CONCRETE
Sika® Technologies
FIBRE REINFORCEMENT

Synthetic fibres are an ideal ingredient for concrete and mortar as they greatly improve the materials mechanical properties. Primarily they increase performance in energy absorption and fire resistance, whilst also reducing shrinkage crack formation and crack widths. This yields in concrete which needs significantly less reinforcing steel than conventional reinforced concrete, but still offers more durability. The concept of using fibre reinforcement in building materials goes back hundreds, if not thousands of years and with the modern advancement of concrete technology, fibre technologies continue to rapidly develop as well, offering more useful solutions than ever. Concrete applications with fibres have expanded and new fibres are also increasingly capable of replacing materials such as steel and glass fibres.
FIBRE REINFORCED CONCRETE is concrete to which fibres have been added during production to improve its cracking and fracturing behaviour. After many years of research and development, fibre reinforced concrete is now fully established in the market for its important advantages. The fibres are embedded in the concrete matrix and have no effect until they inhibit the emergence of cracks through their tensile strength and extensibility, and where there is greater strain they split the cracks into numerous very fine and generally harmless ones. If cracking occurs, the E-modulus of the fibres is crucial. This defines the resistance of a fibre by which it counteracts its elastic deformation.

The addition of fibres can improve the following properties of the concrete:

- Less cracking due to early-age shrinkage
- Better cohesion of the fresh concrete
- Higher flexural strength and shear strength
- Improved loading capacity/ductility
- Increased abrasion resistance
- Protection against freeze-thaw attack
- Increased fire resistance
- Increased energy absorption/toughness

The steel fibre concrete exhibits a higher elastic modulus while the fibres offer the largest stress capacity after the first crack. Due to the shorter steel fibre length (35 mm) the stress level decreases with increasing deflection. The polypropylene fibres show a load drop after the first crack (peak load) but with increasing displacement the fibres take over the loads and the stress level increases. The energy absorption of the beam with 8 kg PP fibres is due to the increasing energy absorption with increasing displacement larger than the one with the steel fibres.
FIBRES ENHANCE AND IMPROVE CONCRETE AND MORTAR for many different applications. Fibres improve the ductility of shotcrete linings and increase the fire resistance of final lining concretes in tunnel construction, they reduce cracking in roads and bridge decks or floor screeds, plus they can increase the impact resistance of precast concrete units.

SHOTCRETE
The addition of synthetic fibres increases the ductility of shotcrete. For instance, if the sprayed concrete lining of an excavated tunnel support is cracked due to high flexural stress the fibres can accommodate the tensile forces and act as an excellent yielding support. This interaction between sprayed concrete and fibres increases the mechanical working capacity of the concrete lining. The reinforcement can then be reduced or secondary reinforcement can be omitted completely. The result is quicker and cheaper tunnel excavation supports!

FIRE PROTECTION
Synthetic microfibres make concrete fire resistant. The fibres are added to the concrete mix during its production. If a fire breaks out, e.g. in a tunnel, the synthetic fibres melt within the concrete and this creates a capillary system through which the water vapour pressure can be relieved. Concrete spalling is strongly minimized.

SLABS / RUNWAYS / ROADS
Synthetic fibres in concrete floor slabs and runways very significantly reduce early-age shrinkage cracks and help to stabilize the mix. The use of fibres also results in better flexural behaviour and greater impact resistance. As a consequence, the reinforcement can be reduced and the joint spacing increased. The fibres also help to prevent the joints and other perimeter edges shearing. The durability of these floor slabs and runways is substantially increased.
FLOOR SCREEDS

Synthetic fibres are primarily used to enhance the workability of the fresh mortar, additionally they improve the quality and durability of the hardened screed by controlled crack distribution and shrinkage reduction. In the hardening phase, separate large cracks are not formed, instead there are many small cracks with greatly reduced potential for damage. Fibre reinforcement also improves the impact and fracture toughness of the mortar.

PRECAST CONCRETE

The use of fibres results in lighter and more economic components because the possible reduction in steel reinforcement saves weight and reduces construction time. The homogeneous distribution of the fibres throughout the concrete cross-section gives the concrete elements high impact strength right to the edges and corners. This allows secure installation of the elements on site without damage and with synthetic fibres there is no hidden risk of injury to workers during production and installation on-site.

REFURBISHMENT

Repair mortars comprising fibres exhibit a greater durability due to the improved crack distribution and an increased working capacity due to their crack bridging ability. The improved internal cohesion of the fibre mortar also allows spray applied layers of greater thickness and, thus, increases the working/application rate and reduces the overall cost of the application.

HIGH STRENGTH CONCRETE (HSC) AND ULTRA HIGH PERFORMANCE CONCRETE (UHPC)

High structural stability (load bearing capacity and serviceability) under extreme conditions (e.g. Earthquakes) and very slender components require the use of HSC or UHPC. With the use of thin, short fibres with a high E-modulus, untensioned reinforcement can be reduced; plus alternatively, very high energy absorption capabilities can be achieved in combination with the untensioned reinforcement.
Synthetic micro-fibres have an even lower E-modulus (3 – 5 GPa). Again the synthetic micro-fibres are non-corrosive. Micro-fibres are mainly used to reduce early shrinkage cracking and their low melting point (160 °C) improves the fire resistance of the concrete.

**SYNTHETIC MACRO-FIBRES**

Synthetic macro-fibres have a lower E-modulus than steel fibres (5 – 15 GPa). Unlike steel fibres, synthetic macro-fibres cannot take extremely high strengths, but they work very effectively in the early phase of emerging cracks in the concrete. Synthetic fibres are corrosion resistant and give the concrete greater ductility.

**SYNTHETIC MACRO AND MICRO HYBRID FIBRES**

Blended synthetic macro & micro fibres provide improved inter-facial bonding and flexural toughness efficiency. This unique fibre is especially made for architectural concrete to reduce the incidence of plastic stage cracking at early age as well as to increase the toughness at the hardened stage. This corrosion resistant hybrid fibre improves the hardened stage properties such as ductility, impact resistance and shear strength.

**SYNTHETIC MICRO FIBRES**

Synthetic micro-fibres have an even lower E-modulus (3 – 5 GPa). Again the synthetic micro-fibres are non-corrosive. Micro-fibres are mainly used to reduce early shrinkage cracking and their low melting point (160 °C) improves the fire resistance of the concrete.

**BEST USE OF THE DIFFERENT TYPES OF SYNTHETIC FIBRES**

<table>
<thead>
<tr>
<th>State of concrete or mortar</th>
<th>Effect</th>
<th>Recommended fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>Homogeneity improvement</td>
<td>Micro-PP fibres</td>
</tr>
<tr>
<td>Until about 12 hours</td>
<td>Early-age cracking reduction</td>
<td>Micro-PP fibres</td>
</tr>
<tr>
<td>1 – 2 days</td>
<td>Reduction of cracks induced by restrain or temperature stresses</td>
<td>Micro &amp; macro-PP fibres</td>
</tr>
<tr>
<td>28 days hardening or more</td>
<td>Transmission of external forces</td>
<td>Macro-PP fibres</td>
</tr>
<tr>
<td>28 days hardening or more</td>
<td>Improvement of fire-resistance</td>
<td>Micro-PP fibres</td>
</tr>
</tbody>
</table>
FIBRES IN CONCRETE SIMPLIFY THE PRODUCTION PROCESS in prefabrication and for work flows on site, because reinforcement can be reduced at many points or even eliminated completely. The time saved on steel fixing can also save costs. In regards to increasing the fire resistance, fibres have again made the construction process much simpler. There is no need to over-design concrete cross-sections or post-apply fire protection systems if synthetic fibres are added to the concrete.

TUNNELLING AND MINING

By using fibre reinforced sprayed concrete, conventional reinforcement can be dispensed with, given moderate rock pressure. The time-consuming steel fixing operations which interrupt the work flow are then eliminated. By eliminating the reinforcement, the concrete is, further more, applied without spray shadows and rebound is reduced. The result is optimization of the application process combined with improved quality.

