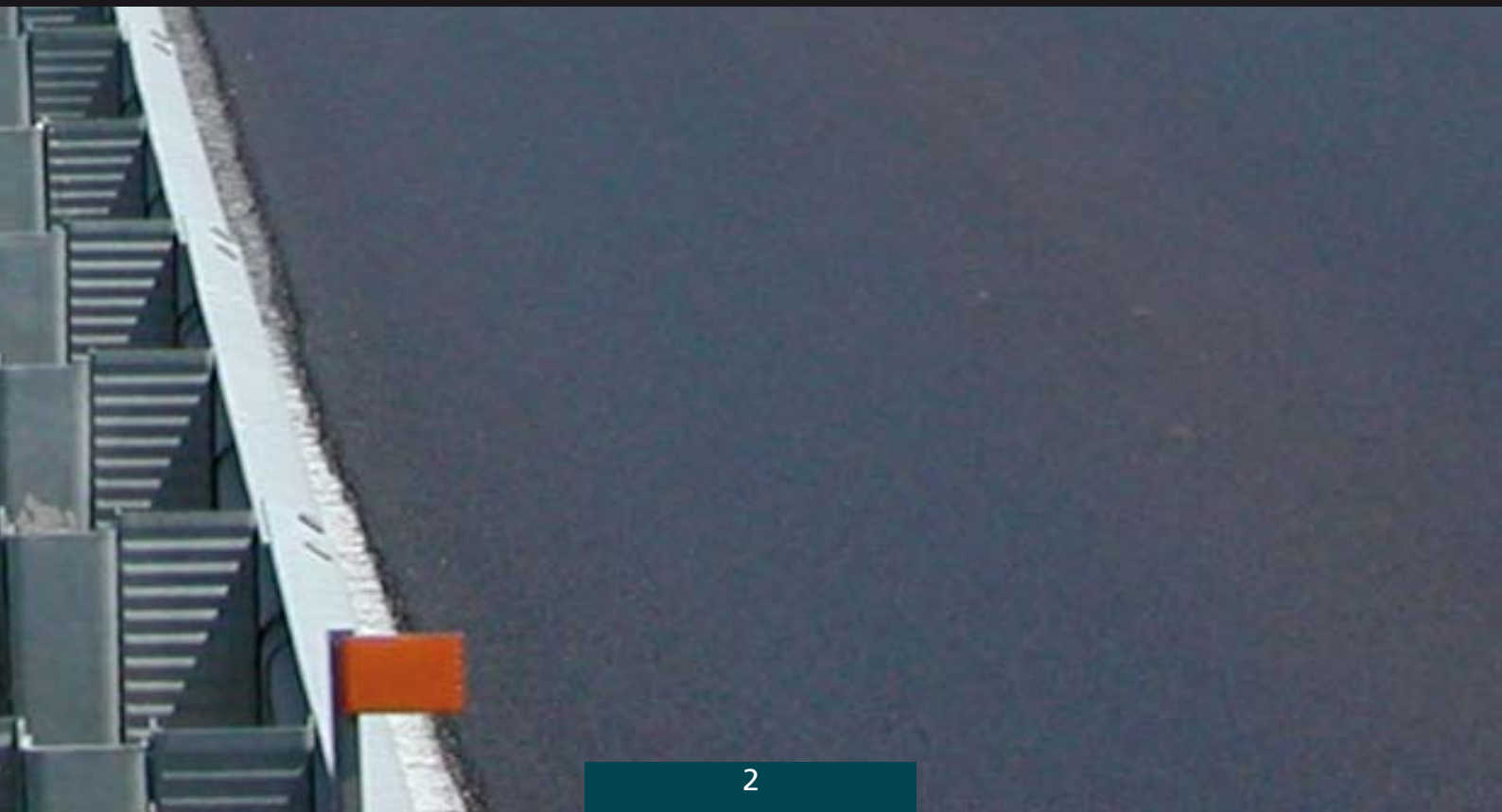


Pavement reinforcement

MACCAFERRI



Reducing fatigue cracking



Innovative solutions for asphalt and unbound pavements and soft ground stabilisation

Whether constructing a gravel forestry track over soft soil or resurfacing a multi-lane highway, Maccaferri has the technical knowledge and wide product range to provide solutions for the rigorous demands of today's roads. Resources are becoming scarce and pavement owners require longer life for less money. By reducing materials and whole-life costs, Maccaferri's leading range of pavement and ground stabilisation products can help achieve these goals.



