PART ONE: GENERAL

1.1 Summary

1.1.1 Section includes general administrative and procedural requirements governing execution for terrazzo flooring. Section includes terrazzo flooring and accessories for products and applications, including those specified in other Sections where terrazzo flooring requirements are specified by reference to this Section including but not limited to, the following:
   a. Poured-in-place resinous matrix epoxy terrazzo flooring
   b. Poured in place integral formed terrazzo wall base
   c. Terrazzo Tile
   d. Terrazzo Base
   e. Accessories

1.2 Related Documents

1.2.1 Construction Documents and general provisions of the Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction and Supplementary Conditions and other Division 01 Specification Sections, applicable to this Section. All methods herein are to follow all applicable state and local code as well as installation standards.

1.2.2 Comply with the requirements of the various specifications and standards referred to in the contract Plans and Specifications, except where they conflict with the specific requirements of these contract Plans and Specifications. Such reference specifications and standards.

1.3 Reference Standards

1.3.1 American National Standards Institute (ANSI)

1.3.2 American Society for Testing and Materials (ASTM)
   d. ASTM C501 Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
e. ASTM C97/C97M Absorption and Bulk Specific Gravity of Dimension Stone
f. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission
g. ASTM D2047 Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
i. ASTM E84 Standard Test Method for Surface Burning characteristics of Building Materials

1.3.3 South Coast Air Quality Management District (SCAQMD)
   a. SCAQMD Rule 1168 Adhesive and Sealant Applications
   b. SCAQMD Rule 1113 Architectural Coatings

1.3.4 National Terrazzo and Mosaic Association (NTMA)
   a. NTMA Info Guide Terrazzo Reference Guide

1.4 Submittals

1.4.1 All submittals shall be made in accordance to section 01 33 00 and as specified herein. Contractor is to submit the following to Owner and/or Consultant for approval prior to construction and fabrication:
   1.4.1.1 Shop Drawings/floor layouts/decorative patterns indicating expansion joint, control joint, isolation joint, perimeter joint and stress joint details; installation methods, transition details, manufacturer’s installation instructions, detail of additional accessory items, profiles of each trim type, joint details and connections to adjoining work
   1.4.1.2 Submit three (3) samples for each type, class, finish and color:
       1. Submit 12 inch square Samples of each color and pattern selected for each terrazzo flooring item specified.
       3. Bases and Accessories: Submit 12 inch long Samples of each color selected/specifed.
   1.4.1.3 Manufacturer’s Certification to verify materials comply with specified requirements and suitable for intended application.
   1.4.1.4 Product data for each product. Submit manufacturer’s specifications, catalog cuts, color range of specified product, product data sheets, installation instructions, and maintenance instructions.
   1.4.1.5 Setting materials, sealants and other misc. product required for complete installation: provide manufacturer product data and installation instructions.
   1.4.1.6 Warranty
   1.4.1.7 Maintenance material submittals: Furnish extra materials, trim and additional accessories that match and are from same production runs as products installed and that are packaged with protective covering and labels describing contents for storage.

1.5 Quality Assurance
1.5.1 Control Samples: All products shall match the Engineer's control samples in all respects. Control samples require the Engineer's approval before they may be used as a standard.

1.5.2 Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.5.3 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.

1.5.4 All work of this Section shall be performed by skilled installers of the trade and shall be of the highest quality specializing in installation of the products specified in this section with minimum five years of documented experience. Comply with applicable Industry Standards for all work and materials as specified. Such Industry Standards are to include but not be limited to the applicable provisions or standards in this section.

1.5.5 Mock-Up - Typical Floor Panel: The Contractor shall install a typical floor panel, approximately 9-feet square in an appropriate location. Mock-up shall include joint treatment and other accessories as required for a finished installation. Provide a typical floor panel for each different type of resilient flooring and floor design indicated. Mock-up will be provided for evaluation of surface preparation techniques and application workmanship for each type using manufacturer approved installation methods. Do not proceed with production work until workmanship and finishes are approved by Architect and/or Owner and/or designer. Mock-up may remain as part of the work.

1.5.6 Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.6 Coordination

1.6.1 Coordinate installation of all tiling. Furnish shop drawings, templates, and directions for a complete installation. Deliver all required items, product and setting materials to project site in time for installation.

1.7 Delivery, Storage and Handling

1.7.1 Deliver and store packaged materials in manufacturer’s original unopened containers with seals unbroken and labels intact indicating brand names, color, pattern and quality designation of contents until time of use.
1.7.2 Store materials to comply with manufacturer’s written instructions to prevent deterioration from moisture, heat, cold, direct sunlight, extreme temperature ranges, or other detrimental effects. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.7.2 Do not open containers or remove labels until materials have been inspected and accepted for installation.

1.7.3 Environmental Limitations: Do not proceed with installation when ambient and substrate temperature conditions are outside limits permitted by material manufacturers. Maintain ambient and substrate temperature as recommended by manufacturer.

