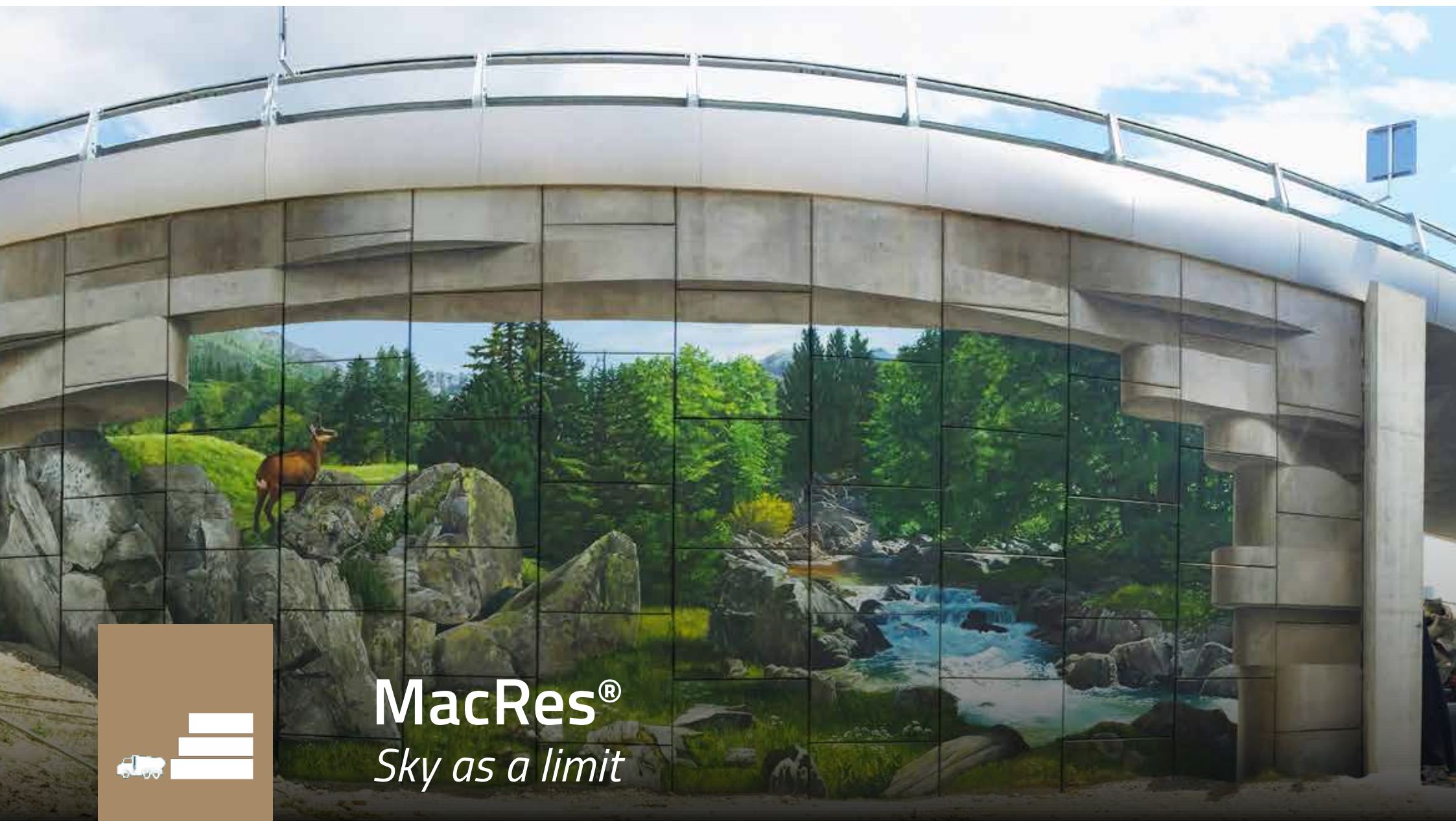


MACCAFERRI



MacRes®
Sky as a limit



INTRODUCTION

In recent decades, global urbanization surged, with urban population increasing from 30% in 1950 to 56% in 2023.

This drives continuous construction for economic growth, but limited space creates a rising demand for vertical structures.

