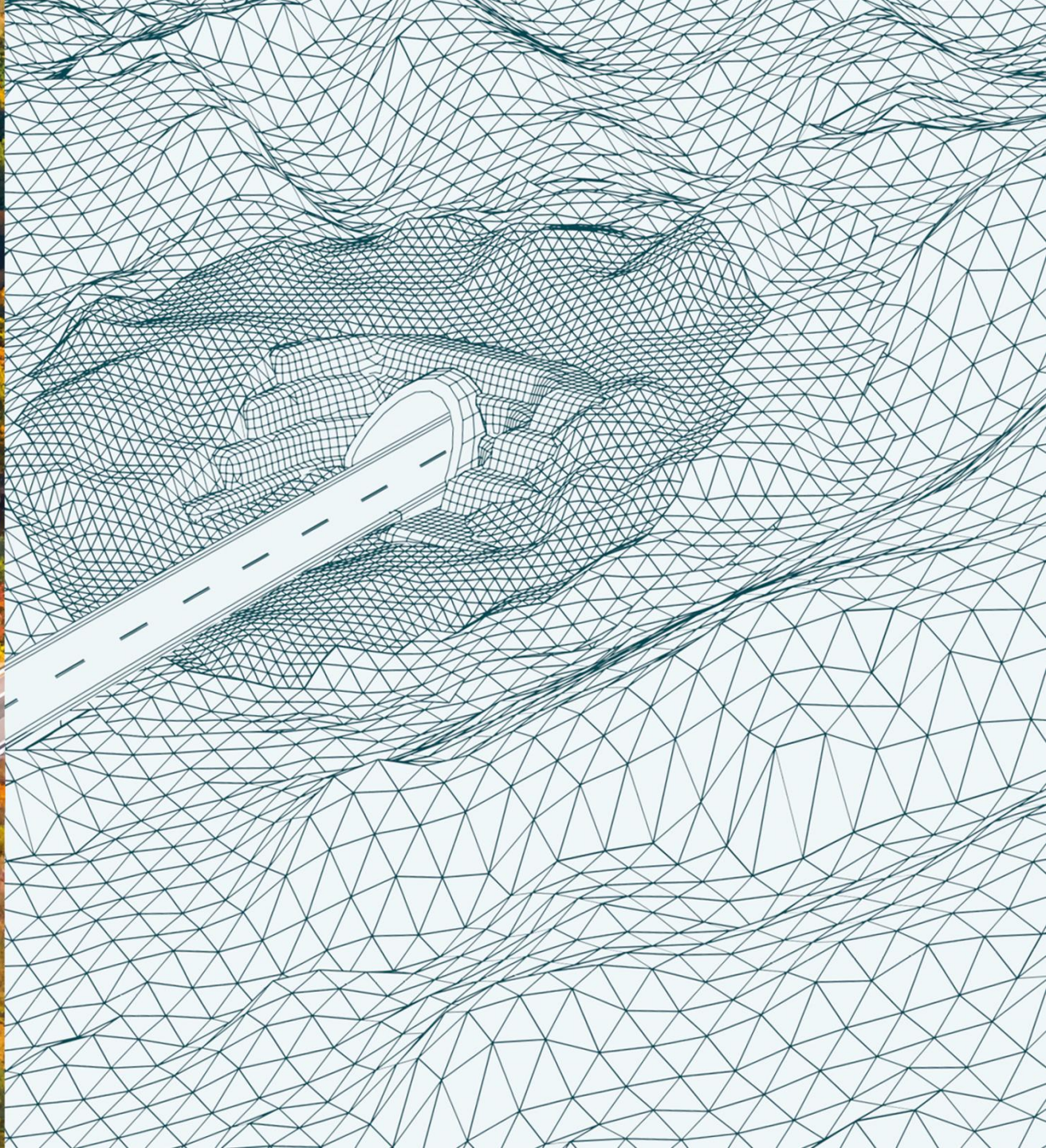


An aerial photograph of a dense forest with trees in various shades of green, yellow, and orange, indicating autumn. A tall, white, lattice-structured tower stands prominently in the upper left quadrant. In the lower right, a multi-lane highway with several cars is visible, running parallel to the forest edge.

Tunnelling solutions

**A new 360°
portfolio built
on innovation**

MACCAFERRI



WEBINAR AGENDA



Introduction

5' Who we are and our positioning

5' Our 360° tunnelling offering

Tailored focus for every stakeholder

10' Conventional excavation method

10' Mechanized excavation method

5' Beyond tunnelling excavation

Reference projects

5' Case histories

Q&A Session at the end of the presentation

Speakers: Anna Bortolussi and Giorgio Klaus Pini



Who **we are** and our positioning



We protect people, infrastructure and ecosystems through future-ready innovation

At a global scale, we support the planet's urgent need for climate change adaptation, with a presence in over 130 countries and more than 145 years of engineering excellence.

Our **integrated, sustainable, and resilient solutions** put us at the forefront of climate adaptation engineering: long before the industry moved beyond mass-produced materials, we already envisioned a new way to build Sustainable Infrastructure.



Who we are

We are a global Industry Platform for Sustainable Infrastructure, constantly adapting to the impacts of climate change through engineering and manufacturing.

With operations across 5 continents and over 145 years of experience, we are a global leader in providing **advanced, sustainable solutions for civil, geotechnical, and environmental construction.** Our innovations include retaining walls, hydraulic works, geohazard mitigation, soil reinforcement, and proactive climate adaptation systems like flood defense and coastal resilience.

Who we are

Global footprint

- M** Regional headquarters
- ◆ Local offices
- ◆ Factories



Officine Maccaferri's multi-business platform

Officine Maccaferri is the core of a growing multi-business platform. We operate in 130+ countries, driven by sustainable innovation and climate resilience. We expand our capabilities through strategic acquisitions and sister companies, adding value across:

This flexible ecosystem strengthens our solutions, from geosynthetics to early-warning systems.

Advanced materials



Smart monitoring



Engineering services



Technical textiles



Tunnelling Solutions



Specialized operations



Joint Ventures



**Built to grow.
Ready for tomorrow.**

We adopt a platform mindset: modular, resilient, future-ready, open to future acquisitions and adjacent innovations in high-impact sectors.

Our platform



A comprehensive one-stop shop connecting the construction value chain

Maccaferri acts as a strategic partner across every stage of the project, providing an integrated ecosystem of engineering solutions to make the construction industry more efficient, innovative, and sustainable.

Complete solutions

- > Certified products and advanced technologies
- > Proprietary design software
- > Technical support and continuous training

One partner for any stakeholder of the infrastructure value chain

- > Public and private owners
- > Designers
- > Contractors and installers
- > End users

Value-added contribution across the infrastructure value chain

- > From concept to execution, reducing on-site impacts and costs
- > Modular, prefabricated solutions for efficient assembly and sustainability
- > Collaborative approach boosting on-site performance and impact



Our market Sectors

- Agribusiness
- Building, Industry, Sport
- Coastal & River Control Works
- Defence & Security
- Emergency & Flood
- Environmental Protection
- Mining
- Oil & Gas / Energy
- Transportation Infrastructure
- Urban Infrastructure

Our solutions

Our world of applications



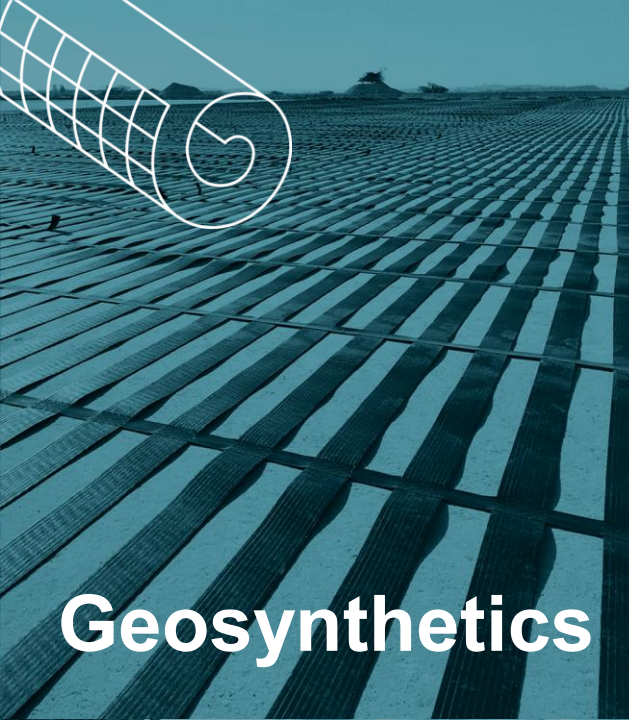
1. Rockfall Protection & Snow Barriers
2. Tunnelling
3. Erosion Control
4. Industrial Manufacturing
5. Retaining Walls & Soil Reinforcement
6. Drainage of Structures
7. Safety & Noise Barriers
8. Coastal Protection, Marine Structures & Pipeline Protection
9. Landscape & Architecture
10. Environment, Dewatering & Landfills
11. Hydraulic Works
12. Soil Stabilisation & Pavements
13. Basal Reinforcement
14. Aquaculture Nets/Cages
15. Concrete Flooring, Precast & other uses
16. Fencing & Wire



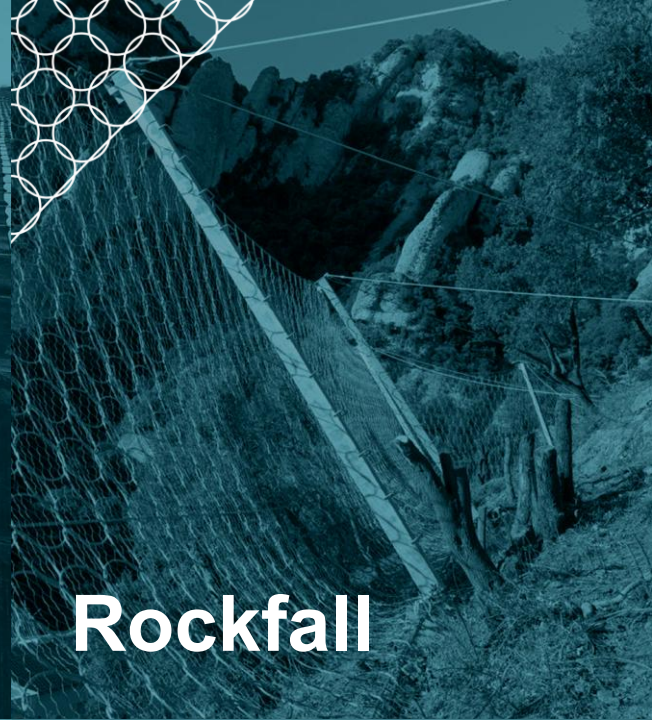
Portfolio overview



Double twist



Geosynthetics



Rockfall



Tunnelling



**IoT & Smart
Monitoring**



**Other growing
portfolios**

[Our solutions](#)



2

Our **360°**
tunnelling offering

The background of the slide is a photograph of a tunnel. The perspective is from the entrance, looking down the length of the tunnel. Yellow overhead lights are visible on both sides, creating a sense of depth. A car is visible in the distance, its headlights illuminating the road ahead. The overall color palette is dominated by the yellow of the lights and the dark blue/teal of the sky above the tunnel.

