

CEMENTITIOUS CRYSTALLINE WATERPROOFING

SECTION 07160

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of cementitious crystalline waterproofing to concrete substrates, above-grade or below-grade, on either dry or wet side of substrates, as indicated on drawings and as specified herein.
- B. *Related Sections*
 - 1. Section 03100 - Concrete Work
 - 2. Section 07900 - Joint Sealers
 - 3. Section 09900 - Paints and Coatings

1.02 References

- A. *Applicable Standards:* The following standards are referenced herein.
 - 1. Australian Standard (AS)
 - 2. Australian Standard / New Zealand Standard (AS/NZS)
 - 3. American Society for Testing and Materials (ASTM)
 - 4. Army Corps of Engineers (CRD)
 - 5. NSF International (NSF)

1.03 System Description

- A. *Cementitious Crystalline Waterproofing:* Blend of Portland cement, fine treated silica sand and active proprietary chemicals. When mixed with water and applied as a cementitious coating, the active chemicals cause a catalytic reaction which generates a non-soluble crystalline formation of dendritic fibers within the pores and capillary tracts of concrete. This process causes concrete to become permanently sealed against the penetration of liquids from any direction.

1.04 System Performance Requirements

- A. *Testing Requirements:* Crystalline waterproofing system shall be tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.
- B. *Independent Laboratory:* Testing shall be performed by an independent laboratory meeting the requirements of Australian Standards (AS) and certified by the Australian National Association of Testing Authorities (NATA) or ASTM E 329-90 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product samples.

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1.04 System Performance Requirements (continued)

- C. *Crystalline Penetration:* Crystallizing capability of waterproofing material shall be evidenced by independent SEM (Scanning Electron Microscope) photographs documenting penetration of crystal-forming waterproofing material to a depth of 50 mm.
- D. *Permeability:* Independent testing shall be performed according to U.S. Army Corps of Engineers CRD-C48-73 "Permeability of Concrete"
1. Concrete samples (treated and untreated) to have design strength of 13.8 MPa and thickness of 50 mm. No admixtures permitted.
 2. Coatings to have maximum thickness of 1 mm per coat with up to two coats permitted.
 3. Samples to be pressure tested to 1.2 MPa (123.4 m head of water).
 4. Treated samples, after crystalline growth has occurred, shall exhibit no measurable leakage.
- E. *Chemical Resistance:* Independent testing shall be performed according to ASTM C 267-77 "Chemical Resistance of Mortars" and ASTM C 39-86 "Compressive Strength of Cylindrical Concrete Specimens".
1. Concrete samples (treated and untreated) to have design strength of 27.6 MPa. No admixtures permitted.
 2. Coatings to have maximum thickness of 1 mm per coat with up to two coats permitted.
 3. Untreated and treated specimens to be immersed for a minimum of 84 days in following chemical solutions: hydrochloric acid (3.5 pH), brake fluid, transformer oil, ethylene glycol, toluene, caustic soda.
 4. Treated specimens shall exhibit no detrimental effects after exposure, and shall have a minimum of 14% increase in compressive strength versus untreated control specimens.
- F. *Potable Water Approval:* Independent testing shall be performed according to AS/NZS 4020:1999 "Products for use in contact with Drinking Water" evidenced by AS/NZS certification, or NSF Standard 61, and approval for use of waterproofing material on structures holding potable water shall be evidenced by NSF certification.

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1.05 Submittals

- A. *General:* Submit listed submittals in accordance with conditions of the Contract and with Division 1 Submittal Procedures Section.
- B. *Product Data:* Submit product data, including manufacturer's specifications, installation instructions, and general recommendations for waterproofing applications. Also include manufacturer's certification or other data substantiating that products comply with requirements of Contract Documents.
- C. *Test Reports:* Submit for acceptance, complete test reports from approved independent testing laboratories certifying that waterproofing system conforms to performance characteristics and testing requirements specified herein.
- D. *Manufacturer's Certification:* Provide certificates signed by manufacturer or manufacturer's representative certifying that the materials to be installed comply in all respects with the requirements of this specification, and that the applicator is qualified and approved to install the materials in accordance with manufacturer's product data.
- E. *Manufacturer's Field Report:* Provide copy of report from manufacturer's representative confirming that the surfaces to which waterproofing material is to be applied are in a condition suitable to receive same.

