

Injection Technologies

Solutions for Underground Construction



Master Builders Solutions®

At Master Builders Solutions®, we are a leading global provider of responsible solutions for the construction industry, driven by our vision — Inspiring people to build better.

We deliver value-added technologies and industry-leading R&D capabilities to enhance the performance of construction materials while enabling the reduction of CO₂ emissions in concrete production. Our comprehensive portfolio includes concrete admixtures, cement additives, and specialised solutions for underground construction, all under the trusted Master Builders Solutions® brand.

Through close collaboration across disciplines and regions, we leverage global innovations and deep local knowledge to develop solutions tailored to the needs of the construction industry. Drawing on experience from countless projects worldwide, we are committed to helping our customers achieve success and advance sustainable construction.

With a legacy dating back to 1909, Master Builders Solutions® has more than 1,700 employees and 37 production sites globally, including over 150 employees and 6 production facilities across Australia and New Zealand. We are dedicated to supporting our customers in meeting today's challenges and building towards a decarbonised future.

Global Underground Construction Team

At Master Builders Solutions® our global underground construction team delivers reliable customer-focused solutions for the tunnelling and mining industries across Australia, New Zealand, and worldwide. We understand that your success depends on our ability to meet and exceed critical project requirements. From project initiation through to completion, we work alongside you to address key challenges and deliver tailored solutions. Our commitment extends beyond products as we provide comprehensive product training, quality control, and 24/7 access to our professional technical services team who offer specialist advice and on-site troubleshooting when you need it most.

Our comprehensive portfolio:

- Concrete admixtures
- Cement additives
- Chemical solutions for underground construction



Pre-Injection

Unexpected water ingress and poor ground conditions during underground construction often cause costly delays and environmental impacts. Pre-injecting the ground ahead of the advancing face is a proven and economical method to prevent water ingress and stabilise ground conditions. Micro-cements and colloidal silica, also known as mineral grout, offer a cost-effective and sustainable solution, enhancing ground stability and improving working safety.

Water Stopping

Foaming, water-sensitive polyurethanes offer a fast and effective solution for controlling water ingress. In more challenging conditions, combining drainage with fast-reacting foaming resins ensures reliable water management and ground stability.

