Water Management
Solutions for Underground Construction
Master Builders Solutions from BASF

The Master Builders Solutions brand brings all of BASF’s expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry.

Our know-how and experience as a global community of BASF construction experts form the core of Master Builders Solutions. We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global BASF 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.

The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, chemical solutions for underground construction, waterproofing solutions, sealants, concrete repair & protection solutions, performance grouts, and performance flooring solutions.

Global underground construction team
BASF, 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 troubleshooting.
Water management for safe, cost-efficient and reliable underground constructions

The tunneling and underground construction industry is facing enormous challenges today: Our clients are aiming at fast economical excavation and construction, low maintenance costs, and 120 years of service life. Stations, caverns, shafts, or tunnels should be attractive, safe and comfortable more than ever. Ground water ingress through concrete and waterproofing systems is feared by contractors and owners because it poses a major threat to their goals.

The challenge is to find the water management solution best suited for the type of tunnel and ground conditions. And this is where we come in.

BASF provides you with high-end water management solutions that are extremely effective, long-lasting, and easily applied. Depending on the type of underground construction you are working on, we offer some pioneering waterproofing technologies with maximum safety and easy maintenance.

Our product systems are tailored to the specific requirements of underground construction designs and various ground conditions. Our water management solutions not only include spray-applied membranes for optimum water-tightness in Drill & Blast/NATM tunnels and flexible elastic coatings for Cut and Cover tunnels, but also pre-injection technologies to help protect the environment and improve the ground.

Mastering underground construction challenges requires the right partner. Continuous innovation and customized solutions ensure that customers using Master Builders Solutions operate successfully and to the highest safety standards.
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On the safe side with pre-injection
Unexpected water ingress and bad ground conditions are feared among contractors working in underground construction. There are high costs involved, the environment suffers damage, and construction time is delayed. Thankfully, there is a cost- and time-efficient approach to minimize the risk. Pre-injecting the ground ahead of the advancing face helps avoid water ingress and fortify the ground. Microcements and colloidal silica – also known as mineral grout – make underground construction a lot safer. Moreover, they are eco-friendly.

- MasterRoc MP microcements for pre-injection application, providing extremely effective penetration into fine cracks in rock and fine grained soils
- MasterRoc MP 325 colloidal silica gel (mineral grout) for water sealing and ground stabilization in jointed rock and fine-grained soils, as a supplement to microcement injection
- MasterRoc MP 350 series of polyurethanes and the fire resistant MasterRoc MP 360 series of polyurea silicates for water stopping and sealing, strata consolidation, and cavity filling applications

Waterproofing Solutions for Drill & Blast/NATM Tunnels

Are mitigating measures necessary to improve conditions and make construction easier? Are proven sheet membranes the right choice, or rather innovative spray-applied double-bonded membranes? We can give you sound advice on which water management technologies are the best match for your specific project.
Sprayable waterproofing membrane as a clever master plan

MasterSeal 345 is a new, advanced concept for waterproofing based on a double-bonded sprayable waterproofing membrane. It can resolve technical problems which have proved difficult with conventional sheet membranes by preventing the migration of water on either side of the membrane.

In case of rehabilitation of old tunnels, this innovative membrane is particularly suitable for projects with limited space. It brings great benefits for concrete structures with complex geometries, offering a flexible and continuous waterproofing system without discrete joints, water stops, or compartmentalization.

The simple spray-on procedure makes installation very fast, getting you ahead of schedule.

Application areas:
- New tunnels
- Refurbishment projects
- Cross passages
- Tunnel intersections

Advantages:
- Easy application by spraying with standard equipment
- Two-sided bond with sprayed or cast-in-place concrete allows for composite behavior
- The fully bonded system provides excellent water tightness preventing development of water migration in both concrete-membrane interfaces
Challenging Projects Solutions

1. **Metro Crossrail, London, UK**
   Scheduled to be up and running in 2018, the new Elizabeth line built by Crossrail Limited is the largest construction project ever undertaken in Europe. As the design made undrained spray-applied waterproofing necessary, MaterSeal 345 membrane was selected after extensive testing. Thanks to accurate production planning, transport, and emergency stocks kept available, BASF was able to supply 2.15 million ft² (200,000 m²) of MasterSeal 345 membrane on time.

2. **Spadina Subway, Toronto, Canada**
   The Toronto-York Spadina Subway Extension Project will be the first rapid transit line to cross the boundary between the City of Toronto and the York Region. As some of the stations were constructed by SEM (Sequential Excavation Method), a waterproofing solution was needed that could be applied without large equipment that would disturb the construction works. MasterSeal 345 membrane was selected because of its flexibility and fast application. Over 64,500 ft² (6,000 m²) of MasterSeal 345 membrane was used in this project.

3. **Metro Monterrey, Monterrey, Mexico**
   As Monterrey’s population is constantly growing, public transport development has long been a priority. To expand the Monterrey Metro, also known as Metrorrey, a third line has been constructed between Estación Zaragoza and Hospital Metropolitano consisting of 4.7 miles (7.5 km) of track and eight passenger stations. MasterSeal 345 membrane provided the flexibility and easy application the contractor was looking for, and over 75,000 ft² (7,000 m²) of MasterSeal 345 membrane was applied in the station sections.

