

## **SECTION 09 66 23 – RESINOUS MATRIX TERRAZZO FLOORING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Provide the work of this Section in accordance with requirements of the Contract Documents.
- B. Section Includes:
  - 1. Thin set, epoxy resin terrazzo flooring **TZ-01, TZ-02, TZ-03, TZ-04, TZ-07, TZ-08.**
  - 2. Precast epoxy resin terrazzo wall base **TZB-01, TZB-03.**
  - 3. Moisture vapor control.
  - 4. Crack isolation membrane.

#### **1.2 DEFINITIONS**

- A. Aggregate: Marble chips or other types of aggregate.

#### **1.3 COORDINATION**

- A. Coordination:
  - 1. Coordinate the concrete mix design for areas to receive epoxy resin matrix flooring so it is compatible with the terrazzo materials.
    - a. Do not use curing agents or other additives which could prevent bonding of the resinous matrix terrazzo flooring.
  - 2. Coordinate the tolerances for concrete floors in areas to receive epoxy resin matrix flooring with the tolerances required for proper installation of the terrazzo.
    - a. Ensure the concrete subfloor has a steel trowel finished surface and is level having a maximum variation not exceeding 1/4 inch in a 10-foot span.
      - 1) Terrazzo is not intended to level the substrate and will only follow the contour of the concrete slab.
    - b. Saw cut control joints between 12 hours and 24 hours after the structural concrete has been placed

#### **1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to terrazzo including, but not limited to, the following:
    - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
    - b. Review special terrazzo designs and patterns.

## 1.5 ACTION SUBMITTALS

- A. Product Data: Technical data for each type of product including methods of installation and material descriptions.
- B. Sustainable Design Submittals:
  - 1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:
    - a. Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.
      - 1) Include statement indicating costs for each product having recycled content.
    - b. Regional Materials: For products that are required to comply with requirements for regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.
      - 1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.
  - 2. Indoor Environmental Quality, Low Emitting Materials: Building Products must be tested and compliant with the California Department of Public-Health (CDPH) Standard Method v1.2 2017, using the applicable exposure scenario.
    - a. For paints, and coatings, wet applied, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure for Architectural Coatings or the South Coast Air Quality Management District (SCAQMD) Rule 1113-2011.
- C. Shop Drawings:
  - 1. Include terrazzo installation requirements. Include plans, sections, component details, and relationship to other work. Show layout of the following:
    - a. Divider strips.
    - b. Control joint strips.
    - c. Accessory strips.
    - d. Terrazzo patterns.
    - e. Abrasive strips.
    - f. Precast epoxy-resin terrazzo bases.
    - g. Terrazzo patterns.
- D. Samples:
  - 1. Submit terrazzo in each each color specified, 6 inches (150 mm) in size.
  - 2. Accessories in each color specified, 6 inch (150 mm) long.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Submit data for Installer.
- B. Test Reports:
  - 1. Submit test result reports for:
    - a. Vapor and moisture testing.
    - b. Alkalinity and adhesion testing.

- C. Material Certificate of Compliance: Resinous matrix terrazzo material supplier/ manufacturer's Certificate of Compliance, certifying that the resinous matrix terrazzo materials being provided meet or exceed the specified requirements and the properties specified by the National Terrazzo and Mosaic Association, Inc. (NTMA) in the NTMA Terrazzo Specifications and Design Guide.
- D. Mix Contents: Submit mix contents for each terrazzo flooring system specified in this section to the Architect.
- E. Installer Certificates: Submit certificates signed by manufacturers certifying that installers comply with requirements.
- F. Sustainable Design Submittals:
  - 1. Building Product Disclosure and Optimization - Environmental Product Declarations
    - a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.
  - 2. Building Product Disclosure and Optimization - Material Ingredients
    - a. Material Ingredient Reporting: Submit documentation confirming chemical inventory of products to at least 0.1 % (1000ppm) with at least one of the following:
      - 1) Submit published manufacturer inventory of ingredients identified by name and Chemical Abstract Service Registration Number (CASRN)
      - 2) Submit documentation that product has been certified as Cradle-to-Cradle v3 at the Bronze Level or better
      - 3) Submit Declare product label indicating that all ingredients have been disclosed down to 1000 ppm or designated as Red List Free or Declared
      - 4) Living Product Challenge
      - 5) Product Lens Certification
      - 6) USGBC approved program.
    - b. Material Ingredient Optimization: Submit documentation confirming chemical inventory of products to at least 0.01 % (100ppm) and/or that has a compliant material ingredient optimization report with at least one of the following:
      - 1) Submit GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
      - 2) Submit third-party verified documentation that product has been certified as Cradle-to-Cradle v3 at the Bronze Level or better
      - 3) Submit third-party verified Cradle to Cradle v3 Material Health certificate at the Bronze Level or better
      - 4) Submit third-party verified Declare product label indicating that all ingredients have been disclosed down to 100 ppm
      - 5) Submit third-party verified documentation that product is Living Product Challenge certified with a Red List Free or LBC Red List Free Declare label.
      - 6) Submit documentation that product has a manufacturer prepared action plan with material inventory to at least 1000 ppm.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Submit data for terrazzo to include in maintenance manuals.

## **1.8 QUALITY ASSURANCE**

- A. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- B. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.
- C. NTMA Standards: Comply with NTMA written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- D. Installer Qualifications:
  - 1. Installer having minimum 5 years documented experience in the installation of Portland cement terrazzo and who is a contractor member of NTMA.
  - 2. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
- E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Build mockups for terrazzo including accessories.
    - a. Size: Minimum 100 sq. ft. of typical poured-in-place flooring condition for each color and pattern in locations directed by Architect.
    - b. Include stair treads.
  - 2. Build room corner mockups of the Gate and Boarding area to be constructed in the field include the following:
    - a. Terrazzo flooring complete with base.
    - b. Transitions to carpet tile.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## **1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in original, undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

## **1.10 FIELD CONDITIONS**

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.

- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

#### 1.11 WARRANTY

- A. Manufacturer Warranty: Submit a Resinous Matrix Terrazzo Flooring Materials Warranty on the manufacturer's standard or customized form, without monetary limitation, in which the manufacturer agrees to replace resinous matrix terrazzo flooring materials that fail within the specified warranty period to the Program/Project Manager for approval
  - 1. Warrant the resinous matrix terrazzo flooring materials against failures within the 2-year period after the Date of Substantial Completion.
- B. Special Warranty:
  - 1. Installer's Warranty: Submit a Resinous Matrix Terrazzo Flooring Installation Warranty on the installer's standard or customized form, without monetary limitation, in which installer agrees to repair resinous matrix terrazzo flooring.
    - a. Warrant the resinous matrix terrazzo flooring workmanship against failures within the 2-year period after the Date of Substantial Completion

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. Low-Emitting Materials:
  - 1. Adhesives and Sealants wet-applied inside the weather-proofing system must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
  - 2. All adhesives and sealants wet-applied inside the weather-proofing system must have VOC content in compliance with the applicable VOC limits (g/L) found in tables in Division 01, Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C."
  - 3. All flooring products must be Floorscore certified or compliant with the VOC emissions testing criteria of CDPH Standard Method v1.2.

#### 2.2 EPOXY RESIN TERRAZZO

- A. Epoxy-Resin Terrazzo **TZ-01, TZ-02, TZ-03, TZ-04, TZ-07, TZ-08:**
  - 1. The thin set epoxy floor system shall consist of multiple components formulated by the

- manufacturer for compatibility and to provide a complete terrazzo floor system, to a total of 1/2 in. thickness, including epoxy primers, 1/8 inch thick reinforced flexible epoxy membrane, minimum 3/8 inch thick epoxy terrazzo matrix, epoxy filler, marble chips (or other type chips), epoxy grout, filler, divider strips and sealer coats.
2. Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
  3. Products:
    - a. Subject to compliance with requirements, provide one of the following:
      - 1) Cheminert Terrazzo by Crossfield Product Corp.; Dex-O-Tex Division.
      - 2) Key Resin Company; "Key Epoxy Terrazzo #108 with Key Resin #580 Flexible Epoxy Membrane" or a comparable product by one of the following:
      - 3) Master Terrazzo Technologies LLC; "Morricite Epoxy Terrazzo Flooring with MasterFlex Epoxy Membrane".
      - 4) Sherwin-Williams Company, General Polymers; "Thin-Set Epoxy Terrazzo #1100 with 3552 Epo-Flex Flexible Epoxy Membrane".
      - 5) Terrazzo & Marble Supply Companies; Terroxy Resin Systems.
  4. Thickness: 3/8 inch (9.5 mm).
  5. Colors and patterns: Formulated General Colors indicated below for TZ-01, -02, -03, -04, -08 match colors to existing Terminal A floor:
    - a. **TZ-01** Field Terrazzo: White.
    - b. **TZ-02** Border Terrazzo: Light blue.
    - c. **TZ-03** Banding Terrazzo: Gray.
    - d. **TZ-04** Field Terrazzo: Warm gray.
    - e. **TZ-05** White, to match High C floor.
    - f. **TZ-06** Gray, to match High C floor.
    - g. **TZ-07** Accent Terrazzo: Medium blue
    - h. **TZ-08** Accent Terrazzo: Dark blue.
- B. Underlayment:
1. Provide an epoxy fill material, that when mixed with the proper proportion of silica aggregate will produce a high strength slurry or dry- pack mortar suitable for installation as a flooring underlayment and leveling compound for interior applications.
  2. Provide an underlayment compound capable of being feathered down to a near zero edge when necessary.
  3. Provide an underlayment with the following physical properties:
    - a. Compressive Strength: 8,000 psi per ASTM C109.
    - b. Tensile Strength: 2,000 psi per ASTM C307.
    - c. Flexural Strength: 1,200 psi per ASTM C580.
    - d. Bond Strength to Concrete: To 100 percent concrete failure per ACI 503R.
- C. Moisture Vapor Control Primer: Impervious, high solids epoxy membrane, 15 mils thick, specifically formulated to control moisture vapor pressure up to 15 lbs.
1. Acceptable Products:
    - a. VaporControl 100 Primer by Crossfield Products Corp.; Dex-O-Tex Division.
- D. Primer: Manufacturer's product recommended for substrate and use indicated.
- E. Crack Isolation Membrane: Reinforced flexible epoxy membrane, 40 mils thick.
1. Acceptable Products:
    - a. Cheminert SC Membrane by Crossfield Products Corp.; Dex-O-Tex Division

- b. 3552 Epo-Flex Flexible Epoxy Membrane by General Polymers.

F. Epoxy-Resin Materials

1. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in colors required for mixes indicated.
  - a. Physical Properties without Aggregates:
    - 1) Hardness: 60 to 85 per ASTM D2240, Shore D.
    - 2) Minimum Tensile Strength: 3000 psi per ASTM D638 for a 2-inch specimen made using a "C" die per ASTM D412.
    - 3) Minimum Compressive Strength: 10,000 psi per ASTM D695, Specimen B cylinder.
  - b. Physical Properties with Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide"; comply with the following:
    - 1) Flammability: Self-extinguishing, maximum extent of burning 1/4 inch per ASTM D635.
    - 2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F for temperature range of minus 12 to plus 140 deg F per ASTM D696.
2. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
  - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
  - b. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C131.
  - c. 24-Hour Absorption Rate: Less than 0.75 percent.
  - d. Dust Content: Less than 1.0 percent by weight.

## 2.3 PRECAST EPOXY-RESIN TERRAZZO

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Precast Terrazzo Enterprises, Inc.
  2. Romoco Precast Terrazzo Products; a subsidiary of Roman Mosaic & Tile Company.
  3. Wausau Tile Inc.
- B. Precast Terrazzo Base Units: Minimum 3/4-inch (19-mm) thick, reinforced epoxy terrazzo cast units. Cast bases in maximum lengths possible to minimize joints but not less than 36 inches. Comply with NTMA's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.
  1. Type: Straight.
  2. Top Edge: Radius edge with polished top surface.
  3. Outside Corner Units: With finished returned edge at outside corner.
  4. Color, Pattern, and Finish:
    - a. **TZB-01**: To match **TZ-01**.
    - b. **TZB-03**: To match **TZ-03**.

## **2.4 STRIP MATERIALS**

- A. Thin-Set Divider Strips: L-type angle in depth required for topping thickness indicated.
  - 1. Material: White-zinc alloy.
  - 2. Top Width: 1/8 inch.
- B. Heavy-Top Divider Strips: L-type angle in depth required for topping thickness indicated.
  - 1. Material: Plastic, in color selected from full range of industry colors White-zinc alloy.
  - 2. Top-Section Width: 1/4 inch.
- C. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- D. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
  - 1. Edge-bead strips for exposed edges of terrazzo.

