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USACE / NAVFAC / AFCESA / NASA **UFGS-09 30 00 (January 2007)**

Preparing Activity: USACE **Superseding UFGS-09 30 00 (July 2006)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2007

Latest change indicated by CHG tags
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DIVISION 09 - FINISHES

SECTION 09 30 00

CERAMIC TILE, QUARRY TILE, AND PAVER TILE

01/07

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SECTION 09 30 00

CERAMIC TILE, QUARRY TILE, AND PAVER TILE
01/07

****
NOTE: This guide specification covers the requirements for ceramic tile for walls and floors, porcelain tile, quarry tile, paver tile, and marble thresholds.

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 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).

This guide specification includes tailoring options for NAVY, floor tiles, mosaic tile, quarry tile, detectable warning tile, porcelain tile, glazed wall tile, and marble thresholds. Selection or deselection of a tailoring option will include or exclude that option in the section, but editing the resulting section to fit the project is still required.
****

PART 1 GENERAL

****
NOTE: Tile grouted with epoxy or furan resin is included in this specification, but quarry tile

subject to severe chemical exposures is specified in Section 09 35 16 CHEMICAL-RESISTANT QUARRY TILE.

For Army facilities, buildings not excluded by UFC 3-310-02A or TI 800-01 Design Criteria will be accessible in accordance with 36 CFR, Part 1191, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

Drawings will indicate location, dimensions, elevations, schedules, content, details and such other information as required to indicate the extent of the work.

Product selections shall be based on esthetic values, function, type of facility, and cost as related to project needs.

****

1.1 REFERENCES

****

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
ANSI A137.1	(1988) Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM A 185/A 185M	(2006; E 2006) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM C 1026	(2002) Standard Test Method for Measuring

	the Resistance of Ceramic Tile to Freeze-Thaw Cycling
ASTM C 1027	(1999; R 2004) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
ASTM C 1028	(2006) Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
ASTM C 1178/C 1178M	(2006) Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
ASTM C 144	(2004) Standard Specification for Aggregate for Masonry Mortar
ASTM C 150	(2005) Standard Specification for Portland Cement
ASTM C 206	(2003) Standard Specification for Finishing Hydrated Lime
ASTM C 207	(2006) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C 241	(1990; R 2005) Standard Specification for Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C 33	(2003) Standard Specification for Concrete Aggregates
ASTM C 373	(1988; R 2006) Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
ASTM C 482	(2002) Bond Strength of Ceramic Tile to Portland Cement
ASTM C 501	(1984; R 2002) Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
ASTM C 648	(2004) Breaking Strength of Ceramic Tile
ASTM C 847	(2006) Standard Specification for Metal Lath
ASTM D 2103	(2005) Standard Specification for Polyethylene Film and Sheeting
ASTM D 226	(2006) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

ASTM D 4068	(2001) Chlorinated Polyethylene Sheeting for Concealed Water-Containment Membrane
ASTM E 2129	(2005) Standard Practice for Data Collection for Sustainability Assessment of Building Products
ASTM F 446	(1985; R 2004e1) Grab Bars and Accessories Installed in the Bathing Area

BAY AREA AIR QUALITY MANAGEMENT DISTRICT (Bay Area AQMD)

Bay Area AQMD Rule 8-51	(1992; R 2001) Adhesive and Sealant Products

GREEN SEAL (GS)

GS-36	(2000) Commercial Adhesives

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual	(2003) Dimension Stone Design Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 99	(2005; Errata 2005) Health Care Facilities

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(1989; R 2005) Adhesive and Sealant Applications

TILE COUNCIL OF AMERICA (TCA)

TCA Hdbk	(2003; R 2005) Handbook for Ceramic Tile Installation

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED	(2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities

1.2 SUBMITTALS

****

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.] [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

Detail Drawings[; G][; G, [_____]]

Drawings showing ceramic tile pattern [elevations][floor plans].

SD-03 Product Data

[Local/Regional Materials; (LEED)

Documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.]

[Environmental Data]
Tile[; G][; G, [_____]]
Setting-Bed[; G][; G, [_____]]
Mortar, Grout, and Adhesive; (LEED)[; G][; G, [_____]]

Manufacturer's catalog data and preprinted installation and cleaning instructions. [Indicate VOC content.]

Tile; (LEED)

Reinforcing Wire Fabric; (LEED)

Documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

SD-04 Samples

Tile[; G][; G, [_____]]
Accessories[; G][; G, [_____]]
Marble Thresholds[; G][; G, [_____]]
Grout[; G][; G, [_____]]

Samples of sufficient size to show color range, pattern, type and joints.

SD-06 Test Reports

Testing[; G][; G, [_____]]

Copy of results for electrical resistance tests.

SD-07 Certificates

Tile[; G][; G, [_____]]
Mortar, Grout, and Adhesive[; G][; G, [_____]]

Certificates indicating conformance with specified requirements. Furnish a master grade certificate for tile.

SD-11 Closeout Submittals

[Local/Regional Materials; (LEED)

LEED documentation relative to local/regional materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.]

Tile; (LEED)

Reinforcing Wire Fabric; (LEED)

LEED documentation relative to recycled content credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

Adhesives; (LEED)

LEED documentation relative to low-emitting materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

1.3 DELIVERY AND STORAGE

Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and stored under cover in accordance with manufacturer's printed instructions.

1.4 ENVIRONMENTAL REQUIREMENTS

a. Close space in which tile is being set to traffic and other work. Keep closed until tile is firmly set. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer.

b. Do not perform ceramic tile work unless the substrate and ambient temperature is at least 10 degrees C 50 degrees F and rising. Maintain temperature above 10 degrees C 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

1.5 SUSTAINABLE DESIGN REQUIREMENTS

1.5.1 Local/Regional Materials

****
NOTE: Using local materials can help minimize transportation impacts, including fossil fuel consumption, air pollution, and labor. Using materials harvested and manufactured within a 800 km (500 mile) radius from the project site contributes to the following LEED credit: MR5. Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION. Use second option if Contractor is choosing local materials in accordance with Section 01 33 29 LEED(tm) DOCUMENTATION. First option shall not be used for USACE projects. Army projects shall include second option only if pursuing this LEED credit.
****

[Use materials or products extracted, harvested, or recovered, as well as manufactured, within a [800][_____] km [500][_____] mile radius from the project site, if available from a minimum of three sources.][See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Tile materials may be locally available.]

1.5.2 Environmental Data

****
NOTE: ASTM E 2129 provides for detailed documentation of the sustainability aspects of products used in the project. This level of detail may be useful to the Contractor, Government, building occupants, or the public in assessing the sustainability of these products.
****

[Submit Table 1 of ASTM E 2129 for the following products: [_____].]

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that

extend beyond a 1-year period.

1.7 EXTRA STOCK

Supply an extra two percent of each type tile used in clean and marked cartons.

1.8 DETAIL DRAWINGS

Dimension and draw detail drawings at a minimum scale of 6 mm = 300 mm 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface.

PART 2 PRODUCTS

****

NOTE: Color and pattern must be indicated. When manufacturer's names, colors, and patterns are shown, add the following sentence: Colors listed are for color identification purpose only; the listing is not intended to limit selection of similar colors from other manufacturers.

The surface datum will be established for the top of the tile floors to indicate to other trades the required elevation for the top of subfloor.

****

2.1 TILE

****

NOTE: Unglazed ceramic tile with low absorption rates are easier to maintain because they are more resistant to staining. They do not readily absorb grease, food or beverage spills, or other staining agents.

A minimum coefficient of friction of 0.50 (wet and dry) is the recognized industry standard for a slip-resistant flooring surface. The Americans with Disabilities Act (ADA) recommends a minimum coefficient of friction of 0.60 (wet and dry) for accessible routes and 0.80 (wet and dry) for ramps.

The basic durability classifications for floors are as follows:

Class 0 - Generally not recommended for use on floors.

Class I - Light Traffic, residential bathroom floors.

Class II - Medium-Light Traffic, residential interiors except kitchens, stairs, landings, and areas near exterior entries.

Class III - Medium-Heavy Traffic, all residential

applications and similar commercial applications except areas of prevalent circulation or turning points.

Class IV - Heavy Traffic, all residential and most commercial applications such as public areas of exhibition halls, shops, and schools.

Class IV Plus - Extra Heavy Traffic; walkways, food service, etc., or where extra wear is required.

Mining raw materials (clay, silica, talc, feldspar, and limestone) for tile produces soil erosion, pollutant runoff, and habitat loss. Clay and sand are non-renewable although relatively abundant resources. Use of materials with recycled content, calculated on the basis of post-industrial and post-consumer percentage content, contributes to the following LEED credit: MR4. Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION. Designer must verify suitability, availability and adequate competition (including verification of bracketed percentages included in this guide specification) before specifying product recycled content requirements.