4. **SS106 Jonica Autostrada, Calabria, Italy**
   The Strada Statale 106 is a traditional highway in Calabria in the south of Italy. It has several tunnels, some of which were refurbished in 2011. These tunnels needed to stay open during refurbishment and hence, only one half of the tunnel could be waterproofed at a time. MasterSeal 345 membrane was chosen, as it is flexible and can be applied quickly. MasterSeal 345 membrane was applied at the rate of 750 to 1050 ft² (70 to 100 m²) per hour, while cars passed through the tunnel as usual. Over 118,000 ft² (11,000 m²) of MasterSeal 345 membrane was used in this project.

Our double-bonded spray-applied waterproofing membrane MasterSeal 345 encompasses high-performance, easy application and cost-efficiency, setting new standards for waterproofing. Already, there are various large underground construction projects in different parts of the world where the technology was successfully used.
Waterproofing Solutions for Cut and Cover Tunnels

Serviceability and easy maintenance are major concerns when building underground constructions such as Cut and Cover tunnels. Waterproofing is an excellent option to reduce maintenance costs significantly. Waterproofing coatings on the exterior of the tunnel have the advantage that water cannot move behind this barrier, even if the coating is damaged.

Waterproofing coating*
MasterRoc WP 1800 is a flexible, seamless elastic coating on the extrados of the tunnel, with easy-to-apply, instantly reacting, 2-component system, and high durability. The spray applied and fast setting coating can easily be applied on vertical surfaces and has no issues with complex geometries. It is fire-resistant, remains elastic at low temperatures and prevents leakage even when punctured, because it bonds well with the concrete.

![Diagram of the waterproofing system](image)

1. One coat MasterRoc WP 1800
2. MasterTop P 617 Primer
3. Concrete substrate

*MasterRoc WP 1800 and MasterTop P 617 products are not available in North America at present. Please contact your BASF representative or call (800) 628-9990 for details.
Keeping Water out on the Long Run: Repair and Maintenance after Completion

Water stopping
Foaming, water-sensitive polyurethanes are designed to combat water ingress quickly and effectively. For particularly difficult cases, the solution is a combination of drainage and the injection of a fast-reacting foaming resin.

**Polyurethanes:**
- MasterRoc MP 355
- MasterRoc MP 355 1K
- MasterRoc MP 355 1K DW

Crack injection in tunnel linings
- Potential leaking joints
- Water can flow in every direction, before and during injection
- Goal of injection into sections and barriers: Seal cracks and stop water ingress

When the underground construction is completed, the ability to swiftly deal with unexpected water ingress and cracks becomes paramount. We have the right products to help you stop water ingress and make repairs without hassle or delay. Additionally, you can benefit from our acrylics injection products that permit the repair of sheet membrane systems.

Crack sealing and concrete rehabilitation
Our range of acrylic resins is perfect for rehabilitation injection of cast-in-place concrete, segment linings, and brick & masonry lined tunnels.

**Acrylic resins:**
- MasterRoc MP 304
- MasterRoc MP 307 CE
- MasterRoc MP 309
Training and education
BASF brings extensive know-how gained through worldwide experience in solving challenging situations in mechanized tunneling. In addition, we support our clients, contractors, and consultants by frequently offering technical trainings and specialized seminars. Whenever required, and especially in the case of large projects, tailored on-site training can also be organized.

Technical services
BASF supplies more than just specialty products for underground construction, 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.


Documentation available on request:
- Reference list
- Project reports
- Technical data sheets
- Design guidelines
- Method statements
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Master Builders Solutions products from BASF for the Construction Industry:

- **MasterAir®** Solutions for air-entrained concrete
- **MasterBrace®** Solutions for concrete strengthening
- **MasterCast®** Solutions for manufactured concrete products
- **MasterColor®** Solutions for concrete coloring
- **MasterEmaco®** Solutions for concrete repair
- **MasterFiber®** Comprehensive solutions for fiber reinforced concrete
- **MasterFinish®** Solutions for formwork treatment
- **MasterFlow®** Solutions for precision grouting
- **MasterGlenium®** Solutions for high-performance flowing concrete
- **MasterInject®** Solutions for concrete injection
- **MasterKure®** Solutions for concrete curing
- **MasterLife®** Solutions for enhanced durability
- **MasterMatrix®** Advanced rheology control solutions for self-consolidating concrete
- **MasterPel®** Solutions for watertight concrete
- **MasterPolyheed®** Solutions for moderate slump concrete with superior finishability
- **MasterPozzolith®** Solutions for conventional slump concrete
- **MasterProtect®** Solutions for concrete protection
- **MasterRheobuild®** Solutions for high slump concrete
- **MasterRoc®** Solutions for underground construction
- **MasterSeal®** Solutions for waterproofing and sealing
- **MasterSet®** Solutions for set control
- **MasterSure®** Solutions for workability control
- **MasterTop®** Solutions for industrial and commercial floors
- **Master X-Seed®** Solutions for strength enhancement
- **Ucrete®** Flooring solutions for harsh environments

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