For Maccaferri, **innovation** is a concrete commitment shaped by real customer needs.

It begins by listening to the field and becomes reliable, sustainable solutions that improve tunnelling work every day.

Our vision is built on four fundamental principles.

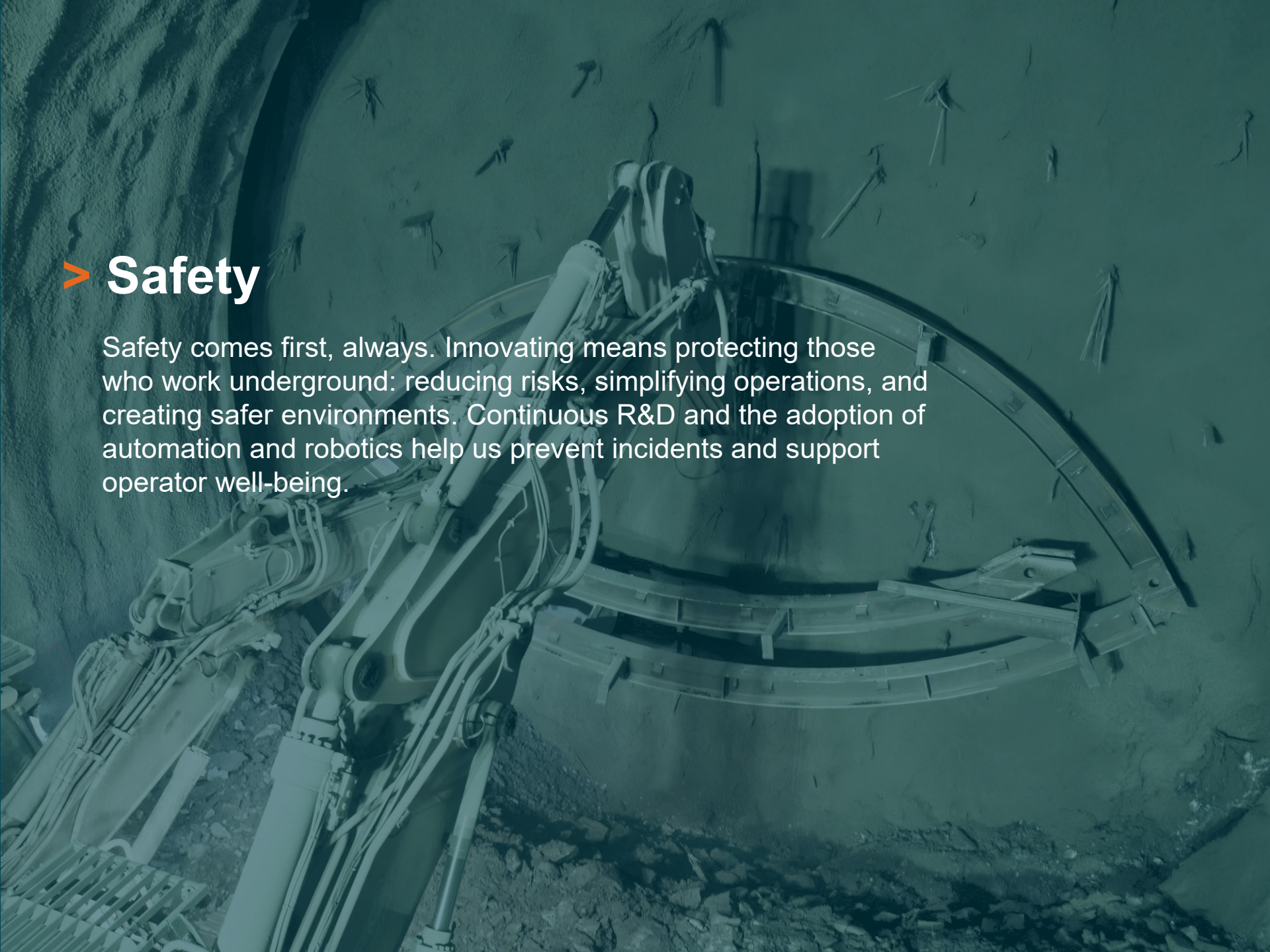




Innovation at our core

> Safety

Safety comes first, always. Innovating means protecting those who work underground: reducing risks, simplifying operations, and creating safer environments. Continuous R&D and the adoption of automation and robotics help us prevent incidents and support operator well-being.





Innovation at our core

- > **Safety**
- > **Excellence of the Final Structure**

Our solutions ensure the long-term technical and aesthetic quality of the finished work: precision, durability, certified performance, and attention to detail. Digital tools and advanced processes support consistent, high-quality results.



Innovation at our core

- > **Safety**
- > **Excellence of the Final Structure**
- > **Resource Optimization**

In a context of limited labor, equipment, and materials, we design solutions that maximize efficiency. Reducing resource needs, increasing productivity, and simplifying operations also means fewer people and machines exposed, turning optimization into a driver of safety.



Innovation at our core

- Safety
- Excellence of the Final Structure
- Resource Optimization
- Industrialization

We bring evolved industrial logic into the tunnel: standardization, prefabrication, rapid installation, and easier maintenance. Automation and robotics, combined with controlled, repeatable processes transform complexity into simple and reliable operations.



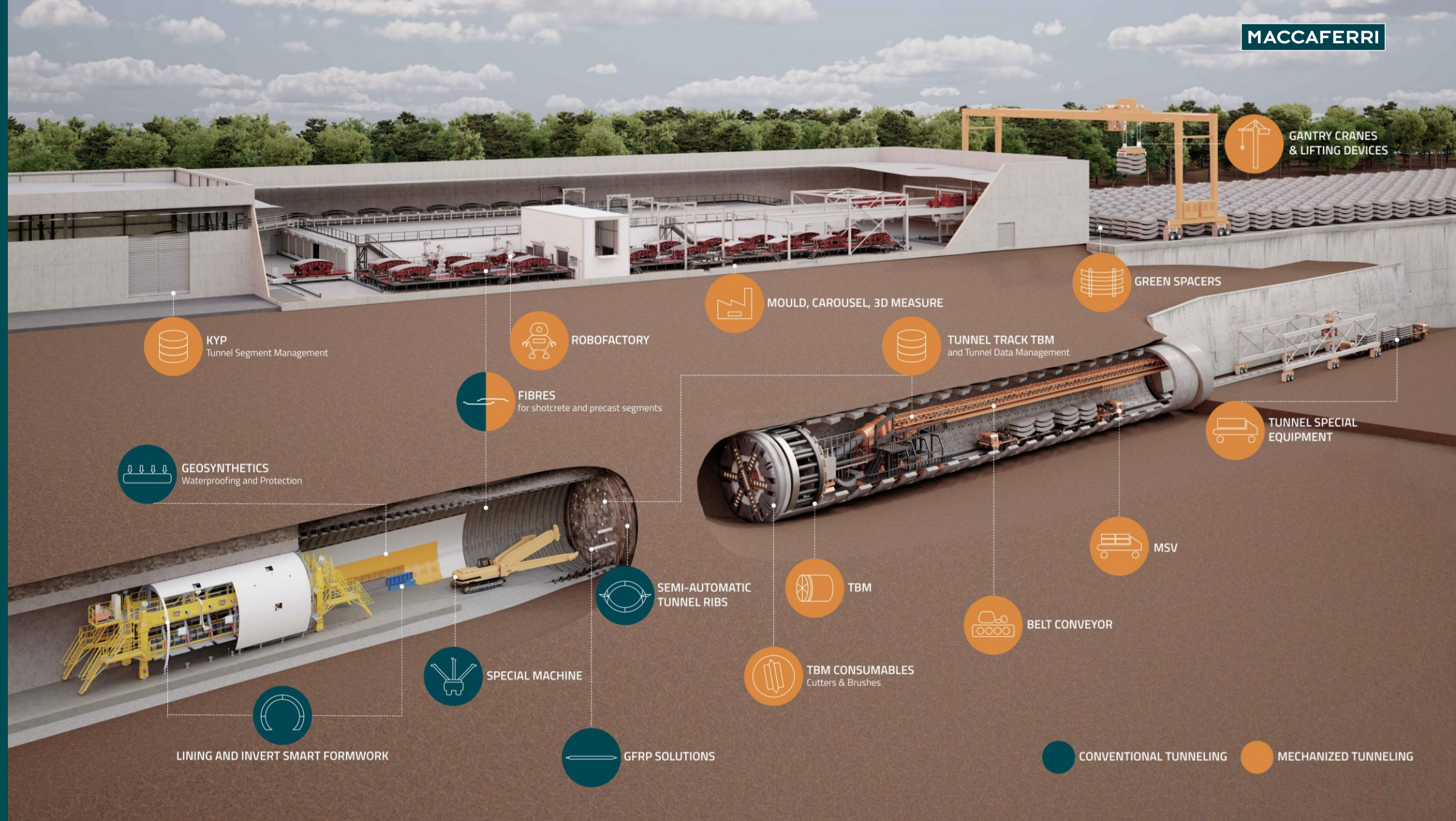


MACCAFERRI

From the merger of a leader in conventional excavation and a leader in mechanized excavation emerges a new key player in the tunnelling sector: **one unique partner** offering a comprehensive **360° portfolio of solutions** that goes beyond excavation and encompasses the entire construction process.



CPT
GROUP
A MACCAFERRI Company



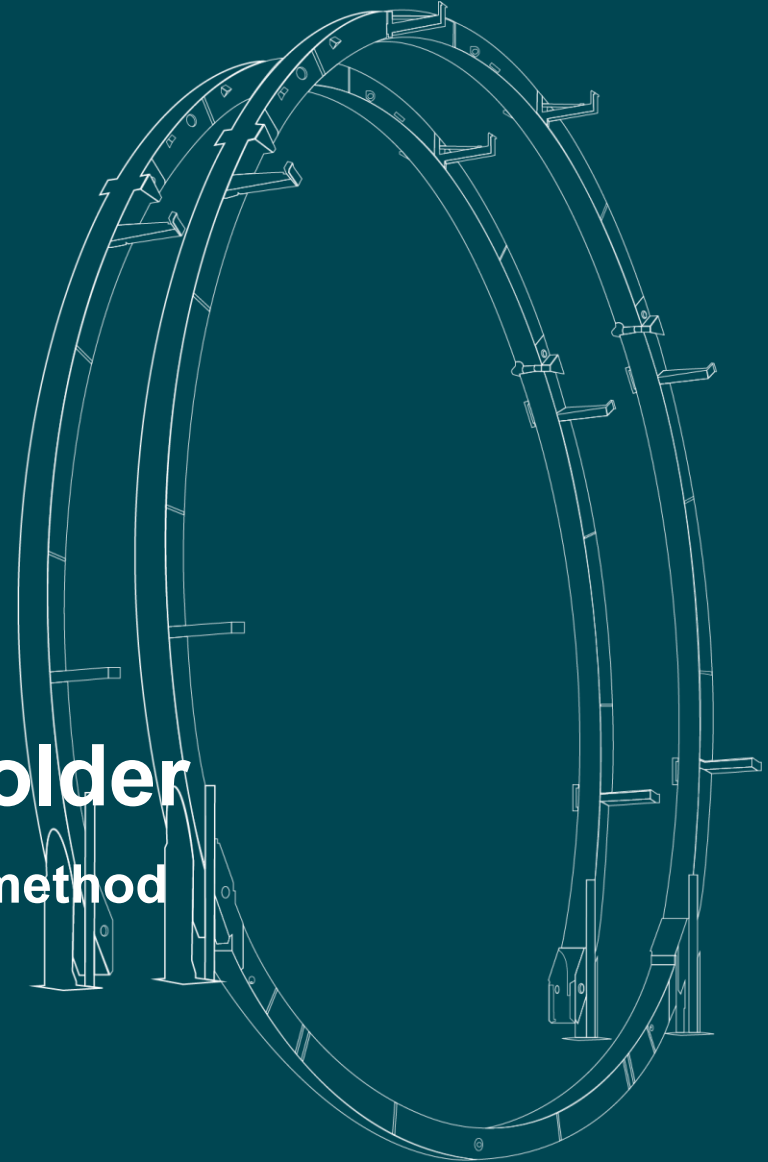
3

Tailored focus
for **every** stakeholder

3.a

Tailored focus for **every** stakeholder

Conventional excavation method





Understand what happens during excavation and react quickly

NATM is a reactive excavation method where deformations are accepted and managed during advance. Stabilization measures such as local reinforcement and temporary support are applied progressively, adapting to changing ground conditions. The approach offers high flexibility, a variable advance rate based on ground behavior, and generally lower initial costs.

When to use NATM

- Partialized excavation sections
- Medium to good rock masses
- Deformations that can be managed without risk to surface infrastructure
- Non-critical geometries
- Sites with good accessibility and flexible scheduling
- Limited initial budget



Prepare optimal conditions before excavation begins

ADECO-RS is a preventive excavation method in which the ground is stabilized before advancing. Pre-confinement and pre-consolidation are applied ahead of the face to control deformability and ensure defined conditions during excavation. The approach supports constant, programmable advance rates in shallow covers, loose or heterogeneous soils, and where minimal deformation is required.

When to use ADECO-RS

- Full face excavation
- Shallow covers or near-surface tunnelling
- Loose or heterogeneous soils
- Faces at risk of collapse
- Presence of sensitive buildings or infrastructure above
- Need for minimal deformation
- Projects requiring constant, predictable advance rates

Semi-automatic Tunnel Ribs

With our innovative technology, traditional tunnel ribs evolve into a ground-breaking system that supports the excavation face without exposing operators to risk.

The automation removes workers from hazardous areas, while accelerating installation and improving overall efficiency, ensuring a safer and more controlled tunneling process.

2x

Faster installation compared to alternative methods

80%

Fewer workers required at the excavation face

H-Beam Profile



Semi-automatic Tunnel Ribs

With our innovative technology, traditional tunnel ribs evolve into a ground-breaking system that supports the excavation face without exposing operators to risk.

The automation removes workers from hazardous areas, while accelerating installation and improving overall efficiency, ensuring a safer and more controlled tunneling process.

2x

Faster installation compared to alternative methods

80%

Fewer workers required at the excavation face

14%

Saving of shotcrete consumption

Tubular Profile



Wirand steel fibres for shotcrete

In conventional tunnel excavation, the primary lining is a temporary but yet crucial structural system applied immediately after rock removal to stabilize the opening and safeguard workers. Here, Steel Fibre Reinforced Shotcrete (SFRS) plays a key role: a composite of cement, aggregates, water, Wirand fibres, and admixtures, pneumatically applied to freshly excavated surfaces to rapidly secure the profile and control deformations.

By adapting instantly to the rock profile, fibre-reinforced shotcrete delivers immediate stability. Eliminating rebar installation streamlines and speeds up operations, while reducing exposure time to risk and raising safety standards.

20%

Concrete reduction enabled by a minimized rebound effect

3x

Faster operations thanks to the elimination of rebar installation

As an alternative to steel: Fibromac

Fibromac macro synthetic fibre, is used in Fibre-Reinforced Shotcrete in infrastructural and mining tunnels and caverns, providing optimum performances to excavation support in temporary applications.



PER Ground and GFRP solutions

Our fiberglass (GFRP) solutions guarantee the improvement of the mechanical characteristics of the soil or rock, increasing the global stability of the excavation face and optimizing the consolidation and reinforcement process from both an operational and economic point of view.

The innovative corrugated hollow profile allows a significant increase in performance. To effectively deal with excavation conditions in particularly adverse terrain, the fully customizable anchoring systems of the P.E.R. Ground System series (Pressurizing Element for Reinforcement of the Ground) can perform multiple functions.

P.E.R. Ground Drain, for example, simultaneously guarantees the reinforcement and the drainage of the excavation face.

45%

fewer perforations required, reducing workers' exposure time at the excavation face



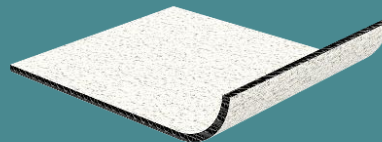
Drainage solutions

As part of the tunnel's final lining, waterproofing the excavation perimeter is essential to ensure structural stability and prevent serious safety risks. This layer must be adequately protected, and effective drainage is also required to manage the water around the excavation profile.

MacDrain provides a 2-in-1 protection and drainage layer, while dedicated drainage pipes offer an additional solution for specific water-collection needs.

Drainage and protection

MACDRAIN™ is a geocomposite consisting of a drainage core between two layers of geotextile. Its dual function of drainage and protection allows for a single installation and process optimization.



