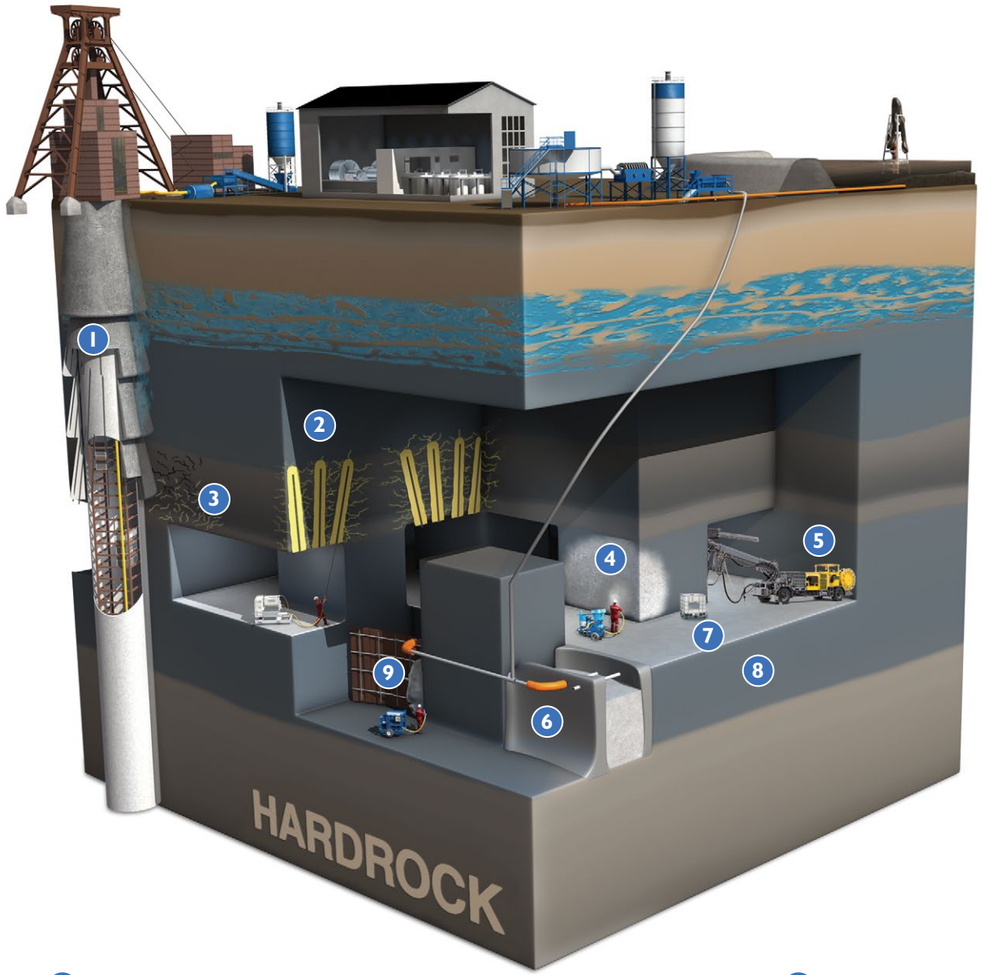
MASTER® BUILDERS SOLUTIONS

Solutions for the Mining Industry



Our Comprehensive Portfolio for the Mining Industry

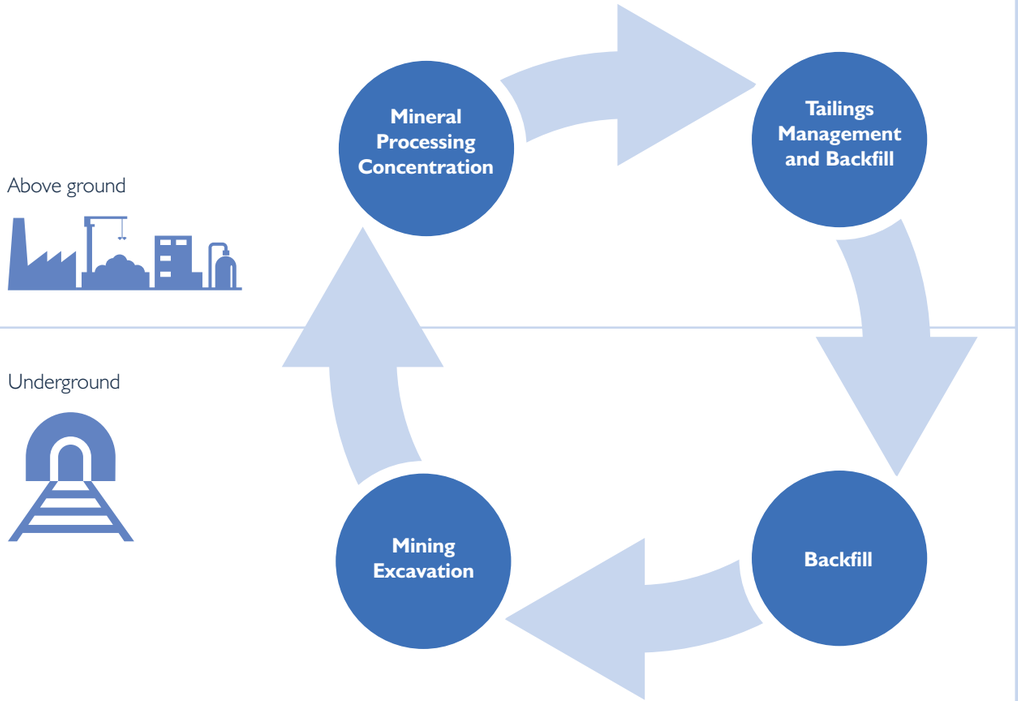


1. Pre-Injection
2. Rock Bolting
3. Injection
4. Thin Spray-on Liner (TSL)
5. Sprayed Concrete
6. Mine Backfill
7. Admixture for Concrete
8. Roadway Concrete
9. Fast Setting Ground Support

Your Partner for Safer Mining

Mining is all about partnership – and in the Master Builders Solutions® experts, you will find the right partner: A partner not just offering tailor-made solutions for each step in the mining cycle, but also supporting you with on-site problem solving, start-up supervision, and