

Coatings CSI Format

Section 071616

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 031000 - Concrete Forming and Accessories
 2. Section 079000 - Joint Protection
 3. Section 099000 - Paints and Coatings

1.02 REFERENCES

- A. **Applicable Standards:** The following standards are referenced herein.
1. American Society for Testing and Materials (ASTM)
 2. Army Corps of Engineers (CRD)
 3. American National Standards Institute (ANSI)
 4. NSF International
 5. European Standards (EN)
 6. RILEM
 7. Drinking Water Inspectorate (DWI)

1.03 SYSTEM DESCRIPTION

- A. **Cementitious Crystalline Waterproofing:** Concrete waterproofing and protection system shall be of the crystalline type that is a 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 diffuse into the concrete and cause a catalytic reaction which generates a non-soluble crystalline structure within the pores and capillary tracts of concrete. This crystalline system causes the concrete to become sealed against the penetration of liquids from any direction and protects the concrete from deterioration due to harsh environmental conditions. The system is used for above or below-grade walls and slabs, including liquid retaining structures and where enhanced chemical resistance is required.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. **Testing Requirements:** Crystalline waterproofing system shall have been tested in accordance with the following standards and conditions and at the dosage rate specified by the manufacturer, and the testing results shall meet or exceed the performance requirements as specified herein.
- B. **Independent Laboratory:** Testing shall have been performed by an accredited independent laboratory meeting the requirements of ASTM E 329 or other applicable international standard for certification of testing laboratories. Testing laboratory shall have obtained all control and treated concrete samples.
- C. **Crystalline Penetration:** Crystallizing capability of waterproofing material shall be evidenced by independent SEM (Scanning Electron Microscope) photographs. Crystal growth 12 inches (30 cm) from the surface of the coating shall be evident with 1000X magnification 1 year after application of the coating and exposure of the sample to normal weathering.
- D. **Permeability:** Independent testing shall be performed according to U.S. Army Corps of Engineers CRD C48 "Permeability of Concrete". Concrete samples shall have design strength of 2000 psi (14 MPa) and thickness of 2 inches (50 mm). Treated samples shall have two coats of crystalline waterproofing applied per manufacturer's directions. Samples to be pressure tested to 175 psi (405 foot head of water) or 1.2 MPa (123.4 m head of water). Control samples shall leak and treated samples, after crystalline growth has occurred, shall exhibit no measurable leakage.
- E. **Permeability - Negative Side Application:** Independent testing shall be performed according to EN 12390-8 or other recognized direct pressure test. Concrete samples shall have a design strength of 25 MPa (3600 psi). Treated samples shall be exposed to water pressure on the side opposite to the crystalline coating. Coated samples shall exhibit a greater than 90% reduction in depth of water penetration as compared to the control samples.
- F. **Chemical Resistance:** Independent testing shall be performed according to ASTM C 267 "Chemical Resistance of Mortars" and ASTM C 39 "Compressive Strength of Cylindrical Concrete Specimens". Concrete samples (treated and untreated) shall have design strength of 4000 psi (27.6 MPa). Treated samples shall have two coats of crystalline waterproofing applied per manufacturer's directions. Untreated and treated specimens must 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. Treated specimens shall exhibit no detrimental effects after exposure and shall have an average of 17% increase in compressive strength versus untreated control specimens.
- G. **Acid Resistance:** Independent testing shall be performed to determine "Sulfuric Acid Resistance of Concrete Specimens". Treated concrete samples shall be tested against untreated control samples. All samples shall be immersed in 5% sulfuric acid and weighed weekly for 10 weeks. Untreated samples shall exhibit at least 8 times more mass loss than treated samples.

- H. **Carbonation Resistance Testing:** Independent testing shall be performed according to RILEM CPC-18 or other recognized accelerated carbonation test. Concrete samples shall have a 0.5 w/cm ratio or be approximately 30 MPa (4500 psi) in strength. Coated samples shall have crystalline coating applied one day after casting and all samples to be cured for 7 days prior to carbonation. After 91 days exposure to CO₂ the coated samples shall show a 35% or greater reduction in carbonation depth as compared to the control samples.
- I. **Potable Water Approval:** Waterproof material shall have a current, valid approval certificate from NSF (NSF 61), DWI, or other recognized certification agency.

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.
- 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 document signed by manufacturer or manufacturer's representative certifying that the materials to be installed comply with the requirements of this specification.
- E. **Manufacturer's Field Report:** Provide copy of report from manufacturer's representative 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 Qualifications:** Manufacturer shall be ISO 9001 registered and shall have no less than 10 years experience in manufacturing the cementitious crystalline waterproofing materials for the required work. Manufacturer must be capable of providing field service representation during construction phase. Manufacturers who cannot provide ongoing field support or 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 installations and shall be approved by the manufacturer in writing.

- C. **Pre-Installation Conference:** Prior to installation of waterproofing, conduct meeting with waterproofing applicator, 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.
- D. **Technical Consultation:** The waterproofing manufacturer's representative shall provide technical consultation on waterproofing application and provide on-site support as needed.

1.07 DELIVERY, STORAGE AND HANDLING

- A. **Ordering:** Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. **Delivery:** Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seals intact.
- C. **Storage:** Store waterproofing materials in dry, enclosed location, at a minimum temperature of 45°F (7°C).

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 authorized company official.
- B. **Applicator's Warranty:** Applicator shall warrant the waterproofing installation against defects caused by faulty workmanship or materials for a period of typically (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, tornado and hurricane. 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.

PART 2 – PRODUCTS

2.01 MATERIALS

A. **Acceptable Manufacturer:**

Xypex Chemical Corporation
13731 Mayfield Place, Richmond, B.C., Canada V6V 2G9
Tel: 800 961.4477 or 604 273.5265 Fax: 604 270.0451
E-mail: info@xypex.com Website: www.xypex.com

Note: Acceptable manufacturers include all licensed manufacturing operations of Xypex Chemical Corporation.

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 Admix series (admixture) and Xypex Concentrate DS-1/DS-2 (dry shake).

C. **Substitutions:** No substitutions permitted.

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

2.02 MIXES

A. **General:** Mix waterproofing material by volume with clean, potable water. Mix waterproofing material in quantities that can be applied within 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)
1.5 lb./sq. yd. (0.8 kg/m ²)	5 powder to 2 water
2.0 lb./sq. yd. (1.0 kg/m ²)	3 powder to 1 water

- 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)
1.5 lb./sq. yd. (0.8 kg/m ²)	5 powder to 3 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 complete a field review, confirming that the sample areas observed, are considered to be in acceptable condition to receive Xypex Coating.
- 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 fully removed.
- C. **Examination for Defects:** Examine surfaces to be waterproofed for defects such as honeycombing, rock pockets, faulty construction joints and cracks. Such defects to be repaired in accordance with manufacturer's product data and 3.02 below.

3.02 PREPARATION

- A. **Surface Preparation:** Smooth surfaces (e.g. where steel forms are used) or surfaces covered with form oil or other contaminants shall be cleaned, water-blasted, lightly sand-blasted, or acid etched as necessary to provide a clean absorbent surface. The surface must also have an open capillary system to provide "tooth and suction" for the Xypex treatment. A minimum of CSP-3 per the International Concrete Repair Institute Concrete Surface Profile Chips or other equivalent standard is required. Surfaces to be acid-etched shall be should be saturated with water before application of the acid. After acid etching flush concrete thoroughly with clean water. 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.
- B. **Repair of Defects:** Concrete defects shall be repaired in accordance with manufacturer's technical literature including relevant Method Statements (www.xypex.com/technical-resources/specifications). Procedures are generally as follows:

1. Cracks and Faulty Construction Joints:
 - a. Chip out cracks, faulty construction joints and other defects to a depth of 1.5 inches (37 mm) and a width of one inch (25 mm). 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.
 - b. 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 1.5 lb./sq. yd. (0.8 kg/m²) to the slot.
 - c. While slurry coat is still tacky, fill cavity with Dry-Pac. Compress tightly into cavity using pneumatic packer or block and hammer.
 - d. This step may be omitted if the area filled with Dry-Pac will be subsequently covered with Xypex coating. Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 - 2 lb./sq. yd. (0.8 - 1 kg/m²) over the repaired area to 6" (150 mm) on either side of slot.
2. Rock Pockets, Honeycombing or other defective concrete: All areas of poor concrete consolidation (honeycomb or rock pockets) shall be repaired.

Note: Where there is active water-flow see Method Statements or contact Xypex Technical Services Representative for assistance.

- C. **Wetting Concrete:** Xypex requires a saturated surface dry (SSD) substrate. Concrete surfaces must be thoroughly saturated with clean water prior to the application so as to aid the proper diffusion of the Xypex chemistry and to ensure the growth of the crystalline formation deep within the pores of the concrete. Remove excess water before the application such that there is no glistening water on the surface. If concrete dries out before application, it must be re-wetted.

3.03 APPLICATION

- A. **Construction Joints:** In addition to specified waterstops, apply one coat of Xypex Concentrate slurry at a rate of 2 lb./sq. yd. (1 kg/m²) to joint surfaces between concrete pours. Moisten surfaces prior to slurry application. Apply slurry and keep moist for 12 hours then allow slurry to set or dry. Where joint surfaces are not accessible prior to pouring new concrete, contact Xypex Technical Services Representative for assistance.

Note: Inclusion, type and position of waterstops are at the discretion of the designer. Expanding waterstops may be placed on Xypex after it has dried or before Xypex slurry application. Xypex slurry may only be applied over waterstop if approved by waterstop manufacturer.

- B. **Sealing Strips:** Where hydrostatic conditions exist, sealing strips shall also be applied at construction joints by filling grooves that are created along the joints. Dimensions of the grooves shall be 1 inch (25 mm) wide and 1.5 inches (37 mm) deep. If grooves are not pre-formed then chip grooves to those dimensions. Fill the grooves as follows:
1. Apply slurry coat of Xypex Concentrate slurry to slot in accordance with manufacturer's instructions or recommendations.

2. While slurry coat is still tacky, fill slot with Xypex Concentrate Dry-Pac.
3. Compact tightly using pneumatic packer or hammer and block.
4. This step may be omitted if the area filled with Dry-Pac will be subsequently covered with Xypex coating. Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 - 2 lb./sq. yd. (0.8 - 1 kg/m²) over sealing strip and extending to 6" (150 mm) on either side.

Note: For further information, see Xypex Schematic Drawings for standard construction joint details.

- C. **Form Tie Holes:** Form tie holes shall be waterproofed in accordance with manufacturer's technical literature including relevant Method Statements (www.xypex.com/technical/statements). Procedures are generally as follows:

1. Prepare the tie hole to create a straight sided void with a profile of at least ICRI CSP-3. For through element ties holes such as those created by taper ties the prepared void is to be at least 5" (125 mm) deep. For cone ties the void is to be to the bottom of the cone.
2. Clean and profile the area to a 12 inch (300 mm) diameter around the tie hole to an ICRI CSP-3 profile.
3. For through-element tie holes create a solid plug of material at the bottom of the profiled hole using Xypex Patch'n Plug leaving at least 4" (100 mm) of empty tie hole from the top of the plug to the surface of the concrete element.
4. Apply a coat of Xypex Concentrate slurry at a rate of 1.5 lb./sq. yd. (0.8 kg/m²) to the inside of the tie hole and to a 12" (300 mm) diameter area around the hole.
5. Fill and compact the tie hole with Xypex Concentrate Dry-Pac.
6. This step may be omitted if the area filled with Dry-Pac will be subsequently covered with Xypex coating. Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 - 2 lb./sq. yd. (0.8 - 1 kg/m²) over the repaired area to a 12" (300 mm) diameter area around the filled void.

