

ITEM 4

CONCRETE

1.0 DESCRIPTION. This item includes furnishing, transporting, and placing of concrete used for site construction of conduits, pavements, curbing, foundation slabs, walls, floor, columns, beams, tanks and other structures as required. Non-shrink grout, low strength mortar (LSM), reinforcement and specialty additives including waterproofing are included under this item. Approved mix designs for specified classes of concrete shall be the responsibility of the Contractor.

2.0 SUBMITTALS. The contractor shall submit the following information:

A. Reference Standards. Latest revisions:

1. ACI 301 latest edition, "Specifications for Structural Concrete for Buildings".
2. ACI 308 latest edition, "Specification for Curing Concrete".
3. ACI 318 latest edition "Building Code Requirements for Reinforced Concrete".
4. ODOT Construction and Materials Standards most current edition.
5. Concrete Reinforcing Steel Institute (CRSI) latest edition "Manual of Standard Practice" except as modified herein.
6. The manufacture, delivery, and installation of cast-in-place concrete shall be in accordance with requirements of ASTM Designation C94 and applicable documents of that Standard, except as specified herein.
7. All bar reinforcement shall meet the requirements of the "Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement", A.S.T.M. Designation: A 625, Grade 60. No re-rolled or high carbon steel bars will be permitted in the work.
8. All wire mesh reinforcement shall be of approved make, and of minimum weight indicated on the contract drawings. Wire mesh shall meet the requirements of the "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement", ASTM A185.
9. 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.
10. US Army Corps of Engineers (CRD).

B. Shop Drawings.

1. An independent testing laboratory shall provide initial mix designs to produce specified classes of concrete within the limiting requirements herein.
2. Plant certification information may be required for SCMSD review.
3. Certifications/tickets for each delivery to the project, including documentation of admixture component(s) where specified, including pozzolanic, Type F.
4. Laboratory sieve analysis of aggregates.

5. The Contractor shall submit to the Engineer detailed drawings showing the number, size, length, bending and placing of the steel he proposes to furnish, and no steel reinforcing bars shall be delivered to the site of the work prior to the approval of the bending and placing diagrams.
6. Bending diagrams and reinforcing details shall conform to "The Manual of Standard Practice for Detailing Concrete Structures", as issued by the American Concrete Institute, (ACI 315R) except as herein modified.
7. Concrete mix design, Job Mix Formula (JMF) with ODOT issued reference number.

C. Calculations.

1. See related project specifications for applicable structural calculations including but not limited to reinforcement steel sizing and placement.

D. Certifications.

1. Reinforcement bars shall be inspected and tested at the mill at which they are rolled, in accordance with "Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement", ASTM A615, and two (2) certified copies of such tests shall be furnished to the Engineer.
2. All tests shall be made on the full size finished bars, and at least one (1) tensile and one (1) bending test shall be made for each lot of ten (10) tons or less from each melt of steel from which reinforcement steel is furnished for this work.

3.0 MATERIALS. Only materials approved by the SCMSD shall be approved for this project.

A. Admixtures.

1. Air entrainment admixtures conforming to ASTM C260 shall be introduced into the mix in quantities to entrain air as follows:
2. Class A, B & D - 5% optimum - allowable variance 1%.
3. Class C - 6% optimum - allowable variance 2%.
4. Pozzolanic admixtures shall conform to the requirements of ASTM C618, Class F. The addition of the pozzolanic admixtures shall not change any of the requirements specified.
5. Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted.
6. High range water reducing admixture (superplasticizer) may be used as an option by the Contractor at no additional cost to the Owner.
7. The admixture shall conform to ASTM C494, Type F.
8. Approved products are Eucon 37 by Euclid Chemical Company; Sikament® by Sika Chemical Corporation or engineering approved equal.
9. 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.