Building vertically presents numerous advantages, notably the ability to make the most of limited ground space and enhance overall quality of life. By reducing the ground footprint of civil engineering projects through vertical construction, we can contribute to space savings and create more efficient urban environments. This rise in vertical structures marks a paradigm shift in urban planning and development, offering innovative solutions to the challenges posed by urbanization.



SHAPING THE FUTURE OF RETAINING WALLS

For over 140 years, Maccaferri has been a pioneering force in the realm of retaining walls.

Our groundbreaking invention of gabions transformed civil engineering and construction practices, marking the beginning of a relentless journey of innovation. Today, Maccaferri's portfolio includes cutting-edge technologies like MacRes®, reflecting our unwavering commitment to research and development.

Through our expertise in retaining walls, Maccaferri has made a lasting impact on the field, shaping modern infrastructure and providing unparalleled engineering solutions worldwide. Our dedication and forward-thinking approach continue to play a pivotal role in advancing the field of civil engineering and construction.



As Maccaferri, we have a long-standing history and technical experience in the research, design and development of retaining wall solutions.



REVOLUTIONIZING MSE RETAINING WALLS

MacRes® is an innovative Mechanically Stabilized Earth (MSE) retaining wall solution with precast concrete facing panels and high-adherence ParaWeb™ geostrips, providing a durable, low creep alternative to steel reinforcements.

Seamlessly connected through the patented MacBox™ system, geostrips harness reinforced concrete's shear strength. A polymeric sleeve ensures long-lasting performance, protecting against steel corrosion during installation.

With flexible aesthetics and geometry, concrete facing panels meet diverse project needs, offering an unmatched retaining wall solution. Experience the future of engineering with MacRes®, where innovation and strength redefine project possibilities.

