

CASE STUDY

Move Concrete Waterproofing & Protection Offsite



Overview

It's nothing new that every project is under pressure to meet deadlines and adhere to budgets. These days, new concerns about health and the maintenance of safe working distances are key challenges that must be dealt with. While your projects have been deemed essential and moving full speed ahead, the need to keep your crews as lean, efficient and as healthy as possible are more important—and challenging—than ever before.

There are aspects of your projects where labor and cost savings may be easily within reach...if you know where to look. One such area is the waterproofing and protection of concrete structures such as sub-grade foundations; combination underground parking and foundations; water holding structures for water treatment and wastewater plants; tunnel linings; elevator pits; and marine structures.

The use of Xypex crystalline concrete waterproofing admixtures, which can be added to your ready-mix or sitemixed concrete, can eliminate the need for coatings and membranes. That means you save the time and expense that is usually required to apply or install waterproofing systems. Depending on the complexity of your project, this type of 'off-siting' can save weeks, even months (fig 1).

Construction Schedule Savings From Using Xypex Admix



Integration of Xypex in the concrete mix not only saves the time that would have been required to apply and inspect blind side and other types of waterproofing, but also provides other advantages as well:

- **Cost savings.** A leading waterproofing contractor in the Salt Lake City, Utah, USA, area recently calculated that the cost to install 1,000 sq.ft. of blind side waterproofing on basement foundation would be about \$10,000; whereas, the cost to waterproof the 37 cubic yards of concrete--that were to be poured for that foundation anyway—with Xypex Admix C-500 would cost about \$1,700, a saving of \$8,300.
- Risk reduction. Since no extra workers are required to install the concrete treated with Xypex, then the risk of worker injury is reduced and social distancing can be achieved.
- Eliminates chance of punctures and tears during installation or later.
- Reduces scheduling hassles and headaches. No separate installation crew is required for Xypex treated concrete.
- Provides both positive and negative water resistance, unlike coatings or membranes.
- Automatically heals cracks in concrete up to 0.5 mm.
- Instills resistance to harsh chemicals and mitigates the attack of chlorides, sulfates, and the effects of carbonation and alkali-aggregate reaction.

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Challenges

The world has changed. Not just because we are all reeling from the impact of a global pandemic, but also due to fundamental changes that have been building for many years. For instance, according to a Q1 2020 report by USG Corp. and the U.S. Chamber of Commerce, labor shortages are still a serious issue, and a high percentage of contractors face challenges completing work on schedule.

Nearly all contractors surveyed report at least moderate difficulty finding skilled workers, and more than half report that it is very difficult to find them. In fact, 73% report that the lack of skilled labor makes it challenging to meet schedule deadlines; 69% say they are having to submit higher bids; and 42% say they are turning down work as a result.

When it comes to managing the use of concrete on your jobs—be it poured-in-place, precast, shotcrete, etc. –one requirement for most projects is the need to ensure water-tight construction. For projects involving deep foundations, positive-side waterproofing is not feasible due to shoring wall construction.

In most cases, waterproofing systems—e.g., PVC sheet or spray-applied membranes—must be applied to the shoring wall. This process is labor-intensive and must be error free to ensure integrity. These systems are applied by specialized waterproofing contractors who need significant time and resources to carry out their work. Waterproofing projects are subject to the same scheduling and labor challenges as all construction projects.

As if the construction industry wasn't challenging enough, along comes a global pandemic that may not end for a year or more. Even then, most experts agree that our world will be very different from this point forward. Employee health and safety will continue to be a concern, including ongoing infection and absenteeism. Other potential impacts that could be long-lasting include:

- Material delays can result in project delays
- · Jittery clients and lenders
- Quarantines and travel bans can lead to worker shortages
- Legal issues may trigger penalty clauses
- Global uncertainty often results in construction industry uncertainty

One Solution: Crystalline Waterproofing and Protection

Project designers, owners, contractors and other stakeholders are working hard to find ways to move labor and certain aspects of projects offsite to achieve new types of benefits. Crystalline waterproofing is uniquely positioned to meet this need in many important ways. It is especially well suited for applications such as water holding tanks, ponds, and other structures; waste water and water treatment plants; elevator pits; underground parking garages; tunnel linings; marine structures; precast products; and power generation plants.

Any project where blindside waterproofing is either planned or under consideration is a candidate for crystalline waterproofing. Wherever deep foundations require positive-side coatings or membranes affixed to sheet pilings or soldier beams and lagging, crystalline waterproofing can be added to the slab and foundation concrete at the ready-mix plant or to on-site batching.

The cost and time savings of using an integrated solution such as Xypex crystalline waterproofing can be dramatic. The typical cost and installation rate for crystalline waterproofing versus membranes and spray-applied coatings is compelling (fig 2). Based on a study done in the United States, crystalline waterproofing cost \$19 per m², compared to \$135 and \$170, respectively, for PVC membrane and spray-applied membranes.

Typical Cost and Installation Comparison (USA)







The installation rate for these waterproofing technologies was also dramatically different, with crystalline waterproofing requiring no installation time (it's added directly to the concrete mix), and typical installation rate for PVC membranes is 85 m²/shift and 250 m²/shift for spray-applied membranes.

The same type of cost and time differences can also be expected in any project where concrete must be protected and waterproofed, including tunnels, parking garages, water holding structures, marine structures, wastewater treatment, and power plants.

Xypex Crystalline Waterproofing Technology

Xypex Crystalline waterproofing products are made up of Portland cement, very fine treated silica sand and proprietary chemicals. This waterproofing system takes advantage of the chemical nature of concrete and uses it to achieve not only waterproof concrete, but concrete that can heal itself when hair-line shrinkage cracks develop.

Crystalline waterproofing reacts with moisture and the by-products of cement hydration such as calcium hydroxide, other soluble mineral salts as well as un-hydrated or partially hydrated cement particles within the concrete substrate to form mineral-based dendritic crystalline structures that are insoluble in water (fig 3). The formation of the crystals in the concrete pores, cracks and other voids is an on-going, gradual process, requiring several days to a couple of weeks for the crystals to reach maturity.



Fig. 3

As the crystals grow across the diameter of the concrete pores, they form a microscopic, mesh-like barrier that blocks the flow of liquids, even under extreme hydrostatic pressure. This barrier characteristic of crystalline waterproofing inherently improves the durability and performance of concrete structures, lowers maintenance costs and extends the lifespan by protecting against the effects of water ingress and aggressive chemicals such as chlorides and sulfates.

Xypex's Crystalline waterproofing works the same way whether it is mixed in new concrete as an admixture or applied to the concrete surface as a slurry coating for repairs or as a waterproofing treatment. As an admixture, crystalline waterproofing becomes a permanent part of the concrete and will continue to work for the life of the structure, preventing the ingress of water from any direction and sealing static hairline cracks and pores up to 0.5 mm.

50 Years of Real World Experience

Let's take a look as some examples of projects where crystalline waterproofing played a critical role. These projects are just a small cross section of the thousands of projects that have been carried out worldwide in which membranes and coatings have been replaced or reinforced through the use of crystalline waterproofing.

Deep Foundations



Amos Rex Helsinki, Finland

Like an alien funhouse, the multi-domed ceiling of the subterranean Amos Rex art museum pushes up from below Helsinki's Lasipalatsi plaza to create an interactive outdoor playscape. The plaza features five mounds of varying sizes, each equipped with large portholes that serve the dual purpose of providing passersby with a glimpse of the artistic treasures below and provide abundant natural light to illuminate more than 2,200 m² (23,680 ft²) of column-



less galleries. A major concern for the design team was the need for absolute moisture resistance in the concrete foundation and walls. At a depth of 14 meters (45 ft), the foundation would be at least seven meters below the average water table for that area and facing constant hydraulic pressure. The design team considered many blindside waterproofing options, including membranes, coatings, and concrete additives. Xypex Admix C-1000 NF was selected due to its track record on a global scale with similar deep-foundation projects. Admix C-1000 NF is added to the concrete at the time of batching. Project engineers consulted with Xypex Technical Services to determine the optimal dosing for Admix C-1000 NF for the concrete used at varying depths in the foundation. The lowest and most hydraulically susceptible structures-footings, slabs and elevator pit-received the highest dose at 5 kg/m³. The lower level (storage area) concrete walls were dosed at 4 kg/m³, and the gallery level walls (just below ground level) were dosed at 3 kg/m³.



409 + 499 Illinois San Francisco, California, USA

When the office space called 409 + 499 Illinois was planned for San Francisco's Mission Bay area, it faced considerable waterproofing challenges. Two six-storey towers were to be constructed over a three-level subterranean parking garage that was adjacent to a filled-in turn-of-the-century shipping channel that provided a water infiltration conduit from the bay to the garage. With an especially high water table at 8 feet (3.8 m) below grade and the likelihood of saltwater attack, developers faced a far greater concrete waterproofing and protection issue than normal. Aware of the reliable performance of Xypex Crystalline Technology in resisting both extreme hydrostatic pressure and saltwater attack, project engineers and designers specified Xypex Admix C-1000 NF to waterproof and protect the below-grade slabs and perimeter walls. The project's readymix supplier blended Xypex Admix into the concrete at the time of batching and worked closely with Xypex to initiate a 15-hour, problem-free continuous pour of over 8,000 yd³ (7,200 m³).



Studio City Casino Macau, China

Studio City Macau is built on the reclaimed land of Cotai. Because of its proximity to the ocean, a major concern was the chloride content of the high water table. Xypex was selected because of its proven track record for resistance to hydrostatic pressure and chloride attack. Xypex Admix was used to waterproof and protect over 100,000 m³ of concrete in the basement slab and walls. Because it is an integral waterproofing system, Xypex Admix allowed the builders to replace membranes thus reducing construction costs and accelerating the construction schedule, saving time and money and allowing the casino top open two months ahead of schedule. Due to the size and scope of this project, five ready-mix producers were needed to supply sufficient concrete to the project.

Tunnels



Thames Tideway Hammersmith London, England

The Thames Tideway Tunnel is London's new "super sewer" running from Acton to Abbey Mills. It is being built to prevent millions of tonnes of pollution reaching the River Thames. Xypex was used within the west section of the tunnel and is the sole waterproofer for the Hammersmith Connection Tunnel. The western section runs from Acton in West London to Fulham in South West London. During the design phase, technical discussions were held



to explore how Xypex's crystalline technology could assist in reducing the permeability of the concrete. This was especially important across the construction joints. Trials were undertaken in conjunction with a ready mix company to establish how the crystalline technology behaved within the very specific mix design. In addition this was to prove its water tightness over standard tunnel construction methods. A number of trials were set up using with and without Xypex products for a clear comparison. The trial results proved that the addition of Xypex Admix C-Series to the concrete gave the greatest protection against permeability. The growth of the crystals across the joint gave a seal in excess of what was thought possible. When tested across the 45 degree "day" joint, cores were taken through the joint in 3 axis to test for water permeability and the results were more than enough to confirm that this technology was superior. A time saving of seven weeks on the tunnel and eleven weeks on the drop shaft was achieved.

Change of Design. The west section was originally planned to be constructed using a sprayed concrete primary liner and a cast-in-place secondary liner with a waterproof membrane placed in between the two layers. The addition of Xypex Admix C-Series meant that following the trials, the stake holders were satisfied enough to remove the membrane in the Hammersmith connection tunnel and throughout the whole of the west section. In addition to self-healing cracks up to 0.5 mm, Xypex provides a significant further benefit for sewer projects - durability against many aggressive chemicals and microbial induced corrosion (MIC). Xypex is excellent at handling chemical attack in severe biochemical conditions such as in sewage and wastewater treatment structures. More than 100,000 kg of Xypex Admix C-Series was used on the primary liner incorporated within the sprayed concrete. The secondary liner will be cast directly against it.