Use second option if Contractor is choosing recycled content products in accordance with Section 01 33 29 LEED(tm) DOCUMENTATION. Army projects shall specify recycled content only if pursuing this LEED credit.

Consider ceramic-free recycled glass tile with a minimum of 85 percent post-consumer recycled glass. Preference shall be given to ceramic-free recycled glass tile with a minimum of 85 percent post-consumer recycled glass.

****

Conform to ANSI A137.1 for standard grade tile. Provide grade sealed containers. Mark seals with the marks on the signed master grade certificate. Provide an impact resistant tile with a minimum floor breaking strength for wall tile of 41 kg 90 pound and for floor tile of 113 kg 250 pound in accordance with ASTM C 648. The manufacturer will provide a frost resistant rating for tile used in cold climate projects as determined by ASTM C 1026. Provide a [0.50] [_____] maximum percent water absorption in accordance with ASTM C 373. Provide a minimum coefficient of friction of [0.50] [0.60] [_____] wet and dry in accordance with ASTM C 1028. Identify floor tile as Class [III-Medium Heavy] [IV Plus-Extra Heavy] [____] Traffic, durability classification as rated by the manufacturer when tested in accordance with ASTM C 1027 for abrasion resistance as related to foot traffic. Coordinate the color [with Section 09 06 90 COLOR SCHEDULE] [_____]. [Tile shall contain a minimum of [5][10][_____] percent post-consumer recycled content, or a minimum of [20][40][_____] percent post-industrial recycled content, unless specified otherwise.][See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Tile may contain post-consumer or post-industrial recycled content.]

2.1.1 Mosaic Tile

****
NOTE: Glass tile will meet accepted industry standards at a minimum. This guide specification does not include technical requirements or referenced standards for glass tile. Determine appropriate product technical requirements and/or referenced standards for reliable products and include in this paragraph.
****

Furnish [ceramic-free recycled glass mosaic tile[, minimum [85][_____] percent post-consumer recycled glass],][Glass-bonded ceramic mosaic tile [, minimum [55][_____] percent post-consumer recycled glass],][ceramic mosaic tile] and trim shall be unglazed [[natural clay] [conductive] with cushion edges] [porcelain [containing a minimum of [70][_____] percent post-industrial feldspar] [unpolished] [polished] with sharply formed face]. Provide tile size [25 by 25 mm 1 by 1 inch] [25 by 50 mm 1 by 2 inch] [50 by 50 mm 2 by 2 inch] [a mixture of standard sizes in a stock pattern] [_____]. Coordinate color [with Section 09 06 90 COLOR SCHEDULE] [_____].

2.1.2 Quarry Tile

****
NOTE: Abrasive surface quarry tile will be specified for vestibules, kitchens, walk-in refrigerators, and work spaces behind serving lanes. Abrasive surface quarry tile should be considered for other areas which may become slippery due to grease or soapy water spillage or for other reasons. Red quarry tile is the most economical color. If other colors are desired, they should be limited to the darker shades.
****

Furnish an unglazed quarry tile and trim with [smooth surface] [abrasive surface]. [Quarry tile shall contain a minimum of [17][_____] percent post-industrial recycled content.] Use [150 by 150] [[_____] by 13] mm [6 by 6] [[_____] by 1/2] inch. Coordinate color [with Section 09 06 90 COLOR SCHEDULE] [_____].

2.1.3 Paver Tile

****
NOTE: Low-fire clay tiles have low embodied energy. Embodied energy is defined as "the total energy required to produce a product from the raw materials stage through delivery."
****

Furnish [100 by 100 by 10 mm 4 by 4 by 3/8 inch][150 by 150 by 10 mm 6 by 6 by 3/8 inch][100 by 200 by 10 mm 4 by 8 by 3/8 inch] size paver tile [made of low-fire clay,][glazed with lead-free glaze][unglazed]. Coordinate color [with Section 09 06 90 COLOR SCHEDULE] [_____].

2.1.4 Detectable Warning Tile

Furnish an unglazed detectable warning tile with raised truncated domes with a diameter of nominal 23 mm 0.9 inch at a height of nominal 5 mm 0.2 inch and a center-to-center spacing of nominal 60 mm 2.35 inch that contrast visually with adjoining surfaces. Provide [150 by 150] [[_____] by 13] mm [6 by 6] [[_____] by 1/2] inch tile. Coordinate color [with Section 09 06 90 COLOR SCHEDULE] [_____].

