

**SECTION 09 66 13  
PORTLAND CEMENT TERRAZZO FLOORING**

SPEC WRITER NOTE: Delete between // // if not applicable to project. Also delete any other items or paragraphs not applicable in the section and renumber the paragraphs.

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

- A. This section covers the requirements for poured-in-place cementitious terrazzo including adhesively bonded monolithic terrazzo.

**1.2 RELATED WORK:**

- //A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS. //
- B. Concrete Sub Floor: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. Color and Location of each Terrazzo Formula: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Precast Terrazzo: Section 09 66 16, TERRAZZO FLOOR TILE.

**1.3 QUALITY ASSURANCE:**

- A. Comply with recommendations of National Terrazzo and Mosaic Association, Inc. (NTMA).
- B. Submit certification that materials conform to specified NTMA properties.
- C. Manufacturer's Qualifications: Obtain each color, grade, type, and variety of granular materials from a single source that has provided Portland Cement Terrazzo Flooring for a minimum of three (3) years. Submit manufacturer qualifications.
- D. Installer's Qualifications: An installer who is a contractor member of NTMA and has a minimum of three (3) years' experience in the installation of products specified. Submit installer qualifications.

**1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- //B. Sustainable Design Submittals as described below:
  - //1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS. //
  - //2. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.// //
- C. Samples: Preliminary samples for approval:

1. Each terrazzo formula size 305 x 305 mm (12 x 12 inches) not more than 25 mm (1 inch) thick.
2. Divider strips:
  - a. One (1), 152 mm (6 inch) length of each type and kind of divider strip as herein specified.

D. Manufacturer's Literature and Data:

1. Cleaning and preservative solutions for terrazzo
2. Terrazzo formula
3. Nonslip aggregate
4. Divider strips
5. Adhesive for adhesively bond monolithic terrazzo

E. Manufacturer's qualifications.

F. Installer's qualifications.

G. Manufacturer's warranty.

**1.5 DELIVERY, STORAGE, AND HANDLING:**

- A. Materials are to be delivered in the manufacturer's unopened containers marked with the brand name. Materials are to be delivered, handled, and stored in accordance with manufacturer's instructions in a manner that will prevent deterioration and contamination.

**1.6 ENVIRONMENTAL REQUIREMENTS:**

- A. Areas to receive terrazzo are to be maintained at a temperature above 10 degree C (50 degrees F) 24 hours prior to the time terrazzo mixtures are placed and until completely cured.

**1.7 WARRANTY:**

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

SPEC WRITER NOTE: Mock-up must be approved by COR in the project's design stage before including requirement in specification.

**//1.8 MOCKUP:**

- A. Build a 9.29 sq. m (100 sq. ft.) mockup of terrazzo including accessories for each color and pattern at locations as indicated on construction documents.
- B. Approved mockup may // not // become part of the completed Project if undisturbed at time of Substantial Completion. //

**1.9 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
  - A1064/A1064M-14.....Carbon-Steel Wire and Welded Wire  
Reinforcement, Plain and Deformed, for Concrete
  - C33/C33M-13.....Concrete Aggregates
  - C150/C150M-12.....Portland Cement
  - C241/C241M-13.....Test Method for Abrasion Resistance of Stone  
Subjected to Foot Traffic
  - D2047-11.....Test Method for Static Coefficient of Friction  
of Polish-Coated Flooring Surfaces as Measured  
by the James Machine
- C. Code of Federal Regulation (CFR):
  - 40 CFR 59.....Determination of Volatile Matter Content, Water  
Content, Density Volume Solids, and Weight  
Solids of Surface Coating
- D. National Terrazzo and Mosaic Association (NTMA):
  - Terrazzo Specifications and Design Guide

**PART 2 - PRODUCTS**

**2.1 PORTLAND CEMENT TERRAZZO SYSTEM:**

- A. Portland Cement Terrazzo System: // Bonded // // Monolithic //.

**2.2 PORTLAND CEMENT:**

- A. Provide Portland cement conforming to ASTM C150/C150M, Type I of colors required to match NTMA Info Guide color plate indicated in Section 09 06 00, SCHEDULE FOR FINISHES.

**2.3 SAND:**

- A. Conform to ASTM C33/C33M for fine aggregate.