Space-efficient design

High resistance against seismic events

120-year lifespan engineering

High alkaline environment durability

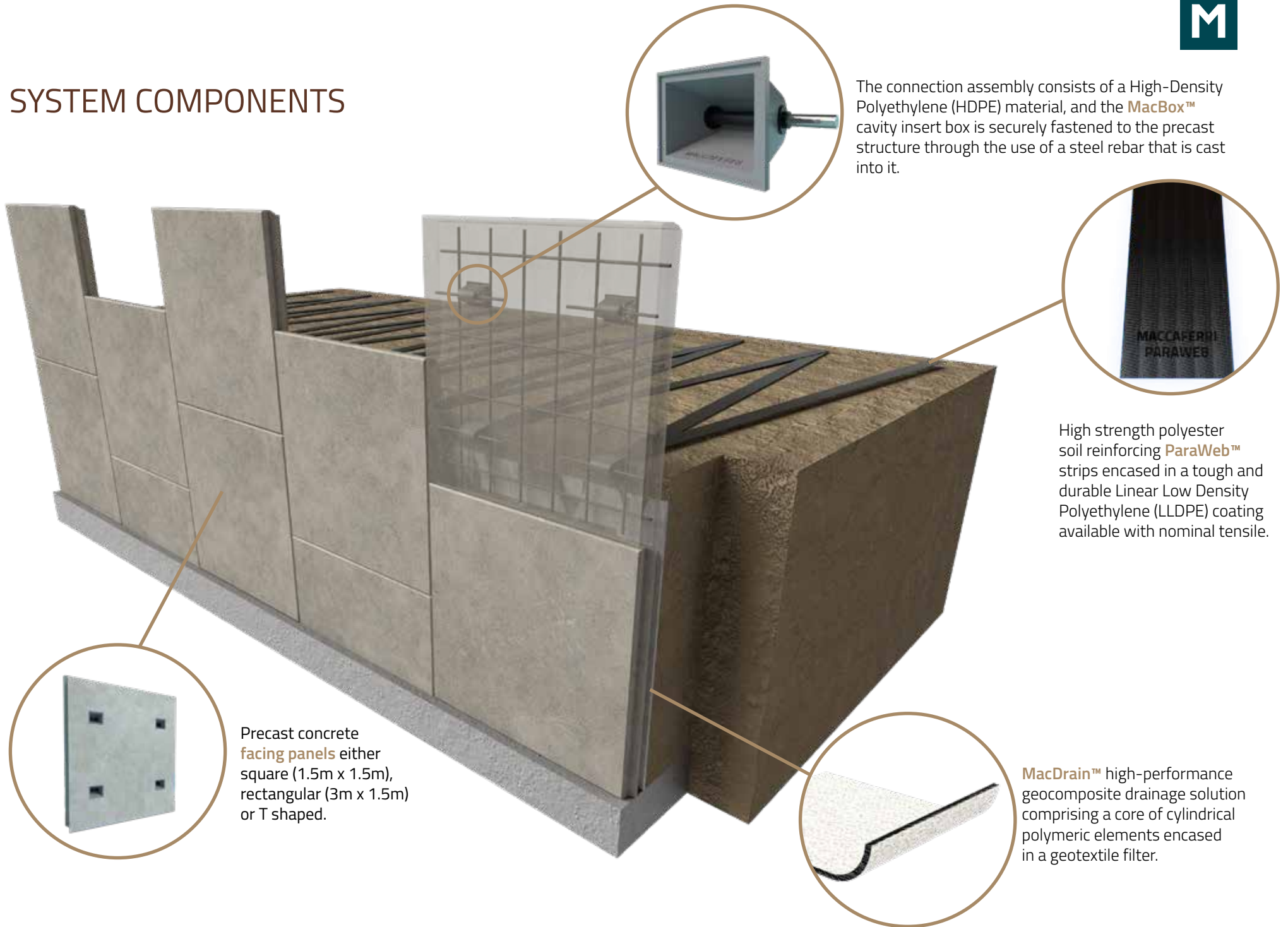
Quick and easy installation capability

Service disruption minimization

Quality of life enhancement

Wide range of customization options available

SYSTEM COMPONENTS



The connection assembly consists of a High-Density Polyethylene (HDPE) material, and the **MacBox™** cavity insert box is securely fastened to the precast structure through the use of a steel rebar that is cast into it.

High strength polyester soil reinforcing **ParaWeb™** strips encased in a tough and durable Linear Low Density Polyethylene (LLDPE) coating available with nominal tensile.

Precast concrete **facing panels** either square (1.5m x 1.5m), rectangular (3m x 1.5m) or T shaped.

MacDrain™ high-performance geocomposite drainage solution comprising a core of cylindrical polymeric elements encased in a geotextile filter.



UNBEATABLE STRENGTH AND DURABILITY

ParaWeb™ geostrips are advanced planar structures with a strong polyester core and a protective polyethylene coating.

The polyester core offers impressive tensile strength and deformation resistance, while the robust coating shields against harsh environments, even with a pH of 12 in tests, yielding outstanding results.

These strips have a proven track record dating back to the 1970s, with the first UK installation in 1977 still unchanged after 40+ years of use. Available in two series, ParaWeb™ 2 and ParaWeb™ M, they come in various thicknesses and widths for tailored project solutions, and their design simplifies on-site recognition and installation.



Resilience



Paraweb™ is subject to continuous testing program. Strips proved to be resistant in harsh condition and highly alkaline environments.

Adaptability



ParaWeb™ can adapt to unusual structures or obstructions easily. Its flexibility allows for vertical and horizontal bending with no issues for the structure stability.

Friction

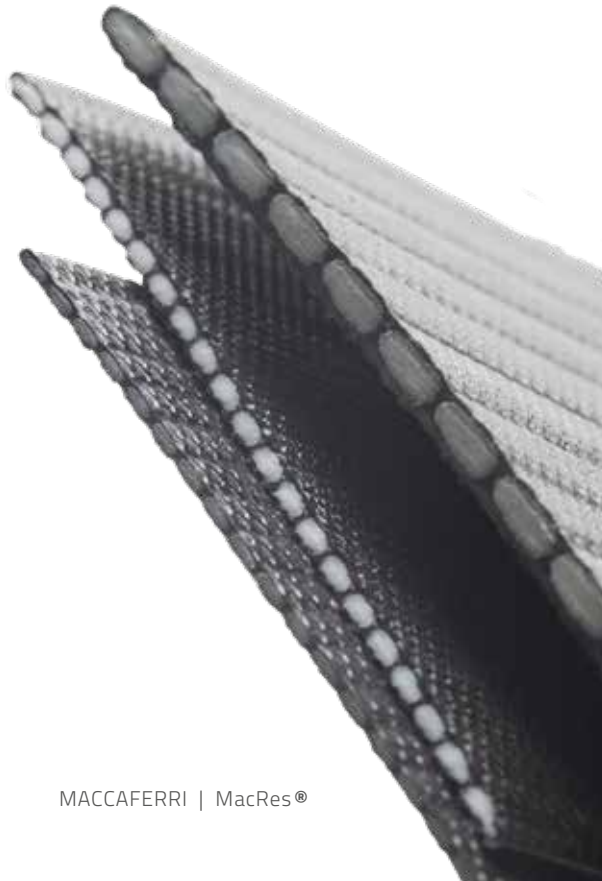


Rough surface which develops excellent friction and pullout capacity in every terrain.