Blacklick Creek Sanitary Interceptor Sewer Tunnel Columbus, Ohio, USA

This \$108.9 million project for the City of Columbus was required to support the development of the service areas of

the city of New Albany and the Jefferson Water and Sewer District. The project featured a 3.65 m (12 ft) outside diameter tunnel approximately 7,010 m (23,000 ft) in length with a depth of 12 m (40 ft) to 42 m (140 ft). The segmentally lined tunnel was excavated using a tunnel boring machine (TBM) and a short section of the project was constructed by open-cut prior to its launching. The TBM tunneled through varying glacial and alluvial materials, tills, boulders, sand, fill and shale. In order to protect the pre-cast concrete segments from microbial-induced corrosion and the harsh environment, the specification included Xypex to improve the acid resistance of concrete and provide protection against sulphate attack. Thanks to labour- and time-saving measures such as integrated offsite waterproofing and protection with Xypex Admix, the project was substantially completed by April 2019, 436 days ahead of schedule.

Marine Structures



Cronulla Wharf – Chloride Diffusion Results New South Wales, Australia

The Cronulla Marina is located within Gunnamatta Bay in New South Wales, Australia. The floating docks are subject to aerosol chlorides and the top surfaces are within the splash zone. The conditions can be described as a severe marine environment. The marina floats were cast in October 1994, employing a high early strength concrete design that incorporated 530 kg of GP cement and 4.2 kg of Xypex Admix NF C-Series. The 100 mm thick panels are pre tensioned with wire strands and have foam flotation attached to the soffit. The wire strand steel reinforcing is only 40 mm below the top surface of the concrete panel. The top surfaces of the panels are a nominal 350 mm above sea level. In 1998, 4 years after the floats were commissioned, a condition survey incorporating a visual inspection, chloride penetration and half-cell testing was commissioned. The results of this testing indicated that the performance of the Xypex treat-



ed concrete exceeded that of untreated concretes in high chloride environments. Testing of the same properties was commissioned in May 2013 after 19 years of service. The same array of tests and inspections were performed by the same durability consultants. The testing included concrete sampling at various depths and analysis of those samples for chloride contents as well as half-cell equipotential mapping. The results were extraordinary with very low chloride diffusion coefficients and half-cell results which are indicative of passive or near passive conditions. Visual inspection of the float also revealed no rust spotting or staining and no cracking that would have been indicative of corrosion of the embedded steel.

The key issues nominated in the testing were "concrete durability", "chloride permeability" and "performance life". The key results of the latest testing were:

1. An expected time to corrosion of 129 years (this is after 19 years of service so a total of nearly 150 years expected time to corrosion from the time of commissioning).

2. Chloride diffusion rates that are 92% lower than the initial test after an additional 15 years of exposure.

3. The absence of any significant half-cell potential gradients. Given the very low concrete cover and the severe environment, this real-life long-term test lends very strong support to the test results showing Xypex's ability to improve a concrete's resistance to chloride ingress and corrosion.



Port Adelaide Australia

Corrosion resistance, durability and an extended service life with reduced maintenance costs were key priorities for Flinders Ports in the construction of the Berth 8 Outer Harbour Grain Wharf. The wharf is a concrete deck and beams on piles structures 228 m long with a roadway along the quay, deep rail support beams and two 36 m wide access ramps. It is designed to berth Panamax and New Panamax vessels and will support a travelling shiploader. A total of approx 4,500 m³ of concrete was poured. Xypex Admix C-1000 NF was specified as the most suitable product to effectively protect and improve the berth's concrete structures for the specified 50-year structure life. Xypex Admix C-1000 NF permanently seals the concrete and prevents the penetration of water and other liquids from any direction. Xypex Admix C-1000 NF is particularly suited to this wharf structure as its chemical composition slows the diffusion of chloride penetration, ensuring protection from the harsh marine environment. Pile plugs, pile caps, rear ramp support walls, wharf beams, the deck and ramps were all dosed with Xypex Admix C-1000 NF at a rate of 3.9 kg per metre.

Wastewater Treatment Plants



Chatham Park WWTP Pittsboro, North Carolina, USA

Chatham Park is 7,000 acre mixed-use development, including commercial, retail, entertainment, hotel, restaurant and office spaces, as well as 22,000 residential units. A waste water treatment plant (WWTP) was constructed specifically for this development. Due to the potentially high levels of H₂S in the bioreactor, the engineers of record McKim & Creed specified the use of a high build acid resistant coating to protect the concrete. Bowen Engineering proposed Xypex Bio-San C500 admixture as an alternate to this coating because it contains Xypex's antimicrobial crystalline technology. This technology provides the concrete with integral protection from microbial induced corrosion (MIC) by killing the acid-producing bacteria. It also contains crystalline technology thereby providing watertight, chemically resistant concrete at the same time. The Xypex Bio-San C500 provides superior protection and eliminates the long term maintenance requirements required by protective coatings. In other parts of the structure such as the headworks and various tanks, Xypex Admix C-500 was used to provide watertight, chemically resistant concrete to protect installed



liners from negative side hydrostatic push off. The use of Xypex products will provide cost effective, long term protection and waterproofing to the concrete of this new piece of critical infrastructure.

Water Treatment Plants



Richland Creek WTP Atlanta, Georgia, USA

Metro Atlanta's new Paulding County Richland Creek Reservoir Water Supply Program includes a 123-ha (305-acre) reservoir and a water treatment plant (WTP) that will produce drinking water for 47,000 customers. Burlington, Vermont-based PC Construction, one of the key players in the \$215 million project, built the water treatment plant as well as other elements of the project. When cracks were discovered in some of the Richland WTP structures during hydrostatic testing, expensive and time-consuming crack injection and patching was not required. The cracks healed themselves because all of the concrete used in the water-holding structures had been treated with Xypex Admix C-500 crystalline waterproofing. Admix C-500 is added to concrete at the time of batching and generates a non-soluble crystalline formation that fills and plugs pores ad micro-cracks in concrete becoming permanent, integral part of the structure. This makes the concrete itself waterproof, preventing the ingress of water and other liquids from any direction for the life of the structure. Admix C-500 also provides chemical resistance properties that mitigate the attack of chlorides and sulfates and the effects of carbonation and alkali-aggregate reaction. Because Xypex Admix C-500 crystalline waterproofing was used in all of the water-holding structures in the WTP, PC Construction was able to achieve leak-free concrete without any additional cost or labor.

Aquariums



Wonders of Wildlife Springfield, Missouri, USA

The \$300 million Wonders of Wildlife (WOW) National Museum and Aquarium took ten years of planning and construction. The 350,000 ft² (32,516 m²) not-for-profit educational and conservation-themed attraction features a 1.5 million gallons of fresh and saltwater tanks show-casing 35,000 fish, amphibians, reptiles, birds, and mammals. Approximately 34,000 lbs (15,422 kg) of Xypex Admix C-500 was added to the ready-mix concrete used in three of the largest aquariums to ensure watertight and corrosion resistant structures.



Cleveland Aquarium Ohio, USA

When local developer Jacobs Investments proposed to create the 70,000 ft² (6,053 m²) Greater Cleveland Aquarium in the lower level of the vintage FirstEnergy Powerhouse on the west bank of the Cuyahoga River, it posed multiple engineering and logistical challenges. One of the



key concerns was how to protect the critical concrete bases and walls of the more than 40 separate aquarium tanks to be built in the basement of the nearly 130-year-old building. About 1,100 yd³ (841 m³) of ready-mix concrete were needed to create the assortment of fresh and saltwater tanks. Designers chose to use Xypex Admix C-500 for all water holding structures, providing integrated and life-time waterproofing and chemical protection. The use of Xypex Admix C-500 saved on installation time and cost less than the cost of coatings or membranes, which would need periodic maintenance and restoration.

Barbados Aquarium

Ocean Park is a unique Marine Aquarium and first commercial saltwater aquarium in Barbados. Xypex Admix C-1000 was used in all 26 display tanks holding sea water as well as in the pump rooms and electrical stations.

Protection Is Built In...For Life

Xypex crystalline waterproofing admixtures and coatings have been studied by researchers for many decades. Below are some of the results of these studies...