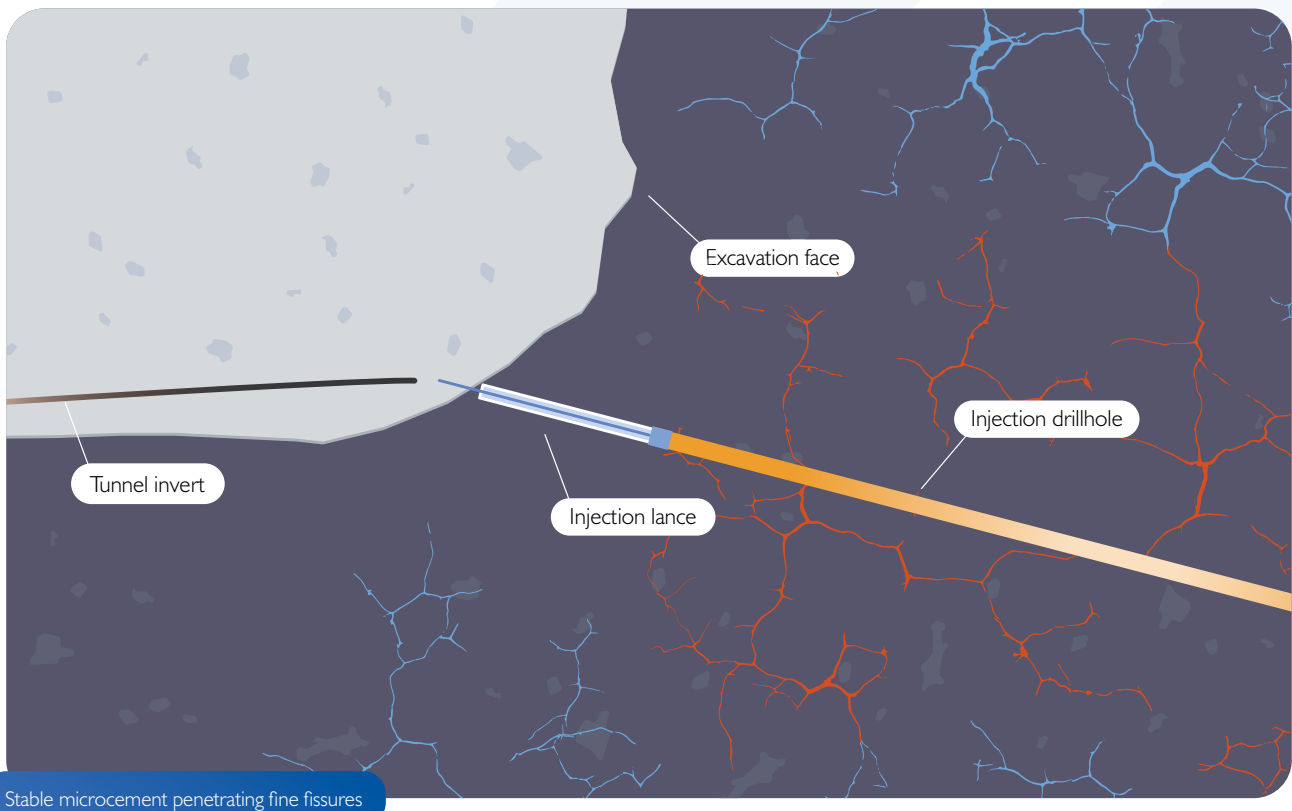
Ground Consolidation

Fast-reacting, non-water-sensitive polyurea silicate systems quickly stabilise poor ground. The high-foaming version is ideal for void filling, while less water-sensitive polyurethanes are also suitable for ground strengthening.

Crack Sealing and Concrete Rehabilitation

Acrylic resins are particularly suited for rehabilitation injection in cast concrete, segment linings, and brick or masonry-lined tunnels.

Microcement



Fast Setting, Fast Cycle

MasterRoc® MP microcements are a range of superfine Portland cements specially designed for pre-injection applications. Their exceptional fineness enables deep penetration into fine cracks and fine-grained soils, ensuring effective water sealing, ground stability, and long-term durability.

These microcements offer a significant technological advantage in cementitious injection through rapid and controlled setting. This innovation allows for uninterrupted blasting rounds or continuous injection sequences, significantly improving productivity. Compared to standard cements, which typically require a six-hour wait between blasting rounds, MasterRoc® MP microcements reduce this to just two hours, delivering valuable time savings on site.