10. Crystalline waterproofing additives shall be utilized on, but not limited to, the following types of structures.
 - a. Manholes
 - b. Wet well
 - c. Water, Wastewater Valve & Air Release Vaults
 - d. Siphon Chambers
 - e. Structures which hold or hold back water
 - f. Other structures as indicated on Detail Plan drawings
 - g. This generally does not include general concrete work such as. footers, walls, floors, driveways, concrete pads etc.
11. Acceptable Manufacturers include Xypex Chemical Corporation, ICS/Penetron International, or approved equal. Only one manufacturer may be used.
 - a. Proprietary Products: Xypex crystalline waterproofing materials as follows: Xypex Admix C-500 or approved equal.
 - b. The manufacturer's instructions for an equal product's application shall meet or exceed specifications herein and shall be complied with, subject to the approval of the Engineer.

B. Fine Aggregate.

1. Fine aggregate shall consist of natural sand composed of clean, hard, strong, durable, uncoated grains. It shall be free from injurious amounts of shale, clay lumps, soft or flaky particles and other unsound or deleterious substances.
2. Sand shall conform to Specifications for Concrete Aggregates, ASTM C33.

C. Coarse Aggregate.

1. Coarse aggregate shall consist of gravel or broken stone composed of strong, hard, clean, durable, uncoated pebbles or rock fragments free from injurious amounts of shale, coal, clay lumps, and soft fragments, dirt, glass and organic or other deleterious substances.
2. Coarse aggregates shall be limestone material. Standard gravel or slag will not be permitted. It shall conform to Specifications for Concrete Aggregates, ASTM C33, Size 467, 57 or 67, Class 4S.
3. For thin sections a smaller maximum size stone shall be used when directed and for heavy sections a larger maximum size stone may be permitted, in which cases the gradation of other sizes shall be modified as directed. All aggregates shall be limestone unless otherwise submitted and approved by the engineer. If approved crushed stone and gravel shall be washed if necessary to remove dust, dirt, or loam and if unsatisfactory shall be excluded from the work.

D. Non-Shrinking Grout.

1. Materials for non-shrinking grout shall conform to CRD-C-621 "Corps of Engineers Specifications for Non-Shrink Grout".
2. Approved products are:

- a. Sauereisen F-100 Grout as manufactured by Sauereisen Cements Company
- b. Five-Star Grout as manufactured by Five Star Products, Sheldon, Connecticut;
- c. Masterflow 713 as manufactured by Master Builders, Beachwood, Ohio and "Eucon NS" by Euclid Chemical Co.

E. Fiberglass Reinforcement. (as indicated on detail drawings) shall meet the following requirements:

1. ASTM C1116/C1116C
2. ASTM C1609/C1609M for dosage mixture.
3. ACI 544.3R-08 & 544.4R-18.

F. Steel Reinforcement.

1. All steel for reinforcement shall be delivered at the site of the work without rust other than that which may have accumulated in normal transit.
2. It shall be stored according to size and length and properly tagged with substantial tags securely attached to each bundle and protected from the weather by housing. Reinforcing steel shall not be stored on the ground.
3. All steel shall be kept free from oil, grease, dirt or other objectionable adhering substances, and it shall be satisfactorily cleaned of scale and heavy or flaky rust before being placed in the work.
4. If, after having been placed in the work, the concreting shall be delayed or interrupted for any considerable number of days, the steel shall be well protected.

G. Low Strength Mortar.

1. Cement shall conform to the ODOT CMS 701.01 or 701.04.
2. Fly ash shall meet ASTM C-618 and come from a source approved by the Engineer.
3. Fine Aggregate shall be natural sand consisting of mineral aggregate particles. The gradation of the sand shall meet the requirements of 703.05. The sand shall be fine enough to stay in suspension in the mixture to the extent required for proper flow. The Engineer reserves the right to reject the sand if a flowable mixture cannot be produced.

H. Concrete Structures. All concrete structures and associated subbases required as part of this specification shall include, but not be limited to, concrete manholes, wet wells, vaults, chambers, footers, walls, floors & equipment pads, etc.