lab testing. Through advanced chemistry for hard rock, coal or open pit mining, we help you increase the efficiency and profitability of operations while improving safety at the same time.

Total Mining Cycle - Sustainable Approach



Sprayed Support

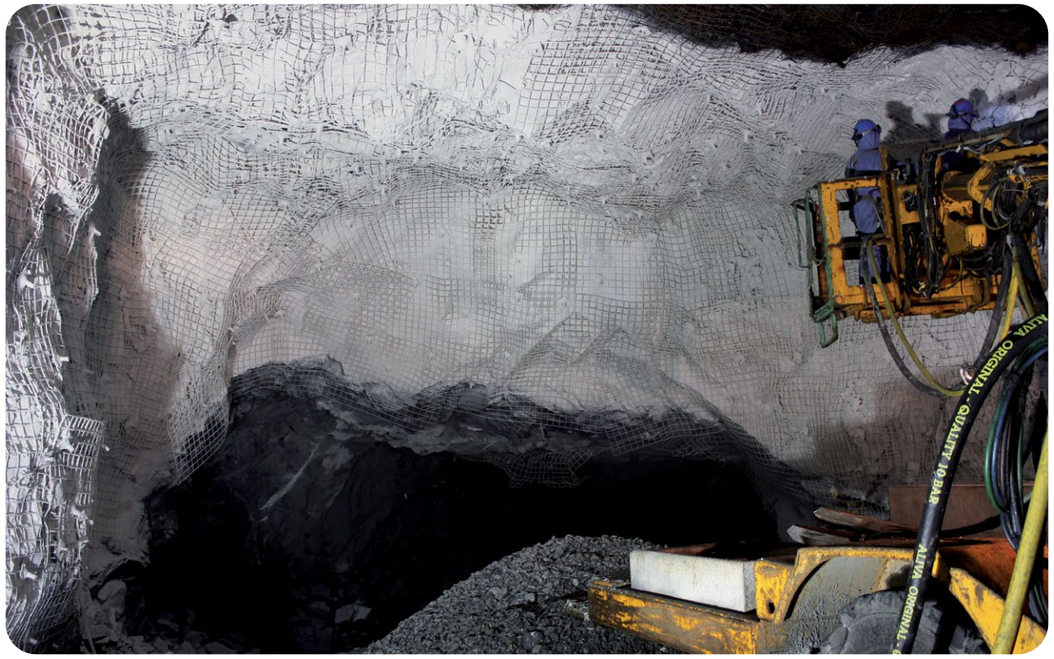
The Master Builders Solutions® brand offers a comprehensive range of products that achieve early and long-term strength in ground support. These products can be tailored to suit specific site requirements, offer compatibility to local cements and excellent long-term durability. Moreover, our innovations in alkali-free accelerators are a safe and essential part of modern sprayed concrete.



