



MODIFIED

CEMENTITIOUS CRYSTALLINE

Concrete Waterproofing

Description

Xypex is a unique chemical treatment for the waterproofing, protection and repair of concrete. XYPEX MODIFIED can be applied as a second coat to reinforce Xypex Concentrate, or applied by itself to damp-proof the exterior of foundation walls. Applied as a second coat, Xypex Modified chemically reinforces Xypex Concentrate where two coats are required and produces a harder finish. Where damp-proofing is required, a single coat of Modified may be used as an alternative to a spray/tar emulsion. Xypex prevents the penetration of water and other liquids from any direction by causing a catalytic reaction that produces a non-soluble crystalline formation within the pores and capillary tracts of concrete and cement-based materials.

Recommended for:

Xypex Modified is recommended as a single coat for the damp-proofing of foundations or as a second coat with Xypex Concentrate for the following applications:

- Reservoirs
- Sewage and Water Treatment Plants
- Secondary Containment Structures
- Tunnels and Subway Systems
- Underground Vaults
- Foundations
- Parking Structures
- Swimming Pools

Advantages

- Resists extreme hydrostatic pressure
- Becomes an integral part of the substrate
- Can seal hairline cracks up to 0.5mm
- Can be applied to the positive or the negative side of the concrete surface
- Allows concrete to breathe
- Highly resistant to aggressive chemicals
- Non-toxic
- Does not require a dry surface
- Cannot puncture, tear or come apart at the seams
- No costly surface priming or levelling prior to application
- Does not require sealing, lapping and finishing of seams at corners, edges or between membranes
- Does not require protection during backfilling or during placement of steel, wire mesh or other materials
- Less costly to apply than most other methods
- Crystalline structure will not deteriorate
- Permanent

For assistance with project requirements, please contact Xypex Technical Services Department.

Packaging

Xypex Modified is packaged in various sizes. Contact your local Xypex representative for details.

Storage

Xypex products must be stored dry at a minimum temperature of 7°C. The product should be used within its shelf life for optimum technical performance, which is one year when stored under proper conditions.

Coverage

For normal surface conditions, the coverage rate for each coat is 0.65 - 1.0 kg/m².

Test Data

When used in conjunction with Xypex Concentrate:

PERMEABILITY

U.S. Army Corps of Engineers (USACE) CRD C48, "Permeability of Concrete", Pacific Testing Labs, Seattle, USA

Two in. (51mm) thick, 2000psi (13.8MPa) Xypex-treated concrete samples were pressure tested up to a 405ft. (124m) water head (175psi/1.2MPa), the limit of the testing apparatus. While untreated samples showed marked leakage, the Xypex-treated samples (as a result of the crystallization process) became totally sealed and exhibited no measurable leakage.

DIN 1048 (equivalent to EN 12390-8), "Water Impermeability of Concrete", Bautest – Corporation for Research & Testing of Building Materials, Augsburg, Germany

Twenty cm thick Xypex-treated concrete samples were pressure tested up to 7 bars (230ft./70m water head) for 24 hours to determine water impermeability. While the reference specimens measured water penetration up to a depth of 92mm, Xypex-treated samples measured water penetration of zero to an average of 4mm.

EN 12390-8, "Depth of Water Penetration on Samples Treated with Concentrate Coating", OL-123, Czech Technical University, Prague, Czech Republic

Three replicate 150mm concrete cubes from four different mix designs (strength classes) were coated with Xypex Concentrate at a thickness of 0.8mm to 1mm. Controls for each of the different mix designs were also cast for comparison purposes. All samples were exposed to 0.5MPa (73psi) of water pressure for 72 hours from the opposite side of the treated surface. Specimens from each set were split transversely from the treated surface at 28 days and 91 days to measure depth of water pene-

tration from the exposed surface. After 28 days, the Xypex coating reduced the depth of water penetration by 90 to 94% compared to the control mixes for the four mix types. At 91 days all Xypex-treated samples measured <1mm of water penetration.