Efficient water management

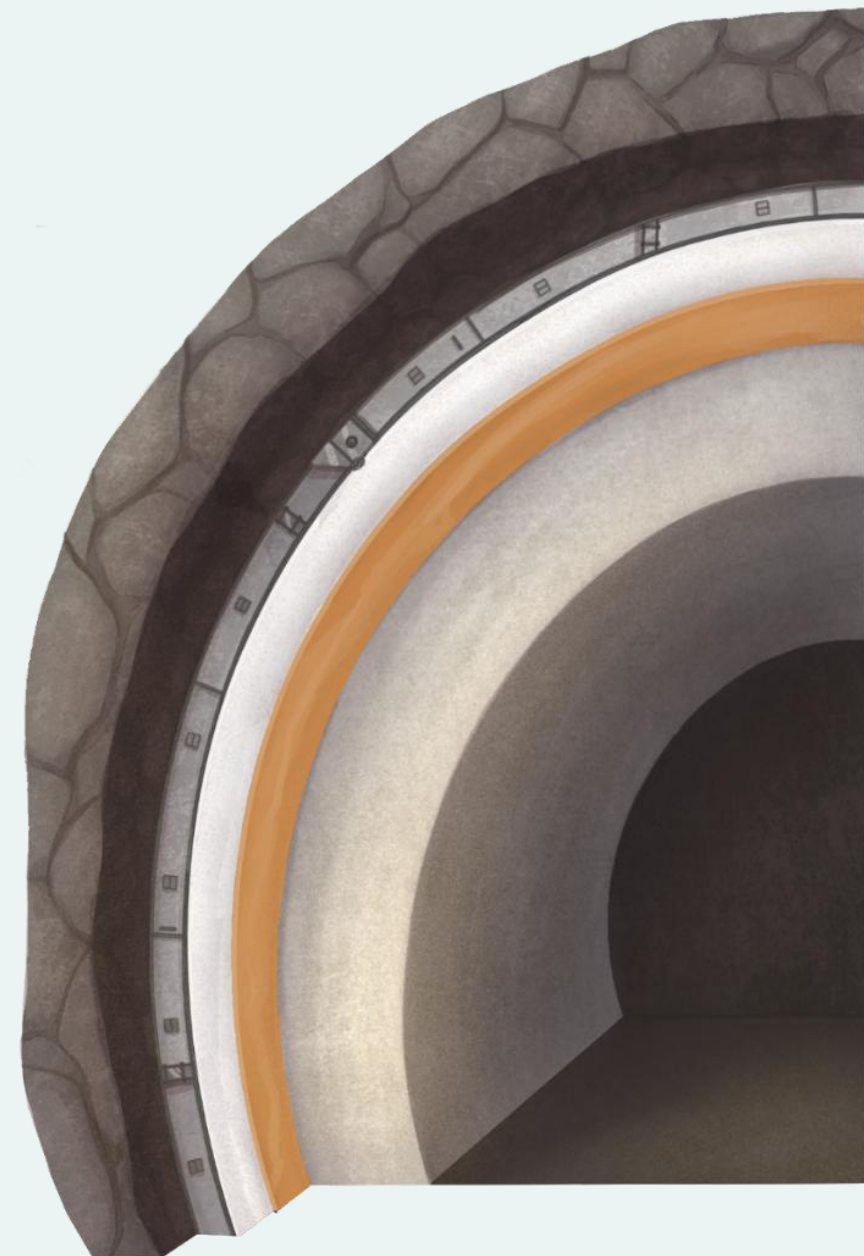
ensures rapid drainage even under high flow rates and heavy loads

Adapted to every scenario

specialized variants designed for unique challenges, such as frost heave prevention or high compression conditions

Reliable performance

engineered to minimize deformation, creep, and maintain permeability over time



Lining and Invert Formwork

A lining formwork is a specialized piece of equipment that is meticulously designed and constructed for the purpose of forming the final lining of a tunnel section. Its primary function is to provide the structural mold within which concrete can be poured and set.

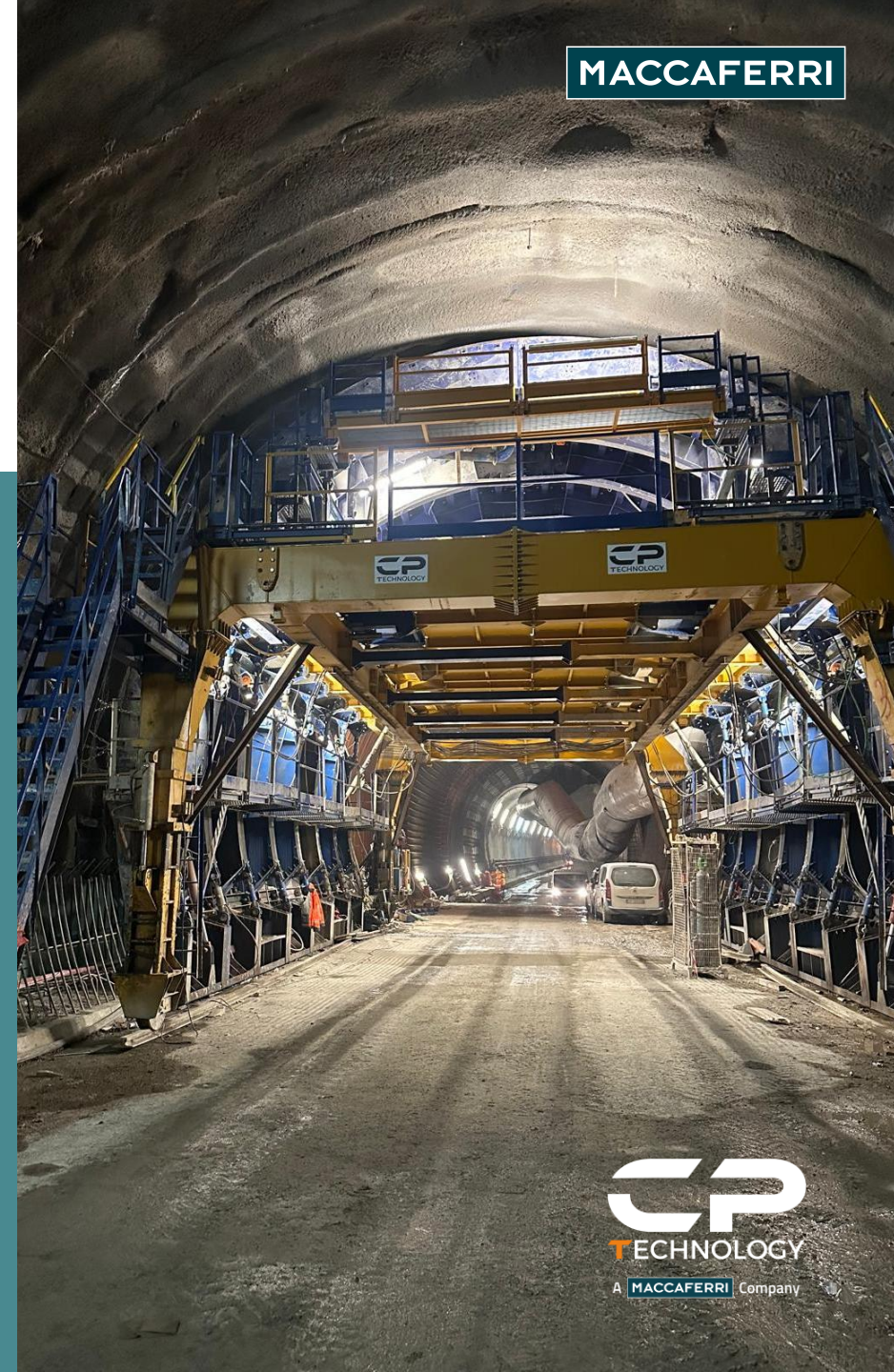
Different configurations available

SELF-SUPPORTING FORMWORKS do not require any anchorage to resist the concrete thrust, offering maximum flexibility and rapid repositioning

ANCHORED FORMWORKS, instead, rely on dedicated anchorages to counteract concrete pressure

Precise hydraulic operation

Hydraulic mechanisms allow controlled and accurate movements of the formwork, ensuring smooth operation, precise positioning and efficient handling throughout the lining process.

MACCAFERRI

Special Machines

Our dedicated special machines engineering team designs and develops automated equipment tailored to the specific logistical and operational needs of tunnelling and construction sites. From custom handling systems to fully automated installation units, each machine is engineered to streamline activities, improve consistency and reduce execution time.

Success story – Boscaccio tunnel

For the Boscaccio tunnel, the client required a fully remote-controlled machine capable of installing tubular semi-automatic tunnel ribs without exposing personnel at the excavation face. The system was engineered to perform the entire installation cycle: positioning and securing the crown, opening the rib, locking the joints, engaging the connection elements and completing the placement. Once the rib is assembled, a central arm supports the crown while two additional arms lower the feet into their final position.

Remote installation for safer operations

The combined use of the rib-installation machine and the tubular steel rib allowed the full installation process to be carried out remotely by only two operators, eliminating exposure at the excavation face and significantly reducing safety risks.

Tailor-made automation for any requirement

Every machine is custom-designed to match project-specific logistic, installation or handling needs, ensuring seamless integration into the site workflow.



3.b

Tailored focus for **every** stakeholder

Mechanized excavation method

Mechanized excavation with a shielded Tunnel Boring Machine (**TBM**), a specialized system equipped with a rotating cutterhead, advances continuously while installing precast concrete segments and automatically controlling all excavation parameters.

It is the preferred solution for projects requiring **high construction quality** and **predictable progress**, and environments where keeping operators away from the excavation face is essential.

Mechanized excavation method



Carousel

Carousels are rotating systems used in manufacturing and production lines to transport items efficiently, enabling continuous movement, higher productivity and reduced manual handling.

Introducing a carousel into precast segment production means fully industrializing the process: a previously fragmented sequence becomes a closed-loop, optimized workflow with automated, repeatable phases. Carousel plants transform segment production into a controlled, high-efficiency manufacturing cycle, where layout, workflow and equipment are customized to project needs while maintaining the flexibility and scalability required for future expansion.

Industrialized and consistent production process

An industrialized carousel setup ensures a constant production flow, minimizes manual handling and automates key phases of the process, resulting in uniform segment quality and stable, repeatable output.

Flexible and scalable configuration

Modular components enable the plant to evolve with production needs, supporting adjustments in output, additional equipment and evolving project requirements over time.

Tailor-made design

Our carousel plants are fully customized through project-specific layout optimization, adapting to factory dimensions, required mould quantity, preferred workflows and logistical constraints.



Robofactory

Robofactory is an automated precast plant for tunnel segments, where robotics and digital monitoring further enhance the continuity and stability of the production cycle.

By automating demanding operations, it reduces manual work and safety risks, while boosting productivity, precision, and efficiency.

+170%

Production capacity: the automation drastically increases the number of segments produced per shift

-30%

Defects with automation: robotic precision and digital control reduce defects and ensure consistent quality

-70%

Accident risk by removing operators away from risky phases

Operators shift from physical tasks to supervision roles, creating a safer and more efficient working environment.

By automating repetitive and labor-intensive processes, operators can focus on higher-value tasks, reducing the reliance on manual work and optimizing the entire workflow.



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Moulds

In tunnelling, the production of TBM segments requires extremely tight tolerances, often within tenths of a millimeter. Segment moulds are therefore highly sensitive equipment, where construction precision is essential to guarantee the final quality of the precast elements. By designing and manufacturing our moulds in-house, we maintain full control over every stage of the process, ensuring compliance with ITA guidelines and long-term reliability in production.

