

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

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for all materials, labor, tools, equipment and services required to install the following:
  - 1. Sand cushion terrazzo flooring including underbed.
  - 2. Isolation membrane.
  - 3. Welded wire mesh.
  - 4. Divider strips.
  - 5. Control joints.
  - 6. Terrazzo topping.

**1.02 SUSTAINABILITY REQUIREMENTS**

- A. Sustainability requirements included in the Section are as follows:
  - 1. Documentation of Recycled materials.
  - 2. Documentation of Regional materials.
- B. The Contractor shall implement practices and procedures to meet the Project's sustainable requirements. The Contractor shall ensure that the requirements related to these goals, as defined in Specification Section S01352, Sustainability Requirements, and as specified in this Section, are implemented to the fullest extent. Substitutions or other changes to the work shall not be proposed by the Contractor or their sub-contractors if such changes compromise the stated Sustainable Design Performance Criteria.

**1.03 REFERENCE STANDARDS**

- A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.
- B. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- C. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.
- D. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
- E. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- F. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine; 2011.
- G. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- H. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.
- I. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; California Department of Public Health; v1.1, 2010.
- J. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition.
- K. NTMA (SPECS) - NTMA Terrazzo Specifications; current edition located at [www.ntma.com](http://www.ntma.com).
- L. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

**1.04 SUBMITTALS**

- A. Product Data

1. Submit manufacturer's technical information and installation instructions for each type of terrazzo and accessory items.
- B. Shop Drawings
  1. Submit drawings showing the layout of the divider strips, expansion, base, and border strips.
  2. Show large-scale details of the following: terrazzo jointing and edge conditions, reinforcement, anchorage, internal and external corners, ends at door and flooring pattern.
- C. Samples
  1. Submit the following:
    - a. Terrazzo: Two samples for each type finish or color combination. Samples to be at least 6" x 6".
    - b. Divider Strips: One 6" length of each type and kind of divider strip.
- D. Record Drawings
  1. Contractor will submit a schedule of application or finish systems marked on a record drawing for maintenance purposes.
- E. Material Certification
  1. Supplier's/manufacturer's written certification that terrazzo materials provided meet or exceed specified NTMA properties.
- F. Guarantee
  1. Submit a guarantee per Article 1.08 of this Specification Section.
- G. Project Closeout Submittals
  1. Maintenance Instructions
  2. Provide Maintenance Data as specified in Article 1.09.
- H. Low Emitting Materials Compliance Submittals
  1. Provide documentation for each sealer and sealant to be used indicating that the sealers and sealants comply with low V.O.C. requirements as stated in Specification Section G01600.
  2. Provide documentation of compliance with the testing and product requirements of CDPH-SPTVOE or applicable rules of SCAQMD as specified, and documentation as required for compliance with local regulations.
- I. Sustainability Submittals
  1. Recycled Content
    - a. Submit documentation of recycled content for terrazzo materials consisting of product data, mix design information, or manufacturer's statement as applicable.
    - b. Submit Contractor's Sustainable Materials Form with complete information on recycled content for materials provided under the work of this section in accordance with Section S01352, Sustainability Requirements. Include cost of materials and percentage, by weight, of materials that have post-consumer or pre-consumer recycled content.
  2. Regional Content
    - a. Submit documentation of regional content for terrazzo materials consisting of product data, mix design information, or manufacturer's statement as applicable.
    - b. Submit Contractor's Sustainable Materials Form with complete information on regional content for the following item provided under the work of this section in accordance with Section S01352, Sustainability Requirements. Include cost of all materials and distance in miles to point of materials extraction and manufacture.

## **1.05 QUALITY ASSURANCE**

### **A. Qualifications**

1. Installer is to be a firm who has a minimum of three years experience with the installation of Portland cement terrazzo and has successfully completed installations of a similar size and scope as specified in this Section.
- B. Performance Requirements
  1. Work of this Section shall conform to all requirements of the following:
  2. New York City Building Code, latest edition.
- C. NTMA Standards
  1. Comply with the provisions and recommendations of the National Terrazzo and Mosaic Association, Inc. (NTMA).
- D. Mock Up/Sample Panel
  1. Prior to the start of general Work, prepare a sample section of each different application of terrazzo and obtain approval from the Architect before proceeding with the balance of the Work. Retain this sample during Work, suitably marked, as a standard for judging completed Work. After completion of Work, Contractor may incorporate approved sample panel into finish floor. The extent of the sample panel will be determined by the Architect, as the size and complexity of the project dictate.
- E. Single Source Responsibility
  1. Obtain all materials from a single manufacturer, including all sealers and curing compounds, as recommended by terrazzo manufacturer.
- F. All terrazzo flooring with sealer shall have a coefficient of friction no less than 0.60 when tested in accordance with ASTM D2047.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials required for the Work of this Section including but not limited to; cement, chips, color mix, sealers, cleaners in original, unopened containers bearing brand name and identification of manufacturers.
- B. Store all materials inside, under cover in a manner to keep them dry, protected from weather, direct sunlight, surface contamination, damage from construction traffic and other causes, adhering to all manufacturers recommendations for storage of materials.

