

## SECTION 09 66 23 - RESINOUS MATRIX TERRAZZO FLOORING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. Section Includes:

1. Poured-in-place resinous matrix epoxy terrazzo flooring [**and base**].
2. Poured in place integral formed terrazzo wall base. [**Pre-cast terrazzo wall base units.**]
3. [**Pre-cast terrazzo tread units**] [**Pre-cast terrazzo tread & riser units**]
4. Joint, edge, and termination strips.

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for sealants installed with terrazzo.
2. Section 03 30 00 "Cast-in-Place Concrete."
  - a. Concrete sub-floor to be level (maximum variation not to exceed ¼ inch in 10 feet) and to have a steel trowel finished surface. No curing agents or other additives which could prevent bonding should be used.
  - b. The slab should have an efficient moisture barrier placed directly under the concrete slab when placed directly on grade. Saw cutting of control joints must be done between 12-24 hours after placement of the structural concrete.
  - c. Shotblast or rough grind area to receive Terrazzo according to manufacturer's recommendations.

#### 1.3 DEFINITIONS

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

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [**Project site**] <Insert location>.

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 and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- c. Review special terrazzo designs and patterns.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals (Projects authorized for LEED certification only):
  1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
  2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
  3. Product Data for Credit IEQ 4.3: For sealers, documentation including printed statement of VOC content.
  4. Product Data for Credit IEQ 4.3: For terrazzo flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.
  5. Laboratory Test Reports for Credit IEQ 4: For **[adhesives] [and] [flooring system]**, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
  1. Divider strips.
  2. Control-joint strips.
  3. Expansion-joint strips.
  4. Accessory strips.
  5. Abrasive strips.
  6. Stair treads, risers, and landings.
  7. Precast terrazzo jointing and edge configurations.
  8. Terrazzo patterns.
  9. **<Insert requirements>**.
- D. Samples: For each exposed product and for each color and texture specified, **[6 inches (150 mm)] <Insert dimension>** in size.
- E. Samples for Initial Selection: NTMA color plates showing the full range of colors and patterns available for each terrazzo type.
- F. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and

proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:

1. Terrazzo: [~~6-inch~~ (150-mm-)] <Insert dimension> square Samples.
2. Precast Terrazzo: [~~6-inch~~ (150-mm-)] <Insert dimension> square Samples.
3. Accessories: [~~6-inch~~ (150-mm-)] <Insert dimension> long Samples of each exposed strip item required.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each type of terrazzo material or product, from manufacturer.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For terrazzo to include in maintenance manuals.

#### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is a contractor member of NTMA.
  1. Installation shall be performed by an applicator with minimum 3 years experience in work of similar nature and scope. Installer must be approved by the manufacturer of the floor surfacing materials. The contractor shall furnish a written statement from the manufacturer that the installer is acceptable.
- 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. Suppliers shall provide materials in accordance with NTMA standards.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Build mockups for terrazzo including accessories.
    - a. Size: Minimum **100 sq. ft. (9 sq. m)** of typical poured-in-place flooring condition for each color and pattern [**in locations indicated**] [**in locations directed by Architect**] <Insert location requirements>.
    - b. Include [**base**] [**first three stair treads**] <Insert item>.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project 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 their 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: Maintain temperature above 50 deg F (10 deg C) for 48 hours before and during 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.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. FloorScore Compliance: Terrazzo floors shall comply with requirements of FloorScore Standard.
- C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

### 2.2 MATERIALS

- 1. Topping: Comply with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo system indicated for matrix and aggregate proportions and mixing.
  - a. Terrazzo Topping Thickness: **[As indicated] <Insert dimension>**.

- b. Formulated Mix Color and Pattern: [As selected by Architect from NTMA standard-terrazzo plates] [As selected by Architect from NTMA Venetian-terrazzo plates] <Insert NTMA color plate designation>.
- c. Custom Mix Color and Pattern: [Match Architect's sample] [Match existing] <Insert custom design-mix attributes>.

B. Materials:

- 1. Epoxy resin mixed according to manufacturer's recommendation and tested without aggregate added. All specimens cured for 7days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2 R.H. The product shall meet the following requirements:

Property	Test Method	Requirement
Hardness	ASTM D-2240 using Shore D Durometer	60-85
Tensile Strength	ASTM D- D-638 run at .2" min. Specimen made using "C" die listed in ASTM D-412	3,000 psi Minimum
Compressive Strength	ASTM D-695 Specimen "B" cylinder	10,000 psi Minimum
Chemical Resistance	ASTM D-1308 seven days at room temperature by immersion method have no deleterious effects:	The following contaminants used: Distilled Water ..... 1% Soap Solution Mineral Water ..... 10% Sodium Hydroxide Isopropanol.....10% Hydrochloric Acid Ethanol ..... 30% Sulfuric Acid .025 Detergent Solution .....5% Acetic Acid

