

SECTION 321316.15-1
LITHOCRETE® ARCHITECTURAL CONCRETE PAVING SPECIFICATION
SYSTEM 1

PART 1 GENERAL

1.1 GENERAL CONDITIONS

- A. Requirements of "General Conditions of the Contract" and of Division 1, "General Requirements," apply to work in this Section with same force and effect as though repeated in full herein.

1.2 SCOPE OF WORK

- A. Furnish materials, labor, transportation, services, and equipment necessary to furnish and install Lithocrete® architectural concrete paving incorporating the patented Lithocrete® process as indicated on Drawings and as specified herein.
- B. Work included in this Section:
1. Installation of architectural concrete paving called Lithocrete® under US Patents (#4,748,788, #6,033,146, and #6,016,635), and US Trademarks (#1,879,329, #2,358,183, and #2,358,054).
 2. Lithocrete® Installers:
 - a) Arizona - Progressive Concrete Works, Inc., *Mike Riggs*, 623.582.2274
 - b) California
 - Chico - Robert T. Hill & Associates, *Robert Hill*, 530.891.4280
 - Fresno - All West Architectural, A Division of All West Construction, Inc., *Mike Carsten*, 559.237.9600
 - Orange/LA County, Shaw & Sons, *Ron Shaw*, 949.642.0660
 - San Diego, T.B. Penick & Sons, Inc., *Frank Klemaske*, 858.558.1800
 - c) Colorado – Colorado Hardscapes, *John Buteyn*, 303.750.8200
 - d) Nevada
 - Las Vegas - Architectural Stains, Inc., *Mike Anderson*, 702.871.0045
 - Las Vegas - Chief Concrete, Inc., *Matt Walker*, 702.435.4038
 - e) Florida - Artistic Concrete Surfaces ■ Harvey Namm ■ 888.567.8809
 - f) Georgia - CSolutions, A Division of Middle Georgia Concrete Constructors, Inc., *Scott Truax*, 678.797.1901
 - g) Minnesota - Hicks Concrete Construction, Inc., *Steven W. Hicks*, 763.420.7755
 - h) New Jersey, New York, Pennsylvania, Delaware, Maryland, Washington, D.C - Beyond Concrete, *Ira Goldberg*, 732.441.2500, estimating@beyondconcrete.com
 - i) New Mexico - Creative Concrete of New Mexico, Inc., *Mary Jo Arrell*, 505.343.9067
 - j) North Carolina - Carolina Bomanite Corporation, *Mike Bernath*, 704.364.1854 or 800.522.6514
 - k) Ohio - T.B. Penick & Sons, Inc., *Bob Bennett*, 614.801.1844
 - l) Texas
 - El Paso - Bomanite Artistic Concrete, *Aaron Echaniz*, 915.533.6497
 - Austin - Innovative Concrete Designs, LP, *Scott Carter*, 512.218.3400
 - San Antonio - Innovative Concrete Designs, LP, *Mike Logsdon*, 830.816.6670
 - m) Washington - Belarde Company, Inc, *John F. Belarde*, 425.376.2500
 - n) Wisconsin - JW Schultz Construction, *David Schultz*, 608.884.4720
 - o) Mexico - Quality Construction Services, S.A., *Pablo Aviles*, 01 55 53 80 54 37
- C. Work related in other Sections:
1. Section 02750 - Portland Cement Concrete Paving: Adjacent concrete paving.

2. Section 02810 - Irrigation System: Coordination of irrigation sleeve installation.
3. Section 02900 - Landscape Planting: Coordination of plant material placement.
4. Section 07900 – Joint Sealers: Installation of caulking.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- A. Federal, State and local laws and regulations governing this Work are hereby incorporated into and made part of this Section. When this Section calls for certain materials, workmanship, or a level of construction that exceeds the level of Federal, State, or local requirements, provisions of this Section take precedence.

1.4 APPLICABLE STANDARDS

- A. Specifications and recommended practices of American Concrete Institute (ACI), American Society for Testing and Materials (ASTM), The Uniform Building Code, and US Patents (#4,748,788, #6,033,146, #6,016,635), and US Trademarks (#1,879,329, #2,358,183, #2,358,054) referred to in this Specification with their individual designations are to be considered part of this Specification.
- B. Design and Control of Concrete Mixtures – Thirteenth Edition; Portland cement Association.