1.06 Quality Assurance

- A. *Manufacturer:* Provide products of manufacturer with no less than 10 years experience in manufacturing the cementitious crystalline waterproofing materials for the required work. Manufacturers that cannot provide the performance test data specified herein will not be considered for the project.
- B. *Applicator:* Waterproofing applicator shall be experienced in the installation of cementitious crystalline waterproofing materials as demonstrated by previous successful installation, and shall be approved by the manufacturer in writing.
- C. *Pre-Installation Conference:* Prior to installation of waterproofing, conduct meeting with waterproofing applicator, installers of work adjacent to or which penetrates waterproofing, architect/engineer, owner's representative, and waterproofing manufacturer's representative to verify and review the following:
 - 1. Project requirements for waterproofing as set out in Contract Document.
 - 2. Manufacturer's product data including application instructions.
 - 3. Substrate conditions, and procedures for substrate preparation and waterproofing installation.

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1.06 Quality Assurance (continued)

- D. *Technical Consultation:* The waterproofing manufacturer's representative shall provide technical consultation on waterproofing application.

1.07 Delivery, Storage and Handling

- A. *Delivery:* Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seal intact.

1.08 Project Conditions

- A. *Compliance:* Comply with manufacturer's product data regarding condition of substrate to receive waterproofing, weather conditions before and during installation and protection of the installed waterproofing system.

1.09 Warranty

- A. *Manufacturer's Warranty:* Manufacturer shall provide standard product warranty executed by authorised company official. Term of warranty shall be (specify term) years from Date of Substantial Completion.
- B. *Applicator's Warranty:* Applicator shall warrant the waterproofing installation against defects caused by faulty workmanship or materials for a period of (specify term) years from Date of Substantial Completion. The warranty will cover the surfaces treated and will bind the applicator to repair, at his expense, any and all leaks through the treated surfaces which are not due to structural weaknesses or other causes beyond applicator's control such as fire, earthquake and cyclone.

The warranty shall read as follows:

1. *Warranty:* The applicator warrants that, upon completion of the work, surfaces treated with cementitious crystalline waterproofing will be and will remain free from water leakage resulting from defective workmanship or materials for a period of (specify term) years from Date of Substantial Completion. In the event that water leakage occurs within the warranty period from such causes, the applicator shall, at his sole expense, repair, replace or otherwise correct such defective workmanship or materials. Applicator shall not be liable for consequential damages and applicator's liability shall be limited to repair, replacement or correcting of defective workmanship or materials. Applicator shall have no responsibility with respect to water leakage or other defects caused by structural failure or movement of the structure, or any other causes beyond Applicator's control.

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PART 2 - PRODUCTS

2.01 Materials

A. *Acceptable Manufacturer:*

Xypex Australia

45 Union Road
North Albury NSW 2640
Australia

Ph: (02) 6040 2444 Fax: (02) 6040 2411

Email: xypenq@xypex.com.au Web: www.xypex.com.au

B. *Proprietary Products:* Xypex crystalline waterproofing materials as follows:

1. Xypex Concentrate
2. Xypex Modified
3. Xypex Patch'n Plug

Note: Supplemental specifications are available for Xypex Concentrate DS-1/DS-2 (Dry shake) and Xypex Admix C-1000NF/C-2000NF (admixture)

C. *Substitutions:* No substitutions permitted.

D. *Source Quality:* Obtain proprietary crystalline waterproofing products from a single manufacturer.

2.02 Mixes

A. *General:* Mix waterproofing material by volume with clean water which is free from salt and deleterious materials. Mix waterproofing material in quantities that can be applied with 20 to 30 minutes from time of mixing. As mixture thickens, stir frequently, but do not add additional water. Do not mix bonding agents or admixtures with crystalline waterproofing materials.

B. *Brush Application Mix:* Measure dry powder and place in mixing container. Measure water and mix into the dry powder with a paddle on a slow speed electric drill (250 RPM) or other type mixer which is acceptable to manufacturer. Mixing proportions shall be as follows:

Coverage	Proportions (by Volume)
0.8 kg/m ²	5 powder to 2 water
1.0 kg/m ²	3 powder to 1 water

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2.02 Mixes (continued)

- C. *Spray Application Mix:* Mixing shall be same as specified for brush application except that mixture shall be thinner. Use following proportions as a guide only. Adjust proportions to match type of spray equipment and pressures used. Mixing proportions shall be as follows:

Coverage	Proportions (by Volume)
0.8 kg/m ²	5 powder to 2 water

- D. *Dry-Pac Mix:* Using a trowel, mix 1 part clean water with 6 parts Xypex Concentrate powder for 10 to 15 seconds. It is acceptable that lumps may be present in mixture. Mix only as much as can be applied in 15 minutes.

