Solutions for Underground Construction
Sprayed Concrete
Sprayed Concrete

Introduction

Master Builders Solutions – connecting innovation and reliability for a sustainable future

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.

The know-how and experience of 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.

Save Time and Reduce Costs

Sprayed concrete is widely used for ground support in tunneling, mining, hydro-power construction and slope stabilization. BASF gives you not only cost-effective products, but also technical services that are tailored to your needs.

Global Underground Construction Team

BASF, with its global underground construction team, is a world leader in the provision of reliable, customer-oriented product solutions focused on your needs in the tunneling and mining industries. We recognise 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.
Expert Advice, Advanced Systems

Master Builders Solutions provides technical consulting expertise at every project stage, keeping you up to date with the most appropriate technologies from start to finish. We support you with product training and quality control, and our professional technical services team is on hand 24 hours a day, 7 days a week, helping you with specialist technical advice and troubleshooting.

- Innovative solutions through continual product development dedicated to tunneling and mining needs.
- Admixture technologies for high quality sprayed concrete applications.
- Unique sprayable fully bonded waterproofing membrane which supports composite lining designs.

Customised Solutions

No two projects are the same: from geotechnical issues to time frames and design constraints - the list of variables is extensive. Master Builders Solutions takes a consultative approach to help you solve the challenges ahead, with resources that ease the way.

- Technical experts and laboratory resources can help you with product selection so that you get it right first time.
- Our global reputation and reliability foster the trust you require from a technology supplier.

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.
Solutions

Safe Systems for High Performing Concrete

You want a sprayed concrete solution that is safe in application and use and formulated to last. Master Builders Solutions’ wide range of admixtures and additives is available during concrete batching to ensure that specifications are reached or even exceeded, whatever your needs.

Superplasticizers

MasterGlenium® is range of high-performance superplasticizers, for reduced accelerator consumption, reduced bleeding and lower levels of segregation. Sprayed concrete mixes that combine low w/c ratios with superior flow and workability allow you to achieve concrete with excellent early strength development as well as high long-term strength and improved durability.

Hydration Control

MasterRoc® HCA DELVO®CRETE is a cement hydration control system for wet and dry sprayed concrete application, grouting and injection. It is capable of maintaining a pot life of up to 72 hours, allowing for total flexibility of site logistics.

Concrete Improvement

MasterRoc TCC 735 is a chloride-free liquid concrete-improving admixture, which enhances the quality of sprayed concrete in both plastic and hardened states. Its unique composition ensures better hydration of the cement. As a result, initial shrinkage is substantially reduced, bonding characteristics are enhanced and density and compressive strength are increased.

Pumping Aid

MasterRoc TCC 780 is a liquid pumping aid for sprayed concrete mixes with difficult or poorly graded aggregates. It improves the thixotropy of the mix, eliminating the risk of segregation, thus improving pumpability.

Pump Lubrication Aid

MasterRoc LUB 1 is specially formulated for lubricating concrete pumps, hoses and pipelines prior to concrete pumping or spraying.
Set Accelerators

MasterRoc SA low dosage, alkali-free accelerators are developed with the safety as a priority, providing low dust and rebound levels. Additional benefits include both high early strength gain and long-term strength development, as well as enhanced durability.

Microsilica

MasterRoc MS Microsilica improves the pumpability and workability performance of sprayed concrete mixes in the fresh state while reducing permeability and increasing density and long-term strength performance in the hardened state. It is available in both densified powder and liquid formulations.

Colloidal Silica

MasterRoc MS Colloidal Silica is an amorphous precipitated silica suspension (liquid) designed to improve the properties of sprayed concrete in both the plastic and hardened states. When improved pumpability and sprayability and reduced rebound in fresh mixes are desired, our colloidal silica solution delivers, at the same time reducing permeability and improving durability in the hardened state.

Structural Plastic/Steel Fibers

MasterRoc FIB structural reinforcing fibers for sprayed concrete application, made of both steel and polypropylene, greatly improve the load absorption capability and cracking resistance of sprayed concrete mixes. They are easy to dispense and use, giving even distribution throughout the mix to ensure uniform results.
Alkali-free Accelerators

SEM pictures (32 000 X magnification)
Normal OPC HYDRATION @ 10 min

SEM pictures (32 000 X magnification)
WITH MasterRoc SA 160 (9% bcw) @ 10 min

Durable Sprayed Concrete

The MasterRoc SA series of alkali-free accelerators has been developed in response to the demand for durable, high-quality sprayed concrete that minimizes any environmental risk. These innovations are an essential part of modern sprayed concrete.

Process Planning and Set-up Support

Master Builders Solutions has the experience and track record to ask the right questions. We will partner with you to ensure that all the necessary preparations are in place for you to apply sprayed concrete successfully.