UNRIVALED MECHANICAL STRENGTH AND PROVEN PERFORMANCE

At Maccaferri, we go the extra mile to ensure the highest quality performance.

We meticulously select the most reliable testing facilities and surpass standard testing methodologies. As a testament to our commitment, ParaWeb™ has been continuously subjected to creep testing for over 7 years.



UNMATCHED MECHANICAL RESILIENCE AND TESTING TRIUMPHS

Over the years, ParaWeb™ polyester strips have undergone extensive research and testing, proving their unparalleled durability, resistance to installation damage, and minimal creep under sustained loading. In fact, ParaWeb™ boasts the lowest creep reduction factor among PET geostrips on the market. Long-term creep testing results reveal that even after post-construction and up to its impressive 120-year design life, ParaWeb™ exhibits a strain of less than 1% when subjected to design load.



UNWAVERING PERFORMANCE FROM 0 TO 40°C AND PH 4 TO 12

ParaWeb™ geostrips have been rigorously tested under the most extreme conditions, enduring temperatures ranging from 0 to 40 degrees Celsius and soil pH levels as low as 4 and as high as 12 for lime stabilized soils. These tests confirm the unmatched resilience and adaptability of ParaWeb™, making it the top choice for demanding projects.



UNBEATABLE SEISMIC PERFORMANCE AND FULL-SCALE TESTING

MacRes® walls are highly flexible and excel in seismic resistance, surpassing other retaining wall types during real earthquakes. Comprehensive bench seismic tests sponsored by Maccaferri demonstrated the exceptional performance of the MacRes® MSE wall system.

The results were remarkable, with the MacRes® wall showing minimal residual displacement (below 10 mm) even after experiencing seismic events with maximum accelerations exceeding 0.5 g. This outstanding resilience establishes MacRes® as the top choice for projects requiring unwavering performance and safety in seismic conditions, offering peace of mind and exceptional strengthtable.



PIONEERING SUCCESS IN CHRISTIANA, DELAWARE

In 2012, the first-ever use of ParaWeb™ reinforcing strips in the United States occurred during the construction of the SR1-I95 Interchange in Christiana, Delaware, led by DelDOT. The project included 16 MSE retaining walls and 12 bridge abutment MSE walls, all featuring ParaWeb™ geostrips and rectangular concrete facing panels.

Ongoing monitoring and inspections of a section of the MSE walls have consistently shown no adverse effects, demonstrating the remarkable long-term performance of ParaWeb™. This project's success establishes ParaWeb™ reinforcing strips as an advanced and dependable solution for enduring infrastructure projects, paving the way for future engineering endeavors.



WHERE FORM MEETS FUNCTION

MacRes® offers the innovative MacRes® system, featuring precast concrete facing panels in various shapes and sizes, providing both aesthetic appeal and structural reliability.

The panels come in square, rectangular, and T-shaped designs with a minimum thickness of 14 or 16 cm. Maccaferri exceeds project specifications with internal minimum standards, ensuring top-notch quality. Architects can choose from a wide range of textures, colors, and finishes to achieve the desired look, making the system suitable for diverse environments. The MacRes® system allows creative freedom without compromising structural stability, making it an ideal choice for any project.

Square shape



T-shape



Simplification



Several panel dimensions available to easily meet the wall geometry.

Customization



Concrete surface finish can vary upon client request and project specifications.

Support

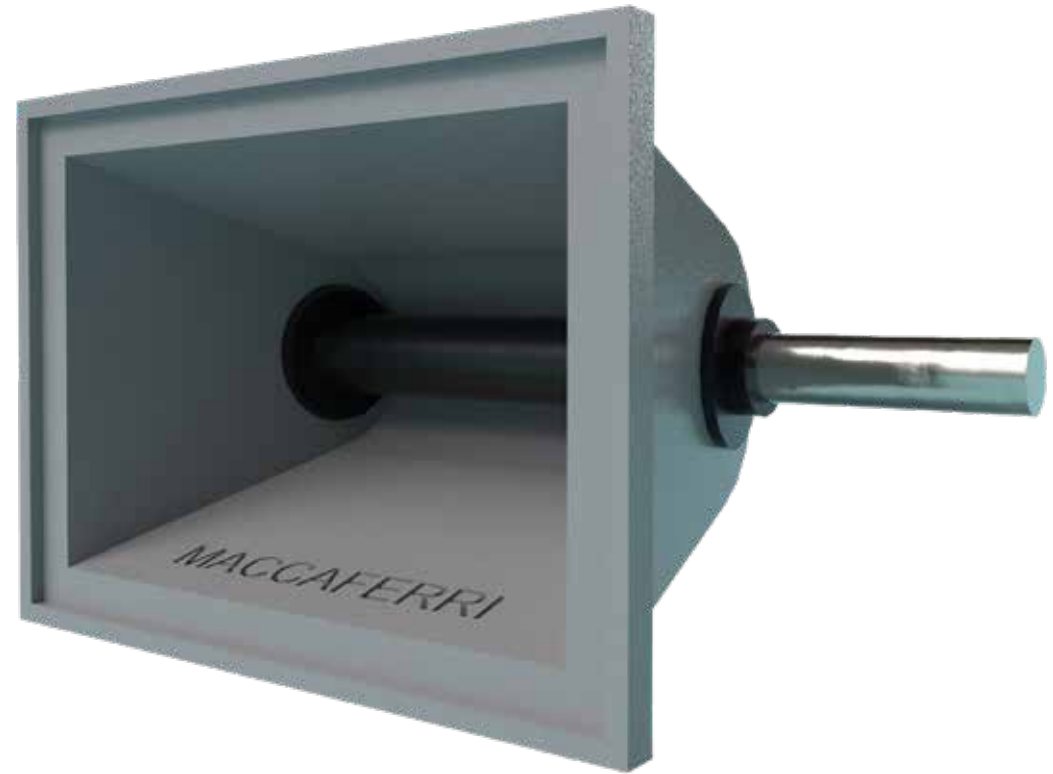


Maccaferri supports construction companies and precaster with technical manuals and site supervision.

VERSATILE CONNECTION SYSTEMS

MacRes® introduces MacBox™, a versatile connection system that utilizes a High-Density Polyethylene (HDPE) cavity insert box anchored by either a steel bar or a GFRP reinforcement rod within precast concrete facing panels.

The ParaWeb™ reinforcing strips are structurally connected to the facing through an anchor rod, allowing easy customization of connection strength. Additionally, MacRes® offers the MacLoop system, a 100% polymeric connection with ParaWeb™ loops protected by a saddle, streamlining installation procedures. With MacRes®, experience unparalleled performance and a range of connection options for your projects.



SUSTAINABLE WATER MANAGEMENT

Proper water management is often the key to prevent and minimize damages to the structures. Maccaferri is able to combine the typical application of needle-punched non-woven geotextile strip behind all horizontal and vertical joints between adjacent panels with an efficient drainage system thanks to MacDrain™.

MacDrain™ is comprised of a flexible core and 1 or 2 non-woven geotextile filters. The channel pattern has very high void ratio and can be customized variable thickness based upon the required flow capacity. MacDrain™ has excellent performances in long term conditions.



IDEAL SOLUTION FOR DIVERSE APPLICATIONS

TRUE ABUTMENT

When MSE Wall support bridge abutment the structure is called True Bridge Abutment. These structures represents a faster and simpler way to construct bridge abutment systems and lead to a more economical structure, minimizing the foundation improvements. The system flexibility is a key factor when dealing with highly relevant structures such as true bridge abutment. MacRes® is tested under the effect of extreme events and proved negligible deformations under increased stresses in the reinforcements.



RETAINING WALL

Reinforced fill walls are considered flexible and light structures that can withstand heavy loads for a selected design life without maintenance, creating space-saving and economical vertical facing when compared with conventional retaining structures.

MacRes® Reinforced fill structures can be adapted to any geometrical and architectural requests to blend with the territory in urban and natural environments. Reusable site won material is an option to increase the infrastructure sustainability.