1.5 QUALITY CONTROL

- A. Quality control to be maintained by licensed installers of Lithocrete[®] throughout duration of project.
- B. Paving Subcontractor Qualifications: provide evidence to indicate successful experience in providing Lithocrete[®] similar to that specified herein and demonstrate successful experience
- C. Demonstration of experience: provide a minimum of 3 projects of installed Lithocrete[®] architectural paving totaling at least 200,000 s.f. with a reference list of each containing contact person and phone number of project's architect and owner's representative.
- D. Supervision: On site superintendent must have a minimum of 5 years experience installing Lithocrete[®].
- E. Slip Resistance: provide a finish with a slip resistance of equal or greater than 0.65 when tested by the owner in accordance with ASTM F 489

1.6 SITE INSPECTION

- A. Verify conditions at site that affect work of this Section.
- B. Take field measurements as required.
- C. Report major discrepancies between Drawings and field dimensions to Owner's Authorized Representative prior to commencing work.

1.7 SUBMITTALS

- A. Product Data: Submit no later than 10 days after contract award a typed list of products specified in this Section.

- B. Shop Drawings:
1. Submit shop drawings for reinforcing steel and accessories in accordance with ACI standards.
 2. Paving Jointing and Pour Sequence Plan - submit six blueprints indicating the following:
 - a. Proposed layout of contraction, construction and isolation joints. Clearly delineate the three different joint types.
 - b. Layout of paving types as indicated on Drawing Paving Schedule. Give overall dimensions of each paving type.
 - c. Concrete pours sequence. Indicate sequence of paving pour installation.
- C. Statement of Mix Design: Submit one (1) copy of Statement of Mix Design prepared by batch plant servicing Project for each load delivered to Project. Statement of Mix Design to contain following information:
1. Name, address, and telephone number of batch plant preparing statement of mix design.
 2. Date of mix design.
 3. Project location.
 4. Contractor requesting load delivery.
 5. Mix design number.
 6. Integral color used.
 7. Gradations for sand and aggregate.
 8. Material weights, specific gravity, and absolute volumes.
 9. Basis of testing, i.e. UBC 2605 D4 and Title 24 2604 D4.
 10. Water/cement ratio.
 11. PSI rating.
 12. Signature of testing laboratory manager.
 13. Signed stamp from registered Project structural engineer or architect.
- D. Lithocrete[®] Surface-Seeded Aggregate (extra stock):
1. One 1-pound sample of each Lithocrete[®] aggregate specified.
 2. One 100-pound sealed bag of each Lithocrete[®] aggregate specified for use by Owner in future repairs of damaged Lithocrete[®] concrete paving.
- E. Washed Concrete Sand (extra stock):
1. One 50-pound sealed bag of washed concrete sand similar to type used during installation of Lithocrete[®].

1.8 SUBSTITUTIONS

- A. None allowed unless approved in writing by Owner's Authorized Representative.

1.9 TESTING

- A. A testing agency may be designated by Owner or Owner's Authorized Representative. Testing personnel to meet ASTM E329 requirements.

1.10 MOCK-UPS

- A. Prior to construction, provide (1) 4-foot x 4-foot x 4-inch sample of each Lithocrete[®] paving type specified on Drawings.
- B. Ensure that each mock-up contains joint types specified on project, i.e. construction, contraction, and isolation.

- C. Locate mock-ups in a conveniently accessible and protected place. Approved mock-ups will be standard for future Lithocrete® installation review.
- D. Remove mock-ups from site upon completion of Work and approval by Owner's Authorized Representative.

1.11 PROJECT CONDITIONS

- A. Keep Work area clean, and in a safe and workmanlike condition so that rubbish, waste and debris do not interfere with work of other trades.

1.12 PRODUCT HANDLING

- A. Store materials in a dry and protected location. Protect reinforcing steel and dowels from rusting, deformation, staining, and moisture damage.
- B. Keep Lithocrete® aggregate dry at all times prior to installation.

1.13 COORDINATION

- A. Notify Owner's Authorized Representative and contractors performing work related to installation of Contractor's Work in ample time, so as to allow sufficient time for them to perform their portion of work.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT

- A. Type I, IA, II, IIA, III, IIIA, IV, and V cements, to conform to ASTM C150.
- B. Use same brand of cement from single source throughout entire project.
- C. Refer to Drawings for cement type specified.

2.2 WASHED CONCRETE SAND

- A. Clean, hard, and durable washed concrete sand, conforming to ASTM C33.
- B. Use same sand from single source throughout entire project.

2.3 COARSE AGGREGATE

- A. Clean, hard, and durable coarse aggregate, conforming to ASTM C33.
- B. Use same aggregate from single source throughout entire project.

2.4 LITHOCRETE® SURFACE-SEEDED AGGREGATE

- A. Refer to drawings for specified Lithocrete® surface-seeded aggregate type, size, color, and distribution percentage.
- B. Use same Lithocrete® surface-seeded aggregate from same source for each paving type specified throughout entire project.

2.5 WATER

- A. Free from deleterious materials such as oils, acids, and organic matter.

