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USACE / NAVFAC / AFCEC / NASA | UFGS-09 66 13 (August 2016)
Change 2 - 11/18

Preparing Activity: USACE | Superseding
UFGS-09 66 13 (August 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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08/16, CHG 2: 11/18

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SECTION 09 66 13

PORTLAND CEMENT TERRAZZO FLOORING
08/16, CHG 2: 11/18

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NOTE: This guide specification covers the requirements for standard terrazzo bonded to concrete subfloor.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

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NOTE: Bonded terrazzo is normally 45 mm 1-3/4 inch total thickness, consisting of 13 mm 1/2 inch thick terrazzo topping over a 32 mm 1-1/4 inch thick underbed.

Where structural movement which may injure the terrazzo is anticipated, installations should be by the sand cushion (floating) method. Where requirement exists for sand-cushion or other-type installation method, bases, precast work, or specialized work such as structural, abrasive, rustic, or venetian terrazzo, or terrazzo over permanent metal forms, the specification should be revised or a separate section should be prepared as

appropriate.

Areas to receive terrazzo will be shown on the drawings. Color should be indicated by showing a selected plate number from the NTMA publication, "Terrazzo Design/Technical Data"

Example: NTMA Terrazzo Color Palette, plate No. S-301-4. Colors selected may be any combination of standard marble granules of domestic origin available in the local market.

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1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C150/C150M	(2022) Standard Specification for Portland Cement
ASTM C171	(2020) Standard Specification for Sheet Materials for Curing Concrete
ASTM C241/C241M	(2021) Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C309	(2019) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NATIONAL TERRAZZO AND MOSAIC ASSOCIATION (NTMA)

NTMA Info Guide	(2017) Terrazzo Reference Guide

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings

1.2 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in

accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation; G[, [_____]]

SD-03 Product Data

Flooring System Materials

Recycled Content for Portland Cement Terrazzo Flooring System; S

Indoor Air Quality for Curing Material; S

Indoor Air Quality for Sealer; S

SD-04 Samples

Terrazzo Flooring

Divider Strips

Control Joint Strips

Colorants

SD-10 Operation and Maintenance Data

Cleaning and Sealing

SD-11 Closeout Submittals

Warranty

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's unopened containers marked with the brand name. Deliver, handle, and store materials in accordance with manufacturers instructions in a manner that prevents deterioration and contamination.

1.4 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive terrazzo at a temperature above 10 degrees C 50 degrees F 24 hours prior to the time mixtures are placed and until completely cured.

1.5 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one-year period.

PART 2 PRODUCTS

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NOTE: Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness

and adequate competition (including verification of bracketed percentages included in this guide specification) before specifying product recycled content requirements.

Research shows the product is commonly available with the minimum recycled content percentages shown below. Include section below when system with recycled content is desired, and select material option based on research of availability and price effectiveness.

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[2.1 PORTLAND CEMENT TERRAZZO FLOORING SYSTEM MATERIALS

Provide system that has a minimum of [40 percent fly ash] [100 percent recycled aggregate] [____]. Provide data identifying percentage of recycled content for portland cement terrazzo flooring system. Do not use coral, dolomite, or limestone aggregates in setting bed.

]2.2 PORTLAND CEMENT

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 SCHEDULES FOR FINISHES].

2.3 SAND

Provide sand conforming to ASTM C33/C33M for fine aggregate.

2.4 MARBLE CHIPS

Provide marble chips of domestic origin of sizes and colors required to match NTMA Info Guide color plate indicated [in Section 09 06 00 SCHEDULES FOR FINISHES]. Marble chips must have an abrasive hardness of not less than 10 when tested in accordance with ASTM C241/C241M; contain no deleterious or foreign matter; and less than one percent by weight dust content.

2.5 DIVIDER STRIPS

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NOTE: Manufacturer's literature should be reviewed when making selections for divider strips. When material and thickness of divider strips and color of plastic strips vary, depending on location in the project, material thickness and color should be shown on the drawings and specified.