DEPTH OF PENETRATION

**“Measurement of Mass Concrete Humidity”,
Czech Technical University, (CVUT) Faculty of Civil
Engineering, Prague, Czech Republic**

A coating of Xypex Concentrate was applied to one face of a 300mm x 300mm x 220mm set of concrete blocks; two replicate sets of blocks were left untreated. Water filled containers were tightly sealed onto the opposite face of the treated blocks and one set of the untreated blocks while the third untreated block set was kept in the laboratory as a control. Humidity probes were installed in 6mm diameter holes that were drilled to within 30 - 40mm of the water exposed surface. Mass humidity was recorded at intervals of 28, 45, 90, 125 and 132 days. Final results showed that the Xypex-treated specimens had an average humidity reading of 4.6%, the untreated sample measured 7.9% and the control block with no water exposure was 4.4%, essentially equivalent to the Xypex specimens' results. The Xypex reactive chemicals had diffused at least 190mm in 132 days.

**“An Enhancement in the Nature of Concrete with a
Multiplicative Cement Crystal-Type Concrete Material”,
Central Research Laboratory of Nikki Shoji in
Association with Hosei University, Japan**



A 60cm x 70cm x 40cm concrete block was cast and a Concentrate coating was applied to the surface and cured. The block was left outdoors for approximately 1 year. Subsequently, a 40cm (15.75 inches) long cylinder was then cored perpendicular to the Xypex treatment and cut into 18 slices of equal length. SEM photographs utilizing a 1000x magnification were taken of slices from various depths from the treated surface to determine the extent of crystalline growth. While the crystalline structure was most dense in specimens located closest to the treated surface, there was evidence of the crystalline structure at 30cm (12 inches) from the treated surface.

SEALING CRACKS

**ASTM C856 “Standard Practice for Petrographic
Examination of Hardened Concrete”, Setco Services
Pte, Ltd., Singapore**

A coat of Xypex Concentrate was applied to a slab that had developed numerous hairline cracks. To determine the crack sealing ability of the Xypex treatment, cores were extracted from a slab at 3, 10, 14 and 20 days following application. Thin sections were taken from each core in order to examine hairline cracks utilizing a polarizing and fluorescent microscope (PFM). In each case, there was evidence of the Xypex crystalline structure

in the cracks to a depth of about 20mm. Photographs taken this depth at 100x magnification showed the Xypex crystalline structure had reduced the width of the cracks dramatically.

TENSILE BOND STRENGTH

**EN 1542 “Products and Systems for the Protection
and Repair of Concrete Structures – Test Methods
– Measurement by Pull-off”, Trow Associates Inc.,
Burnaby, B.C., Canada**

Two coats of Xypex Concentrate were applied at 0.8kg per m² with a total cured thickness of 0.9mm to a standard concrete substrate meeting EN 1766 MC (0,40). The coating was applied and cured to the manufacturer's technical specifications and tested at 30 days age for bond strength. The average tensile bond strength of five replicates was 1.23MPa.

CHEMICAL RESISTANCE

**ASTM C 267, “Chemical Resistance to Mortars”,
Pacific Testing Labs, Seattle, USA**

Xypex-treated cylinders and untreated cylinders were exposed to hydrochloric acid, caustic soda, toluene, mineral oil, ethylene glycol, pool chlorine, brake fluid and other chemicals. Results indicated that chemical exposure did not have any detrimental effects on the Xypex coating. Tests following chemical exposure measured an average 17% higher compressive strength in the Xypex-treated specimens over the untreated control samples.

**IWATE University Technical Report,
“Resistance to Acid Attack”, Tokyo, Japan**



Xypex-treated mortar and untreated mortar were measured for acid resistance after exposure to a 5% H₂SO₄ solution for 100 days. Xypex suppressed concrete erosion to 1/8 of the reference samples.

**ASTM C876 “Influence of Xypex Coating System
on Residual Service Life of Concrete Structures”
Durability Assessment Section, Xypex Australia**

A bridge pier in a tidal splash zone was starting to experience reinforcing steel corrosion after 40 plus years of service. An investigation was conducted to examine the effectiveness of the Xypex coating system on the durability performance of the structure. Three corrosion prediction test methods were conducted before and after application of a) one coat and b) two coats of Xypex Concentrate. Test methods included corrosion current (galvanostatic pulse transient), corrosion potential (Cu/CuSO₄ half-cell) and electrical resistance. After 6 months of surface treatment corrosion rates were reduced by an average of 36 to 51%. Half-cell potentials were less negative and concrete

resistance was increased. Corrosion activity level in the structure was reduced considerably.