DECK CONSTRUCTION

Apart from reducing the steel reinforcement, the addition of fibres can significantly increase the joint spacing. Because a blinding layer can partly be omitted, the layer thicknesses of the slabs can also be reduced. Optimum distribution of the fibres right into the corners can also produce increased edge protection. All these aspects have a positive impact on the installation rate and increase construction efficiency.

UTILITY BASEMENTS

The synthetic micro-fibres added to the concrete during the mixing process prevent or very significantly reduce concrete spalling in the event of a fire. Structural concrete elements do not need to be over-designed and an additional fire protection treatment is not necessary. The use of this fibre fire protection in the concrete generates significant time savings and the best use of available space.
SPECIFIC CONCRETE CHARACTERISTICS are obtained by using different fibre types (or mixtures of different fibres). Longer fibres with a high E-modulus and good anchorage properties are used for high energy absorption and a large number of smaller fibres are added for crack reduction. Many small fibres with a low melting point are needed to obtain fire resistance and there are also many applications where different combinations of fibre types are used to meet a wider range and number of requirements simultaneously.

STRUCTURAL BEHAVIOUR

Concrete generally has high compressive strengths but weak tensile strengths. If concrete fractures due to high bending stress, the system collapses without any recognisable pre-indication when no reinforcement is present. As with conventional steel reinforcement, high forces can also be transferred and distributed by using suitable fibres. (Crack-bridging fibres not only improve the post-cracking behaviour but also reduce further propagation of macro-cracks.) The fibres which cross the crack and are anchored in the matrix on both sides effectively “sew” its two sides together and prevent it widening. Fibre reinforced concrete, therefore, has increased ductility and is capable of absorbing higher energy.

CRACK DISTRIBUTION

The shrinkage stress during the hardening period of cement based binders frequently leads to cracking. These cracks are visible with the naked eye and are perceived as damage. With the help of fibres, the shrinkage stress is reduced and homogeneously distributed over the entire volume. Thus, the formation of macro-cracks is prevented and the shrinkage volume is instead compensated by micro-cracks. Micro-cracks significantly improve the aspect of the surface compared to macro-cracks. Furthermore, these micro-cracks do not weaken the strength to the same extend and, in addition, might promote self healing effects, leading to a higher durability of the construction.
The problem of traditional concrete in case of fire is that the physically and chemically bound water evaporates in a very short time due to the rapid rise in temperature. This transition to the gaseous state causes a thousand-fold increase in the volume of the water. The denser the concrete matrix and the higher the moisture content of the concrete, the higher the developing vapour pressure will become. If the vapour pressure cannot be reduced (or not quickly enough), concrete spalling will result. This occurs after only a few minutes and immediately causes extensive and deep-reaching damage to the structures. If the reinforcement is exposed, it has no protection from the fire and its structural function is soon lost. The addition of polypropylene fibres gives a considerable or even total reduction in explosive concrete spalling. The following effect can be observed: With their low melting point of 160°C, the fibres melt immediately after the fire starts. They leave very fine channels through which the evaporating water can escape without the destructive pressure build-up.

MECHANICAL RESISTANCE

The impact and shock resistance, notched bar impact strength and edge strength can all be increased significantly by adding specific fibres. Synthetic fibres and most steel fibres are suitable. A combination of fibres with a high and low E-modulus and high elongation at break has proved beneficial. An improvement in impact strength has been observed by adding steel fibres and also polypropylene fibres in quantities of only 0.1% by volume. The impact strength improves considerably as the quantity is increased.
TO ACHIEVE THE OPTIMUM EFFECT in concrete, all potentially influencing factors have to be considered. The critical factors are the fibre type and how the concrete mix design is adapted to fibres, including their dosing and mixing. An appropriate concrete placing system must be used.

FIBRE DOSING QUANTITIES

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Fiber type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>High loading capacity</td>
<td>Synthetic macro fibre</td>
<td>4 - 8 kg</td>
</tr>
<tr>
<td></td>
<td>Steel macro fibre</td>
<td>20 - 40 kg</td>
</tr>
<tr>
<td>Extremely high loading capacity</td>
<td>Steel micro fibre</td>
<td>50 - 100 kg</td>
</tr>
<tr>
<td>Reduced early shrinkage cracks</td>
<td>Synthetic micro fibre</td>
<td>0.5 - 1 Kg</td>
</tr>
<tr>
<td>(plastic shrinkage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased fire resistance</td>
<td>Synthetic micro fibre</td>
<td>2 - 3 kg</td>
</tr>
<tr>
<td>Increased impact strength</td>
<td>Synthetic micro fibre</td>
<td>0.5 - 1 Kg</td>
</tr>
</tbody>
</table>

The well-balanced Mix design is the key factor for the best fibre performance. Fibres add a large surface area to the concrete. So the mix design must be adjusted to ensure concrete workability and an optimum bond between matrix and fibres. This involves the right choice of binder and water content, aggregate grading curve, the optimum fibre quantity and any other additives and admixtures. The well-developed Mix design influences positively all steps of the fibre reinforced concrete / shotcrete:

Production
- No fibre balling
- Good fibre distribution
- Low mixer resistance
- Less mixing time

Application
- Easy hopper grill passing
- Good pumpability
- High cylinder fill grade
- Low pump pressure
- Good sprayability
- Less rebound

Performance
- Good fibre embedding
- Low W/C

HANDLING – HOW TO USE
The concrete application system can influence the fibre content and the alignment of the fibres in the matrix. Some fibre types also cause greater machine wear, whilst others generate pumping problems at high dosages. Therefore the application process must be taken into consideration during the fibre type evaluation and selection process.

The specification usually defines the fibre type. It specifies macro- or micro-fibres according to their geometry and shape, with the material as being required to be synthetic, natural or metal. The performance of the fibres in the concrete is also affected by the production process, its surface treatment and finishing etc.

An unsuitable mixing process results in non-homogeneous distribution of the fibres in the concrete or damage to the fibres. The quantity to be added and the mixing time must be defined and followed to prevent any subsequent lack of performance in the concrete or mortar.

DOSING METHODS
The dosing and mixing method has a great influence on the optimum distribution of fibres in the concrete. Macro-fibres are normally formed into bundles, which will only disperse during the wet-mixing process, so that the fibres are homogeneously distributed in the concrete. Water soluble bags are used for dosing smaller fibres to preventballing.

APPLICATION
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FIBRE TYPE
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MIXING PROCESS
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THE DIFFERENT POTENTIAL APPLICATIONS AND USES of fibre reinforced concrete require test methods tailored to these applications, so that the specific performance can be tested and used in future specifications. Generally, the test methods are now fully internationally standardized, for example by European Standards (EN) and the American Society for Testing and Materials (ASTM).

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy absorption</td>
<td>ASTM C1550</td>
<td>Round panel test</td>
</tr>
<tr>
<td></td>
<td>EN 14488-5</td>
<td>Square panel test</td>
</tr>
<tr>
<td>Residual strength</td>
<td>EN 14651</td>
<td>Beam test</td>
</tr>
<tr>
<td>Fire resistance</td>
<td>RWS</td>
<td>Max. 1350 °C, 2 hours</td>
</tr>
<tr>
<td></td>
<td>ISO 834</td>
<td>Starts at low temp, but continuously increasing</td>
</tr>
<tr>
<td></td>
<td>HC modified</td>
<td>Max. 1200 °C, 4 hours</td>
</tr>
<tr>
<td>Shrinkage cracking</td>
<td>ASTM C 1581-04</td>
<td>Test method for determining restrained shrinkage</td>
</tr>
<tr>
<td>Impact resistance</td>
<td>Various local standards</td>
<td>Impact energy tests</td>
</tr>
</tbody>
</table>

Round panel test: ASTM C1550
Square panel test: EN 14488-5
Beam test: EN 14651
CASE STUDIES

FIBRES ARE MULTIFUNCTIONAL and are now used widely and successfully in many applications, especially in tunnelling and mining, precast construction and flooring. Sika’s huge expertise and experience in the design, selection and application of fibre reinforced concretes and mortars is on display in many successful projects throughout the world.

