XYPEX
CHEMICAL CORPORATION

specification & application manual

XYPEX APPLICATIONS

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XYPEX

CHEMICAL CORPORATION

Concrete Waterproofing

By Crystallization™

specification and application manual

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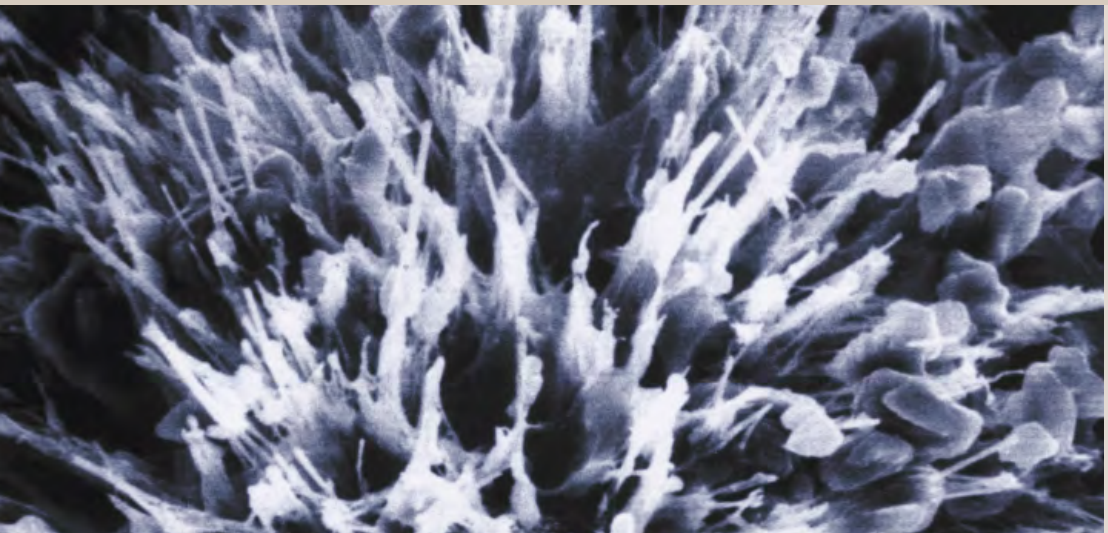
introduction



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XYPEX CHEMICAL CORPORATION

Vancouver, on Canada's west coast is home to the head office and primary manufacturing facility of Xypex Chemical Corporation. In this temperate, raincoast climate, the Xypex crystalline technology for waterproofing, protecting and enhancing concrete was conceived and developed in 1969. Since then, our technology has been tested and proven worldwide in all climates and in widely varying construction situations. Today, through an international network of distributors and licensees in over 60 countries, Xypex is specified and applied on thousands of major concrete structures around the world. The Xypex crystalline waterproofing system is uniquely effective and long-lasting because it becomes an integral part of the concrete itself. Similarly, Xypex Chemical Corporation has grown a successful reputation in the "world of concrete" by carefully integrating corporate, marketing and research strategies around the needs of our customers: our commitment to quality is on-going; our products and technical support are readily available worldwide; our product line meets the demands of value engineering; and our product R&D keeps pace with the advances in cement behavior research.

XYPEX CRYSTALLINE TECHNOLOGY

WHAT IS XYPEX?

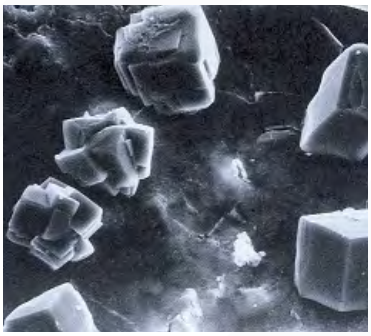
Xypex is a non-toxic, chemical treatment for the waterproofing and protection of concrete. Xypex's primary and most distinguishing performance feature is its unique ability to generate a non-soluble crystalline formation deep within the pores and capillary tracts of the concrete - a crystalline structure that permanently seals the concrete against the penetration of water and other liquids from any direction. Xypex crystalline products are dry powder compounds composed of portland cement, silica sand and many active, proprietary chemicals.

HOW DOES XYPEX WORK?

To create its crystalline waterproofing effect, Xypex must become an integral part of the concrete mass. It does so by taking advantage of the natural and inherent characteristics of concrete; concrete is both porous (capillary tract system) and chemical in nature. By means of diffusion, the reactive chemicals in Xypex use water as a migrating medium to enter and travel through the capillary tracts in the concrete. This process precipitates a chemical reaction between Xypex, moisture and the natural chemical by-products of cement hydration (calcium hydroxide, mineral salts, mineral oxides and unhydrated and partially hydrated cement particles). The result is crystallization and, ultimately, a non-soluble crystalline structure that plugs the pores and capillary tracts of the concrete. In this condition, the pores become discontinuous and the concrete is thereby rendered impenetrable by water and other liquids from any direction. The Xypex crystalline process will reactivate whenever water is present.

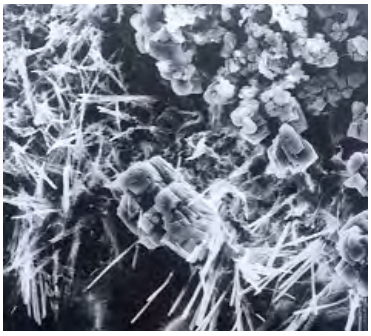
XYPEX CRYSTALLINE TECHNOLOGY

The crystallization process that Xypex causes within the pores and capillary tracts of concrete is illustrated below in electron microscope photos taken by an independent research team.



1. CONCRETE (UNTREATED)

A control sample of concrete was sheared through at 50 mm below the top surface. The sheared face shows some of the by-products of cement hydration with which Xypex reacts. Precipitated calcium hydroxide together with cubic and rhombic particles are visible.



2. XYPEX CRYSTALLIZATION (INITIATION)

Taken at 50 mm within a Xypex-treated concrete sample, this photograph shows the initiation of the Xypex crystalline reaction after Xypex Concentrate was applied to the surface.

3. XYPEX CRYSTALLIZATION (MATURE)

This photo was taken 26 days after the application of Xypex Concentrate at a depth of 50 mm into the concrete sample. A dense, fully developed crystalline structure has formed within the capillary tracts of the concrete to completely block the flow of water.

products

2.0

GENERAL INFORMATION

HOW WATERPROOF IS XYPEX-TREATED CONCRETE?

A major independent testing laboratory performed concrete waterproofing tests on Xypex in accordance with Army Corps Permeability Specification CRD C48-73. The results showed that a two coat application of Xypex on two inch (50 mm) thick 2000 PSI (13.8 MPa) porous concrete totally eliminates leakage at pressures of at least 405 feet (123.4 m) of head pressure (175 PSI/1.2 MPa), the limit of the testing apparatus.

HOW DEEP DOES THE XYPEX CRYSTALLINE FORMATION PENETRATE THE CONCRETE?

The Xypex Chemical reactions that initially take place at the concrete surface or immediately adjacent area, will continue deep into the concrete structure. Independent testing measured the depth of Xypex crystalline penetration into a cast-in-place concrete block at 30 cm (approximately 12 inches). The test concrete sample was coated on the top surface with Xypex Concentrate and left outside the research laboratory in ambient conditions for 12 months.

HOW LONG DOES XYPEX LAST?

A Xypex application, unlike most other systems, is permanent. Its unique, dendritic crystalline growth will not deteriorate under normal conditions.

HOW RESISTANT IS XYPEX TO AGGRESSIVE CHEMICALS?

Based on independent testing according to ASTM C 267-77 “Chemical Resistance of Mortars”, Xypex is not affected by a wide range of aggressive chemicals including mild acids, solvents, chlorides and caustic materials. Because Xypex is pH specific (not chemical specific) it will protect concrete from any chemical whose pH range is 3.0 to 11.0 constant contact, or 2.0 to 12.0 periodic contact.

IS XYPEX AFFECTED BY TEMPERATURE, HUMIDITY, ULTRAVIOLET AND OXYGEN LEVELS?

When applied according to specifications, Xypex performs at 100% efficiency within –25°F to +265°F (–32°C to +130°C) constant temperatures or within –301°F to +2786°F (–185°C to +1530°C) periodic temperatures. Humidity, ultraviolet and the oxygen level (oxidation) have no effect on a Xypex treatment.

GENERAL INFORMATION

DOES XYPEX PROTECT REINFORCING STEEL?

Yes. By preventing the intrusion of chemicals, salt water, sewage and other harmful materials, Xypex protects concrete and reinforcing steel from deterioration and oxidation.

DOES XYPEX PROTECT CONCRETE AGAINST FREEZE/THAW DAMAGE?

Yes. By blocking the intrusion of water into concrete, Xypex helps protect the concrete from the damaging effect of repeated freeze/thaw cycles.

IS XYPEX TOXIC?

No. Xypex contains no volatile organic carriers (VOC) and can be applied safely in enclosed surroundings. Xypex is approved by numerous country and state health and waterworks departments for use on structures which contain potable water or foodstuffs. A few of these agencies are listed below:

NSF International
Swiss Federal Department of Health
Japan Food Research Laboratories
United Kingdom (DWI) Drinking Water Inspectorate
Singapore Institute of Standards and Industrial Research
Australian Water Quality Centre
Slovak Ministry of Health

IN WHAT FORMS ARE XYPEX PRODUCTS AVAILABLE?

Xypex crystalline technology is available in three forms: as a coating (for new or existing structures); as a dry shake material (for fresh horizontal surfaces); and as an admixture (added at the time of concrete batching). These three options will prove an asset to the value-engineering process and to the flexibility of the construction schedule.

CAN XYPEX BE APPLIED AGAINST EXTREME HYDROSTATIC PRESSURE?

Yes. Because Xypex is not dependent upon adhesion to the concrete surface and instead becomes an integral part of the concrete mass through crystallization, it is capable of resisting extreme hydrostatic pressure from either side (positive or negative) of the concrete.

GENERAL INFORMATION

CAN XYPEX BE APPLIED WHILE THE CONCRETE IS WET?

Yes. In fact, the concrete must be wet or moist before applying the Xypex slurry coat. Xypex requires moisture to generate the crystalline growth in the concrete. The presence of moisture is also necessary to ensure proper bonding of the slurry coat to the surface.

IS XYPEX USED TO WATERPROOF CRACKS, JOINTS AND OTHER DEFECTS IN CONCRETE?

Yes. Xypex has a specific repair system that utilizes its unique crystalline waterproofing technology to stop water flow through cracks, faulty joints and other defects. In the case of expansion joints or chronic moving cracks, a flexible sealant is recommended.

IS XYPEX SUITABLE FOR USE ON SURFACES OTHER THAN CONCRETE?

Xypex is totally compatible with the chemistry of concrete, whether poured-in-place, pre-cast or concrete block. It is not suitable for application to cut-limestone, clay brick, wood, metals, asphalt or other non-concrete building materials.

WHAT IS THE APPEARANCE OF A XYPEX COATING?

A Xypex coating normally produces a grey-colored, cementitious surface. However, Xypex “White” is also available.

CAN PAINT AND OTHER FINISHING MATERIALS BE APPLIED OVER A XYPEX COATING?

Yes. Paint, epoxy coatings, cement parge coats, plaster and stucco can be applied or installed over a Xypex coating. For detailed instructions, please refer to pp. 31 and 73 of this manual.

WHAT ARE SOME TYPICAL XYPEX APPLICATIONS?

Typical Xypex applications include reservoirs, sewage and water treatment tanks, secondary containment structures, tunnels, underground vaults, foundations, parking structures, swimming pools, and below grade construction.

ADVANTAGES

HOW IS XYPEX DIFFERENT FROM OTHER PRODUCTS?

The Xypex crystalline system for concrete waterproofing is substantially different from traditional barrier products (membranes, cementitious coatings):

1. Xypex creates a crystalline structure deep within the pores and capillary tracts of the concrete mass to prevent the penetration of water and aggressive chemicals. In contrast, barrier-type products function only at the surface of the concrete.
2. Because Xypex is not dependent on surface adhesion to achieve its waterproofing effect, it is resistant to extreme hydrostatic pressure.
3. Xypex will seal hairline cracks up to 0.4 mm.
4. Xypex is not subject to the deterioration problems encountered by membranes.
5. Xypex is permanent and reactivates whenever water is present.

WHAT ARE THE APPLICATION ADVANTAGES OF USING XYPEX INSTEAD OF MEMBRANES?

