



SECTION 09 66 13 - PORTLAND CEMENT TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Poured-in-place Portland Cement Terrazzo Flooring and Base.

NOTE: Some of the existing terrazzo installations at the airport are cementitious. In the event that one of these existing installations is required to be repaired or replaced, this guide specification section is to be utilized.

1.2 DEFINITIONS

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

1.3 PREINSTALLATION MEETINGS

- A. Pre-Installation Conference: Conduct conference at LAX.
 - 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.
 - d. Review procedures for coping with unfavorable forecasted weather conditions.

1.4 ACTION SUBMITTALS

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



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5. Abrasive strips.
 6. Stair treads, risers, and landings.
 7. Terrazzo patterns.
- C. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.
- D. Samples for Initial Selection: National Terrazzo & Mosaic Association, Inc. (NTMA) color plates showing the full range of colors and patterns available for each terrazzo type.
- E. 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-) square Samples.
 2. Accessories: 6-inch- (150-mm-) long Samples of each exposed strip item required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Engage an experienced Installer who is a current NTMA member in good standing and who has completed a minimum of 3 terrazzo installations similar in material and extent to that indicated for Project – as determined by LAWA – over the last 5 years and that have resulted in construction with a record of successful in-service performance.

NOTE: A letter from the National Terrazzo & Mosaic Association, Inc. (NTMA) dated within 30 days of the bid, stating same, must be submitted with the bid. Any active investigations of contractor's work must be noted in this letter.

- 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. Installer Qualifications: An installer who is a contractor member of NTMA.
- 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. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.



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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 directed by LAWA.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless LAWA specifically approves such deviations in writing.

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. Weather Limitations: Proceed with terrazzo installation only when forecasted weather conditions permit work to be performed according to NTMA's written recommendations.
- B. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- C. 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 PORTLAND CEMENT TERRAZZO

- A. Portland Cement Terrazzo System: Sand cushion.
1. Underbed: Comply with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo system indicated for component proportions and mixing.
 2. 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 required.
 - b. Formulated Mix Color and Pattern: Insert NTMA color plate designation.
 - c. Custom Mix Color and Pattern: Match existing.
- B. Materials:
1. Portland Cement: ASTM C 150, Type 1.
 - a. Color for Exposed Matrix: As required by mix indicated.
 2. Water: Potable.
 3. Sand: ASTM C 33/C 33M.
 4. 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.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
 5. Matrix Pigments: Pure mineral or synthetic pigments, alkali resistant, durable under exposure to sunlight, and compatible with terrazzo matrix.
 6. Bonding Agent: Neat Portland Cement, or epoxy or acrylic bonding agents formulated for use with topping indicated.
 7. Underbed Reinforcement: Galvanized welded-wire reinforcement, wire 2 by 2 inches (51 by 51 mm) by 0.062 inch (1.57 mm) in diameter, complying with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.
 8. Isolation Membrane: Polyethylene sheeting, ASTM D 2103, Type 13300, 4 mils (0.1 mm) thick; or unperforated asphalt felt, ASTM D 226, Type I (No. 15).

2.3 STRIP MATERIALS

- A. Standard Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
- B. Heavy-Top Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.



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- C. Heavy-Top Angle Divider Strips: One-piece, L-type angle strips with anchoring device and in depth required for topping thickness indicated.
- 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. Expansion-Joint Strips: Brass, with removable zip-strip top for installing sealant; minimum 1/2 inch (12.7 mm) wide.
- F. 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.

2.4 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.
- 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; 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).
 - 4. Product: "Scotchgard Stone Floor Protector" or LAWA approved equal.



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 F1869. 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 F2170. 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.



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- 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. Underbed:
 - 1. Comply with NTMA's "Terrazzo Specifications and Design Guide" for underbed installation.
 - 2. Cover entire surface to receive terrazzo with dusting of sand.
 - 3. Install isolation membrane over sand, overlapping ends and edges a minimum of 3 inches (75 mm).
 - 4. Install welded-wire reinforcement, overlapping at edges and ends at least two squares. Stop mesh a minimum of 1 inch (25 mm) short of expansion joints.
 - 5. Place underbed and screed to elevation indicated below finished floor elevation.
- D. Strip Materials:
 - 1. Divider and Control-Joint Strips:
 - a. Locate divider strips directly over control joints, breaks, and saw cuts in concrete slabs.
 - 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. Expansion-Joint Strips: Form expansion joints using divider strips and install directly above concrete-slab expansion joints.

NOTE: All expansion and control joints within the existing concrete slab are to be carried through the terrazzo, to the finish surface.

- 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) 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



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Portland Cement Terrazzo according to NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

1. Grinding: Delay grinding until heavy trade work is complete and construction traffic through area is restricted. Exercise extreme care to ensure fluids from grinding operation do not react with dividers and strips to produce a stain on aggregate.
 - a. Rough Grinding: Grind with 24 or finer grit stones or with comparable diamond plates.
 - b. Intermediate Grinding: Follow initial grind with 80 or finer grit stones.
 - c. Grouting: Cleanse floor with clean water and rinse thoroughly. Remove excess rinse water by wet vacuum and machine until completely dry. Apply epoxy grout to fill voids.
 - d. Fine Grinding: Grind with **120** or finer grit stones until all grout is removed from surface. Upon completion terrazzo shall show a minimum of 70% to 75% of marble chips.

3.5 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 LAWA.

3.6 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