Sprayed Concrete
3 – 15 cm as temporary lining with bearing load capacity and structural support if needed with structural fiber reinforced

TML
10 – 50 mm thin mortar lining with bearing load capacity and bending flexibility for initial and quick rock support in strong fissured soft and hard rock

TSL
10 – 50 mm thin mortar lining with bearing load capacity and bending flexibility for initial and quick rock support in strong fissured soft and hard rock



Sprayed Concrete

High-quality, durable sprayed concrete (shotcrete) has become a vital component of ground support and stabilization in both tunneling and mining. Sprayed concrete support creates state-of-the-art linings. Constantly striving to exceed customer needs and demands, our admixture technologies enhance the workability, hydration control and viscosity of fresh concrete.

Admixtures for Sprayed Concrete

While the MasterEase® range provides superior rheological properties (good pumpability, low viscosity), the MasterSuna® SBS / RCA range is specifically designed to utilize manufactured sands with high fines and / or clay minerals.
Our hydration control system MasterRoc® HCA is capable of maintaining an open time of up to 72 hours, allowing for total flexibility of site logistics. The viscosity modifying admixtures (VMA) of the MasterMatrix® range allow the modification of rheological properties to prevent segregation.
MasterRoc® MS microsilica improves the pumpability and workability of sprayed concrete mixes in the fresh state while reducing permeability and increasing density as well as long-term strength in the hardened state. MasterRoc® TCC is a concrete improving admixture which enhances the quality in the hardened states by reducing shrinkage and improving bonding.



Sprayed Support

Set Accelerators

MasterRoc® SA alkali-free accelerators are added at the nozzle and accelerate the setting and hardening of the sprayed concrete. They provide high early strength gain and long-term strength development, as well as enhanced durability. Furthermore, they reduce dust and rebound levels. The accelerators are also suited for applications where extremely thick layers of sprayed concrete are required.

Admixture type	Master Builders Solutions® product line	Application example	Flowability	Open time	Segregation prevention	Low viscosity	Manufactured sands / clay	Strength / durability
Plasticizer	**MasterGlenium®**	Standard superplasticiser	●	●				●
	MasterEase®	Solution for low viscosity / easy pumpability	●	●		●		●
	MasterSuna® SBS / RCA	Special solution for manufactured sands and clay content	●	●			●	●
Hydration control	**MasterRoc® HCA**	Site locations with difficult availability or logistics		●				
Viscosity modifying admixture	**MasterMatrix®**	Overcome lack of fines within sieve grade			●			
Speciality	**MasterRoc® MS**	Microsilica as powder or slurry			●			●
Curing	**MasterRoc® TCC**	Permanent sprayed concrete linings						●
Alkali-free accelerator	**MasterRoc® SA**	Accelerator for sprayed concrete for fast buildup and early re-entry						●

Fiber Reinforced Sprayed Concrete (FRSC)

Fiber reinforced sprayed concrete is a widely used rock support measure which replaces the conventional mesh reinforcement and can be applied safely, fast and highly mechanized. The structural synthetic macrofibers from the MasterFiber® product range form an internal network and add superior tensile properties to the sprayed concrete system. MasterFiber® structural reinforcing fibers greatly improve the load bearing capability and cracking resistance of sprayed concrete. In comparison to steel fibers, the synthetic fibers are not prone to corrosion and show a better CO_2 footprint. The use of synthetic fibers guarantees a very ductile behavior of the concrete structure, which ensures very big deformation before failure. In hard and soft rock mining, changes in humidity and temperature affect weak strata, causing rock falls and rib degradation.

Effective surface support and protection against weathering of rock and strata are critical to the safety, efficiency and longevity of any mining operation. Master Builders Solutions® provides systems for supplementary surface support to strategic areas of a mine, thus increasing safety for people and infrastructure.



Sprayed Liners

MasterRoc® TML (thin mortar liner) is a range of cement-based mortar designed to support the strata in mines. Formulations have been adapted to the needs of the industry, be it dry or wet spray application, fast or normal setting times. They have an excellent bond to concrete, rock and coal and can be sprayed using simple to operate equipment.

MasterRoc® TSL (thin spray-on liner) range can be used when higher elasticity and elongation are required. These products are based on polymers which allow them to be used in thin layers supporting the strata. Due to the special polymers, they act as a seal for gases and as weathering protection.
By using simple dry spraying equipment, high application rates can be achieved. As they are sprayed in thin layers, logistics in the mines is much easier since less materials must be handled.

Fields of application	Sprayed concrete	Fiber reinforced sprayed concrete	Thin mortar liner	Thin spray-on liner
Substrate sealing, weathering protection	●	●	●	●
Rock support, structural	●	●	●	
Rock support, local surface failure (prevention of rock falls)	●	●	●	●
Mesh replacement		●	●	
Post failure behavior / warning		●		
Easy availability (equipment)	●	●	●	●
Easy logistics			●	●
Typical application thickness [mm]	30 – 150	30 – 100	10 – 50	3 – 10
Elasticity / ductility				
Stiffness / load bearing				

● very suitable
● suitable

Injection Technologies

Water Ingress Prevention with Pre-injection

Unexpected water ingress and poor ground conditions can cause significant delays and escalate costs. To counteract these risks, an economical approach is to pre-inject the ground ahead of the advancing face using microcements. MasterRoc® MP microcements provide extremely effective penetration into fine cracks in rock and fine-grained soils to give efficient water tightness, stability and durability.

MasterRoc® MP 650 / 800 / 900: extremely effective penetration into fine cracks in rock and fine-grained soils

Water Stopping

Foaming, water-sensitive polyurethanes combat water ingress quickly and effectively. Many of the products for preventing water ingress can be adjusted on site to suit local conditions.

MasterRoc® MP 355 1K: to stop low to mid-volume water ingress
MasterRoc® MP 355: to stop mid to high-volume water ingress

Ground Consolidation & Void Filling

The fast reacting and non-water-sensitive polyurethanes and polyurea silicate systems quickly stabilize poor ground and are suitable for strata consolidation and rock reinforcement. Specially developed foams are used for cavity filling and sealing bulk heads.

MasterRoc® MP 358 GS / MP 358 SC: polyurethane resin for consolidation of fractured ground
MasterRoc® MP 368 / MP 368 TIX: compact polyurea silicate injection resin, specifically designed for rapid ground consolidation
MasterRoc® MP 367 Foam: low density polyurea silicate foam for cavity filling in rock, gravel and coal



Many of the products can be adjusted on site to suit local conditions.

Solutions for Rock Bolting

Improved Cycle Times

Increased excavation depths lead to higher geotechnical challenges, such as higher rock stresses affecting the stability of the strata. Working at ever greater depths with potentially unstable strata increases the need for enhanced personnel safety within the mine environment. Master Builders Solutions® offers products that facilitate safe ground stabilization while improving mine productivity. Developed for placement of cable and rock bolts in underground mines, our innovative solutions improve cycle times for both cable and rock bolt installation, while increasing worker safety and strata control.