The crystalline nature of the Xypex waterproofing system provides many application advantages over traditional barrier products:

1. Xypex does not require a dry surface; in fact, a wet surface is necessary.
2. Xypex does not require dry weather to be applied.
3. Xypex does not require costly surface priming or leveling prior to application.
4. Xypex cannot puncture, tear or come apart at the seams.
5. Xypex does not require protection during backfilling or during placement of steel, wire mesh or other materials.
6. Xypex can be applied on either side of a concrete surface - the negative or the positive (water pressure) side.
7. Xypex does not require sealing, lapping and finishing of seams at corners, edges or between membranes.
8. Xypex is less costly to apply than most other methods.

XYPEX PRODUCT DESCRIPTIONS

XYPEX CONCENTRATE

Xypex Concentrate is the most chemically active of the Xypex waterproofing products. When mixed with water, this light grey powder is applied as a slurry coat to above-grade or below-grade concrete either as a single coat or as the first of a two-coat application. It is also mixed in Dry-Pac form for sealing strips at construction joints, or for the repairing of cracks, faulty construction joints and honeycombs.

XYPEX MODIFIED

Xypex Modified can be applied as a second coat to reinforce Xypex Concentrate or by itself to damp-proof the exterior of foundation walls. Applied as a second coat over Concentrate, Modified produces a harder finish and speeds the curing of the Concentrate. Where damp-proofing is required, a single coat of Modified may be used as an alternative to a spray/tar emulsion.

XYPEX CONCENTRATE DS-1 AND DS-2

DS-1 and DS-2 are special dry shake formulations of Xypex Concentrate designed specifically for horizontal concrete surfaces such as parking decks and floor slabs. Applied by hand or by mechanical spreader, DS-1 and DS-2 are trowelled into fresh concrete prior to finishing. DS-2 is used for concrete structures where increased abrasion resistance is required.

XYPEX PRODUCT DESCRIPTIONS

XYPEX ADMIX C-1000 AND C-2000

With the Admix C-Series, Xypex's unique crystalline dry powder compound for the waterproofing, protection and improvement of concrete is added to the concrete mix at time of batching. Admix C-1000 and C-2000 have each been formulated to meet specific project and temperature conditions. Both Xypex Admixes are available in a "no fines" grade.

XYPEX PATCH'N PLUG

Xypex Patch'n Plug is formulated as a crystalline, fast-setting, non-shrink, high-bond-strength, hydraulic cement compound for concrete repairs. It stops flowing water in seconds and is used to seal cracks, fill tie-holes and other defects in concrete.

XYPEX FCM

Xypex FCM is specially designed for repairing cracks subject to movement, sealing construction joints, restoring deteriorated concrete and waterproofing concrete structures. FCM has exceptional adhesive and elongation characteristics and is often used in conjunction with the Xypex Crystalline Concrete Waterproofing and Protection System. FCM is a two component product consisting of a specialized liquid polymer dispersion and a cementitious powder component. These ingredients are mixed just prior to application.

XYPEX PRODUCT DESCRIPTIONS

XYPEX RESTORA-TOP

Xypex Restora-Top products are designed specifically for the repair and rehabilitation of horizontal concrete surfaces such as warehouse floors, bridge decks, roads, curbs, and walkways where the repaired area must be returned to normal service within two hours of the completed repair. Restora-Top products consist of specially modified portland cement, aggregates, admixtures and bonding agents combined in controlled proportions to provide excellent adhesion properties, rapid setting and strength gain, as well as superior durability and reduced shrinkage.

XYPEX GAMMA CURE

Xypex Gamma Cure is a curing agent designed specifically for Xypex crystalline waterproofing products. The use of Gamma Cure may eliminate the need for water curing the Xypex coating in some cases. Consult manufacturer for specific recommendation.

XYCRYLIC-ADMIX

Xycrylic-Admix is a water-based polymer dispersion specifically designed for fortifying portland cement compositions. The liquid is milky-white in colour and has a high solids content. Xycrylic-Admix can be used with Xypex Patch'n Plug to increase bond strength.

WHAT IS THE SHELF LIFE OF XYPEX?

The shelf life of Xypex products is one year when stored under proper conditions. Xypex products must be stored dry at a minimum temperature of 45°F (7°C) and must not be allowed to freeze. Each Xypex package is stamped with a batch reference number. Batch numbers and destinations are maintained. If you wish to know the source or age of a specific package, please call 604 273•5265.

coatings

3.0

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. American Society for Testing and Materials (ASTM)
   2. Army Corps of Engineers (CRD)
   3. 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 ASTM E 329-95 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product samples.

CEMENTITIOUS CRYSTALLINE WATERPROOFING

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 2 inches (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 2000 psi (13.8 MPa) and thickness of 2 inches (50 mm). No admixtures permitted.
2. Coatings to have maximum thickness of 0.05 inches (1 mm) per coat with up to two coats permitted.
3. Samples to be pressure tested to 175 psi (405 foot head of water) or 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 4000 psi (27.6 MPa). No admixtures permitted.
2. Coatings to have maximum thickness of 0.05 inches (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 NSF Standard 61 and approval for use of waterproofing material on structures holding potable water shall be evidenced by NSF certification.

CEMENTITIOUS CRYSTALLINE WATERPROOFING

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 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. 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 installations, 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.

CEMENTITIOUS CRYSTALLINE WATERPROOFING

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 seals 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 authorized 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, 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.

CEMENTITIOUS CRYSTALLINE WATERPROOFING

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

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-1000/C-2000 (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 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

CEMENTITIOUS CRYSTALLINE WATERPROOFING

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)
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 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 oil, 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.

CEMENTITIOUS CRYSTALLINE WATERPROOFING

3.02 PREPARATION (CONTINUED)

B. *Surface Preparation:* Smooth surfaces (e.g. where steel forms are used) or surfaces covered with excess form oil or other contaminants shall be washed, lightly sand-blasted, water-blasted, 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 instructions as follows:

1. *Form Tie Holes, Construction Joints, Cracks:* Chip out defective areas in a "U" shaped slot one inch (25 mm) wide and a minimum of one inch (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 1.5 lb./sq. yd. (0.8 kg/m^2) 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 slurry form at a rate of 2.0 lb./sq. yd. (1.08 kg/m^2) 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.

CEMENTITIOUS CRYSTALLINE WATERPROOFING

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 1.5 lb./sq. yd. (0.8 kg/m^2). 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, one inch (25 mm) wide and minimum of 1.5 inch (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 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 slurry coat while 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.

CEMENTITIOUS CRYSTALLINE WATERPROOFING

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 36°F (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 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.

CEMENTITIOUS CRYSTALLINE WATERPROOFING

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:* 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.

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 two inches (50 mm) or to within 0.5 inch (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

CSI FORMAT

WHAT IS CSI FORMAT?

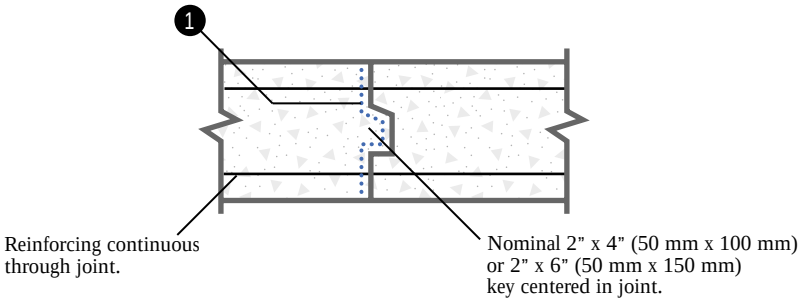
This section of the Xypex Specification and Application Manual utilizes the Section Format™ of the Construction Specifications Institute (CSI) Manual of Practice®. Section Format provides a uniform approach to organizing specification text by establishing a structure consisting of three primary Parts: General, Products, and Execution. Text within each of the three Parts is divided into articles and subordinate paragraphs and subparagraphs. The article titles serve as a checklist for consideration by the specifier. These titles are optional and selections should be based on appropriateness for the specific situation being addressed. CSI is a U.S.A. based professional society for the specifications community. Xypex Chemical Corporation is aware that other organizations with different but equally valid specification formats are available and utilized by specifiers in different parts of the world.

Contact Xypex representatives for alternative formats that incorporate local requirements and standards.

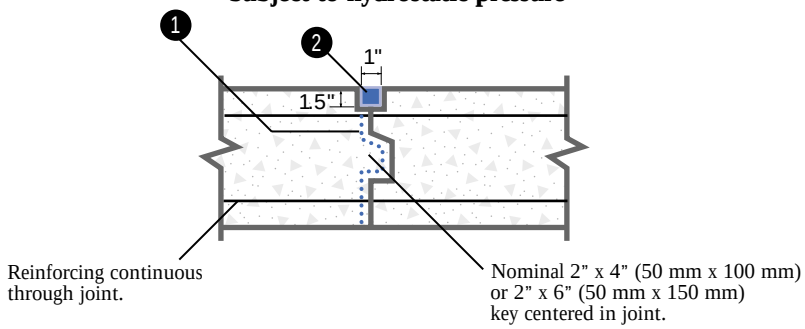
xypex project specifications & schematic drawings

STANDARD CONSTRUCTION JOINT DETAILS

Not subject to hydrostatic pressure



Subject to hydrostatic pressure



WALLS AND SLABS

1. Joint Waterproofing: Clean joint thoroughly. Between pours, apply Xypex Concentrate slurry to joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. Sealing Strip: Clean pre-formed groove thoroughly. Apply Xypex Concentrate slurry to groove at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2). Fill groove with Xypex Concentrate Dry-Pac and pack tightly. Pre-formed groove may be offset to either side of joint.

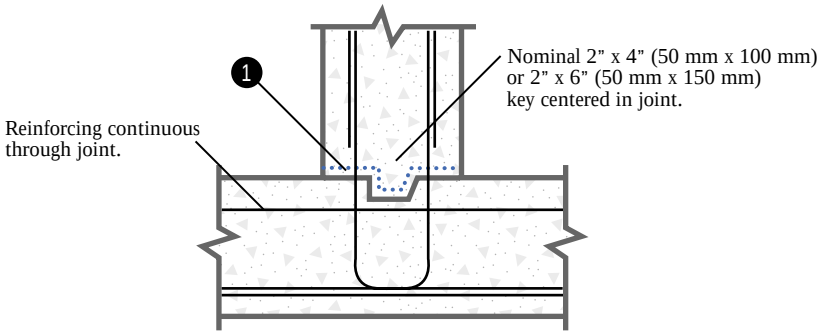
Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

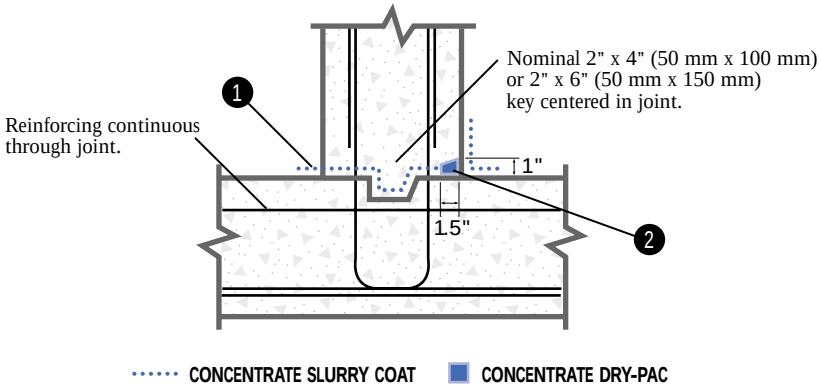
Refer to Standard Specifications for further information.

STANDARD CONSTRUCTION JOINT DETAILS

Not subject to hydrostatic pressure



Subject to hydrostatic pressure



WALLS / SLAB INTERFACE

1. Joint Waterproofing: Clean joint thoroughly. Between pours, apply Xypex Concentrate slurry to joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).