I. Ancillary Concrete. Shall include but not be limited to, sidewalks, curbs, gutters, driveways, wheelchair ramps, etc.

4.0 EXECUTION. The contractor shall provide all labor, materials, equipment and tools necessary to provide and install concrete as detailed and specified.

A. Mixing and Transporting.

1. Concrete may be mixed in portable mixers located at the job site, in central plant mixers, or in truck mixers. Mixers of any type shall conform to the requirements specified herein.
2. Portable and central plant mixed concrete shall be mixed in approved batch mixers of the rotary drum type having sufficient capacity to ensure continuous delivery at the required rate, except that relatively small quantities may be mixed by hand by special permission.
3. The mixing drum shall be kept free of set concrete at all times. A water storage tank equipped with a gauge glass and an accurate measuring device shall be provided to determine the exact amount of water added to each batch. The measuring device shall be readily adjustable, and so designed that it can be locked after setting and that the amount of added water cannot be altered after such setting. Mixing shall continue at least one minute at the manufacturer's rated speed of the drum after water and all aggregate and cement have been added, and until every particle of aggregate is coated with mortar and the whole mass uniform in color and homogeneous.
4. The Contractor shall supply a discharge locking device so designed that concrete cannot be discharged in less than the required mixing time. The mixer shall also be equipped with a gong which sounds at the termination of the mixing time and with an approved batch meter which will accurately record each batch delivered.
5. Truck mixed concrete shall be mixed completely in mixers equipped with specified water-measuring control and locking devices. Each batch of concrete shall be mixed for not less than 70 nor more than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment as mixing speed. Additional mixing shall be at the speed designated by the manufacturer of the equipment at their rated capacity. Trucks shall be equipped with counters that register the number of revolutions of the drum or blades. No additional water is to be added between the concrete plant and the placement destination.
6. Furnish two delivery tickets with each load containing the following information:
 - a. Date.
 - b. Producer and Plant.
 - c. Job, name and location.
 - d. Truck number and time dispatched.
 - e. Concrete designation and cement type.
 - f. Admixture's description and content.
 - g. Time discharge started and completed.
 - h. Amount of concrete in load.
 - i. Amount of any materials added at the site and authorized signature.
7. On-Site Mixing Plant. If the Contractor chooses to operate an on-site mixing plant, the applicable provisions of ACI 301 Chapter 7.2 "Site-mixed concretes" shall apply.
8. The on-site mixing plant shall provide concrete of the types shown in Table I "Concrete Requirements" and as specified herein.
9. For LSM, The initial trial mixture shall consist of the following quantities of materials per cubic yard:

	Type 1	Type 2
Cement	50 lbs.	100 lbs.
Fly Ash	250 lbs.	**
Sand (SSD)*	2910 lbs.	2420 lbs.
Water	500 lbs.	210-300lbs.

*saturated-surface-dry

**Entrained air is substituted for fly ash in this mix (approximately 5 percent)

10. Type 1 or Type 2 Low Strength Mortar may be used. The Engineer may make adjustments of the proportions providing the total absolute volume of the materials is maintained.
 - a. To expedite consolidation of the mortar, it will be necessary for bleed water to appear on the surface immediately after the mortar is struck off. A delay in bleeding indicates there are too many fines in the mixture, so the fly ash quantity shall be reduced in increments of 50 lbs. until mixture is bleeding freely. Approximately 60 lbs. of sand shall be added to replace each 50 lbs. increment of fly ash to maintain the original yield.
 - b. To produce a flowable mortar it may be necessary to make several one cubic yard trial batches at different water contents. Mixture is too dry when cracks develop in the mortar as it flows into place.
 - c. Flowable mortar shall be discharged from the mixer by any reasonable means into the space to be filled. The fill material shall be brought up uniformly to the fill line shown on the plans or as directed by the Engineer. Placing of material over low strength mortar backfill may commence as soon as the surface water is gone or as directed.
11. Admixture Dosing.
 - a. General: Admix must be added to concrete mix at time of batching.
 - b. Dosage Rate: Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at the following rates:
Xypex Admix C-500 no less than 3% by weight of Portland cement material total.
 - c. For enhanced chemical protection or meeting specific project requirements, or where the concrete mix design contains higher than 20% fly ash content or includes a Portland cement/slag cement blend, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

B. Classes of Concrete.

1. Normal weight concrete shall be designated Class QC, A, B, C or D and proportioned and mixed to develop not less than the minimum compressive strength shown in Table I. (ACI 301 - Proportioning based on previous field experience or trial mixtures.)

