SECTION 07162

CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Crystalline waterproofing at elevator pit walls and floors, negative pressure side (inside).

B. Related Sections:

1. Section 03300 - Cast-in-Place Concrete.
2. Section 05500 - Metal Fabrications: Elevator pit ladder and sill angles.
3. Section 14240 - Hydraulic Passenger and service Elevator.

1.2 REFERENCES

A. Industry Standards: The Industry Standards listed below refer to the latest date of issue or edition, unless otherwise indicated.

1. AASHTO T 259 - Standard Test Method for Resistance of Concrete to Chloride Ion Penetration; American Association of State Highway and Transportation Officials; 1980.
2. ASTM C 109/C 109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50 mm) Cube Specimens); 1995.
3. ASTM C 321 - Standard Test Method for Bond Strength of Chemical-Resistant Mortars; 1994.
4. ASTM C 348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 1995.
5. ASTM C 452 - Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate; 1995.
6. ASTM C 596 - Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement; 1996.
7. ASTM C 944 - Standard Test Method for Abrasion Resistance of Concrete or Mortar Surfaces by the Rotating-Cutter Method; 1995.
8. COE CRD-C 48 - Method of Test for Water Permeability of Concrete; Corps of Engineers; current edition.
9. NSF 61 - Drinking Water System Components - Health Effects; NSF International; 1997.

1.3 SYSTEM DESCRIPTION

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

1.4 PERFORMANCE REQUIREMENTS

A. Testing Requirements: Perform the following tests according to the standards listed. Follow the conditions as listed.

1. Testing shall be performed by an independent laboratory meeting the requirements of ASTM E 329-90, and certified by the United States National Bureau of Standards. Testing Laboratory shall obtain concrete samples and waterproofing product samples.
2. Perform independent testing according to CRD C48-73 Permeability of Concrete under the following conditions:
   a. Concrete samples shall be 6 inches (150 mm) in diameter and no thicker than 2 inches (50 mm).
   b. Coatings shall be a maximum thickness of 0.05 inches (1 mm) per coat with up to 2 coats permitted.
   c. Concrete samples shall have a design strength of 2000 psi or less. No admixtures will be permitted.
   d. A minimum of four samples shall be tested; 2 treated and 2 untreated. Untreated samples shall exhibit leakage at 10 psi or less.
   e. Test samples to a pressure of 175 psi (405 foot head of water). Treated samples, after crystalline growth has occurred, shall exhibit no measurable leakage whatsoever.

1.5 SUBMITTALS

A. Product Data: Submit product data including installation methods, for each type of product required, to demonstrate products comply with Contract Documents.

B. Test Reports: Submit and obtain acceptance of independent laboratory test reports of tests specified herein, prior to application of cementitious crystalline waterproofing material.

C. Manufacturer's Certification: Provide a copy of manufacturer's representative's report certifying that surfaces to which waterproofing is to be applied are in an acceptable condition to receive same, that materials to be installed comply with specified requirements, and that applicator has the experience to install the materials in accord with manufacturer's product data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide products of a manufacturer with satisfactory experience in manufacturing the principal materials for the required work. Manufacturers, which cannot supply the performance test data specified here-in will not be considered for use on this project.

B. Applicator Qualifications: Waterproofing applicator shall have documented satisfactory experience and training provided by the product manufacturer. Waterproofing applicator shall be acceptable to the manufacturer and such acceptance shall be indicated in writing.

C. Pre-Installation Conference: Schedule a meeting, before start of construction of surfaces to receive waterproofing, with waterproofing applicator, applicators of work adjacent to or which penetrates waterproofing and Architect to review procedures for substrate preparation and waterproofing application.

1. Review Contract Document requirements for waterproofing and waterproofing manufacturer's product data including application instructions.
2. Document discussion in writing, including issues requiring action, and distribute report to entities concerned with waterproofing work.

D. **Waterproofing manufacturer's representative** shall advise and/or supervise the waterproofing application.

1.7 DELIVERY, STORAGE AND HANDLING

A. **Store waterproofing materials** off the ground and covered; protect products from moisture in accordance with manufacturer's instructions.

B. **Deliver materials** in manufacturer's unopened containers, fully identified with brand, type, grade, class and all other qualifying information. Provide Material Safety Data Sheets for each product.

C. **Take necessary precautions** to keep products clean, dry and free of damage.

1.8 PROJECT CONDITIONS

A. **Coordinate waterproofing work** with work of other trades.

B. **Provide materials** and accessories in timely manner so as not to delay work.

C. **Maintain surfaces** to be waterproofed and surrounding air temperature at not less than 40 degrees F (5 degrees C) for at least 48 hours before, during and after application of waterproofing.

D. **Do not apply materials** to frozen or frost-filled surfaces.

E. **Exercise caution** when temperatures exceed 90 degrees F (32 degrees C). It may be necessary to apply waterproofing during times when the sun is not at its strongest (i.e. early morning, evening or night).

1.9 WARRANTY

A. **Applicator,** individually and separate from performance bonds, shall warrant his work from the Date of Substantial Completion, covering the surfaces treated, and binding him to repair, at his expense, any and all leaks through the surfaces treated which are not due to structural weaknesses or other causes beyond his control, such as fire, earthquake, tornado, and hurricanes, for a period of five (5) years after Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **Approved Manufacturers/Products:**
1. VANDEX SALES AND SERVICES, INC.:
   a. Vandex Super
2. XYPEX CHEMICAL CORPORATION
   a. “Xypex Concentrate Slurry Coat”.

2.2 MATERIALS

A. **Crystalline Waterproofing:** Blend of rapid-hardening portland cement, specially treated quartz sand and a compound of active chemicals, with the following characteristics:
1. Color: Cement gray.

2. Aggregate: Powder.
3. Water: Clean, clear, non-alkaline and free of salts and other harmful elements; comply with NSF (NSF Standard 61).
4. Potable Water Certification: NSF (NSF Standard 61).
5. Permeability in accordance with CRD-C 48: 0.00 cm/sec permeability at 210 psi (1.5 MPa) or 484 feet (148 m) over 20 days testing period on negative side.
6. Compressive Strength when measured in accordance with ASTM C 109/C 109M: 10,200 psi (70.3 MPa) at 28 days.
7. Flexural Strength when measured in accordance with ASTM C 348: 730 psi (5.0 MPa) at 28 days.
8. Bond Strength when measured in accordance with ASTM C 321: 690 psi (4.7 MPa) at 14 days.
9. Abrasion resistance when measured in accordance with ASTM C 944: 1.28 g (10 kg/sq ft on 4000 psi concrete at 28 days).
10. Sulfate Resistance when measured in accordance with ASTM C 452: 0.0012 percent (28 days).
11. Chloride Ion Penetration when measured in accordance with AASHTO T-259: 99.99 percent resistant at 1/4 inch (6 mm), 100 percent at 1 inch (25 mm) depth.
12. Bond of Reinforcement when measured in accordance with ASTM C 321: No loss of bond due to waterproofing material.

2.3 MIXES

A. General: Mix waterproofing material by volume with clean water, which is free from salt and deleterious materials. Mix materials in quantities, which can be applied within 20 to 30 minutes from the time of mixing. As mixture thickens, stir frequently, but do not add additional water.

1. 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 powder with a paddle on a slow speed electric drill (250 RPM) or other type mixer, which will ensure mixing and is acceptable to manufacturer.

1. Mixing proportions shall be as recommended by manufacturer, but not less than the following:

Coverage	Proportions (by Vol.)
1.5 lbs. per sq. yd.	5 powder to 2 water
2.0 lbs. per sq. yd.	3 powder to 1 water

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to start of waterproofing installation arrange a visit to project site by waterproofing material manufacturer's representative. Representative shall inspect and certify that surfaces to which waterproofing is to be applied are in acceptable condition.

B. Verify that surfaces are sound and clean.

C. Verify that form release agents, methods, and materials used to cure concrete surfaces are compatible with waterproofing materials.

3.2 PREPARATION

A. General: Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints, and cracks. Repair these defects in accord with manufacturer's product data and as follows:

1. Form tie holes, faulty construction joints and cracks: Chip defective areas in a "U" shaped slot 3/4 inch to 1 inch wide and a minimum of 1 inch deep. Clean slot of debris and dust. Soak with water and remove surface water. Apply a slurry coat of waterproofing materials at the rate of 1.5 lb. per sq. yd. to the slot. Allow slurry to reach an initial set, then fill cavity with dry pack mortar. Compress 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 surface water and apply one slurry coat of waterproofing material. After slurry has set, but while it is still "green", fill cavity to surface with non-shrink grout.