Reinforcing pavements over peat



Extending life of resurfacing works



Improving access over wet or soft ground

Because every project is different, Maccaferri offers the widest range of products available for asphalt and unbound layers, as well as drainage geocomposites to remove water from the pavement structure.

Project Technical Service

For 130 years Maccaferri has been developing innovative, sustainable engineering solutions. Our staff are on hand to offer full technical support including analysis and design, product selection and installation supervision. Maccaferri are your project partners every step of the way.

Asphalt reinforcement

Reinforcement can produce a threefold increase in the service life of pavements by reducing fatigue, reflective, thermal and settlement cracking. Stress concentrations in the asphalt matrix are relieved and redistributed by the reinforcement, resulting in:

- **Delayed initiation of cracks**
- **Slower crack growth**
- **Narrower crack width**
- **Wider spacing between cracks**
- **Deviation of cracks**

Reinforcement also provides **lateral restraint** within the asphalt, which improves resistance to rutting and shoving.

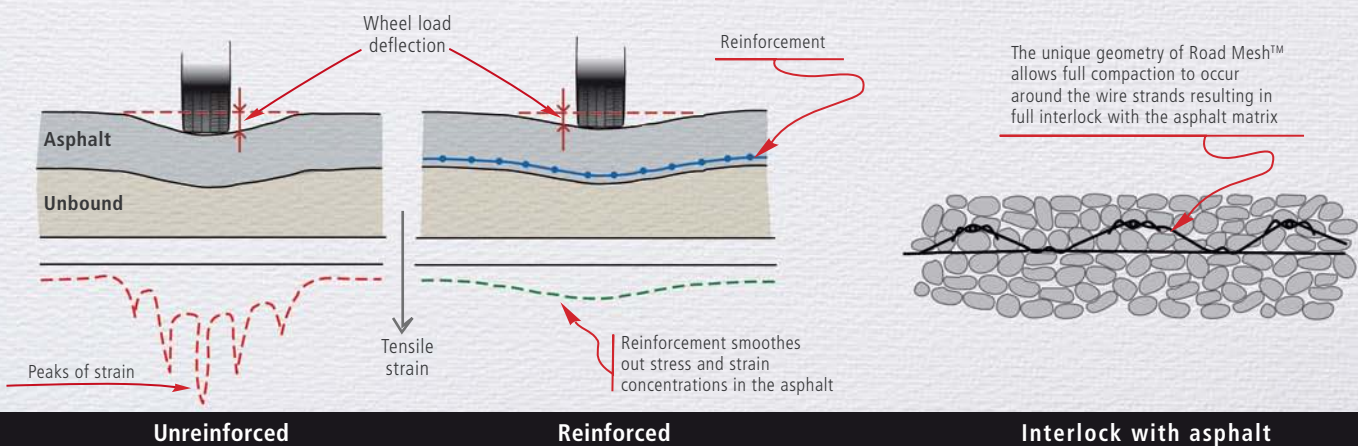
With steel **Road Mesh™** and fibreglass or polyester geogrid **MacGrid® AR**, Maccaferri provides a complete range of asphalt reinforcement solutions.

Typical applications

Runways, highways, road widening, ports and wharves, uphill running lanes, junctions, industrial areas, mining, heavy vehicle turning-areas, bus lanes, trench reinstatement, overlaying concrete pavements, material handling and parking areas.

Key Problems

- Reflective cracking
- Thermal cracking
- Fatigue / "Crocodile" cracking
- Rutting and Shoving
- Haunching failure
- High-axle loads
- Construction on peat soils
- Differential settlement
- Weak subgrades
- Reduced construction layer thickness



Rutting and shoving



Fatigue cracking



Reflective cracking

Proble

Unbound pavement reinforcement and soft subgrade stabilisation

Reinforcement placed within an unbound granular layer can reduce the layer thickness required by a third.