RILEM CPC-18 “Carbonation Resistance of Samples Treated with a Xypex Concentrate Coating”, Construction and Maintenance Technology Research Center (CONTEC), Sirindhorn International Institute of Technology (SIIT) – Thammasat University, Bangkok, Thailand

Control and Xypex Concentrate coated samples were carbonated in an accelerated carbonation chamber. The average depths of carbonation were measured at 28, 56, 77 and 91 days. The depth of carbonation of these Xypex Concentrate coated samples was reduced by 35 - 40% compared to the controls. Following initial carbonation, one set of samples was coated with Xypex Concentrate to model old concrete already damaged by carbonation. For these specimens, testing indicated that carbonation was arrested and in one specimen reduced.

FREEZE/THAW DURABILITY

ASTM C 672, “Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to De-Icing Chemicals”, Twin City Testing Lab, St. Paul, USA

Xypex-treated samples restricted chloride ion concentration to below the level necessary to promote electrolytic corrosion of reinforcing steel. Visual examination of untreated panels after 50 freeze / thaw cycles showed a marked increase in surface deterioration compared to Xypex-treated samples.

POTABLE WATER EXPOSURE

NSF 61, “Drinking Water System Component-Health Effects”, NSF International, Ann Arbor, USA

Exposure testing of potable water in contact with Xypex-treated samples indicated no harmful effects.

Various other national or local potable water approvals are available: please contact your local distributor or representative.

RADIATION RESISTANCE

U.S.A. Standard No. N69, “Protective Coatings for the Nuclear Industry”, Pacific Testing Labs, Seattle, USA

After exposure to 5.76×10^4 rads of gamma radiation, the Xypex treatment revealed no ill effects or damages.

Application Procedures

1. SURFACE PREPARATION Concrete surfaces to be treated must be clean and free of laitance, dirt, film, paint, coating or other foreign matter. Surfaces must also have an open capillary system to provide “tooth and suction” for the Xypex treatment. If surface is too smooth (e.g. where steel forms are used) or covered with excess form oil or other foreign matter, the concrete should be lightly sandblasted, waterblasted, or etched with muriatic (HCL) acid. Refer to local regulations for sandblasting or use of muriatic acid.

2. STRUCTURAL REPAIRS – PRIOR TO COATING APPLICATION For cracks larger than 0.5mm or for actively leaking cracks the following repair procedures are recommended. Chip out cracks, faulty construction joints and other structural defects to a depth of 37mm and a width of 25mm. A “V” shaped slot is not acceptable. The slot may be saw cut instead of chipped but ensure that the slot is dovetailed or otherwise shaped such that there will be mechanical interlock of materials placed into the slot at a later stage. Clean and wet the slot and apply a brush coat of Xypex Concentrate as described in steps 5 & 6 and allow to dry for 10 minutes. Fill cavity by tightly compressing Dry-Pac into the groove with pneumatic packing tool or with hammer and wood block.

NOTE:

- i. Areas of poor concrete consolidation that show evidence of leakage should also be repaired.
- ii. Against a direct flow of water (leakage) or where there is excess moisture due to seepage, use Xypex Patch'n Plug then Xypex Dry-Pac followed by a brush coat of Xypex Concentrate.
- iii. For expansion joints or chronic moving cracks, flexible materials such as expansion joint sealants should be used.

3. WETTING CONCRETE Xypex requires a saturated surface dry (SSD) condition. Concrete surfaces must be thoroughly saturated with clean water prior to the application so as to aid the diffusion of the Xypex chemistry and to ensure the growth of the crystalline formation deep within the pores of the concrete. Remove excess surface water before the application. If concrete surface dries out before application, it must be re-wetted.

4. MIXING FOR SLURRY COAT Mix Xypex powder with clean water to a creamy consistency in the following proportions:

For Brush Application

0.65 - 0.8 kg/m²

5 parts powder to 2 parts water

1.0 kg/m²

3 parts powder to 1 part water

For Spray Application

0.65 - 0.8 kg/m²

5 parts powder to 3 parts water

(ratio may vary with equipment type)

Do not mix more Xypex material than can be applied in 20 minutes. Do not add water once mix starts to harden. Protect hands with rubber gloves.