Key benefits of using our systems include:

- High performance with relatively low dosages
- Fast setting and constant early strength development, allowing fast application and high build rates
- Ability to apply sprayed concrete in areas with moderate water ingress
- Successful sprayed concrete application in ground freezing projects
- Highly durable sprayed concrete for permanent support
- Wide range of products to suit local cements, conditions and site needs

The benefits of MasterRoc SA alkali-free accelerators are maximized when combined with our high-performance MasterGlenium superplasticizers and MasterRoc HCA DELVO CRETE hydration control stabilizers. We recommend the use of Atlas Copco equipment, which incorporates our integrated dosing system in order to ensure accurate dosage control.

The MasterRoc SA series of alkali-free accelerators has the added reassurance of being the market-leading solution.
Research & Development

BASF has a dedicated underground construction development team which focuses its efforts on tailoring the properties of sprayed concrete’s microstructure. Part of the BASF Corporation R&D community, our specialists conduct intensive research on the critical processes at the crystal scale. This work is paving the way for the continuous development of new admixtures which will continue to significantly improve the material properties of sprayed concrete:

Comparison of strength development

Cement:
CEM I 42.5N NORMO4 Untervaz (450 kg)

Additive:
MasterRoc HCA 10 (0.2%)
Sprayed Concrete

Long-Term Durability

The combination of a primary sprayed concrete lining and secondary lining together with our fully bonded membrane MasterSeal® 345 can be designed for long-term durability: a permanent, long-term, durable waterproof tunnel lining.

The well-known composite lining concept is one of BASF’s innovative solutions.

Cost Effective

By employing MasterSeal 345, you can expect to reduce your costs significantly. Typically, costs drop by between 15-20% compared to conventional methods.

Reduced Excavation

Adopting the composite lining approach simplifies the design and delivery of tunnel construction - a practical solution on many levels. Benefits of the composite lining approach:

- Reduced excavation size
- Reduced overall lining thickness
- Fewer construction processes
- Reduced construction programme
Know-How and Service

**Design Support**

BASF provides support to tunnel designers and owners on issues relating to the design of complete system solutions throughout all phases of the tunneling project, which might include:

- The required properties of sprayed concrete acting as a temporary or final support of underground excavations.
- Excavation support by means of composite linings (sprayed concrete + waterproofing membrane + sprayed concrete) and the practicability of this method in special sections such as niches, cross passages and caverns.

**Training and Education**

BASF brings extensive know-how gained through our long-standing experience in solving challenging situations in tunneling. In addition, we frequently support our clients by offering technical training courses as well as organizing tailored training on large projects whenever required.

**Technical Services**

Besides supplying products to our customers, BASF assists them in the selection of the appropriate system and methodology as well as providing initial supervision and site training of our clients’ personnel.

BASF cooperates globally with leading equipment manufacturers to ensure that products meet placing performance requirements.
Future road tunnel: Tunnel face and freshly sprayed first lining using MasterRoc alkali-free accelerator technology.

Future metro station cavern: simultaneous excavation and spraying using MasterRoc technology.
Escape tunnel completed with MasterRoc sprayed concrete technology.

More brochures on our underground construction solutions are available at www.ugc.basf.com

Documentation available on request:
- Reference list
- Project reports
- Technical data sheets
- Design guidelines
- Method statements

The information given in this BASF publication is based upon the present state of our scientific and practical knowledge. As the information herein is of a generic nature, no assumption can be made as to a product’s suitability for a particular use or application and no guarantee or warranty as to its accuracy, reliability or completeness either expressed or implied is given.
Master Builders Solutions from BASF for the Construction Industry

MasterAir®
Complete solutions for air entrained concrete

MasterBrace®
Solutions for concrete strengthening

MasterCast®
Solutions for the manufactured concrete product industry

MasterCem®
Solutions for cement manufacture

MasterEmaco®
Solutions for concrete repair

MasterFinish®
Solutions for formwork treatment

MasterFlow®
Solutions for precision grouting

MasterFiber®
Comprehensive solutions for fiber reinforced concrete

MasterGlenium®
Solution for hyperplasticized 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 water tight concrete

MasterPolyheed®
Solutions for high performance concrete

MasterPozzolith®
Solutions for water-reduced concrete

MasterProtect®
Solutions for concrete protection

MasterRheobuild®
Solutions for superplasticized concrete

MasterRoc®
Solutions for underground construction

MasterSeal®
Solutions for waterproofing and sealing

MasterSet®
Solutions for retardation control

MasterSure®
Solutions for workability control

MasterTop®
Solutions for industrial and commercial floors

Master X-Seed®
Advanced accelerator solutions for pre-cast concrete

Ucrete®
Flooring solutions for harsh environments

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