

SECTION 03330 - ARCHITECTURAL CAST-IN-PLACE CONCRETE

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 Architectural Cast-in-place Concrete (Lithocrete®) incorporating the patented Cast-in-place concrete (Lithocrete®) process as indicated on Drawings and as specified herein.

B. Work included in this Section:

1. Installation of architectural concrete paving called Architectural Cast-in-place concrete (Lithocrete®) under U.S. Patents (# 4,748,788- # 6,033,146 - # 6,016,635 and U.S. Trademark #1,879,329, # 2,358,183 # 2,358,054).

2. Only experienced Architectural Cast-in-place Concrete installers, certified to install (Lithocrete®) are acceptable for this project. Acceptance of certification will be based on proof of certification, experience and approved samples and mockups to be provided within 30 days after Notice to proceed. If timeframe is exceeded, suitable certification/experience is not provided, or mockups are unacceptable – installer will not be eligible to install project.

3. Approved samples, used for design of this project are available at **(location)**, as prepared by Colorado Hardscapes. A recommended certified installer is:

Colorado Hardscapes, Inc.
8085 E Harvard Ave
Denver, CO 80231
303-750-8200

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, under U.S. Patents (# 4,748,788- # 6,033,146 - # 6,016,635 and U.S. Trademark #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 certified & 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. As part of the bid submittal the General Contractor shall submit background information/qualifications on his Architectural Cast-in-place Contractor certified for Lithocrete® installation. This information shall provide evidence to indicate successful experience in providing concrete work identical to that specified herein. A listing of projects shall be provided and shall be reviewed and approved as comparable projects to the specified work by the Owner or Architect prior to award of bid. Failure to provide this information or the submittal of incomplete or inaccurate information shall give cause to reject the entire bid as non responsive and incomplete. The submittal shall provide the Owner and Architect with evidence of successful experience in Lithocrete® similar to that specified herein and can demonstrate successful experience through past project documentation and references.
- D. Demonstration of experience: provide a minimum of five (5) projects of installed Lithocrete architectural cast-in-place concrete totaling at least 10,000 square feet with a reference list of each containing address of installation, contact person and phone number of project's architect or owner's representation. Minimum size of each individual installation shall be 800 square feet. Provide two (2) color photos, 8" x 10" size, of each installation listed above representing the installation. Photo #1 shall show the approximate size of the installation. Photo #2 shall be taken approximately 2 to 3 feet from the paving service. See submittals portion of this section for additional information.
- E. Supervision: On site superintendent must have a minimum of 10 years experience installing Architectural Cast-in-place concrete. See submittals portion of this section for additional information.
- F. 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 30 days after contract award all items required in this section.
 - B. Shop Drawings:
 - 1. Submit shop drawings for reinforcing steel and accessories in accordance with ACI standards.
 - 2. Architectural Cast-in-Place Jointing and Pour Sequence Plan - submit 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 in drawings. Give overall dimensions and location of each different type of Architectural Cast-in-place concrete.
 - c. Concrete pours sequence. Indicate sequence of pour installation.
 - C. Statement of Mix Design: Submit (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. Submit evidence of Licensed/certified quality control procedures and experience. Installer qualifications for experience, demonstration of square footage installed, number of projects, and contact information to verify experience; evidence of supervisor experience, and slip resistance as indicated in Quality Control section of this specification.
- E. Lithocrete[®] Surface-Seeded Aggregate (extra stock):
 - 1. One 1-pound sample of each Lithocrete[®] aggregate specified.
- 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 COURSE 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.
 - e. Solomon Colors (800) 624-0261
 - 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 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.

PART 3 EXECUTION

3.1 SUBGRADE

- A. Subgrade to meet requirements of project's soils report.
- B. Ensure that a minimum 2-inch layer of graded washed concrete sand compacted to 95 percent relative compaction is placed over subgrade prior to placing concrete.
- C. Screed sand to a smooth plane.
- 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: minimum of 4 inch, max 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: 3,000.
 - 3. Cement quantity per yard of mix:
 - a. Minimum: 6 sacks.
 - b. Maximum: 7 sacks.
 - 4. Water/cement ratio: 0.55 – 0.65.

5. Sand: 50% of total mix.
6. Coarse aggregates to be a blend of 1" to 3/8".
7. Admixtures:
 - a. Air entrainment: Per local standards
 - b. Shrinkage Reducing: Do not exceed 2% by weight of cement.
8. Fly ash: ASTM C618 – Type F.
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.

- D. Custom Architectural Cast-in-Place Concrete sample mixes are based on custom samples held in the (location). The custom mix designs involve (number) different Architectural Cast-in-place Lithocrete finishes as indicated in Drawings, involving custom color integral color concrete additives, different glass and rock aggregates seeded into the mix and honed finishes. Exact match to these referee samples is required.

3.4 LITHOCRETE® SURFACE-SEEDED AGGREGATE INSTALLTION

- A. Architectural Cast-in-place concrete "Lithocrete®" is a patented Architectural Cast-in-place concrete process. Installation of Lithocrete® surface-seeded aggregate must be performed by a licensed Lithocrete® installer only.
- B. For certified Lithocrete® installers, see elsewhere in this specification of contact Lithocrete® at 800-899-9921.
- C. Lithocrete® is to be installed in accordance under U.S. Patents (# 4,748,788- # 6,033,146 - # 6,016,635 and U.S. Trademark #1,879,329, # 2,358,183 # 2,358,054) – applicable to Lithocrete® product.
- 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.

- C. Isolation Joint Caulking:
1. Install isolation joint caulking to be installed under Section 07900 – Joint Sealers.

3.6 CURING

A. After Lithocrete is placed, cure concrete for a minimum of seven (7) days (or longer) without foot traffic and a minimum of thirty (30) days or longer without vehicular traffic for all Architectural Cast-in-place areas. Contractor shall verify these suggested time frames and shall coordinate this schedule with other related construction.

3.7 SEALING

- A. Seal surface of paving using Lithocrete[®] Sealer.
- B. Follow Lithocrete[®] Sealer directions when applying this product (sealer must be applied in 3 to 6 coats).

END OF SECTION

(Name of Project)

REQUIRED ARCHITECTECTURAL CAST-IN-PLACE CONCRETE SUB-CONSULTANT INFORMATION

The proper installation of specialty concrete finishes such as Lithocrete is critical to the success of the project. The bidder, **or the bidder's subcontractor**, shall have five (5) or more Lithocrete® projects installed. Minimum size of individual installations shall be 800 square feet.

I. LICENSED LITHOCRETE INSTALLER

- Contractor: _____
- Project Manager/Foreman: _____
- Phone Number: _____

II. COMPARABLE PROJECT LIST (PROVIDE MINIMUM OF 5)

1. Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____
2. Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____
3. Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____
4. Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____
5. Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____

Provide two (2) color photos, 8"x10" in size, of each installation listed above. Photo #1 shall show the approximate size of the installation. **Photo #2 shall be taken approximately 2 to 3 feet from the respective paving surface.** Photos shall clearly show the detail associated with the Lithocrete® finish or the photo(s) will be rejected. The bidder must submit the above information along with the color photos with the bid. Failure to submit the information and photos shall be considered a non-

8085 E. Harvard Ave.

responsive bid and therefore the bidder shall be considered non-responsive. The bidder furthermore shall review the specialty concrete samples on file with the Owner. The signature below acknowledges that the bidder has reviewed the Owner's samples.

Signature of Bidder

Date

Denver, CO 80231

P: 303.750.8200

F: 303.750.8886