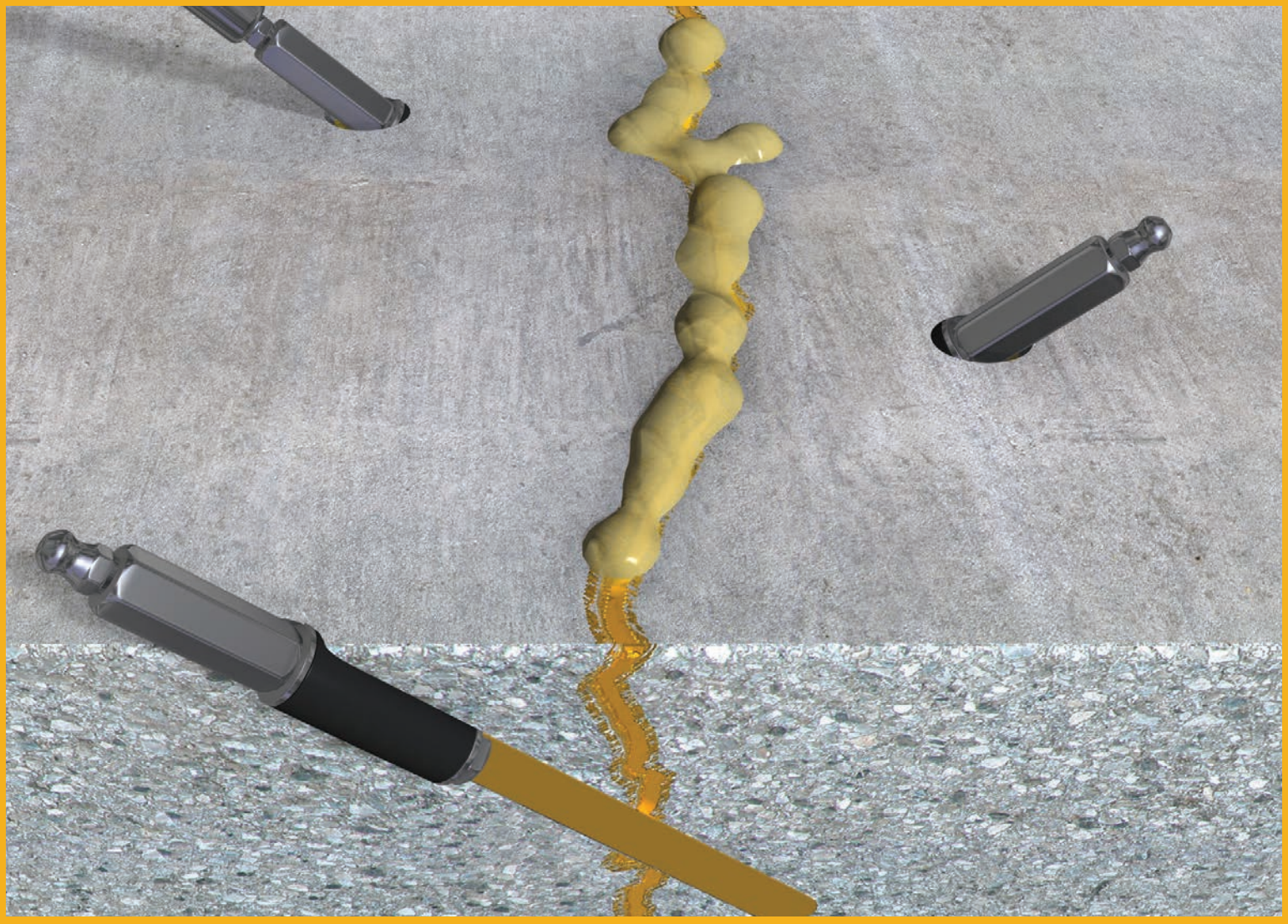


WATERPROOFING
LEAK SEALING SOLUTIONS WITH SIKA INJECTION SYSTEMS

FOR CONCRETE, MASONRY, AND NATURAL STONE STRUCTURES

BUILDING TRUST

LEAK SEALING SOLUTIONS

For concrete, masonry, and natural stone structures

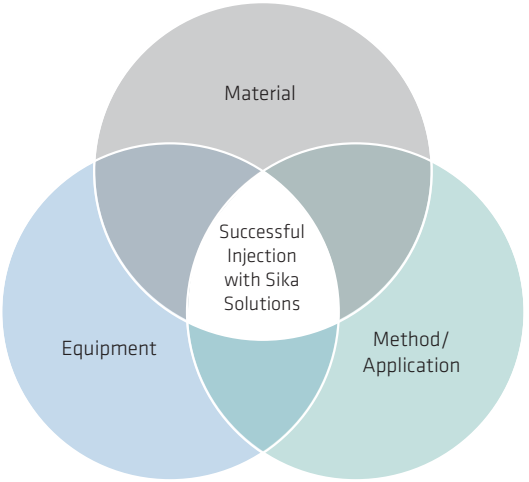
LEAKING CONCRETE STRUCTURES BELOW GROUND, such as basements and civil engineering structures, can have greatly reduced service life due to steel corrosion and concrete damage, in addition to any reduced functionality and use. In order to avoid the expensive costs of repairs to the structure, or to water damaged interior finishings, furnishings or other goods, plus the costs of any operational downtime, these leaks can often be securely sealed and waterproofed by injection.