PART 3 - EXECUTION

3.01 Examination

- A. *Site Visit:* Prior to waterproofing installation, arrange visit to project site with waterproofing manufacturer's representative. Representative shall inspect and certify that concrete surfaces are in acceptable condition to receive waterproofing treatment.
- B. *Verification of Substrates:* Verify that concrete surfaces are sound and clean, and that form release agents and materials used to cure the concrete are compatible with waterproofing treatment.
- C. *Examination for Defects:* Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints and cracks. Such defects to be repaired in accordance to manufacturer's product data and 3.02 below.

3.02 Preparation

- A. *Concrete Finish:* Concrete surfaces to receive waterproofing treatment shall have an open capillary system to provide tooth and suction, and shall be free from scale, excess form laitance, curing compounds and foreign matter. Horizontal surfaces shall have a rough wood float or broom finish. Where a smooth trowel finish is required on horizontal surface, crystalline waterproofing material shall be applied by dry shake method at time of concrete finishing in accordance with manufacturer's product data.

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3.02 Preparation (continued)

- B. *Surface Preparation:* Smooth surfaces (eg. where steel forms are used) or surfaces covered with excess form oil or other contaminants shall be washed, lightly sandblasted, waterblasted, or acid etched with muriatic acid as necessary to provide a clean absorbent surface. Surfaces to be acid-etched shall be saturated with water prior to application of acid.
- C. *Repair of Defects:* Surface defects shall be repaired in accordance with manufacturer's instruction as follows:
1. *Form Tie Holes, Construction Joints, Cracks:* Chip out defective areas in a "U" shaped slot 25mm wide and a minimum of 25 mm deep. Clean slot of debris and dust. Soak area with water and remove excess surface water. Apply a slurry coat of Xypex Concentrate at the rate of 0.8 kg/m² to the slot. Allow slurry to reach an initial set, then fill cavity with Dry-Pac. Compress tightly into cavity using pneumatic packer or block and hammer.
 2. *Rock Pockets, Honeycombing or Other Defective Concrete:* Rout out defective areas to sound concrete. Remove loose materials and saturate with water. Remove excess surface water and apply a slurry coat of Xypex Concentrate to area. After slurry has set, but while still "green", fill cavity to surface level with non-shrink grout.
- D. *Wetting Concrete:* Prior to application of waterproofing treatment, thoroughly saturate concrete surfaces with clean water as required to ensure migration of crystalline chemicals into voids and capillary tracts of the concrete. Remove free surface water before application.

3.03 Application

- A. *Construction Joints:* Apply Xypex Concentrate in a slurry form at a rate of 0.8 kg/m² to joint surfaces between concrete pours. Moisten surfaces prior to slurry application. Where joint surfaces are not accessible prior to pouring new concrete, consult manufacturer for application procedure.

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3.03 Application (continued)

- B. *Sealing Strips and Coves:* Prepare concrete surfaces that will come into contact with sealing strips and coves by applying one coat of Xypex Concentrate in slurry form at a rate of 0.8 kg/m². Then apply Xypex Concentrate in Dry-Pac form (sealing strip) or Xypex Modified in mortar consistency (cove) after slurry coat has reached an initial set but is still "green"
1. *Sealing Strips:* Where indicated on drawings, fill preformed grooves, 25mm wide and minimum of 37 mm deep, located at construction joints with Xypex Concentrate in Dry-Pac form. Compact Dry-Pac tightly into groove using a pneumatic packer or hammer and block.
 2. *Coves:* Where indicated on drawings, trowel apply and pack Xypex Modified mortar into a cove shape.
- C. *Surface Application:* After repairs, surface preparation, treatment of construction joints and sealing strip placement have been completed in accordance with manufacturer's product data and as specified herein, apply Xypex treatment uniformly to concrete surfaces with semi-stiff bristle brush or broom, or suitable spray equipment. Application rates and locations shall be as indicated in the drawings and in accordance with manufacture's product data. When brushing, work slurry well into surface of the concrete, filling surface pores and hairline cracks. When spraying, hold nozzle close enough that slurry is forced into pores and hairlines cracks.
1. *First Coat* (of one of two coat application): Apply Xypex Concentrate slurry coat to locations indicated on drawings in accordance with manufacture's product data.
 2. *Second Coat* (of two coat application): Where indicated on drawings or as required by manufacturer's product data, apply Xypex Modified slurry coat whilst first coat of Xypex Concentrate is still "green" but after it has reached an initial set. Use light prewatering between coats when rapid drying conditions exist.
- D. *Sandwich (Topping) Application:* When treated structural slabs are to receive a concrete or other topping, place the topping while waterproofing material is still "green" but has reached an initial set. Lightly prewater when rapid drying conditions exist.