5. APPLYING XYPEX Apply Xypex with a semi-stiff nylon bristle brush, push broom (for large horizontal surfaces) or specialized spray equipment. The coating must be uni-

formly applied and should be just under 1.25mm. When a second coat (Xypex Concentrate or Xypex Modified) is required, it should be applied after the first coat has reached an initial set but while it is still “green” (less than 48 hours). Curing by misting the coating with water should be done between coats. Ensure first coat is in SSD condition before application of the second coat. The Xypex treatment must not be applied under rainy conditions or when ambient temperature is below 4°C. Avoid application of the Xypex coating in hot and windy conditions as the coating may dry out prematurely. For recommended equipment contact Xypex UK’s Technical Services Department or local representative.

6. CURING Generally a misty fog spray of clean water is preferred and used for curing the Xypex treatment. Curing should begin as soon as the Xypex has set to the point where it will not be damaged by a fine spray of water. Under normal conditions, it is sufficient to spray Xypex-treated surfaces three times per day for two to three days. In hot or arid climates, spraying may be required more frequently. Wet burlap and some specialty curing blankets are also effective for curing. During the curing period, the coating must be protected from rain-fall, frost, wind, the puddling of water and temperatures below 2°C for a period of not less than 48 hours after application. If plastic sheeting is used as protection, it must be raised off the Xypex to allow the coating to breathe. Consult with Xypex (UK) LLP or your local representative for alternative curing methods.

NOTE:

- i. For concrete structures that hold liquids (e.g. reservoirs, swimming pools, tanks, etc.), Xypex should be cured for three days and allowed to set for 12 days (18 days for waste water or corrosive solutions) before filling the structure with liquid.
- ii. If any other cementitious system is applied over the Xypex coating, it should be after the coating has completely set but while it is still green (12 to 48 hours); the 12 to 24 hour window is considered ideal. For installations onto a Xypex coating older than 48 hours contact your Xypex Technical Service Representative regarding surface preparation and application recommendations. XYPEX (UK) LLP makes no representations or warranties regarding the compatibility of Xypex products with plasters, stuccos, tiles and other surface-applied materials.
- iii. Prior to the installation, it is recommended that a test section be completed under anticipated ambient and project conditions to demonstrate appropriate bond strength.

Technical Services

For more instructions, alternative installation methods, or information concerning the compatibility of the Xypex treatment with other products or technologies, contact the Technical Services Department of XYPEX (UK) LLP or your local Xypex Technical Services Representative.

Certification

Xypex Modified satisfies the requirements of EN 1504-3; Initial Type Testing (ITT) according to EN 1504-3 was certified by BSI as the Notifying Body.

Safe Handling Information

Xypex is alkaline. As a cementitious powder or mixture, Xypex may cause significant skin and eye irritation. Directions for treating these problems are clearly detailed on all Xypex pails and packaging. The Manufacturer also maintains comprehensive and up-to-date Safety Data Sheets on all its products. Each sheet contains health and safety information for the protection of workers and customers. The Manufacturer recommends you contact XYPEX (UK) LLP or your local Xypex Technical Services Representative to obtain the latest copies of Safety Data Sheets prior to product storage or use.

Warranty

XYPEX (UK) LLP (Registration No. OC315394) warrants to the purchaser that the products supplied by it shall be free from material defect. Should any of the products be proven defective, the liability to XYPEX (UK) LLP shall be limited to (at the choice of XYPEX (UK) LLP) either replacement of the proven defective products ex-factory with Xypex products, or refund of the NETT ex-factory purchase price at the date the proven defective products were supplied. XYPEX (UK) LLP will not be liable or responsible, to such an extent as permitted by law, for any consequential or direct damages, compensation, costs, expenses, losses or other liabilities that may occur as a result of the defective products. XYPEX (UK) LLP makes no warranty as to the merchantability or fitness for a particular purpose and the terms of this warranty are in lieu of all other warranties expressed or implied by law. The purchaser should consult with Xypex UK LLP for further details in relation to the Warranty.