- 2. Epoxy Resin mixed according to manufacturer's recommendations and blended with 3 volumes of Georgia White marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to 3.02 C-2-Finishing to a nominal 1/4" thickness. All specimens cured 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2% R.H. The finished epoxy terrazzo shall meet the following requirements:
  - a. Flammability: When tested in accordance with ASTM-D-635, the Epoxy terrazzo shall comply with the following value: Self-extinguishing, extent of burning 0.25 inches maximum.
  - b. Thermal Coefficient of Linear Expansion: when tested in accordance with ASTM-D-696, the Epoxy terrazzo will comply with the following value: 25 x 10-6 inches per inch per degrees to 140 degrees Fahrenheit maximum. Temperature range - 12 degrees to 140 degrees Fahrenheit.
  - c. Bond Strength: When tested in accordance with Field Test Method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin Title No. 59-43 (Pages 1139-1141) the Epoxy terrazzo shall comply with the following value:
    - 1) 100% concrete failure minimum, with 300 PSI minimum tensile strength.  
 NOTE: THIS TEST IS INTENDED TO EVALUATE THE BOND TO THE CONCRETE SUBFLOOR. A 100% CONCRETE FAILURE INDICATES A GOOD BOND.

3. Marble Chips:
  - a. Size: To conform to NTMA gradation standards.  
*NOTE: SEE PRODUCT INFORMATION.*
  - b. Abrasion and Impact resistance when testing in accordance with ASTM C 131-89 shall not exceed 40% loss.
  - c. 24 Hour absorption rate not to exceed 0.75 percent.
  - d. Chips shall contain no deleterious or foreign matter.
  - e. Dust content less than 1% by weight.

## 2.3 PRECAST TERRAZZO

- A. Manufacturers: Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:
- B. Manufacturers: Subject to compliance with requirements, provide by one of the following:
  1. [Precast Terrazzo Enterprises, Inc.](#)
  2. [Romoco Precast Terrazzo Products, subsidiary of Roman Mosaic & Tile Company](#)
  3. [Wausau Tile, Inc.; Terra Paving Products Division.](#)
  4. Substitutions: see section 01 25 00 – Substitution Procedures.
- C. Precast Terrazzo Base **<Insert designation>**: Minimum **3/4-inch- (19-mm-)** thick, reinforced, portland cement terrazzo units cast in maximum lengths possible, but not less than **36 inches (900 mm)**. Comply with NTMA's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.
  1. Type: **[As indicated] [Coved with minimum 3/4-inch (19-mm) radius] [Straight] [Splayed] <Insert requirements>**.
  2. Top Edge: **[Straight, unfinished] [Beveled with polished top surface] [Radius edge with polished top surface] <Insert requirements>**.
  3. Metal Toe Strip: **[Zinc] [Brass]**.
  4. Outside Corner Units: With finished returned edges at outside corner.
  5. Color, Pattern, and Finish: **[As selected by Architect from full range of industry colors] [Match Architect's sample] [Match adjacent poured-in-place terrazzo flooring] <Insert requirements>**.
- D. Precast Terrazzo Units **<Insert designation>**: Minimum **[3/4-inch- (19-mm-)] <Insert dimension>** thick, reinforced, portland cement terrazzo units. Comply with NTMA's written recommendations for fabricating precast terrazzo units in sizes and profiles indicated. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer. Finish exposed-to-view edges and reveals to match face finish. Ease exposed edges to **1/8-inch (3.2-mm)** radius.
  1. Tiles.
  2. Planks.
  3. Stair treads **[ and landings]**.

4. Thresholds.
5. Sills.
6. Benches.
7. Planters.
8. Countertops.
9. Shower bases.
10. <Insert item>.
11. Color, Pattern, and Finish: [As selected by Architect from full range of industry colors] [Match Architect's sample] [Match adjacent poured-in-place terrazzo flooring] <Insert requirements>.

