

SECTION 03351
Ultra High Performance Cementitious Topping

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Supply and installation of Section 03351 – Ultra High Performance Cementitious Topping

B. Related Sections

1. Drawing and general provisions of the contract, including General and Supplementary Conditions apply to this Section.
2. Provisions of Section 03310 - Structural Concrete and 03350 – Concrete Finishing apply to this Section.

1.02 REFERENCES (Note: The following documents typically are not included within the product specifications)

A. American Concrete Institute (ACI)

1. ACI 212.3R-91 –Chemical Admixtures for Concrete
2. ACI 301- Specifications for Structural Concrete
3. ACI 302.1R – Guide for Concrete Floor and Slab Construction
4. ACI 304R-00 – Guide for Measuring, Mixing, Transporting and Placing Concrete
5. ACI 305R-Hot Weather Concreting
6. ACI 306R-Cold Weather Concreting
7. ACI 318-Building Code Requirements for Structural Concrete
8. ACI 347R– Guide to Formwork for Concrete
9. ACI 503.5R-92 – Guide for Polymer Adhesives in Concrete

ACI Committee Reports, Guides, Standard Practices, and Commentaries are intended for guidance in planning, designing, executing, and inspecting construction. This document is intended for the use of individuals who are competent to evaluate the significance and limitations of its content and recommendations and who will accept responsibility for the application of the material it contains. The American Concrete Institute disclaims any and all responsibility for the stated principles. The Institute shall not be liable for any loss or damage arising therefrom.

Reference to this document shall not be made in contract documents. If items found in this document are desired by the Architect/Engineer to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the Architect/Engineer.

- B. American Society for Testing and Materials (ASTM) (Note: Noneed for these references unless called for within the productspecification)
1. ASTM A-615 – Standard Specification for Deformed and Plain Steel Bars for Concrete Reinforcement (Including Supplementary Requirements S1)
 2. ASTM C-31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
 3. ASTM C-33-01a – Standard Specification for Concrete Aggregates
 4. ASTM C-39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 5. ASTM C-94 – Standard Specification for Ready-Mixed Concrete
 6. ASTM C-150-00 – Standard Specification for Portland Cement
 7. ASTM C-171-97a – Standard Specification for Sheet Materials for Curing Concrete
 8. ASTM C-172-99 – Standard Practice for Sampling Freshly Mixed Concrete
 9. ASTM C-173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
 10. ASTM C309-98a – Standard Specification for Liquid Membrane Compounds for Curing Concrete
 11. ASTM C-494 – Standard Specification for Chemical Admixtures for Concrete
 12. ASTM C1315-00 – Standard Specification for Liquid Membrane forming Compounds Having Special Properties for Curing and Sealing Concrete

13. ASTM D-4259-88 (1999) – Standard Practice for Abrading Concrete
14. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E548.
15. Personnel conducting field shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI –1 or an equivalent certification program.

C. International Concrete Repair Institute (ICRI)

1. Guideline 310.2 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

1.03 SYSTEM DESCRIPTION

- A. Ultra High Performance Cementitious Topping:
Pre-formulated heavy-duty aggregate combined with a high strength cement based mortar topping as indicated on the Contract Drawings and specified in this section.
- B. The topping applicator shall provide and place heavy duty pre-formulated and pre-mixed topping, blended and packaged at the manufacturer's owned and controlled factory and deliver to the job site ready to apply. Work shall include materials and procedures for the required concrete surface preparation, including bonding, mixing, placing, finishing and curing.

1.04 SUBMITTALS

- A. Manufacturer's Product Data: Within 45 days after award of the contract, submit:
 1. Complete materials list showing all the items proposed to be furnished and delivered under this section.
 2. Sufficient technical data and manufacturer's specifications to demonstrate that all such items meet or exceed the specified requirements.
 3. Manufacturer's recommended installation instructions. The manufacturer's recommended installation procedures will become the basis for inspecting and accepting or rejecting actual installation procedures on this work.
 4. Hold pre-slab construction conference per section 2.5.

1.05 QUALITY ASSURANCE

A. Qualifications

1. **Installer Qualifications:** Typical projects requiring a high performance topping also require a very experienced installer which has been previously approved by the manufacturer. An installer with a minimum of 10 years' experience who has completed topping Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of similar size and application is required. Recent experience (dating no earlier than year 2010) must include at least 5 successful in-service projects, especially for public agencies and/or waste disposal facilities. A list of the previous installs shall be provided prior to bid date. Installer must be approved in writing by material manufacturer prior to bid. Contractors who are qualified members of NACT (North American Construction Technologies) have been trained and meet the qualified installer criteria for Ultra high-performance toppings.
2. **Topping Material Manufacturer Qualifications:** Material manufacturers shall be ISO 9001/9002 registered and provide proof thereof. They also must provide proof of documented quality assurance system. Quality system must be registered by an independent registrar who is accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB) or by another internationally recognized body. ISO 9001/9002 certification shall be included with material submittals.
3. **Testing Agency Qualifications:** An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 - a. Personnel conducting field testing shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI -1 or an equivalent certification program."
 - b. **Compressive Strength Testing:** Samples using 2x2" cubes or 2x3" cylinders are acceptable. Larger units are not acceptable.
 - c. **Tensile Bond (Elcometer) Testing:** Testing lab must show proficiency in running this test for bond quality of the topping to the substrate.
 - d. Prior to testing, a representative must review the testing procedures with the manufacturer's representative.

B. Warranty

1. The contractor shall furnish the owner a 1-year minimum material and labor warranty signed jointly by the topping manufacturer and installer. The warranty shall include the following:
 - a. Suitability of topping material for the project;
 - b. Service preparation and bonding of topping for 1 year; and
 - c. Wear resistance: a wear failure shall be construed if the topping material wears through down to the substrate at any point during the warranty period.
 - d. A sample warranty must be submitted prior to bid date

C. Pre-Installation Meetings (new construction only)

1. At least 35 days prior to start of the concrete construction schedule, the contractor shall conduct a meeting to review the proposed mix designs and to discuss the required methods and procedures to achieve the required concrete construction.
2. The contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:
 - Contractor's superintendent – Topping
 - Manufacture's Rep- Concrete subcontractor
3. Minutes of the meeting shall be recorded, typed and printed by the contractor and distributed by him to all parties concerned within five days of the meeting. One copy of the minutes shall also be transmitted to the following for information purposes: Owner's representative - Resident engineer - Consultant engineer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Ultra-High Performance Cementitious Topping: "EucoFloor 404", manufactured by The Euclid Chemical Company. Product shall be a pre-formulated specially processed and graded aggregate, tested cement and other high performance proprietary complementary components. Material shall be formulated and processed under stringent quality control free from n, in manufacturer's owned and controlled facilities. Product must attain a minimum strength of 10,000 psi @7 days and 14,000 psi @ 28 days. Contact Euclid Chemical - Bob Swan (702-239-1027) regarding testing procedures.
- B. Bonding Agent: "EucoFloor Epoxy Primer", manufactured by The Euclid Chemical Company a 100 percent reactive, two component aliphatic/amine type epoxy resin bonding agent, sand saturated, designed for bonding EucoFloor 404 to a well cured and properly prepared and hardened base concrete. Application rate of epoxy not to exceed 125 sq.ft. per gallon.
- C. Evaporation Retarder: "Eucobar", manufactured by The Euclid Chemical Company. Water-based mono-molecular film applied to plastic concrete to reduce the rapid, early evaporation of water from the surface.
- D. Curing Compound: "Super Aqua Cure VOX" or "Super Diamond Clear VOX" manufactured by The Euclid Chemical Company applied at a maximum rate of 300 square feet pergallon.

PART 3 EXECUTION

3.01 EXISTING FLOOR SLAB SURFACE PREPARATION

- A. Saw cut perimeter of work areas and prepare existing slab surface to receive new topping as shown in the Drawings along the repair and overlay boundaries.
- B. Prepare all remaining surfaces to be repaired or overlaid using shot-blasting, scabblers, concrete milling machines or other suitable equipment to remove all deleterious material and create a surface profile of ¼" amplitude. Acid-etched surface preparations are not acceptable. Surface preparation shall result in a surface profile acceptable to the bonding agent manufacturer, both in terms of amplitude and removal of surface grease, oils, or other materials that may adversely affect the bond of the topping. Surface preparation must be meet a minimum of ICRI CSP 7 per Guideline 310.2.

- C. At all termination points around the perimeter of the product placement, the topping material must be keyed into the existing concrete to a minimum depth that matches or exceeds the overall floor topping thickness requirement.
- D. Clean scarified surface thoroughly until all laitance, dirt and similar deleterious materials have been removed.
- E. Survey the surface of the existing slab. Map and report to the Owner any existing cracks that might telegraph through the new concrete repair or topping. The Owner shall evaluate any such cracks for the need for additional repair prior to repair or topping placement.
- F. Apply bonding agent to the prepared surface to receive repair or topping in accordance with the manufacturer's recommended instructions (application rate dependent upon floor surface profile) and sand saturate the wet epoxy until refusal. (recommended 16-20 mesh sand gradation). . Strict adherence to the working life of the bonding agent will be enforced. Allow the epoxy to cure and remove all loose sand prior to placement of performance cementitious topping by sweeping and or vacuuming the area.
- G. Wear Monitoring: If required, install triangular shaped wear Indicators every 1000 ft² to show amount of floor wear over time if required by owner. Or contact either Jim Andrews (714 267-7626) or Bob Swan (702-239-1027) for other wear monitoring options.

3.02 MIXING

- A. Thorough mixing of the topping material shall be in accordance with the manufacturer's written recommendations.

3.03 INSTALLATION

- A. Slab preparation, topping termination, bonding agents, topping placement, finishing and curing shall be in accordance with material manufacturer's written instructions.
- B. Materials manufacturer shall provide continual construction inspection during slab preparation and topping application. This inspection may be performed by the Contractor, as long as the Contractor is certified in writing by the manufacturer to do so prior to installation.
- C. Any deviations from the manufacturer's installation instructions must be approved by the manufacturer in writing prior to execution.

3.04 TOPPING APPLICATION (to determine proper installation technique, contact manufacturer.)

- A. Bonding to Existing Concrete
 - 1. All slabs in the topping area shall receive a minimum of 1 ½" thick topping over a properly prepared based slab. Prior to the topping placement the surface shall be coated with bonding agent, sand saturated and fully cured. The bond coat shall be mixed and placed in strict accordance with the written instructions of the manufacturer.
- B. New Construction
 - 2. Unless otherwise recommended, base concrete should be a minimum of 28 days old prior to placing the topping.

3.05 PLACING AND FINISHING

- A. Immediately after thorough mixing is completed, discharge topping material for immediate placing and screeding. Use evaporation retarder to keep moisture in topping material.

3.06 CURING AND PROTECTION

- A. Protect concrete from physical damage or reduced strength due to weather extremes and plant operations.
- B. After finishing and as soon as applicable, apply the curing compound on the topping. Maximum coverage rate of 300 sq.ft. per gallon. As soon as the curing compound has dried, the surface should have water applied and/or covered with polyethylene sheeting to minimize moisture lose.

PART 4 EXECUTION

3.07 NEW FLOOR SLAB

- A. Topping thickness shall be a minimum of 1.5 inches. To accommodate the topping thickness, block out the area to receive the topping and recess the new concrete 1.5 inches or the topping thickness specified whichever is greater. Tolerance for topping block out recess thickness is +/- 1/8". Areas that will receive the topping are to be given a smooth float finish.

3.08 NEW FLOOR SLAB SURFACE PREPARATION

- A. Prepare all surfaces to be overlaid using shot-blasting machines or other suitable equipment to create a surface profile of CSP 4-6. Acid-etched surface preparations are not acceptable. Surface preparation shall result in a surface profile acceptable to the bonding agent manufacturer, both in terms of amplitude and removal of surface grease, oils, or other materials that may adversely affect the bond of the topping. Surface preparation must meet a minimum of ICRI CSP 4 per Guideline 310.2.
- B. Clean prepared surface thoroughly until all laitance, dirt and similar deleterious materials have been removed.
- C. Survey the surface that will receive the topping. Map and report to the Owner any existing cracks that might telegraph through the topping. The Owner shall evaluate any such cracks for the need for additional repair prior to repair or topping placement.
- D. Apply bonding agent to the prepared surface to receive topping in accordance with the manufacturer's recommended instructions (application rate dependent upon floor surface profile) and sand saturate the wet epoxy until refusal. (recommended 16-20 mesh sand gradation). . Strict adherence to the working life of the bonding agent will be enforced. Allow the epoxy to cure and remove all loose sand prior to placement of performance cementitious topping by sweeping and or vacuuming the area.
- E. Wear Monitoring: If required, install triangular shaped wear Indicators every 1000 ft² to show amount of floor wear over time if required by owner. Or contact either Jim Andrews (714 267-7626) or Bob Swan (702-239-1027) for other wear monitoring options.

3.09 MIXING

- A. Thorough mixing of the topping material shall be in accordance with the manufacturer's written recommendations.

3.10 INSTALLATION

- A. Slab preparation, topping termination, bonding agents, topping placement, finishing and curing shall be in accordance with material manufacturer's written instructions.
- B. Materials manufacturer shall provide continual construction inspection during slab preparation and topping application. This inspection may be performed by the Contractor, as long as the Contractor is certified in writing by the manufacturer to do so prior to installation.
- C. Any deviations from the manufacturer's installation instructions must be approved by the manufacturer in writing prior to execution.

3.11 TOPPING APPLICATION (to determine proper installation technique, contact manufacturer.)

- A. Bonding to New Construction Concrete
 - 2. Unless otherwise recommended, base concrete should be a minimum of 28 days old prior to placing the topping.

3.12 PLACING AND FINISHING

- A. Immediately after thorough mixing is completed, discharge topping material for immediate placing and screeding. Use evaporation retarder to keep moisture in topping material.

3.13 CURING AND PROTECTION

- A. Protect concrete from physical damage or reduced strength due to weather extremes and plant operations.
- B. After finishing and as soon as applicable, apply the curing compound on the topping. Maximum coverage rate of 300 sq.ft. per gallon. As soon as the curing compound has dried, the surface should have water applied and/or covered with polyethylene sheeting to minimize moisture loss.

END OF SECTION

