



**SPECIAL PROVISIONS
FOR
SCULPTED CONCRETE**

**Polk County
EDP-PA26(002)--7Y-77**

**Effective Date
October 15, 2024**

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

231040.01 DESCRIPTION.

This special provision includes concrete and shotcrete that is tooled, stamped, textured, colored, and finished by an experienced artisan to create sculpted concrete to mimic the appearance of natural rock, including furnishing materials, transporting, placing, finishing, curing and other appurtenant items of construction.

A. Submittals.

1. Permanent installations of sculpted concrete shall not be constructed on the project before the submittals and quality assurance items have been reviewed and approved by the Engineer.
2. See Section 1105 of the Standard Specifications for general submittal requirements and Special Provisions for In-River Structural Concrete for concrete submittal requirements.
3. The following documents shall be submitted in accordance with project specifications.
 - a. Submit integral color pigment samples or colored concrete chip and appropriate technical information on color pigments, dry-shake color hardeners, stains, texture mat patterns, and sealants.
 - b. Other appropriate technical information for placing and finishing sculpted concrete.
 - c. Three samples of colored, stained, textured, or stamped concrete for each sculpted concrete finish type on the project measuring at least 48 inches by 48 inches shall be submitted to the Engineer for the purpose of approving the aesthetic concept of sculpted concrete before construction of the large sample areas, including selected colors, shades, hues, and surface texture. The Engineer will have 15 calendar days to either approve or reject the submittal. Production of sculpted concrete shall use the same materials, colorants, finishes and mix proportion as the approved concept samples or as revised during construction and approval of the larger sample area.

B. Quality Assurance.

1. The sculpted concrete Contractor shall meet the following requirements. Documentation must be provided to the Engineer, prior to any work onsite.
 - a. The Contractor must have successfully completed at least three demonstrated projects, totaling at least 5000 square feet within the last 5 years, utilizing the methods proposed for this project to replicate natural rock surfaces with textured or stamped and colored concrete. Demonstrated projects shall include projects such as zoos, golf courses, waterways, and other high-end rock simulations. Portions of demonstrated projects submitted (or area accounted in these qualification requirements) shall not include any work related to residential construction, driveways, paths, curbs, and so forth. The Contractor shall submit a statement detailing related experience and in meeting stated requirements.
 - b. The Contractor shall submit a list of these three demonstrated projects as specified above, including photographs as noted below. The list shall include project name, location and the name, address and phone number of an Owner's representative who can be contacted as a reference. Also included shall be the name of the project's manager and other key individuals.
 - c. The Contractor shall submit the name of the crew chief of the work to be performed and their experience must include at least one of the demonstrated projects acting in the same role. The crew chief shall be onsite during placement of sculpted concrete and shall direct all finishing and sculpting efforts.
 - d. The Contractor shall submit at least three 8 inch by 10 inch color photographs of each of the demonstrated projects listed above to demonstrate the Contractor's ability to replicate natural surfaces.
2. The Engineer will review the submittals described above and will either approve or reject the Contractor's qualifications for performing the work on this project.
3. Construct sample areas for each type of sculpted concrete to be used on the project based on the approved 48 inch by 48 inch samples. Each area shall measure not less than 50 square feet. The sample area shall represent the finished surface texturing, coloring, and etching of the sculpted concrete features. The Engineer and/or other representatives of the Contracting Authority shall observe and approve the sample panel prior to the construction of any sculpted concrete features. The location of each sample area will be determined with the Engineer, and if acceptable, the sample area may remain in place, if not the sample area shall be removed and a second sample area shall be constructed. Additional sample areas shall be constructed until approved by Engineer. Approved sample areas are not to be repeated exactly in the project or pre-cast. Variation of the texture, coloring, and surface relief of sculpted concrete throughout the project is required that meets the aesthetic concept approved by the Engineer.
4. At least 10 working days prior to beginning the work, submit to the Engineer for review and approval all working drawings and calculations required to complete the work. The working drawings shall clearly show all sculpted concrete features, embedded rocks, sketches of their shapes and features that show geologic intent, and all visible elements of the work. The working drawings shall also show reinforcing details, transition details including reinforcing, and details of connections to any previously completed work.
5. During installation, remove small (4 inch to 6 inch square) areas of sculpted concrete after placement, sculpting, and surface treatment coloring for visual testing purposes by the Engineer. The Engineer will verify depth of penetration of surface treatment coloring. Replace and repair these areas immediately so that no cold joints or color variations occur. Approximate tests may be one per 3 square yards to 10 square yards.

231040.02 MATERIALS.

A. Concrete Materials.

1. Concrete, shotcrete, admixtures, surface treatments, and finishes for sculpted concrete shall meet the requirements of Special Provisions for In-River Structural Concrete as modified below.
 - a. Fibrous Concrete Reinforcement: Shall be included for Sculpted Concrete, Type I and meet the requirements of Special Provisions for In-River Structural Concrete.
 - b. Color Additives for Sculpted Concrete: Sculpted concrete shall have integral color pigments added to the mix at the rates indicated as acceptable following sample panel/sample area installation.
 - 1) Basis of design color shall match the pigment used in the Phase 1 Dam Modifications and User Access Project as follows:
 - a) River Stone SikaColor Powdered Integral Color as manufactured by the Sika Corporation.
 - b) Alternate suppliers subject to color matching requirements include Brickform, Butterfield Color, or Approved Equal.
 - 2) Colored additives shall contain pure, concentrated mineral pigments specially processed for mixing into concrete and complying with ASTM C979.
 - 3) Color additives containing carbon black are not acceptable. Black and gray coloring shall be obtained using black iron oxide pigments.
 - 4) The Contractor shall determine exact color or combination of colors to be added to mimic the natural rock of the project and construct sample panels for approval by the Engineer. Color samples shall be submitted to the Engineer prior to sample panel construction.
 - 5) The Contractor shall determine the exact dosage required to produce concrete to mimic the natural rock of the project as per manufacturer recommendations and Engineer approval.
 - 6) Meter and dispense colors using computer-controlled automated color weighing and dispensing systems provided by the manufacturer of the color additive. As an alternative, manual dispensing may be used and accomplished by addition of premeasured disintegrating bags. Particular attention must be given to thorough mixing of concrete after addition of the color additives.
 - 7) Do not re-temper mix by adding water in the field.
2. **Surface Treatment and Finishes.**
 - a. Basis of design surface treatment finish shall match the appearance of the approved mock-ups for the Phase 1 Dam Modifications and User Access Project as follows: Walnut CS-1000 Blush-Tone Acid Stain as manufactured by Brickform. Alternate surface finishes subject to matching the basis of design treatment are contained in the rest of this article below.
 - b. **Dry Shake Color Hardeners:** Color hardeners shall be as manufactured by Brickform, Scofield Company, Butterfield Color, or approved equal at the manufacturer recommended application rates or as approved following sample panel(s) installation. The Sculpted Concrete Contractor shall determine exact color or combination of colors to be applied to mimic the natural rock of the project and construct sample panel for approval by the Engineer. Color samples shall be submitted to the Engineer prior to sample panel construction.
 - c. **Stain and Sealant:** Concrete stain, where required by contract documents, shall be as recommended by the Contractor to meet the following requirements.
 - 1) Create base colors, and color variations that are deemed acceptable following sample panel/sample area production.
 - 2) Accurately simulate hues, streaking and coloration matching onsite bedrock and boulders.
 - 3) Must maintain color (little to no fading) in submerged conditions or direct sunlight.
 - 4) Following staining, the finish shall be sealed with sealant recommended by the Sculpted Concrete Contractor and stain manufacturer, and shall meet the following requirements:
 - a) No discoloration with exposure to sunlight.
 - b) Increases durability by limiting water penetration.
 - c) Preserves color of original stain.
 - 5) Stain and sealants shall be applied per manufacturer's recommendations.

- d. **Copper Shake:** The copper shall be from 98% to 99.999% pure electrolytic copper powder - 325 Mesh.
- e. **Coloring and Finishes Summary:** See the information in the following table for a summary of the coloring and finishes requirements for this project.

3. Sculpted Rock Color Admixtures and Finishing Requirements. Project requirements for sculpted rock coloring and finishing per table below:

Finish	Integral Concrete Color	Dry-Shake Surface Color Hardeners	Surface Stains	Copper Shake
Sculpted Rock – All Types	Yes – In a minimum of the top 5 inches. (Care will be taken to ensure that there are no cold joints) Minimum of 5% color additive. Color to be selected by Engineer.	As recommended by Contractor	As recommended by Contractor	Include on 10% of total area of the sculpted rock – Areas are generally located within and adjacent to the drops as directed by Engineer. Apply in addition to other finish treatments but do not paint over.

B. Concrete Accessory Materials.

- 1. Concrete accessory materials for sculpted concrete shall meet the requirements of Special Provisions for In-River Structural Concrete as modified below.
- 2. Colored powder release agent shall be Antique Release as manufactured by Brickform, Scofield Company, Butterfield Color or approved equal by Engineer.
- 3. Liquid Membrane: Membrane-curing compound shall be in accordance with ASTM C309. Membrane curing compound shall be sprayable, 18% minimum solids content, manufactured by L&M Construction Chemicals, Inc., Euclid Chemical Company, TK Products, or approved equal. Membrane curing compound used on colored concrete shall be in accordance with ASTM C1315 and shall be manufactured by L&M Construction Chemicals, Inc., Euclid Chemical Company, ChemMasters, Conspec, Dayton Superior, Kaufman Products, Inc or approved equal. Curing compound shall be non-toxic. When used on colored or stained concrete, curing compound shall be approved by color additive/stain manufacturer and compatible with the color additives, stains, and any surface treatments/finishes used.

C. Reinforcement.

- 1. Reinforcement for sculpted concrete shall be in accordance with Section 2404 of the Standard Specifications.
- 2. Dowels or rock anchors shall be embedded in the grouted core rock or bedrock and attached to sculpted concrete reinforcement as per lap length and embedment requirements as shown on plans. Dowels or rock anchors shall be installed at a rate of one dowel/anchor per 5 square feet, unless shown otherwise on plans.

231040.03 CONSTRUCTION.

A. General

- 1. Concrete placement, conveyance, and consolidation shall meet the requirements of Special Provisions for In-River Structural Concrete.

2. Complete all subgrade and surface preparations, reinforcement, and form installation 24 hours prior to any pour to allow inspection and approval by Engineer.

B. Surface Preparation.

1. General.

- a. Moisten subgrade prior to placement, but do not cause water to pond, nor muddy or soft spots to appear.
- b. Designate limits of each placement and obtain Engineer's review of entire installation area prior to proceeding.
- c. Engineer will inspect and approve all subgrade prior to installation.

2. Concrete Placed Against Hardened or Existing Concrete.

Prior to placing fresh concrete against surface of hardened concrete, remove all laitance, foreign substances (including curing compound), wash with clean water, and thoroughly wet hardened surface before placing fresh concrete.

C. Joints.

1. Construction joints (i.e., expansion and contraction/control joints) shall be at locations shown on plans and as required between placements. Engineer will approve the location of all construction joints not shown on plans.
2. Where saw-cut joints are required or permitted, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. In all cases, the saw cutting shall be completed no later than within the first 12 hours after the slab finishing operations have been completed.
3. Edge exposed edges of floated or troweled surfaces with a tool having a 1 1/2 inch corner radius unless these edges are specified to be beveled.

D. Sculpted Concrete Finishes.

1. Sculpted concrete shall have a combination of surface stain and/or dry-shake color hardener, and integral concrete color to simulate onsite rock outcrops, bedrock, or individual boulders as designated by the Engineer. The surface shall have a character as presented in the working drawings and sample panel and blend harmoniously with other portions of the work. Sculpted concrete work shall be performed to match the approved sample areas and use the same construction procedures and techniques employed to assemble the approved sample areas.
2. **General.**
 - a. Concrete for Sculpted Type I shall be placed at a slump appropriate to the slope of the slab being placed but generally have a slump between 1/2 to 2 inches. Slopes steeper than 3 to 1 (horizontal to vertical) shall be placed using irregular step forms or as shown on Plans.
 - b. Type I Sculpted Concrete may also be shotcrete applied using a wet mix process per the following:
 - 1) Placement Techniques: Provide a platform that permits nozzleman unobstructed access to the receiving surface. Place shotcrete first in corners, recesses, and other areas where rebound and overspray cannot escape easily. Remove rebound and overspray from previously prepared surfaces prior to shotcrete placement.
 - 2) Place shotcrete with nozzle held approximately perpendicular to the receiving surface. In corners, direct nozzle at approximately 45 degree angle or bisect the corner angle. Apply

shotcrete so sags or sloughing do not occur. Discontinue shooting or shield the nozzle stream if wind causes separation of ingredients during shooting.

- 3) Do to reuse rebound or overspray. Remove laitance from shotcrete surfaces to receive additional shotcrete layers. Surface preparation after final set shall comply with Article SP-231040.03, C, 3. Do not apply shotcrete on surfaces with standing water from adjacent surfaces, including exposed reinforcement.
 - 4) Encasement of Reinforcement: Place shotcrete to completely encase reinforcing steel. Encase reinforcement by shooting with enough velocity and plasticity so material flows around and behind the reinforcement. Front face of reinforcement shall remain clean during encasement.
 - 5) Place shotcrete to provide the cover over reinforcement required by ACI 301. Minimum slump of shotcrete is 1 inch.
- c. During and immediately after placement, thoroughly compact and work concrete around all reinforcements, embedments, and into corners of forms, eliminating all air or stone pockets that may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall be used to consolidate concrete.
 - d. Use trowels, floats, brushes/brooms, and other concrete finishing tools to consolidate, build up, sculpt, and texture the surface.
 - e. Finished surfaces must be slip resistant.
 - f. Do not dampen finishing tools when integral colored concrete is used.
 - g. Do not over-trowel or start troweling late when integral colored concrete is used.
 - h. Use dry shake color hardeners and/or stains to create color accents. Apply per manufacturer recommendations.
 - i. Stain shall be applied once the concrete has cured 28 days or as recommended by stain manufacturer. A sealant shall be applied per manufacturer recommendations that is compatible with the stain used.
 - j. Texture mats or stamps may be used to attain desired effect. Final sculpted concrete surface finishes shall not be uniform or repeatable. Colored powdered releasing agents may be used to enhance the finish.

3. Appearance and Types.

- a. Sculpted concrete finishes shall be the result of hand carving, texturing, stamping, and smoothing of concrete by experts provided by the Contractor and approved by the Engineer, based on previous work examples, and approved test panels for this project.
- b. Appearance of the sculpted concrete shall of a quality and detail similar or exceeding that shown in the photos shown in the plans. Colors and shading shall be determined in the submittal process with the intent being to match the color and shading of natural rock on the project.
- c. Sculpted Type I: Finish shall be concrete or shotcrete and consist of variable surface relief of up to 6 inches above and 4 inches below design grade or as shown on the Plans, with variable sculpted surface joints (fissures) of 1/2 inch to 1 1/2 inch deep in an irregular pattern. Joint edges shall be smoothed and rounded. All edges and corners shall have a minimum radius of at least 1½ inches unless otherwise approved by the Engineer. Supplemental reinforcing of surface variability, relief, or features is not required, see Plans. Finish shall also consist of placing foil or “rubber skin” over the surface to create minor (1/8 inch deep) irregular lines in the surface. Texture mats/stamps may be used to create surface texture. Concrete shall be integrally colored and surface colored with dry-shake color hardener and stains to match appearance as described above. The finish will be partially submerged and in direct contact by people. Final sealing, as recommended by the Contractor and coloring product manufacturers, shall not allow efflorescence unless deemed by the Engineer to enhance the quality of the work.
- d. Areas where powdered copper shall be worked into the surface shall be as directed by the Engineer. Powdered copper shall be worked in evenly within the upper 1/2 inch of the sculpted concrete finish. The application shall be at no less than 3 pounds per square yard.
- e. If not identified elsewhere in the contract documents, a Type I finish is to be used.