Sika provides an extensive range of injection systems for all types of leak sealing applications in concrete, masonry, and natural stone structures. These can be used at any time, including during the initial construction works, or later to extend the service life during any subsequent refurbishment, according to the specific project's requirements. Sika injection systems can not only close, flexibly bridge, seal, and make leaking structures watertight for the long term, some can also be used to increase or restore structural integrity and load bearing capacity, thereby providing complete and durable maintenance solutions.

Sika's high performance injection materials are also fully compatible with Sika's complete Engineered Waterproofing range and they can be used for the repair and sealing of cracks, voids, joints, hoses, and compartment systems in many different structures. As a prerequisite, all of Sika's injection products are also fully tested and conform to all of the relevant global standards.

SUCCESSFUL WATERPROOFING WITH SIKA INJECTION SYSTEMS

There are three primary success factors involved in ensuring the effectiveness and durability of injection works. It is essential that the right combination of injection materials, injection equipment, and injection method are selected and this is what Sika's extensive technical and practical experience provides:



INJECTION MATERIAL
The selection of the right injection material and the right specific injection product for the defined project requirements is the first key factor for success. This especially means the materials' viscosity, flexibility, and behavior in contact with water, all of which can significantly influence the effectiveness of the injection.

INJECTION EQUIPMENT
Appropriate equipment for the selected injection material, including for the correct preparation, mixing, and delivery of the material, is the second key success factor. This means everything from the initial dosage and mixing, delivery from a suitable pump, to the use of the right packers/ports/ connectors.

INJECTION METHOD / APPLICATION
Third, the correct injection method and application techniques must be used by trained, competent, and experienced contractors in order to ensure the success and provide complete and permanent leak sealing solutions.

ADDITIONAL ADVANTAGES OF SIKA

COMPLETE SIKA SOLUTIONS
Sika is a 'full range' supplier, meaning that Sika not only has the full range of alternative injection technologies and materials, but we are also the world's leading supplier of engineered waterproofing, concrete repair, and protection solutions in order to prevent or seal and waterproof any type of leak in your structure - from the basement to the roof.

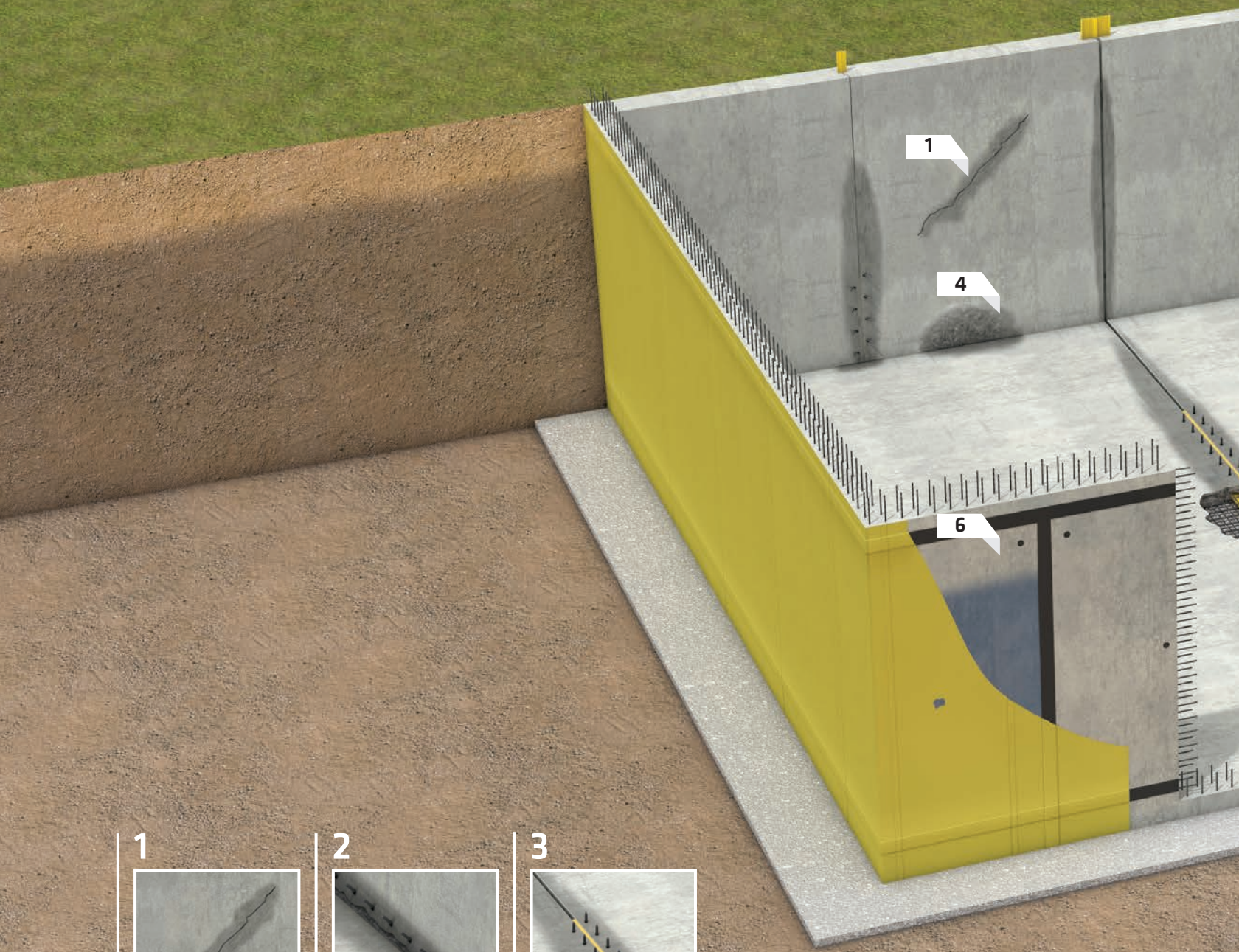
SIKA INJECTION SOLUTIONS TO GLOBAL STANDARDS
Sika's injection solutions are tested and approved to the leading global standards to provide safe and reliable injection solutions.

TECHNICAL EXPERTISE AND PRACTICAL EXPERIENCE
Sika provides advice and support from the design office through to completion of the injection and any associated works on site. This expert technical advice and practical assistance is to help ensure the selection and installation of the right injection materials, equipment, and application methods.

TRAINING
We understand that, on many projects, it will be preferable to use an experienced Specialist Contractor for injection works to seal any leaks that occur. On others, for different practical and logistic reasons, it will be better to train teams from the main contractor to do the work. This is why Sika provides unrivaled technical and practical training both on- and off-site, to help ensure that both the engineering staff and the site operatives fully understand the requirements and procedures - all supported with Sika's detailed documentation including Method Statements and Quality Control checklists.

LOCAL SIKA PRESENCE
All around the world, there are experienced Sika professionals to provide technical support exactly where it is required - in your office or on-site.

SUCCESSFUL WATERPROOFING WITH SIKA INJECTION SYSTEMS



1

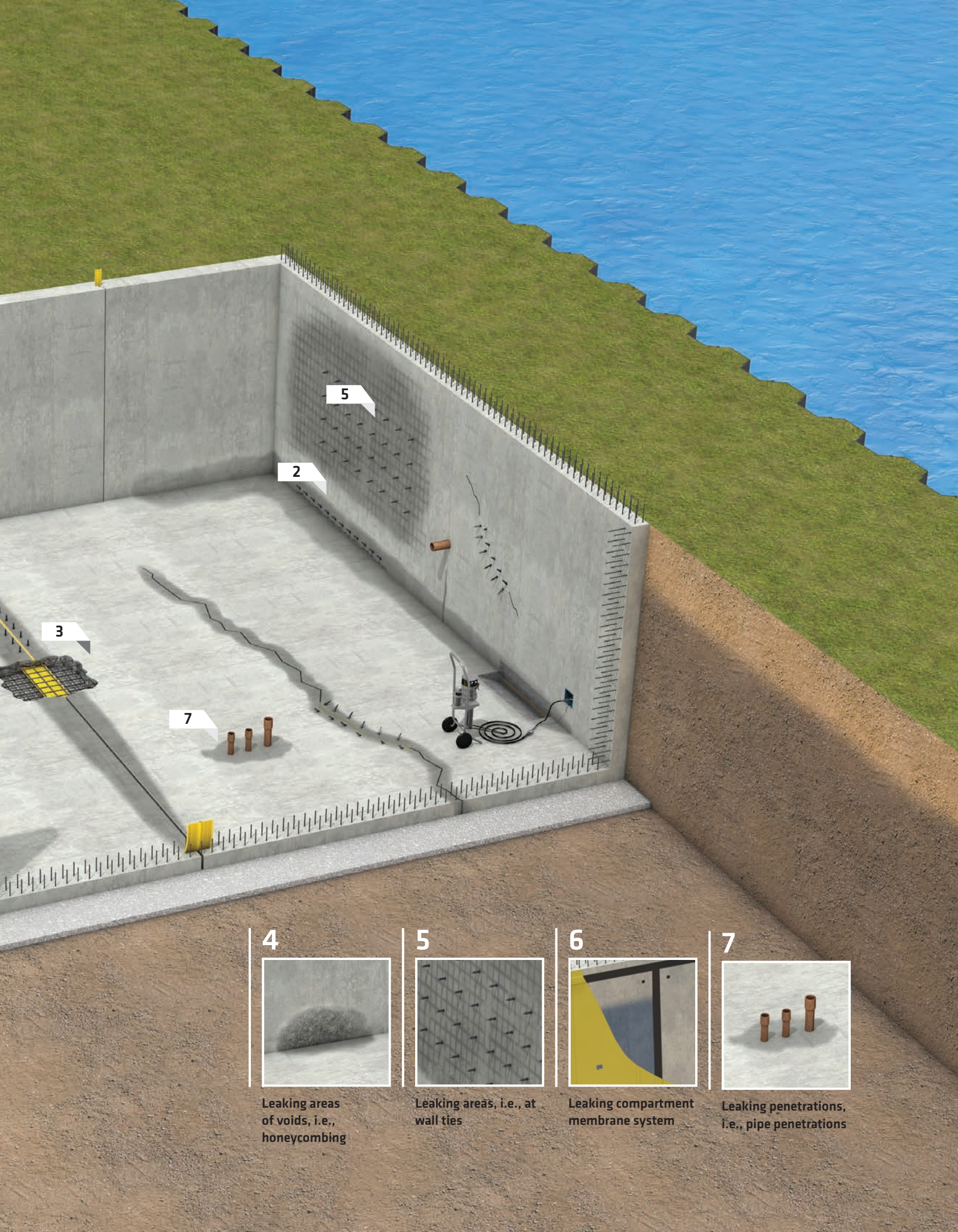
Leaking cracks

2

Leaking construction joints

3

Leaking movement joints



4

Leaking areas of voids, i.e., honeycombing

5

Leaking areas, i.e., at wall ties

6

Leaking compartment membrane system

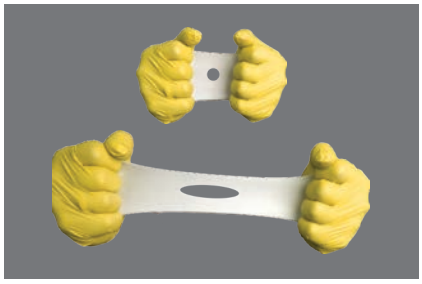
7

Leaking penetrations, i.e., pipe penetrations

INJECTION MATERIAL TECHNOLOGIES AND SIKA INJECTION PRODUCTS

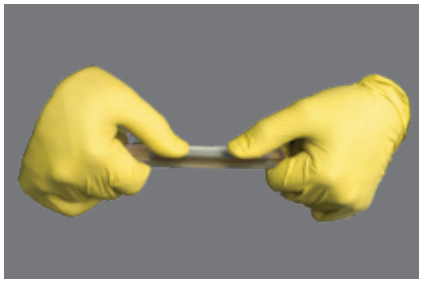
POLYURETHANE FOAM RESINS

Polyurethane foaming resins are designed to expand with water to block the passage of water through the crack or void. Their fast expansive reaction with water forms a tough and flexible/elastic foam. Polyurethane foaming resins may be used in combination with acrylate resins to achieve enhanced flexibility in sealing and waterproofing a leak.



ACRYLATE RESINS

Acrylate resins are hydrophilic, very flexible, and used for non-structural injections of cracks, joints, and voids, including for injection hose systems, compartment systems, and area (e.g., Grid and Curtain) injection works. For application, Acrylate resins have an extremely low viscosity (similar to water) and therefore have ideal penetration abilities. Their reaction (hardening) time is also adjustable, which allows flexibility in adaptation of the injection material to the prevailing conditions on site (e.g., temperature and injection distance, etc.). Acrylate resin based materials seal and waterproof leaks through their hydrophilic swelling behavior in contact with water. The injection equipment is also easily cleaned with water.



EPOXY RESINS

Epoxy resins have relatively high tensile and compressive strengths in relation to concrete, they are generally regarded as 'rigid' materials and widely used for structural repairs by injections of cracks and voids in load bearing reinforced concrete structures or elements. Their low viscosity allows excellent penetration into cracks in the structure and this also helps to ensure permanent and durable load transfer based on their excellent adhesion to the concrete. Epoxy resin based materials are suitable for many different structural injection requirements and dry and slightly damp applications.

MICROFINE CEMENT SUSPENSION

Microfine cement suspensions are non-flexible and therefore non-movement accommodating, rigid, polymer modified, injection materials (also often known as Microfine cement grouts), which are based on blends microfine cements. They are now widely used for structural injection works to seal non-moving cracks, voids, and daywork joints for example. Due to their polymer modification, these cement based materials can also have high flow characteristics and very good penetration ability.

Sika® Injection-101 US

A low viscosity, fast-foaming, solvent-free, water-reactive polyurethane foaming resin based injection product, which cures to a very dense and hard-elastic foam with a very fine cellular structure. It has stable expansion with no shrinkage after curing. The free-foaming volume expansion rate in contact with water is up to 40 times.

SikaFix® HH+

A hydrophobic polyurethane foam grout that, when used with accelerator, is designed to stop water infiltration and fill voids outside a structure or joint and cracks in concrete structures. It may also be used in applications with high pressure flowing water.

SikaFix® HH Hydrophilic

A nonflammable hydrophilic polyurethane foaming resin designed to form a flexible gasket or plug joints and cracks in concrete from water infiltration. When it comes in contact with water, the grout expands quickly and cures to a tough, flexible, adhesive, closed cell foam that is essentially unaffected by mildly corrosive environments.

Sika® Injection-304

An ultra-low viscosity, elastic, and very quick settling polyacrylic resin based injection gel. The reaction time is adjustable between 40 seconds and 4 minutes. Due to this fast reaction time, Sika® Injection-304 is only injected with a two component pump and it is generally used for sealing and waterproofing areas of damage or leaks with high water ingress, including under hydrostatic pressure.

Sika® Injection-307

A 3-part polyacrylic elastic injection resin with a very low viscosity. Unique steel passivation properties provide active corrosion protection. It can be injected with either a 1- or 2-component injection pump and is mainly used as a re-injectable leak sealing resin system for SikaFuko® hoses and around damaged membrane/compartment systems. The reaction time is adjustable between 10 and 50 minutes.

Sika® Injection-215

A very low-viscosity, elastic and quick-setting polyacrylic resin-based injection gel. The reaction time is adjustable between 2 and 15 minutes. Due to this fast reaction time, it is only injected with a 2-component pump. It is primarily used in crack sealing and curtain wall injections.

Sika® Injection-310 US

An easy-to-use 1-component, powder based acrylate based resin for permanent watertight sealing.

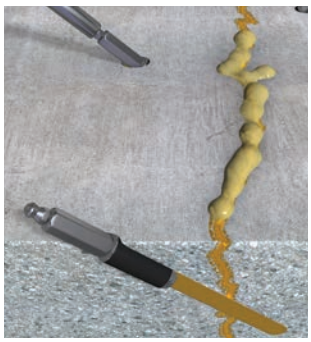
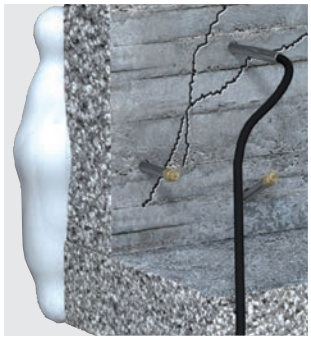
Sikadur®-52 N/LP

A rigid, solvent-free, low viscosity, high strength structural, epoxy resin based injection product with medium and long pot-life grades available. It is used to structurally bond and seal cracks over 0.3 mm in width.

Sika® InjectoCem®-190

A rigid, two-component injection product, based on a blend of polymer modified microfine cements. It is widely used for sealing, filling, and structural strengthening of wider cracks and into or around construction joints. It is also used for the injection of SikaFuko® Injection Hoses as a re-injectable system.

SELECTION OF SIKA INJECTION MATERIALS

PROBLEM		REQUIREMENTS
Leaking Cracks/ Penetrations Dry and/or containing water		■ Waterproofing cracks and around penetrations of width > 0.2mm with hydrostatic pressure ■ Waterproofing cracks and around penetrations of width > 0.2 mm without hydrostatic pressure (dry, damp, or wet surface) ■ Force transfer across dry cracks of width > 0.3mm
Leaking Expansion Joints (movement) and Construction/Daywork Joints (non-moving)		■ Waterproofing construction joints with and without hydrostatic pressure ■ Waterproofing joints where the original joint sealing/ waterproofing system is damaged or was not properly installed
Leaking Membrane Compartment Systems		■ Waterproofing damaged and leaking sheet membrane compartment systems
Leaking Wall/ Kicker Areas		■ Grid Injection (Into the surface for larger areas, e.g., Honeycombing or poor concrete compaction etc.) ■ Curtain Injection (e.g., Behind the structure or element to seal leaks due to multiple tie bar holes or other multiple minor defects/leaks)

CRITERIA	SUITABLE SIKA INJECTION PRODUCTS
■ Fast and stable foaming and expansion for waterstopping of high water intrusion.	■ Sika® Injection-101 US or ■ SikaFix® HH+ followed by: ■ Sika® Injection-307 /-310 US (for permanent flexible sealing)
■ Very low viscosity and long-term flexibility for permanent sealing.	■ Sika® Injection-215 (for permanent flexible sealing) ■ Sika® Injection-307 (for permanent flexible sealing)
■ Low viscosity, rigid, excellent adhesion and full bond to the crack substrate surfaces for structural bonding.	■ Sikadur®-52
■ Fast and stable foaming and expansion for waterstopping, plus very low viscosity and long-term flexibility for permanent sealing and waterproofing.	■ Sika® Injection-101 US followed by: ■ Sika® Injection 215/-304 (for permanent flexible sealing) ■ Sika® Injection 307/-310 US (permanent flexible sealing)
Pre-installed SikaFuko® injection hose system in construction joints or as a back-up system on waterstops: ■ Very low viscosity, long term flexibility, long pot-life for optimum penetration, re-injectable for permanent sealing.	■ Sika® Injection-307 (for permanent flexible sealing in reinforced concrete) ■ Sika® Injection-310 US (for permanent flexible sealing) ■ Sika® InjectoCem®-190 (for use in dry areas only)
Damaged expansion sections of waterstops: ■ Very low viscosity, long term flexibility, long pot-life for optimum penetration, re-injectable for permanent sealing.	■ Sika® Injection-307 (for permanent flexible sealing in reinforced concrete) ■ Sika® Injection-215/-304 (for permanent flexible sealing)
■ Low viscosity, tough-elastic, very easy to use, re-injectable for permanent sealing.	■ Sika® Injection-310 US (for permanent flexible sealing)
■ Low viscosity, void filling, rigid material for load transfer in both dry and damp areas.	■ Sika® InjectoCem®-190 (dry area) (optional patch repairs with Sikadur®-31 CF)
■ Very low viscosity, flexible, designed for permanent sealing (in wet areas).	■ Sika® Injection-307 (optional patch repairs with Sikadur®-31 CF) ■ Sika® Injection-215/-304 (optional patch repairs with Sikadur®-31 CF
■ Extremely low viscosity, highly flexible, adjustable reaction time, designed for permanent sealing.	■ Sika® Injection-215

EQUIPMENT FOR SIKA INJECTION MATERIALS

ADDITIONAL ADVANTAGES OF SIKA

There are two different pump technologies available on the market today for resin and microfine cement injection, there are 1- and 2-component pumps. The most widely used are the 1- or single-component pumps, which have the key advantage of being available for a much lower cost, and so the contractor's investment is a fraction of what it would be for a 2- or two-component pump. The main reason that 2-component pumps are still used is that they are the best and the only way to inject fast and very-fast curing resins, because of their extremely short pot-life, plus they are best for injecting large volumes of material.

SINGLE-COMPONENT PUMPS

The storage container of the pump is filled with the pre-mixed resin or microfine cement grout. The pot-life of this injection material starts after mixing and it is always necessary to apply the complete mixed volume within the relevant pot-life.

There are hand, piston, and diaphragm pumps available using 1-component pump technologies and they are designed to accommodate and handle small or medium volumes of injection material.

TWO-COMPONENT PUMPS

These have two storage containers, each of which is filled separately with a different component. The components only come together when they are pumped through the static mixer, therefore, the pot-life starts in the static mixer. Due to this, this kind of pump can be used for very fast reacting resin based materials.

There are 2-component pumps designed specifically for each of the different resin technologies available, which is due to their differing viscosity, mixing ratio, and reaction time etc., as well as for different types of applications. For fast-gelling acrylate or polyacrylate resins, a separate rinsing pump is recommended for cleaning the pump and static mixer.

There are also 2-component piston pumps available which can successfully inject medium to high volumes of 2-component PU or epoxy resins, even against high hydrostatic pressure.