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Provide divider strips in accordance with NTMA Info Guide and 30 mm 1-1/4 inch deep, [_____] mm gauge thick and of [brass] [zinc] [plastic in color as indicated [in Section 09 06 00 SCHEDULES FOR FINISHES]]. Standard type one-piece divider strips must [be not lighter than 1.5 mm No. 16 Brown & Sharpe gage thick] [be of thickness indicated]. Heavy-top strips may be either one- or two-piece strips with a solid top section, [not less than 6 mm 1/4 inch nor more than 10 mm 3/8 inch in depth and not less than [3] [6] mm [1/8] [1/4] inch thick] [of thickness shown]. Submit two 150 mm 6 inch lengths of each type divider.

2.6 CONTROL JOINT STRIPS

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NOTE: Manufacturer's literature should be reviewed when making selections for control joint strips.
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Provide control joint strips in accordance with NTMA Info Guide and [_____] mm inches deep, [_____] mm gauge thick of [brass] [zinc]. Use neoprene filler [_____] mm inches thick in color as indicated [in Section 09 06 00 SCHEDULES FOR FINISHES]. Submit two 150 mm 6 inch lengths of each type control joint strip.

2.7 COLORANTS

Provide alkali-resistant and nonfading colorants. Pigments must be of colors required to match NTMA Info Guide color plate indicated [in Section 09 06 00 SCHEDULES FOR FINISHES].

2.8 CURING MATERIAL

Curing material must be either liquid membrane-forming compound, wet sand, polyethylene sheeting, or water. Liquid membrane-forming compound must conform to ASTM C309, Type I. Floor curing material products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for curing material. Polyethylene sheeting must conform to ASTM C171.

2.9 TERRAZZO CLEANER

Use biodegradable, phosphate free terrazzo cleaner with a pH factor between 7 and 10 and of a type specially prepared for use on terrazzo. Submit maintenance instructions for bonded terrazzo.

2.10 SEALER

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NOTE: Include bracketed pH factor for NAVFAC SW projects only.
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Sealer must [have a pH factor between 7 and 10 and] be a penetrating type specially prepared for use on terrazzo. The sealer must not discolor or amber the terrazzo and must produce a slip resistant surface. Flash point of sealer must be in accordance with NTMA Info Guide. Sealer products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for sealer.

2.11 SHEET MATERIALS

Sheet materials used for curing the terrazzo must conform to ASTM C171.

PART 3 EXECUTION

3.1 TERRAZZO PROPORTIONS

3.1.1 Underbed

Use underbed composed of one part portland cement to [4] [4.5] parts sand. Add water to provide workability at as low a slump as possible. Spread to a level 13 mm 1/2 inch below the finished floor, to a thickness of approximately 30 mm 1-1/4 inches.

3.1.2 Terrazzo Topping

Topping must be composed of one 43 kg 94 pound bag of portland cement per 91 kg 200 pounds of marble chips and approximately 20 L 5 gallons of water. Add color pigment as needed, but not to exceed 1 kg 2 pounds per bag of cement. Add water in sufficient quantity to provide workability at as low a slump as possible.

3.2 INSTALLATION

Submit drawings indicating the type, size, and layout of divider strips and control joint strips and color of floor areas.

3.2.1 Underbed Placement

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 semiplastic 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.

3.2.2 Setting Divider Strips

Set 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.

3.2.3 Placing Terrazzo Topping

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.

3.2.4 Curing

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.

3.2.5 Finishing

[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. Finished thickness of terrazzo topping must be a minimum of 13 mm 1/2 inch.]

3.2.5.1 Rough Grinding

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 2 mm/meter 1/4 inch in 10 feet.

3.2.5.2 Grouting

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.

3.2.5.3 Fine Grinding

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 CLEANING AND SEALING

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.

3.4 PROTECTION

cover and protect the terrazzo work from damage until completion of the work of all other trades.

-- End of Section --