2.1.5 Porcelain Tile

Furnish an unglazed porcelain tile and trim with the color extending uniformly through the body of the tile. [Porcelain tile shall contain a minimum of [70][_____] percent post-industrial [feldspar][recycled content].] Provide a nominal size of [305 by 305] [_____] by 8 mm [12 by 12] [_____] by 5/16 inch thick. Criteria for tile to meet or exceed is as follows: Abrasive wear in accordance with ASTM C 501 and bonding strength in accordance with ASTM C 482. Comply with 36 CFR 1191 for coefficient of friction for interior tiled floors. Coordinate color [with Section 09 06 90 COLOR SCHEDULE] [_____].

2.1.6 Glazed Wall Tile

****
NOTE: One type of finish will be retained. Generally, matte glaze will be used; however, bright glaze may be selected where a glossy finish would not be objectionable.
****

Provide glazed wall tile with cushioned edges and trim edged with lead-free [bright] [matte] finish. Provide tile [106 by 106] [106 by 150] [150 by 150] mm [4-1/4 by 4-1/4] [4-1/4 by 6] [6 by 6] inch. Coordinate color [with Section 09 06 90 COLOR SCHEDULE] [_____].

2.1.7 [Stone Tile][Stone Chip Tile]

****
NOTE: Stone tile is made of post-industrial waste. Stone chip tiles are stone fragments bound in a portland cement matrix.
****

Tile shall be [_____] by [_____] mm inches. Color shall be [in accordance with Section 09 06 90 COLOR SCHEDULE] [_____].

2.1.8 Accessories

****
NOTE: Where glazed accessories are required, the color, style, and number will be inserted and locations indicated on the drawings. This paragraph will be coordinated with Section 10 28 13 TOILET ACCESSORIES.
****

Provide built-in type accessories of the same materials and finish as the wall tile. Provide accessories as follows:

	Quantity	Location
a. Recessed soap holders	[_____]	[_____]
b. Tumbler holders	[_____]	[_____]
c. Combination tumbler and toothbrush holders	[_____]	[_____]
d. Towel bars, [stainless steel] [ceramic] [600] [750] mm long, two towel posts	[_____]	[_____]
d. Towel bars, [stainless steel] [ceramic] [24] [30] inch long, two towel posts	[_____]	[_____]
e. Robe hooks	[_____]	[_____]
f. Roll paper holder	[_____]	[_____]
g. Recessed soap holder and hand hold combination: support static load in compliance with ASTM F 446	[_____]	[_____]

2.2 SETTING-BED

Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to ASTM C 33 for aggregate fill. Do not exceed one-half the thickness of concrete fill for maximum size of coarse aggregate.

2.2.2 Portland Cement

Conform to ASTM C 150 for cement, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Conform to ASTM C 144 for sand.

2.2.4 Hydrated Lime

Conform to ASTM C 206 for hydrated lime, Type S or ASTM C 207, Type S.

2.2.5 Metal Lath

Conform to ASTM C 847 for flat expanded type metal lath, and weighing a minimum 1.4 kg/square meter 2.5 pound/square yard.

2.2.6 Reinforcing Wire Fabric

****

NOTE: Designer must verify suitability, availability and adequate competition (including verification of bracketed percentages included in this guide specification) before specifying product

recycled content requirements. Army projects will specify bracketed LEED VOC option only if pursuing this LEED credit. Use second option if Contractor is choosing recycled content products in accordance with Section 01 33 29 LEED(tm) DOCUMENTATION.

****

Conform to ASTM A 185/A 185M for wire fabric. Provide [50 by 50 mm 2 by 2 inch mesh], [16/16 wire] [or] [38 by 50 mm 1-1/2 by 2 inch mesh, 16/13 wire]. [Wire fabric shall be manufactured from a minimum of [80][_____] percent recycled post-consumer waste and a minimum of [10][_____] percent recycled post-industrial waste.][See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Wire fabric may contain post-consumer or post-industrial recycled content.]

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

****

NOTE: Using low-VOC interior products contributes to the following LEED credit: EQ4. Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION. Designer must verify availability and adequate competition (including verification of bracketed VOCs included in this guide specification) before specifying product VOC requirements. Army projects will specify bracketed LEED VOC option only if pursuing this LEED credit.

