XYPEX® Concrete Waterproofing by Crystallization™

BRIDGES

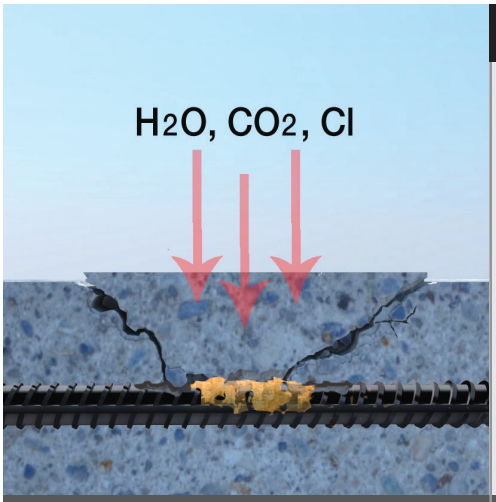
Meeting the Challenge

Protecting Bridges

Reinforced concrete bridges are constantly under attack by the destructive effects of moisture and chloride-induced corrosion. Without proper protection, the structural integrity of a bridge is soon compromised, leading to expensive remediation efforts and a shortened life span. Once the moisture and chlorides have reached the reinforcing steel, an expansive oxidation process begins to take place. This causes the formation of cracks and spalling in the concrete. When cracking takes place and is combined with weathering effects such as freeze/thaw damage or accelerated corrosion in hot weather climates, this deterioration takes place at a faster pace. With over 50 years of experience in 90 countries around the world, the Xypex Crystalline Technology has been used in bridge structures to waterproof, protect, repair and enhance the durability of concrete subject to water and chloride attack. In challenging environments exposed to salt or fresh water, de-icing chemicals, freezing cold or blistering heat, or where chemical resistance to sulphate attack or ASR is necessary, Xypex is a highly respected partner in extending the service life of bridges.

XYPEX® The Structures – The Problems

Xypex products play a key role in the waterproofing and protection of concrete against water penetration, chloride ion attack, cracking, carbonation, sulphate attack, Alkali Aggregate Reaction and freeze/thaw damage – problems typically associated with the reduced service life of bridge structures.



Water Permeability & Corrosion

The primary purpose of waterproofing concrete bridge structures is the protection of reinforcing steel from the damaging effects of corrosion. The nature of concrete and the problems associated with placement and consolidation means having to deal with permeability issues permitting the penetration of water into the substrate and through to the reinforcing steel. With the presence of oxygen this can initiate corrosion.

This permeability facilitates the entry and diffusion of chlorides into contact with the reinforcing steel. The resulting loss of alkalinity and hence the passivating layer allow for an electrochemical process culminating in corrosion of the reinforcing steel and the expansive disruption of the concrete substrate.

Cracking

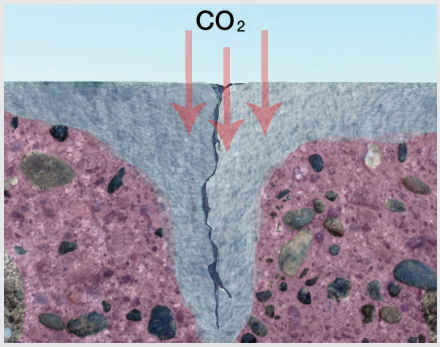
Cracks in the concrete are the most obvious means by which water and damaging chemicals can enter a structure. These cracks are formed in a number of different ways but the most common are drying shrinkage, thermal cracking, strain formed cracks, settlement cracks and plastic shrinkage cracking in the slab.

Surface Deterioration

Whether caused by the degenerative effects of corrosion and other reactions, or through freeze/thaw and abrasion, concrete bridge structures will often require some form of surface maintenance during their service life.

Carbonation

Carbon dioxide in the air reacts with calcium hydroxide in the concrete to form calcium carbonate which reduces the alkalinity of the concrete. Below a pH of 10, the rebar's thin layer of surface passivation dissolves and corrosion of the reinforcing steel takes place at an accelerated rate.

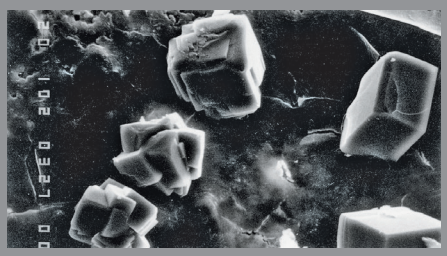


Sulphate Attack & Alkali Aggregate Reaction

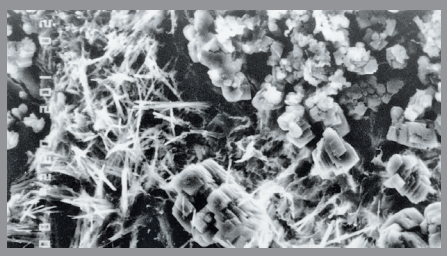
Where sulphates are present in water or soils, the permeability of concrete and the presence of water allows sulphate ions to diffuse into the concrete and create an expansive reaction causing spalling and deterioration.

A similar effect is caused by Alkali Aggregate Reaction whereby the presence of water in concrete permits a reaction between silica in certain aggregates and the alkalis in cement.

