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USACE / NAVFAC / AFCEA / NASA UFGS-09 66 13 (August 2010)  
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Preparing Activity: USACE Superseding  
UFGS-09 66 13 (May 2009)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2013

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08/10

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### SECTION 09 66 13

#### PORTLAND CEMENT TERRAZZO 08/10

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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 items(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 \(CCR\)](#).

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#### 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 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 C150/C150M	(2012) Standard Specification for Portland Cement
ASTM C171	(2007) Standard Specification for Sheet Materials for Curing Concrete
ASTM C241/C241M	(2009) Standard Specification for Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C33/C33M	(2013) Standard Specification for Concrete Aggregates

NATIONAL TERRAZZO & MOSAIC ASSOCIATION (NTMA)

NTMA Info Guide (2000) Terrazzo Information Guide

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS Scientific Certification Systems  
(SCS) Indoor Advantage

UL ENVIRONMENT (ULE)

ULE Greenguard UL Greenguard Indoor Air Quality  
Certification Program

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 to reflect only the submittals required for the project.

The Guide Specification technical editors have designated 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 submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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.

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" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation 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][; G, [\_\_\_\_\_]]

## SD-03 Product Data

### Certification

## SD-04 Samples

Terrazzo Flooring  
Divider Strips  
Control Joint Strips  
Colorants

## SD-10 Operation and Maintenance Data

### Cleaning and Sealing

## 1.3 SUSTAINABLE DESIGN CERTIFICATION

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NOTE: Products meeting the Gold standard will also meet the basic standard. Require Gold when the facility will be used by people sensitive to air quality conditions, such as child development centers and medical facilities.  
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Product shall be third party certified in accordance with ULE Greenguard[ Gold], SCS Scientific Certification Systems Indoor Advantage[ Gold ]or equal. Certification shall be performed annually and shall be current.

## 1.4 DELIVERY, STORAGE, AND HANDLING

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

## 1.5 ENVIRONMENTAL REQUIREMENTS

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

## 1.6 WARRANTY

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

## PART 2 PRODUCTS

### 2.1 PORTLAND CEMENT

Provide portland cement conforming to ASTM C150/C150M, Type I, of colors required to match NTMA Info Guide color plate indicated [on the drawings] [in Section 09 06 90 COLOR SCHEDULE].

### 2.2 SAND

Sand shall conform to ASTM C33/C33M for fine aggregate.

### 2.3 MARBLE CHIPS

Marble chips shall be of domestic origin of sizes and colors required to match NTMA Info Guide color plate indicated [on the drawings] [in Section 09 06 90 COLOR SCHEDULE]. Marble chips shall have an abrasive hardness of not less than 10 when tested in accordance with ASTM C241/C241M; shall contain no deleterious or foreign matter; and the dust content shall be less than one percent by weight.

### 2.4 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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Divider strips shall be in accordance with NTMA Info Guide and shall be 30 mm 1-1/4 inch deep, [ ] mm gauge thick and of [brass] [zinc] [plastic in color as indicated [on the drawings] [in Section 09 06 90 COLOR SCHEDULE]]. Standard type one-piece divider strips shall [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.

### 2.5 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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Control joint strips shall be in accordance with NTMA Info Guide and shall be [ ] mm inches deep, [ ] mm gauge thick and of [brass] [zinc]. Neoprene filler shall be [ ] mm inches thick in color as indicated [on the drawings] [in Section 09 06 90 COLOR SCHEDULE]. Submit two 150 mm 6 inch lengths of each type control joint strip.

### 2.6 COLORANTS

Colorants shall be alkali-resistant and nonfading. Pigments shall be of colors required to match NTMA Info Guide color plate indicated [on the drawings] [in Section 09 06 90 COLOR SCHEDULE].

### 2.7 CURING MATERIAL

Curing material shall be either liquid membrane-forming compound, wet sand, polyethylene sheeting, or water. Liquid membrane-forming compound shall conform to ASTM C309, Type I. Polyethylene sheeting shall conform to ASTM C171.

## 2.8 TERRAZZO CLEANER

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

## 2.9 SEALER

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**NOTE: Include bracketed pH factor for NAVFAC SW projects only.**  
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Sealer shall [have a pH factor between 7 and 10 and] be a penetrating type specially prepared for use on terrazzo. The sealer shall not discolor or amber the terrazzo and shall produce a slip resistant surface. Flash point of sealer shall be in accordance with [NTMA Info Guide](#).

## 2.10 SHEET MATERIALS

Sheet materials used for curing the terrazzo shall conform to [ASTM C171](#).

# PART 3 EXECUTION

## 3.1 TERRAZZO PROPORTIONS

### 3.1.1 Underbed

Underbed shall be composed of one part portland cement to [4] [4.5] parts sand. Water shall be added 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 shall 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. Color pigment shall be added as needed but not to exceed [1 kg 2 pounds](#) per bag of cement. Water shall be added 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

Surfaces of concrete subfloor shall be cleaned and saturated 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. Excess water shall be removed from the subfloor before slushing and brooming with neat cement paste. The underbed shall be placed on the concrete subfloor and shall be screeded to an elevation [13 mm 1/2 inch](#) below the finished floor. Divider strips shall be installed in the semiplastic underbed. The underbed shall be firmly troweled along the edges to insure positive anchorage of the divider strips. Control joint strips shall be installed over subfloor expansion joints and shall 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

The underbed shall be slushed and broomed in accordance with NTMA Info Guide with neat cement paste of the same color as required for the topping. The topping shall be placed in panels formed by divider strips and shall be troweled level with the top of the strips. The troweled surface shall be seeded with chips in the same color proportions as contained in the terrazzo mix, troweled and rolled with heavy rollers until excess water has been extracted. The terrazzo shall be troweled to a uniform surface disclosing the lines of the divider strips.

### 3.2.4 Curing

The terrazzo shall be cured 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

[Finishing shall be 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 shall show not less than 70 percent of the area as exposed aggregate evenly distributed, and shall conform in appearance to the approved samples. Finished thickness of terrazzo topping shall be a minimum of 13 mm 1/2 inch.]

#### 3.2.5.1 Rough Grinding

After topping has cured, the terrazzo shall be machine ground 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 shall not vary by more than 2 mm/meter 1/4 inch in 10 feet.

#### 3.2.5.2 Grouting

After rough grinding, the floor shall be cleansed with clean water and rinsed. After removing excess rinse water, the floor shall be grouted 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, the surface shall be cured for a minimum of 72 hours.

#### 3.2.5.3 Fine Grinding

After grout has cured, the surface shall be ground with fine grit stones until all grout is removed from the surface. Upon completion of grinding, the **terrazzo flooring** shall 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**

The terrazzo shall be washed with a neutral cleaner and where required shall be cleaned with a fine abrasive to remove stains or cement smears. The cleaned surfaces shall be rinsed. When dry, a terrazzo sealer shall be applied in accordance with the manufacturer's directions.

#### 3.4 PROTECTION

The terrazzo work shall be covered and protected from damage until completion of the work of all other trades.

-- End of Section --