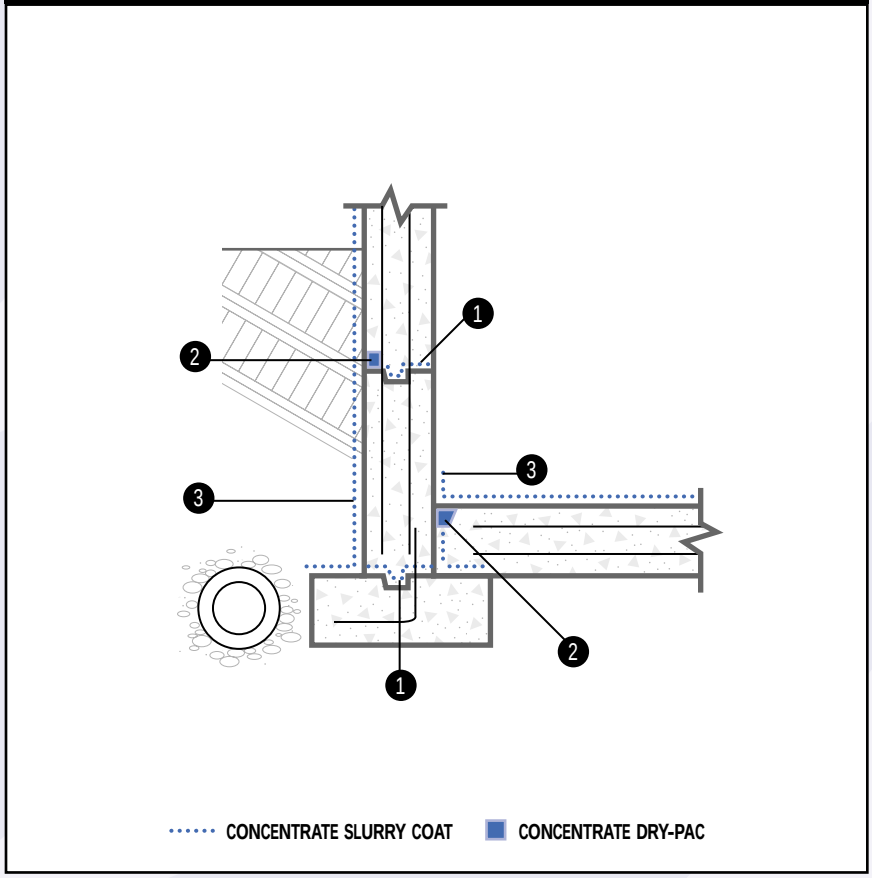
2. Sealing Strip: Clean pre-formed groove thoroughly. Apply Xypex Concentrate slurry to groove at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2). Fill groove with Xypex Concentrate Dry-Pac and pack tightly. Pre-formed groove may be offset to either side of joint.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

CONCRETE WALL AND SLAB - BELOW GRADE



1. Between pours, apply Xypex Concentrate slurry to joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2) then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. Apply one coat of Xypex Concentrate to wall and slab surfaces as indicated at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).

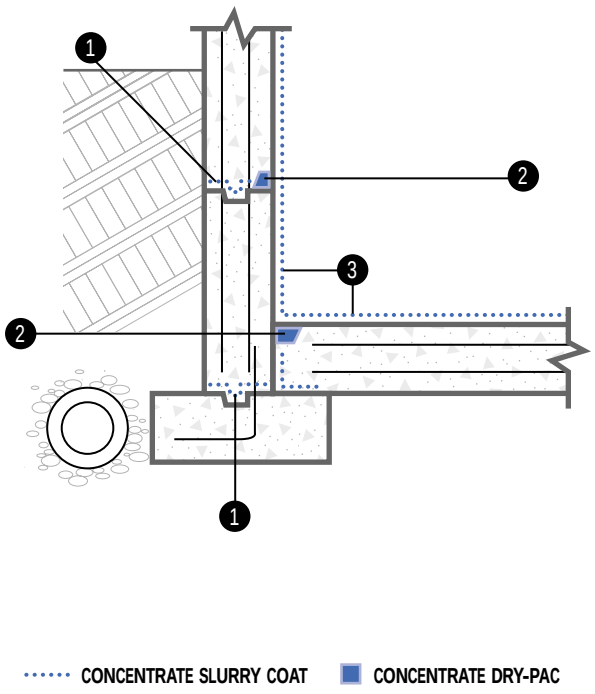
   Note: Where poor drainage conditions exist or high hydrostatic pressures are anticipated, also apply a coat of Xypex Modified to wall and slab surfaces at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

   Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

   The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

   Refer to Standard Specifications for further information.

FOUNDATION WALL - INSIDE APPLICATION



1. Between pours, apply Xypex Concentrate slurry to joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. Apply one slurry coat of Xypex Concentrate to wall and slab surfaces as indicated at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).

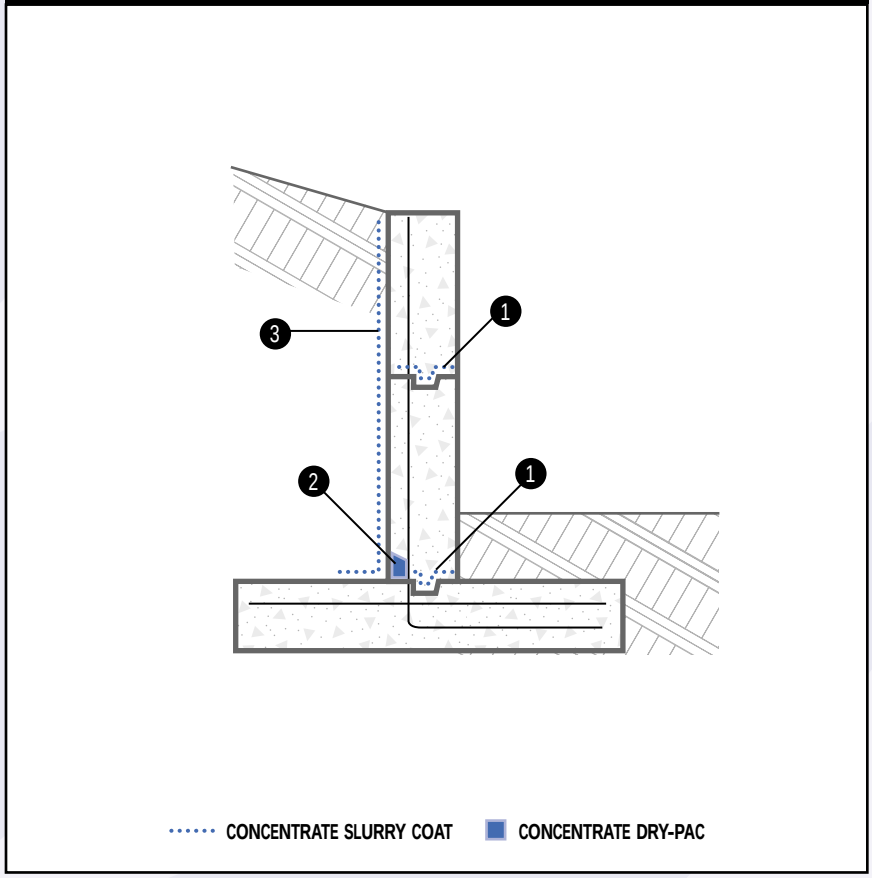
Note: Where poor drainage conditions exist or high hydrostatic pressures are anticipated, also apply a coat of Xypex Modified to wall and slab surfaces at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

RETAINING WALL



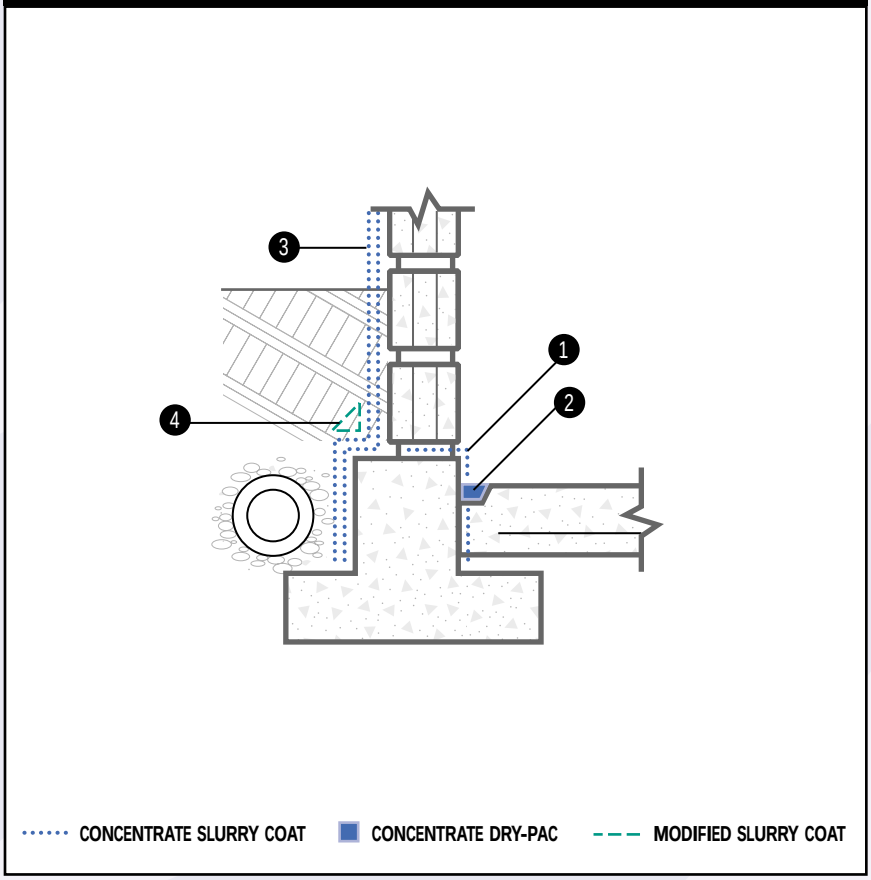
1. Between pours, apply Xypex Concentrate slurry to joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2) then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. Apply one coat of Xypex Concentrate to wall face and over sealing strip at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

CONCRETE BLOCK WALL - BELOW GRADE



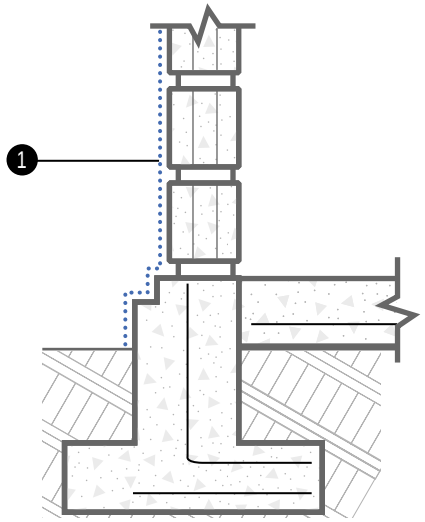
1. Prior to placement of the concrete wall and slab, apply one slurry coat of Xypex Concentrate to joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To exterior wall surface and footing, apply two slurry coats of Xypex Concentrate at a rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2) per coat. The second coat should be applied after the first coat has set but is still “green”.
4. Apply a cove strip of Xypex Modified mortar to exterior of joint between footing and block wall.

Note: Because of the variances in the quality of concrete block (e.g. cement content, porosity, etc.), please consult your Xypex technical representative.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

Refer to Standard Specifications for further information.

CONCRETE BLOCK WALL - ABOVE GRADE



CONCENTRATE SLURRY COAT

1. Apply one slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2). Coating should extend to ground level. Where poor quality block is encountered, a second coat of Xypex Concentrate should be applied at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

Note 1: Wall sections should be defined before application and each of these sections should be completed during the same day to obtain maximum uniformity in appearance.

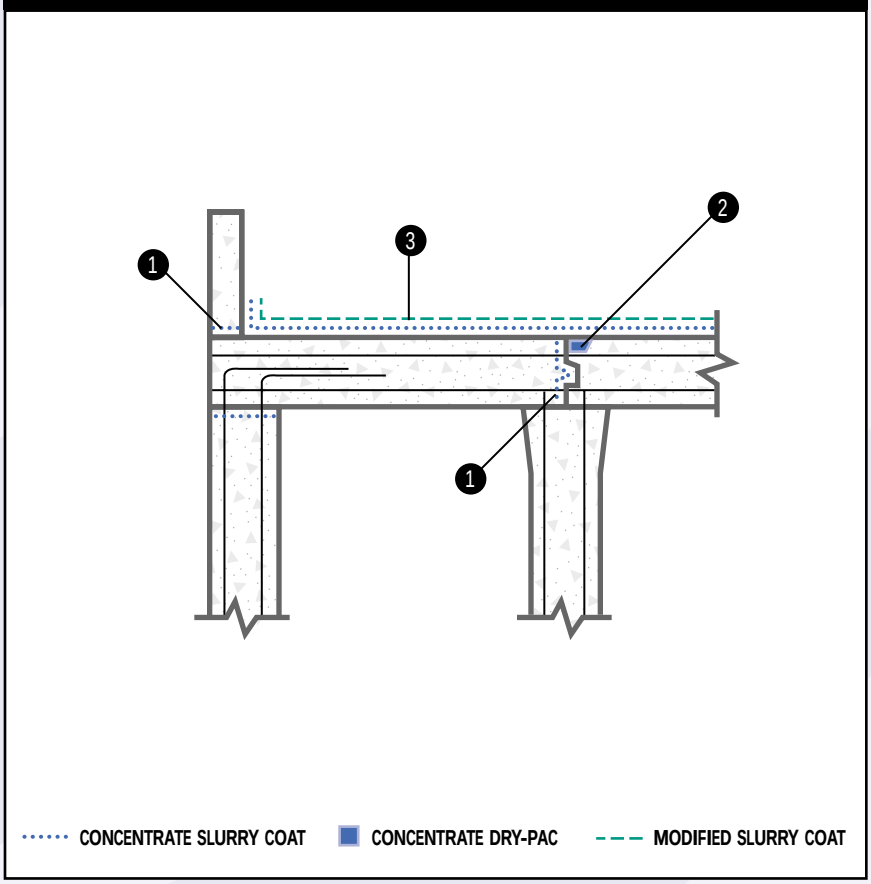
Note 2: Because of the variances in the quality of concrete block (e.g. cement content, porosity, etc.), please consult your Xypex technical representative.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

PARKING DECK



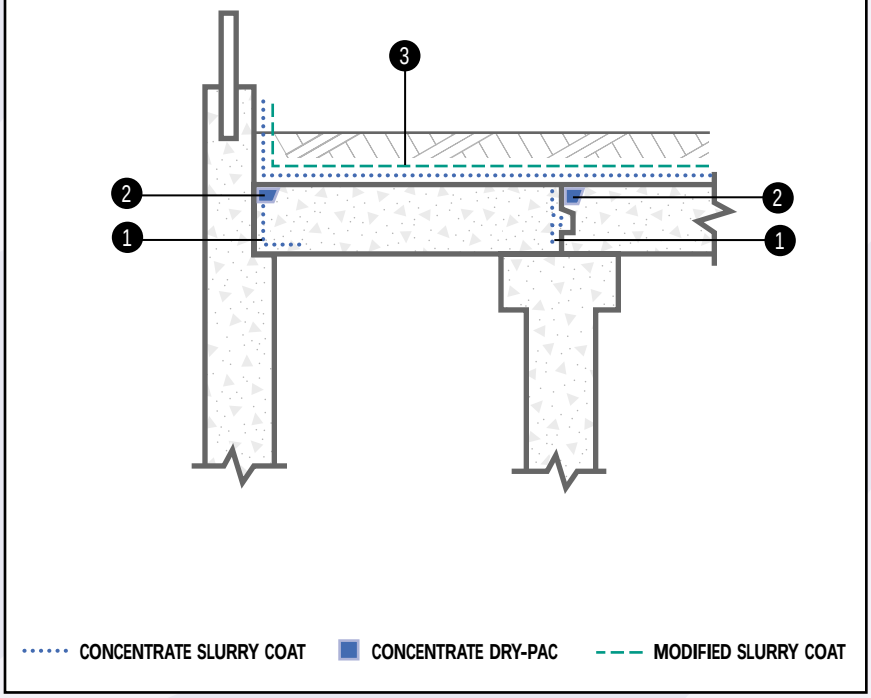
1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To slab, apply one coat of Xypex Concentrate at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set but while it is still "green", apply a coat of Xypex Modified at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

ROOF / PLAZA DECK



1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To slab and adjacent curb wall apply one coat of Xypex Concentrate at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set, but while it is still “green”, apply a coat of Xypex Modified at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

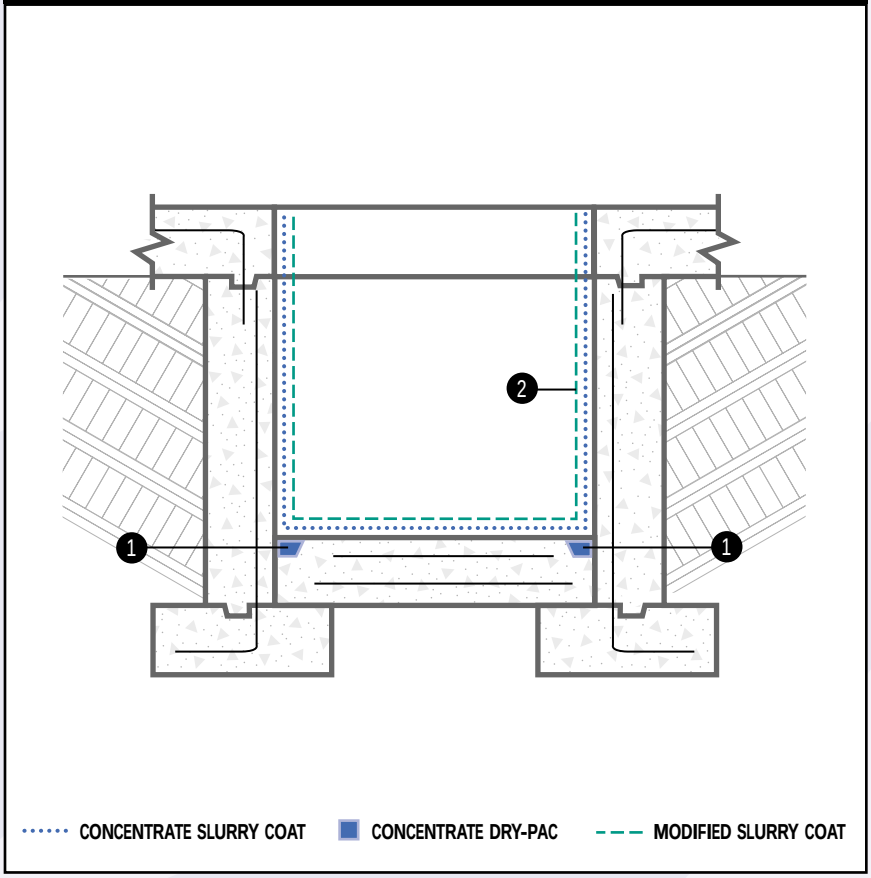
Note: Use appropriate material for protection against sudden thermal changes.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

ELEVATOR PIT / SUMP PIT



1. In sealing strip, apply one coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
2. Apply one slurry coat of Xypex Concentrate to walls and floor slab at a rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set but while it is still “green”, apply a coat of Xypex Modified at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

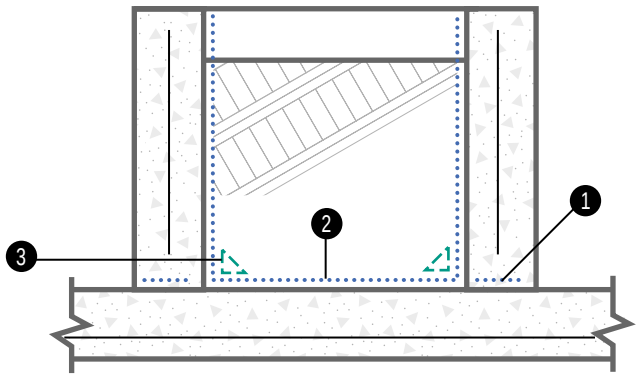
Note: For hydraulic elevators, please contact your Xypex representative for detail drawings.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

PLANTER



CONCENTRATE SLURRY COAT MODIFIED SLURRY COAT

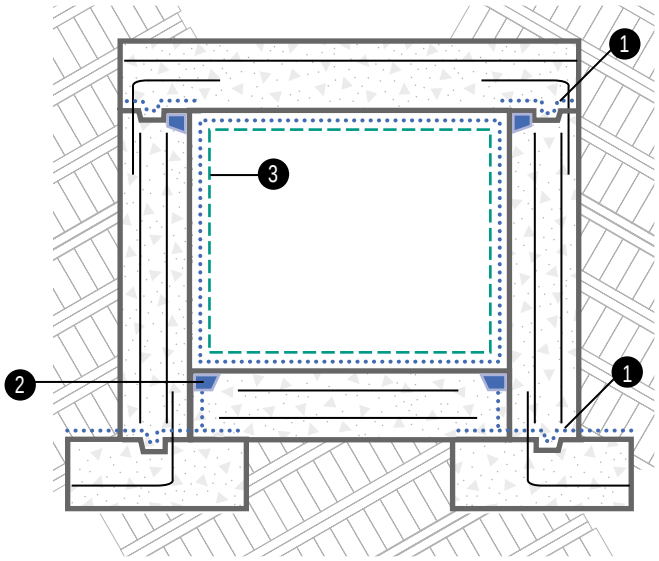
1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. Apply one slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2) to all interior wall and floor surfaces.
3. After slurry coat has set but while it is still “green”, apply a cove strip of Xypex Modified mortar over interior slab/wall construction joint.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

TUNNEL



CONCENTRATE SLURRY COAT CONCENTRATE DRY-PAC MODIFIED SLURRY COAT

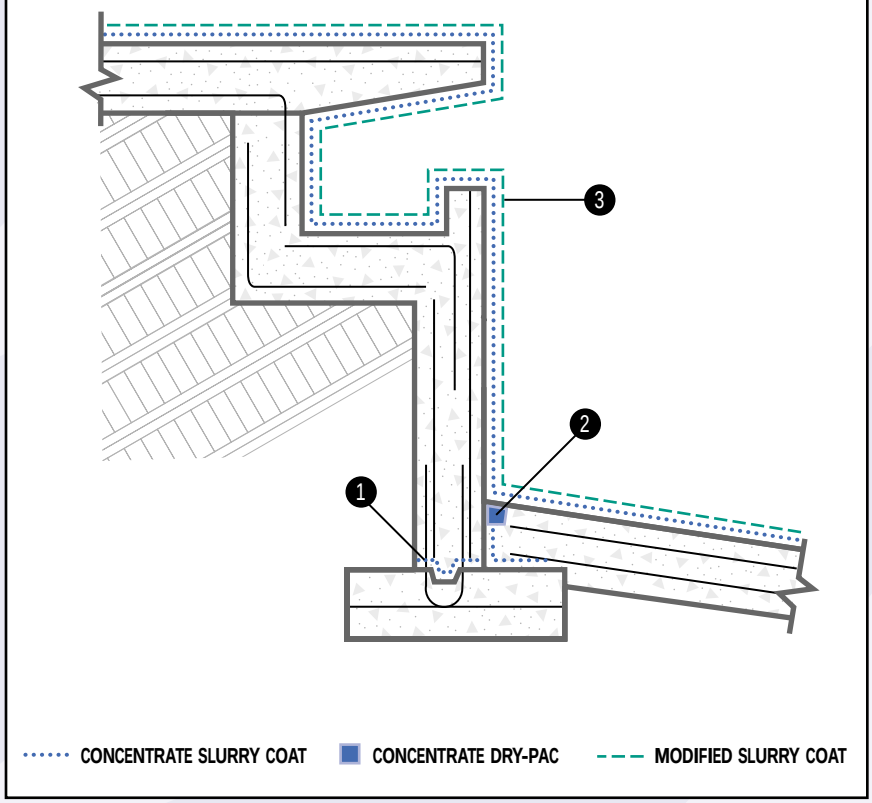
1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To all ceiling, wall, and floor surfaces, apply one slurry coat of Xypex Concentrate at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set but while it is still “green”, apply a coat of Xypex Modified at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

