Additive CSI Format

Section 033000

1.01 SUMMARY

A. ***Section Includes:*** Furnishing of all labor, materials, services and equipment necessary for the supply and installation of crystalline waterproofing additive to concrete as indicated on the drawings and as specified herein.

B. ***Related Sections:***

1. Section 031000 - Concrete Forming
2. Section 032000 - Concrete Reinforcement
3. Section 031516 - Concrete Construction Joints
4. Section 033713 - Shotcrete
5. Section 034000 - Precast Concrete
6. Section 071616 - Crystalline Coatings
7. Section 079000 - Joint Protection

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 Concrete Institute (ACI)
4. American National Standards Institute (ANSI)
5. NSF International
6. European Standards (EN)
7. Drinking Water Inspectorate (DWI)

1.03 SYSTEM DESCRIPTION

A. ***Crystalline Waterproofing Additive:*** Concrete waterproofing and protection system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure within the pores and capillary tracts of the 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 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 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 Formation:*** Crystallizing capability of waterproofing system shall be evidenced by independent SEM (Scanning Electron Microscope) photographs showing crystalline formations within the concrete matrix.

D. ***Permeability 1:*** Independent testing shall be performed according to a U.S. Army Corps of Engineers CRD-C48 (Mod.) "Permeability of Concrete". Concrete samples shall be pressure tested to 150 psi (350 foot head of water) or 1.05 MPa (106 m head of water). After 5 days the untreated samples shall leak and the treated samples shall exhibit no measurable leakage.

E. ***Permeability 2:*** Independent testing shall be performed according to EN 12390-8. Treated samples shall be exposed to water with a pressure of 0.5 MPa for 72 hours. Treated samples must exhibit a reduction in permeability coefficient of at least 80% when compared to control concrete. Control samples must have a depth of penetration of at least 50 mm.

F. ***Sulfuric Acid Resistance:*** Independent testing shall be performed to determine "Sulfuric Acid Resistance of Concrete Specimens". Treated concrete samples dosed at 3% shall be tested against untreated control samples. All samples shall be immersed in 7% sulfuric acid and weighed daily until a control sample reaches a mass loss of 50%. On final weighing the percentage mass loss of the treated samples shall be significantly lower than the control samples.

G. ***Sulfate Resistance:*** Independent testing shall be performed to determine "Sulfate Resistance of Concrete Specimens" treated with integral crystalline admixture. Treated and untreated samples shall be immersed in a concentrated sulfate solution for at least 4 months. On final weighing the percentage mass loss of the treated samples shall be significantly lower than the control samples.

H. ***Compressive Strength:*** Concrete samples containing the crystalline waterproofing additive shall be tested against an untreated control sample of the same mix. At 28 days, the treated samples shall exhibit equal or increased compressive strength over the control sample.

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.

1.06 QUALITY ASSURANCE

A. ***Manufacturer Qualifications:*** Manufacturer to be ISO 9001 registered, and to have no less than 10 years experience in manufacturing the crystalline waterproofing additive for the required work. Manufacturer must be capable of providing field service representation during construction phase. Manufacturers who cannot provide ongoing field support or who cannot provide the performance test data specified herein will not be considered for the project.

B. ***Installer:*** Ready-mix supplier and/or installer of crystalline waterproofing additive shall be approved by the manufacturer or manufacturer's representative in writing.

C. ***Pre-Installation Conference:*** Prior to installation of waterproofing system, conduct meeting with Architect/Engineer, owner's representative, concrete supplier, concrete placer and waterproofing manufacturer's representative to verify and review the following:

1. Project requirements for waterproofing as set out in Contract Documents.
2. Manufacturer's product data including mixing and installation instructions.

D. ***Technical Consultation:*** The waterproofing manufacturer's representative shall provide technical consultation on waterproofing applications and shall 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 WARRANTY

A. ***Project Warranty:*** Refer to conditions of the Contract for project warranty provisions.

B. ***Manufacturer's Warranty:*** Manufacturer shall provide standard product warranty executed by authorized company official.

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 Admix C-500 / C-500NF
2. Xypex Admix C-1000 / C1000NF
3. Xypex Admix C-2000 / C2000NF
4. Xypex Concentrate
5. Xypex Patch'n' Plug

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

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

2.02 DOSAGE

A. ***General:*** Xypex Admix must be added to concrete mix at time of batching.

B. ***Dosage Rate:*** Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at the following rates:

1.	Xypex Admix C-500	2% – 3% by weight of cement content
2.	Xypex Admix C-1000	2% – 3% by weight of cement content
3.	Xypex Admix C-2000	2% by weight of cement content

For Xypex Admix NF Series dosages are 1% - 1.5% by weight of cement content.

Note: For enhanced chemical protection or for meeting specific project requirements or where the concrete mix design contains higher than 25% type F fly ash content or includes a portland cement/slag cement/type C fly ash blend, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. ***Compliance:*** Comply with manufacturer's product data regarding installation, including technical bulletins, product catalogue, installation instructions and product packaging labels.

3.02 PROJECT CONDITIONS

A. ***Crack Control:*** All reinforcement shall be in accordance with applicable standards. Concrete elements shall be designed and constructed to minimize and control cracking.

B. ***Setting Time and Strength:*** Some delay of set may occur when using Xypex Admix products. The amount of set delay will depend upon the concrete mix design, the particular Admix product used, dosage rate of the Admix, temperature of the concrete and climatic conditions. Concrete containing a Xypex Admix product may develop higher ultimate strengths than plain concrete. Conduct trial mixes under project conditions to determine setting time and strength of the concrete. Consult with manufacturer or

manufacturer's representative regarding concrete mix design, project conditions and proper dosage rate.

