SECTION 035300 - CONCRETE TOPPING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. Section Includes:

Revise list below to suit Project.

Emery-aggregate concrete floor topping.

Iron-aggregate concrete floor topping.

* + - 1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at Project site.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for each concrete mix within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services*.

* + - * 1. Product Test Reports: For each concrete floor topping, for tests performed by **[manufacturer and witnessed by a qualified testing agency] [a qualified testing agency]**.

Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control test reports.
			1. QUALITY ASSURANCE

Retain "Testing Agency Qualifications" Paragraph below if Contractor or manufacturer selects testing agency for material test reports or field quality control.

* + - * 1. Testing Agency Qualifications: An independent agency qualified according to ASTM C1077 and ASTM E329 for testing indicated.
				2. Mockups: Place concrete floor topping mockups to demonstrate typical joints, surface finish, bonding, texture, tolerances, and standard of workmanship.

Revise size of mockups in first subparagraph below if required.

Build mockups approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Director’s Representative.

If Director’s Representative determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.

Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

* + - 1. DELIVERY, STORAGE, AND HANDLING
				1. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.
				2. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.
			2. FIELD CONDITIONS
				1. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.

Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F.

* + - * 1. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and Masterworks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. CONCRETE FLOOR TOPPINGS
				1. Emery-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded, crushed emery aggregate containing not less than 50 percent aluminum oxide, not less than 24 percent ferric oxide, and not more than 8 percent silica; portland cement or blended hydraulic cement; plasticizers; and other admixtures to which only water needs to be added at Project site.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Anti-Hydro International, Inc.

Dayton Superior.

Laticrete International, Inc.

Approved equivalent.

Revise "Compressive Strength (28 Days)" Subparagraph below if required. Some manufacturers report strengths exceeding 14,000 psi. Add other properties, such as flexural strength and abrasion resistance, if required.

Compressive Strength (28 Days): 10,000 psi; ASTM C109.

* + - * 1. Iron-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded iron aggregate, portland cement, plasticizers, and other admixtures to which only water needs to be added at Project site.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Anti-Hydro International, Inc.

BASF Corporation.

Euclid Chemical Company (The); an RPM company.

Approved equivalent.

Revise "Compressive Strength (28 Days)" Subparagraph below if required. Some manufacturers report strengths exceeding 13,000 psi. Add other properties, such as flexural strength and abrasion resistance, if required.

Compressive Strength (28 Days): 12,000 psi; ASTM C109.

* + - 1. CURING MATERIALS

Evaporation retarder in "Evaporation Retarder" Paragraph below temporarily reduces moisture loss from topping surface awaiting finishing in hot, dry, and windy conditions.

* + - * 1. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

Retain curing materials from "Absorptive Cover," "Moisture-Retaining Cover," "Water," and "Clear, Waterborne, Membrane-Forming Curing Compound" paragraphs below.

* + - * 1. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
				2. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
				3. Water: Potable.

Material in "Clear, Waterborne, Membrane-Forming Curing Compound" Paragraph below is a waterborne, membrane-forming curing compound. Verify that curing compounds comply with maximum VOC emission limits of authorities having jurisdiction.

* + - * 1. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, 25 percent solids content, minimum.
			1. RELATED MATERIALS

Retain "Semirigid Joint Filler" Paragraph below for joint filler to fill contraction joints and, if required, construction joints.

* + - * 1. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids **[epoxy resin with a Type A Shore durometer hardness of 80] [aromatic polyurea with a Type A Shore durometer hardness range of 90 to 95]** according to ASTM D2240.

Retain type of joint-filler strips from options in "Joint-Filler Strips" Paragraph below if used in isolation joints.

* + - * 1. Joint-Filler Strips: **[ASTM D1751, asphalt-saturated cellulosic fiber] [or] [ASTM D1752, cork or self-expanding cork]**.

Retain "Portland Cement," "Sand," "Water," and "Acrylic-Bonding Agent" paragraphs below if bonding slurry is used on new, hardened concrete. Slurry recommendations of topping manufacturers include neat cement and water; cement, sand, and water; and cement, sand, water, and acrylic-bonding agent.