SWIMMING POOL



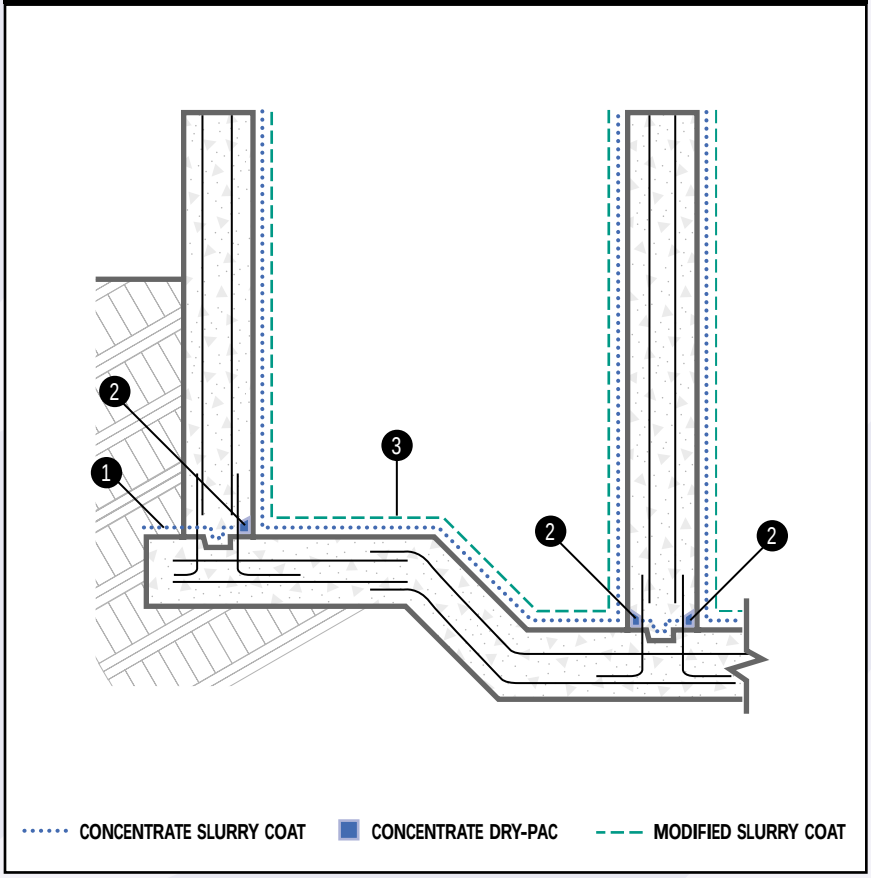
1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To pool deck and all interior wall and floor surfaces, apply one slurry coat of Xypex Concentrate at a rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set but while it is still “green”, apply a coat of Xypex Modified at a rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). In new construction, Xypex Concentrate DS-1 is recommended for pool deck and floor surfaces. Please refer to product data sheets.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

SEWAGE PLANT CLARIFIER TANK



1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To all ceiling, wall, and floor surfaces, apply one slurry coat of Xypex Concentrate at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set, but while it is still “green”, apply a coat of Xypex Modified at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

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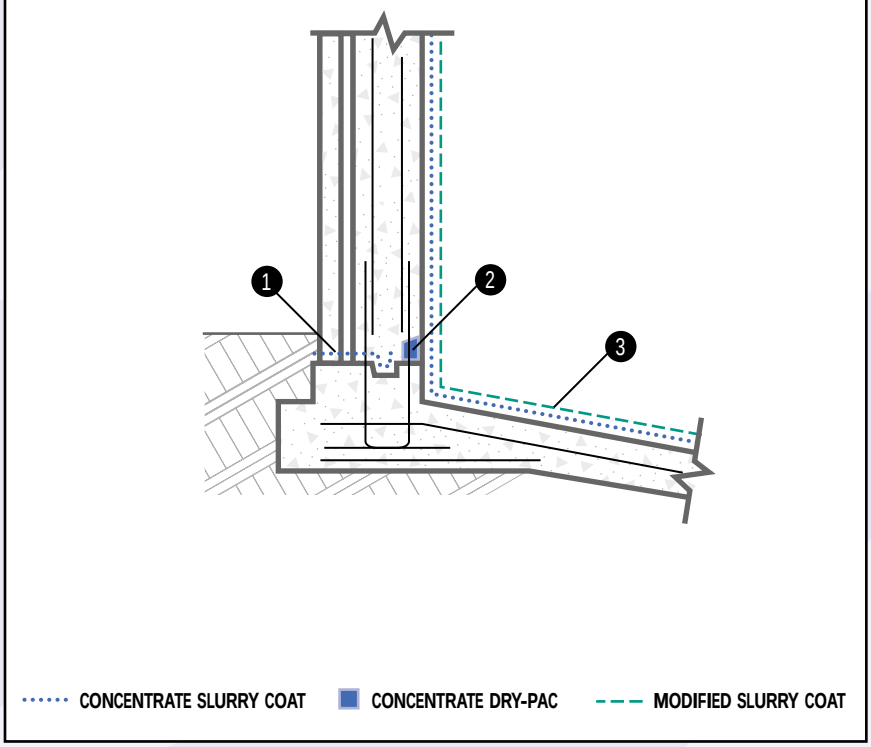
SEWAGE PLANT DIGESTER TANK



1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To all wall and slab surfaces, apply one slurry coat of Xypex Concentrate at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set, but while it is still “green”, apply a coat of Xypex Modified at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

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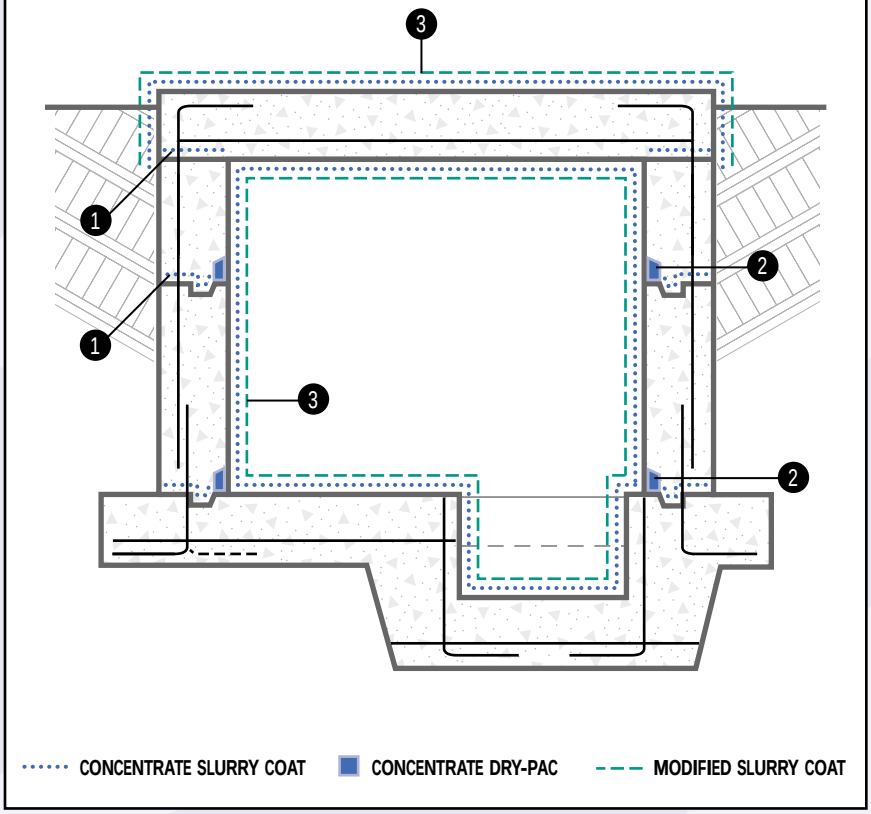
RESERVOIR / WET WELL



1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To interior walls, slab and exterior of roof area, apply one slurry coat of Xypex Concentrate at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set, but while it is still “green”, apply a coat of Xypex Modified at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

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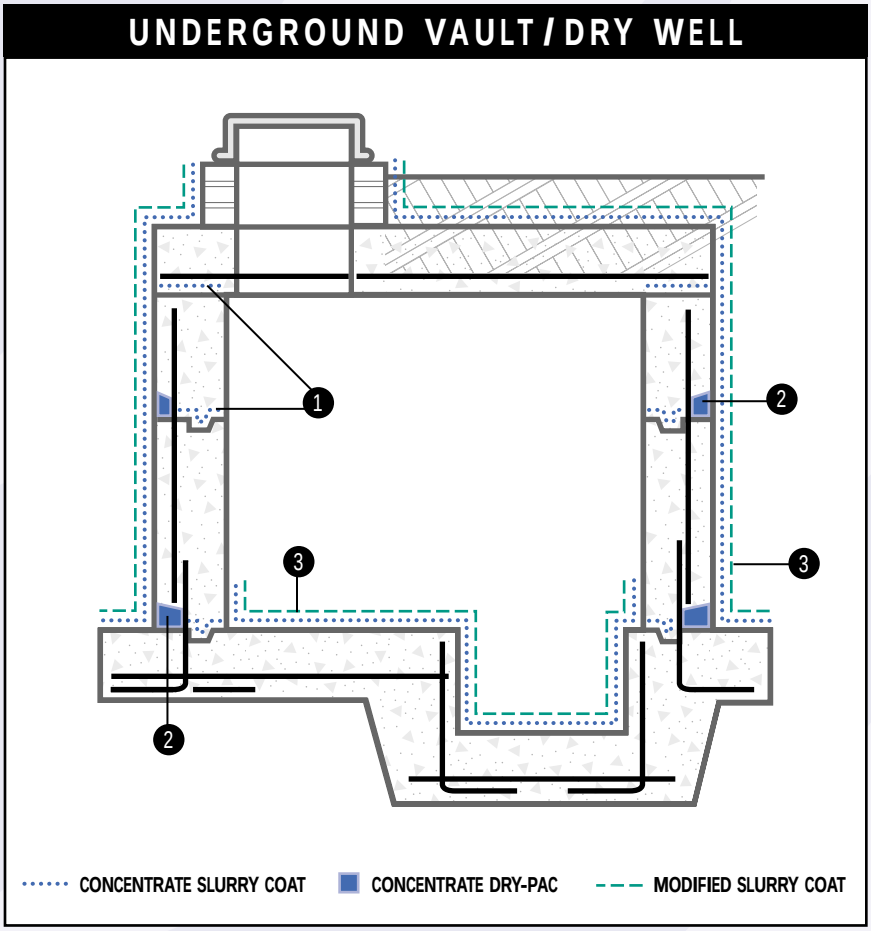
Refer to Standard Specifications for further information.

UNDERGROUND VAULT / DRY WELL



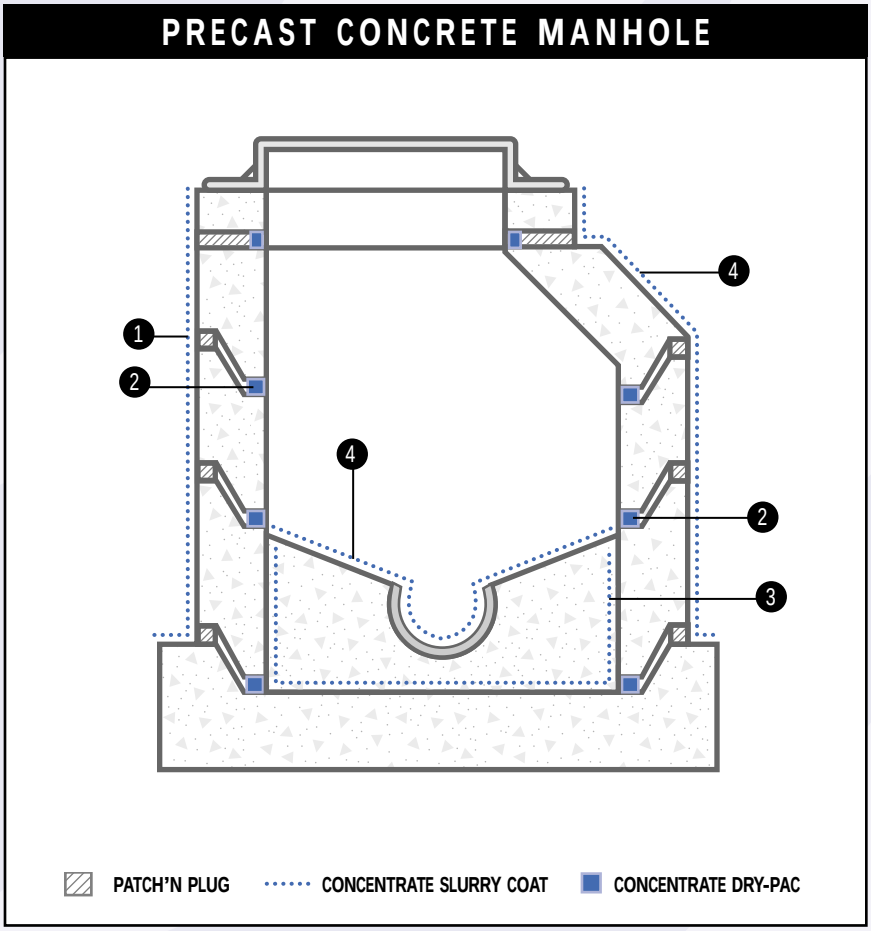
1. Between pours, apply Xypex Concentrate slurry to all joint surfaces at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2).
2. In sealing strip, apply one coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill slot to surface with Xypex Concentrate in Dry-Pac form.
3. To interior floor areas and exterior walls and roof, apply one slurry coat of Xypex Concentrate at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2). After the Concentrate has set, but while it is still “green”, apply a coat of Xypex Modified at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