MasterRoc® RBA 380: compact thixotropic polyurea silicate injection resin, specifically designed for rock and cable bolt installations
MasterRoc® RBA 387: fast reacting compact thixotropic polyurea silicate injection resin suited for self-drilling anchors and automated installation

Wide Range of Products

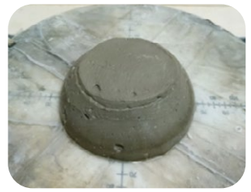
Master Builders Solutions® offers a wide range of rock bolting solutions. Besides reactive resins from the MasterRoc® RBA 38X range, the portfolio includes ready-to-use cementitious products and admixtures for OPC based grouts to adjust the behavior in terms of shrinkage compensation, corrosion protection, pumping capacity and bond improvement.

MasterRoc® MG Thick Mix:
- Highly pumpable and thixotropic
- Application for cable and/or rock bolts

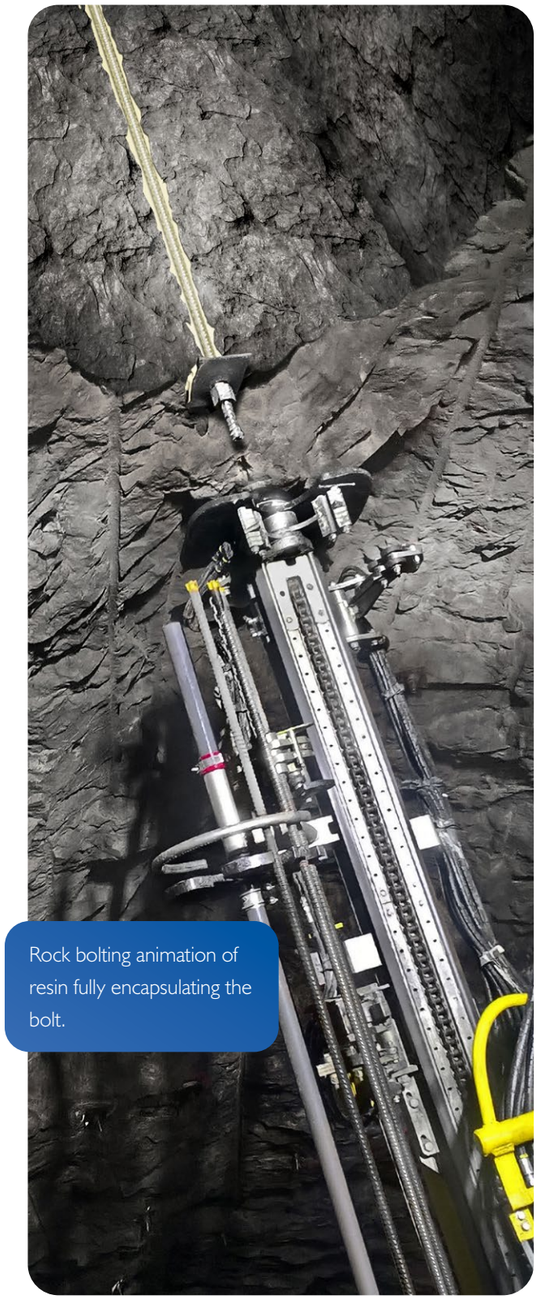
MasterRoc® MG Thin Mix:
- Highly fluid ground consolidation
- Application for rock bolts



MasterRoc® MG Thin Mix



MasterRoc® MG Thick Mix



Rock bolting animation of resin fully encapsulating the bolt.

Backfill Technologies

Backfill, the process of backfilling material into the underground voids created by mining, is becoming increasingly important because of current trends in mining: deeper excavation, optimizing ore and water recovery, improving the mine cycle as well as production while reducing environmental impact and overall costs.

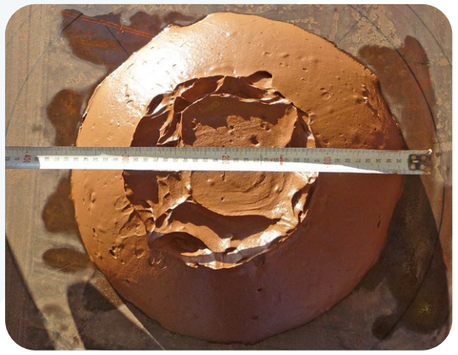
Backfill operations represent 25 to 30 per cent of the overall mining costs. Thus, optimization of the backfill process leads to significant total mining cost reductions as well as improved mining production.