* + - * 1. Portland Cement: ASTM C150, Type I or II.
				2. Sand: ASTM C404, fine aggregate passing No. 16 sieve.
				3. Water: Potable.
				4. Acrylic-Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

Retain "Epoxy Adhesive" Paragraph below if epoxy adhesive is used for bonding topping to dry new concrete or dry old concrete.

* + - * 1. Epoxy Adhesive: ASTM C881, Type V, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

Some concrete topping manufacturers recommend using a perimeter pattern of power-actuated fasteners installed in the cured concrete substrate to minimize edge curling and delamination.

* + - * 1. Power-Actuated Fasteners: Fastener systems with an evaluation report based on UNIFORM CODE-ES AC70.

Design Consultant to review code references and verify that the referenced sections/tables are current. Note that code references shall be based on the current version of the Uniform Code.

* + - 1. MIXING

Retain one of two "Bonding Slurry" paragraphs below if bonding slurry is used to bond topping to new, hardened concrete. Delete both if epoxy adhesive is required for existing, aged concrete or if topping is monolithically placed on plastic concrete. Retain first paragraph if mixing a neat-cement slurry. Retain second paragraph if mixing a sand-cement slurry alone or in combination with an acrylic-bonding agent.

* + - * 1. Bonding Slurry: Mix portland cement with water to a thick paint consistency.
				2. Bonding Slurry: Mix 1 part portland cement and **[1-1/2] [2] [2-1/2]** parts sand with water**[ and an acrylic-bonding agent according to manufacturer's written instructions]** to a thick paint consistency.
				3. Floor Topping: Mix concrete floor topping materials and water in appropriate drum-type batch machine mixer or truck mixer according to manufacturer's written instructions.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine substrates, with Installer present, for conditions affecting performance of the Work.

Retain first paragraph below for deferred floor topping placed over new, hardened concrete slab. Coordinate finish with Section 033000 "Cast-in-Place Concrete."

* + - * 1. Verify that base concrete slabs comply with scratch finish requirements specified in Section 033000 "Cast-in-Place Concrete."

Retain first paragraph below if placing topping over existing, aged concrete slab. Test method below requires at least 16 hours to complete. Add other methods of moisture testing if required.

* + - * 1. Verify that base slabs are visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D4263.
				2. Proceed with application only after unsatisfactory conditions have been corrected.
			1. PREPARATION

Retain "Existing Concrete" Paragraph below if applicable.

* + - * 1. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch.

Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.

Mechanically remove contaminants from existing concrete that might impair bond of floor topping.

Retain first subparagraph below if existing joints are not already filled with a semirigid joint filler.

Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch and fill with semirigid joint filler.

Retain subparagraph below to minimize edge curling and delamination of concrete floor topping at joints and perimeter. Retain option recommended by concrete floor topping manufacturer.

To both sides of joint edges and at perimeter of existing base slab, **[mechanically remove a** 4-inch- **wide and** 0- to 1-inch- **deep, tapered wedge of concrete and retexture surface] [install concrete nails in manufacturer's recommended staggered pattern]**.

* + - * 1. Install joint-filler strips where topping abuts vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

Extend joint-filler strips full width and depth of joint, terminating flush with topping surface unless otherwise indicated.

Retain subparagraph above or first subparagraph below or, if both are required, indicate location of each on Drawings.

Terminate full-width, joint-filler strips 1/2 inch below topping surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.

Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

* + - * 1. Install power-actuated fasteners according to written directions of floor topping manufacturer at perimeter of areas that are to receive floor topping, including both edges of locations where joints will be formed in floor topping.
			1. FLOOR TOPPING APPLICATION

Retain first paragraph below unless application is not critical or does not justify cost of manufacturer's representative. A technical representative can help with preinstallation conference, mockups, examination, preparation, and early installation phases of a project.

* + - * 1. Start floor topping application in presence of manufacturer's technical representative.

Retain application methods from "Monolithic Floor Topping" and "Deferred Floor Topping" paragraphs below. Retain both paragraphs if decision is left to Contractor's option. See the Evaluations for further discussion.

Retain "Monolithic Floor Topping" Paragraph below if bonding floor topping monolithically to plastic concrete.

* + - * 1. Monolithic Floor Topping: After textured-float finish is applied to fresh concrete of base slabs specified in Section 033000 "Cast-in-Place Concrete," place concrete floor topping while concrete is still plastic.

Retain "Deferred Floor Topping" Paragraph below if bonding floor topping to new, hardened concrete. Revise time limit if required.

* + - * 1. Deferred Floor Topping: Within 72 hours of placing base slabs, mix and scrub bonding slurry into dampened concrete to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while slurry is still tacky.

Retain "Existing Concrete" Paragraph below if using epoxy-bonding adhesive over existing base slabs.

* + - * 1. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while adhesive is still tacky.
				2. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.

Screed surface with a straightedge and strike off to correct elevations.

Slope surfaces uniformly where indicated.

Begin initial floating, using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

* + - * 1. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.

Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.

Retain surface plane tolerances in two subparagraphs below if needed. Revise to suit Project if different tolerances are required. Retain first subparagraph if measurement according to F-number system is required. Retain second subparagraph if measurement by straightedge method is required. See the Evaluations in Section 033000 "Cast-in-Place Concrete" for description of F-number system.

Finish surfaces to specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15, and **[measure] [notify independent testing agency to permit measurement]** within 24 hours according to ASTM E1155 for a randomly trafficked floor surface.

Value in subparagraph below is roughly equivalent to F(F) 25.

Finish and measure surface, so gap at any point between surface and an unleveled freestanding 10-foot- long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/4 inch.

* + - * 1. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Director’s Representative.

Coat face of construction joint with epoxy adhesive at locations where concrete floor topping is placed against hardened or partially hardened concrete floor topping.

* + - * 1. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.

Insert spacing of contraction joints in first subparagraph below or on Drawings if joint spacing of existing base slabs is unsuitable.

Form joints in concrete floor topping over contraction joints in base slabs unless otherwise indicated.

Retain first subparagraph below for monolithic floor topping placement. Retain second subparagraph for deferred floor topping placement or if topping existing base slabs. Retain both subparagraphs if Contractor may choose either installation method for new, hardened concrete.

Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.

Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch deep.

* + - 1. PROTECTING AND CURING
				1. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.
				2. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.
				3. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, according to concrete floor topping manufacturer's written instructions:

Retain one or more of "Moisture Curing," "Moisture-Retaining-Cover Curing," and "Curing Compound," subparagraphs below. Moisture curing or moisture-retaining-cover curing of iron-aggregate topping is discouraged by concrete floor topping manufacturers.

Moisture Curing: Keep surfaces continuously moist for not less than seven days with **[water] [continuous water-fog spray] [or] [absorptive cover, water saturated and kept continuously wet. Cover topping surfaces and edges with 12-inch lap over adjacent absorptive covers]**.

Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

* + - 1. JOINT FILLING
				1. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.
				2. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
				3. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.
			2. REPAIR
				1. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.
			3. FIELD QUALITY CONTROL

Retain "Testing Agency" Paragraph below to identify who shall perform tests and inspections. If retaining second option, retain "Field quality-control test reports" Paragraph in "Informational Submittals" Article.

* + - * 1. Testing Agency: **[Director’s Representative will engage] [Engage]** a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
				2. Testing Services: Testing and inspecting of completed applications of concrete floor toppings shall take place in successive stages, in areas of extent and using methods as follows:

Revise frequency of sampling in "Sample Sets" Subparagraph below to suit Project. Because there are no industry recommendations, frequency below is an example only. Cubes are 2 inches square.

Sample Sets: At point of placement, a set of three molded-cube samples shall be taken from the topping mix for the first 1000 sq. ft., plus one set of samples for each subsequent 5000 sq. ft. of topping, or fraction thereof, but not less than six samples for each day's placement. Samples shall be tested according to ASTM C109 for compliance with compressive-strength requirements.

Concrete floor topping shall be tested for delamination by dragging a steel chain over the surface.

Concrete floor topping shall be tested for compliance with surface flatness and levelness tolerances.

* + - * 1. Remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements.
				2. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 035300