RAILWAY INFRASTRUCTURES

Temporary and permanent MSEs supporting roads and railways new or reconstruction projects represent an effective way to solve problems in locations where Right of Way is restricted and expedite construction is crucial for the urban accessibility. MacRes® is easy and fast to install, Maccaferri is on the side of the installation companies supporting the construction crew with pre-construction meetings and supervisions on site. Successful project might require a significant level of customization: MacRes® is adaptable to match circular culverts and any infrastructural or hydraulic obstruction.



CRUSHER WALLS IN MINING

Mining sites are always in remote locations where material must be delivered quickly to support the construction schedule. Haul trucks and cranes shall be considered in various load distributions. Traditional concrete systems that are common in the mine fields are rigid structures and continuous vibrations might lead to cracks in the concrete structures.

The wide range of Paraweb™ geostrips available, customizable in grade and coating, can support the project optimization to build a stable, cost-effective structure that can withstand extreme conditions and various combinations of vertical, horizontal and dynamic loads. The construction, usually completed in few months, lead to important savings for the stakeholders.



QUALITY WITH NATURE

At Maccaferri, our primary commitment is to address environmental, economic, and social aspects with a holistic approach.

We firmly believe in the adoption of sustainable approaches and solutions throughout the entire life cycle of a project. From the design stage of an engineering system to manufacturing, construction, and decommissioning, our engineering solutions are aimed at creating long-term benefits that extend beyond the product itself.

In addition, we prioritize the quality of our products and actively seek certifications to underscore our unwavering commitment to both product quality and environmental stewardship.



The MacRes® system fully embrace the Company vision. Paraweb™ has been tested by the most accredited third parties international laboratories for verification of the technical and mechanical parameters and has positively obtained the BBA (British Board of Agreement Certificate HAPAS 12/H191) and NTPEP (National Transportation Product Evaluation Program REGEO-2016-01), to cover European, AASHTO and other National Standards requirements.

MacRes® system is also approved for use in many Countries and States with worldwide experience on structures of different nature, from railway to highway infrastructure, from lime stabilized backfill to mining crusher walls.