2.6 ADMIXTURES

- A. Integral Concrete Coloring Admixture: Refer to Drawings for color type and manufacturer.
 - 1. Acceptable Manufacturers:
 - a. L.M. Scofield: (800) 800-9900
 - b. Colorfull by Admixtures, Inc.: (626) 357-3263
 - c. QC: (800) 453-8213
 - d. Davis Color: (323) 269-7311
- B. Air Entrainment Admixtures: Conforming to ASTM C260.
 - 1. Acceptable Manufacturers:
 - a. Grace Construction Products; Daravair[®], (800) 433-0020 or www.graceconstruction.com/concrete/air_entraining.html#daravair.
 - b. Master Builders, Inc.; Micro-Air[®], (800) 628-9990 or www.masterbuilders.com/MB/pub/Product.asp?TypeCat=2&ParentID=78&ProductID=22.
- C. Water Reducing Admixtures: Conforming to ASTM C494, Type A.
 - 1. Acceptable Manufacturers:
 - a. Grace Construction Products; WRDA[®] (800) 433-0020 or www.graceconstruction.com/concrete/water_reducers.html#wrda.
 - b. Master Builders, Inc.; Micro-Air[®] (800) 628-9990 or www.masterbuilders.com.
- D. Shrinkage Reducing Admixtures: Conforming to ASTM C157.
 - 1. Acceptable Manufacturers:
 - a. Grace Construction Products; Eclipse[®] (800) 433-0020 or www.graceconstruction.com/concrete/shrinkage_reducers.html#eclipse.
 - b. Eclipse[®] Shrinkage Reducing Admixture is a liquid admixture which dramatically reduces concrete shrinkage and curling due to drying.

2.7 READY MIXED CONCRETE

- A. Batched mixed and transported in accordance with ASTM C94 - "Specifications for Ready Mixed Concrete."

2.8 REINFORCING

- A. Reinforcing Steel: Conforming to ASTM A615, clean and free of rust, dirt, grease or oils.
- B. Tie Wire: 16-gauge plain cold-drawn steel conforming to ASTM A82, clean, and free of rust, dirt, grease or oils.
- C. Supports for Reinforcement:
 - 1. Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars in place.
- D. Polypropylene Fiber Reinforcement: 100% virgin multifilament polypropylene fibers, complying with ASTM C 1116 - Type III.
 - 1. Acceptable Manufacturers:

- a. Fibermesh; Fibermix Stealth[®] – 1/4” long (423) 892-8080 or www.fibermesh.com/family/stealth.htm.
 - b. Grace Construction Products; MicroFiber[™] (800) 433-0020 or www.graceconstruction.com/concrete/fibers.html
2. Application Rate: 1/2 lb/cy of mix.

2.9 ISOLATION JOINT MATERIALS

- A. Refer to Section 07900 – Joint Sealers for isolation joint construction.

2.10 CONSTRUCTION JOINT DOWELS

- A. Construct Speed Dowel construction joints at modules not larger than 20’-0” x 20’-0”.
- B. Dowel schedule to match rebar schedule and at a minimum spacing of 18”o.c.
- C. 1/2-inch-diameter smooth dowel, free of dirt, grease, and oils. Encase 50 percent of each dowel in a Speed Dowel[™] plastic sleeve to allow parallel lateral movement of each Dowel. Double check steel dowel to Speed dowel tolerance to insure snug fit. Contact Greenstreak at (800) 325-9504 or www.greenstreak.com/speeddowelhome.htm. Or contact local suppliers such as White cap.

2.11 FLY ASH

- A. ASTM C618 - Type F. While fly ash may be used when using reactive Lithocrete[®] aggregates, when LEED certification is a concern or as a tool to enhance color, it should under no circumstances be used to replace more than 30% (by weight) of the cement content of the proposed mix.

PART 3 EXECUTION

3.1 SUBGRADE

- A. Subgrade to meet requirements of project’s soils report.
- B. Ensure that a minimum 4-inch layer of FREE DRAINING graded washed aggregate or clean washed and graded concrete sand compacted to 95 percent relative compaction is placed over subgrade prior to placing concrete.
- C. Place all aggregate base material to a smooth plane ensuring proper slab design thickness to a tolerance plus or minus 1/2”.
- D. Ensure that utilities, including irrigation lines are buried and compacted below bottom of sand layer.
- E. Keep sand damp prior to placing concrete.

3.2 FORMING

- A. Be responsible for design and engineering of form work as well as its construction.
- B. Ensure that work conforms to recommended practice for concrete form work (ACI 347), latest edition.
- C. Do not exceed 20-feet by 20-feet in a formed construction area.