- f. Finishes of sculpted concrete that do not meet the requirements of the contract documents shall be removed and replaced at the Contractor's sole expense.

E. Safety Of Whitewater Users.

1. Sculpted concrete shall be installed to meet project safety requirements for recreational whitewater use as directed by the Engineer including, but not limited to, no sharp edges or protrusions oriented in the upstream direction or in areas of fast-moving water, large gaps or holes that could entrap persons or persons extremities, and slopes or features of the sculpted concrete that impair access to or from the water.
2. Should the Engineer deem any sculpted concrete areas unsafe for recreational whitewater use, the areas shall be modified or removed and replaced at the Contractor's sole expense.

F. Curing.

1. Curing method shall be compatible with, and not cause any discoloration or damage to, surface finishes and color treatments.
2. Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures and shall be maintained without drying at a relatively constant temperature for the period of time necessary for the hydration of the cementitious materials and proper hardening of the concrete. A list of all intended curing methods including a description of materials shall be submitted to the Engineer for review.
3. Initially, the concrete temperature shall be maintained at or above 70° F for 3 days or at or above 50°F for 5 days. Continue curing as required to achieve the specified 28 day strength.
4. Keep concrete continuously moist for at least 7 days after placement by use of ponding or continuous sprinkling as noted below:
 - a. Begin as quickly as possible after initial set.
 - b. Provide complete coverage with minimum of runoff by regulating rate of water application.
 - c. Interrupt application of water to walls for finishing or repair work only over areas being finished.
 - d. Do not permit wall areas to become dry that are not being finished.
 - e. Resume curing immediately after each day's finishing operations.
 - f. Polyethylene film.
 - g. Wet burlap, wet absorptive mats, or wet sand.
 - h. Leave forms in place for concrete walls and keep wet.
5. Use membrane-curing compound as noted below.
 - a. Conforming to ASTM C 309.
 - b. Shall be used prior to placement of plastic sheeting on concrete floor and roof slabs, walls, and other miscellaneous concrete areas where acceptable to Engineer.
 - c. Spray-apply in two coats perpendicular to each other at coverage recommended by manufacturer. Use clear membrane curing compound, not white, on flatwork (walks, trails, paths, etc.).
 - d. Cover unformed surfaces with curing compound within 30 minutes after final finishing.
 - e. Apply curing compound immediately to formed surfaces if forms are removed before end of specified curing period. Curing compound sprayed in tie holes is to be cleaned out before patching tie holes. Forms may be left in place for all or part of the curing period; wood forms shall be kept wet.
 - f. Protect compound against abrasion during curing period.
6. Use film curing as noted below.
 - a. Conforming to ASTM C 171.

- b. Film curing shall not be used in lieu of water curing on tank floor and roof slabs. Use only where specifically reviewed and acceptable to Engineer.
- c. Concrete placed early in the concrete placing operation shall not be allowed to dry out. Apply membrane curing compound, or other material acceptable to the Engineer, as noted above prior to placing the polyethylene film or other coverings.
- d. Begin as quickly as possible after initial set of concrete.
- e. Cover surfaces completely with polyethylene sheeting.
- f. Overlap edges for proper sealing and anchorage.
- g. Cover joints between sheets with dunnage as required to prevent displacement due to wind or other factors.
- h. Promptly repair all tears, holes, and other damage.
- i. Anchor continuously all edges and anchor surface as necessary to prevent billowing.

