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Preparing Activity:   NASA              Superseding  
                                UFGS-09 30 16.00 40 (April 2006)  
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## UNIFIED FACILITIES GUIDE SPECIFICATIONS

Latest change not indicated by CHG tags

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## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 18 July 2006

Latest change not indicated by CHG tags

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### SECTION 09 30 16.00 40

#### QUARRY TILING 06/06

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers quarry-tile floors, bases, and marble thresholds installed using conventional setting and thin-set methods utilizing portland cement or adhesive mortars and portland cement.

Drawings must indicate locations and schedule sizes, color patterns, expansion and control joints, construction details, and sections for types of tile.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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## PART 1    GENERAL

### 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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1 (2005) Installation of Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM A 185 (2002) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

ASTM C 144 (2004) Standard Specification for Aggregate for Masonry Mortar

ASTM C 150 (2005) Standard Specification for Portland Cement

ASTM C 171 (2003) Standard Specification for Sheet Materials for Curing Concrete

ASTM C 206 (2003) Standard Specification for Finishing Hydrated Lime

ASTM C 207 (2005) Standard Specification for Hydrated Lime for Masonry Purposes

ASTM C 241 (1990; R 1997e1) Standard Specification for Abrasion Resistance of Stone Subjected to Foot Traffic

ASTM C 387 (2004) Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete

ASTM C 847 (2001; R 2004) Standard Specification for Metal Lath

ASTM C 920 (2005) Standard Specification for Elastomeric Joint Sealants

ASTM D 1056	(2000) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1752	(2004a) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D 2103	(2003) Standard Specification for Polyethylene Film and Sheeting
ASTM D 226	(2005) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 4397	(2002) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual	(2003) Dimension Stone Design Manual
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## 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. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" 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.] [for 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

Fabrication drawings shall be submitted for the following items consisting of fabrication and assembly details to be performed in the factory. Drawings shall include scale drawings of special pattern and special design tile work.

Quarry Floor Tile  
Quarry Tile Trim  
Frostproof Tile  
Marble Thresholds

Installation drawings shall be submitted for quarry tile in accordance with the paragraph entitled, "Installation of Tile," of this section.

#### SD-04 Samples

The following samples shall be submitted:

Three full-size samples of each type, color, and pattern of Quarry Floor Tile.

Three samples not less than 200 millimeter 8-inches long of Marble Thresholds.

Three full-size samples of each type, color and pattern of Frostproof Tile.

Three full-size samples of each type of Quarry Tile Trim.

#### SD-07 Certificates

The following Certificates shall be submitted:

Marble Thresholds  
Mortar Materials and Mortars  
Joint Sealant  
Welded Wire Fabric  
Metal Lath  
Grout

Certificates for Tile Materials shall be submitted in accordance with paragraph entitled, "Tile Material Information," of this section.

Ceramic Tile Containers shall be grade marked in accordance with paragraph entitled, "Delivery, Handling and Storage," of this section.

Certificates of compliance for .

## SD-08 Manufacturer's Instructions

Manufacturer's instructions shall be submitted for the following including special provisions required to install proposed materials and equipment. Special notices shall detail impedances, hazards and safety precautions.

Preformed Joint Filler  
Quarry Floor Tile  
Mortar  
Acid Cleaning Materials  
Grout  
Quarry Tile Trim

### 1.3 FIELD MEASUREMENTS

Field measurements shall be taken prior to installation.

### 1.4 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered in manufacturer's unopened containers with grade seals unbroken. Seals shall remain intact until time of use. Ceramic Tile Containers shall be grade marked with a grade seal in accordance with requirements for "standard grade" as specified in ANSI A108.1.

Cement, lime, and packaged materials for concrete and masonry cement shall be furnished in bags displaying manufacturer's trademark and indicating type of material. Material shall be dry and free of lumps.

Aggregates shall be stored and handled to prevent intermixing.

Materials shall be stored above ground in a dry, weathertight, ventilated structure.

### 1.5 PROTECTION

Work shall be protected from damage. Cracked, chipped, or defective work will not be accepted. Areas in which tile work is in progress shall be closed to traffic and work of other trades until tile work is completed and cured.

Warning signs shall be posted after completion, prohibiting work around floors for a minimum of 7 calendar days.

