

SECTION 32 13 16 - DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes decorative concrete paving types:
 - 1. Finish A: Integrally colored concrete paving with a light exposed aggregate finish.
 - 2. Finish B: Integrally colored concrete paving with a medium sandblast finish.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product, including aggregates, and for each color and texture specified.
- C. Other Action Submittals:
 - 1. Design Mixtures: For each decorative concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. ACI Publications: Comply with ACI 301 unless otherwise indicated.
- D. Mockups: Build mockups of each type of decorative concrete paving not less than 120 x 168 inches to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship.
- E. Preinstallation Conference: Conduct conference at Project site.
- F. Review of Formwork Layout: Owner's Representative to review and approve form layout of each pour prior to installation of concrete.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615, Grade 60; deformed.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, gray portland cement, Type I-II, manufactured by Buzzi Cement. Product – Buzzi Cement. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C or F.
 - b. Slag: ASTM C 989, Manufacturer: Holcim, product: Holcim-Birmingham.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4M, uniformly graded. Provide aggregates as follows:
 - 1. Granite Aggregate:
 - a. Size: No 57.
 - b. Material: Dark gray locally available granite. Manufacturer: Hanson Aggregates, Product: Hanson-Lithonia MFG.
 - c. Proportion: 100% of total aggregate by volume.
- C. Natural sand
 - 1. Manufacturer: Lambert
 - 2. Product: Hanson-Lithonia MFG.
- D. Manufactured sand
 - 1. Manufacturer: Hanson Aggregates
 - 2. Product: Hanson-Lithonia MFG.

- E. Water: Potable and complying with ASTM C 94/C 94M.
 - F. Air-Entraining Admixture: ASTM C 260.
 - 1. Manufacturer: W.R. Grace & Co.
 - 2. Product: Darex II.
 - G. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water reducing admixture, Type A, ASTM C 494/C 494M
 - a. Manufacturer: W. R. Grace & Co.
 - b. Product: Zyla 620.
 - H. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
 - 1. Product: L.M. Scofield Company; Chromix Admixture or approved equal.
 - 2. Color: Landmarks Gray.
 - I. Top Surface Retarder: Apply to freshly placed concrete for duration recommended by manufacturer.
 - 1. Manufacturer: Dayton Superior by W.R. Grace & Co.
 - 2. Product: Topcast 05.
- 2.4 CURING MATERIALS
- A. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
 - B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
 - C. Clear Acrylic Sealer: Manufacturer's standard, waterborne, nonyellowing and UV-resistant, membrane-forming, medium-gloss, acrylic copolymer emulsion solution, manufactured for colored concrete, containing not less than 15 percent solids by volume.
 - 1. Product: L.M. Scofield Company; Cureseal W, matte or approved equal.
 - 2. Application: Apply after sandblasting.
- 2.5 RELATED MATERIALS
- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

2.6 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
 - 2. Compressive Strength (28 Days): 4000 psi.
 - 3. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.48 max.
 - 4. Slump Limit: 4 inches, plus or minus 1 inch.
 - 5. Air Content: 5 percent plus or minus 1.5 percent.
- B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 6. Fly Ash: 20 percent.
- D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Proof-roll prepared subbase surface below decorative concrete paving to identify soft pockets and areas of excess yielding.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- D. Owner's Representative to review and approve form layout of each pour prior to installation of concrete.
- E. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.2 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent decorative concrete paving.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool as shown on Drawings. Repeat tooling of edges after applying surface finishes. Eliminate edging tool marks on concrete surfaces.

3.3 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, placing, and consolidating concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.4 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

3.5 INTEGRALLY COLORED CONCRETE FINISH

- A. Lightly Exposed Aggregate Finish:
 - 1. After final floating, finish concrete with a steel trowel to eliminate

surface irregularities and voids.

2. After final floating and steel trowel finish, apply surface retardant per manufacturer's instructions. Hosing and brushing to occur after manufacturer's recommended period of time to produce lightly exposed aggregate finish.
3. Depth of Cut: Hosing and brushing to lightly expose aggregate and surrounding matrix surface to match mockup, as follows:
 - a. Lightly Exposed Aggregate: Expose fine aggregate with occasional exposure of coarse aggregate; maximum 1/16 inch reveal.
4. Surface Continuity: Perform lightly exposed aggregate finish in as continuous an operation as possible to maintain continuity of finish on each surface or area of work.

B. Medium Sandblast Finish:

1. After producing lightly exposed aggregate finish, apply medium sandblast finish. Perform sandblasting at least 72 hours after placement of concrete. Coordinate schedule to ensure that surfaces to be sandblasted are treated at the same age to ensure uniform results.
2. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surface to match mockup, as follows:
 - a. Medium Sandblast: Expose fine aggregate with occasional exposure of coarse aggregate; maximum 1/8 inch reveal.
3. Surface Continuity: Perform sandblasting in as continuous an operation as possible to maintain continuity of finish on each surface or area of work.

3.6 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Comply with ACI 305.1 for hot-weather concreting.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining cover curing, or a combination of these as follows:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the water, or water-fog spray.
 2. Moisture-Retaining Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- E. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and

during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

- F. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

3.7 SEALER

- A. Clear Acrylic Sealer: Apply uniformly in two coats according to manufacturer's written instructions. Allow first coat to dry before applying second coat, at 90 degrees to the direction of the first coat.

- 1. Begin sealing dry surface no sooner than 14 days after concrete placement.

3.8 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117.

3.9 REPAIRS AND PROTECTION

- A. Remove and replace decorative concrete paving that is broken or damaged or does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Owner's Representative.
- B. Protect decorative concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain decorative concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION