CONCRETE PRODUCTS FOR MICROTUNNELING

BUILDING TRUST

SIKA AND THE MICROTUNNELING WORLD

TUNNEL BORING MACHINES (TBMs) are commonly found with diameters from 5 to 17 meters and increasing. There are also the micro TBMs which are smaller, have an excavation diameter up to 4 meters and are extensively used today to construct kilometres of underground infrastructure worldwide.

Microtunneling is a fast alternative to conventional pipe installation systems. It is a fully automated method of boring and pipe installation without the need for disturbing the surface. Micro TBMs start at diameters from a few centimetres and increase up to 4 meters. They are typically used for excavation of many of the vital utility facilities such as fresh water, wastewater, oil, gas, communications and electricity.

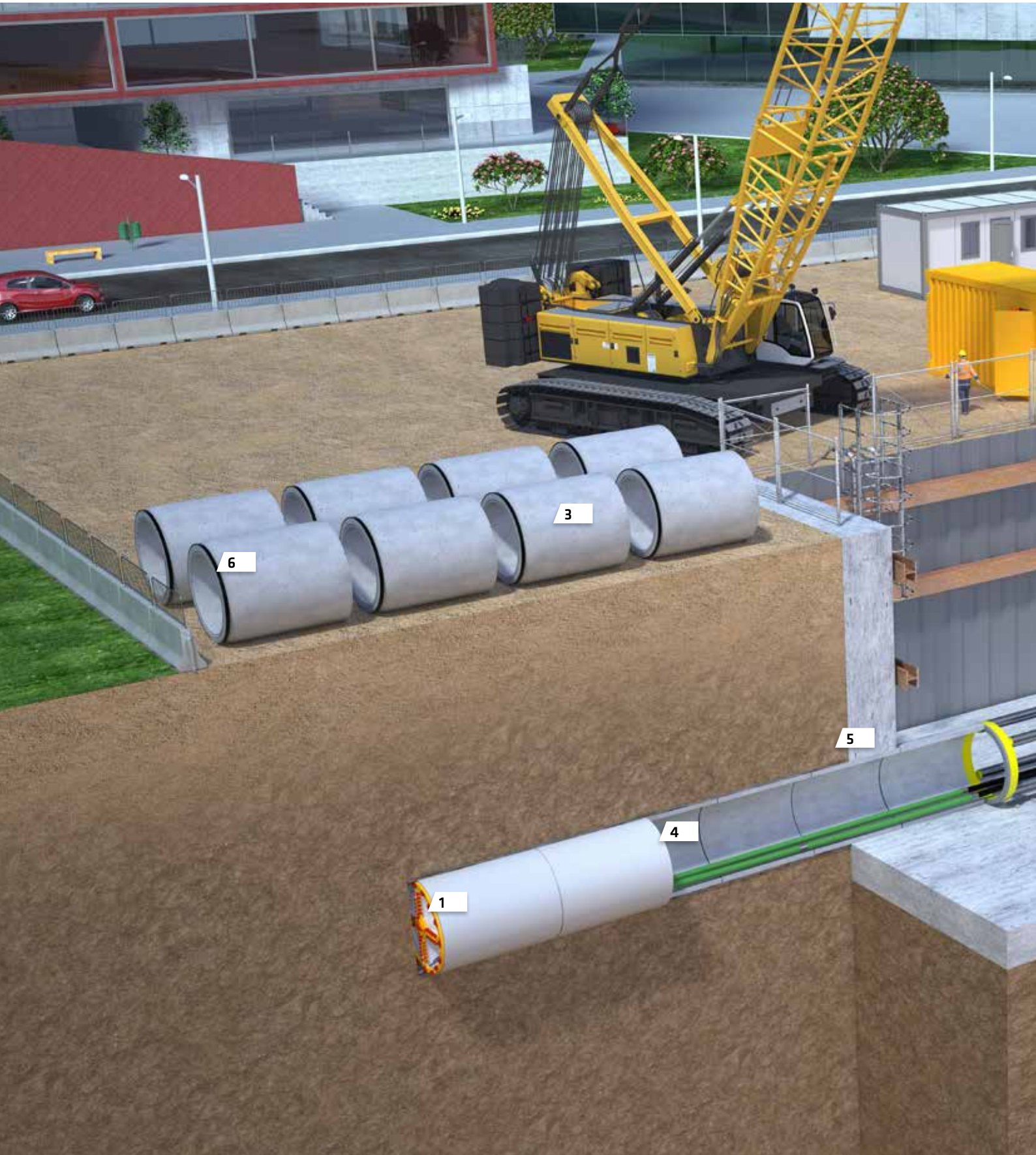
Projects with micro TBMs do not require trench excavation work. It is a technique especially suited for minimising disruption in densely populated areas, crossing difficult geological zones, penetrating through ground with high water levels, under rivers or generally overcoming obstacles where room for construction is restricted. The use of micro TBM is increasing more and more and has the advantage of limiting the environmental impact compared to traditional excavation methods. It is a fast method of continuous excavation with minimal interruptions.