Backfill material types and processes are various but generally require a blend of binders, process water and aggregates to provide the required amount of restraint to enable massive strategic support for the ore extraction sequence within mining cycle.

Master Builders Solutions® takes a scientific approach to this challenge that can help mining companies understand and run backfill operations at lower risks and lower costs with higher efficiency through our tailor-made chemistry and backfill expertise.

With over 30 years of experience in backfill, Master Builders Solutions® has been a pioneer in creating an admixture market for backfill in the mining industry.

Master Builders Solutions® extensive range of mine backfilling solutions have been developed to provide the optimum balance of high early strength and sustainable long-term strength, ensuring dimensional stability after placement by meeting (or exceeding) design fill performance requirements. Depending on the site specific requirements, Master Builders Solutions® offers an extensive range of customized solutions: rheology enhancers, viscosity modifiers, and hydration control as well as water reducers, superplasticizers and durability enhancers.



Fill without admixture



Fill with admixture

Benefits at a Glance:

Cost Optimization:

- Binder and water savings
- Production increase
- Lower maintenance costs
- Enhanced productivity or placement of the fill
- Continuous fill opportunity

Increased Safety:

- Minimizing blockage risk
- Dimensional stability after placement
- Reduced risk of fill failure or liquefaction
- Enhanced early and final strength of placed fill

Sustainability:

- Reduction of cement content in mix
- Increase in tailing underground and decrease in surface disposal of tailings
- Decrease in fresh water consumption
- Flexibility for long distance placement

Infrastructure above Ground

Admixtures for Ready-Mix and Precast Concrete

Master Builders Solutions® admixtures aid in the production of high-strength, durable concrete – a prerequisite for complex structures. They render unnecessary the mechanical compacting by vibration allowing the concrete to flow, thus increasing performance and making it easier to use. They aid in the curing process of the concrete, preventing the concrete's components from segregating. After curing they leave the concrete with a smooth and clean surface – and ensure an extremely long service life for the structure. The increased energy efficiency, higher concrete durability and better construction process contribute to reducing CO_2 emissions and to saving time and costs.

- **MasterEase®** superplasticizer for low-viscosity concrete, improving the rheological properties of high-performance concrete and allowing concrete mix design optimizations for higher performance concrete and concrete mixes with a reduced CO_2 footprint.
- **MasterGlenium®** superplasticizer to provide high water reduction and slump retention, accelerated strength development and extended workability without delayed setting characteristics.
- **MasterMatrix®** advanced rheology control solutions for selfcompacting concrete.
- **MasterPozzolith®** to plasticize, accelerate or retard concrete, improving its performance and making it more uniform and predictable in behavior.
- **MasterPolyheed®** water reducing admixture to ensure superior workability and finishing. It improves concrete performance with a wide range of cements, fly ashes, granulated slags, and aggregates, including coarse and manufactured sands.
- **MasterRheobuild®** to impart rheoplastic qualities to concrete and to improve the pumpability of fresh concrete.
- **Master X-Seed®** hardening accelerator to provide excellent high early strength development at low ambient and heat curing temperatures.

Repair and Maintenance

As a full-range supplier of repair and protection products, we offer customized solutions for your concrete structures. We do not, however, only look at the visible damage, but also provide support for the evaluation of the causes of your structural damage. As a result, we are able to offer an integrated solution, providing a specifically designed product combination based on the needs of your individual structure. With our system solutions, we help you to extend the service life of your construction and, lastly, make a significant contribution to sustainability.

- **MasterRoc® MP** series for crack repair for shaft bunkers and other concrete structures.
- **MasterRoc® STS** high build sprayed concrete mortar ideal for structural repair of metal and concrete structures that require corrosion resistance.
- **MasterRoc® MSL** portfolio of hand and spray-applied waterproofing products to stop water leakage and moisture ingression in a variety of new and existing structures.



Know-how & Service



Training and Education

Master Builders Solutions® brings extensive know-how gained through worldwide experience in solving challenging situations in tunneling and mining. In addition, support is offered frequently for clients, contractors and consultants by offering technical training courses and specialized seminars. Whenever required, and especially in the case of large projects, tailored on-site training can be organized.

Technical Services

Master Builders Solutions® supplies more than just specialty products for underground construction and mining, assisting in the selection of the most suitable combination of products for each project specific geology, as well as providing start-up supervision and site support.

More brochures on our underground construction solutions are available at:

https://master-builders-solutions.com/en-us/sectors/mining-tunneling/

Documentation available on request:

- Reference list
- Project reports
- Technical data sheets
- Design guidelines
- Method statements

Master Builders Solutions®

As Master Builders Solutions®, we are a leading global producer of responsible solutions for the construction industry, focussed on delivering our vision: Inspiring people to build better.

We provide value-added technology and market-leading R&D capabilities to improve the performance of construction materials and to enable the reduction of CO_2 emissions in the production of concrete. The comprehensive portfolio under the Master Builders Solutions® brand encompasses concrete admixtures, cement additives, and solutions for underground construction.

We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide, leveraging global technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction.

Founded in 1909, Master Builders Solutions® operates 35 production sites globally, supporting you in mastering your building challenges of today and tomorrow for a decarbonised future.

Global underground construction team

Master Builders Solutions®, with its global underground construction team, provides reliable, customer-oriented solutions focused on your needs in the tunneling and mining industries all over the world. We recognize that your success is underpinned by our ability to deliver solutions that meet or exceed your critical needs. By accompanying you from the start of your project and understanding the issues that are important to you, we can contribute to your success. We support you with product training and quality control, and our professional technical services team is on hand around the clock, helping you with specialist technical advice and trouble shooting.

Our comprehensive portfolio:

- Cement additives
- Chemical solutions for underground construction
- Mine Backfill Admixtures
- Anchoring solutions
- Fibers for Sprayed Concrete
- Injections and Water Stopping solutions

Master Builders Solutions® for the Construction Industry

MasterAir®
Complete solutions for air entrained concrete

MasterCast®
Solutions for the manufactured concrete product industry

MasterCem®
Solutions for cement manufacture

MasterCO$_2$re™
Solutions for low-clinker concrete

MasterEase®
Low viscosity for high performance concrete

MasterFinish®
Solutions for formwork treatment and surface improvement

MasterFiber®
Comprehensive solutions for fiber reinforced concrete

MasterGlenium®
Solutions for high performance concrete

MasterLife®
Solutions for enhanced durability

MasterMatrix®
Advanced rheology control for concrete

MasterPel®
Solutions for hydrophobization, anti-efflorescence and surface protection

MasterPolyheed®
Solutions for mid-range concrete

MasterPozzolith®
Solutions for water-reduced concrete

MasterRheobuild®
Solutions for high strength concrete

MasterRoc®
Solutions for underground construction and surface improvement

MasterSet®
Solutions for set control

MasterSphere®
Solutions for guaranteed freeze-thaw resistance

MasterSuna®
Solutions for sand and gravel in concrete

MasterSure®
Solutions for extraordinary workability retention

Master X-Seed®
Advanced accelerator solutions for concrete

Quantified sustainable benefits. Advanced chemistry by Master Builders Solutions®.

Let the numbers do the talking: We have portrayed some of our most eco-efficient product solutions for concrete and precast production, construction, civil engineering, and flooring.

sustainability.master-builders-solutions.com



Master Builders Solutions Deutschland GmbH
Glücksteinallee 43-45
68163 Mannheim
Germany

ugc@masterbuilders.com
https://master-builders-solutions.com/en-us/sectors/mining-tunneling/

The data contained in this publication are based on our current knowledge and experience. They do not constitute the agreed contractual quality of the product and, in view of the many factors that may affect processing and application of our products, do not relieve processors from carrying out their own investigations and tests. The agreed contractual quality of the product at the time of transfer of risk is based solely on the data in the specification data sheet. Any descriptions, drawings, photographs, data, proportions, weights, etc. given in this publication may change without prior information. It is the responsibility of the recipient of our product to ensure that any proprietary rights and existing laws and legislation are observed (04/2024).

® = registered trademark of Master Builders Solutions® in many countries of the world