****

[Interior adhesives, sealants, primers and sealants used as filler must meet the requirements of LEED low emitting materials credit.] Conform to [SCAQMD Rule 1168 and Bay Area AQMD Rule 8-51], and to the following for mortar, grout, adhesive, and sealant:

2.4.1 Dry-Set Portland Cement Mortar

ANSI A108.1. [Zero-volatile organic compound (VOC) content.]

2.4.2 Conductive Dry-Set Mortar

ANSI A108.1. [Zero-VOC content.]

2.4.3 Latex-Portland Cement Mortar

ANSI A108.1. [Zero-VOC content.]

2.4.4 Ceramic Tile Grout

ANSI A108.1; petroleum-free and plastic-free [sand portland cement grout] [dry-set grout] [latex-portland cement grout] [commercial portland cement grout]. [Maximum VOC content of 150 grams/liter.]

2.4.5 Organic Adhesive

ANSI A108.1, Type I. Water-resistant. Comply with applicable regulations

regarding toxic and hazardous materials[, GS-36,] and as specified. [Tile adhesive shall have a maximum VOC content of [65][44] grams/liter.]

2.4.6 Epoxy Resin Grout

****
NOTE: Resin grout will be used only where chemical resistance is required.
****

ANSI A108.1. Prohibited unless specifically indicated otherwise.

2.4.7 Furan Resin Grout

ANSI A108.1 and consist of an intimate mixture of furfuryl-alcohol resin with carbon filler and catalyst. Prohibited unless specifically indicated otherwise.

2.4.8 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. [Single-component polyurethane sealant shall have a zero-VOC content.][Two-component polyurethane sealant shall have a maximum VOC content of 45 grams/liter.]

2.4.9 Cementitious Backer Board

Provide cementitious backer units, for use as tile substrate over wood sub-floors, in accordance with ANSI A108.1. Furnish [6.35] [12.7] mm [1/4] [1/2]inch thick cementitious backer units.

2.4.10 Glass Mat Gypsum Backer Panel

****
NOTE: Additives used to produce water-resistant gypsum board ("green board") may include VOCs. Water-resistant types may be difficult to recycle. Glass-fiber reinforced types may be difficult to recycle.
****

Provide glass mat water-resistant gypsum backer board, for use as tile substrate over wood subfloors, in accordance with ASTM C 1178/C 1178M. Provide [6.35] [12.7] mm [1/4] [1/2] inch thick glass mat gypsum backer board.

2.5 MARBLE THRESHOLDS

****
NOTE: Where the top of tile floors will occur at a different elevation from the top of finished floors in adjoining spaces, provision for marble thresholds or saddles will be edited appropriately.
****

Provide marble thresholds of size required by drawings or conditions. Categorize marble Group A as classified by MIA Design Manual. Provide a fine sand-rubbed finish marble with [white] [pink] [or] [gray] in color as approved by the Contracting Officer. Provide minimum 12.0 marble abrasion

when tested in accordance with ASTM C 241.

2.6 MEMBRANE MATERIALS

Conform to ASTM D 226, Type 1 for 33 kg 15 pound waterproofing membrane, asphalt-saturated building felt. Conform to [ASTM D 2103] [ASTM D 4068] 0.0102 4 mil for polyethylene film.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

****

NOTE: When using the dry-set method to install tile on concrete or masonry surfaces, Section 03 31 00.00 10 CAST-IN-PLACE STRUCTURAL CONCRETE and Section 04 20 00 MASONRY, as applicable, will be coordinated to require (1) steel trowel and fine broom-finished concrete floors free of curing compounds and waxes, (2) masonry surfaces that are level and plumb with struck joints and square openings.

****

Inspect surface to receive tile in conformance to the requirements of ANSI A108.1 for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	3 mm in 2.4 meter	3.0 mm in 3 meter
Organic Adhesives	3 mm in 2.4 meter	1.5 mm in 1 meter
Latex Portland Cement Mortar	3 mm in 2.4 meter	3.0 mm in 3 meter
Epoxy	3 mm in 2.4 meter	3.0 mm in 3 meter

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar.

3.3 INSTALLATION OF WALL TILE

****

NOTE: This paragraph covers three different methods of installing tile on walls: the mortar bed method W211, W221, W222, W231, and W241; direct to masonry with dry-set mortar W202; and the organic adhesive method W223, and W242, 243 or 244. See TCA Hdbk for detailed guidance.

General guidance is as follows:

The mortar bed method or cementitious backer board method will be used for all prolonged wet areas such as showers. Ceramic tile over gypsum board will be used only in dry areas.

Dry-set mortar applied direct to masonry is suitable for all but prolonged wet areas such as showers.

The organic adhesive method will be limited to dry areas and will generally be used over gypsum wallboard.

Where more than one method is used for the same project, care must be taken to ensure that the drawings clearly indicate the various substrates and where each method is used. Where only one method is used on a project, clearly specify that method only.

****

Install wall tile in accordance with the TCA Hdbk, method [_____].

3.3.1 Workable or Cured Mortar Bed

Install tile over workable mortar bed or a cured mortar bed at the option of the Contractor. Install a 0.102 mm 4 mil polyethylene membrane, metal lath, and scratch coat. Conform to ANSI A108.1 for workable mortar bed, materials, and installation of tile. Conform to ANSI A108.1 for cured mortar bed and materials.

3.3.2 Dry-Set Mortar and Latex-Portland Cement Mortar

Use [Dry-set] [or] [Latex-Portland Cement] to install tile in accordance with ANSI A108.1. Use Latex Portland Cement when installing porcelain ceramic tile.

3.3.3 Organic Adhesive

Conform to ANSI A108.1 for the organic adhesive installation of ceramic tile.

3.3.4 Furan Mortar and Grout

Conform to ANSI A108.1 for furan mortar and grout installation.

3.4 INSTALLATION OF FLOOR TILE

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NOTE: This paragraph covers two different methods of installing tile on floors. The mortar bed method F111, F112, F114, and F121 and direct to concrete

with dry-set mortar method F113 and F115. See TCA Hdbk for detailed guidance.

General guidance is as follows:

The mortar bed method will be used for areas having a floor drain.

Dry-set mortar direct to concrete is suitable for areas without a floor drain or when it is not practical to recess the slab.

Where more than one method is used for the same project, care must be taken to ensure that the drawings clearly indicate the various substrates and where each method is used. Where only one method is used on a project, clearly specify that method only.

****

Install floor tile in accordance with TCA Hdbk method [_____]. Install shower receptors in accordance with TCA Hdbk method [B414] [B415].

3.4.1 Workable or Cured Mortar Bed

Install floor tile over a workable mortar bed or a cured mortar bed at the option of the Contractor. Conform to ANSI A108.1 for workable mortar bed materials and installation. Conform to ANSI A108.1 for cured mortar bed materials and installation. Provide minimum 6.35 mm 1/4 inch to maximum 9.53 mm 3/8 inch joints in uniformed width.

3.4.2 Dry-Set and Latex-Portland Cement

Use [dry-set] [or] [Latex-Portland cement] mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with ANSI A108.1. Use Latex Portland cement when installing porcelain ceramic tile.

3.4.3 Resinous Grout

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NOTE: Resin grout will be used where chemical resistance is required. For quarry tile subject to severe chemical exposure conditions, use Section 09 35 16 CHEMICAL-RESISTANT QUARRY TILE.

The areas to receive resin grout must be clearly indicated on the drawings or defined in the specifications. Due to the higher cost of this grout, its use will generally be limited to areas such as:

a. Within the areas bounded by a line 600 mm (2 feet) outside of the trough areas for ranges, kettles, and ovens.

b. Within the areas of potwashing and dishwashing. In small kitchens where it may be impracticable to subdivide areas for grouting, resin grout method F114 or F133 may be used throughout.

For severe chemical exposure such as meat packing plants and photo labs, resin grout method F134 will be used throughout and a resin setting-bed will be required. Wherever resin setting-bed is used, the concrete slab will be steel-troweled finished to the final slope of the finished floor. The tile shall be set in a 3 mm (1/8 inch) thick layer of epoxy-or furan-resin mortar. When using furan resins, the concrete slab will be neutralized or painted in accordance with the resin manufacturer's directions.

****

When resinous grout is indicated, grout quarry tile with either furan or epoxy resin grout. Rake and clean joints to the full depth of the tile and neutralize when recommended by the resin manufacturer. Install epoxy resin grout in conformance with ANSI A108.1. Install resin grout in accordance with manufacturer's printed installation instructions. Provide a coating of wax applied from the manufacturer on all tile installed and furan resin. Follow manufacturer's printed installation instructions of installed resin grout for proportioning, mixing, installing, and curing. Maintain the recommended temperature in the area and on the surface to be grouted. Protect finished grout of grout stain.