		Single-Component Pump	Two-Component Pump (Acrylate)	Vacuum Pump	Colloidal Mixer
Polyurethane Foam Resins	Sika® Injection-101 US Sika® Injection-207	X			
Acrylate Resins	Sika® Injection-307/-310 US	X	X	X	
	Sika® Injection-304 Sika® Injection-215		X		
Epoxy Resins	Sikadur®-52	X			
Microfine Cement	Sika® InjectoCem®-190	X		X	X

INJECTION EQUIPMENT FOR SUCCESSFUL WATERPROOFING

SINGLE-COMPONENT PUMPS FOR POLYURETHANE (PU), POLYACRYLATE AND EPOXY RESINS, PLUS MICROFINE CEMENT SUSPENSIONS

Single component pumps are the universal injection pumps and are suitable for a wide range of applications. They are ideal for professional crack sealing applications and for the injection of SikaFuko® hoses and membrane compartment systems.

VACUUM PUMPING EQUIPMENT FOR RE-INJECTION OF SikaFuko® INJECTION HOSE SYSTEMS

Vacuum pumping equipment is important for re-injection of the SikaFuko® Injection hose systems. It is used for flushing and cleaning the SikaFuko® hoses with water after injection with acrylate gel or microfine cement materials to enable the system to be used for future re-injection, if required.

TWO-COMPONENT PUMPS FOR POLYACRYLATE GELS

Two component pumps are designed for curtain injection behind the structure, for high volumes, or using fast reacting polyacrylate gel resins.

MIXING EQUIPMENT FOR MICROFINE CEMENT SUSPENSIONS

A colloidal mixer is needed for the complete and thorough mixing of microfine cement suspensions such as the high performance Sika® InjectoCem®-190.

SIKA ACCESSORIES FOR SUCCESSFUL INJECTION WORKS

Sika® INJECTION PACKERS FOR DIFFERENT APPLICATIONS

Sika® Injection Packers, or Ports, are fixed into or onto the structure and are used as nozzles to connect the injection pump to the structure and direct the material to fill the cracks or voids. Sika® Connection Packers are used to connect embedded injection hoses or compartment systems.

MECHANICAL PACKERS

For high and low pressure injection where drilling holes is possible.

Type MPS
For polyurethane, epoxy, and acrylate resin injection

Type MPR
For polyurethane, epoxy, and acrylate resin injection

Type MPC
For microfine cement injection

SURFACE PACKERS

For low pressure injection, where drilling holes in the surface is not possible or best avoided due to damage or the location of steel reinforcement, etc.

Type SP
For epoxy injections - generally with patch repairs.

CONNECTION PACKERS

Sikaplan® W injection piece for injection of membrane compartments

Type Sikaplan® W Inj.
For acrylate injection

SikaFuko® PACKER TONG

For injection of SikaFuko® injection hose system

Type SikaFuko® Packer tong
For acrylate, polyurethane, epoxy, and microfine cement injections

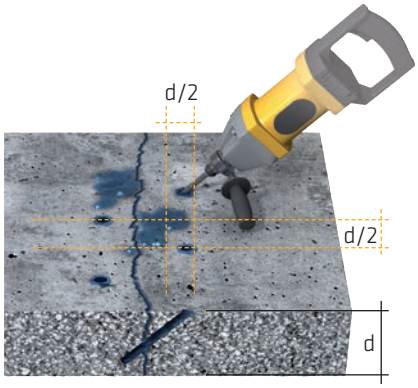
			Packer Type					
			Mechanical			Surface	Connection	
Application	Concrete/Substrate Condition/ Quality	Injection Pressure	MPS	MPR[1]	MPC[2]	SP	SikaPlan® W Inj.	SikaFuko® Packer Tong
Crack and Void Injection	Drilling Not Possible (steel reinforcement)	1 - 10 bar				X		
	Good or Poor (drilling is possible!)		X	X	X	X		
SikaFuko® Injection								X
Compartment Injection	N/A						X	
Curtain Injection	Good or Poor (drilling is possible!)	10 - 200 bar		X3				
Crack and Void Injection			X	X				

1) Recommended for high pressures and low flow rates; 2) Specially designed for injection with microfine cement, 3) Only with button head (non-return fitting)

THE CRACK INJECTION PROCESS

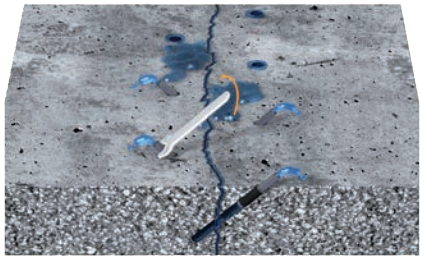
CRACKS IN CONCRETE STRUCTURES can be caused as the result of excessive load or stress on the structure by internal or external forces (e.g. ground movement). Leaking cracks need to be closed and sealed to secure the watertightness and durability of the structure.

SEQUENCE OF APPLICATIONS

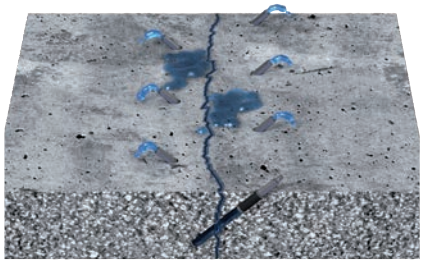


1 Drill holes for the packer alternating at a 45° angle to the concrete surface as shown in the picture.

Ø of drill hole = Ø of packer + 2mm



2 Install the mechanical packers. Tighten the mechanical packers so that they can withstand the maximum injection pressure.



3 Fix the non-return valve on the first packer and start the injection process.

4 When the injection material flows out of the second packer during the injection process, fix the non-return valve on to this as quickly as possible. Stop injection at the first packer and continue at the second packer.

5 Repeat this procedure from packer to packer.

6 If necessary, e.g., after injection of PU-foaming resins, a secondary injection procedure is carried out to ensure the crack is completely filled and sealed with an acrylate injection material.

GENERAL INFORMATION

- On vertical elements, always start from the bottom and work upwards
- Slow, low pressure injection is more effective than rapid, high pressure injection
- For detailed information, please refer to the Sika Method Statement for Crack Injection (Waterproofing)

TYPICAL SIKA PRODUCT

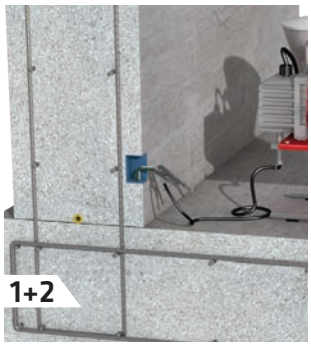
For Waterproofing:
Sika® Injection-101
+ Sika® Injection-307/-310 US

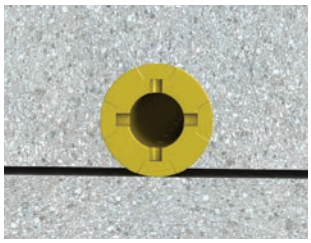
For Load Transfer:
Sikadur®-52

JOINT INJECTION WITH SikaFuko® INJECTION HOSE SYSTEM

SikaFuko® INJECTION HOSE SYSTEM is used on its own for construction joint sealing, or as a back-up system in combination with waterstops. Installation is done during the concreting phases of the project.

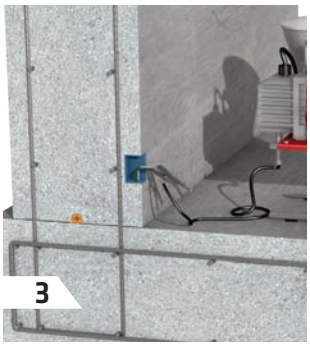
SEQUENCE OF APPLICATIONS

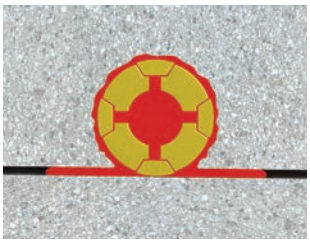




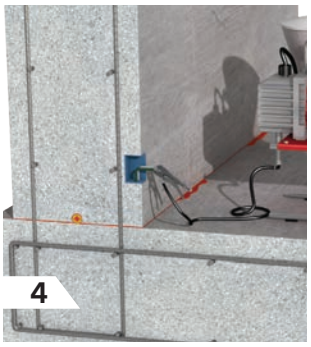
1 Locate the start and end of injection hose in the affected construction joint, e.g., in junction boxes.

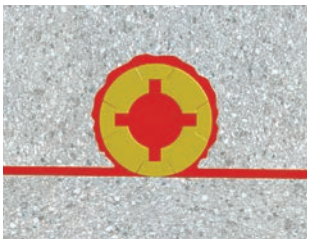
2 Connect the pump to the injection hose system, e.g., through Sika® Packer tong.



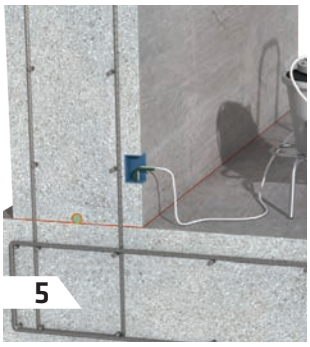


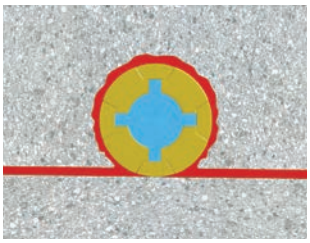
3 Begin injecting the SikaFuko® hose until the material flows out of the opposite end.





4 Close the opposite end and start injecting again until material is seeping out along the length of the joint.





5 When using re-injectable materials, the SikaFuko® hose can be flushed clean with water, which is also removed by vacuum. The SikaFuko® hose is then ready for future re-injection if required.

GENERAL INFORMATION

- SikaFuko® Systems must be installed before concreting the construction joint
- Documenting the location of the junction boxes and run of the hoses is important
- For detailed information, please refer to the Sika Method Statement for SikaFuko®
- On vertical elements, always start injection from the bottom and work upwards
- Slow, low pressure injection is more effective than rapid, high pressure injection

TYPICAL SIKA PRODUCT

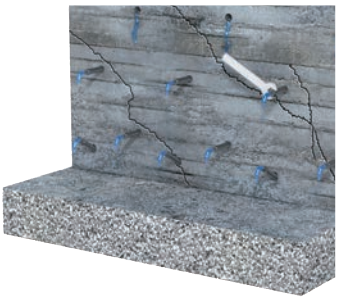
Sika® Injection-307
Sika® Injection-310 US

THE CURTAIN INJECTION PROCESS

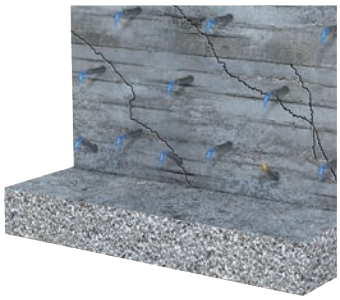
BASEMENTS CAN DEVELOP LEAKS over large sections of their whole area for many reasons including inadequate concrete mix design, placing, or compaction, in addition to ground movement and rising water tables, etc. These larger areas can be sealed by curtain injection behind the concrete structure.

SEQUENCE OF APPLICATIONS

1 Drill holes for the mechanical packers through the leaking building component at a spacing of 30 - 50 cm, as shown in the picture.



2 Install the mechanical packers. Tighten the mechanical packers so that they can withstand the maximum injection pressures.



3 Fix the button head (non-return) fittings on the first packer and start the injection process at the lowest row of drill holes.

4 When the injection material flows out of the second packer during the injection process, fix the non-return valve on it as quickly as possible. Stop injection at the first packer and continue at the second packer.

5 Continue the injection procedure from packer to packer.

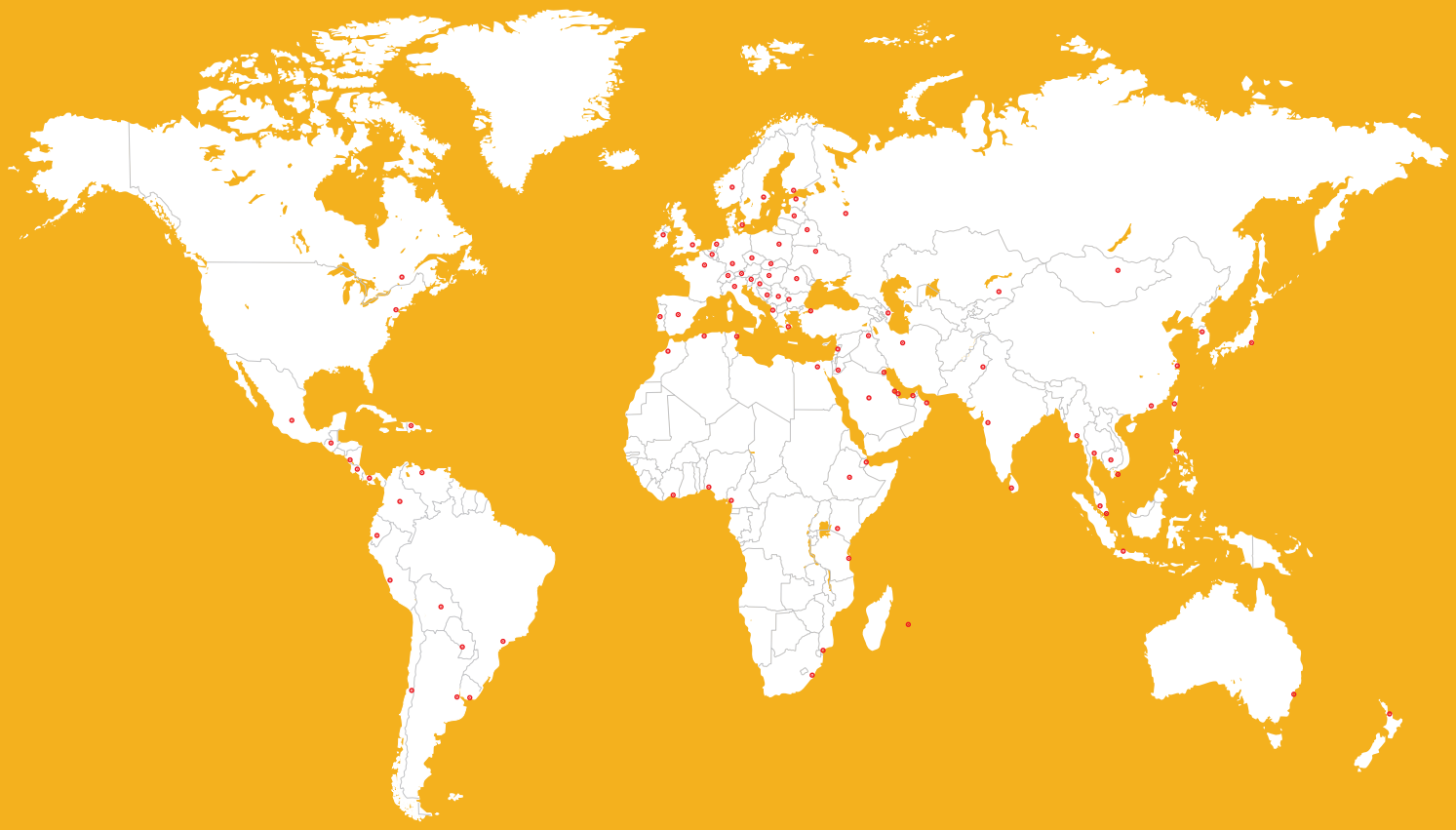
GENERAL INFORMATION

- On vertical elements, start injection from the bottom and work upwards
- Slow, low pressure injection is more effective than rapid, high pressure injection
- Detailed recording of the material flow in and out of each packer is important
- Test injection is recommended to define the best spacing for the packers

TYPICAL SIKA PRODUCT

Sika® Injection-215
Sika® Injection-304 (high water ingress)

GLOBAL BUT LOCAL PARTNERSHIP



The sale of all Sika products are subject to the following Limited Warranty:

LIMITED MATERIAL WARRANTY

Sika warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor.

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Contact Sika Team 800 325 9504 ■ Website usa.sika.com

For up to date and accurate information please consult the current Product Data Sheet at usa.sika.com

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