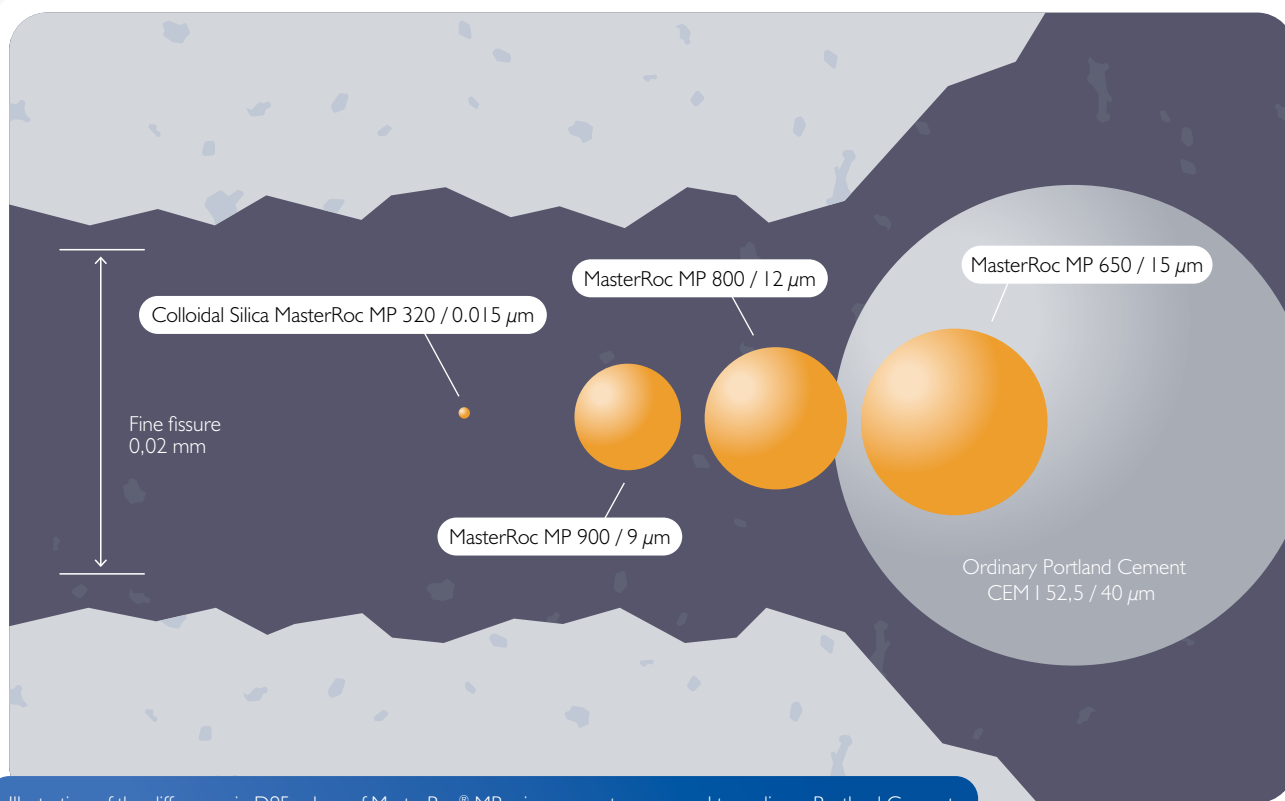


Illustration of the difference in D95 values of MasterRoc® MP microcements compared to ordinary Portland Cement

Microcement - Stable Penetrating Grout

A stable grout is essential for effective penetration into rock formations, something that ordinary cement cannot provide. Stable grouts travel further without losing performance, reducing drilling and pumping requirements and saving valuable time. Microcements are particularly suited for this purpose, as they penetrate fine cracks and inter-granular spaces while allowing for high pumping pressures without compromising stability. An additional advantage is their compatibility with standard cement injection equipment, making them both efficient and practical on site.

Limit Grout Travel Distance with Accelerated Setting of Microcement

The setting time of microcement grout suspensions can be precisely adjusted using a specially formulated alkali-free accelerator. This method allows the open time of the grout to be controlled between 1 and 20 minutes, ensuring the suspension remains pumpable until it sets.

This flexibility is ideal for controlled injection applications, where limiting grout spread in highly permeable rock masses and soils is critical, or in cold groundwater conditions where rapid setting is required. MasterRoc® MP microcements are also available, on request, as slower-setting sulphate-resistant versions and in various grades based on maximum particle size, as indicated by D95 values.