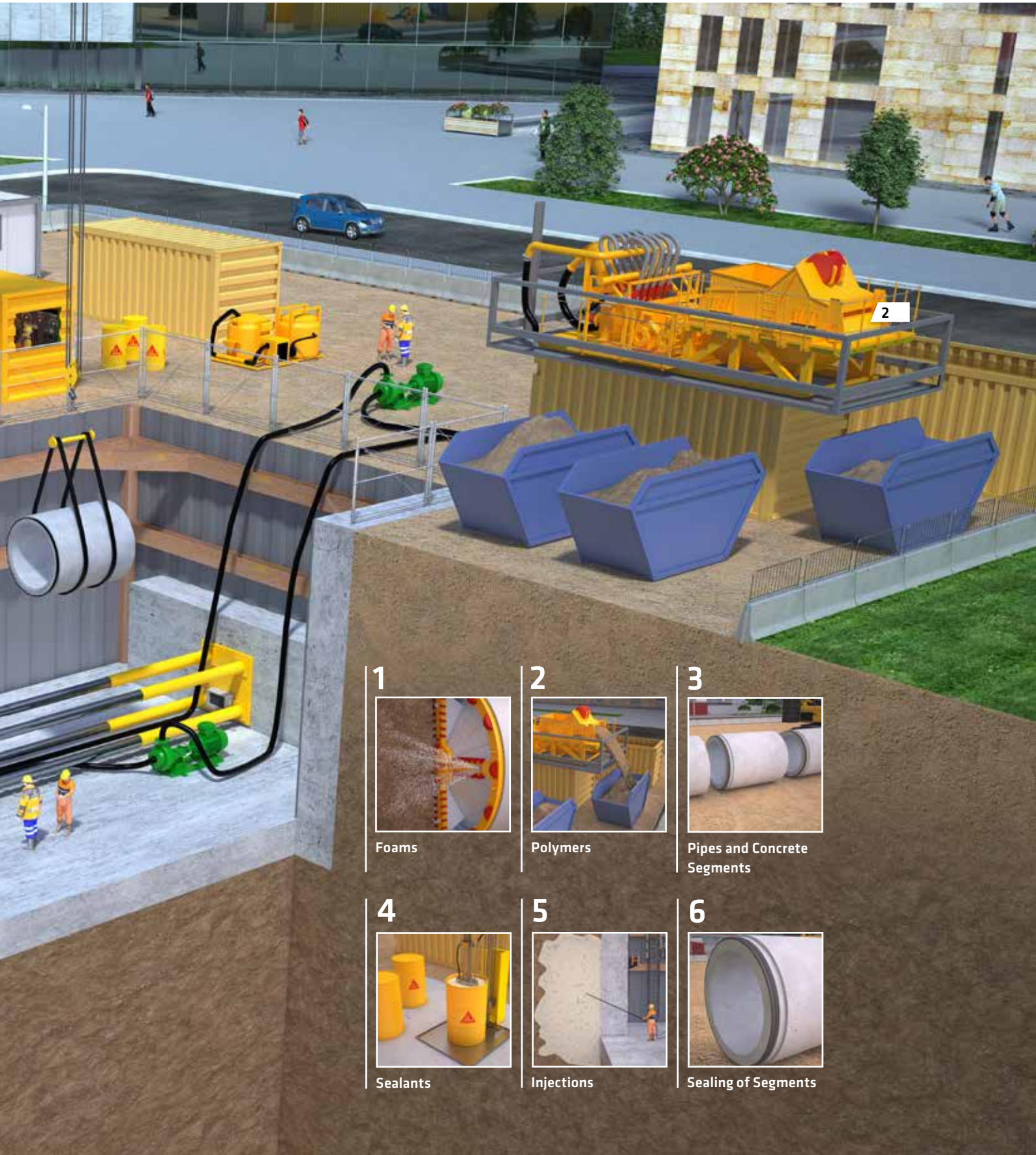
The main parameters to be considered when planning a project are the size of the tunnel, the length, the alignment, location and depth of shafts, entry and exit points, the groundwater and of course the geology . Even the most complex and changing geologies can be excavated over long distances, it is only a matter of the technology selection.