#### **1.07 FIELD CONDITIONS**

- A. Maintain minimum temperatures above 40oF during installation of the terrazzo and for a minimum of one week after placement
- B. Inspection of Surfaces
  1. Before beginning operations, carefully examine all surfaces to receive terrazzo. Any surface that is found unsuitable to receive Work should be reported to the Authority's Representative. Do not begin work until substrate is in satisfactory condition.
- C. Installation of terrazzo will signify acceptance of the substrate by the Contractor as satisfactory to receive his Work.

#### **1.08 GUARANTEE**

- A. Terrazzo installer shall furnish written guarantee against defects due to improper or defective materials or workmanship for a period of one year following substantial completion of the terrazzo installation.

#### **1.09 MAINTENANCE LITERATURE**

- A. Upon substantial completion of the Work under this heading, furnish Maintenance Literature:
- B. Two copies of manufacturer's printed maintenance instructions for each type of terrazzo
- C. NTMA Literature on the "Care of Terrazzo"
- D. Submit to the following persons:

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Portland Cement
  - 1. ASTM C150, Type 1, except as modified to comply with NTMA requirements for compressive strength.
    - a. Provide non-staining white cement for terrazzo matrix unless otherwise specified.
    - b. Provide standard gray cement for underbed, unless otherwise specified.
- B. Sand
  - 1. Shall be clean, hard, natural and manufactured conforming with the ASTM C33 specifications for fine aggregate.
- C. Marble Chips
  - 1. Shall be standard quarry products of sizes and colors necessary to match samples specified from NTMA's Catalog & Design Book, or to match Architect's sample.
- D. Water
  - 1. Shall be clean, clear New York City drinking water.
- E. Pigments
  - 1. Shall be lime proof, non-fading mineral or synthetic pigment resistant to alkalies. Mix pigments with matrix to provide required colors for use with Portland cement.
- F. Mesh and Reinforcement
  - 1. Galvanized welded wire fabric 2" x 2" - W0.3 x W0.3 conforming to ASTM A185 Wire Fabric for Concrete Reinforcement and ASTM A82 except for minimum wire size.
- G. Isolation Membrane
  - 1. Where shown or required, provide .004" thick polyethylene sheet conforming to ASTM D2103 Type 13300 or 15 lb. roofing felt conforming to ASTM D226 or equivalent.
- H. Curing Material
  - 1. Liquid membrane forming compound conforming to ASTM C309, wet sand, polyethylene sheeting, or clean water.

### **2.02 TERRAZZO ACCESSORIES**

- A. Divider Strips
  - 1. White metal alloy zinc - 11/4" deep by 1/4" thickness or as otherwise indicated on drawings.
- B. Accessory Strips
  - 1. White metal alloy to match width of divider strips, unless otherwise indicated for the following types of accessory strips:
    - a. Base bead and cove base dividers.
    - b. Channels to receive abrasive inserts.
- C. Control Strips
  - 1. Double or split units, 1/8" wide of same material and color as divider strips with 1/8" wide full-depth filler laminated between strips:
    - a. Filler: Elastomeric sealant.
- D. Cleaner
  - 1. Neutral, liquid cleaner, recommended by sealer manufacturer for type of terrazzo used, complying with all NTMA requirements.
- E. Floor Sealer
  - 1. Penetrating type, free from harmful alkali or acid content, specially prepared for the terrazzo trade. Shall not discolor or amber. Shall produce a slip-resistant surface.
  - 2. Sealer to be equal to terrazzo sealer #341 by Hillyard, St. Joseph, Missouri, or Huntington Terrazzo by Huntington Laboratories, Huntington, Indiana

## 2.03 MIXES

- A. Underbed
  - 1. Comply with NTMA recommendations
    - a. One part Portland cement and four to five parts clean, sharp sand. Mix with sufficient water to produce workability at as low a slump as possible.
- B. Terrazzo Toppings
  - 1. Comply with NTMA recommendations.
    - a. Standard Topping; 200 pounds of marble chips per 94 pound bag of white Portland cement. Chips and cement to be identical to those in approved samples or selected from NTMA color plates.
    - b. Color pigment, if required, is to be mixed in with the dry ingredients. When thoroughly mixed, add (5) five gallons of water per bag of cement. Adjust amount of water to allow for water present in marble chips, if necessary. Use consistent proportion of water in each batch mixed. Comply with all NTMA requirements for mixes specified.
- C. Terrazzo Types
  - 1. Comply with NTMA Guide Specification for terrazzo type indicated for matrix and marble chip proportions and mixing.
  - 2. Mix Color and Pattern: Match Architect's sample, Match existing or as selected by Architect from NTMA [standard-terrazzo plates]

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Thoroughly vacuum or broom clean existing surfaces of loose chips and foreign matter.

### 3.02 INSTALLATION

- A. General
  - 1. Comply with all NTMA recommendations for proportioning mixes, installation of divider strips, and for placing, curing, grinding, grouting, and finishing terrazzo.
  - 2. Contractor is to make itself aware of all existing obstructions and is to coordinate placement and finishing of terrazzo to achieve continuous color, pattern and texture.
- B. Underbed
  - 1. Cover entire surface to receive terrazzo with one eighth to one-quarter inch of sand and screen to a uniform level.
  - 2. Over the sand install one layer of isolation membrane, as specified, overlapping the edge a minimum of 3".
  - 3. Place the mesh reinforcement, lapping two squares and tie mesh at all expansion type (divided) strip locations.
  - 4. Place concrete underbed. Screed underbed to uniform levels or slopes required.
  - 5. While the underbed is in a semi-plastic state, install divider strips specified in accordance with layouts. Set accurately, straight, and to levels required. Trowel firmly along edge of the divider strips to assure anchorage in the underbed.
  - 6. Where indicated, the field dividers shall extend across the borders at alternate strips at right angles thereto and at intersections.
  - 7. Install control joint strips directly above expansion joints taking care that the control joint strip is full depth of underbed.
- C. Terrazzo
  - 1. Comply with NTMA "Guide Specification for Sand Cushion Terrazzo".
    - a. Slush underbed with neat cement grout of same type specified for the topping and broom into underbed surfaces. Where color pigments are required, add like proportions to grout.

- b. Place terrazzo topping in the panels formed by the divider strips; trowel to surface even with the top of strips. Seed surfaces with same proportions and kinds of marble chips contained in topping.
- c. Trowel the sprinkled marble chips uniformly over finish and roll with heavy rollers until all excess water has been extracted. Trowel to uniform surfaces disclosing the lines of dividers strips.

### **3.03 CURING**

- A. With due regard for weather conditions encountered during the curing processes, the terrazzo installer shall determine the time suitable for necessary curing.

### **3.04 GRINDING**

- A. The initial rubbing shall be accomplished by floor machines outfitted with No. 24 or finer grit stones. A second rubbing, using No. 80 or finer grit stones, shall immediately follow initial rubbing.

### **3.05 GROUTING**

- A. Immediately following rough grinding, surfaces shall be cleaned with sufficient clean water to remove dust. Rinse thoroughly with clean water. Remove excess, and apply paste consistency Portland cement grout of type employed in the topping, by hand or machine, with pigment added in like amounts. Fill all voids.

### **3.06 CURING GROUTS**

- A. As soon as the grout has obtained initial set, cover the entire surface with a generous application of specified curing material; allow to remain to help protect finishes from staining until final polishing.

### **3.07 FINAL POLISHING**

- A. Final polishing shall not be done until all heavy trades have completed their Work, just prior to start of painters' Work, as directed by the Authority.
- B. Fine Stoning
  - 1. Final machine rubbing shall not take place sooner than three days following the grouting. The grouting shall be removed by means of floor machines using No. 80 or finer grit stones.
  - 2. Upon completion of the final rubbing the terrazzo finish shall show an average of not less than 70-75% of marble chips.

### **3.08 SEALING AND FINISH TREATMENTS**

- A. As soon as the terrazzo surfaces are thoroughly dry, apply sealer.

### **3.09 CLEANING**

- A. Immediately following the machine rubbing or fine stoning wash all surfaces with a solution of neutral cleaner, and rinse.

### **3.10 PROTECTION OF FINISHES**

- A. Upon completion of the sealing or other finish treatments, the floors shall be ready for final inspection and acceptance by the Authority. The floors shall be protected by the use of Kraft paper or other means acceptable to the Authority.

**END OF SECTION**