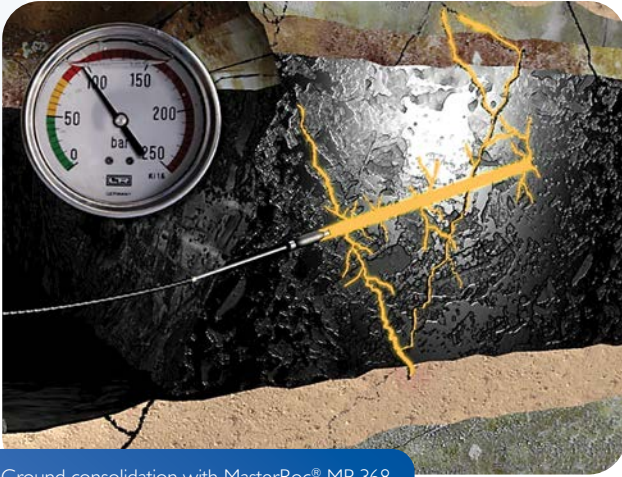
Polyurethane and Polyurea Silicates

Water Stopping, Water Sealing, Consolidation and Cavity Filling

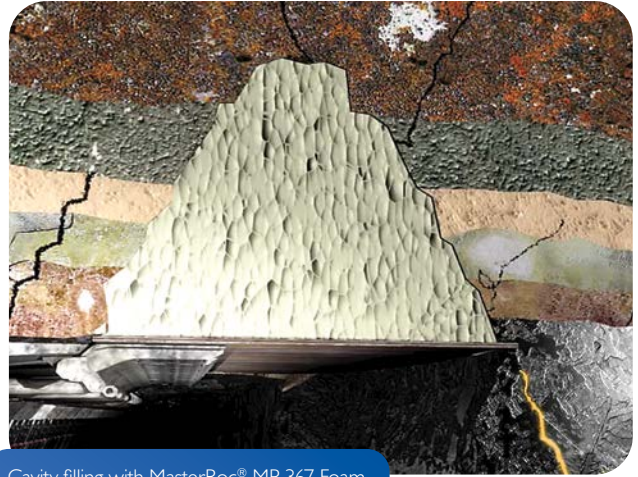
The MasterRoc® MP 350 series of polyurethanes and the fire-resistant MasterRoc® MP 360 series of polyurea silicates (DIN 4102-B2 certified) are designed for water stopping and sealing, strata consolidation, and cavity filling applications, meeting the modern demands of the tunnelling and mining industry. The range extends from convenient one-component polyurethanes for small-scale water sealing to robust two-component systems capable of controlling severe water ingress.

Many of these products can be adjusted on-site using different accelerators to suit specific ground conditions and performance requirements. All MasterRoc® MP polyurethane and polyurea silicate systems are solvent-free, with all foaming products forming closed-cell structures that act as reliable water barriers. They have been independently tested and certified for both technical performance and health and safety compliance.





Ground consolidation with MasterRoc® MP 368



Cavity filling with MasterRoc® MP 367 Foam

Water Stopping

MasterRoc® MP 355 IK

- To stop low- to mid-volume water ingress
- Foaming time: 10 to 50 seconds
- Foam factor: 20 to 30
- MasterRoc® MP 355 IK DW is an almost identical product with a potable water approval and more flexible behavior
- 1-component pump

MasterRoc® MP 355

- To stop mid- to high-volume water ingress
- Reaction time: 10 to 70 seconds depending on accelerator type and amount
- Foam factor: 8 to 20 depending on accelerator type and amount of water
- MasterRoc® MP 355 Thix is a similar product for very high-volume water ingress
- 2-component pump

Water Sealing

MasterRoc® MP 350

- For permanent structural crack sealing of concrete and masonry structures
- Reaction time: 30 to 100 seconds (accelerator provided to adjust reaction time)
- Foam factor: up to 8
- 1-component pump

Ground Consolidation

MasterRoc® MP 358 GS / MP 358 SC

- To consolidate fractured ground, low sensitivity to water
- Reaction time: 30 to 70 seconds
- Foam factor: GS – up to 1.5, SC – up to 3
- 2-component pump

MasterRoc® MP 368

- Dense glue-like resin for fractured rock, gravel and coal, not sensitive to water
- Gel time / solidification time: 90 seconds / 160 seconds
- Foam factor: 1
- 2-component pump

MasterRoc® MP 367 Foam

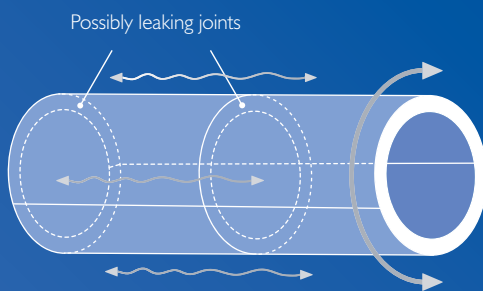
- Brittle foam for cavity filling in rock, gravel and coal, not sensitive to water
- Foaming time: 20 to 60 seconds
- Foam factor: up to 30
- 2-component pump

MasterRoc® MP 368 TIX

- Thixotropic dense glue-like resin for very fractured rock and strata, not sensitive to water
- Gel time / solidification time: 140 seconds / 210 seconds
- 2-component pump