G. Tolerances.

1. Thicknesses of sculpted concrete as indicated on plans shall be a minimum. Concrete cover over reinforcement shall meet the requirements as shown on the Plans.
2. Control Areas: Overall finished surface elevations of sculpted concrete in Control Areas shall be within ± 1 inch of design grade and design elevations shown on the Plans as determined by the Engineer. Evaluation will be completed by averaging the finished surface elevations of sculpted concrete above and below the design surface elevations for any area selected by the Engineer. The Engineer will use visual inspection, survey, or other measurement techniques for evaluation of tolerances of Control Areas. Control Areas include, but are not limited to, any areas identified on the Plans or by Engineer as Control Areas, crests of drop structures, water control structures, tuning areas, wall caps, boat chutes, areas adjacent to boat chutes and areas adjacent to whitewater features.
3. Non-Control Areas: Non-control areas of sculpted concrete are any area not defined as a control area by the contract documents. Overall finished surface elevation of sculpted concrete in non-control areas shall be within ± 3 inches of design grade and design grade on average as determined by the Engineer with no areas exceeding the limits as shown on the plans. Evaluation will be completed by averaging the finished surface elevations of sculpted concrete above and below the design surface elevations for any area selected by the Engineer. The Engineer will use visual inspection, survey, or other measurement techniques for evaluation of tolerances of non-control areas.
4. Sculpted concrete that does not meet the specified tolerances shall be removed and replaced or otherwise modified if approved by the Engineer at the Contractor's sole expense.

231040.04 METHOD OF MEASUREMENT.

A. Structural Concrete (Miscellaneous) – Sculpted Concrete Type I.

1. Quantity shown in the contract documents.
2. The Engineer will compute in cubic yards the total volume of the respective classes of sculpted concrete placed using the nominal volume of each batch and a count of batches. Only material used to construct sculpted concrete to the dimensions shown in the contract documents, along with the changes that have been made according to a written order from the Engineer, will be counted. The Engineer will estimate and deduct sculpted concrete that is unused or wasted; however, no deduction will be made for a partial batch remaining at the completion of the operation.
3. Reinforcing Steel and Structural Steel: according to Sections 2404 and 2408 of the Standard Specifications, respectively.

- B. The surface area on which concrete sealer is applied to structural concrete: not measured separately for payment.

231040.05 BASIS OF PAYMENT.

- A. Payment for Structural Concrete (Miscellaneous) Sculpted Concrete Type I as specified above will be the actual number of cubic yards of concrete placed in accordance with the contract documents or as otherwise directed by the Engineer. The unit price will include all of the Contractor's costs.
- B. This bid item includes, but is not limited to:
 - 1. Furnishing and installing the in-river structural concrete and related components shown on the plans or specified, and items which may not specifically be shown or specified but which are required to provide a complete and proper installation.
 - 2. Formwork.
 - 3. Excavation, loading, stockpiling, or hauling offsite and proper disposal of excess excavated material not re-used onsite.
 - 4. Preparing and stabilizing subgrade.
 - 5. Supporting excavations, shoring, or laying slopes back if shoring is not used.
 - 6. Concrete curing.
 - 7. Cold and hot weather concrete protection.
 - 8. Protecting aboveground and underground utilities and service connections disposing of debris, pipe, excess excavated materials, and damaged materials.
 - 9. Concrete sealer.
 - 10. Providing all other related and necessary labor, equipment, and materials to complete the work as designed and intended to a satisfactory and properly functioning condition.
- C. Reinforcing Steel and Structural Steel: according to Sections 2404 and 2408 of the Standard Specifications, respectively.