- D. **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 to concrete surfaces with semi-stiff bristle brush, push broom (for large horizontal surfaces), or suitable spray equipment. The Xypex coating must be uniformly applied and should be just under 1/16" (1.25 mm) thick.

Application rates and locations shall be as indicated in the drawings and in accordance with manufacturer'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 to ensure that slurry is forced into pores and hairline cracks.

1. First Coat (of one or two coat application): Apply Xypex Concentrate slurry coat to locations indicated on drawings in accordance with manufacturer'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 or Xypex Concentrate slurry coat after the first coat of Xypex Concentrate 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.

Note: Prior to the installation, it is recommended that a test section be completed under anticipated ambient and project conditions to demonstrate acceptable bond

- E. ***Sandwich (Topping) Application:*** When treated structural slabs are to receive a concrete or other topping, place the topping while waterproofing material is still “green” (less than 48 hours) but after it has reached an initial set. The preferred time frame is 12 to 24 hours after the installation of Xypex coating. Curing by misting the coating with water should be done between application of coating and installation of concrete overlay. Ensure coating is in SSD condition prior to placement of concrete.

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. Wet burlap and some specialty curing blankets are also effective for curing during 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 air 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 water 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. 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, puddling of water and temperatures below 36°F (2°C). If plastic sheeting is used for protection, it must be raised off of the waterproofing coating to allow sufficient air circulation.

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 proceed with surface preparation or application of paint or other coatings until waterproofing treatment has cured and set for a minimum of 21 days. Light abrasive blasting or washing the Xypex surface with a 3 - 5% acid solution followed by a rigorous rinse with clean water is recommended before applying the coating. Be sure to flush all acid off the surface. Alternately, removal of the Xypex coating by high pressure washing or abrasive blasting following full curing is acceptable. Consult epoxy and paint manufacturer for additional coating instructions and restrictions.

- C. **Grout, Cement Parge Coat, Plaster or Stucco:** It is recommended that any other cementitious system be applied over the Xypex coating after the Xypex has completely set but while it is still “green” (12 to 48 hours). The 12-to-24-hour window is considered ideal. Contact your Xypex Technical Services Representative regarding surface preparation and other procedures for installations of other materials onto Xypex coatings older than 48 hours. Alternately, removal of the Xypex coating by high pressure washing or abrasive blasting following the full 21 day curing is acceptable. Use of a polymer additive to help improve bond in the over coating mortar mix should be considered.
- D. **Responsibility to Ensure Compatibility:** Xypex Chemical Corporation 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 adhesion to the waterproofing treatment.

Note: Prior to the installation, it is recommended that a test section be completed under anticipated ambient and project conditions to demonstrate acceptable bond.

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. **Testing for Tanks and Foundation Works**
1. Testing: Fill tanks or, for foundation works, shut off dewatering system as soon as practical so that the structure shall be exposed to its normal service conditions. Examine for leaks. For structures that will be dry until a specific event (e.g. interior located containment basin) the concrete elements should be fully saturated several times over a period of several weeks to encourage crystal development to occur.
 1. Monitoring:
 - a. Actively leaking cracks and joints shall be left to self-heal for as long as practical. Depending on job site and ambient conditions crack healing can be expected to take several days to weeks.
 - b. Any crack or joints that do not heal in the allowable time frame shall be repaired by the general contractor.
 - c. Moving cracks shall be repaired using polyurethane injection or other appropriate method.
 2. Repair: Use Xypex repair procedures to seal any static crack or joint that does not self-heal. See Method Statements (www.xypex.com/technical/statements) or contact Xypex Technical Services Representative for appropriate repair procedures.

Note: Lower temperatures will extend the times for crystalline development.

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 until the coating is hard enough to not be damaged. In normal conditions protect from pedestrian traffic for 3 days and vehicular traffic for 7 days. If coatings will be exposed to ongoing vehicular traffic or other abrasive environments consult Xypex Technical Services.

End of Section 071616