



Mine Backfill

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.

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.

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

Global Underground Construction Team

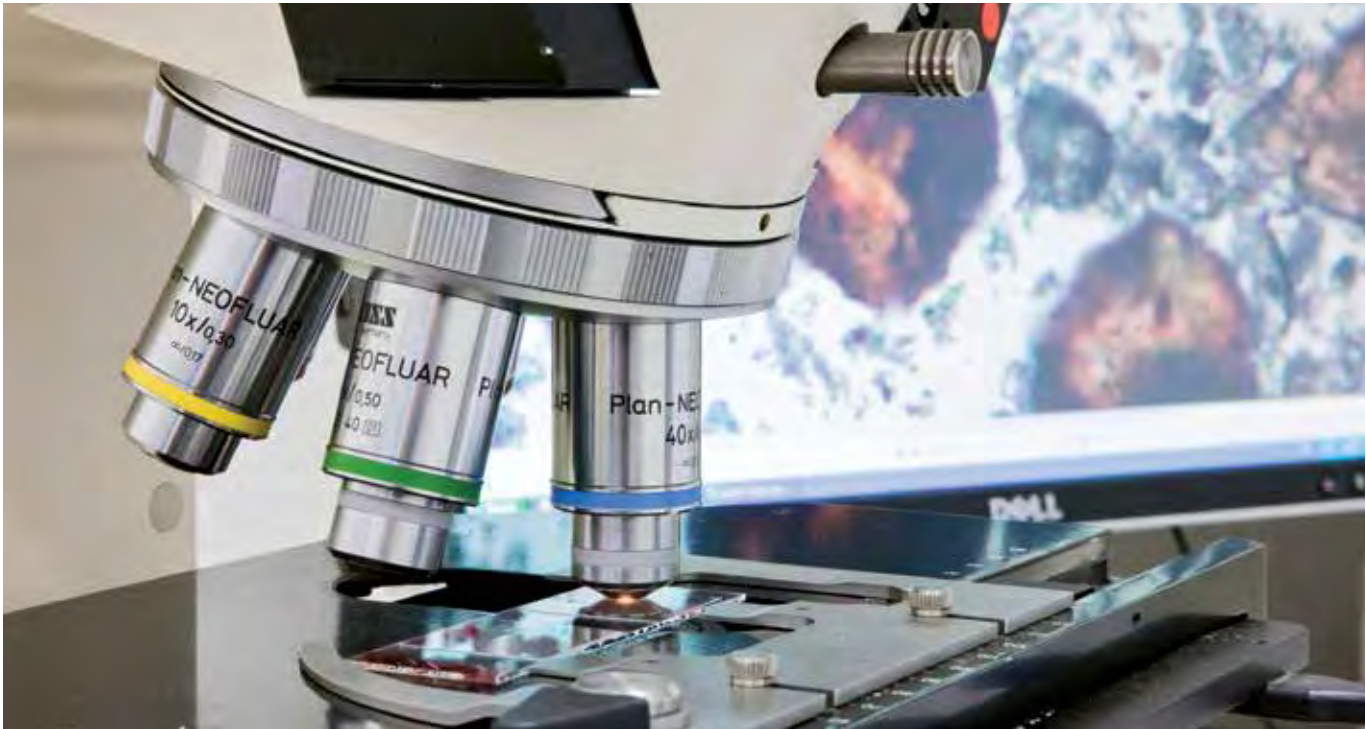
BASF, with its global underground construction team, is a world leader in the provision of reliable, customer-oriented solutions focused on your needs in the tunneling and mining industries. We recognise that your success is underpinned by our ability to deliver solutions that meet or exceed your critical 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. 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.





Introduction



Backfill, the process of back filling material into the underground voids created by mining, is essential in many underground operations for the holistic extraction process. Backfill material types and processes are numerous but generally utilize a blend of binders, process water and aggregates ranging from rock, crushed aggregates, gravel and quarried sands to tailings left over from mineral processing to provide the required restraint to enable massive strategic support for the underground extraction sequence of the ore. Mine backfill is becoming increasingly important because of the trends in mining to mine deeper, optimize ore recovery, optimize water recovery, improve the mine cycle and optimize production, decrease environmental impact and reduce overall cost.

BASF takes a scientific approach to this challenge that can help mining companies understand and run backfill operations at lower risks and lower costs. With over 30 years of experience in backfill, BASF has been a pioneer in creating an admixture market for Backfill in the mining industry.

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.



Performance Requirements



Fill without admixture



Fill with admixture

The criteria and requirements for backfilling can vary substantially, depending on the site specific requirements. BASF offers an extensive range of customized solutions for all types of mine and underground backfill operations, all of which have been developed with a focus on:

- Optimizing production efficiency and maintenance costs
- Providing a cost-effective, efficient and sustainable backfill solution as a part of the total mining operation
- Improving reliability of fill delivery (ensuring reliable and adequate delivery volumes)
- Maximizing the quality, consistency, uniformity and performances of the fill
- Minimizing blockage risk, thus improving safety
- Minimizing the risk of fill failure or liquefaction
- Ensuring adequate early strength and sustaining long-term strength
- Achieving dimensional stability after placement
- Minimizing segregation
- Reducing build-up in the pipe lines

BASF can control and achieve these requirements by implementing the following chemical processes with its

technologies such as rheology modifying admixtures, viscosity modifying admixtures, hydration control admixtures, water reducers, superplasticizers and durability enhancers:

- Hydration control
- Acceleration
- Rheology and flow control
- Viscosity modification
- Reduction in yield stress and pumping pressure
- Stabilization of fines in the fill matrix
- Reduction in slime run off, friction, segregation and porosity
- Enhanced strength development
- Optimized binder content

BASF's 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. These solutions should not only be considered for new mining projects but also for existing operations as they create opportunities to operate systems that are safer, more environmentally friendly and more cost effective.