B. Construction Joints: Apply waterproofing materials in slurry form at rate of 2.0 lb. per sq. yd. to joint surfaces between pours. Moisten surfaces prior to slurry application.

1. Where joint surfaces are not accessible prior to pouring new concrete, consult manufacturer for application.

C. Coves and Sealing Strips: Prepare concrete surfaces which will come into contact with coves and sealing strips by applying one coat of waterproofing material in slurry form at rate of 1.5 lb. per sq. yd. Apply dry-pack or mortar while slurry coat is still "green" but after it has reached an initial set. Install flexible sealant in expansion joints as specified in Sealant section.

1. Coves: Trowel and pack waterproofing mortar into cove shape where indicated on Drawings. This application relates to block/slab interfaces or planter construction joints only.
2. Sealing Strips: Where indicated on the Drawings, preformed grooves 3/4 inch wide by a minimum of 1 inch deep, located at construction joints, shall be filled with waterproofing dry-pack and compacted using a pneumatic packer or hammer and block. Forming of sealing strip grooves shall be responsibility of General Contractor.

D. Concrete Finish: Concrete surfaces shall have an open capillary system to provide tooth and suction and shall be clean; free from scale, excess form oil, laitance, curing compounds and foreign matter. Smooth surfaces caused by steel forms and surfaces covered with excess form oil or other contaminants shall be washed, lightly sandblasted, water-blasted, or acid-etched with muriatic acid as necessary to provide a clean absorbent surface. Saturate surfaces to be acid-etched with water prior to application of acid.

1. Vertical surfaces may have a sacked finish.
2. On horizontal surfaces where a trowel finish is required, apply waterproofing by dry shake method in accordance with manufacturers product data.
3. On horizontal surfaces, which do not require a trowel finish a broom finish shall be provided. Do not apply waterproofing material to this surface if concrete is less than 20 hours old.
4. Apply waterproofing material to "green" concrete as soon as possible after forms have been stripped, or to existing concrete which has been saturated with water. Moisten surfaces to be treated prior to application, as required to insure migration of crystalline chemicals into capillary voids in concrete. Remove free water prior to treatment with waterproofing material.

3.3 APPLICATION

A. Surface Application: After repair, patching and sealing strip placement has been completed in accord with manufacturer's product data and as specified herein, treat concrete surfaces with waterproofing material slurry applied at rates and locations indicated on Drawings and in accord with manufacturer's product data.

B. Brushing: Use a semi-stiff bristle brush or broom to work slurry into concrete surface, filling hairline cracks and surface pores.

C. Second Coat: When indicated on Drawings or required by manufacturer's product data, a second coat of waterproofing material may be necessary. Apply while first coat is still "green", but after it has reached an initial set. Lightly pre-water when rapid drying conditions occur.

D. Do not conceal installed waterproofing before it has been observed by Architect, waterproofing manufacturer's representative and other designated entities.

3.4 CURING

A. General: Begin curing as soon as waterproofing materials have set up sufficiently so as not to be damaged by a fine spray. Fog-spray treated surfaces three times a day for a two-day period, or cover treated surfaces with damp burlap for the prescribed period.

1. In warm climates, more than 3 sprayings per day may be necessary to prevent excessive drying of coating.
2. Do not lay plastic sheeting directly on waterproofing coating as air contact is required for proper curing.
3. If there is poor air circulation in treated areas, provide fans or blown air to aid in curing of waterproofing.
4. Horizontal surfaces: Begin curing as soon as final set has occurred but before surface starts to dry. Conventional moist procedures such as water spray, and wet burlap may be used. Cure for a minimum of 48 hours.
5. In hot dry sunny conditions, consult manufacturer's product data.

B. If moist curing is not possible, a chemical curing agent manufactured for or compatible with each approved waterproofing material shall be available for the work. Chemical agent shall have at least 2 years of successful field use to be eligible for acceptance.

C. Protect cured surfaces from damage to wind, sun, rain and temperatures below 36 degrees F. for a period of not less than 48 hours after application. If plastic sheeting is used as protection, it shall be raised off waterproofing coating to allow air circulation.

END OF SECTION