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3.04 Curing

- A. *General:* Begin curing as soon as Xypex coating has hardened sufficiently so as not to be damaged by a fine spray. Cure Xypex treatment with a mist fog spray of clean water three times a day for 2 to 3 days, or cover treated surfaces with damp burlap for the prescribed period. In warm climates, more than three sprayings per day may be necessary to prevent excessive drying of coating.
- B. *Air Circulation:* Do not lay plastic sheeting directly on the waterproofing coating as air contact is required for proper curing. If poor circulation exists in treated areas, it may be necessary to provide fans or blown air to aid in curing of waterproofing treatment.
- C. *Holding Structures:* For concrete holding structures such as swimming pools, reservoirs, water treatment tanks and wet wells, cure Xypex treatment for three days and then allow treatment to set for 12 days before filling structure with liquid. For structures holding hot or corrosive liquids, cure waterproofing treatment for three days and allow to set for 18 days before filling.
- D. *Protection:* During the curing period, protect treated surfaces from damage by wind, sun, rain and temperatures below 2°C. If plastic sheeting is used for protection, it must be raised off of waterproofing coating to allow sufficient air circulation.
- E. *Curing Agent:* If moist curing is not possible, use a chemical curing agent that is specifically designed for or compatible with the approved crystalline waterproofing treatment. Curing agent shall have at least two years of successful field use and shall be approved by waterproofing manufacturer in writing.

3.05 Interface with other materials

- A. *Backfilling:* Do not backfill for 36 hours after application. If backfill takes place within seven days after application, then backfill material shall be moist so as not to draw moisture from waterproof coating.
- B. *Paint, Epoxy or Similar Coatings:* Do not apply paint or other coatings until waterproofing treatment has cured and set for a minimum of 21 days. Before applying paint or coatings until waterproofing treatment has cured and set for a minimum of 21 days. Before applying paint or coating, neutralize treated surface by dampening with water and then washing waterproofed surface with 15% muriatic acid, diluted in a ratio of one part acid to four parts water by volume. Flush acid off treated concrete surfaces.

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3.05 Interface with other materials (continued)

- C. *Grout, Cement Parge Coat, Plaster or Stucco:* Because the waterproof coating forms a relatively smooth surface and the resulting crystalline formation fills the concrete pores thereby reducing suction characteristics of the concrete, it may be necessary to use a suitable bonding agent for proper bonding of cementitious systems.
- D. *Responsibility to Ensure Compatibility:* The manufacturer makes no representations or warranties regarding compatibility of Xypex treatment with coatings, plasters, stuccos, tiles or other surface-applied materials. It shall be the responsibility of the installer of the surface-applied material that is to be applied over the Xypex waterproofing treatment, to take whatever measures are necessary, including testing, to ensure acceptance by or adherence to the waterproofing treatment.

3.06 Field Quality Control

- A. *Observation:* Do not conceal installed waterproofing system before it has been observed by Architect/Engineer, waterproofing manufacturer's representative and other designated entities.
- B. *Flood Testing:*
 - 1. Perform flood test on completed waterproofing installation before placement of other construction.
 - 2. Plug or dam drains and fill area with water to a depth of 50 mm or to within 12.5 mm of top of waterproofing treatment.
 - 3. Let water stand for 24 hours.
 - 4. If leaks are discovered, make repairs and repeat test until no leaks are observed.

3.07 Cleaning and Protection

- A. *Cleaning:* Clean spillage and soiling from adjacent surfaces using appropriate cleaning agents and procedures.
- B. *Protection:* Take measures to protect completed Xypex coating from damage after application. Do not permit traffic on unprotected coating.

END OF SECTION 07160