TABLE I: CONCRETE REQUIREMENTS

Concrete Class	Cement Type	Min. 28-Day Compressive Strength, PSI	Maximum Water-Cement Ratio	Minimum Cement Content Sacks/CY	Slump Min., Inches	Slump Max., Inches
A / QC1	I, II	4,000	0.45	6 1/2	1	4
B	I	2,000	0.74	4 1/2	2	6
C /QC1	I,II	4,000	0.50	6 1/2	1	4
D /QC1	II or IP	4,000	0.45	6 1/2	1	4
S / QC2	I, II, III	4,500	0.44	7 3/4	1	5

2. Water – Cement Ratio. Except by special written permission of the Engineer, maximum amounts of water (U.S. gallons), including the surface water carried by the fine and coarse aggregates per sack (94 lbs. net) of cement shall be listed in Table I. Standard methods shall be used for determination of surface moisture in the aggregates.
 - a. Concrete of the maximum strength, density, and durability possible with the specified water-cement ratio is required. No increase of these ratios will be permitted. Refer to the Engineer for the mix design of any concrete for the project that is to be pumped.
 - b. With the approval of the Engineer, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded.
 - c. Each cubic yard of concrete shall contain the minimum number of sack (94 lbs. net) of cement listed in Table 1.
 - d. The minimum amounts of cement listed shall be used regardless of tests and design methods used.
3. The proportions of aggregate to cement for concrete of the specified water-cement ratio shall be such as to produce concrete that can be puddled readily into the corners and angles of forms and around reinforcement without excessive spading and without segregation of materials or collections of free water on the surface.
 - a. In no case shall concrete be placed which shows slumps outside the limits listed in Table 1.
 - b. Consistency of the concrete shall be closely regulated and the proportions of fine and coarse aggregate shall be such as to produce no harshness in placing nor honeycombing in the structures.
 - c. If required, the mixture shall be modified by changing the relative volume of fine and of coarse aggregate. The Contractor shall cooperate in every way to the end that concrete of the desired quality shall be obtained.

C. Steel Reinforcement.

1. All reinforcement bars shall be bent to the shapes as shown on the drawings or as ordered.

2. Bars of a single length shall be used in all cases, except where the length required is such that they cannot be so obtained, or where the Engineer shall give permission to use shorter lengths or allow lapping.
3. Cold bends shall be made around a pin having a diameter at least six (6) times the least dimension of the reinforcing bar for one-quarter (1/4) to seven-eighths (7/8) inch bars, and eight (8) times the least dimension for bars one (1) to one and one-quarter (1-1/4) inches in diameter.
4. All steel reinforcement shall be carefully placed and fastened in position so as to maintain the proper spacing between adjacent bars. Joints shall be wired with annealed iron wire of diameter not less than No. 18 U.S. Standard gauge or by using acceptable clips.
5. All reinforcement shall be firmly supported by the use of metal bolsters, bars, spacers, chairs, or hangers, or by the use of precast concrete piers. All lapped bars shall be fastened together securely, and, for bonding adjacent bars, overlapping shall be not less than forty (40) diameters of the smaller bar in the lap.
6. Concrete cover over the principal reinforcing steel shall be 3" unless otherwise shown.
7. Wire re-enforcing mesh where indicated shall be 6"x6" xW4.0xW4.0 reinforcing mesh located a minimum of 2" below finished surface.
8. All anchor bolts shall be set true and plumb.