High-precision tolerances

Engineered to stay within tenths of a millimeter, ensuring dimensional accuracy and consistent segment quality.

Strict quality control

Our surveying team verifies that each mould fully complies with project tolerances both before commissioning and throughout years of segment production. Highly specialized technicians use advanced measuring instruments to ensure maximum accuracy and long-term precision.

Fully customizable design

Moulds can be configured to match any production setup: hydraulic or mechanical openings for safer and faster operations, electrical or pneumatic vibrators for controlled compaction, fixed or universal lids depending on plant layout, and stationary or carousel configurations to suit any precast workflow.



Wirand Steel Fibres for precast segments

For tunnels excavated by TBM or shield machines, precast concrete segments reinforced with Wirand fibres offer a safer, more efficient and cost-effective solution. By fully or partially replacing conventional reinforcement, these fibres enhance the mechanical performance of concrete. Already applied in subway, drainage, hydraulic and hydropower tunnels worldwide, this technology is adaptable to a wide range of diameters and operating conditions.

Precast fibre-reinforced segments not only provide greater impact resistance during handling and installation but also deliver measurable savings in reinforcement.

-50%

Less steel used during production

20%

Reinforcement cost savings

For fire and microcracking protection

Fibromac micro synthetic polypropylene fibres can be used in precast segments requiring additional protection against microcracking, improving durability and long-term performance. They also provide enhanced resistance to fire and explosive spalling, increasing safety in the most demanding operating conditions.



Green Spacers

Green Spacers represent a new generation of sustainable spacers, built from recycled plastic and featuring a lightweight, high-performance design that improves efficiency and safety on site.

As an alternative to traditional wooden spacers, they offer a durable solution that is fully compatible with automated handling systems and are already adopted across major infrastructure projects worldwide.

100%

Recycled plastic, giving waste a second life and replacing timber spacers to help reduce deforestation.

< 4 kg

A lightweight design that reduces workers' injury risk, especially when compared to traditional 20 kg wooden spacers.

160 tons

Optimized load transmission makes it suitable for extreme stacking conditions.

MACCAFERRI

Impact
A **MACCAFERRI** Company

Tunnel Boring Machine

We are sales and after-sales partners of CRCHI – China Railway Construction Heavy Industry for Italy and Spain, and we also supply CRCHI equipment to Italian and Spanish contractors working abroad.

CRCHI is a leading manufacturer of smart tunneling equipment and high-end railway track systems. As one of the world's largest TBM producers, CRCHI delivers over 200 machines every year, combining innovation, reliability, and global expertise.

A complete range of TBM configurations

We provide all major TBM types, from open and hard-rock machines to single shield, EPB, slurry, hybrid and double-shield configurations, ensuring the right technology is available for any ground condition and project requirement.

- OPEN TBM - single gripper and double gripper
- SINGLE SHIELD - EPB, slurry, HR, double mode
- DOUBLE SHIELD

Spare parts supply

A dedicated stock system ensures fast delivery of TBM spare parts, with local warehouse availability reducing lead times and guaranteeing timely support on site.

**MACCAFERRI**

TBM
TECHNOLOGY
A MACCAFERRI Company

Cutters, brushes and sensors

Cutters play a fundamental role in tunnel excavation, ensuring efficient penetration of rock and soil through cutting, breaking, or crushing actions. Built with high-strength steel and ultra-durable inserts, they are engineered to deliver consistent performance even in demanding geological conditions. Their design versatility and reliability make them a critical element in maintaining excavation speed, safety, and project continuity.

We also supply tailskin brushes for reliable TBM sealing, and with Tunnel Track all cutter-sensor data is integrated into a single platform alongside the rest of the machine's instrumentation.

Real-time monitoring

Cutter sensors track force, vibration, and rotational speed in real time, helping detect wear and potential failures, enabling timely maintenance and preserving high productivity.

Tailored to any ground condition

A complete range of cutters ensures optimal performance in any geological setting: disc cutters for hard and abrasive rock, scrapers for softer soils or mixed ground, and specialized tools such as rippers or grippers for the most challenging conditions.

Spare parts supply & full technical support

A strong global structure provides spare parts supply, technical assistance, and maintenance support to keep operations running efficiently.



KYP – Tunnel Segment Management

KYP is a web-based tunnel segment management platform that provides complete visibility and centralized control over all data related to precast tunnel elements. It covers the entire tunnel process and supports the efficient management of precast factories.

Each segment is uniquely identified using a barcode or RFID, ensuring full traceability throughout its lifecycle. Real-time data is synchronized across all devices, enabling fast, reliable decision-making and guaranteeing the traceability of the final product.

Its modular architecture, allows seamless integration with third-party software and PLC-controlled machinery, collecting and consolidating operational data for advanced analysis and smooth coordination among all project stakeholders.

Full process traceability

A unique segment database tracks every phase of the process, from production and storage (in/out) to logistics and installation, ensuring complete transparency, quality control, and lifecycle traceability across the entire tunnel process.

Real-time monitoring on any device

Production dashboards, KPI tracking, and live storage mapping provide instant visibility over plant performance. as a web-based platform, KYP enables real-time monitoring from any device, supporting fast and informed decision-making throughout the process.

Adaptable to any project requirement

KYP adapts to different project requirements through its modular architecture, integrating with batching plants, PLC-controlled machinery and third-party software. it supports multiple ring types, production lines and entire projects within a single unified environment.

MACCAFERRI

KYP
Tunnel Segment Management



Tunnel Track TBM and Tunnel Data Management

Tunnel Track is a real-time data management web platform that collects and centralizes information from multiple TBMs and other systems involved in the tunnel excavation process. The software offers customizable analyses, reports, and automatic alerts based on user-defined thresholds. Designed for multi-TBM and multi-project environments, it provides continuous visibility and reliable analytics across the entire tunneling operation, enabling comparison between past and ongoing tunnel projects.

Underground & surface monitoring

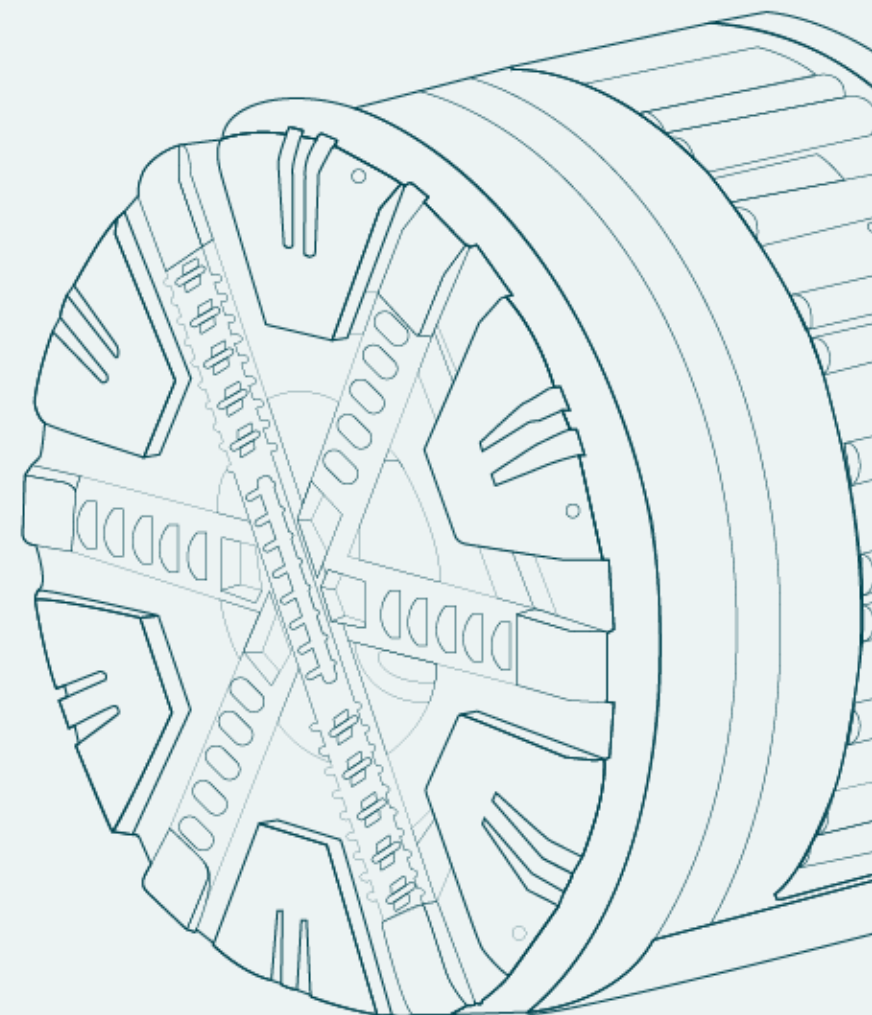
Tunnel Track collects data from TBMs and a wide range of geotechnical and surface sensors, providing a full overview of ground behavior above and below the tunnel, essential when excavating in urban environments.

Cross-TBM and cross-tunnel comparison

By centralizing data from multiple TBMs and excavation sites, Tunnel Track enables impartial performance comparisons across machines and tunnels, offering useful insights for planning future projects with similar conditions.

Integrated with KYP or fully standalone

Tunnel Track can be deployed on its own or integrated seamlessly with the KYP ecosystem, ensuring flexibility and consistent data flow across production, logistics, and excavation workflows.



3D Measure Solution

A 3D Measurement Service is available using a next-generation system for the precise and efficient inspection of concrete tunnel segments and moulds. The solution combines the i-Scanner and i-Tracker, delivering ultra-high-resolution measurements powered by 25-megapixel cameras and 99 laser lines, supported by real-time data processing and long-range tracking. Its wireless, battery-powered design ensures smooth operation and easy integration into existing quality-control workflows.