Backfill Processes



Backfill process can be categorized into the following 3 types:

- Cemented Paste Backfill (CPF)
- Cemented Hydraulic Fill (CHF)
- Cemented Rock and Aggregate Fill (CRF/CAF)

The type used depends on geotechnical requirements, the value of the ore, conditions in the mine, budget, lifetime of the project, experiences, and available equipment.

Cemented Paste Fill

The workability of cemented paste fill mixes can be enhanced in the following ways:

- Reduced binder usage for any given strength requirement
- Decreased pumping pressure and reduced pressure loss (longer transportation distance and improved flow)
- Reduced pipeline wear rate
- Improved fill placement (reduced beach angle)
- Improved consistency of the fill mix and reduced segregation

Cemented Hydraulic Fill

Improved stability and transportability at a constant solids density or enhanced flowability and transportability of the fill at higher density can achieve the following:

- Reduced binder usage for any given strength requirement
- Decreased pumping pressure and reduced pressure loss (longer transportation distance and improved flow)
- Reduced pipeline and mixer wear rate
- Reduced blockage risk
- Improved fill placement (reduced beach angle)
- Decreased energy consumption
- Improved fill placement (more consistent and homogenous)
- Improved consistency of the fill mix and reduced segregation
- Improved drainage capabilities and significantly decreased fines migration from the fill (slimes)
- Better water management



Cemented Rock and Aggregate Fill

The effectiveness of rock and aggregate fill can be increased in the following ways:

- Hydration control – extending open time
- Segregation reduction with coating effect
- Strength enhancement
- Uniformity improvement
- Binder improvement
- Percolation improvement

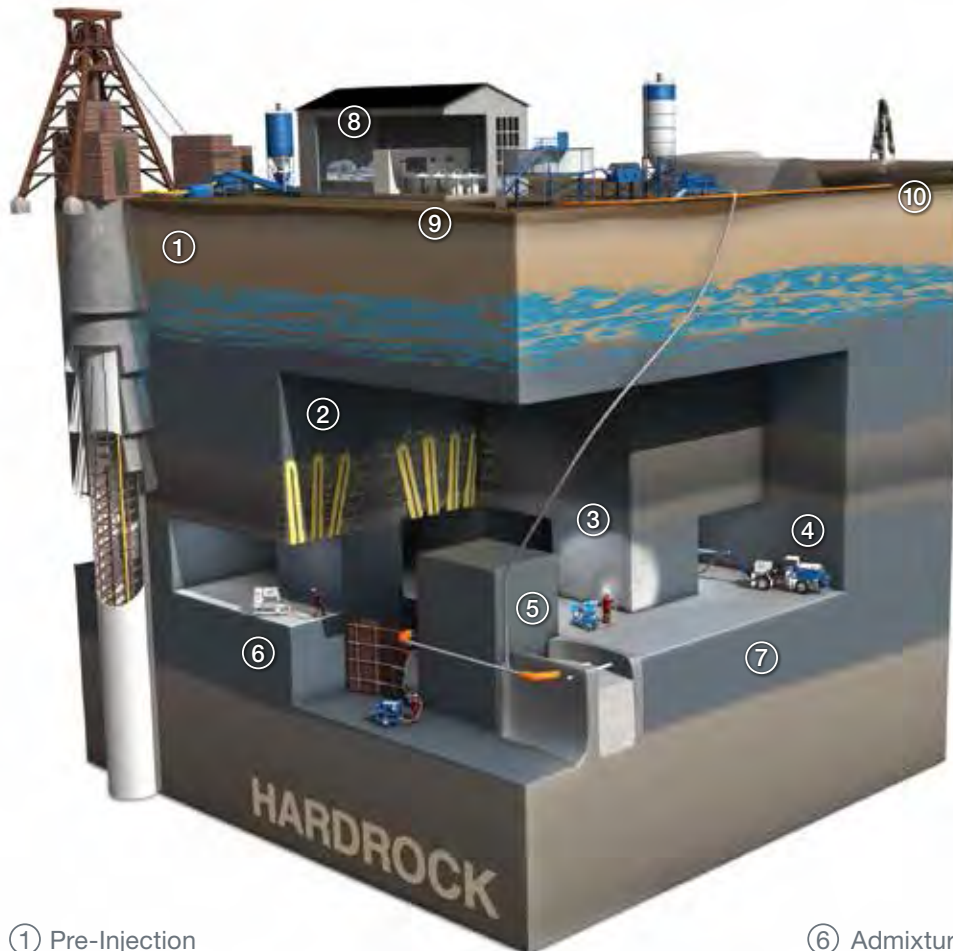
Technical Services

BASF brings extensive know-how gained through worldwide experience in solving challenging situations in hard rock mining. Supplying more than just specialty products for underground construction, assistance is offered 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.

BASF strives to offer innovative solutions through continual product development dedicated to mining needs. Part of BASF's Research & Development Community, a dedicated underground construction development team focuses its efforts on tailoring the properties of its backfill admixtures.



Hard Rock Mining Technology Overview



- ① Pre-Injection
- ② Injection / Rock Bolting
- ③ Thin Spray-on Liner (TSL)
- ④ Sprayed Concrete
- ⑤ Mine Backfill
- ⑥ Admixture for Concrete
- ⑦ Roadway Concrete
- ⑧ Grinders
- ⑨ Flotation
- ⑩ Tailing Pond

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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

MasterCem®

Solutions for cement manufacture

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

Ucrete®

Flooring solutions for harsh environments

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