D. Subbase. All materials, excavation and preparation, including compaction shall be in accordance with:

1. SCSE Specification Items 1 & 6.
2. AASHTO Standards for gradation, liquid & Plastic Limits, maximum density and optimum moisture standards
 - a. Aggregate shall be evenly graded per ASTM D2940.
 - b. Compaction for all concrete subbase shall meet or exceed a compacted dry density of at least 98% of the material's maximum dry density as determined by ASTM D698 at a moisture content of +/- 3% of optimum moisture content.

E. Forms. All concrete forms shall comply with the following:

1. All forms for exposed surfaces shall be pre-manufactured construction forms or built from materials pre-approved by the engineer.
2. All forms shall produce a smooth surface with minimal joint marks.
3. All forms whether new or reused, shall be cleaned, oiled and properly shored to assure all edges are straight and true. No split/delaminated forms will be accepted.
4. Comply with all SCSE Item 7 specifications, ODOT and ACI requirements.
5. For all pipe sleeves through concrete walls, foundations, floors etc., the contractor shall be required to make suitable keyed openings of minimum practical size and after placement of the sleeve.
6. Seal and make openings watertight through the use of a non-shrinking grout such as Emebco by Master Builders, Thoroset by Standard Dry Wall Products, Euco Firmix Grout by Euclid Chemical Company, non-air entrained cement or any pre-approved engineering equal in accordance with the manufacturer's instructions.

7. Formwork supporting structural elements or equipment may not be removed prior to 14 days or until 75% of 28 day compressive strength is attained. Forms such as for driveway or sidewalks may be removed sooner provided the concrete is protected and curing operations continue.

F. Concrete Placement. Concrete placement shall comply with the following requirements.

1. Contractor shall provide 24 hrs. minimum notice prior to any concrete placement.
2. After final mixing and once concrete placement has begun NO water may be added to the concrete truck.
3. All concrete shall be placed within 90 minutes of continuous operation from arrival on site, final mixing and placement of concrete.
4. All concrete shall be vibrated into place utilizing a mechanical concrete vibrator designed to remove potential air pockets and voids.
5. No concrete shall be dropped more than 5' during placement of concrete.
6. No concrete shall be placed during rain, sleet, or snow unless adequate protection is provided and approval is obtained. Rainwater shall not be allowed to increase the mixing water nor damage the surface finish.
7. Placement of concrete shall be in accordance with ACI, ODOT and ASTM standards pertaining to placement of concrete in:
 - a. Cold or hot weather applications.
 - b. Under water.
 - c. By use of pumping equipment
8. In addition to this specification all materials and placement of concrete shall comply with:
 - a. SCSE detail plans and contract specifications.
 - b. ACI 304 Standards.
 - c. ODOT 499, 500 & 700 Standards
 - d. ASTM Standards.

G. Concrete Finish.

1. Prior to concrete placement the Contractor shall provide and install Euroweld or a pre-approved concrete bonding agent on all existing concrete surfaces over 1 day old, prior to any freshly placed concrete.
2. All concrete floors, slabs and sidewalks and exposed concrete surfaces shall be straight edged, and bull floated in a normal manner and finished with a magnesium trowel, bull float or powered bull float. Unless otherwise directed by design plans or engineering, the surface shall receive a light broom finish.
3. Finished surface shall be sloped in accordance with all detailed plan requirements. No ponding or bird bath depressions greater than ¼" depth shall be permitted in the finished surface.
4. All exposed horizontal and vertical surfaces of concrete, walls, foundations, slabs, floors etc. shall receive a 2" chamfer edge unless otherwise noted on the design plans or indicated by the engineer.

5. ½" thick x 4" (minimum) deep expansion joint with ½" deep removable cap, to allow for caulking, shall be installed between all existing concrete structures and any newly placed concrete surface.
6. The contractor shall cut 1"-deep control joints into the concrete surface as shown on all detail plans or into equal quadrant sizes where not shown, one (1) day after concrete placement.
7. All control and expansion joints shall be caulked with sonnet-Borne NP-1 caulking or approved equal, 24 to 48 hours after concrete placement.
8. Upon removal of forms the concrete shall be "rubbed" to remove any:
 - a. Distinguishable edges between form joints, new and existing concrete and any shrink cracks which may have occurred.
 - b. All ties shall be removed and their voids properly filled/rubbed out with non-shrinking grout.
 - c. Any concrete surfaces which are spalled, buckled or bowed shall be filled and rubbed out in accordance with all ACI standards.

H. Concrete Curing.

1. Curing of concrete shall be in conformance with "Standard Practice for Curing Concrete" ACI 308, ODOT 511 standards and as specified herein.
2. Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury; and shall be maintained with minimal moisture loss and at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The Contractor shall provide thermometers as required by the Engineer.
3. In lieu of conventional water/burlap curing the Contractor may utilize a chemical concrete curing compound for curing. All curing compounds shall be:
 - a. Translucent without dye.
 - b. In accordance with:
 - i. ASTM C309 Standards
 - ii. AASHTO M148 Regulations
 - iii. Manufactured by Euclid Chemical or Engineering approved equal.
4. Concrete floors and pads shall be sealed with a pre-approved two (2) part epoxy based penetrating concrete sealer.

I. Concrete Protection. Concrete and concrete placement shall be protected as follows:

1. Free Water: Concrete for structures shall not be placed in water, nor shall water be allowed to come into contact with freshly poured concrete until it has attained a sufficient set, except where written permission has been given to place concrete under water by tremie.
2. Water used for cleaning the placing equipment shall be discharged outside the forms and within an approved area for concrete wash-down.
3. Forms and Reinforcing Steel: All forms and reinforcing steel located above the concrete being placed, and all placing equipment shall be kept clean and free of hardened concrete.

4. Aluminum Inserts: All aluminum materials inserted in concrete shall have the contact surface coated with bitumastic.

J. Striping/Marking. Contractor shall provide all safety striping as indicated on all detail plans.

1. Color: Safety Yellow
2. Fast dry water-based alkyd type 1 or water-based traffic paint in accordance with ODOT CMS 641 & 740.
3. Applied in accordance with ODOT and manufacturers requirements.

5.0 ELECTRICAL. This section is not applicable.

6.0 QUALITY ASSURANCE.

A. Testing.

1. Laboratory services may be required by the Engineer for sample testing.
2. The laboratory shall provide the forms for testing cylinders and beams for compressive strength testing at the specified concrete PSI strength.
 - a. A set of 6 cylinders for 7- and 28-day breaks, with 1 spare, shall be required for every 100 CY of concrete placed.
 - b. Two cylinders will be broken at 7 days and three at 28 days.
3. Laboratory technicians shall have free access to the job and concrete production facilities at all times and receive the full cooperation of the Contractor for the preparation, storage, and transportation of concrete sample test cylinders, test beams, slump and air testing.
4. Reinforcement bars shall be inspected and tested at the mill at which they are rolled, in accordance with "Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement", ASTM A615.
 - a. Two (2) certified copies of such tests shall be furnished to the Engineer.
 - b. All tests shall be made on the full size finished bars, and at least one (1) tensile and one (1) bending test shall be made for each lot of ten (10) tons or less from each melt of steel from which reinforcement steel is furnished for this work.
5. Testing of crystalline waterproofing systems shall be performed by an independent laboratory meeting the requirements of ASTM E 329, latest edition, and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product samples.
 - a. Crystalline Formation: Crystallizing capability of waterproofing system shall be evidenced by independent SEM (Scanning Electron Microscope) photographs showing crystalline formations within the concrete matrix.
 - b. 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.

- c. 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. The product shall be tested according to ASTM C 267-77 "Chemical Resistance of Mortars" and be resistive from any chemical with a pH between 3.0 to 11.0 in constant contact and 2.0 to 12.0 of periodic contact.
- d. Compressive Strength: Independent testing shall be performed according to ASTM C30 "Compressive Strength of Cylindrical Concrete Specimens". Concrete samples containing crystalline waterproofing additives shall be tested against untreated control sample. At 28 days, the treated samples shall exhibit an increase in compressive strength over the control sample.

B. Observation.

1. SCMSD designated representative will visually observe the work performed. The representative will notify the Engineer of any discrepancies with the contract documents in the course of the contractor performing the work. The progress observations by the SCMSD do not waive any rights or remedies, nor divest the Contractor of any responsibility for contract compliance or liability for damage.
2. A qualified representative of the testing laboratory shall inspect the plant and determine if the necessary facilities and equipment are available and adequate for scheduled production of concrete as specified.
 - a. Plant equipment and facilities shall be in accordance with applicable requirements of the latest edition of ASTM C94, ODOT CMS latest edition standards and as specified herein.
 - b. Equipment shall comply with the following requirements:
 - i. The accuracy of the weighing equipment shall conform to the requirements of the United States Bureau of Standards.
 - ii. Equipment shall be capable of compensating for the varying weight of moisture contained in the aggregates, or for changing the proportionate batch weights.
 - iii. The equipment shall be capable of accurately controlling the weight of the cement and aggregate.
 - iv. The equipment shall be so arranged as to permit the convenient removal of overweight material.
 - v. Standard testing weights and other necessary equipment for testing the accuracy of the weighing equipment shall be available at the plant at all times.
3. If the plant does not meet requirements, the Contractor shall be informed of the deficiencies so that they may be corrected.

4. When, in the opinion of the laboratory representative, the plant meets the requirements for specified production, he shall notify the Engineer in writing. The notification shall include a list of all major facilities necessary for use in production of specified concrete for use in the Project.
5. In lieu of the requirements above, the Contractor may submit the latest edition of the National Ready Mixed Concrete Association's "Check List for Certification of Ready Mixed Concrete Production Facilities," executed and certified for conformance by a Registered Professional Engineer.
6. Production of concrete shall not be started until the Engineer has approved the plant for use.
7. Examination for Defects: Do not conceal crystalline waterproof treated concrete before it has been observed by the 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 need to be repaired in accordance with manufacturer's repair procedures.

C. Crystalline Waterproofing Applications.

1. Manufacturer to be ISO 9001 registered, and to have no less than 10 years of experience in manufacturing the crystalline waterproofing additive for the required work. Manufacturers 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.
2. Applicator: Installer of crystalline waterproofing additive shall be approved by the manufacturer or manufacturer's representative in writing.
3. Pre-Installation Conference: Prior to installation of waterproofing, conduct meeting with the SCMSD, applicator (concrete supplier), concrete placer and waterproofing manufacturer's representative to verify and review the following:
 - a. Project requirements for waterproofing as set out in Contract Document.
 - b. Manufacturer's product data including application instructions.
4. The waterproofing manufacturer's representative shall provide technical consultation on waterproofing applications.
5. Comply with manufacturer's product data regarding installation, including technical bulletins, product catalogue, installation instructions and product packaging labels.
6. 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: It shall be the responsibility of the concrete contractor to take whatever measures are necessary, including testing, to ensure compatibility of additives or admixtures being used in the cementitious mix, and it shall be the responsibility of the installer of the surface-applied material that is to be applied to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion.

D. Warranty.

1. Refer to conditions of the contract for project warranty provisions.
2. For admixtures, manufacturers shall provide standard product warranty executed by authorized company official.
3. Term of warranty shall be a minimum of three (3) years from Date of Substantial Completion.

7.0 MEASUREMENT. Unless specifically ordered otherwise by the Engineer, the amount of concrete shall be included in the overall requirements set forth in the Contract Documents.

8.0 PAYMENT. The cost for all labor, equipment, tools, and all other necessary and incidental work to install concrete, concrete structures and concrete admixtures shall be included in other items except where specified and as follows below.

<u>Item</u>	<u>Unit</u>	<u>Description</u>
4A	CY	Low Strength Mortar (Project Specific)
4B	GAL	Grout (Project Specific)
4C	LS	Pad & Subbase (Equipment Being Installed)

END OF SECTION