CONCENTRATE DS-1

CEMENTITIOUS CRYSTALLINE

Concrete Waterproofing

Description

Xypex Concentrate is a unique chemical treatment for the waterproofing and protection of concrete. XYPEX CONCENTRATE DS-1 is a special formulation designed specifically for a dry-shake application on horizontal concrete surfaces. Packaged in the form of a dry powder compound, Concentrate DS-1 consists of Portland cement, various active proprietary chemicals, and an aggregate which has been crushed and graded to particle sizes suitable for concrete floors. DS-1 becomes an integral part of the concrete surface thereby eliminating problems normally associated with coatings (e.g. scaling, dusting, flaking and delamination). The active chemicals react with the moisture of the fresh concrete causing a catalytic reaction which generates a non-soluble crystalline formation within the pores and capillary tracts of the concrete.

Recommended for:

- Sewage and Water Treatment Plants
- Reservoirs
- Foundation Slabs
- Bridge Decks
- Parking Structures
- Roof Decks

Note: For concrete surfaces that are subject to heavy traffic conditions or that require increased resistance to impact and abrasion, please consult with a Xypex Technical Services Representative regarding the use of Xypex Concentrate DS-2.

Advantages

- Resists extreme hydrostatic pressure from either positive or negative surface of the concrete slab
- Chloride protection in marine environment
- Becomes an integral part of the substrate
- Highly resistant to aggressive chemicals
- Can self-heal static hairline cracks up to 0.4 mm
- Allows concrete to breathe
- Non-toxic / no VOCs
- Less costly to apply than most other methods
- Permanent
- Increases flexibility in the construction schedule

Packaging

Xypex Concentrate DS-1 is available in 20 kg buckets.

Storage

Xypex products must be stored dry at a minimum temperature of 7ºC. Shelf life is one year when stored under proper conditions.

Coverage

Under normal conditions, the coverage rate for Xypex Concentrate DS-1 is 0.95 kg/m^2.

Test Data

PERMEABILITY

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

Two in. (51 mm) thick, 2000 psi (13.8 MPa) Xypex-treated concrete samples were pressure tested up to a 405 ft. (124 m) water head (175 psi/1.2 MPa), 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 (230 ft./70 m water head) for 24 hours to determine water impermeability. While the reference specimens measured water penetration up to a depth of 92 mm, Xypex-treated samples measured water penetration of zero to an average of 4 mm.

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

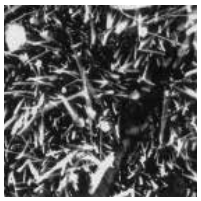
Three replicate 150 mm concrete cubes from four different mix designs (strength classes) were coated with Xypex Concentrate at a thickness of 0.8 mm to 1 mm. Controls for each of the different mix designs were also cast for comparison purposes. All samples were exposed to 0.5 MPa (73 psi) of water pressure for 72 hours from the opposite side of the treated surface. Specimens from each set were split transversely from the treated surface at 28 and 91 days to measure depth of water penetration 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 <1 mm 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 300 mm x 300 mm x 220 mm 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 6 mm diameter holes that were drilled to within 30 - 40 mm 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 190 mm 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 60 cm x 70 cm x 40 cm 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 40 cm (15.75 in.) 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 30 cm (12 inches) from the treated surface.

SEALING CRACKS

ASTM C856 "Standard Practice for Petrographic Examination of Hardened Concrete", Setsco Services Pte, Ltd., Singapore

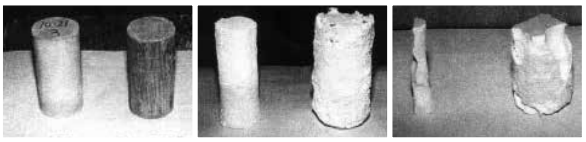
A coat of Xypex Concentrate was applied to a slab that had developed numerous hairline cracks. To determine the crack sealing ability of the Xypex treatment, cores were extracted from a slab at 3, 10, 14 and 20 days following application. Thin sections were taken from each core in order to examine hairline 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 20 mm. Photographs taken this depth at 100x magnification showed the Xypex crystalline structure had reduced the width of the cracks dramatically.

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, ethelyne 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



Before Immersion *After 5 Weeks* *After 10 Weeks*

Xypex-treated mortar and untreated mortar were measured for acid resistance after exposure to a 5% H_2SO_4 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 exposed to seawater in a tidal splash zone for over 40 years experienced different types of deterioration mechanisms including surface abrasion (skin loss), cracking, and corrosion of steel reinforcement. Corrosion monitoring was conducted before and six months after application of Xypex Concentrate. This non-destructive testing (NDT) included a measurement of the corrosion rate, corrosion potential, and concrete resistivity. Results indicated a reduction of corrosion rate and corrosion potential up to 50% and 40% respectively, and significant enhancement of the concrete resistivity.

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.

RADIATION RESISTANCE

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

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

Application Procedures

1. Fresh concrete is placed, consolidated and levelled.

2. Wait until concrete can be walked on leaving an indentation of 6.5 - 9.5 mm. Concrete should be free of bleed water and be able to support the weight of a power trowel. Then, trowel open the surface.

3. Immediately after trowelling open the surface, apply the dry shake material by hand or mechanical spreader. The dry shake material must be spread evenly.

4. As soon as the dry shake material has absorbed moisture from the base slab, it must be worked into the surface.

5. When concrete has hardened sufficiently, power trowel surface to the required finish.

NOTE:

1. Environmental conditions (e.g. hot or cold temperatures) may affect the application and installation of the Dry Shake powder. In hot, dry or windy conditions where rapid evaporation of bleed water is occurring, the DS-1 powder should be applied immediately after Step 1 above (i.e. screeding). Keep top of slab from premature drying to ensure homogeneous mixture of DS-1 powder into concrete paste. It is advisable to use an evaporation retardant on the fresh concrete surface.

2. When concrete has hardened sufficiently, power trowel surface to the required finish.

3. It is common that edges of a slab wall will set up earlier than the main body of concrete. Such edge areas can be dry-shaked and finished with hand tools prior to proceeding with application to the main body of concrete.

4. Consult with Xypex Australia's Technical Services Department or your local Xypex Technical Services Representative regarding the optimum concrete performance under a variety of conditions during application of DS-1.

Curing

Curing is important and should begin as soon as final set has occurred but before surface starts to dry. Conventional moist curing procedures such as water spray, wet burlap or plastic covers may be used. Curing should continue for at least 48 hours. In hot, dry, sunny conditions, consult manufacturer for specific instructions. In lieu of moist curing, concrete sealers and curing compounds meeting AS 3799 may be used.

NOTE:

1. For best results when applying dry shake materials, the air content of the concrete should not exceed 3% (a high air content can make it difficult to achieve a proper application). If a higher entrained air content is specified (e.g. for concrete that will be exposed to freezing and thawing), contact the Technical Services Department of Xypex Australia for further application information.

2. Chronic moving cracks or joints will require a suitable flexible sealant.

3. For certain concrete mix designs, we recommend a test panel be produced and evaluated for finishing. For example, higher performance concrete with a low water/cement ratio, air entrainment, superplasticizers, or silica fume may reduce bleed water and make the concrete more difficult to finish.

Technical Services

For more instructions, alternative application methods, or information concerning the compatibility of the Xypex treatment with other products or technologies, contact the Technical Services Department of Xypex Australia or your local Xypex Technical Services Representative.

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 buckets 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 your employees and customers. Contact Xypex Australia or your local Xypex Technical Services Representative to obtain copies of Safety Data Sheets prior to product storage or use.

Warranty

Concrete Waterproofing Manufacturing Pty Ltd (trading as Xypex Australia) (the “Manufacturer”) warrants that the products manufactured by it shall be free from material defects and of a consistent quality. Should any of the products be proven defective, the liability of the Manufacturer shall be limited to replacement of the product ex-factory. The Manufacturer gives no warranty as to fitness of the products for any particular purpose. The user shall: determine the suitability of the product for its intended use; comply with the directions for use and safe handling information available from Xypex; where necessary, engage an experienced Xypex applicator; and assume all risks and liabilities in connection with the use of this product.

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