3.4.4 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with ANSI A108.1.

3.4.5 Waterproofing

Shower pans are specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE. Conform to the requirements of Section 07 12 00 BUILT-UP BITUMINOUS WATERPROOFING for waterproofing under concrete fill.

3.4.6 Concrete Fill

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NOTE: In areas to receive conductive ceramic tile, the first sentence will be chosen.

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Provide a 24.1 MPa 3500 psi concrete fill mix to dry as consistency as practicable. [Compose concrete fill by volume of 1 part Portland cement to 3 parts fine aggregate to 4 parts coarse aggregate, and mix with water to as dry a consistency as practicable.] Spread, tamp, and screed concrete fill to a true plane, and pitch to drains or levels as shown. Thoroughly damp concrete fill before applying setting-bed material. Reinforce concrete fill with one layer of reinforcement, with the uncut edges lapped the width of one mesh and the cut ends and edges lapped a minimum 50 mm 2 inch. Tie laps together with 1.3 mm 18 gauge wire every 250 mm 10 inch along the finished edges and every 150 mm 6 inch along the cut ends and edges. Provide reinforcement with support and secure in the centers of concrete fills. Provide a continuous mesh; except where expansion joints occur, cut mesh and discontinue across such joints. Provide reinforced concrete fill under the setting-bed where the distance between the under-floor surface and the finished tiles floor surface is a minimum 50 mm 2 inch, and of the same thickness that the mortar setting-bed over the concrete fill with the thickness required in the specified TCA Hdbk method.

3.5 INSTALLATION OF CONDUCTIVE FLOORING

Install conductive ceramic mosaic tile floors in accordance with ANSI A108.1.

3.6 INSTALLATION OF MARBLE THRESHOLDS

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NOTE: Where the top of tile floors will occur at a different elevation from the top of finished floors in adjoining spaces, provision for marble thresholds or saddles will be edited appropriately.
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Install thresholds where indicated, in a manner similar to that of the ceramic tile floor. Provide thresholds full width of the opening. Install head joints at ends not exceeding 6 mm 1/4 inch in width and grouted full.

3.7 TESTING

Perform electrical resistance tests on conductive flooring, in the presence of the Contracting Officer, by a technician experienced in such work. Furnish a copy of the test results. Provide test procedures, testing apparatus, and test results in accordance with the provisions for Conductive Flooring in NFPA 99.

3.8 EXPANSION JOINTS

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Note: Expansion-joint details will be indicated on the drawings. Details as provided in UFC 3-190-01FA will be used as applicable. Location of expansion joints should, insofar as practical, be located outside the areas of tile finishes.
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Form and seal joints as specified in Section 07 92 00JOINT SEALANTS.

3.8.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.8.2 Floors

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NOTE: Second sentence will be deleted for projects where the use of tile is limited to small areas or long narrow corridors or where chemical resistant grouts are used.
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Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 7.2 to 10.8 m 24 to 36 feet each way in large interior floor areas and 3.6 to 4.8 m 12 to 16 feet each way in large exterior areas or areas exposed to direct sunlight or moisture. Extend expansion joints through setting-beds and fill.

3.9 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on tiled floors that are to be continuously used as passageways by workmen. Replace damaged or defective tiles.

3.10 WASTE MANAGEMENT

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NOTE: Take-back programs refer to programs in which the product manufacturer "takes-back" scrap material and/or packaging associated with its product. Use of this program and diverting waste from the landfill contributes to the following LEED credit: MR2. Coordinate with Section 02 42 00 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT. Designer will verify that items are able to be disposed of as specified.

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Separate waste, including metal and cardboard, in accordance with the Waste Management Plan[and recycle or reuse]. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in designated containers and areas. Close and seal tightly partly used sealant and adhesive containers and store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in designated containers and areas and dispose of properly. Set aside and protect half-tile and larger offcuts and remainders for reuse [by the Government] [_____]. Crush broken tile, offcuts smaller than a half tile, and excess mortar and grout for use as mosaic, sub-base, or fill. Identify manufacturer's policy for collection or return of [construction scrap,] [unused material,] [demolition scrap,] and [packaging material]. Institute recycling to take advantage of manufacturer's programs. When such a service is not available, seek local recyclers to reclaim the materials.

-- End of Section --