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USACE / NAVFAC / AFCEC / NASA **UFGS-09 30 10 (August 2020)**

Preparing Activity: USACE **Superseding**
UFGS-09 30 10 (August 2017)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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SECTION 09 30 10

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08/20

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SECTION 09 30 10

CERAMIC, QUARRY, AND GLASS TILING
08/20

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NOTE: This guide specification covers the requirements for a variety of types of ceramic tile for walls and floors.

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: 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 TILING.

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

Base product selections on aesthetic 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/A118/A136.1	(2019) American National Standard Specifications for theInstallation of Ceramic Tile
ANSI A137.1	(2019) American National Standards Specifications for Ceramic Tile
ANSI A137.2	(2019) American National Standards Specifications for Glass Tile
ANSI A137.3/A108.19	(2017) American National Standard Specifications for Gauged Porcelain Tile and Gauged Porcelain Tile Panels/Slabs

ASTM INTERNATIONAL (ASTM)

ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C144	(2018) Standard Specification for Aggregate for Masonry Mortar
ASTM C150/C150M	(2020) Standard Specification for Portland Cement

ASTM C206	(2014) Standard Specification for Finishing Hydrated Lime
ASTM C207	(2018) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C241/C241M	(2015) Standard Specification for Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C373	(2018)Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products
ASTM C648	(2020) Standard Test Method for Breaking Strength of Ceramic Tile
ASTM C847	(2014a) Standard Specification for Metal Lath
ASTM C1026	(2013; R 2018) Standard Test Method for Measuring the Resistance of Ceramic and Glass Tile to Freeze-Thaw Cycling
ASTM C1027	(2009; R 2017) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
ASTM C1178/C1178M	(2013) Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
ASTM F446	(2019) Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual	(2016) Dimension Stone Design Manual

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk	(2017) Handbook for Ceramic, Glass, and Stone Tile Installation

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

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

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

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

Detail Drawings; G[, [_____]]

SD-03 Product Data

Porcelain Tile; G[, [_____]]

[Recycled Content for Porcelain Tile; S

] Gauged [Porcelain Tile][and][Porcelain Tile Panels/Slabs]; G[, [_____]]

Quarry Tile; G[, [_____]]

[Recycled Content for Quarry Tile; S

] Mosaic Tile; G[, [_____]]

[Recycled Content for Mosaic Tile; S

] Large Format Glass Tile; G[, [_____]]

[Recycled Content for Glass Tile; S

] Glazed Ceramic Wall Tile; G[, [_____]]

[Recycled Content for Glazed Ceramic Wall Tile; S

] Transition Strips; G[, [_____]]

Metal Strips; G[, [_____]]

Setting-Bed; G[, [_____]]

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

Reinforcing Wire Fabric

[Cementitious Backer Units; G[, [_____]]

][Glass-Mat Gypsum Water-Resistant Backing Board; G[, [_____]]

] Waterproof Membrane; G[, [_____]]

Crack Isolation Membrane; G[, [_____]]

SD-04 Samples

Tile; G[, [_____]]

Accessories; G[, [_____]]

Transition Strips; G[, [_____]]

Metal Strips; G[, [_____]]

Grout; G[, [_____]]

SD-07 Certificates

[Indoor Air Quality for Adhesives; S

][Indoor Air Quality for Sealants; S

][Water Absorption Rates

] SD-08 Manufacturer's Instructions

Manufacturer's Approved Cleaning Instructions

SD-10 Operation and Maintenance Data

Gauged [Porcelain Tile][and][Porcelain Tile Panels/Slabs], Data Package 1; G[, [_____]]

Porcelain Tile, Data Package 1; G[, [_____]]

Quarry Tile, Data Package 1; G[, [_____]]

Mosaic Tile, Data Package 1; G[, [_____]]

Large Format Glass Tile, Data Package 1; G[, [_____]]

Glazed Ceramic Wall Tile, Data Package 1; G[, [_____]]

Transition Strips, Data Package 1; G[, [_____]]

Metal Strips, Data Package 1; G[, [_____]]

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body.When product does not have certification, provide validation that product meets the indoor air quality product requirements cited in this Section.