**2.4 MARBLE GRANULES:**

- A. Marble chips are to be of domestic origin of sizes and colors required to match NTMA Info Guide color plate indicated in Section 09 06 00, SCHEDULE FOR FINISHES. Provide marble chips with an abrasive hardness of not less than 10 when tested in accordance with ASTM C241/C241M; containing no deleterious or foreign matter; and having a dust content less than one (1) percent by weight.

**//2.5 DECORATIVE AGGREGATES:**

- A. Provide decorative aggregate material // glass // // mother-of-pearl // // // of sizes, kind, and color as indicated in Section 09 06 00, SCHEDULE FOR FINISHES and shall be compatible with the portland cement terrazzo flooring material.
- B. Size shall conform with NTMA gradation standards. Aggregate shall not contain any deleterious or foreign matter. Dust shall be less than one (1) percent by weight. Aggregate shall be maintained in a perfectly clean and dry state throughout tenure of work. //

**//2.6 RECYCLED CONTENT OF TERRAZZO PRODUCTS:**

- A. Recycled Content of terrazzo products: Post-consumer content plus one-half of preconsumer content not less than // 30 // // // percent.//

**2.7 MATRIX PIGMENTS:**

- A. Pure mineral or synthetic pigments, alkali resistant, durable under exposure to sunlight, and compatible with terrazzo matrix.

**2.8 NONSLIP AGGREGATE:**

- A. Aluminum oxide or carborundum particles, uniformly graded from 0.8 mm to 6 mm (1/32 to 1/4 inch) and black or dark color.

**2.9 NONSLIP NOSING INSERTS:**

- A. Precast semivitreous, dark color containing not less than thirty-five percent of nonslip aggregate bonded by vitrified ceramic material; not less than 101 mm (4 inches) wide, nor less than 13 mm (1/2 inch) thick. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

**2.10 BASE BEADS:**

- A. // Flush // // Projecting // type with // zinc-alloy // // brass // nosing, and 24 gage galvanized steel backing.

**2.11 METAL STRIPS:**

- A. Provide metal strips in accordance with NTMA Design Guide.
- B. // White-zinc alloy // // Brass // types specified below.
- C. Base Divider Strips: One (1) piece, 3 mm (1/8 inch) thick, shaped to profile of base from top edges to toe edge of base.
- D. Floor Divider Strips (Strips): 32 mm (1-1/4 inch) deep strip with // 3 // // 6 // mm (// 1/8 // // 1/4 // inch) thick top and // 20 // // 16 // gage bottom member.
- E. Floor Divider Strips (T-Strips): // 3 // // 6 // mm (// 1/8 // // 1/4 // inch) thick top with // 16 // // 12 // gage backing 38 mm (1-1/2 inches) wide.

- F. Floor Divider Strips (Special): // 3 // // 6 // mm (// 1/8 // // 1/4 // inch) thick top with offset on one side to provide bearing surface for resilient flooring 32 mm (1-1/4 inches) deep.
- G. Floor Divider Strips (Adhesively Bonded Monolithic Terrazzo):  
16 Brown & Sharpe (B&S) gage, folded, T-type formed for double expansion 16 mm (5/8 inch) deep.

**2.12 ADHESIVE FOR MONOLITHIC TERRAZZO:**

- A. Liquid polymer formulation, modified with epoxy resin, mixed in accordance with manufacturer's recommendations. Adhesive is to resist embrittlement, remain flexible and be resistant to impact.
- //1. Adhesive to have a VOC content of // 70 // // // g/L or less when calculated according to 40 CFR 59, (EPA Method 24). //

**2.13 CLEANING SOLUTION:**

- A. Use a neutral chemical cleaner, produced by manufacturer of preservative solution that will not change color of or damage terrazzo.

**2.14 SEALER:**

- A. Provide sealer with a pH factor between 7 and 10 and that is a penetrating type specially prepared for the terrazzo trade. The sealer is not permitted to discolor or amber the terrazzo. Sealer is required to produce a slip resistant surface. (Not less than 0.5 when tested in accordance with ASTM D2047.)
- //1. Sealant to have a VOC content of // 200 // // // g/L or less when calculated according to 40 CFR 59, (EPA Method 24).//

**2.15 TERRAZZO PROPORTIONS:**

- A. Underbed: Comply with NTMA's Design Guide for terrazzo system indicated for component proportions and mixing.
- B. Terrazzo Topping: Comply with NTMA's Design Guide for terrazzo system indicated for matrix and aggregate proportions and mixing. Mixing color as indicated in // Section 09 06 00, SCHEDULE FOR FINISHES.// // NTMA Color Plate: // // .//

**PART 3 - EXECUTION**

**3.1 INSTALLING METAL STRIPS:**

- A. Set strips with close, butt joints, true and square; hold in place with cement mortar, except where specified to be held with adhesive.
- B. Provide floor divider strips //, T-strips, // 3 mm (1/8 inch thick top) between cast-in-place terrazzo base and floors, and to divide floors into approximately 1800 mm (6 feet) squares, or pattern indicated in construction documents.