PRECAST CONCRETE MANHOLE



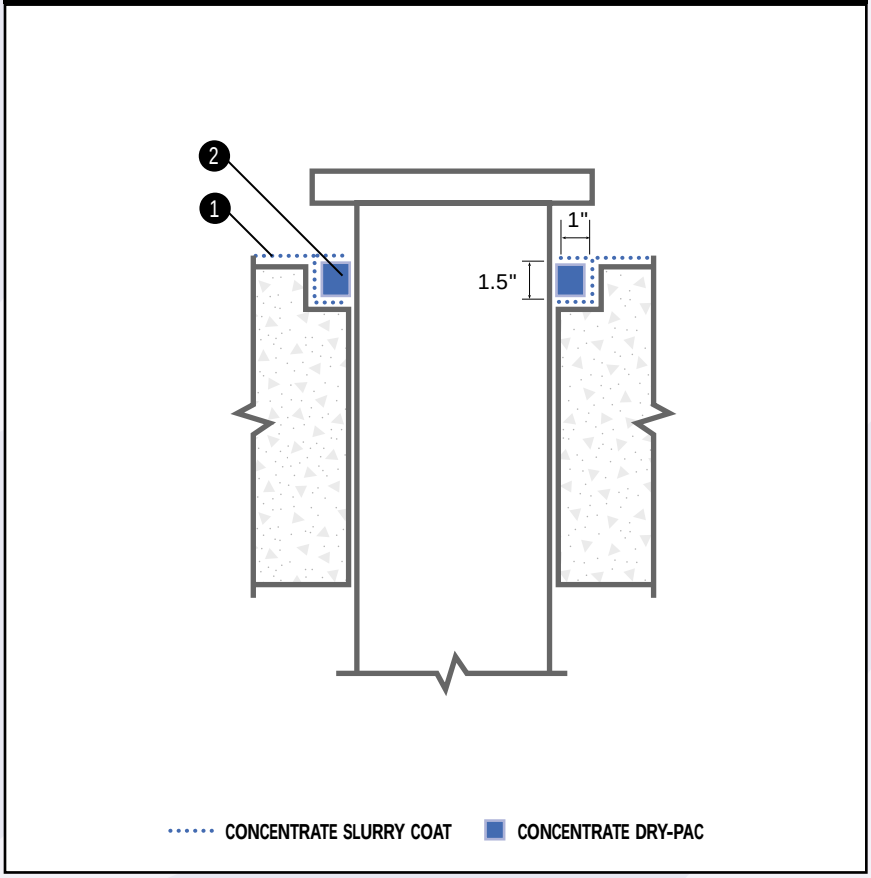
1. Place block in joints to allow 0.5 to 0.75 inch (13 mm to 19 mm) gap between precast sections. Fill exterior gap with Xypex Patch'n Plug grout.
2. Apply one slurry coat of Xypex Concentrate to the interior gap at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2), then fill gap to surface with Xypex Concentrate in Dry-Pac form.
3. Apply one slurry coat of Xypex Concentrate to interior of bottom ring, floor and exterior walls at the rate of 1.25 to 1.5 lb./sq. yd. (0.65 to 0.8 kg/m^2).
4. After placement of concrete trough, apply one slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2) to its surface.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

STANDARD METAL PIPE DETAIL



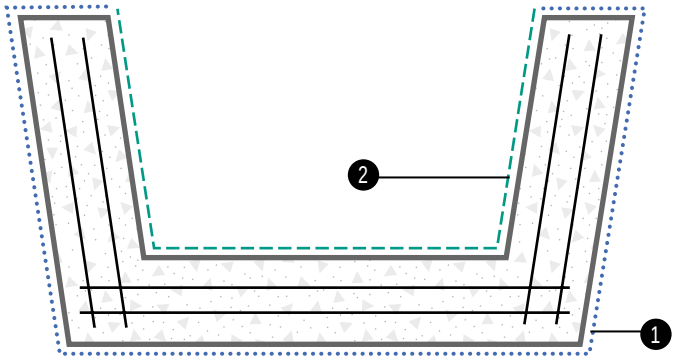
1. Apply Xypex Concentrate slurry to the groove at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).
2. Fill groove to surface with Xypex Concentrate in Dry-Pac form and pack tightly. Brush Dry-Pac liberally with water and apply a Xypex Concentrate slurry over the Dry-Pac at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

FERRO-CEMENT BOAT / CAISSON / FLOATING DOCK



CONCENTRATE SLURRY COAT MODIFIED SLURRY COAT

1. Apply one slurry coat of Xypex Concentrate to hull exterior, gunwhales, and all exterior decks at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).
2. Apply one coat of Xypex Modified to interior surface of hull at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).

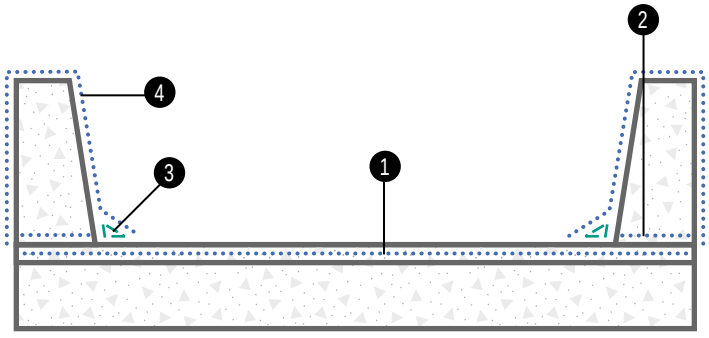
Note: In the case of sealed, hollow-core caissons, step 2 is eliminated and the Concentrate slurry coat in step 1 should extend over entire exterior of unit.

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

BRIDGE



CONCENTRATE SLURRY COAT MODIFIED SLURRY COAT

1. Apply one slurry coat of Xypex Concentrate to structural slab at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).
2. Apply one slurry coat of Xypex Concentrate to joint surface between parapet wall and bridge deck at the rate of 2.0 lb./sq. yd. (1.0 kg/m^2). Xypex must be applied no more than 24 hours prior to concrete placement.
3. Apply a cove strip of Xypex Modified mortar over slab/wall construction joint so that the cove extends one inch (25 mm) up the wall and one inch (25 mm) out on to the deck surface.
4. Apply one slurry coat of Xypex Concentrate to wall surfaces at the rate of 1.5 lb./sq. yd. (0.8 kg/m^2).

Schematic diagram shows Xypex application only and does not depict the standard requirements for waterstops or expansion joint sealants.

The specifier can consider the alternative use of Xypex Dry Shake or Xypex Admix, where applicable.

Refer to Standard Specifications for further information.

xypex repair procedures

CRACKS AND CONSTRUCTION JOINTS

A. REPAIR OF CRACKS AND FAULTY CONSTRUCTION JOINTS

1. NO WATER FLOW

Step 1 Rout out crack/joint in a “U” shaped slot one inch (25 mm) wide and at least 1.5 inches (37 mm) deep. A “V” shaped slot is not acceptable.

Step 2 Remove all loose material and saturate with water. Allow water to soak into concrete and then remove all surface water.

Step 3 Apply one slurry coat of Xypex Concentrate at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2) to slot and to six inch (150 mm) strip on either side of slot. Application may be performed by brush or by gloved hand.

Step 4 While slurry coat is still tacky, fill slot to surface with Xypex Concentrate Dry-Pac mixed in the following proportions: one part clean water to six parts Concentrate by volume. Blend by trowel for 10 to 15 seconds only (lumps should be present in the mixture). Apply Dry-Pac by gloved hand, then compress it tightly using a pneumatic packing device or a hammer and block.

Step 5 Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2) over the repaired area.

Step 6 Cure by fog spraying periodically with water for two days or apply Xypex Gamma Cure immediately after the slurry coat has set.

CRACKS AND CONSTRUCTION JOINTS

A. REPAIR OF CRACKS AND FAULTY CONSTRUCTION JOINTS

2. AGAINST A FLOW OF WATER

Step 1 Rout out crack/joint in a “U” shaped slot one inch (25 mm) wide and at least 1.5 inches (37 mm) deep. A “V” shaped joint is not acceptable. Areas with most water flow should be identified and chipped slightly deeper.

Step 2 Remove all loose material and saturate dry areas with water. Allow water to soak in and then remove all surface water.

Step 3 Apply Xypex Patch’n Plug to half the depth of slot immediately after removing surface water. Patch’n Plug is mixed by adding one part clean water to 3.5 parts Patch’n Plug powder by volume. Patch’n Plug should be applied to full length of crack/joint area.

Step 4 Apply a slurry coat of Xypex Concentrate at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2) in the slot over the Patch’n Plug and on the six inch (150 mm) strip of concrete surface on either side of the slot. Application may be performed by gloved hand or by brush.

Step 5 While slurry coat is still tacky, fill slot to surface level with Xypex Concentrate Dry-Pac. Dry-Pac is mixed by adding one part clean water to six parts Xypex Concentrate powder by volume. Blend by trowel for 10 to 15 seconds only (lumps should be present in mixture). Apply the Dry-Pac by gloved hand, then compress it tightly by using a pneumatic packing tool or a hammer and block.

Step 6 Wet the Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2) over the repaired area.

Step 7 Cure by fog spraying periodically with water for two days or apply Xypex Gamma Cure immediately after the slurry coat has set.

CRACKS AND CONSTRUCTION JOINTS

A. REPAIR OF CRACKS AND FAULTY CONSTRUCTION JOINTS

3. AGAINST HIGH PRESSURE WATER FLOW

Step 1 Rout out crack/joint in a "U" shaped slot one inch (25 mm) wide and two to three inches (50 mm to 75 mm) deep. A "V" shaped slot is not acceptable.

Step 2 In area of greatest water flow, drill hole or cavity one-half inch (13 mm) deeper into slot to accommodate a bleeder hose. A bleeder hose is a minimum 1.5 foot (0.5 m) length of smooth surfaced, fairly rigid tubing. Its purpose is to relieve the water pressure while crack/joint is being repaired.

Step 3 Remove all loose material and saturate dry areas with water. Allow water to soak in and then remove all surface water.

Step 4 Place one end of bleeder hose into the hole or cavity and, while holding hose steady, apply Xypex Patch'n Plug to the slot around the hose. Approximately two to four applications of Patch'n Plug may be necessary to secure the hose in place and embed the tubing completely up to surface level.

Step 5 Apply Xypex Patch'n Plug to half the depth of remaining slot area. Patch'n Plug is mixed by adding one part clean water to 3.5 parts Patch'n Plug powder by volume. If slot has dried out before Patch'n Plug application, it should be re-wetted.

Step 6 Apply a slurry coat of Xypex Concentrate at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2) in the slot over the Patch'n Plug and on the six inch (150 mm) strip of concrete surface on either side of the slot. Application may be performed by gloved hand or by brush.

Step 7 While slurry coat is still tacky, fill slot to surface level with Xypex Concentrate in Dry-Pac consistency. Dry-Pac is mixed by adding one part clean water to six parts Xypex Concentrate powder by volume. Blend by trowel for 10 to 15 seconds only (lumps should be present in mixture). Apply the Dry-Pac by gloved hand, then compress it tightly by using a pneumatic packing tool or a hammer and block.

Step 8 Wet the Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2) over the repaired area.

Step 9 Cure by fog spraying periodically with water for two days or apply Xypex Gamma Cure immediately after the slurry coat has set.

DEFECTIVE CONCRETE AND ROCK POCKETS

B. REPAIR OF DEFECTIVE CONCRETE, ROCK POCKETS AND HONEYCOMBS

1. NO WATER FLOW

Step 1 Rout out faulty concrete to sound concrete.

Step 2 Remove all loose materials and saturate area with water. Allow time for concrete to absorb water, then remove all free-standing water.

