Dryshake CSI Format

Section 03 35 00

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 (dry shake) to horizontal concrete surfaces as indicated on drawings and as specified herein.

B. ***Related Sections:***

1. Section 031000 - Concrete Forming
2. Section 032000 - Concrete Reinforcement
3. Section 033000 - Cast-In-Place Concrete
4. Section 033600 - Concrete Finishing
5. Section 079000 - Joint Protection
6. 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 (Dry Shake):*** Concrete waterproofing and protection system shall be of the crystalline type that is a blend of Portland cement, specially graded aggregateand active proprietary chemicals. When applied as a dry shake onto and floated into a fresh slab, 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 and protects the concrete from deterioration due to harsh environmental conditions. The system is used for above or below-grade slabs, including liquid retaining structures and where enhanced chemical resistance is required. For areas where increased abrasion resistance is required, utilize Xypex DS-2 which is formulated with a proprietary aggregate hardener.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. ***Testing Requirements:*** Crystalline waterproofing system shall have been 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 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 CO_2 the coated samples shall show a 35% or greater reduction in carbonation depth as compared to the control samples.

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

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 dry shake cementitious 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, concrete placer, concrete finisher, 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.

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 45ºF (7ºC).

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

B. ***Proprietary Products:*** Xypex crystalline waterproofing materials as follows:
1. Xypex Concentrate DS-1 (general applications)
2. Xypex Concentrate DS-2 (where enhanced abrasion resistance is required)

Note: Supplemental specifications are available for Xypex Concentrate and Modified (coatings) and Xypex Admix C-series (additive) products.

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

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

2.02 COVERAGE

A. ***Dry Shake Materials:*** Coverage rate for cementitious crystalline waterproofing shall be as follows:

Xypex Concentrate DS-1	1.75 lb per sq. yd. (0.95 kg/m2)
Xypex Concentrate DS-2	6.75 - 7.5 lb sq. yd. (3.6 - 4.0 kg/m2)

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. ***Air Entrainment:*** For best results, air content of the concrete should not exceed 3% (natural air only). If entrained air content is specified (e.g. for concrete that will be exposed to freeze-thaw cycle), consult with a manufacturer's technical representative for further application information.

A. ***Water Reducers and Supplementary Cementing Materials:*** 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, fly ash or silica fume may reduce bleed water and make the concrete more difficult to finish. Consult with Xypex Technical Services for assistance.

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

D. ***Joint Sealants:*** Suitable flexible sealant or other flexible systems shall be used for expansion joints and chronic moving cracks.

E. ***Weather Conditions:*** 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 evaporation of bleed water is occurring, the DS 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 powder into concrete paste. It is advisable to use an evaporation retardant on the fresh concrete.

3.03 APPLICATION

A. ***General:*** Apply cementitious crystalline waterproofing (dry shake) after placement, consolidation and leveling of fresh concrete.

B. ***Concentrate DS-1:*** Wait until concrete can be walked on leaving an indentation of 1/4 - 3/8 in. (6.5 - 9.5 mm). Concrete should be free of bleed water and be able to support the weight of a power trowel, then float open the surface. Immediately after floating open the surface, apply the dry shake material by hand or mechanical spreader. The dry shake material must be spread evenly. As soon as the dry shake material has absorbed moisture from the base slab, it must be floated into the surface. The DS-1 powder must be thoroughly worked into the cement paste using a float (not a trowel). Failure to utilize a float for this process could result in damage to the hardened surface (i.e. flaking, blistering or peeling). When concrete has hardened sufficiently, power trowel surface to the required finish.

C. ***Concentrate DS-2:*** Wait until concrete can be walked on leaving an indentation of 1/4 - 3/8 in. (6.5 - 9.5 mm). Concrete should be free of bleed water and be able to support the weight of

a power trowel, then float open the surface. Immediately after floating open the surface, apply one half of the dry shake material by hand or mechanical spreader. The dry shake material must be spread evenly. As soon as the dry shake material has absorbed moisture from the base slab, it must be floated into the surface. The DS-2 powder must be thoroughly worked into the cement paste using a float (not a trowel). Failure to utilize a float for this process could result in damage to the hardened surface (i.e. flaking, blistering or peeling). Immediately after power floating, apply remaining dry shake material at right angles to the first application. Allow remaining dry shake material to absorb moisture from the base slab and then power float the material into the surface. Again, it is essential that the DS-2 powder is thoroughly worked into the cement paste using a float (not a trowel). When concrete has hardened sufficiently, power trowel surface to the required finish.

D. ***Slab Edges:*** Where edges of concrete slab set up earlier than main body of concrete, apply dry shake material to edges and finish with hand tools prior to proceeding with the dry shake application to the main body of concrete slab.

3.04 CURING

A. ***General:*** Begin curing as soon as concrete has reached a final set but before the surface starts to dry. Conventional moist curing procedures such as water spray, wet burlap or plastic covers may be used in accordance with ACI Reference 308, "Standard Practice for Curing Concrete".

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.

3.05 PROTECTION

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

3.06 INTERFACE WITH OTHER MATERIALS

A. ***Paint, Epoxy, Grout, Thinset, Concrete Topping:*** Xypex DS-1 treatment of concrete does not adversely affect the bond of subsequently applied materials. After curing allow 21 days for chemical diffusion and then follow surface preparation and other relevant directions of the over coating material's manufacturer. For Xypex DS-2 contact Xypex Technical Services for assistance.

B. ***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.

3.07 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, faulty construction joints, cold joints and cracks larger than 1/64” (0.4 mm). Such defects to be repaired in accordance with manufacturer's Method Statements (www.xypex.com/technical/statements).

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.
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 CLEANING AND PROTECTION

A. ***Cleaning:*** Clean spillage and soiling from adjacent surfaces using appropriate cleaning agents and procedures.

B. ***Protection:*** Take measures to protect installed product and finished surfaces from damage after application.

End of Section 033500