ELOISE COPPER MINE, AUSTRALIA

In this mining project SikaFiber® Rad 65s is used in the sprayed concrete, mainly for excavation support. Its use ensures an efficient, cost-effective and safe work flow as driving advances.

EVERHARD INDUSTRIES GROUND SLAB, AUSTRALIA

SikaFiber Force PP48 synthetic fibre were used in conjunction with Sika concrete admixtures for industrial ground supported slab in Geebung QLD. The Australian made macro fibres were used to replace the crack control mesh (SL72) in 200-210mm ground slabs of 3000m2.

HOLLOW CORE TOPPING SLAB, AUSTRALIA

SikaFiber PPM 48/19 macro/micro blend fibres were used to replace the crack control mesh in 50-60mm topping slabs at Prince Alfred College boarding house project. Hybrid fibre delivered a more efficient and cost effective slab compared to the traditional reinforced concrete topping slab.

PRECAST TUNNEL SEGMENTS, USA

In the Central Subway Project, San Francisco, the SikaFiber® HP was used at a dosage of 1.2 kg/m³ of concrete to prevent explosive spalling of concrete in the event of fire in the tunnel.
SIKA® UCS Pak
UNDERWATER/ANTI-WASHOUT ADMIXTURE

PRODUCT DESCRIPTION
Sika® UCS Pak is a powdered underwater/anti-washout admixture formulated to increase the cohesion of concrete to enable a significant reduction in washout of cement when placed under water. Sika® UCS Pak is packaged in water-soluble bags to enable ease of addition.

Sika® UCS Pak is mainly used in the following applications:
- A wide range of applications where concrete or grout is to be placed underwater or in wet conditions
- Marine construction
- Concrete piles placed in wet conditions or below the water table

KEY BENEFITS
- Binds cement in the fresh concrete/grout to prevent wash out under water
- Retains strength and durability of concrete/grout placed under water
- Significantly reduces contamination of surface or underground water bodies
- Significantly reduces segregation of concrete/grout placed below the water table (very beneficial for concrete piles)
REMEDIATION OF SEAWALL SYLVANIA WATERS CANALS GEORGE’S RIVER, SOUTHERN SYDNEY

The project was to replace the damaged sea wall which was over 40 years old. First stage was approximately 40 meters in length. This was to be casted in situ in Plastic wall sections, 6.5m in height x cross section of 400mm - 200mm. Sika UCS Pak was used at a dosage rate of 3 x 0.4kg to enhance the cohesion of concrete and to reduce the washout of cement paste when placed under water.

BEN ANDERSEN WEIR PROJECT, BUNDABERG QLD.

Ben Andersen weir separates the saltwater section of the Burnett River from the freshwater side. After 2012 floods, it appeared to have some damages to the shield located under the wall. The upstream area which was up to 18metres deep in places had to be filled with 600mm armour rock in layers, with each layer being filled with a flow able, underwater concrete. It went for almost full length of the wall and out to 30metres on the upstream side. This project consisted of approximately 20,000cubic metres of rock and 5,000+cubic metres of UCS Pak treated underwater concrete. The project catered only for one side of the wall which was 20kilometres from the concrete plant. The Sika UCS pak was used at a dosage rate of 4 x 0.4kg/m3 of concrete in moving water and half the dosage for still water application successfully.

LOCAL PROJECT REFERENCES
Sika® UCS Pak has been used in many successful projects throughout in Australia in recent past.
SIKAFIBER PPM 48/19
SIKA SOLUTION FOR DURABLE, SAFER & FASTER CONCRETE CRACK CONTROL

Blended polyolefin macro & micro fibres provides improved interfacial bonding and flexural toughness efficiency. This Australian made macro synthetic fibre blend provides optimum solutions for ground supported slabs, shotcrete and precast industry.