- D. Ensure that form lumber is new #2 or better grade wood. Do not use used form lumber.
- E. Perform form layout with a digital electronic transit for line layout accuracy.
- F. Allow forms to remain in place long enough to allow concrete to set properly. Remove forms when appropriate.

3.3 DESIGN OF MIXES AND PROPORTIONING

- A. Proportion and mix of cement, aggregate, admixture and water to attain required plasticity and strength in accordance with current edition of ACI Manual of Concrete Practice and PCA "Design and Control of Concrete Mixtures."
- B. Concrete mixtures to be designed by an approved commercial testing laboratory, using approved materials to obtain specified minimum compressive strength.
- C. Concrete Mix Criteria:
 1. Slump: 5-inch, with a 1/2-inch slump differential between successive batches. Obtain approval from Owner's Authorized Representative if slump is outside these parameters.
 2. Minimum PSI Rating at 28 days: 4,500.
 3. Cement quantity per yard of mix:
 - a. Minimum: 6 sacks.
 - b. Maximum: 7 sacks.
 4. Water/cement ratio: 0.45 – 0.52.
 5. Sand: 50-55% of total mix.
 6. Blended Gravel: 45-50% of total mix.
 7. Admixtures:
 - a. Air entrainment: Per local standards.
 - b. Shrinkage Reducing: Do not exceed 2% by weight of cement.
 8. Fly ash: Use only when seeding reactive Lithocrete[®] aggregates such as glass and seashells or per item 2.11 above.
 9. Non-Chloride Accelerators: Do not use corrosive accelerators such as calcium chloride.
 10. Concrete Delivery: Use of concrete loads exceeding 90 minutes from time of batch plant must be approved by Owner's Authorized Representative.
 11. Ensure that batch plant guarantees single source supply for cement, sand, and aggregate for the entire project.
 12. Final mix designs shall be based on criteria above and meet critical minimum points stipulated in items 2,4, and 7 above. Other items may vary by geographical region and required certain modifications but shall in no way compromise the strength and integrity of mix design stipulated.

3.4 LITHOCRETE[®] SURFACE-SEEDED AGGREGATE INSTALLTION

- A. Lithocrete[®] is a patented paving process. Installation of Lithocrete[®] surface-seeded aggregate must be performed by a licensed Lithocrete[®] installer only.
- B. Contact Lithocrete[®] at (949) 642-0660 for a licensed Lithocrete[®] installer in project area.
- C. Lithocrete[®] is installed in accordance under US Patents (# 4,748,788, #6,033,146, and #6,016,635) and US Trademarks (#1,879,329, #2,358,183, and #2,358,054).
- D. Lithocrete[®] process incorporates use of following patented products:
 - a. Lithocrete[®] Conditioner
 - b. Lithocrete Etch Retarder[®]

- c. Lithoseal™ paving sealer

3.5 JOINTING

- A. Refer to ACI 302 “Guide for Concrete Floor and Slab Construction” for work under this section.
- B. Construction and Contraction Joints:
 - 1. Sawcut construction and contraction joints in locations indicated on Drawings.
 - 2. Perform jointing with a new diamond tip circular saw.
 - 3. Joint Width: Per Drawings. Do not exceed 3/16-inch in width.
 - 4. Depth of sawcuts: 1/4th depth of slab.
 - b. Decorative Sawcut Joints: Per Drawings.
 - 5. Sawcut joints in a straight line with no overcutting.
 - 6. Use a hand tool to sawcut up to vertical edges such as walls, steps, curbs and columns. No cutting into vertical surfaces will be allowed nor shall saw-cuts be allowed to stop short of vertical surfaces and allowed to crack to the end.
 - 7. All saw-cuts shall be further treated with a Soff-Cut Beveled Blade or sealed with structural silicone joint sealant to be determined by the Architect.
- C. Isolation Joint Caulking:
 - 1. Install isolation joint caulking to be installed under Section 07900 – Joint Sealers.

3.6 CURING

- A. After initial Lithocrete® aggregate exposure, continuously sprinkle or fog paving with water for minimum 7 days or install a moisture retaining, non-staining, non-woven curing cover and maintain sufficient moisture under cover to provide for 100% humidity conditions at Lithocrete® surface for a minimum of 7 days. Cover shall be reflective in nature to prevent excessive heat build up under cover and allow for optimal curing conditions.

3.7 SEALING

- A. Seal surface of paving using Lithocrete® Sealer.
- B. Final cleaning, staining, caulking, and sealing operations shall not commence until Lithocrete® surfaces have been completely and properly cured or 28 days which ever is later.
- C. Follow Lithocrete® Sealer directions when applying this product (sealer must be applied in 3 to 6 coats).

END OF SECTION