PART TWO: PRODUCTS

2.1 General

2.1.1 Acceptable manufacturer/supplier as specified in contract drawings and/or Interior Design drawing set and specifications or an Owner approved equal. Approved equals and/or substitutions will only be approved for Work if submitted and approved in accordance with provisions of Section 01 25 00.

2.2 Materials

2.2.1 Use only products for types, compositions, and other characteristics indicated. Provide terrazzo flooring complying with NTMA’s "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

2.3 Products

2.3.1 All products provided for installation shall be the products specified by designer and/or Architect unless noted otherwise. If material is no longer available or if a substitution is required, then, refer to section 01 25 00 for Substitution Procedures.

2.3.2 Verify with drawing documents and schedules for tile specification number designations and product information as follows:

1. Composition
2. Size
3. Thickness
4. Finish
5. Formulated Mix
6. Color/Pattern
7. Slip Resistance must meet a Static coefficient of friction of 0.5 or greater is required, when tested in accordance with ASTM D2047.
8. Trim Units – if not specified it is the responsibility of the contractor to suggest compatible trim and submit for approval prior to installation.

2.3.3 Topping: Comply with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo system indicated for matrix and aggregate proportions and mixing.

2.3.4 Epoxy Resin: mixed in accordance with manufacturer’s recommendations and tested. Must meet ASTM standards for hardness, tensile strength, compressive strength and chemical resistance.

2.3.5 Portland Cement Terrazzo Flooring: Provide Portland cement conforming to ASTM C150/C150M, Type I, of colors required to match NTMA Information Guide.

2.3.6 Marble Chips: size of marble chips to conform to NTMA gradation standards, abrasion and impact resistance when testing in accordance to ASTM C131-89.

2.3.7 Precast Terrazzo: precuts are to be provided from specified vendor unless noted otherwise. Substitutions can be recommended as needed, see section 01 25 00 for substitution procedures.
   1. Manufacturers: Subject to compliance with requirements
   2. Precast Terrazzo Base:
      a. Minimum thickness per drawings
      b. Reinforced and cast in maximum lengths possible but not less than 36”
      c. Comply with NTMA's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.
      d. Type: Coved with a ¾” minimum radius, straight or splayed; refer to drawings
      e. Outside corner units are to be provided where required
   3. Precast Terrazzo Units:
      a. Minimum ¾” thick, reinforced Portland cement terrazzo units.
      b. Comply with NTMA's written recommendations for fabricating precast terrazzo units in sizes and profiles indicated.
      c. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer.
      d. Finish exposed-to-view edges and reveals to match face finish.
      e. Ease exposed edges to 1/8-inch (3.2-mm) radius.
      f. Precast Terrazzo units includes but is not limited to the following types: Tiles, planks, stair treads, thresholds, sills, benches, planters, countertops, shower bases

2.3.8 Provide terrazzo tile of the indicated colors and consisting of marble or granite chips embedded in a flexible or rigid thermoset resin matrix. Submit drawings indicating pattern, size, style, and color of tiles and two 150 by 150 mm 6 by 6 inch minimum samples of each color and pattern of terrazzo tile to be used.
tiles with a polished, polished and honed, textured or honed finish with uniform color distribution of chips.

2.3.9 Accessories:
Provide extruded metal material and size as indicated in drawings.

2. Heavy-Top Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
3. Heavy-Top Angle Divider Strips: One-piece, L-type angle strips with anchoring device and in depth required for topping thickness indicated.
4. 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.
5. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. The following types of accessory strips are to be provided as required for a complete installation:
   a. Base-bead strips for exposed top edge of terrazzo base.
   b. Edge-bead strips for exposed edges of terrazzo
   c. Nosings for terrazzo stair treads and landings
6. Abrasive Strips: abrasive inserts at nosings. Silicon carbide or aluminum oxide, or combination of both, in epoxy-resin binder and set in channel.

2.4 Misc. Setting Materials

Provide and install additional items for a sound installation. Additional setting materials for installation include but not limited to the following:

2.4.1 Strip Adhesive: Recommended by manufacturer for this use.

2.4.2 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.

2.4.3 Isolation and Expansion-Joint Material: Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, and non-outgassing in unruptured state

2.4.4 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.
2.4.5 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 THREE: EXECUTION

3.1 Examination

3.1.1 Do not begin installation until substrates have been properly prepared.

3.1.2 Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Subfloor and substrate surfaces shall be firm, dry, clean, and free from defects or irregularities that may impair bond or jeopardize the quality of the work.

3.1.3 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.1.4 Examine materials before installation. Reject materials that are defective and/or damaged.

3.1.5 Proceed with installation only after unsatisfactory conditions have been corrected.

3.1.6 Do not take any corrective action without written permission from the Client, Architect.

3.1.7 Determine the suitability of the concrete subfloor for receiving the terrazzo flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.
3.1.8 Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.