## **2.5 MISCELLANEOUS ACCESSORIES**

- A. Strip Adhesive: Epoxy resin adhesive recommended by adhesive manufacturer.
- B. Anchoring Devices:
  - 1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and as required for secure attachment to substrate.
  - 2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.
- C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- F. Sealer: Slip and stain resistant, penetrating type sealer that is chemically neutral; does not affect terrazzo color or physical properties; and recommended by sealer manufacturer.
  - 1. Surface Friction: Not less than 0.6 according to ASTM D2047.
  - 2. Acid Base Properties: With pH factor between 7 and 10.
  - 3. Sealers shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and areas for compliance with requirements for installation tolerances and



other conditions affecting performance of the work.

- B. Proceed with installation after correcting unsatisfactory conditions, including flatness and levelness tolerances.

### **3.2 PREPARATION**

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
  - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
    - a. Shot blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    - b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written instructions.
    - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
    - d. Provide underlayment materials as required to bring substrate concrete surfaces within level of flatness specified in "Administrative Requirements" article of this Section.
- C. Verify concrete substrates are dry and moisture vapor emissions are within acceptable levels according to manufacturer's written instructions.
- D. Preinstallation Moisture Testing:
  - 1. Testing Agency: Engage a qualified testing agency to perform tests.
  - 2. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.
  - 3. Proceed with terrazzo installation after concrete substrates pass moisture testing or after installation of moisture vapor emission control membrane on substrate areas that fail testing.
- E. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
  - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

### **3.3 EPOXY RESIN TERRAZZO INSTALLATION**

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.

- B. Moisture Vapor Control Primer: Provide at all newly constructed floor slabs where concrete is placed over a non-vented, permanent metal deck form (slab on metal deck) AND for all new or existing floor slabs where work must proceed, and the maximum relative-humidity-level exceeds 75 percent.
1. Install moisture vapor control primer solution by wetting the concrete substrate with water to be surface saturated dry (SSD).
  2. Immediately spray or roll moisture vapor control primer onto the concrete surface at a rate of 115 square feet per gallon. Do not allow to puddle.
  3. Backroll to a wet-film thickness of 15 mil with spiked roller to release any entrapped air.
  4. Allow to cure a minimum of 12 hours before any foot traffic.
- C. Crack Isolation Membrane: Install membrane to produce full substrate coverage in areas to receive terrazzo.
1. Prepare and prefill substrate cracks with membrane material.
  2. Reinforce membrane at cracks with fiberglass scrim.
  3. Prepare membrane according to manufacturer's written instructions before applying substrate primer.
- D. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.
- E. Strip Materials:
1. Divider and Control Joint Strips:
    - a. Locate divider strips over control joints and in locations indicated.
    - b. Install control joint strips back to back and directly above concrete slab control joints.
    - c. Install control joint strips with 1/4-inch (6.4 mm) gap between strips, and install sealant in gap.
    - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
  2. Accessory Strips: Install as necessary to provide a complete installation.
  3. Abrasive Strips: Install with surface of abrasive strip positioned 1/16 inch (1.6 mm) higher than terrazzo surface.
- F. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide" and as follows.
1. Installed Thickness: 3/8 inch (9.5 mm), nominal.
  2. Terrazzo Finishing: Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control joint strips.
    - a. Rough Grinding: Grind with 24 grit or finer stones or with comparable diamond abrasives. Follow initial grind with 60/80 grit stones or with comparable diamond abrasives.
    - b. Grouting: Before grouting, clean terrazzo with water, rinse, and allow to dry. Apply and cure epoxy grout.
    - c. Fine Grinding/Polishing: Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted. Grind with 80 or finer grit stones or with comparable diamond abrasives until grout is removed from surface.
- G. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.

- H. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- I. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet (6.4 mm in 3 m); noncumulative.

### **3.4 PRECAST TERRAZZO INSTALLATION**

- A. Install precast terrazzo units using method recommended in writing by NTMA and manufacturer unless otherwise indicated.
- B. Do not install units that are chipped, cracked, discolored, or improperly finished.
- C. Seal joints between units with joint compound matching precast terrazzo matrix.

### **3.5 REPAIR**

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

### **3.6 CLEANING AND PROTECTION**

- A. Cleaning:
  - 1. Remove grinding dust from installation and adjacent areas.
  - 2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing:
  - 1. Seal surfaces according to NTMA's written recommendations.
  - 2. Apply sealer according to sealer manufacturer's written instructions.
- C. Protection: Provide final protection and maintain conditions to ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

### **END OF SECTION**