Step 3 Apply a slurry coat of Xypex Concentrate to cavity area at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2).

Step 4 While slurry coat is still tacky, fill cavity to surface with non-shrink grout. For large patches, the use of a bonding agent is recommended.

Step 5 Allow patch to set, then apply a slurry coat of Xypex Concentrate over repaired area at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2).

Step 6 Cure by fog spraying periodically with water for two days or apply Xypex Gamma Cure immediately after the slurry coat has set.

DEFECTIVE CONCRETE AND ROCK POCKETS

B. REPAIR OF DEFECTIVE CONCRETE, ROCK POCKETS AND HONEYCOMBS

2. AGAINST A FLOW OF WATER

Step 1 Rout out faulty concrete to sound concrete.

Step 2 Remove all loose materials and saturate the area with water. Allow time for concrete to absorb water, then remove any free-standing water.

Step 3 To stop the flow of water, fill the cavity to surface with Xypex Patch'n Plug. For large cavities, first handrub a layer of Patch'n Plug into the cavity to help "key" the patch. Large patches may require the addition of aggregate to the Patch'n Plug. For the size and amount of aggregate, please refer to product data sheet. Where increased bonding is required, use suitable bonding agent.

Step 4 After the patch has set, apply a slurry coat of Xypex Concentrate over repaired area at a coverage of 1.5 lb./sq. yd. (0.8 kg/m^2).

Step 5 Cure by fog spraying periodically with water for two days or apply Xypex Gamma cure immediately after the slurry coat has set.

xypex application instructions

APPLICATION PROCEDURES

WEATHER AND CONCRETE CONDITIONS

1. The Xypex treatment must not be applied under rainy conditions or when ambient temperature is below 40°F (4°C).
2. Because Xypex requires moisture to initiate the crystalline waterproofing process, all concrete, whether fresh or old, must be saturated with water. (See Wetting Concrete below.)
3. The concrete surface must be a minimum of 20 hours old before application of the Xypex coating treatment.
4. For fresh concrete, the period between 24 hours and 72 hours is the optimum time within which to apply Xypex, as the new concrete is still “green” and requires very little pre-watering.

COVERAGE

For normal surface conditions, the coverage rate for each Xypex coat is 1.25 to 1.5 lb./sq. yd. (0.65 - 0.8 kg/m^2).

SURFACE PREPARATION

1. The concrete surface to be treated must be clean and free of laitance, dirt, film, paint, coatings or other foreign matter. The surface must also have an open capillary system to provide “tooth and suction” for the Xypex treatment.
2. If surface is too smooth (e.g. where steel forms are used) or if surface is covered with excess form oil or other foreign matter, the concrete should be lightly sandblasted, waterblasted, or etched with muriatic (HCL) acid.
3. Horizontal surfaces should have a rough wood float or broom finish. Concrete laitance must be removed from surface by light sandblasting, waterblasting or etching with muriatic (HCL) acid.
4. Surfaces to be etched with muriatic acid should be dampened with water before application of the acid. After acid etching flush concrete thoroughly with clean water.

APPLICATION PROCEDURES

STRUCTURAL REPAIR

1. Rout out cracks, faulty construction joints and other structural defects to a depth of 1.5 inches (37 mm) and a width of one inch (25 mm).
2. Apply a brush coat of Xypex Concentrate (as described below) in cavity and allow to dry for 10 minutes.
3. Fill cavity by tightly compressing Dry-Pac into the groove with pneumatic packing tool or with hammer and wood block. (See below for Dry-Pac mixing instructions.)
4. Against a direct flow of water (leakage) or where there is excess moisture due to seepage, use Xypex Patch'n Plug in lieu of Dry-Pac followed by a brush coat of Xypex Concentrate. For expansion joints or chronic moving cracks, flexible materials such as expansion joint sealants should be used.

   Refer to Xypex Repair Procedures for more detailed instructions.

WETTING CONCRETE

Xypex requires a saturated substrate and a damp surface. Concrete surfaces, therefore, must be thoroughly saturated with clean water prior to the application so as to aid the proper curing of the treatment and to ensure the growth of the crystalline formation deep within the pores of the concrete. Remove excess surface water before the application. If concrete surface dries out before application, it must be re-wetted.

MIXING

1. Mix Xypex with clean water only (water that is free of salt and other deleterious materials).
2. Mix clean water into the Xypex powder with a paddle on a slow speed electric drill (250 RPM) or with other equipment that ensures adequate mixing. For small jobs, Xypex may be mixed by gloved hand or by trowel.
3. Be sure that the quantity mixed can be applied within 20 minutes. As the mixture thickens, stir frequently but do not add water.

APPLICATION PROCEDURES

MIXING FOR SLURRY COAT

Mix Xypex powder with clean water to a creamy consistency in the following volume proportions:

For Brush Application

1.25 - 1.5 lb./ sq. yd. (0.65 - 0.8 kg/m^2)	5 parts powder to 2 parts water
2.0 lb./sq. yd. (1.0 kg/m^2)	3 parts powder to 1 part water

For Spray Application

1.25 - 1.5 lb./sq. yd. (0.65 - 0.8 kg/m^2)	5 parts powder to 3 parts water (ratio may vary with equipment type)

MIXING DRY-PAC

Using a trowel, mix one part clean water with six parts Xypex Concentrate powder by volume for 10 to 15 seconds. Lumps should be present in this mixture. Do not mix more than can be applied in 20 minutes.

APPLYING XYPEX

1. Apply Xypex with a semi-stiff nylon bristle brush, push broom (for large horizontal surfaces), or specialized spray equipment. Do not apply Xypex with a trowel, roller, paintbrush or paint sprayer. Consult the Xypex Tools and Equipment Guide or your Xypex representative for further information.
2. The Xypex coating must be uniformly applied and should be just under 0.0625 inches (1.25 mm) thick. A thicker coating can cause curing difficulties, especially in warm weather.
3. When a second coat (Xypex Concentrate or Xypex Modified) is required, it should be applied after the first coat has reached an initial set but while it is still “green” (less than 48 hours). Light pre-watering between coats may be required due to drying.
4. For slab (horizontal) applications, care should be taken to spread the Xypex evenly, pulling a heavy broom over the fresh Xypex. This should be done in long strips and will serve to eliminate settlement of the Xypex in low spots on the slab and also to remove excess material which may have been applied.

APPLICATION PROCEDURES

APPLYING XYPEX (CONTINUED)

5. In hot weather it is advisable to apply Xypex either early in the morning or late in the day. This will prevent the Xypex coating from drying out too quickly.

   Note 1: Where a smooth, steel-trowelled finish is required for horizontal slab or where slab will be exposed to traffic (e.g. parking deck), apply Xypex Concentrate DS-1 or DS-2 by dry shake method. Consult Xypex Technical Data or your Xypex representative for further information.

   Note 2: In hot weather, it is advisable to apply Xypex either early in the morning or late in the day. This will prevent the Xypex coating from drying out too quickly.

CURING

1. A misty fog spray of clean water must be used for curing the Xypex treatment. Curing should begin as soon as the Xypex has set to the point where it will not be damaged by a fine spray of water.
2. Under normal conditions, it is sufficient to spray Xypex treated surfaces three times per day for two to three days. In hot or arid climates, spraying may be required more frequently to prevent premature drying of the coating.
3. During the curing period, the coating must be protected from rainfall, frost, wind, the puddling of water and temperatures below 36°F (2°C) for a period of not less than 48 hours after application. If plastic sheeting is used as protection, it must be raised off the Xypex to allow the coating to breathe.
4. For concrete structures that hold liquids (e.g. swimming pools, reservoirs, wet wells, tanks, etc.), Xypex should be cured for three days and then allowed to set for 12 days before filling the structure with liquid.
5. For structures holding particularly hot and/or corrosive liquids, Xypex should be cured for three days and allowed to set for 18 days before filling.
6. In situations where there is poor air circulation (e.g. small, enclosed reservoirs or wet wells), fans or blown air may be necessary to aid the curing of Xypex.
7. Xypex Gamma Cure may be used in lieu of water curing for certain applications (consult with Xypex Chemical Corporation or your nearest Xypex distributor). Gamma Cure should be applied using a garden type sprayer and must be diluted as per directions before use. Do not apply more Gamma Cure than is specified.
8. For Xypex coated slabs that will be a wearing surface, water curing is recommended.

APPLICATION PROCEDURES

BACKFILLING

Backfilling can take place 36 hours after the Xypex application. If backfilling takes place within seven days after the application, the backfilling material should be moist so as not to draw moisture from the Xypex coating.

APPLICATION OF PAINTS, EPOXIES OR SIMILAR COATINGS

Xypex requires 21 days of curing and crystal generation before the application of any paint or epoxy. Washing the Xypex surface with a 3 - 5% muriatic acid solution is recommended before applying the coating. Be sure to flush all acid off the wall.

APPLICATION OF GROUT, CEMENT PARGE COAT, PLASTER OR STUCCO

It is important that any other cementitious system be applied over the Xypex coating before the Xypex crystals have had time to plug the pores of the concrete. Therefore, grouts, cement parge coats etc. should be applied after the Xypex has completely set but while it is still “green” (8 to 48 hours). Use of a bonding agent is recommended.

Note: Xypex Chemical Corporation makes no representations or warranties regarding the compatibility of Xypex products with plasters, stuccos, tiles and other surface-applied materials. It is the responsibility of the installer of these surface-applied materials to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the Xypex treated surface.

For more instructions, alternative application methods, or information concerning the compatibility of the Xypex treatment with other products or technologies, contact the technical department of Xypex Chemical Corporation.

APPLICATION PROCEDURES

CAUTION

Xypex is highly alkaline.

1. Avoid contact with skin or eyes.
2. Protect hands with rubber gloves when handling dry powder or wet mixture.
3. If skin comes into contact with Xypex material, wash immediately and thoroughly with water for 15 minutes. If discomfort continues, seek prompt medical attention.
4. Wear eye protection. If dry powder or wet mixture gets into eyes, flush immediately and thoroughly with water and seek medical aid.
5. Wear a suitable mask where there is potential for generating dust. If Xypex is ingested, do not induce vomiting; have affected person drink two glasses of water and obtain immediate medical attention.
6. For material safety data sheets, contact Xypex Chemical Corporation at 604 273‑5265.

ESTIMATING TABLE

MEASURE	XYPEX CONCENTRATE	XYPEX MODIFIED	XYPEX PATCH'N PLUG
SINGLE SLURRY COAT			
lb. per sq. yd.	1.50	1.50	n/a
kg per sq. m	0.80	0.80	n/a
ONE OF TWO SLURRY COATS			
lb. per sq. yd.	1.25-1.50	1.25-1.50	n/a
kg per sq. m	0.65-0.80	0.65-0.80	n/a
FILLING A 0.75" (19 mm) DEEP X 1" (25 mm) WIDE SLOT			
lb. per lineal ft.	0.45	n/a	0.50
kg per meter	0.65	n/a	0.75
FILLING A 1" DEEP (25 mm) X 1" (25 mm) WIDE SLOT			
lb. per lineal ft.	0.55	n/a	0.60
kg per meter	0.85	n/a	0.90
FILLING A 1.5" DEEP (37 mm) X 1" (25 mm) WIDE SLOT			
lb. per lineal ft.	0.85	n/a	0.85
kg per meter	1.25	n/a	1.40

The above is a guide only. Actual usage may vary according to the project.

APPLICATION TOOLS

Using the proper tools and equipment and wearing the proper clothing while working with Xypex products encourages a safer and more effective result.

PROTECTIVE CLOTHING AND EQUIPMENT

Hard Hat

Ear Protectors

Eye Goggles

Safety Glasses

Face Shield

Dust and Mist Mask

Coveralls

Knee Protectors

Work Boots

Leather Gloves

Rubber Gloves

Rain Gear

Sandblasting Protection Gear

SURFACE PREPARATION EQUIPMENT

Sandblaster (Pot and Hose)

Chipping Hammer and Chisels

Waterblaster

Scabblers/Scarifiers

Crack Chaser

Compressor

MIXING EQUIPMENT

Mixing Pail

Electric Drill & Mixing Paddle

APPLICATION TOOLS

APPLICATION EQUIPMENT

Semi-Stiff Concrete Brush

Pattern Pistol (Gun & Hopper)

Hy-Flex Spray Pump

Quickspray Carrousel Pump

Water Sprayer

Packing Gun with Packer Head

Mechanical Spreader

MISCELLANEOUS EQUIPMENT

Extension Cords

Flood Lights

Industrial Vacuum (Wet/Dry Capability)

Ladders and Scaffolding

Maintenance Tools and Equipment

Power Trowel

Water Hoses and Spray Nozzles

Ropes

Space Heating Units

Tarpaulins

Ventilation Fans

For more detailed information, please see the Xypex Tools and Equipment Guide. Contact Xypex Chemical Corporation at 604 273·5265 or your local Xypex representative for a Guide and for recommended equipment suppliers.

admix

4.0

CRYSTALLINE WATERPROOFING ADDITIVE

SECTION 03050

PART 1-GENERAL

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 structures as indicated on the drawings and as specified herein. The crystalline waterproofing material shall be added to concrete during the mixing cycle, and shall be used in above or below-grade walls and slabs, including liquid retaining structures where enhanced chemical resistance is required.