## 2.4 STRIP MATERIALS

- A. Standard Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
1. Material: [As indicated] [White-zinc alloy] [Brass] <Insert requirements>.
  2. Depth: [As indicated] [3/4 inch (19 mm)] [1-1/4 inches (32 mm)] [2 inches (51 mm)] <Insert dimension>.
  3. Width: [As indicated] [0.05 inch (1.27 mm)] [1/8 inch (3.2 mm)] [1/4 inch (6.4 mm)] <Insert dimension>.
- B. Heavy-Top Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
1. Base-Section Material: [As indicated] [White-zinc alloy] [Galvanized steel] <Insert requirements>.
  2. Top-Section Material: [As indicated] [White-zinc alloy] [Brass] [Plastic, in color selected from full range of industry colors] <Insert requirements>.
  3. Depth: [As indicated] [3/4 inch (19 mm)] [1-1/4 inches (32 mm)] [2 inches (51 mm)] <Insert dimension>.
  4. Top-Section Width: [As indicated] [1/8 inch (3.2 mm)] [1/4 inch (6.4 mm)] [1/2 inch (12.7 mm)] <Insert dimension>.
- C. Heavy-Top Angle Divider Strips: One-piece, L-type angle strips with anchoring device and in depth required for topping thickness indicated.
1. Material: [As indicated] [White-zinc alloy] [Brass] [Plastic, in color selected from full range of industry colors] <Insert requirements>.
  2. Top-Section Width: [As indicated] [1/8 inch (3.2 mm)] [1/4 inch (6.4 mm)] [3/8 inch (9.5 mm)] [1/2 inch (12.7 mm)] <Insert dimension>.
- D. 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.
- E. 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. Base-bead strips for exposed top edge of terrazzo base.
2. Edge-bead strips for exposed edges of terrazzo.
3. Nosings for terrazzo stair treads and landings.
4. <Insert requirements>.

F. Abrasive Strips: [**Three-line**] [**Two-line**] [**One-line**] [**Abrasive nosing strip and two-line**] <Insert requirements> abrasive inserts at nosings. Silicon carbide or aluminum oxide, or combination of both, in epoxy-resin binder and set in channel.

1. Width: [**1/2 inch (12.7 mm)**] <Insert dimension>.
2. Depth: As required by terrazzo thickness.
3. Length: [**4 inches (100 mm) less than stair width**] [**As indicated**] <Insert dimension>.
4. Color: [**As selected by Architect from full range of industry colors**] <Insert requirements>.

## 2.5 MISCELLANEOUS ACCESSORIES

A. Strip Adhesive: Recommended by manufacturer for this use.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

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. Isolation and Expansion-Joint Material: Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, and non-outgassing in unruptured state; butyl rubber; rubber; or cork; [**in width indicated**] [**minimum 1/2 inch (12.7 mm) wide**] <Insert dimension>.

D. Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by cleaner manufacturer for use on terrazzo type indicated.

E. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
2. Acid-Base Properties: With pH factor between 7 and 10.
3. Shall not discolor or amber.
4. Flash point: ASTM D-56, 80 degrees Fahrenheit minimum, where applicable.

5. U/L listed as "Slip Resistant."
6. 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, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

#### 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.
  1. Roughen concrete substrates before installing terrazzo system according to NTMA's written recommendations.
- B. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
  1. Moisture Testing: Perform tests indicated below.
    - a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **[3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)]** <Insert rate> in 24 hours.
      - 1) Perform tests so that each test area does not exceed **[200 sq. ft. (18.6 sq. m)]** <Insert area>, and perform not less than two tests in each installation area and with test areas evenly spaced in installation areas.
    - b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum **[75]** <Insert number> percent relative-humidity-level measurement.
    - c. Test Method: Test for moisture content by **[method recommended in writing by terrazzo manufacturer]** <Insert test method>. Proceed with installation only after substrates pass testing.
- C. 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 INSTALLATION, GENERAL

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Installation Tolerance: Limit variation in terrazzo surface from level to **[1/4 inch in 10 feet (6.4 mm in 3 m)]** <Insert dimensions>; noncumulative.
- C. Strip Materials:
  1. Divider and Control-Joint Strips:
    - a. Locate divider strips **[over each edge of steel beams and girders] [centered over steel beams and joists] [directly over control joints, breaks, and saw cuts in concrete slabs] [in locations indicated]** <Insert requirements>.
    - b. Install control-joint strips **[back to back and directly above concrete-slab control joints] [in locations indicated]** <Insert requirements>.
    - c. Install control-joint strips with **[1/4-inch (6.4-mm)]** <Insert dimension> 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. above concrete-slab expansion joints.
  3. Accessory Strips: Install as required to provide a complete installation.
  4. Abrasive Strips: Install with surface of abrasive strip positioned **[1/16 inch (1.6 mm)]** <Insert dimension> higher than terrazzo surface.

### 3.4 POURED-IN-PLACE TERRAZZO INSTALLATION

- A. Pour in place and seed additional aggregates in matrix to uniformly distribute granular material and produce a surface with a minimum of 70 percent aggregate exposure. Cure and finish terrazzo according to NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.
- B. Grinding: Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

### 3.5 PRECAST TERRAZZO INSTALLATION

- A. Install precast terrazzo units using method recommended 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 **[cement grout matching terrazzo matrix] [joint sealant] <Insert requirements>**.

### 3.6 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate including areas that emit a "hollow" sound if tapped. 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.

### 3.7 CLEANING AND PROTECTION

- A. Terrazzo Cleaning:
  - 1. Remove grinding dust from installation and adjacent areas.
  - 2. Wash surfaces with cleaner immediately after final cleaning of terrazzo flooring 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, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 66 13