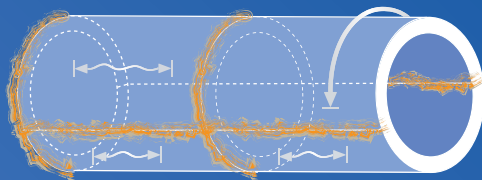
Acrylic Resins

Crack injection in tunnel linings



Water can flow in every direction, before and during injection

Goal of injection into sections and barriers: subsequently removing water



Strong Durable Gels for Crack Sealing and Concrete Rehabilitation

The MasterRoc® MP acrylic series offers high-performance acrylic resins designed to permanently seal fine cracks in concrete while accommodating limited movement thanks to their flexibility and swelling properties. These resins are ideal for curtain injection behind leaking tunnel linings and diaphragm walls.

In addition to crack sealing, they provide immediate stabilisation of weak soils and sands while effectively preventing water ingress. Widely applied in major infrastructure projects, including power station generator housings, they deliver long-lasting waterproofing and concrete rehabilitation solutions.

Overcoming underground construction challenges begins with choosing the right partner. Through continuous innovation and tailored solutions, Master Builders Solutions® helps customers achieve efficient, safe, and successful operations.

Crack Sealing and Consolidation

MasterRoc® MP 300

- Flexible, adhesive gel with adjustable set times and water-to-resin ratios, maintaining excellent swelling properties even after dry period
- Reaction time: 10 seconds to 30 minutes
- Viscosity: 2 - 5 mPa·s (cP), depending on mixing ratio
- 2-component pump

MasterRoc® MP 707

- Low viscosity, fast reacting acrylic resin for permanent water sealing and layer curtaining of concrete and masonry
- Reaction time: 3 and 22 minutes
- Viscosity: 5 mPa·s
- 2-component pump



Colloidal Silica



The Mineral Grout

MasterRoc® MP 320 and MP 325 are colloidal silica gels, also known as “mineral grouts”, made from natural ingredients — quartz sand, water, and salt. They form a stable liquid dispersion of nanometric, spherical particles composed of 100% amorphous silicon dioxide.

These products are used in jointed rock and fine-grained soils, often combined with microcement injections, to provide durable water sealing and ground stabilisation. With a viscosity similar to water, colloidal silica easily penetrates soils and fine rock fissures, delivering superior penetration and

permanent stabilisation of fine, silty sands.

Unlike sodium-silicate-based grouts, colloidal silica is durable, maintains groundwater pH, and continues to strengthen over time. Gel time is adjustable from 10 minutes to 2 hours, allowing for project-specific flexibility. Standard cement injection equipment can be used, and future rehabilitation or leak repairs are simpler and less time-consuming than with most other waterproofing systems.



Training and Education

We regularly provide technical injection training at the Hagerbach underground facility in Switzerland. Courses include demonstration workshops in realistic underground settings and practical training for injection operators. The workshops are hands-on “show-and-tell” sessions designed to demonstrate application methods and the technical performance of our injection systems.

Practical operator training is offered exclusively to customers using Master Builders Solutions® injection systems. Participants work in small groups under the guidance of experienced instructors to develop practical skills for the correct execution of injection works. Tailored training for

specific projects is also available worldwide upon request.

Technical Services

We provide more than just a range of products. Assisting customers in selecting the right injection system and defining the appropriate injection method, as well as providing initial supervision and on-site training for customer personnel, is a key part of our approach. We collaborate closely with equipment and injection accessory suppliers to deliver the best, most cost-effective, and complete technology solutions. Our solutions are backed by local research, development, and testing conducted at our Seven Hills facility, ensuring they are tailored to meet the specific demands of the ANZ market.

More brochures on our underground construction solutions are available at:

ugc.master-builders-solutions.com

Documentation available on request:

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

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

MasterCO₂re™

Solutions for low-clinker concrete

MasterEase®

Low viscosity for high performance concrete

MasterFinish®

Solutions for formwork treatment and surface improvement

MasterFlow®

Solutions for precision grouting

MasterFiber®

Comprehensive solutions for fiber reinforced concrete

MasterGlenium®

Solutions for high performance concrete

MasterKure®

Solutions for concrete curing

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

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



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