<5 min

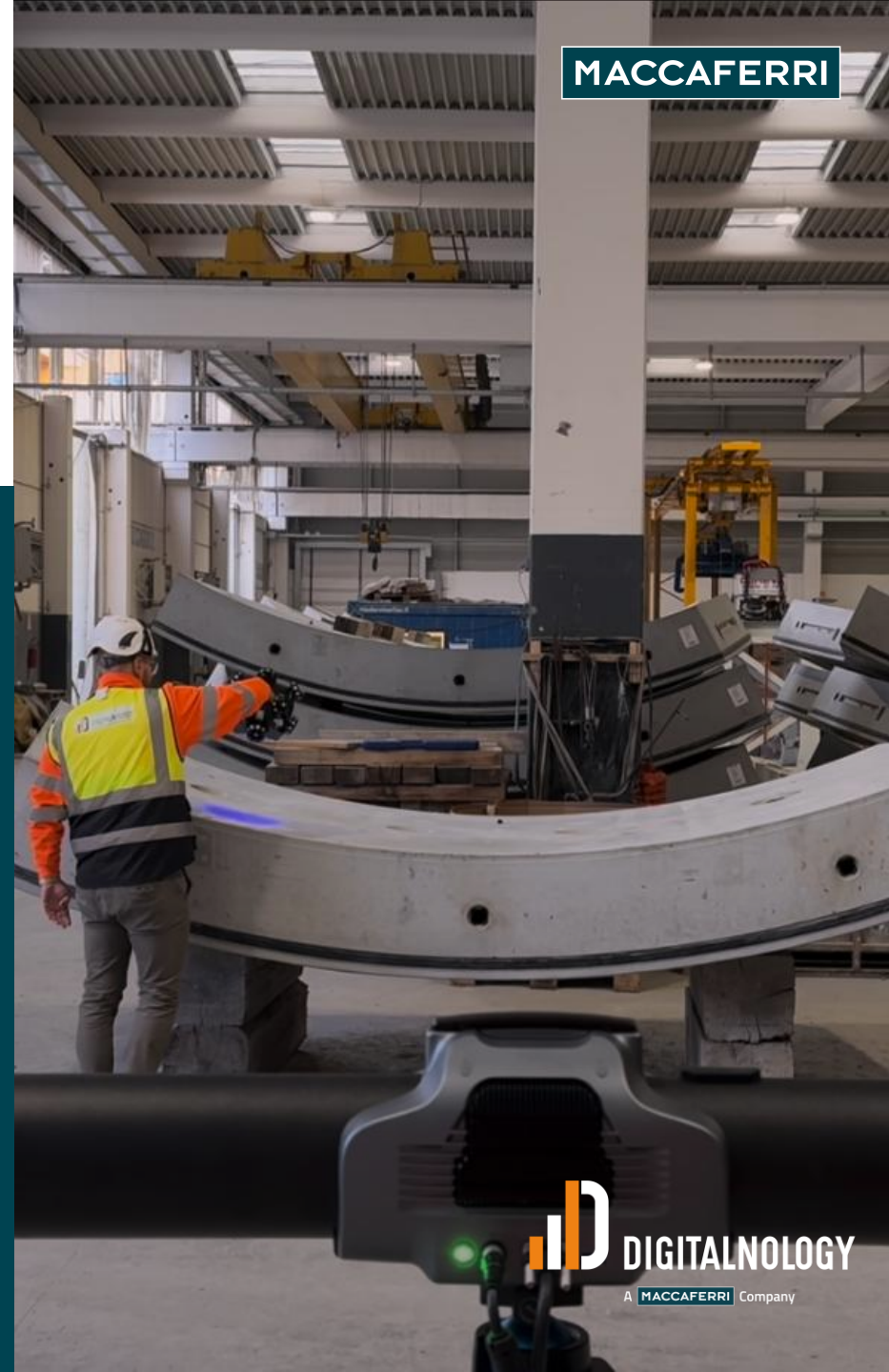
The system completes the full measurement cycle in less than five minutes; a dramatic reduction compared to the hour required by traditional methods.

6-face

All six faces of the concrete segment can be scanned in place, avoiding heavy lifting operations and enabling a faster, safer, and fully continuous inspection flow.

Easy operation and optional on-site service

The system is straightforward to operate and requires only minimal training for in-house use. alternatively, a certified on-site 3D measurement service can be provided by our team using our own equipment.



MSV (Multi Service Vehicles)

MSVs are purpose-built machines designed to support excavation and lining operations in mechanized tunnelling and mining. They ensure the efficient and safe transport of precast segments, consumables, equipment and personnel between the logistics area and the TBM, without the need for fixed rail infrastructure. Thanks to their high load capacity, modular loading platforms and excellent maneuverability in confined spaces, MSVs help maintain a continuous supply flow to the TBM, reducing downtime and improving overall productivity.

Flexibility and tailored configuration

They offer greater versatility than rail-based systems, operating on steep gradients and tight curves while allowing customized configurations to suit different load types and logistics needs.

Enhanced operator safety

Their configuration reduces exposure to operational hazards, improving maneuverability and control in confined underground environments.

Fully electric options for better working conditions

Electric versions lower emissions, noise and ventilation demand, improving environmental performance and overall working conditions inside the tunnel.



Belt Conveyors

Belt conveyors are widely used across industrial sectors for efficient, continuous and reliable material transport, handling heavy loads and operating effectively in diverse environments. Bringing this level of industrialization into tunnelling enables long-distance, steady and low-handling movement of materials directly underground.

When equipped with BC Sensors, these systems evolve into fully monitored, data-driven solutions, offering precise control over performance and operating conditions.

Continuous and industrialized material flow

Belt conveyors introduce a stable, continuous transport system into the tunnelling environment, handling heavy loads over long distances while reducing manual handling and improving overall productivity.

Real-time condition monitoring with bc sensors

BC sensors provide live data on parameters such as pressure, temperature and flow, enabling early anomaly detection, safer operations and optimized performance across the entire conveying system.



Tunnel Special Equipment

Our dedicated special machines engineering team designs and develops automated equipment tailored to the specific logistical and operational needs of tunnelling and construction sites. From custom handling systems to fully automated installation units, each machine is engineered to streamline activities, improve consistency and reduce execution time.

Tailor-made automation for any requirement

Every machine is custom-designed to match project-specific logistic, installation or handling needs, ensuring seamless integration into the site workflow.

Success story

Santa Lucia tunnel (Italy) – a custom overpass bridge was developed for culvert installation.

One single equipment had to allow for:

- rotation of the culvert precast elements
- installation of the elements at the bottom of the tunnel
- safe passage of vehicles back and forth to the TBM

Thanks to this equipment, culvert installation could begin during TBM excavation.



Gantry cranes & Lifting devices

One of the most delicate phases in the TBM segment production is their handling within the precast plant, to the storage location and all the way to the installation in the tunnel.

These heavy concrete pieces require special lifting equipment carefully designed to fit their geometry. Our expertise allows to assess the best technology for each case, with the objective of supporting the customer in the choice not only in terms of investment, but also in terms of reliability of the machine and efficiency during the use.

Gantry cranes

Sliding on ground-fixed rails, these cranes are the ideal solution for indoor or outdoor storage areas with a regular shape, such as rectangular or square layouts.

Vacuum lifters

The traditional equipment used to demould concrete segments is a vacuum lifter, which lifts the segment from the mould and moves it to the tilting area.

Demoulder

Our innovative demoulding device no longer relies on vacuum technology, but uses hydraulic pistons instead, providing the following benefits:

- demoulding and rotation with a single piece of equipment
- reduced risk of segment damage
- lower manpower requirements
- automated, consistent operations



MACCAFERRI

3.C

Tailored focus for
every stakeholder

Beyond tunnelling excavation: Maccaferri's full infrastructure portfolio of solutions complementary to tunnelling

An aerial photograph of a highway winding through a mountainous landscape. Two tunnel portals are visible on the left side of the road. The highway is bordered by green retaining walls and has several trucks traveling on it. A river flows through the foreground, and a forested hillside rises in the background under a blue sky with scattered clouds.

There's a world outside the tunnel and we cover it too.

From retaining walls for portal construction and embankments, to rockfall protection systems and IoT-based early-warning solutions for the safety of people.

TerraMesh™ System

TerraMesh System is a modular system used to form a rock-faced mechanically stabilized earth wall with vertical facing. The system has been used on some of the most referenced infrastructures, including a 74m high structure.

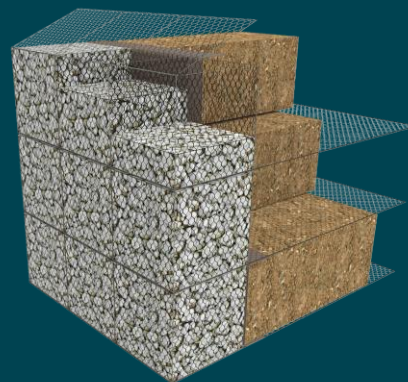
It is made of pre-assembled units of double twisted wire mesh (8×10 type). The front section has a rear panel and diaphragms behind, thus creating a rectangular shaped cellular confinement for the stones.

120+ years

Long-lasting performance: superior durability against corrosion and mechanical wear thanks to PoliMac or Bio PoliMac coating, even in harsh environments.

50 sqm

Installed in one shift



Great performance under high loads



TerraMesh™ Green

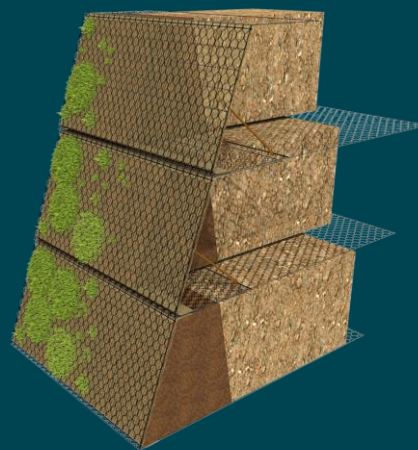
TerraMesh™ Green is an environmentally friendly modular system for constructing green-faced, soil-reinforced slopes and embankments. Its defining feature is the integrated erosion control blanket, designed to accelerate vegetation growth and ensure rapid natural integration of the structure. This enhanced vegetative cover not only improves the visual and ecological blending of the slope but also contributes to CO₂ sequestration, supporting broader sustainability objectives.

120+ years

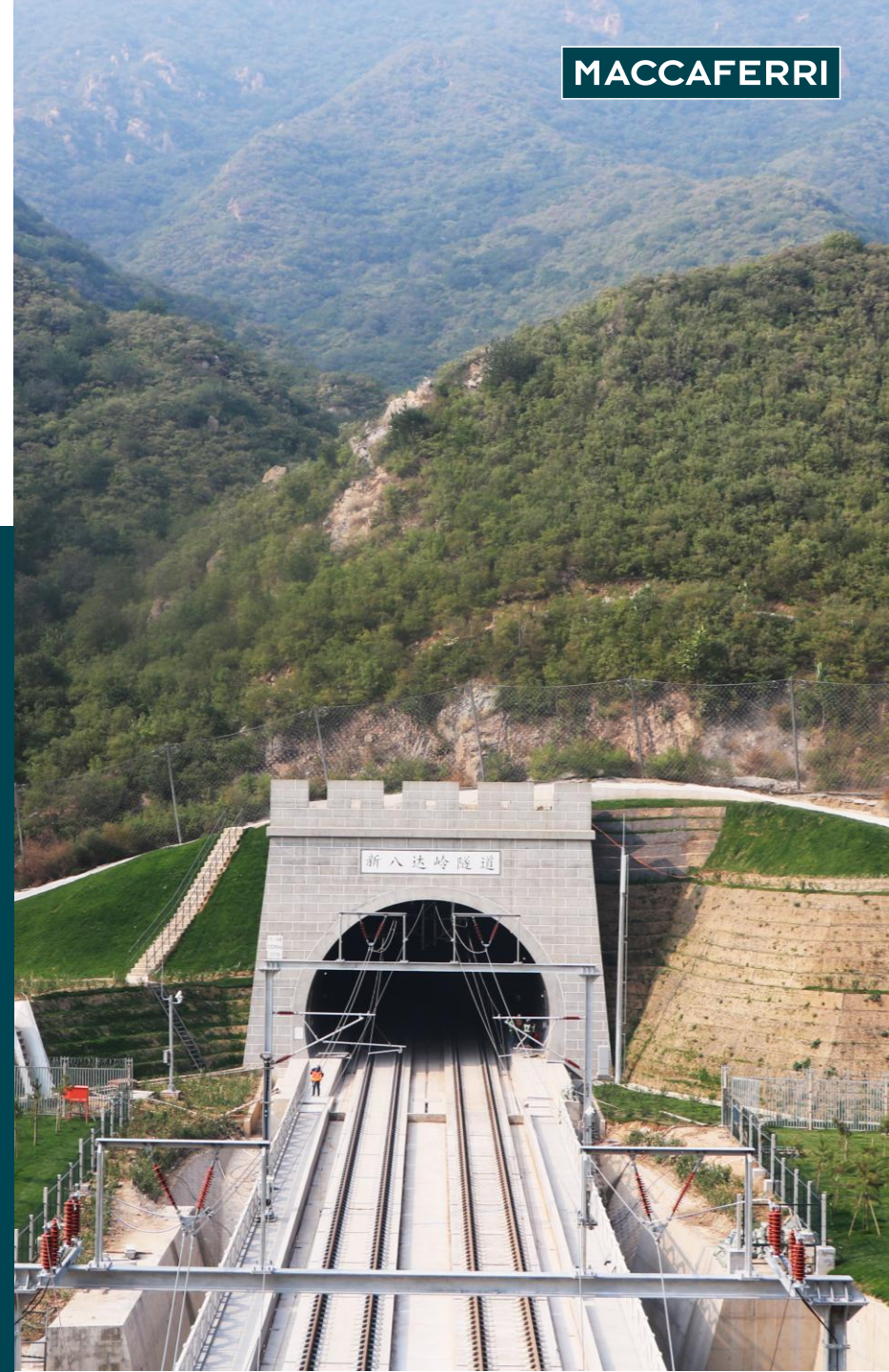
Long-lasting performance: superior durability against corrosion and mechanical wear thanks to PoliMac or Bio PoliMac coating, even in harsh environments.

150 sqm

Installed in one shift



Enhanced ecosystem diversity
and carbon sequestration



TerraMesh™ Mineral

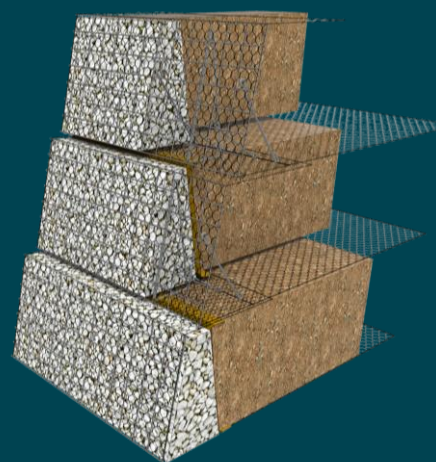
TerraMesh™ Mineral is an engineered soil reinforcement system designed to create steep, rock-faced slopes with inclinations up to 87°. It incorporates an external welded mesh panel that provides a stable, durable and natural-looking rock finish. This solution is ideal when a reinforced soil slope must combine structural performance with an almost-vertical, visually appealing retaining façade.

120+ years

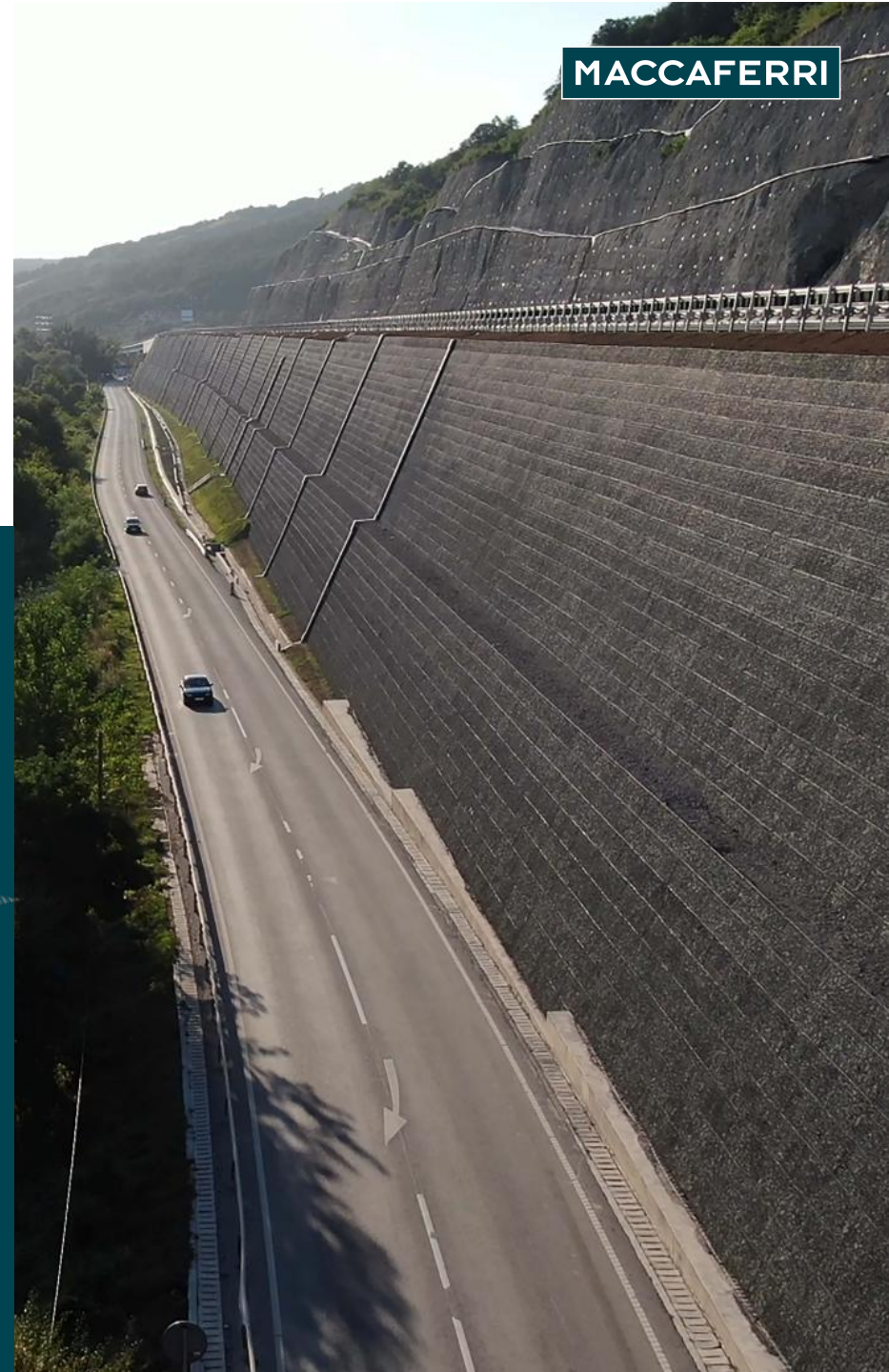
Long-lasting performance: superior durability against corrosion and mechanical wear thanks to PoliMac or Bio PoliMac coating, even in harsh environments.

