STM
Sika® TECHNOLOGIES FOR SHOTCRETE, TUNNELING & MINING

BUILDING TRUST

Sika® SHOTCRETE TECHNOLOGY

SUCCESSFUL SPRAYED CONCRETE REQUIRES THE COMBINATION OF MANY ASPECTS OF MODERN CONCRETE TECHNOLOGY, especially concrete admixture chemistry, together with modern materials handling technology. The increasing demands for cost-effectiveness and the protection of health and the environment mean that shotcrete has been in continuous development. Sika's products for shotcrete represent the newest generation of cutting-edge technologies that have resulted from more than one hundred years of involvement in the business. With this experience, expert knowledge, and a focus on performance and economy, Sika provides reliable, proven solutions.

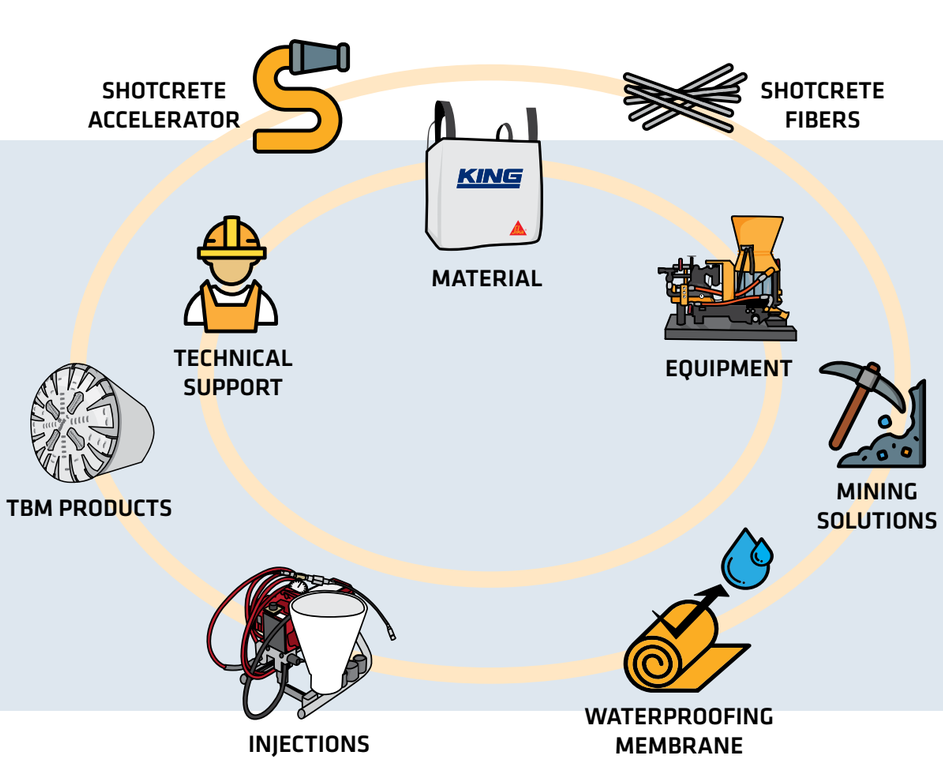
The multiple demands placed on shotcrete today no longer allow standard solutions. Dependent on the spraying process and the type of structure, different conditions are imposed on the shotcrete during application and in service. In tunnel construction, shotcrete is normally used for excavation stabilization. In open-pit mining and on major construction sites it is typically used for rock and soil stabilization on slopes. In bridge and other civil engineering repair and refurbishment works, shotcrete is often used because it is a more efficient method. Through more than 100 years of activity in these complex areas, Sika profoundly understands the difficulties and challenges of the market place. In order to surmount the project requirements Sika has developed the Shotcrete, Tunneling and Mining (STM) team.

SHOTCRETE SOLUTIONS

For over a century, Sika has been involved in highly challenging shotcrete, tunneling and mining projects around the globe. Sika supplies solutions for the largest and technically most complex projects - from below the Atacama Desert in Chile inside the large Chuquicamata block caving mine to the Gotthard base tunnel 2,500 meters below the Swiss Alps.

All projects above and below ground have unique challenges and requirements. Together with our partners, we take on these challenges and implement tailored solutions for their specific technical requirements, environmental conditions and logistical hurdles. Sika is at the forefront when it comes to efficiency improvements in shotcrete, tunneling and mining (STM); from reducing excavation times with faster shotcrete solutions to optimizing the cost performance of sprayed concrete. With a fully integrated and smart, high quality product portfolio, we are your ideal business partner to continue forging ahead in construction.

Our STM team integrates King's shotcrete credibility with Sika's global experience to provide the state-of-the-art technologies for all aspects of your shotcrete rehabilitation, tunneling and underground projects. King brings the well-known pre-packaged cementitious mixes designed for shotcrete, concrete and grout application for the mining and civil sectors. Sika has industry-leading chemical injection, waterproofing products and furthermore fibers and admixtures for shotcrete optimization. In addition, the STM team is able to offer a robust portfolio of tunnel boring machine (TBM) products and mine backfilling (MBF) products.



SIKA OFFERS
FULL CIRCLE
SOLUTIONS...

Learn More →

SHOTCRETE APPLICATIONS

- Excavation stabilization in tunneling and mining construction
- Slope and trenching stabilization
- Sewer and culvert rehabilitation
- Protective linings
- Shoring construction
- Concrete repair
- Restoration of historic buildings
- Pools and skate parks construction
- Refractory applications and building-up thicker layers

PRE-PACKAGED BENEFITS

- Pre-blended technology containing blended aggregates & carefully selected components to develop the correct mix required for the project
- Easy shipped to remote locations
- Ability to mix on demand

SIKA STM SOLUTIONS

- Pre-Packaged Shotcrete Materials
- Shotcrete Accelerators
- Shotcrete SikaFibers
- Injections
- Tunnel Boring Machine Products
- Mining Solutions
- Waterproofing

THE MANY DEMANDS PLACED ON A SHOTCRETE MATERIAL AND OPERATION TODAY NO LONGER ALLOW FOR THE INDUSTRY'S PREVIOUS SHOTCRETE SOLUTIONS.

Depending on the shotcrete spraying process, the type of structure, and the environment, there are many different conditions that are imposed on the shotcrete during application and in service.

Sika's shotcrete solutions are designed to overcome these challenges. Sika's shotcrete product offering represent the newest generation in cutting-edge technologies that have resulted from more than one hundred years of involvement in the industry. With this experience, expert knowledge and a focus on performance and economy, Sika provides reliable proven solutions.

PRE-PACKAGED SHOTCRETE MATERIALS

In 2019 Sika acquired King Packaged Material Company which has been a trusted industry resource of both dry-mix and wet mix processes. The strength of the King shotcrete solution brand lies in its ability to provide high-quality shotcrete material combined with the industry's best technical support team. The pre-packaged materials are produced from three ISO 9001 registered, shotcrete production facilities. The facilities have the capabilities to meet many different project requirements. The pre-packaged shotcrete material can include; air-entrainment for improved freeze thaw and salt-scaling resistance, synthetic or steel fiber reinforcement for increased load-carrying and energy absorbing capacities, set-time accelerators for early-age strength gain and rapid re-entry into a mine, and specialty mixes that perform exceptionally well in cold temperatures and other demanding conditions.

The pre-packaged shotcrete materials can be adjusted to have additional features which include the following:

- Micro-Synthetic fibers (SY) to reduce plastic shrinkage cracking.
- Macro-Synthetic fibers (MF) to increase energy absorption, load carrying capacity, and impact resistance.
- Steel fiber (ST) to increase energy absorption, load carrying capacity, and impact resistance.
- Accelerator (X, X2, X3) can be added to the pre-packaged mix at three different dosage rates for increased setting times with air entrainment for above grade applications.
- Underground Accelerated (UG, UG2, UG3) can be at three different accelerator dosage rates with non air entrainment for underground (tunneling & mining) applications.
- (CI) Available with corrosion inhibitor.
- Can be blended to meet ACI 506 "Guide to Shotcrete" Table 1.1, Gradation No. 1 or Gradation No. 2.

PRODUCT FAMILY	ADVANTAGES	TARGET APPLICATIONS
King® MS-D1	• Dry Mix process shotcrete • Portland cement based • Micro Silica Fume enhanced • Air entrainment provides superior resistance to freeze thaw cycles and salt scaling	Civil Construction / Repair or Tunneling • Additional option to meet requirements of NSF/ANSI-61 standard for structures containing drinking water
King® MS-D3	• Dry Mix process shotcrete • High-early Portland cement based • Micro Silica Fume enhanced • Air entrainment provides superior resistance to freeze thaw cycles and salt scaling	Civil Construction / Repair or Tunneling / Mining
King® MS-W1	• Wet Mix process shotcrete • Portland cement based • Micro Silica Fume enhanced • Air entrainment provides superior resistance to freeze thaw cycles and salt scaling	Civil Construction / Repair or Tunneling / Mining
King® LR-D1	• Dry Mix process shotcrete • Portland cement based • Provides low resistivity values • Specifically designed for use with cathodic protection systems	Civil Construction / Repair

PRODUCT FAMILY	ADVANTAGES	TARGET APPLICATIONS
King® HC-D1	• Dry Mix process shotcrete • Portland cement based • Low cracking potential • Very low shrinkage • Air entrainment provides superior resistance to freeze thaw cycles and salt scaling	Civil Repair
King® RS-D1	• Dry Mix process shotcrete • Utilizing Rapid Set technology providing reduced setting times and very rapid strength development	Civil Construction / Repair or Tunneling
King® RS-D2	• Dry Mix process shotcrete • Utilizing Rapid Set technology providing reduced setting times and very rapid strength development	Mining or Tunneling
King® ArmourGuard	• Dry Mix process shotcrete • High-early Portland cement based • Steel fiber reinforced for increased impact and abrasion resistance and load carrying capacity	Mining - Ore pass linings and brows, truck dumps, ore and rock chutes or other applications of high impact and abrasion

Sika® Sigunit® SHOTCRETE ACCELERATOR & SikaFiber® SOLUTIONS

Sigunit® SHOTCRETE ACCELERATOR

The use of shotcrete has increased in popularity as it has become the preferred method for providing rock support. This trend has also led to the higher demands being placed on the shotcrete accelerator's performance. Project requirements, most notably in underground construction, can be especially challenging. Projects can require the accelerator to develop fast and high compressive-strengths for rapid excavation with minimal rebound to reduce waste. In addition, alkali free accelerators can be required to avoid pollution and leachate of alkalis into the ground and surface water.

ACCELERATOR
Sika® Sigunit® L-50 AFX

- High early concrete strength development.
- Significant concrete rebound reduction.
- Good long-term strength and durability.
- Alkali-free: avoids pollution and leachate of alkalis into ground and surface water.
- Easier overhead spraying by improved adhesion of shotcrete to rock and concrete.
- Reduction of dust formation.

SikaFiber®

Fiber reinforced sprayed concrete is the most effective means of support due to speed of delivery, economy, safety, and durability.

SELECTING THE RIGHT SikaFiber® FOR SHOTCRETE APPLICATIONS

PRODUCT FAMILY	PRODUCTS	ADVANTAGES
Microfiber for Explosive Spalling	• Sika® Fibermesh®-150F	• Tested and proven in different fire tests and applications. • The correct material, length, and fiber count.
Microfiber for Sprayed Concrete	• Sika® Fibercast®-500	• Rebound reduction of sprayed concrete. • Provides enhanced resistance to early age shrinkage cracking. • Improves impact and abrasion resistance.
Macrofibers for Sprayed Concrete	• SikaFiber® Force-48 • SikaFiber®-54 Force • Sika® Fibermesh®-650S 	• Ideal for preliminary tunnel linings and slope stabilization. • Three dimensional reinforcing which easily replaces WWF. • More efficient shotcrete profile. • Improves safety, impact resistance, daily completion rates and energy absorption especially at large deformations. • Reduction in crack propagation and widths. • Significantly lighter weight than steel fibers (similar performance with 1/4 the weight). • Non-corrosive.
Steel Fibers for Sprayed Concrete	• SikaFiber® Novocon® CHE-6535	• Ideal for final linings. • Three dimensional reinforcing which easily replaces WWF. • More efficient shotcrete profile. • Improves safety, impact resistance, daily completion rates, and energy absorption especially at small deformations. • Reduction in crack propagation and widths.

INJECTION RESIN TECHNOLOGIES

INJECTIONS

Sika offers an extensive range of injection resin technologies for all types of applications. Unconstrained geology below ground represents a major challenge in tunneling and mining operations around the world, and Sika is there to help you meet the task.

PRODUCTS	
Sika® Injection-101 RC	• 1-part injection for temporary water-stopping of high water intrusion in cracks and joints • A low viscosity, fast foaming and solvent free water reactive polyurethane injection resin, which cures to a dense flexible foam with a fine cellular structure • Suitable for use in hot and tropical climates
Sika® Inject-215	• 2-part elastic Polyacrylic Injection resin for permanent watertight sealing cracks and voids
Sika® Injection-216	• 2-part polyurethane structural injection resin for filling and sealing voids and cracks
Sika® Injection-307	• 3-part polyacrylic resin with very low viscosity. The resin has a versatile and adjustable reaction for stopping water
Sika® Injection 310 US	• A single component powder based polyacrylic injection resin for waterproofing repair. Activation by just adding water • After the addition of water the chemical reaction produces a very low viscosity resin which cures to a form a tough elastic gel
SikaFix® HH+	• 1-part, low viscosity, high solids, hydrophobic (water-reacted) polyurethane injection foam for water stopping and filling voids

TBM & MINING SOLUTIONS

TUNNEL BORING MACHINE (TBM)

TBMs are very advanced equipment used as an alternative to drilling and blasting through rock and "conventional mechanical excavation" in soft ground. Mechanized tunneling has become more important with the rapid growth and expansion of underground construction in recent years. Sika provides a wide range of products designed specifically for use with a variety of TBMs, throughout the whole tunnel excavation and construction process.

PRODUCT FAMILIES - SIKA STABILIZER	
Sika® Stabilizer-1xxx TBM	Foaming agents for the production of injection foams which are sprayed into the tunnel face to modify the characteristics of soft ground, including its plasticity, texture and permeability, in order to make the work and progress of the TBM easier and faster
Sika® Stabilizer-2xxx TBM	A series of main drive and tail seal sealants for sealing the TBM from ground contaminants
Sika® Stabilizer-3xxx TBM	A series of water absorbing polymers, viscosity modifiers or stabilizers for foams specially formulated for improving the excavation process in difficult ground conditions
Sika® Stabilizer-5xxx TBM	A series of set retarding admixture for cement / bentonite injection grouts, commonly used in backfilling operations during tunnel excavation with shielded TBMs
Sika® Stabilizer-6xxx TBM	A series of set and hardening accelerating admixture for cement / bentonite injection grouts, commonly used in backfilling operations during tunnel excavation with shielded TBMs

MINE BACKFILL ADMIXTURES (MBF)

Sika admixtures for paste backfill operations are designed to optimize and significantly reduce the necessary binder consumption and cost. Additionally, these will also help to ensure the rheology and stability of the paste, thereby reducing the backfill line pressure that is required.

PRODUCTS	
Sika® Stabilizer-313 MBF	Strong high range water reducing admixture suited for a range of gold deposit and polymetallic base metal deposits
Sika® Stabilizer-402 MBF	Liquid-based viscosity modifying admixture, suitable for hydraulic fill mixes containing variable proportions of tailings and/or sands which can be manufactured and/or poorly graded

GROUTING

Sika is a market leader in high quality cement-based grouts. These cementitious grouts are available all over the globe and widely used within the tunneling and mining industry for many different applications.

	PRODUCTS	
GROUTS	King® Nordic Cable	Anchoring grout specifically designed for cold weather applications
	King® Nordic	Sanded grout specifically designed for cold weather applications
	King® MS Cable	Neat, high performance, shrinkage-compensated, anchoring grout
	King® HS Cable	Neat, high performance, shrinkage-compensated, anchoring grout for applications exposed to sulphates
	KingAnchor	High performance, non-shrink grout material for anchoring applications
ADMIXTURES	SikaSet® RHE	Low temperature, non-chloride, accelerating admixture that can be used in subfreezing temperatures
	SikaCem® Accelerator	Non-chloride hardening accelerator formulated to increase the early strength of grouts without affecting the initial workability that can be used in hot weather conditions

WATERPROOFING

Sika's waterproofing systems are designed to protect underground structures for the duration of their lifespans against water infiltration which can cause expensive and irreversible damage. Count on Sika's industry leading waterproofing systems to provide life-long protection of the structures on your project.

Compartmentalized Membrane System with Integrated Injection Backup: For more than 50 years, Sika's loose-laid synthetic, PVC or TPO-based membranes have been the below ground waterproofing system of choice where high performance and an 100+ year service-life is required. Through continual development of this technology the service life of Sika membranes remains unchallenged and their leading position is maintained by the most comprehensive materials testing.

Fully-Bonded Sheet Membranes: Fully bonded sheet membrane systems have been developed as an alternative to the market standard loose-laid membrane systems. With a fully bonded sheet membrane system, Sika's advanced polymeric membranes are designed to form a full surface bond with the structural concrete. The benefits of this type of system include cost-efficiency due to its ease of application, while maintaining a high level of durability.

PRODUCTS	
Sikaplan®	Loose laid PVC and TPO sheet membrane systems designed for long-term durability that can be built as standard single layer compartment systems up to an active control system to meet the highest demands of any tunnel or below ground structure
SikaProof®	Fully-bonded TPO membrane system offering a high level of waterproofing safety along with installation efficiency. Typically used for tunnel shafts and cut-and-cover tunnels
Sika® Greenstreak® PVC Waterstops	The industry's most comprehensive collection of waterstop products and solutions used to seal construction and expansion joints in concrete structures. Available in varying sizes, types, design and dimensions according to their use
Sika® Hydrotite®	Profile and sealant waterstops which can swell and are used in watertight concrete structures for systematic sealing of construction joints
Sika® Drainage Mat	Prefabricated drainage composites used as a protection course for Sikaplan® and/or SikaProof® membrane systems as well as to provide a means of collecting and conveying excess water to drain locations

SIKA FULL RANGE SOLUTIONS FOR CONSTRUCTION:

WATERPROOFING

CONCRETE

REFURBISHMENT

SEALING AND BONDING

FLOORING

ROOFING

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