[1.3.2 Water Absorption Rates Certification

****

NOTE: The four water absorption (wa) classifications indicated below are from ANSI A137.1. Lower water absorption (wa) indicates a denser product.

1. Impervious tile has water absorption (wa) of less than 0.5 percent. Porcelain tile is typically impervious tile.

2. Vitreous tile has water absorption (wa) of 0.5 to 3.0 percent. Mosaic tile and quarry tile can be vitreous tile.

3, Semi-Vitreous tile has water absorption (wa) of 3.0 to 7.0 percent. Quarry tile can be semi-vitreous tile, but with a maximum of 5 percent water absorption.

4. Non-Vitreous tile has water absorption (wa) of 7.0 percent or more. Ceramic wall tile, glazed and unglazed, is typically non-vitreous tile suitable for interior wall use.

The designer must select the water absorption (wa) rate for each type of tile needed on a project-specific basis, and must verify the tile manufacturers' actual water absorption (wa) rates for each tile product specified.

****

Provide certification for each tile type indicating compliance with the following water absorption (wa) rates per ANSI A137.1 criteria as tested per ASTM C373 requirements.

[a. [Porcelain][and][Mosaic] Tile (Impervious): Provide water absorption (wa) of 0.5 percent or less.

][b. [Mosaic][_____] Tile (Vitreous): Provide water absorption (wa) of more than 0.5 percent, but not more than 3.0 percent.

][c. [Mosaic][_____] Tile (Semi-Vitreous): Provide water absorption (wa) of more than 3.0 percent, but not more than 7.0 percent.

][d. [Ceramic Wall][_____] Tile (Non-Vitreous): Provide maximum water absorption (wa) of [7.0][___] percent.

]]1.4 QUALITY ASSURANCE

Provide installers having a minimum of two years of experience with a company specializing in performing the type of work described. Each type and color of tile to be provided from a single source. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.5 DELIVERY, STORAGE, AND HANDLING

Ship tiles in sealed packages and clearly marked with the grade, type of tile, producer identification, and country of origin. 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 store them under cover in accordance with manufacturer's printed instructions. Store and handle tiles per manufacturer's instructions for gauged porcelain tile and gauged porcelain tile panels/slabs.

1.6 ENVIRONMENTAL REQUIREMENTS

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.

1.7 WARRANTY

Provide manufacturer's warranty to repair or replace defective tiling materials and workmanship[, including tile, mortar and grout products and installation as a system,] for a period of [one year][[_____][years]] from date of final acceptance of the work..

1.8 EXTRA MATERIALS

Supply an extra [2][_____] percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

****

NOTE: 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.

Not all tiles with a wet dynamic coefficient of friction (DCOF) equal to or greater than 0.42 are appropriate for all types of level interior spaces. Designer to consider application, use, and coordinate requirements with manufacturers to determine the recommended DCOF value. Tiles with a wet DCOF AcuTest of less than 0.42, should only be installed when the surface will be kept dry when walked upon and proper safety procedures will be followed when cleaning the tiles. For level interior spaces expected to be walked on when wet, the threshold minimum wet DCOF AcuTest value is 0.42.

Gauged porcelain tile and gauged porcelain tile panel/slabs are defined by the American National Standard Specification: "Gauged" means manufactured to a thickness that is specified and largely associated with installation and use. Tile panel/slabs are those that are on one square meter in facial area or larger.

Gauged porcelain tile and gauged porcelain tile panels/slabs are not suitable for some project types. Verify application with manufacturer of this tile type. Tiles with a 3 mm 1/8 inch thickness are suitable for wall application only. Tiles with a 6 mm 1/4 inch thickness are suitable for floors,

walls and counter tops.

Per TCNA Hdbk breaking strength is measured in "lbf". This specification uses "pounds" since this is how most manufacturers list the method of measurement.

Take into account expected foot traffic, building and site conditions and maintenance during selection of tile. In accordance with ANSI 137.1 the visible abrasion classifications for floors are as follows:

Class 0 - Generally used on walls. Not recommended for use on floors. This type of tile should not be exposed to wear, traffic or aggressive maintenance.

Class I - Light Residential. Tile may withstand soft-soled foot traffic as long as dirt and/or other abrasives are not present. Tile should not be used in areas with direct access to the outside or in areas with large amounts of foot traffic.

Class II - Residential. Tile may withstand soft-soled and some normal traffic with limited quantities of dirt and/or other abrasives. Tile is not recommended in areas with direct access to the outside or in areas with large amounts of foot traffic.

Class III - Heavy Residential or Light Commercial. Tile may withstand normal footwear and regular traffic with some dirt and/or other abrasives in limited quantities. Tile may be used in light commercial facilities with limited foot traffic and no direct access to the outside. Examples: residential kitchens and hallways with limited outside traffic.

Class IV - Commercial. Tile may withstand heavier amounts of traffic with more dirt and abrasives. Examples: commercial kitchens and spaces with regular outside traffic.

Class V - Heavy Commercial. Tiles may withstand constant foot traffic with larger amounts of dirt and/or other abrasives. Examples: airports, malls, and other commercial walkways subject to high volumes of foot traffic and constant traffic from the outside.

Manufacturers use the aesthetic classification to identify the variation of color, texture, and appearance within a particular line of tile. Delete this requirement if not necessary to express design intent.

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.

Check availability of tile colors in the sizes specified before specifying color. Also, check availability of tile thickness before specifying.

Trim pieces are rarely made in the same factory as the tile and could be fabricated from other materials. Trim pieces are "coordinating trim pieces".

Per TCNA Hdbk Base/Cove Alternate installation details include square, flush and thin-lip. Provide direction for installation type.

****

Provide tiles that comply with ANSI A137.1 and are standard grade tiles[, the exception is glass tile. Furnish glass tiles that comply with ANSI A137.2][, the exception is gauged [porcelain tile][porcelain tile panels/slabs]. Furnish gauged [porcelain tile][porcelain tile panels/slabs] that comply with ANSI A137.3/A108.19]. Provide a minimum breaking strength of 57 kg 125 lbs. for wall tile and 113 kg 250 lbs. for floor tile in accordance with ASTM C648. Provide exterior building tile for cold climate projects that is approved by the manufacturer for exterior use when tested in accordance with ASTM C1026. Provide floor tiles with a minimum wet dynamic coefficient of friction (DCOF) value of [0.42][_____] when tested in accordance with ANSI A137.1 requirements. Provide glazed floor tile with a Class [III-Heavy Residential or Light Commercial][IV-Commercial][V-Heavy Commercial][_____] classification as rated by the manufacturer when tested in accordance with ASTM C1027 for visible abrasion resistance as related to foot traffic. For materials like tile, accessories, and transition strips submit samples of sufficient size to show color range, pattern, type and joints.

Submit manufacturers' descriptive product data for [each type of] ceramic, quarry and glass tiling indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for [each type of] ceramic, quarry and glass tiling indicated in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.1.1 Porcelain Tile

Provide [unglazed[through body (surface color and pattern go all the way through the tile body)]][or][glazed[color body (body of tile is stained to match the glaze color)]],[rectified] porcelain tile[and [cove][bullnose] base and trim pieces]. [Provide tile with a [V0][V1][V2][V3][V4] aesthetic classification. Blend tiles in factory and in a packages to have same color range and continuous blend for installation.] Provide nominal tile size(s) of [150 by 150][300 by 300][450 by 450][300 by 600] [_____] mm and [8][10][_____] mm [6 by 6][12 by 12][18 by 18][12 by 24][_____] inch and [3/8][5/16][_____] inch thick.

Provide porcelain tiling materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for porcelain tile.

2.1.2 Gauged [Porcelain Tile][and][Porcelain Tile Panels/Slabs]

Provide [unglazed [through body (surface color and pattern go all the way through the tile body)]] [or] [glazed [color body (body of tile is stained to match the glaze color)]], [rectified] gauged [porcelain tile] [porcelain tile panels/slabs] [and [cove] [bullnose] base and trim pieces]. [Provide tile with a [V0][V1][V2][V3][V4] aesthetic classification.] Blend tiles in factory and in packages to have same color range and continuous blend for installation. Provide nominal tile size(s) of [750 by 375][750 by 750][1500 by 750][1500 by 1500][3000 by 1500][_____]mm [30 by 15][30 by 30][60 by 30][60 by 60][120 by 60] [_____] inch and [3][6][_____] mm [1/8][1/4][_____] inch thick.

Provide gauged [porcelain tile] and [porcelain tile panels/slabs] materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for gauged [porcelain tile] and [porcelain tile panels/slabs].

[2.1.3 Quarry Tile

****
NOTE: Specify abrasive surface quarry tile for vestibules, kitchens, walk-in refrigerators, and work spaces behind serving lanes. Consider abrasive surface quarry tile 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, [cove][bullnose] base and trim pieces. Provide tile with [smooth][abrasive] surface. Provide nominal tile size(s) of [150 by 150][_____] mm and 13 mm [6 by 6][_____] inch and 1/2 inch thick.

Provide quarry tiling materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for quarry tile.

]2.1.4 Mosaic Tile

****
NOTE: Glazed porcelain and ceramic mosaic tiles are recommended for walls only.

Typically glass, stone, and metal mosaic tiles are recommended for walls only, but can be installed on the floor. Verify application with manufacturer.

Verify that glass tiles specified are made in the USA. Many of these products are made in countries that do not comply with the Buy American Act.
****

Furnish [unglazed][glazed], mosaic tile[, [cove][bullnose] base] and trim composed of [ceramic][porcelain][glass][stone][metal]. [Provide tile with a [V0][V1][V2][V3][V4] aesthetic classification. Blend tiles in factory and in a packages to have same color range and continuous blend for

installation.] Provide [nominal tile size(s) of [25 by 25][25 by 50][50 by 50][_____] mm [1 by 1][1 by 2][2 by 2][_____] inch][a mixture of standard sizes in a stock pattern].

Provide mosaic tiling materials that contain a minimum of 3 percent recycled content. Provide data identifying percentage of recycled content for mosaic tile.

2.1.5 Large Format Glass Tile

****
NOTE: Verify that glass tiles specified are made in the USA. Many of these products are made in countries that do not comply with the Buy American Act.

Typically glass tiles are recommended for walls only.
****

[Provide tile with a [V0][V1][V2][V3][V4] aesthetic classification.] Provide nominal tile size(s) of [75 by 75] [_____] mm [3 by 3] [_____] inches or greater.

****
NOTE: Research shows glass tile is available among US national manufacturers above the minimum recycled content shown.
****

Provide glass tiling materials that contain a minimum of [10][_____] percent recycled content. Provide data identifying percentage of recycled content for glass tile.

2.1.6 Glazed Ceramic Wall Tile

****
NOTE: Glazed wall tiles are recommended for walls only.
****

Provide glazed[, rectified] ceramic wall tile that has [cushioned edges][square edges] and trim with lead-free [bright][matte] finish. Provide nominal tile size(s) of [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.

Provide glazed ceramic wall tile materials that contain a minimum of 3 percent recycled content. Provide data identifying percentage of recycled content for glazed ceramic wall tile.

2.1.7 Accessories

****
NOTE: Where glazed accessories are required, add the color, style, and number to the accessories table in this paragraph, unless otherwise noted. For Navy projects add a sentence stating that color is as indicated since they provide color information in the drawings. Provide mounting heights for accessories in the drawings. Coordinate this

paragraph 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
Recessed soap holders	[_____]	[_____]
Tumbler holders	[_____]	[_____]
Combination tumbler and toothbrush holders	[_____]	[_____]
Towel bars, [stainless steel][ceramic] [600] [750] mm [24] [30] inch long, two towel posts	[_____]	[_____]
Robe hooks	[_____]	[_____]
Roll paper holder	[_____]	[_____]
Recessed soap holder and hand hold combination: support static load in compliance with ASTM F446	[_____]	[_____]
Premade niche and shelf	[_____]	[_____]

2.2 SETTING-BED

Submit manufacturer's catalog data. Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to ASTM C33/C33M 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 C150/C150M for cement, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Conform to ASTM C144 for sand.

2.2.4 Hydrated Lime

Conform to ASTM C206 for hydrated lime, Type S or ASTM C207, Type S.

2.2.5 Metal Lath

Conform to ASTM C847 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

Conform to ASTM A1064/A1064M for wire fabric. Provide [50 by 50 mm2 by 2 inch mesh, 16/16 wire] [or] [38 by 50 mm1-1/2 by 2 inch mesh, 16/13 wire].

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

****

NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the bracketed sentences below requiring products with indoor air quality certifications as defined in Part 1 of this specification.

Glass Tile Installation: Designer of record to verify with the glass manufacturer the thin-set mortar color best suited for glass tile installations.

Organic Adhesive: Not all tiles are suitable for the use of organic adhesive, verify with tile manufacturer.

****

[Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting 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 1168. Provide aerosol adhesives used on the interior of the building meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. For products located on the interior of the building (inside of the weatherproofing system, provide certification or validation of indoor air quality for adhesives.] Provide bond coat, mortar, and grout supplied from the same manufacturer.

2.4.1 Dry-Set Portland Cement Mortar

TCNA Hdbk.

2.4.2 Furan Mortar

TCNA Hdbk.

2.4.3 Latex-Portland Cement Mortar

TCNA Hdbk.

2.4.4 Ceramic Tile Grout

TCNA Hdbk; petroleum-free and plastic-free [sand-portland cement grout] [standard unsanded cement grout (dry-set grout)] [high-performance cement grout (latex-portland cement grout)] [standard cement commercial portland cement grout].

2.4.5 Organic Adhesive

TCNA Hdbk, Type I. Water-resistant. Comply with ANSI A108/A118/A136.1.

2.4.6 Epoxy Resin Grout

****
NOTE: Use resin grout where chemical resistance is required.
****

TCNA Hdbk. Water cleanable epoxy conforming to ANSI A108/A118/A136.1; provide manufacturer proportioned and packaged kit having hardener, resin and colored filler and horizontal and vertical grade products as applicable. Provide antimicrobial additive designed for prevention of mold and mildew.

2.4.7 Furan Resin Grout

TCNA Hdbk; chemical resistant furan conforming to ANSI A108/A118/A136.1; and consist of an intimate mixture of furfuryl-alcohol resin with carbon filler and catalyst. Prohibited unless specifically indicated otherwise.

2.4.8 Urethane Grout

TCNA Hdbk; premixed, urethane, water-based grout with color consistency and antimicrobial protection; no color fading, streaking or shading, chemical and stain resistant; and UV stable.

2.4.9 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Provide sealant that does not change the color or alter the appearance of the grout. Refer to Section 07 92 00 JOINT SEALANTS.
****
NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the bracketed sentences below requiring products with indoor air quality certifications as defined in Part 1 of this specification.
****

[Provide sealants used on the interior of the building (defined as inside of the weatherproofing system) meeting 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 1168. For products located on the interior of the building (inside of the weatherproofing system), provide certification or validation of indoor air quality for sealants.]

2.5 SUBSTRATES

[Refer to Section 09 29 00 GYPSUM BOARD][for cementitious backer units][and][glass-mat water-resistant backing board].

****
NOTE: If substrates are specified in Section 09 29 00 GYPSUM BOARD, then delete paragraphs "Cementitious Backer Units" and "Glass-Mat Water-Resistant Backing Board".
****

[2.5.1 Cementitious Backer Units

Provide cementitious backer unit, for use as tile substrate as indicated, in accordance with TCNA Hdbk. Furnish [13][16] mm [1/2][5/8] inch thick cementitious backer units.

][2.5.2 Glass-Mat Gypsum Water-Resistant Backing Board

Provide glass-mat water-resistant backing board, for use as tile substrate as indicated, in accordance with ASTM C1178/C1178M. Provide [13][16] mm [1/2][5/8] inch thick glass-mat water-resistant backing board.

]2.6 MISCELLANEOUS TRIMS

****
NOTE: Provide transition strips where the top of tile floors will occur at a different elevation from the top of finished floors in adjoining spaces and to transition between different flooring materials.

Metal and vinyl cove-shaped trim profiles can be used for floor and wall transitions in lieu of cove tile base. Metal edge protection trims and other tile transition trim profiles are available to protect and conceal tile edges.
****

2.6.1 Transition Strips

Provide [[clear][_____] anodized aluminum transitions between tile and carpet or resilient flooring. Provide types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified][marble transitions appropriate for conditions]. Categorize marble Group A as classified by MIA Design Manual. Provide a fine sand-rubbed finish marble, [white][pink][gray][beige] in color. Provide [minimum 12.0 marble abrasion when tested in accordance with ASTM C241/C241M.][solid surfacing material transitions appropriate for conditions. Refer to Section 06 61 16 SOLID SURFACING FABRICATIONS.] Provide transition strips that comply with 36 CFR 1191requirements.

2.6.2 Metal Strips

Provide [Cove][,][Angle][,][and][L-shape][,] [_____] trim shapes, height to match tile and setting thickness, designed specifically for flooring, and wall applications. [Provide [extruded, [clear] [_____] anodized aluminum][stainless steel][rigid-vinyl] cove strip where floor tile abuts wall tile for sanitary transition and elimination of cove tile base.] [Provide extruded [radiused][square][_____], [[clear][_____] anodized

aluminum][stainless steel] edging at tile surfaces with exposed outside [and inside] corners.] [Provide profiles appropriate for finished floor and wall materials as indicated.]

2.7 WATERPROOF MEMBRANE

2.7.1 General

Manufacturer's standard product that complies with ANSI A108/A118/A136.1 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.7.2 Chlorinated-Polyethylene Shower Waterproof Membrane

Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; [1][_____] mm [0.040][_____] inch nominal thickness.

2.8 CRACK ISOLATION MEMBRANE

2.8.1 General

Manufacturer's standard product that complies with ANSI A108/A118/A136.1 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.8.2 Chlorinated-Polyethylene Crack Isolation Membrane

Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; [0.75][_____] mm [0.030][_____] inch nominal thickness.

2.9 COLOR, TEXTURE, AND PATTERN

****

NOTE: Editing of color reference sentence(s) must be coordinated with the Government. Generally Section 09 06 00 SCHEDULES FOR FINISHES or drawing is used when the project is designed by an Architect or Interior designer. Color should be selected from manufacturer's standard colors or identified in this specification only when the project has minimal finishes.

When the government directs that color be located in the drawings add a note that states: "Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval. Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers. The word "color" as used herein includes surface color and pattern."

When more than one type, pattern or color is specified identify location and extent of work for each.

When a manufacturer's name, stock number, pattern, and color is used, be certain that the product conforms to this specification, as edited.

NOTE: Drawings are required for projects with floor patterns.
****

Provide color, pattern and texture [as specified in Section 09 06 00 SCHEDULES FOR FINISHES.][as indicated; colors listed are not intended to limit the selection of equal colors from other manufacturers.].

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

****
NOTE: When using the dry-set method to install tile on concrete or masonry surfaces, coordinate Section 03 30 00 CAST-IN-PLACE CONCRETE and Section 04 20 00 UNIT MASONRY, as applicable, 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 TCNA Hdbk 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 meter1/8 inch in 8 ft.	3.0 mm in 3 meter1/8 inch in 10 ft.
Organic Adhesives	3 mm in 2.4 meter1/8 inch in 8 ft.	1.5 mm in 1 meter1/16 inch in 3 ft.
Latex-Portland Cement Mortar	3 mm in 2.4 meter1/8 inch in 8 ft.	3.0 mm in 3 meter1/8 inch in 10 ft.
Epoxy	3 mm in 2.4 meter1/8 inch in 8 ft.	3.0 mm in 3 meter1/8 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. Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. 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. 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. Dimension and draw detail drawings at a minimum scale of1:50 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. Submit drawings showing ceramic tile pattern [elevations][and][floor plans]. Submit manufacturer's preprinted installation instructions.

Do not install building construction materials that show visual evidence of biological growth.

3.3 INSTALLATION OF SUBSTRATES

3.3.1 [Cementitious Backer Units] [and] [Glass-Mat Water-Resistant Backing Board]

Install [as specified in Section 09 29 00 GYPSUM BOARD.][in accordance with manufacturer's written instructions.]

3.4 INSTALLATION OF WALL TILE

****

NOTE: See current TCNA Hdbk for detailed guidance. Specify project-specific TCNA Hdbk numbers for each type of wall tile installation method. Edit text accordingly.

General guidance for wall tile installation methods as follows:

Specify TCNA Hdbk B-series methods for interior wet areas, including shower stalls, over wood or metal studs with glass-mat water-resistant backing board substrate or with cementitious backer unit substrate.

Specify TCNA Hdbk EJ-series methods for movement (i.e. construction, contraction, expansion, isolation or perimeter) joints.

Specify TCNA Hdbk W-series methods for interior and exterior walls, including masonry or concrete substrates, and wood or metal studs with glass-mat water-resistant backing board substrate.

Specify TCNA Hdbk TR-series methods for renovation applications over existing substrates.

****

Install wall tile in accordance with the TCNA Hdbk, method [_____] and with grout joints [[as recommended by the manufacturer for the type of tile][of [_____] mm][of [_____] inch]. [Install thinner wall tile flush with thicker wall tile applied on same wall and provide installation materials as recommended by the tile and setting materials manufacturer's to achieve flush installation.]]

3.4.1 Installation of Gauged [Porcelain Tile][Porcelain Tile Panels/Slabs]

Install gauged [porcelain tile][porcelain tile panels/slabs] in accordance with TCNA Hdbk method [_____] and ANSI A137.3/A108.19 for thin-bed method

bonded with modified dry-set cement mortar over improved modified dry-set cement mortar.

3.4.2 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 TCNA Hdbk method [_____] for workable mortar bed, materials, and installation of tile. Conform to TCNA Hdbk method [_____] for cured mortar bed and materials.

3.4.3 Dry-Set Mortar and Latex-Portland Cement Mortar

Use [dry-set] [or] [latex-portland cement] to install tile in accordance with TCNA Hdbk method [_____]. Use latex-portland cement when installing porcelain ceramic tile.

3.4.4 Organic Adhesive

Comply with the requirements of TCNA Hdbk method [_____] for organic adhesive installation of ceramic tile.

3.4.5 Furan Mortar and Grout

Comply with the requirements of TCNA Hdbk method [_____] for furan mortar and grout installation.

3.4.6 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with TCNA Hdbk method [_____]. [Provide and apply manufacturer's standard [_____] product for sealing grout joints in accordance with manufacturer's recommendations.]

3.4.7 Epoxy Resin Grout

Prepare and install epoxy resin grout in accordance with TCNA Hdbk method [_____].

3.4.8 Urethane Grout

Prepare and install urethane grout in accordance with TCNA Hdbk method [_____].

3.5 INSTALLATION OF FLOOR TILE

****

NOTE: See current TCNA Hdbk for detailed guidance. Specify project-specific TCNA Hdbk numbers for each type of floor tile installation method. Edit text accordingly.

General guidance for floor tile installation methods as follows:

Specify TCNA Hdbk B-series methods for interior shower receptors.

Specify TCNA Hdbk EJ-series methods for movement (i.e. construction, contraction, expansion,

isolation or perimeter) joints.

Specify TCNA Hdbk F-series methods for interior and exterior floors, including concrete substrates (above-ground and on-ground), and interior floors over wood substrates.

Specify TCNA Hdbk TR-series methods for renovation applications over existing substrates.

****

Install floor tile in accordance with TCNA Hdbk method [specified herein] [_____] and with grout joints [as recommended by the manufacturer for the type of tile][of [_____] mm][of [_____] inch]. Install shower receptors in accordance with TCNA Hdbk method [B414] [B415] [_____].

3.5.1 Installation of Gauged [Porcelain Tile][Porcelain Tile Panels/Slabs]

Install gauged [porcelain tile][porcelain tile panels/slabs] in accordance with TCNA Hdbk method [_____] and ANSI A137.3/A108.19 for thin-bed method bonded with modified dry-set cement mortar over improved modified dry-set cement mortar.

3.5.2 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 TCNA Hdbk method [_____] for workable mortar bed materials and installation. Conform to TCNA Hdbk method [_____] for cured mortar bed materials and installation. Provide minimum 6 mm 1/4 inch to maximum 10 mm 3/8 inch joints in uniformed width.

3.5.3 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 TCNA Hdbk method [_____]. Use latex-portland cement when installing porcelain ceramic tile.

3.5.4 Resinous Grout

****

NOTE: Use resin grout where chemical resistance is required. For quarry tile subject to severe chemical exposure conditions, use Section 09 35 16 CHEMICAL-RESISTANT QUARRY TILING.

Ensure the areas to receive resin grout are 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 610 mm 2 feet outside of the trough areas for ranges, kettles, and ovens.

b. Within the areas of pot washing and dish washing. 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. Set tile 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 grout conforming to ANSI A108/A118/A136.1 or epoxy resin grout conforming to ANSI A108/A118/A136.1. 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 TCNA Hdbk method [_____]. Install resin grout in accordance with manufacturer's printed installation instructions. Provide a coating of wax applied from the manufacturer on all tile installed with 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.

3.5.5 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with TCNA Hdbk method [_____]. Provide and apply manufacturer's standard [_____] product for sealing grout joints in accordance with manufacturer's recommendations.

3.5.6 Waterproof and Crack Isolation Membranes

Install as indicated in accordance with manufacturer's written instructions.

3.5.7 Concrete Fill

****

NOTE: Select the first sentence in areas to receive conductive ceramic tile.

****

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 51 mm 2 inch. Tie laps together with 1.02 mm 18 gauge wire every 254 mm 10 inch along the finished edges and every 152 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 of 51 mm 2 inches, and of the same thickness that the mortar setting-bed over the concrete fill with the thickness required in the specified TCNA Hdbk method [_____].

3.6 INSTALLATION OF MISCELLANEOUS TRIMS

****

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, or other hard surface thresholds or saddles will be edited appropriately.

****

3.6.1 Transition Strips

Install transition strips where indicated, in a manner similar to that of the ceramic tile floor and as recommended by the manufacturer. Provide thresholds full width of the opening. Install head joints at ends not exceeding 6 mm 1/4 inch in width and grouted full.

3.6.2 Metal Trims

Install trim where indicated. Embed anchoring leg in setting mortar in accordance with manufacturer's instructions. During grouting of tile joints, immediately wipe grout from finish surface.

3.7 EXPANSION JOINTS

****

Note: Indicate expansion-joint details on the drawings. Location of expansion joints should, insofar as practical, be located outside the areas of tile finishes.

****

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.7.1 Walls

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

3.7.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs in accordance with TCNA Hdbk method [_____] EJ171 type to suit conditions. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 6.1 to 7.6 m 20 to 25 feet each way in large interior floor areas[.][and 2.4 to 3.7 m 8 to 12 feet each way in large exterior areas or areas exposed to direct sunlight or moisture.] Extend expansion joints through setting-beds and fill.

3.8 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.

-- End of Section --