60 sqm

Installed in one shift



Reduced stone consumption



Rockfall Barriers

Rockfall barriers are engineered systems designed to dissipate the kinetic energy of high-speed falling rocks, before they reach critical infrastructure. They are composed of high-strength steel nets and energy-dissipating devices and are installed along slopes to provide effective protection. Thanks to their modular design, they allow for rapid installation in critical or high-risk zones. All systems are certified and compliant with the relevant European Assessment Documents.

x2

Enhanced service life minimum x2, adapting the corrosion protection to the environment corrosivity. GalMac® C2 and C3 coatings provide corrosion resistance , ensuring long-lasting performance and reduced maintenance over the system's life cycle.

Complete solution

Our rockfall barriers are supplied as a CE-marked kit, including all components: nets, posts, base plates, energy dissipators, ropes, and accessories



SteelGrid and MacArmour

Unstable rock slopes require effective surface protection to prevent rock detachment and ensure the safety of areas below. SteelGrid and MacArmour combine double-twisted wire mesh with high-tensile steel ropes for rockfall mitigation and slope stabilization. Draped or fixed to rock faces, they deliver superior stiffness and strength for reliable protection in demanding conditions.

120+ years

Long-lasting performance: superior durability against corrosion and mechanical wear thanks to PoliMac or Bio PoliMac coating, even in harsh environments.

+80%

Punch Resistance vs other systems. Versatile protection, suitable for both drapery applications and high-load bolted facings where traditional meshes are insufficient



Debris Flow and Shallow Landslides Barriers

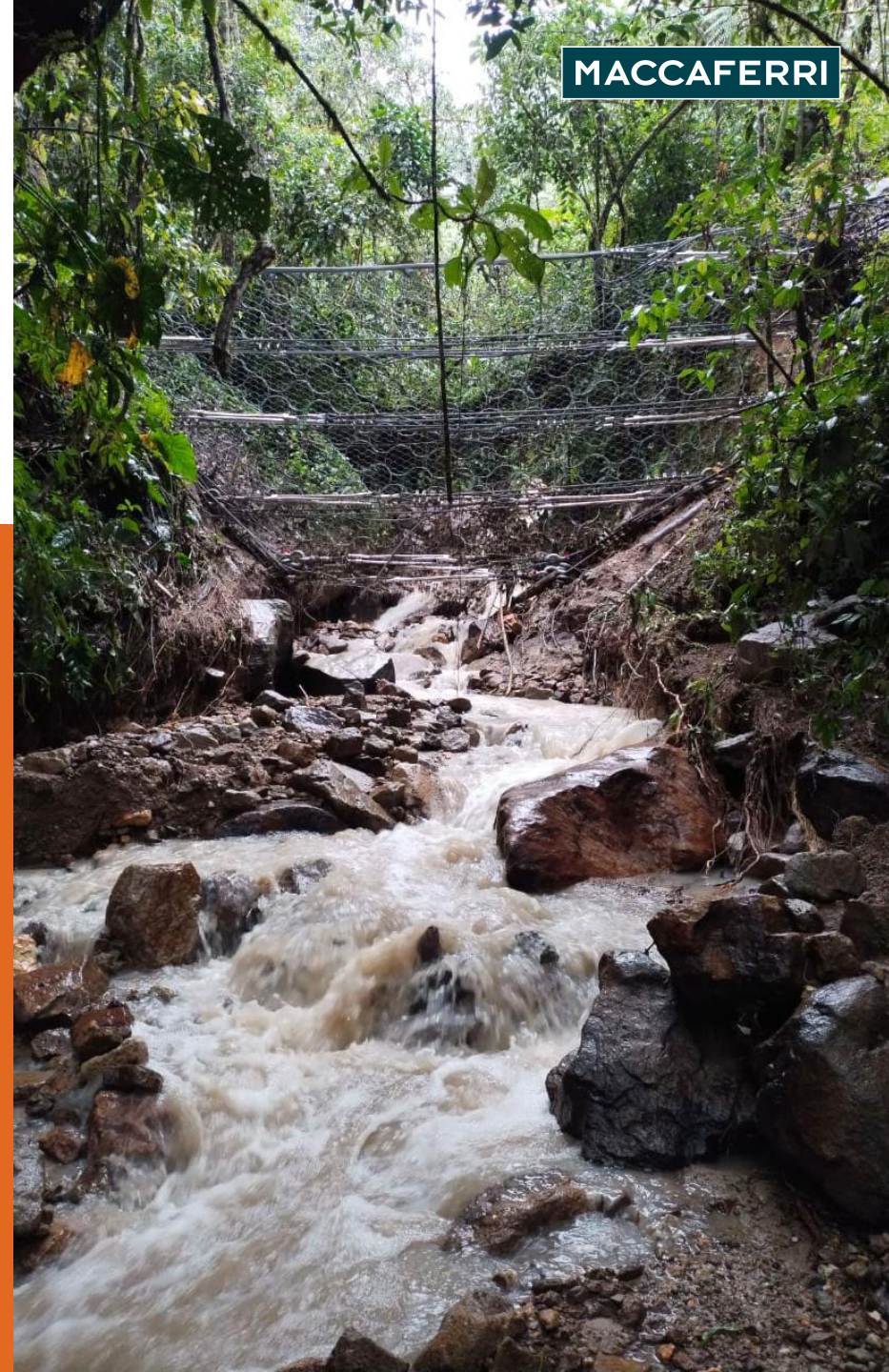
Our debris flow barriers are designed to contain debris flows in channels and shallow landslides on open slopes. Each system is custom-engineered to site conditions, flow volumes, and material characteristics. They provide effective protection with minimal visual impact on the surrounding environment.

185 kPa

Certified resistance up to 185 kPa: installed and trusted in challenging mountain and hillside environments worldwide

Custom fit

Tailored to site conditions, debris characteristics, and expected flow volumes



HELLOMAC Geo

All our solutions are designed to enhance safety and efficiency in civil engineering. By integrating smart early warning systems, we can elevate these solutions to new levels of intelligence and effectiveness, contributing to empower communities and their well-being.

HELLOMAC Geo emerges as a comprehensive suite of solutions meticulously designed for the intricate demands of rockfall protection. Applicable to all rockfall protection systems and unstable rock slopes, it enables real-time monitoring and sends alerts via app, SMS or email based on client-defined thresholds.

3 minutes

It takes no more to receive the alert

8 kg

So light and small, it installs easily anywhere

5 years

Long-lasting battery, no need for maintenance



4

Reference **projects**
and case histories

Terzo Valico dei Giovi, Cravasco Tunnel

In an area characterized by intense fracturing, discontinuities and highly variable geotechnical conditions, excavation faced significant convergence, frequent reinstatement needs and critical safety constraints. Rapid and precise installation of support ribs was essential to maintain stability and productivity.

Solution:

Semi-automatic tunnel rib HEB300.

Terzo Valico dei Giovi, Cravasco Tunnel

Results:

- Removal of personnel from the excavation face during rib installation
- Sharp reduction of operational issues and installation errors
- 23% increase in productivity (linear meters excavated)
- Overall improvement of site safety

Success story

Napoli–Bari High-Speed Line

The project required a state-of-the-art precast factory with unprecedented production capacity in Italy, to be built entirely from scratch on a completely empty site.

Solution:

We supported the client in designing the entire precast area, optimizing not only the carousel plant but the full layout. Two high-performance Robofactories were developed, each producing one segment every 7 minutes with only seven operators, supported by an integrated software platform ensuring full production traceability.



Success story

Napoli–Bari High-Speed Line

Results:

- 150 segments/day average output per Robofactory
- Zero injuries in the first 14 months of operation
- Removal of the initially planned night shift, with significant labor-cost savings
- Lower defect rate compared to industry standards



Success story

Qingdao Metro Line 1, Qing Dao city, China

Qingdao Metro Line 1 (60.11 km) aimed to introduce innovative tunnel segment technologies and launched a dedicated research program. Based on geological conditions, two intervals were selected to test steel fiber reinforced concrete segments in place of traditional high-steel-content designs.

Solution:

We supported the research by using our Wirand FF3HS fibres and proposing two reinforcement strategies, each tailored to the required bending performance. :

- pure steel-fiber solution for one interval
- hybrid steel + fiber design for the other one

Success story

Qingdao Metro Line 1, Qing Dao city, China

Results:

The collaboration enabled effective resolution of key aspects such as segment design, material testing, concrete mix optimization and quantity control. In total, **186** rings using the pure steel-fiber solution and 100 rings using hybrid reinforcement were successfully installed. This project marked the first large-scale application of pure steel fiber reinforced concrete segments in China, supporting Qingdao Metro Group in establishing local standards and providing the first comprehensive case study for the adoption of SFRC technology in the Chinese market.

Success story

Belpasso Precast Plant, Messina–Catania Line

Supply of Green Spacers to the Belpasso precast plant, dedicated to the intensive production of reinforced concrete segments for the Palermo–Catania–Messina high-capacity railway line. Client: Consorzio Messina Catania Lotto Nord (WeBuild–Pizzarotti).

Solution:

Green Spacers 17×15×50 cm, with a total supply of 116,000 units.



Success story

Belpasso Precast Plant, Messina– Catania Line

Results:

Use of 430 tons of 100% recycled plastic, replacing traditional wooden spacers and improving segment-yard optimization thanks to the high performance and uniformity of Green Spacers.

Success story

San Donato Tunnel, Italy

During the construction of the new San Donato tunnel, the tunnel ribs originally specified in the executive design were replaced with tubular automated tunnel ribs. The decision was driven by the need to improve safety in one of the most critical phases of tunnelling: rib installation, which traditionally requires operators to work at the excavation face in close proximity to suspended steel elements.

Solution:

650 tubular semi-automatic tunnel ribs, installed using a three-arm rib-installation system designed to operate with fully-remote control. More than 173,000 GFRP solutions.



Success story

San Donato Tunnel, Italy

Results:

The automation eliminated the presence of operators at the excavation face during rib installation, significantly reducing safety risks in the initial support phase. The installation became faster, more uniform and more controlled, improving both operational efficiency and overall site safety.



Success story

MACCAFERRI