
USACE / NAVFAC / AFCEA / NASA UFGS-09 30 00 (April 2006)

Preparing Activity: USACE Replacing without change
UFGS-09310 (August 2005)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 1 April 2006

Latest change indicated by CHG tags

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SECTION 09 30 00

CERAMIC TILE, QUARRY TILE, AND PAVER TILE 04/06

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

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.

This guide specification includes tailoring options for floor tile, 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 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.

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 (2002) Steel Welded Wire Reinforcement, Plain, for Concrete

ASTM C 1026 (2002) Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling

ASTM C 1027 (1999) Determining Visible Abrasion Resistance of Glazed Ceramic Tile

ASTM C 1028	(1996) 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	(2004e1) Glass Mat Water-Resistant Gypsum Backing Panel
ASTM C 144	(2004) Aggregate for Masonry Mortar
ASTM C 150	(2005) Portland Cement
ASTM C 206	(2003) Finishing Hydrated Lime
ASTM C 207	(2005) Hydrated Lime for Masonry Purposes
ASTM C 241	(1990; R 1997e1) Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C 33	(2003) Concrete Aggregates
ASTM C 373	(1988; R 1999) 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	(2001; R 2004) Metal Lath
ASTM F 446	(1985; R 2004e1) Grab Bars and Accessories Installed in the Bathing Area

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual	(2003) Dimension Stone Design Manual
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 99	(2005) Health Care Facilities
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TILE COUNCIL OF AMERICA (TCA)

TCA Hdbk	(2003-2004) Handbook for Ceramic Tile Installation
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

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

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.] The following shall be submitted 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

Tile[; G][; G, [_____]]
Setting-Bed
Mortar, Grout, and Adhesive

Manufacturer's catalog data and preprinted installation and cleaning instructions.

SD-04 Samples

Tile[; G][; G, [____]]
Accessories
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
Mortar, Grout, and Adhesive

Certificates indicating conformance with specified requirements. A master grade certificate shall be furnished for tile.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Materials shall be kept dry, protected from weather, and stored under cover in accordance with manufacturer's instructions.

1.4 ENVIRONMENTAL REQUIREMENTS

Ceramic tile work shall not be performed unless the substrate and ambient temperature is at least 10 degrees C 50 degrees F and rising. Temperature shall be maintained 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 they shall be vented to the outside to avoid carbon dioxide damage to new tilework.

1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period shall be provided.

1.6 EXTRA STOCK

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

1.7 DETAIL DRAWINGS

Detail drawings shall be dimensioned and drawn 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.

Tile shall be standard grade conforming to ANSI A137.1. Containers shall be grade sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate. Tile shall be impact resistant with a

minimum breaking strength for wall tile of 41 kg 90 lbs and 113 kg 250 lbs for floor tile in accordance with ASTM C 648. Tile for cold climate projects shall be rated frost resistant by the manufacturer as determined by ASTM C 1026. Water absorption shall be [0.50] [_____] maximum percent in accordance with ASTM C 373. Floor tile shall have a minimum coefficient of friction of [0.50] [0.60] [_____] wet and dry in accordance with ASTM C 1028. Floor tile shall be Class [III-Medium Heavy] [IV-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. Color shall be [in accordance with Section 09 06 90 COLOR SCHEDULE] [_____] .

2.1.1 Mosaic Tile

Ceramic mosaic tile and trim shall be unglazed [[natural clay] [conductive] with cushion edges] [porcelain [unpolished] [polished] with sharply formed face]. Tile size shall be [25 x 25 mm 1 x 1 inch] [25 x 50 mm 1 x 2 inches] [50 x 50 mm 2 x 2 inches] [a mixture of standard sizes in a stock pattern] [_____] . Color shall be [in accordance 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.

Quarry tile and trim shall be unglazed with [smooth surface] [abrasive surface]. Tile shall be [150 x 150] [[_____] x 13] mm [6 x 6] [[_____] x 1/2] inch. Color shall be [in accordance with Section 09 06 90 COLOR SCHEDULE] [_____] .

2.1.3 PAVER TILE

Paver tile shall be [glazed] [unglazed], size [100 x 100 x 10 mm 4 x 4 x 3/8 inch] [150 x 150 x 10 mm 6 x 6 x 3/8 inch] [100 x 200 x 10 mm 4 x 8 x 3/8 inch] . Color shall be [in accordance with Section 09 06 90 COLOR SCHEDULE] [_____] .

2.1.4 Detectable Warning Tile

Detectable warning tile shall be unglazed 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 inches and shall contrast visually with adjoining surfaces. Tile shall be [150 x 150] [[_____] x 13] mm [6 x 6] [[_____] x 1/2] inch. Color shall be [in accordance with Section 09 06 90 COLOR SCHEDULE] [_____] .

2.1.5 Porcelain Tile

Porcelain tile and trim shall be unglazed with the color extending

uniformly through the body of the tile. Tile size shall be nominal [305 by 305] [_____] by 8 mm [12 by 12] [_____] by 5/16 inch thick. Tile shall meet or exceed the following criteria: Abrasive wear in accordance with ASTM C 501 and bonding strength in accordance with ASTM C 482. Tile shall comply with 36 CFR 1191 for coefficient of friction for interior floors. Color shall be in accordance 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.

Glazed wall tile and trim shall be cushion edged with [bright] [matte] glaze. Tile shall be [106 x 106] [106 x 150] [150 x 150] mm [4-1/4 x 4-1/4] [4-1/4 x 6] [6 x 6] inches. Color shall be [in accordance with Section 09 06 90 COLOR SCHEDULE] [_____] .

2.1.7 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.

Accessories shall be the built-in type of the same materials and finish as the wall tile. Accessories shall be provided 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] inches 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

The setting-bed shall be composed of the following:

2.2.1 Aggregate for Concrete Fill

Aggregate shall conform to ASTM C 33. Maximum size of coarse aggregate shall not be greater than one-half the thickness of concrete fill.

2.2.2 Portland Cement

Cement shall conform to ASTM C 150, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Sand shall conform to ASTM C 144.

2.2.4 Hydrated Lime

Hydrated lime shall conform to ASTM C 206, Type S or ASTM C 207, Type S.

2.2.5 Metal Lath

Metal lath shall be flat expanded type conforming to ASTM C 847, and weighing not less than 1.4 kg/square meter 2.5 pounds/square yard.

2.2.6 Reinforcing Wire Fabric

Wire fabric shall conform to ASTM A 185. Wire shall be either 50 x 50 mm 2 x 2 inch mesh, 16/16 wire or 38 x 50 mm 1-1/2 x 2 inch mesh, 16/13 wire.

2.3 WATER

Water shall be potable.

2.4 MORTAR, GROUT, AND ADHESIVE

Mortar, grout, and adhesive shall conform to the following:

2.4.1 Dry-Set Portland Cement Mortar

ANSI A108.1.

2.4.2 Conductive Dry-Set Mortar

ANSI A108.1.

2.4.3 Latex-Portland Cement Mortar

ANSI A108.1.

2.4.4 Ceramic Tile Grout

ANSI A108.1; [sand portland cement grout] [dry-set grout] [latex-portland cement grout] [commercial portland cement grout] [silicone rubber grout].

2.4.5 Organic Adhesive

ANSI A108.1, Type I.

2.4.6 Epoxy Resin Grout

ANSI A108.1.

2.4.7 Furan Resin Grout

ANSI A108.1 and consist of an intimate mixture of furfuryl-alcohol resin with carbon filler and catalyst.

2.4.8 Cementitious Backer Board

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

2.4.9 Glass Mat Gypsum Backer Panel

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

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.

Marble thresholds shall be of size required by drawings or conditions. Marble shall be Group A as classified by MIA Design Manual. Marble shall have a fine sand-rubbed finish and shall be [white] [pink] [or] [gray] in color as approved by the Contracting Officer. Marble abrasion shall be not less than 12.0 when tested in accordance with ASTM C 241.

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.

Surface to receive tile shall be inspected and shall conform to the requirements of ANSI A108.1 for surface conditions for the type setting bed specified and for workmanship. Variations of surface to be tiled shall

fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	3 mm in 2.4 meters	3.0 mm in 3 meters
Organic Adhesives	3 mm in 2.4 meters	1.5 mm in 1 meters
Latex portland cement mortar	3 mm in 2.4 meters	3.0 mm in 3 meters
Epoxy	3 mm in 2.4 meters	3.0 mm in 3 meters

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

Tile work shall not be started 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. Floor tile installation shall not be started in spaces requiring wall tile until after wall tile has been installed. Tile in colors and patterns indicated shall be applied in the area shown on the drawings. Tile shall be installed with the respective surfaces in true even planes to the elevations and grades shown. Special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Tile bases and coves shall be solidly backed 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.

Wall tile shall be installed in accordance with the TCA Hdbk, method [_____].

3.3.1 Workable or Cured Mortar Bed

Tile shall be installed over a workable mortar bed or a cured mortar bed at the option of the Contractor. A 0.102 mm 4 mil polyethylene membrane, metal lath, and scratch coat shall also be installed. Workable mortar bed, materials, and installation of tile shall conform to ANSI A108.1. Cured mortar bed and materials shall conform to ANSI A108.1.

3.3.2 Dry-Set Mortar and Latex-Portland Cement Mortar

[Dry-set] [or] [Latex-portland cement] shall be used to install tile in accordance with ANSI A108.1. Latex portland cement shall be used when installing porcelain ceramic tile.

3.3.3 Organic Adhesive

Organic adhesive installation of ceramic tile shall conform to ANSI A108.1.

3.3.4 Furan Mortar and Grout

Furan mortar and grout installation shall conform to ANSI A108.1.

3.4 INSTALLATION OF FLOOR TILE

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.

Floor tile shall be installed in accordance with TCA Hdbk, method [_____]. Shower receptors shall be installed in accordance with TCA Hdbk, method [B414] [B415].

3.4.1 Workable or Cured Mortar Bed

Floor tile shall be installed over a workable mortar bed or a cured mortar

bed at the option of the Contractor. Workable mortar bed materials and installation shall conform to ANSI A108.1. Cured mortar bed and materials shall conform to ANSI A108.1. Joints between quarry tile shall be between 6.35 mm 1/4 inch and 9.53 mm 3/8 inch in width and shall be uniform in width.

3.4.2 Dry-Set and Latex-Portland Cement

[Dry-set] [or] [Latex-portland cement] mortar shall be used to install tile directly over properly cured, plane, clean concrete slabs in accordance with ANSI A108.1. Latex portland cement shall be used when installing porcelain ceramic tile.

3.4.3 Resinous Grout

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, quarry tile shall be grouted with either furan or epoxy resin grout. Joints shall be raked and cleaned to the full depth of the tile and neutralized when recommended by the resin manufacturer. Epoxy resin grout shall be installed in conformance with ANSI A108.1. Furan resin grout shall be installed in accordance with manufacturer's instructions. Tile installed with furan resin shall be coated with wax by the tile manufacturer. Installation of resin grout shall be in strict accordance with manufacturer's instructions for proportioning, mixing, installing, and curing. Recommended temperature shall be maintained in the area and on the surface to be grouted. After grouting, tile shall be left free of grout stain.

3.4.4 Ceramic Tile Grout

Ceramic Tile grout shall be prepared and installed in accordance with ANSI A108.1.

3.4.5 Waterproofing

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

3.4.6 Concrete Fill

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

[Concrete fill shall be 24.1 MPa 3500 psi concrete, mixed to as dry a consistency as practicable.] [Concrete fill shall be composed by volume of 1 part portland cement to 3 parts fine aggregate to 4 parts coarse aggregate, and mixed with water to as dry a consistency as practicable.] The fill shall be spread, tamped, and screeded to a true plane, and pitched to drains or leveled as shown. Concrete fill shall be thoroughly damp cured before application of setting-bed material. Concrete fill shall be reinforced with one layer of reinforcement, with the uncut edges lapped the width of one mesh and the cut ends and edges lapped not less than 50 mm 2 inches. Laps shall be tied together with 1.3 mm 18 gauge wire every 250 mm 10 inches along the finished edges and every 150 mm 6 inches along the cut ends and edges. The reinforcement shall be supported and secured in the centers of concrete fills. The mesh shall be continuous; except where expansion joints occur, mesh shall be cut and discontinued across such joints. Reinforced concrete fill shall be provided under the setting-bed where the distance between the under-floor surface and the finished tile floor surface is 50 mm 2 inches or greater, and shall be of such thickness that the mortar setting-bed over the concrete fill shall be not less nor more than the thickness required in the specified TCA Hdbk methods.

3.5 INSTALLATION OF CONDUCTIVE FLOORING

Conductive ceramic mosaic tile floors shall be installed in accordance with ANSI A108.1.

3.6 INSTALLATION OF 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.

Thresholds shall be installed where indicated in a manner similar to that of the ceramic tile floor. Thresholds shall be the full width of the opening. Head joints at ends shall not exceed 6 mm 1/4 inch in width and shall be grouted full as specified for ceramic tile.

3.7 TESTING

Electrical resistance tests shall be performed on conductive flooring in the presence of the Contracting Officer by a technician experienced in such work and a copy of the test results shall be furnished. Test procedures, testing apparatus, and test results shall be in accordance with the provisions for Conductive Flooring in NFPA 99.

3.8 EXPANSION JOINTS

Note: Expansion-joint details will be indicated on the drawings. Details as provided in TM 5-805-6 will be used as applicable. Location of expansion joints should, insofar as practical, be located outside the areas of tile finishes.

Joints shall be formed as indicated and sealed as specified in Section 07 92 00 JOINT SEALANTS.

3.8.1 Walls

Expansion joints shall be provided at control joints in backing material. Wherever backing material changes, an expansion joint shall be installed to separate the different materials.

3.8.2 Floors

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.

Expansion joints shall be provided over construction joints, control joints, and expansion joints in concrete slabs. Expansion joints shall be provided 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. Expansion joints shall extend through setting-beds and fill.

3.9 CLEANING AND PROTECTING

Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions. Acid shall not be used for cleaning glazed tile. Floor tile with resinous grout or with factory mixed grout shall be cleaned in accordance with instructions of the grout manufacturer. After the grout has set, tile wall surfaces shall be given a protective coat of a noncorrosive soap or other approved method of protection. Tiled floor areas shall be covered with building paper before foot traffic is permitted over the finished tile floors. Board walkways shall be laid on tiled floors that are to be continuously used as passageways by workmen. Damaged or defective tiles shall be replaced.

-- End of Section --