Two mechanisms work to increase the elastic modulus and bearing capacity, resulting in improved resistance to deformation and rutting;

- lateral restraint to the aggregate particles
- tensioned membrane effect

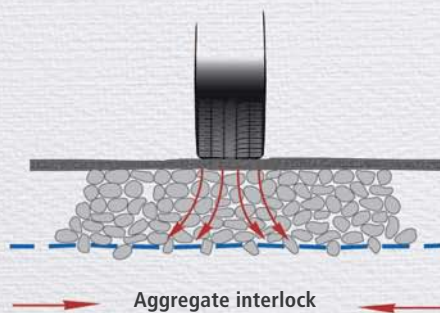
Maccaferri's woven geogrids and extruded polymer grids **MacGrid® WG** and **EG**, provide a complete solution to reinforcement of the unbound layer and can be used in conjunction with **MacTex®** geotextiles to form a barrier membrane to prevent interlayer contamination. The woven polypropylene geotextile **MacTex®W1** is used to provide cost effective reinforcement of unbound roads on soft ground.

Key Problems

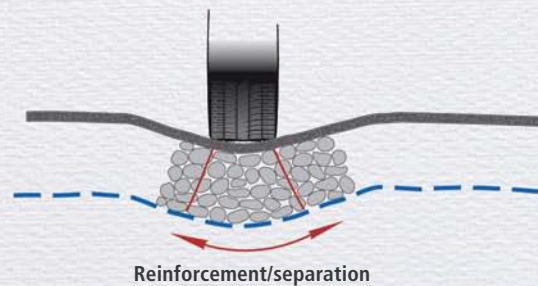
- Bearing capacity failure
- Differential settlement
- Rutting
- Wet / saturated ground
- Construction layer thickness
- Weak subgrades

Typical applications

Mines, quarries, agricultural roads, military, landfill, forestry roads, construction sites, haul roads, port areas, wharves and parking areas.



Lateral restraint



Tensioned membrane



Access over wet/soft ground



Soft ground stabilisation



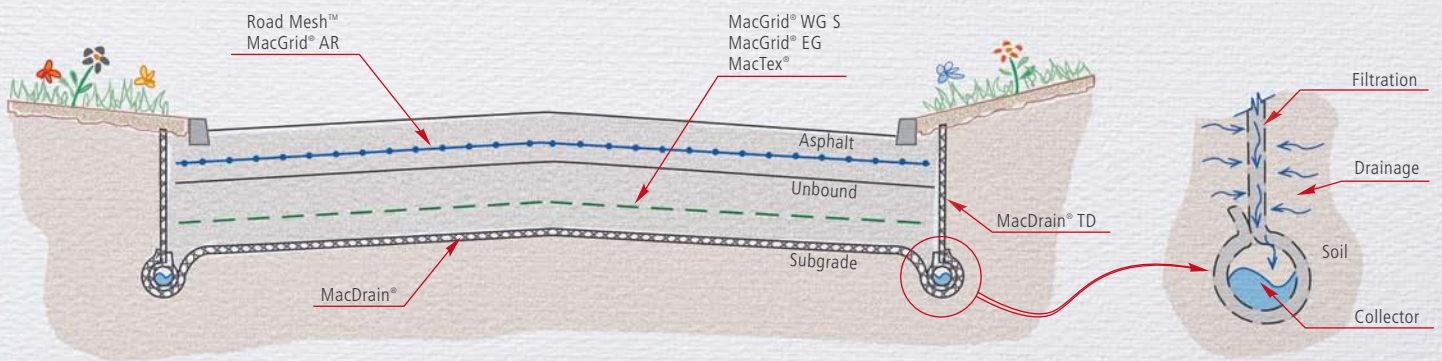
Reduction of granular layer thickness

Pavement Drainage

The pavement structure can be weakened by water within, beneath or adjacent to it. Maccaferri's **MacDrain®** drainage geocomposites are used to control and remove this water, enhancing pavement performance.

Selection of an appropriate drainage geocomposite is dependent upon its intended location within the pavement, the materials it will be in contact with and the drainage capacity required. Performance requirements will be different for an unbound pavement in a monsoon region, to an asphalt pavement in an area susceptible to ground frost.

