

SECTION 09 6613 - PORTLAND CEMENT 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 portland cement terrazzo flooring and base.
2. Precast terrazzo units.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealants installed with terrazzo.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. LEED Submittals:

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. Product Certificates for MR 5: For Products and materials required to comply with requirements for regional materials.

- 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.
- D. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) 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: 12-inch- (150-mm-) square Samples for each type finish and color combination selected.
 - a. A maximum of four (4) separate submittals maybe required to obtain the desired aggregate proportions and color.
 - b. Provide samples finished as specified, numbered on the back side for reference with a description of the aggregate colors and proportions.
 2. Precast Terrazzo: 6-inch- (150-mm-) square Samples.
 3. Accessories: 6-inch- (150-mm-) long Samples of each exposed strip item required.
 - a. Color selection samples for abrasive warning strips.
- G. Prior to start of terrazzo work, construct a sample mock-up of the proposed installation where directed by the Architect to be left in place after the Architect's review as guide until terrazzo work is complete. The mock-up sample will be reviewed by the Architect and Owner for acceptance of color, finish, and workmanship.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
 - B. Material Certificates: For each type of terrazzo material or product, from manufacturer.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For terrazzo to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Comply with the most current edition of the Northwestern University Design Standards.
 - B. Installer Qualifications: An installer who is a contractor member of NTMA.

- C. 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.

1.8 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.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Maintain temperature above 50 deg F (10 deg C) for 48 hours before and during terrazzo installation.
- B. Weather Limitations: Proceed with rustic terrazzo installation only when forecasted weather conditions permit work to be performed according to NTMA's written recommendations and temperatures remain above 45 deg F (7.2 deg C).
- C. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- D. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- E. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- F. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
- G. Pre-Installation Conference: Conduct conference at the Project Site. Review methods and procedures related to installation including, but not limited to, the following:
 - 1. Inspect and discuss conditions of substrate and other preparatory work performed by other trades.
 - 2. Review structural loading limitations.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review dust-control procedures.

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.

2.2 PORTLAND CEMENT TERRAZZO

- A. Portland Cement Terrazzo System: Monolithic.

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. Portland Cement: ASTM C 150, Type 1.
 - a. Color for Exposed Matrix: As required by mix indicated.
2. Water: Potable.
3. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131 and ASTM C 535.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
4. Matrix Pigments: Pure mineral or synthetic pigments, alkali resistant, durable under exposure to sunlight, and compatible with terrazzo matrix.
5. Bonding Agent: Neat portland cement, or epoxy or acrylic bonding agents formulated for use with topping indicated.

2.3 PRECAST 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.
- B. Precast Terrazzo Base: 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: **[Coved with minimum 3/4-inch (19-mm) radius] [Straight]**.
 2. Top Edge: **[Straight, unfinished] [Beveled with polished top surface] [Radius edge with polished top surface]**.

3. Outside Corner Units: With finished returned edges at outside corner.
 4. Color, Pattern, and Finish: Match adjacent poured-in-place terrazzo flooring.
- C. Precast Terrazzo Units: Minimum 3/4-inch- (19-mm-) 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. Color, Pattern, and Finish: **<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: **<Insert requirements>**.
 2. Depth: 3/4 inch (19 mm).
 3. Width: **<Insert dimension>**.
- B. 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.
- C. 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.
- D. Abrasive Strips: Three-line 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).
 2. Depth: As required by terrazzo thickness.
 3. Length: 4 inches (100 mm) less than stair width.
 4. Color: As selected by Architect from full range of industry colors.

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).
- 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; minimum 1/2 inch (12.7 mm) wide.
- D. Portland Cement 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. 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) in 24 hours.

- 1) Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), 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 percent relative-humidity-level measurement.
 - c. Test Method: Test for moisture content by method recommended in writing by terrazzo manufacturer. 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); noncumulative.
- C. Strip Materials:
1. Divider and Control-Joint Strips:
 - a. Locate divider strips 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, other size gap to be reviewed by Architect and Owner, 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. Expansion-Joint Strips: Form expansion joints using divider strips and install directly above concrete-slab expansion joints.
 3. Accessory Strips: Install as required to provide a complete installation.

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 portland cement 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 precast terrazzo matrix.

3.6 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate or underbed, 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 and Owner, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion. General Contractor shall protect the finished floor after the Terrazzo Contractor has completed final grinding and applied sealer to terrazzo surfaces.

END OF SECTION 09 6613