- C. Provide floor divider strips //, T-strips, // 6 mm (1/4 inch thick top) where terrazzo abuts cement or ceramic tile. Where joints occur at door openings, set strips directly under center of doors.
- D. Provide special floor divider strips where cast-in-place terrazzo abuts resilient flooring.
- E. Set base divider strips plumb for cast-in-place base. Anchor and space them not over 1524 mm (5 feet) on centers, or to align with floor divider strips. Set divider strips symmetrically at doors other openings and wall breaks and in line with field divider strips of floor.

SPEC WRITER NOTE: If floor divider spacing is not indicated in construction documents, consult Contracting Officer Representative (COR) for spacing.

- F. Use floor divider, // T-strips // for adhesive bonded monolithic terrazzo floors, located as indicated in construction documents. Set strips with same adhesive used for bonding terrazzo topping, and shim where necessary to produce a straight and level floor. Tightly butt strips at intersection, and install 24 hours prior to floor installation.

### **3.2 INSTALLING TERRAZZO FLOORS:**

- A. Bonded to Concrete Terrazzo:
  1. Provide bonded to concrete terrazzo consisting of an underbed and terrazzo topping on a rough concrete slab.
  2. Finish terrazzo floors a minimum of 44 mm (1-3/4 inches) above rough concrete slab.
  3. Clean surfaces of concrete slabs to receive terrazzo to remove plaster, oil, grease, and foreign matter. Saturate slabs with water, remove excess water and then, immediately before placing underbed, slush and broom concrete with neat cement.
  4. Provide underbed that is a minimum of 32 mm (1-1/8 inches) thick. Wet cement-sand mix to proper consistency and spread evenly over surfaces to receive terrazzo.
  5. Provide shrinkage reinforcement of 50 mm (2 inch) wire mesh (16 gage).
  6. Finish underbed to true, level surface, and prepare and condition it to receive terrazzo topping and ensure permanent bond.
- //B. Monolithic Terrazzo: Provide monolithic terrazzo consisting of terrazzo topping placed integrally on prepared concrete slab.

1. Broom clean concrete slabs to receive terrazzo.
  2. Before placing of terrazzo topping, saturate slabs with water until all absorption by concrete has stopped.
  3. Remove excess water.
  4. Place terrazzo over prepared slab in one continuous operation. //
- //C. Adhesively Bonded Monolithic Terrazzo: Provide adhesively bonded monolithic terrazzo consisting of terrazzo topping adhesively applied to concrete slab.
1. Clean concrete slabs so that they are free of dirt, dust, oil, paint and other foreign materials.
  2. Damp mop surface before applying adhesive.
  3. On porous concrete slabs, apply a prime coat of same adhesive used for bonding terrazzo topping, 24 hours in advance of application of bonding coat.
  4. Install specified divider strips.
  5. Apply adhesive evenly to concrete slabs to approximately 10 mils thickness.
  6. When spray or broom application is used reduce viscosity of adhesive with solvents as recommended by adhesive manufacturer. Allow minimum of 1/2 hour lapse before applying bond coat.
  7. Immediately broadcast marble chips over adhesive film and continue with placing terrazzo topping in one continuous operation. //
- D. Topping:
1. Spread topping to provide finished thickness of 10 mm (3/8 inch), after grinding, on vertical surfaces, and 16 mm (5/8 inch) on horizontal surfaces.
  2. Provide topping in uniform composition, and use same marble granules that appear on surface for its entire thickness.
  3. Trowel and pack base to proper form, and roll floor and thresholds with heavy roller so that terrazzo will be dense with even surface showing at least 70 percent marble granules.
  4. Lay terrazzo topping full above strips to permit grinding terrazzo down to finish floor level.