Resists Hydrostatic Pressure.... Positive and Negative

U.S. Army Corps of Engineers CRD C48, " Permeability of Concrete", Aviles Engineering Corp., Houston, USA

Two concrete samples containing Xypex Admix and an untreated control sample were tested for water permeability. Both the treated and untreated samples were subjected to a pressure of 150 psi / 1.04 MPa (350 ft. / 106.7 m water head). Results showed moisture and permeated water throughout the untreated sample after 24 hours. However, the Xypex Admix samples showed no leakage, and water penetration of only 1.5 mm / 0.06 inches after 120 hours (5 days).

ACCI Water Permeability Test, "Water Permeability of Concrete", Australia Centre of Construction and Innovation, University of New South Wales, Sydney, Australia

Concrete samples containing Xypex Admix NF at a dosage rate of 0.8% and 1.2% were tested for water permeability against control samples. All the samples were subjected to a pressure of 10 bars (100 meters / 328 ft. water head) for 2 weeks. Water permeability coefficients were calculated and the Xypex Admix-treated concrete showed significant reduction in water permeability by up to 93% at a dosage rate of 1.2%.

Protects Concrete From Chlorides, Sulfates And Acidic Corrosion

HB 84-2006, "Durability Assessment of Reinforced Concrete Structure Containing Xypex Admix Exposed to 19 Years of Severe Marine Environment", Sharp and Howells Pty. Ltd. Chemical Laboratories, Victoria, Australia

Lascelles Wharf serves as a bulk chemical and grain dock. In 1995, as part of an extensive maintenance program and to protect new precast concrete panels from the extremely harsh and aggressive marine environment, the concrete was dosed with Xypex Admix C-2000 NF at 1%. Tests were conducted to predict "initiation time to corrosion". Extracted cores were tested for chloride content at incremental depths into the concrete. Chloride content profiles, concrete cover, surface chloride content, and chloride corrosion threshold were used in a model based on Fick's 2nd law of diffusion to predict the residual service life of this structure. The average initiation time to corrosion was estimated at 164 years; whereas, the structure had been designed for 50 years of service life.

See also: Cronulla Wharf chloride diffusion case example; pages 8 above

CSN 73 1326 "Measuring Loss of Surface Due to Sulphate Attack of Concrete Treated with Admix C-1000/C-1000 NF", Betonconsult, Building Materials Testing Laboratory, Prague, Czech Republic

Concrete specimens treated with Admix C-1000 at 1% and 2%, and Admix C-1000 NF at 0.5% and 1% were cast along with non-treated concrete specimens. The specimens were exposed to a highly concentrated sulfate solution (i.e. 36,000 mg/l) for 4 months and samples were periodically weighed to determine mass loss. The Admix treated samples recorded a mass loss between 5 and 50 g/m² and showed no surface deterioration, while the non-treated specimens measured an average mass loss of 4,860 g/m² with significant surface deterioration (see figure in next column).

Sulphate Resistance

- C30/37 concrete cubes
- 36,000 mg/l sulphate solution, 4 months
- Mass loss for Xypex treated samples 5-50 g/m²
- Mass loss for control samples 4,860 g/m²
- Xypex sample achieved same sulphate resistance levels (3,000 - 6,000 mg/l) (EN 206)





Control

Xypex treated

"Sulfuric Acid Resistance Test", Aviles Engineering Corporation, Houston, USA

Concrete containing Xypex Admix at different dosage rates, including 3% specimens, were tested against untreated control samples for sulfuric acid resistance. After immersion in the sulfuric acid, each sample was tested for weight loss on a daily basis until a weight loss of 50% or a definite response trend was obtained. The percentage weight loss of the samples containing Xypex Admix tested significantly lower than the control samples.

Protects Concrete From Microbiologically Induced Corrosion

SO 22196 (Modified) "Evaluation of Antimicrobial Effect of Xypex Bio-San C500 and Corrosion Rate", McGrath Engineering Ltd, North Vancouver, B.C., Canada

Xypex Bio-San C500 was added at 1% dosage rate to Portland cement mortar and compared to untreated control samples for antimicrobial performance. A substantial reduction in the sewer bacteria Thiobacillus novellus / Starkeya novella was found indicating a definite antimicrobial effect.



Corrosion Rate at 50 ppm H₂S

Concrete was cast in 100 x 200 mm cylinders with both control and treated mixes. A wastewater facility was chosen that had elevated H_2S levels and substantial existing MIC corrosion damage. Test samples were suspended

in the air space of the tank for 10 years. Exposure trials showed that treated concrete had nine times less concrete mass loss compared to control samples. After exposure of 10 years, the bacterial concentration on the treated samples was minimal, indicating continued antimicrobial action and efficacy (see chart above).

Heals Cracks In Concrete

Numerous scientific studies have been conducted over the years that confirm the crack healing performance of crystalline admixtures and surface treatments for concrete. Below are a few examples:

ASTM C1585 and ASTM C1202, Evaluation of Self-healing Capability of Self-compacting Concrete Made with Blast-furnace Slag Cements Activated by the Xypex Crystalline Catalyst, Instituto Tecnologico de Aeronautica, Sao Jose dos Campos, Brazil

Portland, blast furnace slag and slag-modified Portland concrete samples, treated with 2.5% Admix C-500, were evaluated for self-healing capabilities. Microcracks were induced by loading to 90% of ultimate compressive strength. Cracked samples were then immersed in water to trigger self-healing after 28, 56 and 84 days. Strength and ultra-sonic pulse velocity tests were used to determine mechanical recovery; sorptivity and rapid chloride permeability were used to evaluate watertightness recovery. Results substantiated the ability of Xypex Admix to provide self-healing of cracked concrete.

Testing of Xypex Admix C-1000 NF Crack Healing Capabilities, CH Karnchang (Lao) Company Ltd., Xayaburi Laboratory, Ban Xieng Yeun, Vientiane, Laos

Prior to construction of a Mekong River dam, testing was undertaken to substantiate the ability of Xypex Admix to self-heal static cracks up to 0.5 mm. Three large concrete slabs treated with Admix C-1000 NF at 0.8% were cast along with three control slabs. Following curing, a force was applied at the mid-point of each slab to create cracks; on average measuring 0.5 mm width. Water was ponded above the cracked area. Initially all cracks leaked; at 4 days all dripping had ceased from the cracks of the Xypex treated panels, while leaking continued through the cracks of the control slab until the end of the test period (25 days). SEM photographs showed significant crystalline growth throughout the cracks of the Admix treated slab.



Links to additional research related to the crack healing capabilities of crystalline waterproofing technology:

School of Civil Engineering, Beijing Jiaotong University, Beijing, 100044, China CLICK HERE

The Blue Book Network: "Who's Who in Building & Construction"; 2020 CLICK HERE

See also: Richland Creek Water Treatment Plant, Atlanta, Georgia, USA—see photos below of before and after evidence of crack self-healing:



Before – hydrostatic test reveals leaking hairline cracks in concrete tank treated with Xypex Admix C-500 crystalline waterproofing...

Conclusion

The need to control costs, reduce the need for skilled labor, and meet contract goals is a never ending battle. For many types of projects, crystalline waterproofing technology can not only provide superior moisture resistance, but also heal cracks and protect against aggressive chemicals such as H₂S, chlorides and sulfates. Applications that would ordinarily require costly and time-consuming blindside waterproofing measures such as membranes or coatings can be replaced, in many circumstances, with crystalline waterproofing admixtures. An added benefit is the ability to move concrete waterproofing and protection offsite by ordering that crystalline waterproofing admixture be added at the ready-mix plant. The choice of crystalline waterproofing and protection technology is backed by more than 50 years of global market experience and research results.

To Learn More

Xypex products and services are available in over 90 countries. *Being There* means we know the territory and that knowledge benefits our customers. We look forward to your inquiries.

To find a Xypex representative near you, please visit www.xypex.com/contact/distributors.



After-cracks in water tank are permanently healed