POST CRACK PERFORMANCE

A) Mini mortar beam test load vs. deflection curve

B) Concrete beam test (600x150x150mm) to compare the performance of PP 48/19 fibre and 4mm & 6mm steel rods (welded wire)

ADVANTAGES OVER CONVENTIONAL WELDED WIRE MESH

- Durable: No rusting of poly fibre hence no requirement of maintaining a minimum cover to reinforcement.
- Safer: No transportation, cutting, bending & fixing of steel hence reduce the injury risk of workers & public.
- Easy to transport: No need of large trucks or trailers to move around as it comes in 2.3kg small boxes.
- Less labour: No cutting and fixing of steel hence less labour cost and faster to use.
- Easy dosing: No need of special dosing equipment hence fibre could be added at site or at ready-mix plant.
- Easy finishing: No special tools required for finishing and could use conventional vibrating and finishing tools to place and finish the concrete.
- Better crack control: Reduce incidents of plastic shrinkage & plastic settlement cracking.
- Improved hardened stage properties: improves impact resistance, abrasion resistance, shear strength and toughness of concrete.

AREAS OF APPLICATION

- Ground supported slabs: Domestic, industrial or commercial slabs, car parks.
- Driveways, bikeways, walkways and footpaths.
- Topping slabs and repair works.
- Boat ramps, spillways and drainage channels.
- Shotcrete: swimming pools, batter walls, spoon drains.
- Precast and in situ concrete.
TYPICAL DOSAGE
- Light load applications: 2.3kg boxes (e.g. footpaths, cycle ways, spoon drains etc.)
- Medium load applications: 2 x 2.3kg boxes (e.g. drive ways, topping slabs to replace SL62 to SL72 mesh, storm water pits, head walls)
- Heavy load applications: 3 x 2.3kg boxes (e.g. ground supported slabs such as car parks, domestic / commercial flat slabs, roadways to replace SL72 to SL82 mesh, septic tanks, soak wells)

SPECIAL NOTES
- SikaFiber PPM 48/19 should not be used to replace the structural steel in suspended slabs/beams, slender columns & walls etc.
- SikaFiber PPM 48/19 should not be used to reduce the slab thickness, joint spacing & dowels.
- Compatibility, technical data and for more information please refer to Product Data Sheet (PDS) of SikaFiber PPM 48/19.
- Contact your local Sika representative for specification or to confirm the suitability of the product for your application.

IMPORTANT NOTIFICATION
The information, and, in particular, the recommendations relating to the application and end-use of Sika’s products, are given in good faith based on Sika’s current knowledge and experience of the products when properly stored, handled and applied under normal conditions. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The proprietary rights of third parties must be observed. All orders are accepted subject of our terms and conditions of sale. Users should always refer to the most recent issue of the Australian version of the Product Data Sheet for the product concerned, copies of which will be supplied on request. PLEASE CONSULT OUR TECHNICAL DEPARTMENT FOR FURTHER INFORMATION.
EXCELLENCE IN WATERPROOF CONCRETE WITH Sika® WT-200 P

FEATURES OF SIKA WT-200 P

The addition of a water resisting admixtures is one measure to improve the impermeability of the concrete. The active components in Sika WT-200 P form non-soluble materials throughout the pore and capillary structure of the concrete, protecting the concrete against the ingress of water and other deleterious substances and contributing to a waterproofing matrix. In addition, the special formula and ingredients of Sika WT-200 P enhances the self-healing properties of concrete and will improve the ability to heal concrete cracks and enhance durability.

TECHNOLOGY

Impermeability of concrete against water is determined by the impermeability of the binder matrix, i.e. capillary porosity. These capillaries are the voids created by the excess water in the concrete, typically added to improve the workability of the concrete, but which is not used for the chemical reaction for hardening or strength. These pores are the potential migratory paths for water through the concrete. Therefore concrete can be described as a porous material that allows the passage of water through a structure of capillary pores.