Traditional roadside trench drains can often be replaced with **MacDrain®**, reducing excavation, backfill material volume and cost.



Drainage








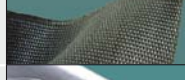


Solution

Product Range & Selection Matrix

Maccaferri offers a range of solutions to meet your pavement needs. Our products are CE marked and many have local conformance certification.

Please contact your nearest Maccaferri office for product selection advice, data sheets and project specific technical assistance. For global contact details, please visit

www.maccaferri.com

	Product	Feature / Benefit		
Asphalt layers	Road Mesh™	Steel wire hexagonal mesh with transverse steel bars. Road Mesh™ provides the highest level of protection against rutting, shoving, fatigue, thermal, reflection and settlement cracking.		Grid Size: 80x100mm Strength: 40 - 60kN/m
	MacGrid® AR	Glass fibre or polyester woven geogrid with coating. With high tensile strength and high modulus of elasticity at low elongation, MacGrid® AR is a cost effective solution for preventing cracks in the upper pavement layers.		Grid Size: 12.5mm or 40mm Strength: 50 - 200kN/m
	MacGrid® AR G	Glass fibre or polyester woven geogrid with coating and geotextile backing. MacGrid® AR G is impregnated with bitumen to provide crack prevention with a waterproof membrane and improved bond between the asphalt layers.		Grid Size: 12.5 or 40mm Strength: 50 - 200kN/m
Unbound layers	MacGrid® EG	Extruded polypropylene biaxial geogrids. MacGrid® EG controls deformation and rutting, enabling the thickness of granular layers to be reduced.		Grid Size: 38mm Strength: 15 - 40kN/m
	MacGrid® WGS	Woven polyester geogrids with polymer coating. MacGrid® WG provides cost effective, long term control of deformation and rutting with soft subgrades or high axle loads.		Grid Size: 20 - 35mm Strength: 20 - 300kN/m
	MacTex® W1/W2	Woven polypropylene (W1) and polyester geotextiles (W2) provide separation and reinforcement for construction on soft ground.		Strength: (W1): 20 - 110kN/m Strength: (W2): 40 - 880kN/m
	MacTex® N / H	Non-woven needle-punched polyester geotextiles. MacTex® N/H are used to separate granular materials preventing interlayer contamination.		Strength: 6 - 35kN/m
Drainage	MacDrain®	Drainage geocomposites with a polymeric drainage core and a non-woven geotextile filter on one or both sides to stop the core clogging with soils.		Drain core and textile performance selected to suit application

	Solution					
Problem	Asphalt		Unbound			
	Road Mesh™	MacGrid® AR	MacGrid® EG	MacGrid® WG	MacTex W1	MacTex H / N
Reflective cracking	+++	+++				
Fatigue cracking	+++	++				
Thermal Cracking	+++	+				
Rutting & Shoving	+++	+				
Road widening	+++	+				
Haunching Failure	+++	++				
Differential Settlement	+++	+	+++	+++	++	+
Overlay of concrete pavements	+++	+				
Reducing layer thickness	++	++	++	+++	+	++0
Bearing capacity failure			++	+++	+	+0
Wet / saturated ground			++	++	++	++0
High axle loads	+++	+	++	++		

0 = in conjunction with other reinforcement products

Research and Development

Maccaferri's pavement products have been developed through an extensive program of international research.

Smart Road, Virginia Tech, USA

Full scale instrumented field trials showed Road Mesh™ produced a 72% decrease in strain and a fatigue life improvement of up to 120%.

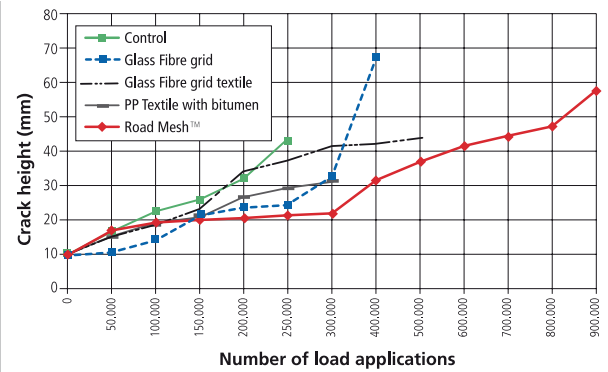
Nottingham University, UK

Beam bending tests showed Road Mesh™ can reduce thermal cracking and extend the service life of asphalt overlays by three times. Wheel track tests showed Road Mesh™ can halve the depth of rutting.

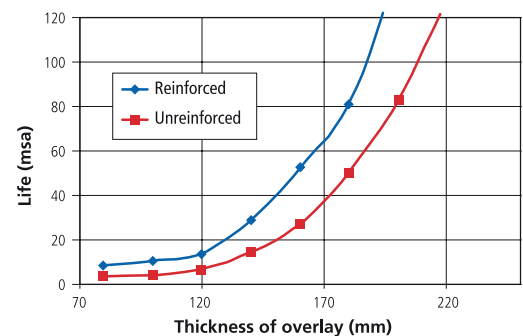
ISMES, Italy

Cyclic loading showed Road Mesh™ can extend the service life of asphalt pavements by three times.

Comparison between various asphalt reinforcements



Life extension with Road Mesh™



Research

Design and Installation

Maccaferri uses state of the art design software, featuring various design methodologies, to optimise the reinforcement and the required thickness of the pavement layers.

As reinforced pavements require less maintenance, whole life costs are lower:

- **Reduced materials**
- **Reduced vehicle movements**
- **Reduced traffic congestion.**

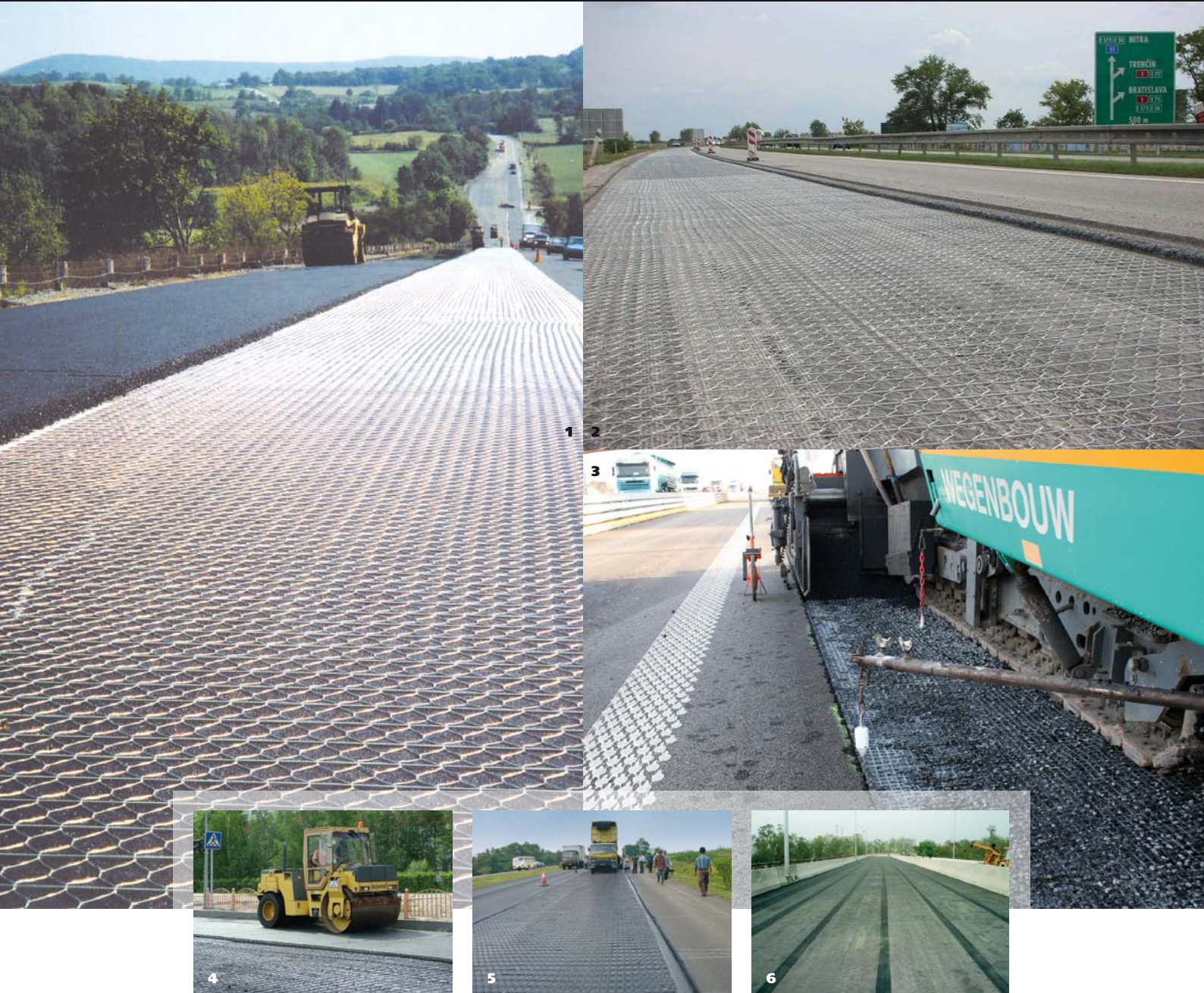
Maccaferri’s pavement products are straightforward to install and recycle:

	Installation	Recycling
Road Mesh™	Can be laid on milled surfaces. Stretched, rolled and secured with asphalt blinding or nails. Requires a minimum of 70 mm asphalt cover. Can be trafficked during installation by site vehicles.	Mill down to 15 mm above the mesh. Locate mesh, and pull out with hydraulic excavator. Recycle as galvanised wire.
MacGrid® AR / AR G	Secured to smooth asphalt surfaces with bituminous bond coat or self-adhesive backing. Cannot be trafficked during installation. Requires 40 mm asphalt cover	Mill out and recycle with asphalt.
MacGrid® EG / WG MacTex® MacDrain®	Installed in the granular layers (geogrid), or on soft ground (geotextile).	Recycle as polyester/polypropylene.



Project examples

Asphalt Pavements



1. Road Mesh™ - State highway, Pennsylvania, USA
2. Road Mesh™ - Interstate, Bratislava, Slovakia
3. MacGrid® AR - Major highway, Belgium

4. Road Mesh™ - City road, Surgut, Russia
5. Road Mesh™ - Dual carriageway, Indonesia
6. MacGrid® AR - Major highway, India

Unbound Pavements / Surfaces



7



8



9



10

- 7. MacGrid® WG - Subgrade reinforcement, Brazil
- 8. MacGrid® WG - Subgrade reinforcement, Brazil
- 9. MacGrid® EG - Subgrade reinforcement, USA
- 10. MacTex® - Windfarm access road on soft ground, Canada

Officine Maccaferri Group Profile

Founded in 1879, **Officine Maccaferri** soon became a technical reference in the design and development of solutions for erosion control and retaining structures.

Since then, through technological innovation, geographical expansion and focussed diversification, Maccaferri now offers solutions at a global level for a wide range of **civil and environmental engineering** applications.

Consultancy and Partnership

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**.

Organisational Structure

Officine Maccaferri is at the heart of the Maccaferri Industrial Group. Its continued growth is based upon long-held values of innovation, integrity, excellent service and respect for the environment.

Maccaferri's vision is to become a leading international provider of advanced solutions to the civil engineering and construction market. Implementing a strategy of vertical integration, Maccaferri researches, manufactures, designs, supplies and constructs solutions within its target markets.

The capability of the business continues to expand due to a strategic plan to open new markets and grow existing ones; Maccaferri now offers advanced engineered solutions from **beach nourishment to reinforced soil structures** and from **rockfall mitigation to tunnelling systems**.

With over 2000 employees, 26 manufacturing facilities and local operations in 100 countries around the world, Maccaferri can truly claim to have a global presence with local focus.

Maccaferri: Engineering a Better Solution



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Bureau Veritas Certified Quality System Company with
SINCERT's and UKAS's accreditation



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