### 1.6 MINIMUM TEMPERATURE FOR SETTING TILE

Areas to receive tile shall be maintained at a minimum ambient temperature of 16 degrees C 60 degrees F for not less than 2 calendar days before starting work and not less than 3 calendar days after completion. If practical, tile shall be stored in or around the area it will be installed for 48 hours prior to installation to allow acclimation.

### 1.7 TILE MATERIAL INFORMATION

Tile Materials shall meet the physical requirements and tests listed in ANSI A108.1, and shall be tested as specified therein for each type of material. Testing shall be performed by an independent testing laboratory.

A Master Grade Certificate for tile, prior to shipment, certifying grade, type, and quantity of material. Certificate shall bear certification mark of the Tile Council of America (TCA), and shall be signed by tile manufacturer and by tile Contractor.

## PART 2 PRODUCTS

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NOTE: Delete inapplicable the paragraph headings and following paragraphs. Drawings and finish schedules must indicate size, color, patterns, designs, expansion and control joints, and trim shapes where specific types are required.  
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### 2.1 QUARRY FLOOR TILE

Standard grade, square-edge-ground four-sides, unglazed, natural clay tile, shall conform to ANSI A108.1; in the color and size indicated, and exactly matching approved samples.

Standard grade, square-edge-ground four sides, unglazed, natural clay tile with abrasive aggregate surface shall conform ANSI A108.1; in the color and size indicated, and exactly matching approved samples. Abrasive content shall be not less than 7.5 percent by weight of abrasive grains.

Tile shall be [15] [20] millimeter [1/2-inch] [3/4-inch] thick.

### 2.2 QUARRY TILE TRIM

Trim shall be standard grade trim units conforming to ANSI A108.1, and shall match the color, size, and finish of approved samples.

### 2.3 FROSTPROOF TILE

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NOTE: Drawings must locate and schedule as "frostproof" tile scheduled for exterior use or for use in refrigerated spaces.  
\*\*\*\*\*

Tile shall be certified by manufacturer for use as an exterior facing material capable of withstanding exposure to minus 29 degrees C 20 degrees F for extended periods without crazing or spalling.

### 2.4 MARBLE THRESHOLDS

Thresholds shall be sound, durable, domestic marble conforming to MIA Design Manual, Group A marble, and shall be free of stains, discoloration, cracks, or defects.

Marble shall be not less than 22 millimeter 7/8-inch thick, profile as indicated, hone finish, and shall match the approved sample in color, finish and quality. Abrasion resistance shall be not less than 12.0 when tested in accordance with ASTM C 241.



## 2.5 MORTAR MATERIALS AND MORTARS

### 2.5.1 Portland Cement

Cement shall conform to ASTM C 150, Type I.

### 2.5.2 Fine Aggregate

Aggregate shall be washed, sharp, uncoated natural sand conforming to ASTM C 144. Aggregate used shall be so graded that not less than 100 percent of the aggregate passes a 2.36 millimeter No. 8 sieve, and 95 percent of the aggregate passes a 1.18 millimeter No. 16 sieve.

### 2.5.3 Hydrated Lime

Lime shall conform to ASTM C 206 and ASTM C 207, Type S.

### 2.5.4 Water

Water shall be potable.

### 2.5.5 Portland Cement Mortar

Mortar shall be a job mix of the specified materials as follows:

Setting bed mix for walls shall range, by volume, from 6-parts portland cement, 1/2-part hydrated lime, and 5-parts damp sand to 1-part portland cement, 1-part hydrated lime, and 7-parts damp sand.

Setting bed mix for floors shall consist of 1-part portland cement, 5-parts dry sand or 6-parts damp sand, and 1/10-part hydrated lime, by volume, mixed with no more water than required to make a stiff mix.

### 2.5.6 Dry-Set Portland Cement Mortar

Mortar shall conform to ANSI A108.1.

### 2.5.7 Organic Adhesive Mortar

Mortar shall conform to ASTM C 387. Type I shall be used for prolonged water resistance and Type II for intermittent water resistance.

## 2.6 GROUT MATERIALS

[Grout for floor tile shall be 1-part portland cement, 2-parts sand, and 1/5-part hydrated lime, by volume. Color shall be as indicated.]

[Grout for walls shall be 1-part portland cement, 2-parts sand, and 1/2-part hydrated lime, by volume, color as indicated.]

\*\*\*\*\*  
NOTE: The following grouts should be considered  
only when the project requires special inherent  
qualities.  
\*\*\*\*\*

Grout shall be a two-component epoxy grout, of an approved type and color, formulated in accordance with ANSI A108.1, and shall be certified by manufacturer as suitable for use with quarry tile.

## 2.7 EXPANSION JOINT MATERIALS

### 2.7.1 Preformed Joint Filler

Preformed Joint Filler shall be closed-cell, expanded cellular rubber conforming to ASTM D 1056, Grade No. SBE42; or sponge rubber or cork conforming to ASTM D 1752, Type I, II, or III; or an approved type of vinyl tubing or foam rope, as recommended by sealant manufacturer.

### 2.7.2 Joint Sealant

Joint sealant shall conform to ASTM C 920, Type II.

## 2.8 CURING COVERS, MEMBRANE, AND BOND-PREVENTIVE MATERIALS

### 2.8.1 Curing Covers

Covers shall conform to ASTM C 171.

### 2.8.2 Cleavage Membrane

Membrane shall be No. 15, asphalt-saturated building felt conforming to ASTM D 226, Type I, or reinforced-asphalt paper, concrete-curing paper, and polyethylene film or sheeting conforming to ASTM D 2103 or ASTM D 4397.

### 2.8.3 Bond-Preventive

Bond-preventive material for expansion joints to receive sealant shall be strips of polyethylene tape or aluminum foil the same width as joint.

## 2.9 METAL REINFORCEMENT MATERIALS

### 2.9.1 Welded Wire Fabric

Reinforcing for mortar bed shall be plain, cold-drawn, welded steel wire conforming to ASTM A 185, in 50 by 50 millimeter by 1.25 millimeter steel wire 2- by 2-inch by No. 16 U.S. steel gage; or 80 by 80 millimeter by 2.3 millimeter steel wire 3-by 3-inch by No. 13 U.S. steel wire gage; or 40 by 50 millimeter by 1.25 millimeter (No. 16) 1-1/2- by 2-inch by No. 16-U.S. steel wire gage.

### 2.9.2 Metal Lath

[Expanded-steel lath shall be painted, shall weigh not less than 1.4 kilogram per square meter 2.5 pounds per square yard, and shall conform to ASTM C 847, Class 3.]

[Expanded-steel lath shall be painted, self-furring, shall weigh not less than 1.8 kilogram per square meter 3.4 pounds per square yard, and shall conform to ASTM C 847, Class 3.]

## PART 3 EXECUTION

### 3.1 CONDITION OF WORK-IN-PLACE

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NOTE: Tolerances of work-in-place must be  
coordinated with Section 03 30 00.00 40

#### CAST-IN-PLACE CONCRETE.

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Previously finished surfaces to receive quarry tile shall be clean, dry, and free of oils, waxes, and curing compounds and shall be firm, level, and plumb.

### 3.2 PREPARATION OF SURFACES TO RECEIVE TILE

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NOTE: Include the following paragraph if tile is to be set directly on concrete which is smooth and glossy, painted or effloresced, or has loose surface material.

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Concrete surfaces shall have all loose particles, laitance, and foreign material removed and shall be roughened as required to receive tile by wire brushing, sandblasting, chipping, or scarifying.

### 3.3 INSTALLATION OF TILE

#### 3.3.1 General

Installation and workmanship shall be in accordance with ANSI A108.1, and as specified. Printed instructions of tile manufacturer and manufacturers of proprietary mortars and grouts shall be followed where applicable.

Before commencing work, field pattern and border line locations shall be established and the work shall be centered symmetrically so that no tile need be cut to less than half size. Joints in tile shall be aligned vertically and horizontally; staggered joints will not be accepted.

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NOTE: Select type of material and method of tile setting.

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#### 3.3.2 Portland Cement Mortar

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NOTE: Portland cement mortar is the conventional method and material for setting tile. It is suitable for most surfaces and ordinary types of installation, and is rated as a heavy-service-level material with quarry tile.

Portland cement mortar beds can be applied thick enough to facilitate accurate slopes or planes in finished tile work, and to true or level existing work. Conventional mortars are structurally strong and are not affected by prolonged contact with water. Use of this mortar requires soaking of tile and damp-curing of portland cement grouts.

Suitable backings, when properly prepared, include plumb and true concrete, and conventionally cured floor-setting beds.

Drawings must indicate depth of setting beds, floor recesses, metal reinforcing, waterproof backing and cleavage membrane materials and expansion and control joints.

Select type of cement mortar installation required.

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Quarry tile shall be set in a portland cement mortar bed, reinforced with welded wire fabric, separated from the subfloor by a membrane as indicated, and grouted and cured in accordance with ANSI A108.1.

Quarry tile shall be set in a portland cement mortar bed, grouted and cured, as indicated and in accordance with ANSI A108.1.

### 3.3.3 Dry-Set Mortar

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NOTE: Dry-set mortar is a portland cement and sand mixture with a water retaining additive. It is applied in a single layer as thin as 2.38 millimeter 3/32 inch. It is suitable over plumb and true concrete, and cured-floor setting beds if expressly approved by mortar manufacturer.

Dry-set mortar has excellent water and impact resistance, is water-cleanable, nonflammable, good for exterior work, and requires no presoaking of tile. It is not affected by prolonged contact with water, and will not form a water barrier.

This method of installation is classified by TCA as "moderate" service level with all types of tile.

Surfaces to receive tile set by dry-set mortar method must be plumb and true. Dry-set mortar is limited to approximately 6 millimeter 1/4 inch in truing or leveling existing work.

Drawings must indicate depth of setting beds, floor recesses, expansion and control joints.

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Quarry tile shall be set with dry-set, portland cement mortar and grouted and cured as indicated and in accordance with ANSI A108.1.

### 3.3.4 Expansion and Control Joints

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NOTE: Drawings must indicate location and detail of all expansion and control joints, and show filler and back up materials.

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Expansion-joint fillers and sealants shall be provided at joints as indicated and where tilework abuts walls, curbs, columns, utility lines, and other restraining surfaces where expansion and control joints are located in the backing; and where compressive stresses or movement may be transmitted to tilework; and in large floor areas to provide a joint

spacing of not more than 7.3 to 11 meter 24 to 36 feet each way.

Expansion joints shall be treated and sealed as specified in ANSI A108.1 with the specified joint filler and sealant.

#### 3.3.5 Setting Marble Threshold

Marble thresholds shall be set in a portland cement mortar bed not less than 20 millimeter 3/4-inch thick and aligned to a true and level surface. Finished surface shall be protected until completion of work.

#### 3.3.6 Cleaning Tile and Protection of Adjacent Surfaces

Upon completion of setting and grouting, tile shall be sponged and washed thoroughly and polished with clean, dry cloths.

Acid cleaning of tile shall be done in accordance with the tile manufacturer's printed directions and not until installation has cured for 10 calendar days, using approved Acid Cleaning Materials.

Metal surfaces, enameled cast iron, and vitreous plumbing fixtures shall be protected from the effects of acid cleaning of adjacent tile surfaces. Surfaces shall be flushed thoroughly with water after acid cleaning.

Materials or fixtures damaged by acid cleaning shall be removed and replaced at no expense to the Government.

#### 3.3.7 Curing

Portland cement grouts and commercial grouts shall be cured for not less than 72 hours by means of fog-spray, sponging, covers, or other approved methods.

#### 3.3.8 Covering Tile Floors

Tile floors shall be covered, after grouting and cleaning, with kraft paper or polyethylene curing covers. Adjoining sheets shall be side lapped not less than 150 millimeter 6 inches. Endlaps shall be not less than 300 millimeter 12 inches. Cement or tape joints shall form a continuous membrane.

Floor covers shall be maintained in good condition.

#### 3.3.9 Finished Tile Work

Finished tile installation shall be level and plumb within plus or minus 3 millimeter 1/8 inch of true plane in 2400 millimeter 8 feet. Joint lines, including miter joints, shall be straight and even in width.

Finished tile installation shall display no uneven surfaces or high or low spots in excess of 3 millimeter in 2400 millimeter 1/8 inch in 8 feet when measured with an 2400 millimeter 8-foot straightedge in any direction. Tile floors pitched to a floor drain shall be measured at any point along an 2400 millimeter 8-foot radius from the floor drain.

### 3.4 ACCEPTANCE PROVISIONS

#### 3.4.1 Repairing

Damaged and unacceptable portions of completed work shall be removed and replaced with new work matching adjacent surfaces at no additional cost to the Government.

#### 3.4.2 Cleaning

Surfaces of new work, and adjacent surfaces soiled as a result of this work, shall be cleaned. Equipment, surplus materials, and rubbish from the work shall be removed from the site.

-- End of Section --