There are different types of machines, mainly: Slurry machines and in some cases Earth Pressure Balance machines (EPB). It is possible with both to excavate through most ground conditions including silts, clays, sands, gravels and even hard rock. Slurry machines inject a bentonite suspension into the face to reduce settlements on the surface. In slurry machines the excavated ground is mixed with the suspension and pumped out of the tunnel to a separation plant. This type of machine is mainly used for silt and cohesive soils and can also be used in gravels and rocks. EPB machines do not need the injection of bentonite during excavation but require the conditioning of the ground, using foaming agents and sometimes polymers, before removal with a screw conveyor. In EPB machines the excavated ground is collected in a chamber and transported out of the tunnel mainly in wagons pulled by a winch, short trains or pumped with a thick matter pump. This micro tunnel boring machine is mainly used in cohesive soils.

Sika is offering a wide range of products for the micro tunnelling excavation.

MICROTUNNELING – AN OVERVIEW




2
1
Foams
2
Polymers
3
Pipes and Concrete Segments
4
Sealants
5
Injections
6
Sealing of Segments

PRODUCTS FROM SIKA

FOAMS

Not all ground is ideal for excavation with a micro EPB TBM. Foaming agents are sometimes necessary to condition the ground in front of the machine to achieve better advance rates.

Sika® foaming agents are specially developed to fulfil the different requirements during excavation making it easier for micro EPB machines to excavate through the ground.

POLYMERS

Polymers can change the characteristics of the excavated ground.

Sika® polymers are specially developed to reduce ground adhesion on steel surfaces, reduce segregation in the mixing chamber and help grading in the separation plant.

PIPES AND CONCRETE SEGMENTS

Concrete pipes and segments for tunnels must be made to a high quality with no surface imperfections. The concrete is often required to have a high early strength for fast production and increased durability to extend the service life.

Sika® ViscoCrete® is a superplasticizer which improves the concrete workability and increases the concrete strength while SikaRapid® is used to control the hardening and setting process. Sika® Separol® release agents are used to ensure easy demoulding and improving the concrete surface. In specific cases, where there are aggressive agents in the ground which could attack concrete, Sikagard® coating systems provide a higher level of concrete protection.

SEALANTS

Instead of installing pipes for large diameters, concrete lining segments are fixed inside the tunnel to form the rings.

Sika® tail sealants are pumped between the rows of brushes in the gap between the tail-skin and the lining segments to prevent water, soil or backfilling grout from entering the machine.

INJECTIONS

Before excavation work starts it may be necessary to improve the condition of the ground in order to avoid groundwater entering the shaft, as the machine penetrates the sealing ring. In specific cases it may be necessary to stabilize the ground to avoid surface settlements.

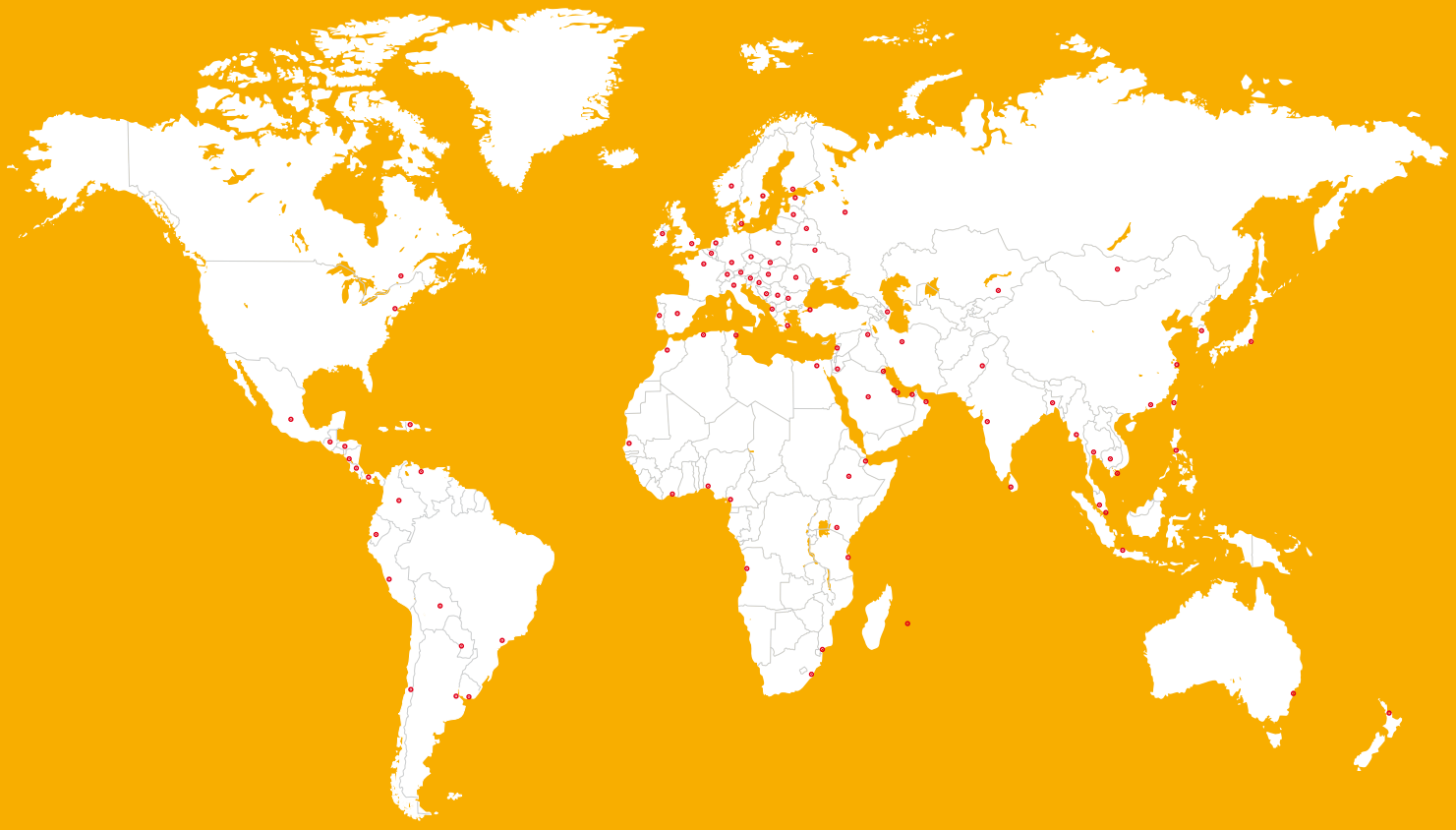
Within Sika® Injection and SikaFix® portfolio there are specific products for ground treatment.

SEALING OF SEGMENTS

Hydrophilic gaskets are used to seal gaps between concrete and steel segments.

SikaSwell® P is a hydrophilic strip which swells in contact with water and seals the gap to prevent water ingress according to the required working pressure, size of the gap and durability needs.

GLOBAL BUT LOCAL PARTNERSHIP



FOR MORE CONCRETE INFORMATION:

WE ARE SIKA
Sika is a specialty chemicals company with a leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing and protecting in the building sector and the motor vehicle industry. Sika's product lines feature concrete admixtures, mortars, sealants and adhesives, structural strengthening systems, flooring as well as roofing and waterproofing systems.

SIKA SERVICES AG
Tueffenwies 16
CH-8048 Zurich
Switzerland

Contact
Phone +41 58 436 40 40
www.sika.com

BUILDING TRUST