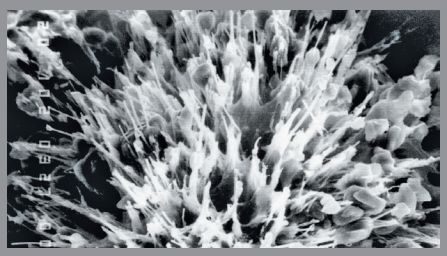
The Permanent Solution



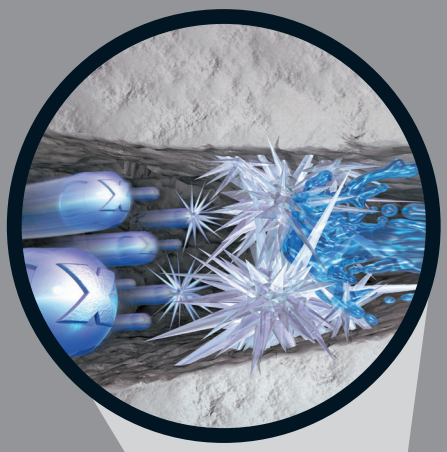
CONCRETE UNTREATED



CRYSTALLIZATION INITIATED



CRYSTALLIZATION MATURE



Xypex Crystalline Technology

Xypex products use the natural porosity of concrete and chemical diffusion to penetrate its pores and capillaries. Inside the concrete, Xypex chemicals react with the by-products of cement hydration to form a non-soluble crystalline structure deep within the substrate. In this condition, the concrete becomes impermeable, preventing the penetration of liquids and chemicals from any direction even under extreme hydrostatic pressure. The chemical resistant properties of the crystalline structure will mitigate the attack of chlorides and sulfates. In prolonging the durability of concrete Xypex has also proven to be effective against the effects of carbonation and Alkali Aggregate Reaction as well as having the ability to self-heal static cracks up to 0.5 mm (0.02 in). Xypex also improves the freeze-thaw durability of concrete.

Proven Performance Worldwide

Comprehensive quality systems and standards along with thorough testing in the lab and the field have resulted in Xypex's highly respected position in the concrete industry. Xypex has been extensively tested by independent testing laboratories in the U.S., Canada, Australia, Japan, Europe and other countries.

The Xypex Advantage

Xypex Crystalline Technology works inside the concrete, thus avoiding typical problems associated with traditional barrier products.

✔ Permanent and reactivates whenever water is present	✔ Not subject to deterioration problems encountered by surface coatings and membranes
✔ Protects against chlorides	✔ Reduces the rate of carbonation
✔ Self-heals static cracks up to 0.5 mm (0.02 in)	✔ Protects against sulphate attack and Alkali Aggregate Reaction (AAR)

The Right Products

Xypex Admix Advantages

- Permanent integral waterproofing
- Enhances concrete durability
- Value engineering
- Non-toxic
- Non-combustible
- Resists damaging effects of water penetration and chemical attack

Xypex Admix for New Concrete Construction

Xypex Admix is the preferred choice for installing Xypex Crystalline Technology into most new concrete bridge structures. Because Xypex Admix is blended into the mix at the time of batching, it becomes an integral part of the entire concrete matrix, thus reducing the potentially damaging effects of water penetration, chloride and sulfate attack, carbonation and Alkali Aggregate Reaction. The addition of Xypex Admix to concrete is a highly effective method of enhancing the durability of concrete structures.

Precast

Cast-in-place

Shotcrete

Xypex Coating Advantages

- Doesn't require a dry surface
- Apply to either side of the concrete
- Won't puncture, blister or tear
- No costly surface priming or leveling
- Sealing, lapping & finishing, protection during backfilling not required
- Permanent waterproofing
- Enhanced concrete durability
- Doesn't contain VOCs
- Non-toxic and non-combustible
- Can be applied safely in confined spaces

Other Accessory Products

- FCM 80
- Megamix I & II
- Gamma Cure
- Xycrylic Admix

Rehabilitation & Repair

Xypex's coating systems and repair products enable transport authorities, engineers and contractors to economically and confidently repair structures that have been damaged due to the effects of chloride attack, carbonation, Alkali Aggregate Reaction or surface deterioration through abrasion and freeze/thaw. Xypex Concentrate and Modified are applied as slurry coatings to the surface of the concrete. Unlike other materials that need a dry substrate, Xypex products require a moist surface – a condition typical of bridge structures. This type of environment is conducive to the Xypex Crystalline process. Xypex Patch'n Plug, Concentrate Dry-Pac and Megamix products are specifically designed to permanently repair concrete defects such as static cracks and faulty cold or construction joints. Xypex Megamix returns structural integrity to severely damaged concrete, whilst maintaining the same protective properties of Xypex-treated concrete.

Coating
Concentrate & Modified

Plugging
Patch'n Plug

Rehabilitation
Patch'n Plug & Megamix

Visit us online at xypex.com for more info & product details.

Beingthere™

PROJECTS WORLDWIDE

Second Orinoco River Bridge, Venezuela

D1 Highway Bridge, Slovakia

Badaling Expressway Overpass, China

Pentele Bridge, Hungary

Koeberg Interchange, South Africa

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