BENEFITS OF SIKA WT-200 P

The use of Sika WT-200 P in waterproof concrete results in the following advantages:

- Increase in service life of the construction
- Significantly improved durability and sustainability of the hardened concrete
- Ensured watertightness without other expensive measures
- Reduced maintenance costs
- Sika WT-200 P additionally enhances the self-healing properties of concrete and promotes the ability to heal concrete cracks
- Non-toxic - Potable water approved (AS/NZS 4020:2005) Permanent

<table>
<thead>
<tr>
<th>Keeping water OUT</th>
<th>Keeping water IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basements</td>
<td>Swimming pools</td>
</tr>
<tr>
<td>Habitable basements</td>
<td>Water retaining structures</td>
</tr>
<tr>
<td>Parking structures</td>
<td>Dams</td>
</tr>
<tr>
<td>Tunnels</td>
<td>Waste water treatment structures</td>
</tr>
<tr>
<td>Utility/plant rooms</td>
<td>Water structures</td>
</tr>
<tr>
<td>Precast components</td>
<td>Underground vaults</td>
</tr>
<tr>
<td>Foundations</td>
<td>Secondary containment</td>
</tr>
</tbody>
</table>

DEPTCH OF WATER PENETRATION UNDER HYDROSTATIC PRESSURE (EN 12390-8)

- Dosage rate = 1%

SORPTIVITY (ASTM C1585)

- Initial Soretivity x 10^-4 (MM/V/S)
- Dosage rate = 1%

COMPRESSIVE STRENGTH

- Compressive Strength (MPa)
- Dosage rate = 1%

CONCRETE Sika® TECHNOLOGY
REQUIREMENTS
The water impermeability of a construction is determined by fulfillment of the decisive requirements regarding limitation of water permeability through the concrete. With the use of Sika WT-200 P the
- Water penetration depth
- Water conductivity
- Water absorption
- Self-healing properties of a concrete can be positively enhanced.

SIKA SOLUTIONS FOR WATERTIGHT CONCRETE SYSTEM
The Sika Watertight Concrete System offers a comprehensive solution for watertight structures. The system consists of concrete that has been specially modified with Sika admixtures to produce waterproof concrete; and carefully selected waterstops for construction and movement joints. Watertight concrete structures can be designed to keep water in or out or both. The need to maximize design flexibility has led clients and specifiers to look below ground as an alternative, whether for basement parking or a habitable environment.

STRUCTURES AND APPLICATIONS
The Sika Watertight Concrete System can be used for all types of below-ground structures, including habitable basements, car parks and areas for business use. As with all below-ground structures, adequate ventilation and air conditioning should be appropriate to the intended use.

According to the EN 12390-8 the waterpenetration depth tests has to be conducted over 72 hours with a water pressure of 5 bar. In order to gain knowledge after these three days the same tests have been performed with extended testing time up to 28 days.
Our most current general sales conditions shall apply.
Please refer to the relevant data sheet prior to any use or processing of Sika products.

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SIKA’S FULL RANGE OF CONSTRUCTION SOLUTIONS

Roofing
Sarnafil®
Sikaplan®
Sarnacol® Adhesives

Waterproofing
Sikaplan®, Sikalastic®
Sika® & Tricosal® Waterstops
Sika® Injection Systems

Sealing & Bonding
Sikaflex®
Sikasil®
SikaSeal®
SikaBond®
Sika MaxTack®

Flooring
Sikafloor®
SikaBond®

Concrete
Sika ‘ViscoCrete’
Sika ‘Retarder’
Sikaﬁber®

Refurbishment
Sika ‘CarboDur’
Sikagard®
Sikadur®
SikaGrout®
Sika ‘MonoTop’

Concrete Refurbishment September 2018

SIKA® FULL RANGE OF CONSTRUCTION SOLUTIONS

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