### 3.3 INSTALLING BASES:

- A. Provide base 140 // // mm (5-1/2 // // inches) high, and with 25 mm (1 inch) radius cove at bottom. Make external corners of base conform to contour of wall finish above. Provide // square toe // // cove // at corners of floor field.

- B. Round top of projecting base to 6 mm (1/4 inch) radius.
- C. At openings, having metal door frames, return base on itself, with  
// toe // // cove // in line with back edge of metal frame.

#### **3.4 INSTALLING TERRAZZO CONCRETE STAIRS:**

- A. Divide landings and intermediate platforms into approximately 300 mm (12 inch) squares with 3 mm (1/8 inch) thick top floor divider strips. Stair treads, landings, and platforms are to be finished 38 mm (1-1/2 inches) above rough concrete slab unless otherwise indicated in construction documents.
- B. Nonslip Aggregate: Sprinkle 113 grams (1/4 pound) of nonslip aggregate to each .09 square meter (1 square foot) of terrazzo surface for stair treads, platforms, and floors within stair wells.
  - 1. At stair treads and nosing areas of stair platforms, and floor landings provide tile nosing inserts or nonslip filled-grooves in addition to nonslip aggregate.
- C. Nosings: In addition to nonslip abrasive, install nosing edge on terrazzo treads, platforms and landings. Nosing are to be nonslip inserts extending to within 101 mm (4 inches) of ends of treads and landings; bond them to terrazzo.
  - 1. In lieu of inserts, provide three (3) grooves, 6 mm (1/4 inch) wide and not less than 9.5 mm (3/8 inch) deep, approximately 32 mm (1-1/4 inches) on centers, filled flush with nonslip aggregate mixed with suitable binder which will bond with terrazzo.
  - 2. Start grooves at not less than 19 mm (3/4 inch) from nosing edges and extend them continuously to within 101 mm (4 inches) of ends of treads and landings.

#### **3.5 CURING:**

- A. Cure terrazzo topping at least six (6) days before grinding and until it sets sufficiently hard to permit coarse stone grinding without dislodging surface aggregate.
  - 1. Curing time for terrazzo base may be reduced to four (4) days, subject to approval of Contracting Officer Representative (COR).
  - 2. During curing period, cover terrazzo with either waterproof paper, cotton mats, or 25 mm (1 inch) of clean wet sand. Lap and secure against displacement of joints in paper or mats.
  - 3. Keep sand (if used) wet by sprinkling with clean water at intervals of not more than eight (8) hours.



4. Do final grinding or rubbing of terrazzo before finish coat of plaster or other connecting wall finish is applied.

### **3.6 FINISHING:**

- A. Finishing is to be in accordance with NTMA Design Guide for terrazzo and accessory installation.
- B. Rough Grinding: After topping has cured, machine grind terrazzo using the wet method, to a true even surface using No. 24 or finer grit followed by No. 80 grit or finer grit stone.
  1. Grind terrazzo surfaces with electric grinding machines.
  2. Where impossible to use machines, hand rub surfaces.
  3. Dry grinding of terrazzo is prohibited.
- C. Grouting: After rough grinding, wash and rinse floor with clean water.
  1. After removing excess rinse water, grout floor using identical portland cement, color and pigments as used in the topping taking care to fill voids.
  2. After the grout has attained its initial set, cure surface for a minimum of 72 hours.
- D. Fine Grinding: After grout has cured, fine grind terrazzo to remove scratches, and produce true surface of uniform color and texture, without irregularities.
  1. When tested with steel straight edge, terrazzo base surfaces are to not show wave exceeding 1.6 mm (1/16 inch) between divider strips.
  2. When tested with steel straight edge 900 mm (3 feet) long, floor surfaces are to not show wave exceeding 0.8 mm (1/32 inch).
  3. Upon completion of grinding, the terrazzo flooring is to show a minimum of 70 percent of marble chips.
  4. Protect adjacent walls, floors, and other connecting work from rubbing stones and from splashing, while grinding is in progress.

### **3.7 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 COR.

### **3.8 CLEANING:**

- A. After final grinding, clean terrazzo and condition to counteract efflorescence. Apply mixture in accordance with manufacturer's instructions.

**3.9 SEALING:**

- A. After surfaces are dry, wash and rinse terrazzo and (except on terrazzo surfaces containing nonslip aggregate) apply coat of sealer in accordance with the manufacturer's instructions. Buff terrazzo surfaces with a weighted polishing brush or electric buffing machine.

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