

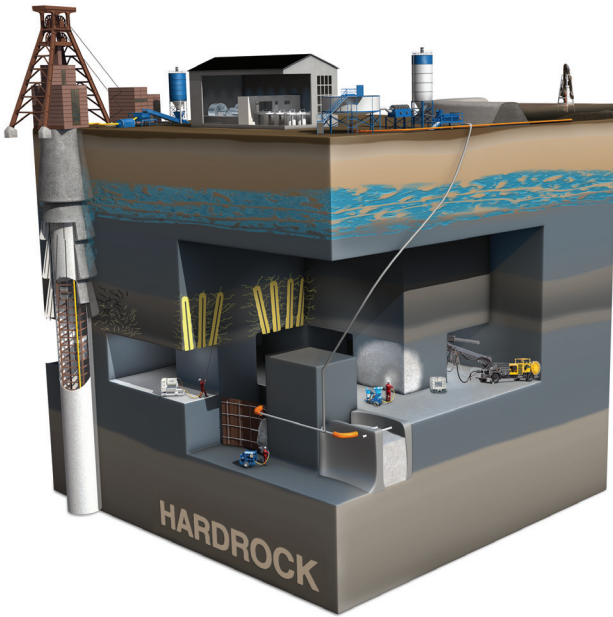


Mining Brochure

Solutions for the
Mining Industry



Our Comprehensive Portfolio for the Mining Industry

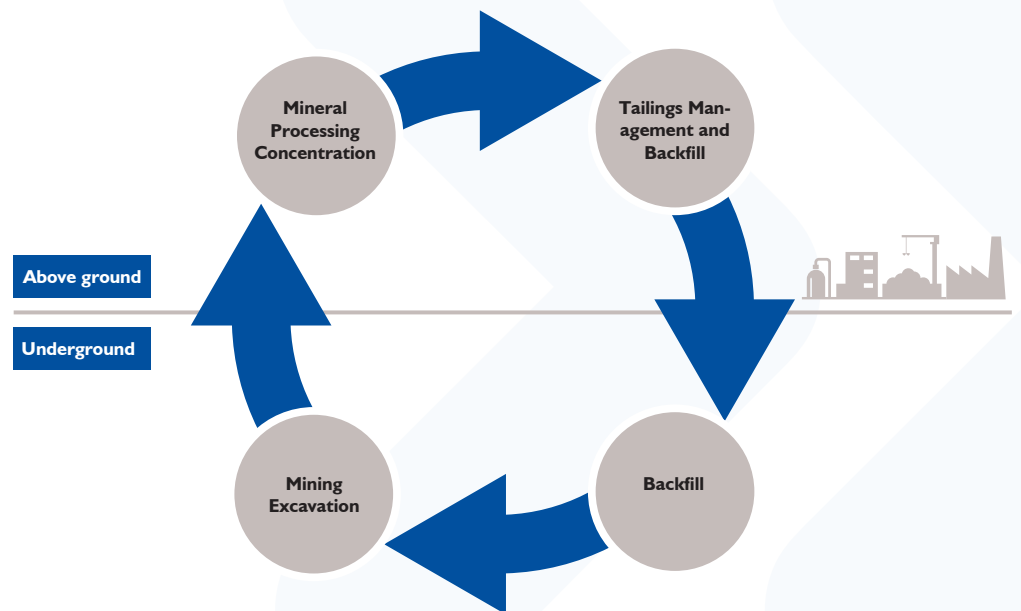


Your Partner for Safer Mining

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

- Pre-Injection
- Rock Bolting
- Injection
- Thin Spray-on Liner (TSL)
- Sprayed Concrete
- Mine Backfill
- Admixture for Concrete
- Roadway Concrete
- Grinders



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

TSL

3 – 10 mm thick flexible and elastic rock coatings for anti-weathering or vent stopping in soft rock and swelling clays, in combination with mesh and bolts



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 **MasterSet® DELVO** 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.



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 superplasticizer	●					●
	MasterEase	Solution for low viscosity / easy pumpability		●	■	●		●
	MasterSuna SBS / RCA	Special solution for manufactured sands and clay content	■				●	●
Hydration control	MasterRoc MasterSet DELVO	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			●			●
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 CO₂ 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

Thin Spray-On Liner

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 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	3 – 10
Elasticity / ductility			
Stiffness / load bearing			

* For optimal performance of a TSL in a specific field of application, we recommend consulting with your local Master Builders Solutions mining product specialist to ensure the most suitable product is selected, as not all TSL perform equally across all applications.

● very suitable
■ suitable

- **MasterRoc SRS 720:**
fast-reacting, two-component resin suitable for high-resistance surface support, stabilization, and reinforcement
- **MasterRoc TSL 865:**
elastic single-component thin spray-on liner ideal for surface reinforcement, stabilization, and weathering protection
- **MasterRoc MSL 345:**
elastic single-component polymer membrane suitable for waterproofing and protection

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 / 680 / 800 / 900 / 910:**

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 IK:**

to stop low to mid-volume water ingress

- **MasterRoc MP 355:**

to stop mid to high-volume water ingress

Ground Consolidation and 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 SC:**

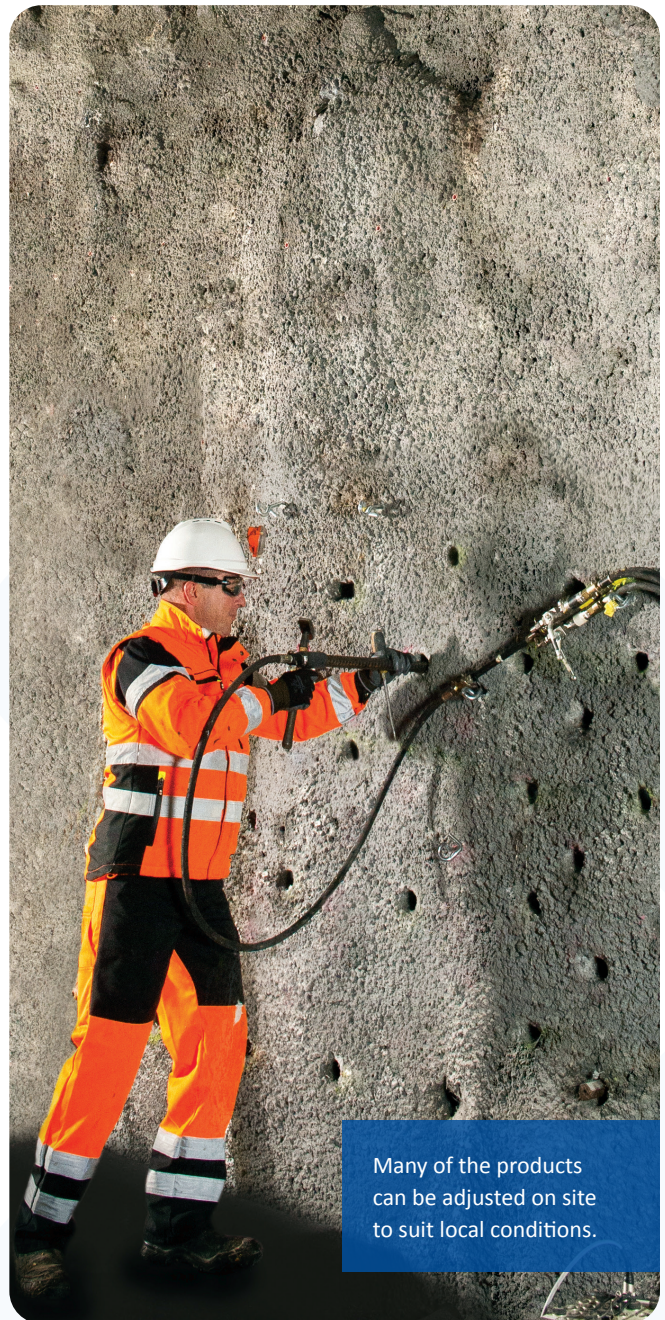
polyurethane resin for consolidation of fractured ground

- **MasterRoc MP 368:**

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:**

Highly reactive compact thixotropic polyurea silicate injection resin, specifically designed for rock and cable bolt installations Set time is approximately 160 to 200 seconds

- **MasterRoc RBA 382:**

Highly reactive compact thixotropic polyurea silicate injection resin for rock and cable bolt installations when extended open times are required. Set time is approximately 330 to 390 seconds.

- **MasterRoc RBA 384:**

Highly reactive compact thixotropic polyurea silicate injection resin for rock and cable bolt installations in areas with higher ambient temperatures and longer open times are required Set time is approximately 250 to 310 seconds

- **MasterRoc RBA 387:**

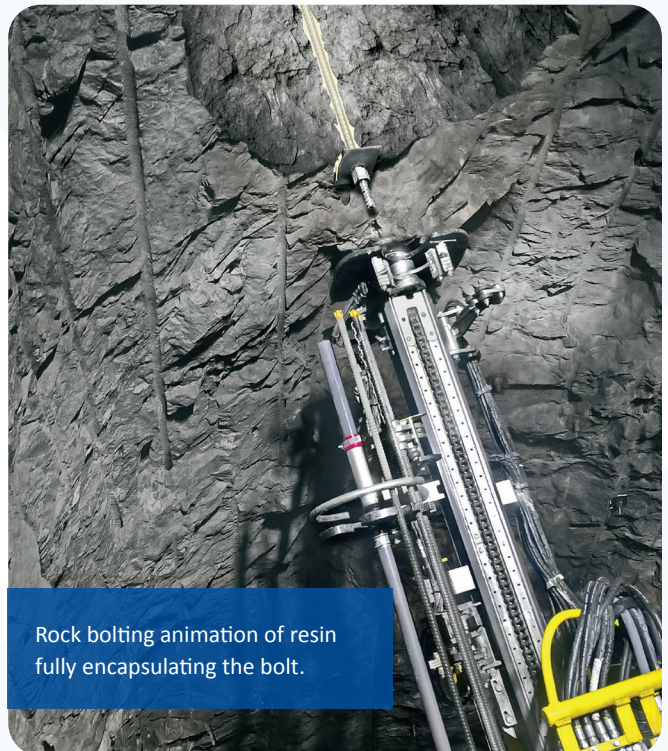
Fast reacting compact thixotropic polyurea silicate injection resin suited for self-drilling anchors and automated installations in areas with lower ambient temperatures Set time is approximately 25 - 35 seconds

Reaction characteristics:

Thixotropic time	Immediately
Foam expansion factor	1
Compressive strength	> 5000 psi (35 Mpa)
Pull-out strength	> 320 kN (600 mm)

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.



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.

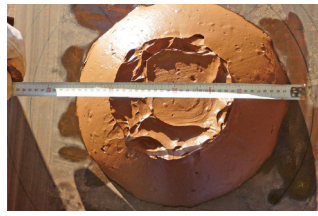
Backfill operations represent 25 to 30 percent of the overall mining costs. Thus, optimization of the backfill process leads to significant total mining cost reductions as well as improved mining production.

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 the 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



Anti-Dust and Abrasion Solutions for Cutting Tools

Applying tunnel boring machine (TBM) technology in mining replaces conventional drilling and blasting methods for main development and access drives.

As a global leader in custom-designed solutions for tunneling we deliver a comprehensive range of reliable and technically sophisticated TBM products and services for soft ground shielded machines and open hard rock methods, such as abrasion resistance solutions, bearing greases and lubricants, and anti-wear and dust suppression technologies.

Our total solution approach identifies the most cost-effective products and systems to improve TBM operational efficiency by reducing down time, increasing TBM utilization, accelerating excavation rates and improving working conditions.



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 CO₂ 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 CO₂ 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 self-compacting 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.

Global Network of Underground Specialists

Master Builders Solutions, with its global underground construction team, is a world leader in the provision of reliable, customer-oriented solutions focused on your needs in the tunneling and mining industries. 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 technical advice and troubleshooting.



Hands-On Exercises and Training



Master Builders Solutions provides technical shotcrete and injection training courses on a frequent basis centrally located in the Hagerbach underground facility in Switzerland. The courses are organized both as demonstration workshops in realistic underground settings and as practical injection operators training. The demonstration workshops are “show-and-tell” sessions that aim to visualize and explain the possible types of application and the technical performance of our injection systems. The practical injection operators training is offered exclusively to injection customers who are working with Master Builders Solutions injection systems. During this training the participants are given the chance to work in small groups, taking part in hands-on exercises under the supervision of experienced instructors. The main objective is to gain practical skills for the correct application and execution of injection work. In addition, customized training is available for individual projects worldwide when required by customers.

Master Builders Solutions

About Master Builders Solutions

Master Builders Solutions is a leading global manufacturer of concrete admixtures, as well as other sustainable solutions for the construction industry, focussed on delivering its vision: **Inspiring people to build better**. Master Builders Solutions provides value-added technology and market-leading R&D capabilities to improve the performance of construction materials and to enable the reduction of CO2 emissions in the production of concrete. Founded in 1909, Master Builders Solutions has ca. 1600 employees operating 35 production sites globally, supporting their customers in mastering their building challenges of today – for a decarbonised future.

Our Comprehensive Portfolio

- Concrete admixtures
- Cement additives
- Chemical solutions for underground construction
- Waterproofing solutions
- Performance grout additives
- Wind turbine grouts

Master Builders Solutions Admixtures US, LLC

23700 Chagrin Boulevard
Beachwood, OH 44122 USA
(800) 628-9990

master-builders-solutions.com/en-us
ugc@masterbuilders.com

Master Builders Solutions Canada, Inc

1800 Clark Boulevard
Brampton, Ontario L6T 4M7 CANADA
(289) 360-1300

master-builders-solutions.com/en-ca
admixtures@masterbuilders.com

Email: ugc@masterbuilders.com

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