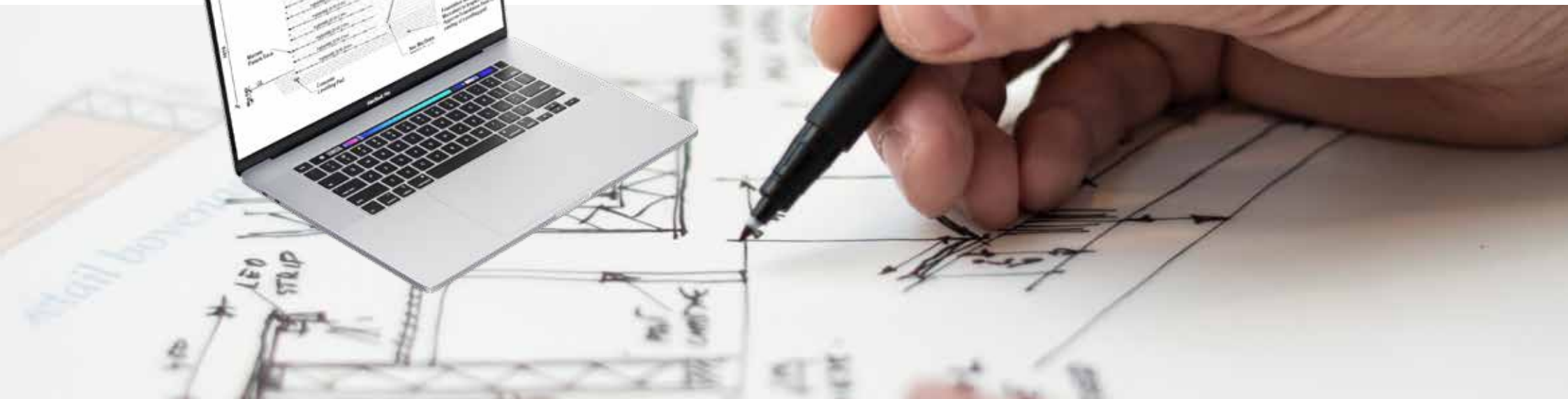
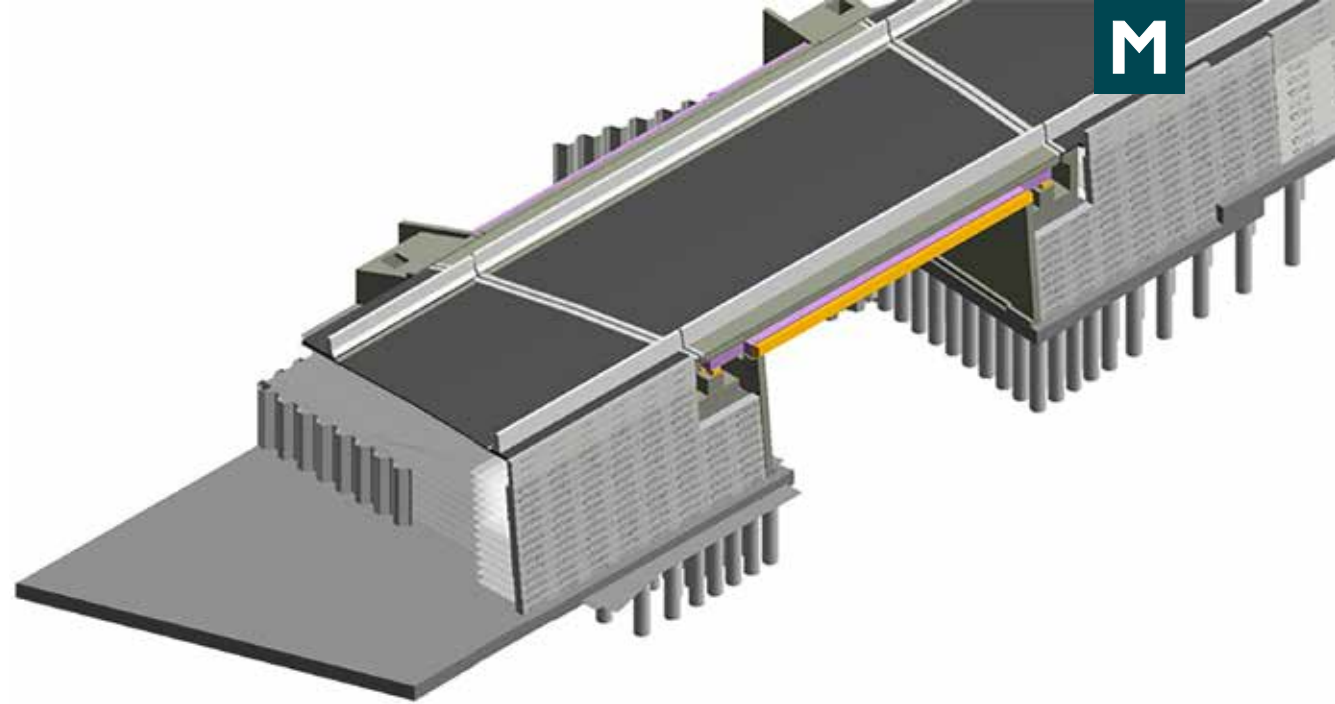
Maccaferri communicates the attention to nature also analyzing the life-cycle environmental impact of the products during their production. Paraweb™ has achieved the Environmental Product Declaration EPD® certification, which reports environmental data over the life cycle of products in accordance with the international standard ISO 14025. Maccaferri is also available to provide MacRes® LCA analysis on a project specific basis.



BIM

Cooperation is a key-word for Maccaferri that works with different stakeholders to reach the same success goal. For this reason we moved in the direction of working with BIM (Building Information Modeling) software to support designers, construction companies and clients in creating a 3D visual plan.

Maccaferri uses the new BBA "BIM Object Assurance" service so to give the end-user the assurance that the BIM models are fully aligned with our existing product BBA Certificates.



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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 subsidiaries and 20 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



TUNNELLING



AQUACULTURE NETS/CAGES



ROCKFALL PROTECTION
& SNOW BARRIERS



COASTAL PROTECTION,
MARINE STRUCTURES & PIPELINE
PROTECTION



LANDSCAPE & ARCHITECTURE



CONCRETE FLOORING,
PRECAST & OTHER USES*



EROSION CONTROL



ENVIRONMENT, DEWATERING
& LANDFILLS



SAFETY & NOISE BARRIERS



INDUSTRIAL
MANUFACTURING

MACCAFERRI