C. ***Weather Conditions:*** For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices such as those referred to in ACI 305R (Hot Weather Concreting) and ACI 306R (Cold Weather Concreting) or other applicable standards.

3.03 APPLICATION

A. ***General:*** Xypex Admix is added to the concrete at the time of batching. It is important to obtain a homogeneous mixture of Xypex Admix with the concrete. Do not add dry Admix powder directly to wet mixed concrete as this could cause clumping and thorough dispersion may not occur.

B. ***Concrete Batching & Mixing:*** Procedures for addition of Xypex Admix will vary according to type of batch plant operation and equipment.

1. Addition to Coarse Aggregate Belt: Add Xypex Admix powder directly to the course aggregate conveyor belt manually or through computer controlled mass batching system. Account for worker health and safety issues relating to moving belts and wind-blown dust.

2. Addition to Ready Mixed Truck at Plant: Add Xypex Admix in bulk powder or soluble bag form to the drum of the ready-mix truck immediately prior to driving the truck under the batch plant. Then add the balance of the materials or the premixed concrete in accordance with standard concrete batching practices. Take measures to ensure that soluble bags are dispersed properly. Such measures can include: a) adding the bags as far forward in the drum as possible, b) adding a small amount of batch water along with the bags, and c) spinning the drum prior to adding remaining components. Avoid delays in adding other components and utilize high speed mixing to ensure homogeneity of mix. Where there may be insufficient water for thorough dispersion of the bulk powder, mix the Admix powder with water to form a slurry and add to the truck mixer drum prior to batching. Account for added water in the mix design and slump.

3. Addition to Central Mixer: Load the Xypex Admix in bulk powder form or in soluble bags along with the other components. Mix in accordance with standard batching practices to ensure thorough dispersion and a homogeneous mixture. Account for worker safety issues when accessing the equipment.

4. Precast Batch Plant - Pan Type Mixer: Add Xypex Admix to the rock and sand, then mix thoroughly for 2 - 3 minutes before adding the cement and water. The total concrete mass shall be blended using standard practices.

Note 1: While it is preferable to install the Xypex Admix at the batch plant; when necessary, a slurry mixture containing the Admix can be added on site to the ready mix truck. To create a slurry, mix 5 parts Admix powder to 3 parts water by volume (i.e. a water to powder ratio of 0.67 by mass). Following addition to the drum, mix concrete for a minimum of 5 minutes on high speed or until thoroughly dispersed. Account for added water in the mix design and slump.

Note 2: Consult with local Xypex Technical Services Representative concerning additional procedures for addition and mixing.

C. ***Construction and Cold Joints:*** In addition to specified waterstops apply one coat of Xypex Concentrate slurry at a rate of 2 lb./sq. yd. (1 kg/m^2) 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.

D. ***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 been pre-formed then chip grooves to those dimensions. Fill the groves as follows:

1. Apply slurry coat of Xypex Concentrate 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. 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.

E. ***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 6 inch (150 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/m^2) 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. 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/m^2) over the repaired area to a 12" (300 mm) diameter area around the filled void.

F. ***Repair of Defects:*** Concrete defects shall be repaired in accordance with manufacturer's technical literature including relevant Method Statements (www.xypex.com/technical/statements). 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/m^2) 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. 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.

3.04 Placing

A. ***Concrete Placement:*** Concrete placement shall be in accordance with “309R: Guide for Consolidation of Concrete" or other applicable standard. Special attention is to be given to consolidation at joints, penetrations and other potential leakage locations.

3.05 CURING

A. ***General:*** Concrete containing Xypex Admix shall be moist cured in accordance with ACI 308, "Standard Practice for Curing Concrete" or other applicable standard.

B. ***Curing Compounds:*** Curing compounds may be used in the event that project requirements or conditions prevent moist curing. Curing compounds shall comply with ASTM C-309 or other applicable standard.

3.06 PROTECTION

A. ***Protection:*** Protect installed product and finished surfaces from damage during construction.

3.07 FIELD QUALITY CONTROL

A. ***Examination for Defects:*** Do not conceal Xypex treated concrete before it has been observed by Architect/Engineer, waterproofing manufacturer's representative or other designated entities. Concrete shall be examined for structural defects such as honeycombing, rock pockets, tie holes, faulty construction joints, cold joints and cracks larger than 1/64” (0.4 mm). Such defects to be repaired in accordance with manufacturer's repair procedures as noted above.

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 it's normal service conditions. Examine for leaks.
2. 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.
    c. Moving cracks shall be repaired using polyurethane injection or other appropriate method.
3. 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.

3.08 INTERACTION WITH OTHER MATERIALS

A. ***Backfilling:*** Normal backfilling procedures may be used after concrete has been cured.

B. ***Paint, Epoxy, Grout, Cement Parge Coat, Plaster or Stucco:*** Xypex Admix treatment of concrete does not adversely affect the bond of subsequently applied materials. Follow surface preparation and other relevant directions of the coating or parge material manufacturer.

C. ***Responsibility to Ensure Compatibility:*** Xypex Admix products are compatible with most admixtures used in the production of quality concrete. However, Xypex Chemical Corporation makes no representations or warranties regarding such compatibility of Xypex Admix products with other additives or admixtures. It shall be the responsibility of the concrete contractor to take whatever measures are necessary, including testing, to ensure compatibility of the Xypex Admix with other additives or admixtures being used in the concrete mix, and it shall be the responsibility of the installer of the surface-applied material that is to be applied over the Xypex treated concrete to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the Xypex treated concrete.

End of Section 033000