B. *Related Sections:*
   1. Section 03100 - Concrete Work
   2. Section 03200 - Concrete Reinforcement
   3. Section 07900 - Joint Sealers

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. NSF International (NSF)

1.03 SYSTEM DESCRIPTION

A. *Crystalline Waterproofing Additive:* Concrete waterproofing system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. The system shall cause the concrete to become sealed against the penetration of liquids from any direction, and shall protect the concrete from deterioration due to harsh environmental conditions.

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.

CRYSTALLINE WATERPROOFING ADDITIVE

1.04 SYSTEM PERFORMANCE REQUIREMENTS (CONTINUED)

B. *Independent Laboratory:* Testing shall be performed by an independent laboratory meeting the requirements of ASTM E 329-90 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product 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:* Independent testing shall be performed according to U.S. Army Corps of Engineers CRD-C48-73 "Permeability of Concrete". Treated concrete samples shall be pressure tested to 150 psi (350 foot head of water) or 1.05 MPa (106 m head of water). The treated samples shall exhibit no measurable leakage.

E. *Chemical Resistance:* Independent testing shall be performed to determine "Sulfuric Acid Resistance of Concrete Specimens". Treated concrete samples (dosage rates of 3%, 5% and 7%) shall be tested against untreated control samples. All samples shall be immersed in sulfuric acid and weighed daily until a control sample reaches a weight loss of 50% or over. On final weighing the percentage weight loss of the treated samples shall test significantly lower than the control samples.

F. *Compressive Strength:* Independent testing shall be performed according to ASTM C39 "Compressive Strength of Cylindrical Concrete Specimens". Concrete samples containing the crystalline waterproofing additive shall be tested against untreated control sample. At 28 days, the treated samples shall exhibit a minimum of 10% increase in compressive strength over the control sample.

G. *Potable Water Approval:* Independent testing shall be performed according to NSF Standard 61, and approval for use of waterproofing material on structures holding potable water shall be evidenced by NSF certification.

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.

CRYSTALLINE WATERPROOFING ADDITIVE

1.05 SUBMITTALS (CONTINUED)

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 certificate signed by manufacturer or manufacturer's representative certifying that the materials to be installed comply in all respects 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 that cannot provide the performance test data specified herein will not be considered for the project.

B. *Applicator:* 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, conduct meeting with Architect/Engineer, owner's representative, applicator (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 Document.

2. Manufacturer's product data including application instructions.

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

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 temperature and humidity conditions recommended by manufacturer.

CRYSTALLINE WATERPROOFING ADDITIVE

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. Term of warranty shall be [specify term] years from Date of Substantial Completion.

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 Admix C-1000
2. Xypex Admix C-2000

Note: Supplemental specifications are available for Xypex Admix C-1000 NF (no fines grade) and Xypex Admix C-2000 NF (no fines grade).

C. *Substitutions:* No substitutions permitted.

D. *Source Quality:* Obtain 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 a rate of 2% - 3% by weight of portland cement content. For enhanced chemical protection or meeting specific project requirements, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

CRYSTALLINE WATERPROOFING ADDITIVE

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. *Reinforcement:* All reinforcement shall be rib deformed bar in accordance with applicable standards. Exposed concrete decks (joint free) shall contain sufficient reinforcement to minimize thermal movement and control cracking.

B. *Setting Time and Strength:* Some retardation of set may occur when using Xypex Admix. The amount of retardation will depend upon the concrete mix design, the dosage rate of the Admix, temperature of concrete and climatic conditions. Concrete containing Xypex Admix 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 as referred to in ACI 305R-77 (Hot Weather Concreting) and ACI 306R-78 (Cold Weather Concreting). For flatwork being placed in either hot, dry or windy conditions use of monomolecular film (evaporation retardant) is recommended to control loss of bleed water.

3.03 APPLICATION

A. *General:* Xypex Admix shall be added to the concrete mix at time of batching. Thorough blending of the Xypex Admix throughout the concrete mix is essential for correct performance of the product and, therefore, care should be taken to ensure that a homogeneous mixture is obtained.

CRYSTALLINE WATERPROOFING ADDITIVE

3.03 APPLICATION (CONTINUED)

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

1. *Ready Mix Plant - Dry Batching Operation:* Add Xypex Admix powder to drum of ready-mix truck, then add 60% - 70% of required water along with 300 - 500 lb. (136 - 227 kg) of aggregate. Mix the materials for 2 - 3 minutes to ensure that the Admix is distributed evenly throughout the mix water. Add balance of materials to the ready-mix truck and mix in accordance with standard batch practices.

2. *Ready Mix Plant - Central Mix Operation:* Mix Xypex Admix with water to form a very thin slurry (e.g. 15 - 20 lb. or 6.75 - 9 kg of powder mixed with 3 gal. or 13.6 l of water). Pour the required amount of material in drum of ready-mix truck. The aggregate, cement and water should be batched and mixed in the plant in accordance with standard practices (taking into account the quantity of water that has already been placed in the ready-mix truck). Pour the concrete into the truck and mix for at least 5 minutes to ensure even distribution of the Xypex Admix throughout the concrete.

3. *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 should be blended using standard practices.

3.04 CURING

A. *General:* Concrete containing Xypex Admix shall be moist cured 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.

CRYSTALLINE WATERPROOFING ADDITIVE

3.06 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 and other designated entities. Concrete shall be examined for structural defects such as faulty construction joints, cold joints and cracks. Such defects to be repaired in accordance with manufacturer's repair procedures.

B. *Flood Testing for Suspended Slabs:*

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 two inches (50 mm) or to within 0.5 inch (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 INTERACTION WITH OTHER MATERIALS

A. *Backfilling:* Normal backfilling procedures may be used after concrete has been cured for at least seven days. If backfill takes place within seven days after concrete placement, then backfill material shall be moist so as not to draw moisture from the concrete. In no event shall backfilling take place before concrete has gained sufficient strength to withstand the applied load.

B. *Grout, Cement Parge Coat, Plaster or Stucco:* Because concrete containing Xypex Admix 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.

C. *Responsibility to Ensure Compatibility:* Xypex Chemical Corporation makes no representations or warranties regarding compatibility of Xypex treated concrete 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 treated concrete, to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the waterproofing treatment.

END OF SECTION 03050

dry shake

5.0

CRYSTALLINE WATERPROOFING DRY SHAKE

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

B. *Related Sections:*
   1. Section 03100 - Concrete Work
   2. Section 03300 - Cast-In-Place Concrete
   3. Section 03360 - Concrete Finishing

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)

1.03 SYSTEM DESCRIPTION

A. *Cementitious Crystalline Waterproofing (Dry Shake):* Blend of portland cement, active proprietary chemicals and aggregate that has been graded and crushed to particle sizes suitable for concrete floors. When applied as a dry shake to freshly poured concrete slabs, 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. For areas where increased abrasion resistance is required, the dry shake waterproofing shall contain a proprietary aggregate hardener.

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.

CRYSTALLINE WATERPROOFING DRY SHAKE

1.04 SYSTEM PERFORMANCE REQUIREMENTS (CONTINUED)

B. *Independent Laboratory:* Testing shall be performed by an independent laboratory meeting the requirements of ASTM E 329-90 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product samples.

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 2 inches (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 2000 psi (13.8 MPa) and thickness of 2 inches (50 mm). No admixtures permitted.
2. Samples to be pressure tested to 175 psi (405 foot head of water) or 0.12 MPa (123.4 m head of water).
3. Treated samples, after crystalline growth has occurred, shall exhibit no measurable leakage.

E. *Chemical Resistance:* Independent testing shall be performed according to ASTM C267-82 (1990) and ASTM C39-86 "Chemical Resistance of Mortars".

1. Concrete samples (treated and untreated) to have design strength of 4000 psi (27.6 MPa). No admixtures permitted.
2. 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.
3. Treated specimens shall exhibit no detrimental effects after exposure, and shall have a minimum of 14% increase in compressive strength versus untreated control specimens.

1.05 SUBMITTALS

A. *General:* Submit listed submittals in accordance with conditions of the Contract and with Division 1 Submittal Procedures Section.

CRYSTALLINE WATERPROOFING DRY SHAKE

1.05 SUBMITTALS (CONTINUED)

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.

1.06 QUALITY ASSURANCE

A. *Manufacturer Qualifications:* Manufacturer should be ISP 9001 registered, and shall have no less than 10 years experience in manufacturing the cementitious crystalline waterproofing materials (dry shake) 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 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.
3. Procedures for substrate preparation, waterproofing installation and concrete finishing.

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

CRYSTALLINE WATERPROOFING DRY SHAKE

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.

1.08 WARRANTY

A. *Manufacturer's Warranty:* Manufacturer shall provide standard product warranty executed by authorized 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, 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 its 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.

CRYSTALLINE WATERPROOFING DRY SHAKE

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-1000/C-2000 (additives).

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/m^2)
Xypex Concentrate DS-2	6.75 - 7.5 lb sq. yd. (3.6 - 4.0 kg/m^2)

When using Xypex Concentrate DS-2 for enhanced impact and abrasion resistance, consult with manufacturer or its authorized representative to determine appropriate coverage rate.

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.

CRYSTALLINE WATERPROOFING DRY SHAKE

3.02 PROJECT CONDITIONS

A. *Air Entrainment:* For best results, air content of the concrete should not exceed 3%. If higher 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.

B. *Joint Sealants:* Suitable flexible sealant shall be used for joints and chronic moving cracks.

C. *Weather Conditions:* In hot, dry, windy conditions, or where the use of a super-plasticizer will reduce amount of bleed water available for the dry shake material, consult with manufacturer's technical representative for additional or alternative application procedures.

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 fresh concrete can be walked on leaving an indentation of 1/4 - 3/8 in. (6.5 - 9.5 mm), then power float the surface (the concrete should be free of bleed water before power floating). Immediately after floating open the surface, apply the dry shake material evenly by hand or mechanical spreader. As soon as the dry shake material has absorbed moisture from the fresh base slab, power float the material into the surface (do not use a trowel). Thoroughly work the powder into the cement paste. When concrete has hardened sufficiently, power trowel concrete surface to the required finish.

C. *Concentrate DS-2:* Wait until fresh concrete can be walked on leaving an indentation of 1/4 - 3/8 in. (6.5 - 9.5 mm), then power float the surface (the concrete should be free of bleed water before power floating). Immediately after floating open the surface, apply one half of the required dry shake material evenly by hand or mechanical spreader. Then, after power floating the initial portion of the powder into the surface, apply the remaining dry shake material at right angles to the first application, and power float (do not use a trowel) the material into the surface. Thoroughly work the powder into the cement paste. When concrete has hardened sufficiently, power trowel concrete 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.

CRYSTALLINE WATERPROOFING DRY SHAKE

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.

C. *Protection:* During the curing period, protect treated surfaces from damage by wind, sun, rain and temperatures below 32°F (0°C).

3.05 INTERFACE WITH OTHER MATERIALS

A. *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 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.

B. *Grout, Cement Parge Coat, Concrete Topping:* Because the waterproof treatment 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.

C. *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.

3.06 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 and other designated entities. Concrete shall be examined for structural defects such as faulty construction joints, cold joints and cracks. Such defects to be repaired in accordance with manufacturer's repair procedures.

CRYSTALLINE WATERPROOFING DRY SHAKE

3.06 FIELD QUALITY CONTROL (CONTINUED)

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 two inches (50 mm) or to within 0.5 inch (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 installed product and finished surfaces from damage after application.

END OF SECTION 07160

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- VIETNAM

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MAN-SPEC