3.2 Preparation

3.2.1 Protect surrounding work from damage.

3.2.2 Roughen concrete substrates via shot-blasting or diamond drilling before installing terrazzo system according to NTMA's written recommendations.

3.2.3 Treat all stress cracks with Crack Isolation System as specified by the architect following the manufacturer installation instructions. Install 100% or partial coverage when required and indicated.

3.3 Installation

3.3.1 Clean and saturate concrete surfaces with water in accordance with NTMA Info Guide. Do not treat concrete substrate to receive bonded terrazzo with curing agent or additives which would preclude bonding. Remove excess water from the subfloor before slushing and brooming with neat cement paste. Place the underbed on the concrete subfloor and screed to an elevation 13 mm 1/2 inch below the finished floor. Install divider strips in the semi-plastic underbed. Firmly trowel the underbed along the edges to insure positive anchorage of the divider strips. Install control joint strips over subfloor expansion joints and extend the full depth of the underbed.

3.3.2 Set Divider Strips in accordance with layout indicated while underbed is still plastic. Set strips to straight lines and to the proper level to ensure that tops of strips will show uniformly after completing grinding and finishing operations. Fit joints and intersections tight. Where divisions in field work are not shown, divide field work into squares or rectangles of uniform size and not more than 1800 mm 6 feet on a side. Divide borders by strips to coincide with the layout of division strips in the field of floors. Place edging strips at doorways between terrazzo and other types of flooring and along the edges of terrazzo borders adjoining other types of floor finishes or floor coverings. Place expansion strips over control joints, construction joints, and expansion joints.

3.3.3 Placing Terrazzo Tipping: Slush and broom the underbed in accordance with NTMA Info Guide with neat cement paste of the same color as required for the topping. Place the topping in panels formed by divider strips and trowel level with the top of the strips. Seed the troweled surface with chips in the same color proportions as contained in the terrazzo mix, trowel and roll with heavy rollers until excess water has been extracted. Trowel the terrazzo to a uniform surface disclosing the lines of the divider strips.
3.3.4 Cure the terrazzo until the topping develops sufficient strength to prevent lifting or pulling of terrazzo chips during grinding. Keep the completed terrazzo continuously moist and free of traffic during the curing period. Cure by covering with a liquid membrane-forming compound, sheet materials, wet sand, or sprinkling with water.

3.3.5 Finish in accordance with NTMA Info Guide. After curing the grout coat for a minimum of 72 hours, grind the floor using a No. 80 or finer grit stone. In the latter stages of grinding, use grit stones or other abrasive in the grinding machine of a grain or fineness that will give the surface a honed finish. Grind and rub by hand small areas, inaccessible portions, and corners that cannot be reached by the grinding machine. The honed surface of finished terrazzo must show not less than 70 percent of the area as exposed aggregate evenly distributed, and conform in appearance to the approved samples.

3.3.6 After topping has cured, machine gring the 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. Finish floor surface must not vary by more than 2mm/meter 1/4 inch in 10 feet.

3.3.7 After rough grinding, cleanse and rinse the floor with clean water. After removing excess rinse water, grout the floor using identical Portland cement, color and pigments as used in the topping taking care to fill voids. After the grout has attained its initial set, cure the surface for a minimum of 72 hours.

3.3.8 After grout has cured, gring the surface with fine grit stones until all grout is removed from the surface. Upon completion of grinding, the terrazzo flooring must show a minimum of 70 percent of marble chips. Submit two 150 x 150 mm 6 x 6 inch (minimum) samples of each color of terrazzo

3.3.9 Wash the terrazzo with a neutral cleaner and, where required, clean with a fine abrasive to remove stains or cement smears. Rinse the cleaned surface. When dry, apply a terrazzo sealer in accordance with the manufacturer’s directions.

3.3.10 Install tile in accordance with the manufacturer’s approved installation instructions, except as specified herein. Lay tile symmetrical about center lines of rooms or areas. Joints must be tight, inconspicuous as possible, and in alignment. Cut tile to fit snugly at pipes and other vertical surfaces. Seal joints at pipes with adhesive. Remove spots or smears of adhesive immediately. Entire surface of finished tile floor must be smooth, straight, and free from bleeding adhesive, buckles, waves, or projecting tile edges upon completion. Bleeding of adhesive on finished floors is cause for rejection by the Contracting Officer. Remove and replace damaged or rejected tiles.

3.3.11 Where seams occur at right angle corners, cut pieces that butt each other from the same roll.
3.4 Protection, Cleaning and Repairs

3.4.1 Cleaning: Immediately upon completion of flooring installation in a room or an area, dry/clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer’s printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and/or finish in accordance with manufacturer’s written instructions.

3.4.2 Protect installed work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

3.4.3 Prohibit foot and wheel traffic from floors for at least 72 hours after installation.

3.4.4 Before final inspection, remove protective coverings and clean per manufacturer’s recommendations.

3.4.5 Remove and replace any items which are abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION