SECTION 09 30 13

CERAMIC/PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies ceramic, porcelain tile, marble thresholds, waterproofing membranes for thin-set applications,

1.2 RELATED WORK

A. Sealing of joints where specified: Section 07 92 00, JOINT SEALANTS.

B. Color, texture and pattern of field tile and trim shapes, size of field tile, trim shapes, and color of grout specified: Refer to AS-622, Room Finish Schedule and Interior Finish Legend CT-1 through CT-4, and P-1 through P-5(C) indicted on the Drawings.

C. Metal and resilient edge strips at joints with new resilient flooring: Section 09 65 19, RESILIENT TILE FLOORING.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples:

1. Base tile, each type, each color, each size.
2. Porcelain tile, each type, color, patterns and size.
3. Wall (or wainscot) tile, each color, size and pattern.
4. Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.

C. Product Data:

1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
2. Leveling compound.
3. Latex-Portland cement mortar and grout.
4. Slip resistant tile.
5. Waterproofing isolation membrane.

D. Certification:

1. Master grade, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
   a. Commercial Portland cement grout.
   b. Latex-Portland cement mortar and grout.
   c. Leveling compound.

d. Waterproof isolation membrane.

1.4 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.

B. American National Standards Institute (ANSI):

1. A10.20-05 Safety Requirements for Ceramic Tile, Terrazzo, and Marble Works

2. A108.5-05 Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar

3. A108.10-05 Installation of Grout in Tilework

4. A108.13-05 Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone

5. A118.1-05 Dry-Set Portland Cement Mortar

6. A118.4-05 Latex-Portland Cement Mortar

7. A118.6-05 Standard Cement Grouts for Tile Installation

8. A118.10-05 Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation

9. A137.1-88 Ceramic Tile

C. American Society For Testing And Materials (ASTM):

1. C109/C109M-07 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch. or (50-mm) Cube Specimens)

2. C241-90 (R2005) Abrasion Resistance of Stone Subjected to Foot Traffic

3. C348-02 Standard Test Method for Flexural Strength of Hydraulic- Cement Mortars

4. C627-93(R2007) Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester

5. C954-07 Steel Drill Screws for the Application of Gypsum Board on Metal Plaster Base to Steel Studs from 0.033 in (0.84 mm) to 0.112 in (2.84 in thickness

6. C1002-07 Steel Self-Piercing Tapping Screws for the Application of Panel Products

7. C1027-99(R2004) Determining "Visible Abrasion Resistance on Glazed Ceramic Tile"

8. C1028-07 Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal

Dynamometer Pull Meter Method

9. C1127-01 Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface

10. C1178/C1178M-06 Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel

11. D4397-02 Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

D. Marble Institute of America (MIA):

1. Design Manual III-2007

E. Tile Council of America, Inc. (TCA):

1. 2007 Handbook for Ceramic Tile Installation

PART 2 - PRODUCTS

2.1 TILE

A. Comply with ANSI A137.1, Standard Grade, except as modified:

1. Inspection procedures listed under the Appendix of ANSI A137.1.

2. Abrasion Resistance Classification:

a. Tested in accordance with values listed in Table 1, ASTM C 1027.

b. Class V, 12000 revolutions for floors in Corridors, Kitchens, Storage including Refrigerated Rooms

c. Class IV, 6000 revolutions for remaining areas.

3. Slip Resistant Tile for Floors:

a. Coefficient of friction, when tested in accordance with ASTM C1028, required for level of performance:

1) Not less than 0.7 (wet condition) for bathing areas.

2) Not less than 0.8 on ramps for wet and dry conditions.

3) Not less than 0.6, except 0.8 on ramps as stated above, for wet and dry conditions for other areas.

4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.

5. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

6. Factory-Applied Temporary Protective Coating:

a. Protect exposed face surfaces (top surface) of tile against adherence of mortar and grout by pre-coating with a continuous film of petroleum paraffin wax, applied hot.

b. Do not coat unexposed tile surfaces.

c. Pre-wax tiles set or grouted with latex modified mortars.

B. Unglazed Ceramic Mosaic Tile: Nominal 6 mm (1/4 inch) thick with cushion edges.

C. Glazed Wall Tile: Cushion edges, glazing, Refer to Room Finish Schedule indicated on the Drawings.

D. Trim Shapes:

1. Conform to applicable requirements of adjoining floor and wall tile.

2. Use slip resistant trim shapes for horizontal surfaces of showers overflow ledges, recessed steps, shower curbs, drying area curbs, and seats.

3. Use trim shapes sizes conforming to size of adjoining field wall tile including existing spaces unless detailed or specified otherwise in Room Finish Schedule indicated on the Drawings.

4. Internal and External Corners:

a. Square internal and external corner joints are not acceptable.

b. External corners including edges: Use bullnose shapes.

c. Internal corners: Use cove shapes.

d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.

e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.

f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.

g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.

h. For unglazed ceramic mosaic and glazed wall tile installed in dry-set Portland cement mortar, latex-Portland cement mortar, and organic adhesive (thin set methods), use cove and surface bullnose shapes as applicable.

2.2 GLASS MAT WATER RESISTANT GYPSUM BACKER BOARD

A. Confirm to ASTM C1178/C1178M, Optional System for Cementitious Backer Units.

2.3 SETTING MATERIALS OR BOND COATS

A. Conform to TCA Handbook for Ceramic Tile Installation.

B. Latex-Portland Cement Mortar: ANSI A118.4.

1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A118.4.

2. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of Portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

C. Elastomeric Waterproofing Membrane and Bond Coat:

1. TCA F122-02.
2. ANSI A118.10.
3. One component polyurethane, liquid applied material having the following additional physical properties:
   a. Hardness: Shore "A" between 40-60.
   b. Elongation: Between 300-600 percent.
   c. Tensile strength: Between 40-60 psig.
   d. No volatile compounds.
4. Coal tar modified urethanes are not acceptable.

D. Waterproofing Isolation Membrane:

1. Sheet System TCA F122-02.
2. Optional System to elastomeric waterproof membrane.
3. Composite sheet consisting of ASTM D5109, Type II, Grade I Chlorinated Polyethylene sheet reinforced on both sides with a non-woven polyester fiber.
4. Designed for use in wet areas as an isolation and positive waterproofing membranes for thin-set bonding of sheet to substrate and thin-set bonding of ceramic and porcelain tile or marble to sheet. Suited for both horizontal and vertical applications.
5. Conform to the following additional physical properties:

Property	Units	Results	Test Method
Hardness Shore A	Points	70-80	ASTM D2240 (10 Second Reading)
Shrinkage	Percent	5 maximum	ASTM D1204
Brittleness		No crack remains flexible at temperature-37 degrees C (-25 degrees F)	ASTM D2497 13 mm (1/2- inch) Mandrel Bend
Retention of Properties after Heat Aging	Percent of original	80 Tensile 80 Breaking 80 Elongation	ASTM D3045, 90 degrees C (194 degrees F) for 168 hours

6. Manufacturer¢s standard sheet size with prefabricated or preformed inside and outside corners.
7. Sheet manufacturer¢s solvent welding liquid or xylene and edge sealant.

2.4 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6 color as specified.

1. Unsanded grout mixture for joints 3.2 mm (1/8 inch) and narrower.

2. Sanded grout mixture for joints 3.2 mm (1/8 inch) and wider.

2.5 PATCHING AND LEVELING COMPOUND

A. Portland cement base, polymer-modified, self-leveling compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

B. Shall have minimum following physical properties:

1. Compressive strength - 25 MPa (3500 psig) per ASTM C109/C109M.

2. Flexural strength - 7 MPa (1000 psig) per ASTM C348 (28 day value).

3. Tensile strength - 600 psi per ANSI 118.7.

4. Density – 1.9.

C. Capable of being applied in layers up to 38 mm (1-1/2 inches) thick without fillers and up to 100 mm (four inches) thick with fillers, being brought to a feather edge, and being trowelled to a smooth finish.

D. Primers, fillers, and reinforcement as required by manufacturer for application and substrate condition.

E. Ready for use in 48 hours after application.

2.6 MARBLE

A. Soundness Classification in accordance with MIA Design Manual III Groups.

B. Thresholds:

1. Group A, Minimum abrasive hardness (Ha) of 10.0 per ASTM C241.

2. Honed finish on exposed faces.

3. Thickness and contour as shown.

4. Fabricate from one piece without holes, cracks, or open seams; full depth of wall or frame opening by full width of wall or frame opening; 19 mm (3/4-inch) minimum thickness and 6 mm (1/4-inch) minimum thickness at beveled edge.

5. Set not more than 13 mm (1/2-inch) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2. On existing floor slabs provide 13 mm (1/2-inch) above ceramic tile surface with bevel edge joint top flush with adjacent floor.

6. One piece full width of door opening. Notch thresholds to match profile of door jambs.

7. Manufacturer: Refer to AS-622, Room Finish Schedule and Interior Finish Legend.

2.7 WATER

A. Clean, potable and free from salts and other injurious elements to mortar and grout materials.

2.8 CLEANING COMPOUNDS

A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

B. Materials containing acid or caustic material not acceptable.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three days after installation.

B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation and ANSI Specifications for installation.

C. Do not install tile when the temperature is above 38 degrees C (100 degrees F).

D. Do not install materials when the temperature of the substrate is below 16 degrees C (60 degrees F).

E. Do not allow temperature to fall below 10 degrees C (50 degrees F) after fourth day of completion of tile work.

3.2 ALLOWABLE TOLERANCE

A. Variation in plane of sub-floor, including concrete fills leveling compounds and mortar beds:

1. Not more than 1 in 1000 (1/8 inch in 10 feet) where dry-set Portland cement, and latex-Portland cement mortar setting beds and chemical-resistant bond coats are used.

B. Variation in Plane of Wall Surfaces:

1. Not more than 1 in 800 (1/8 inch in eight feet) where dry-set or latex-Portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION

A. Cleaning New Concrete or Masonry:

1. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding by mechanical method, or by using products specifically designed for cleaning concrete and masonry.

2. Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete slabs where ceramic tile will be installed directly on concrete

surface with thin-set materials.

3. Steam cleaning or the use of acids and solvents for cleaning will not be permitted.

B. Patching and Leveling:

1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.

2. Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.

a. Thickness of compound as required to bring finish tile system to elevation shown.

b. Float finish except finish smooth for elastomeric waterproofing.

c. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

3. Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.

4. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

C. Walls:

1. In showers or other wet areas cover studs with polyethylene sheet. Extend at least 12 inches beyond vertical edge of tile area.

2. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.

3. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

3.4 GLASS MAT WATER-RESISTANT GYPSUM BACKER BOARD

A. Install in accordance with manufacturer’s instructions. TCA Systems W245-01.

B. Treat joints with tape and latex-Portland cement mortar or adhesive.

3.5 MARBLE

A. Secure thresholds and stools in position with minimum of two stainless steel dowels.

B. Set in dry-set Portland cement mortar or latex-Portland cement mortar bond coat.

C. Set threshold to finish 12mm (1/2 inch) above ceramic tile floor unless shown otherwise, with bevel edge joint top flush with adjacent floor similar to TCA detail TR611-02.

3.6 CERAMIC TILE - GENERAL

A. Comply with ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" applicable to

methods of installation.

B. Comply with TCA Installation Guidelines:

C. Setting Beds or Bond Coats:

1. Set floor tile in elastomeric bond coat over elastomeric membrane ANSI 108. 13, TCA System F122 where scheduled,.

2. Set wall tile installed over concrete or masonry in dry-set Portland cement mortar, or latex-Portland cement mortar, ANSI 108.1B.and TCA System W211-02, W221-02 or W222-02.

3. Set wall tile installed over concrete backer board in latex-Portland cement mortar, ANSI A108.1B.

4. Set trim shapes in same material specified for setting adjoining tile.

D. Workmanship:

1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field. Align new tile work scheduled for existing spaces to the existing tile work unless specified otherwise.

2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise.

3. Form intersections and returns accurately.

4. Cut and drill tile neatly without marring surface.

5. Cut edges of tile abutting penetrations, finish, or built-in items:

a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.

b. Seal tile joints water tight as specified in Section 07 92 00, JOINT SEALANTS, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place.

6. Completed work shall be free from hollow sounding areas and loose, cracked or defective tile.

7. Remove and reset tiles that are out of plane or misaligned.

8. Floors:

a. Extend floor tile beneath casework and equipment, except those units mounted in wall recesses.

b. Align finish surface of new tile work flush with other and existing adjoining floor finish where shown.

c. In areas where floor drains occur, slope to drains where shown.

d. Shove and vibrate tiles over 200 mm (8 inches) square to achieve full support of bond coat.

9. Walls:

a. Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or

from floor to nominal wainscot heights shown with tile.

b. Finish reveals of openings with tile, except where other finish materials are shown or specified.

c. At window openings, provide tile stools and reveals, except where other finish materials are shown or specified.

d. Finish wall surfaces behind and at sides of casework and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.

10. Joints:

a. Keep all joints in line, straight, level, perpendicular and of even width unless shown otherwise.

b. Make joints 2 mm (1/16 inch) wide for glazed wall tile and mosaic tile work.

c. Make joints in quarry tile work not less than 6 mm (1/4 inch) nor more than 9 mm (3/8 inch) wide. Finish joints flush with surface of tile.

d. Make joints in Paver tile, porcelain type; maximum 3 mm (1/8 inch) wide.

11. Back Buttering: For installations indicated below, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:

a. Tile wall installations composed of tiles 200 by 200 mm (8 by 8 inches or larger.

3.7 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH DRY-SET PORTLAND CEMENT AND LATEX-PORTLAND CEMENT MORTAR

A. Installation of Tile: ANSI A108.5, except as specified otherwise.

3.8 CERAMIC AND PORCELAIN TILE INSTALLED WITH ELASTOMERIC BOND COAT

A. Surface Preparation: Prepare surfaces as specified in paragraph 3.3G

B. Installation of Elastomeric Membrane: ANSI A108.13 and TCA F122-02.

1. Prime surfaces, where required, in accordance with manufacturer's instructions.

2. Install first coat of membrane material in accordance with manufacturer's instructions, in thickness of 0.75 to 1.3 mm (30 to 50 mils).

3. Extend material over flashing rings of drains and turn up vertical surfaces not less than 100 mm (four inches) above finish floor surface.

4. When material has set, recoat areas with a second coat of elastomeric membrane material for a total thickness of 1.3 to 1.9 mm (50 to 75 mils).

5. After curing test for leaks with 25 mm (one inch) of water for 24 hours.

C. Installation of Tile in Elastomeric Membrane:

1. Spread no more material than can be covered with tile before material starts to set.

2. Apply tile in second coat of elastomeric membrane material in accordance with the coating manufacturer's instructions in lieu at aggregate surfacing specified in ASTM C1127. Do not install top coat over tile.

3.9 GROUTING

A. Grout Type and Location:

1. Grout for glazed wall and base tile, latex-Portland cement grout, dry-set grout, or commercial Portland cement grout.

B. Workmanship:

1. Install and cure grout in accordance with the applicable standard.

2. Portland Cement grout: ANSI A108.10.

3. Dry-set grout: ANSI A108.5.

3.10 MOVEMENT JOINTS

A. Prepare tile expansion, isolation, construction and contraction joints for installation of sealant. Refer to Section 07 92 00, JOINT SEALANTS.

B. TCA details EJ 171-02.

C. At expansion joints, rake out joint full depth of tile and setting bed and mortar bed. Do not cut waterproof or isolation membrane.

D. Rake out grout at joints between tile, at toe of base, and where shown not less than 6 mm (1/4 inch) deep.

3.11 CLEANING

A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.

B. Methods and materials used shall not damage or impair appearance of tile surfaces.

C. The use of acid or acid cleaners on glazed tile surfaces is prohibited.

D. Clean tile grouted with epoxy, furan and commercial Portland cement grout and tile set in elastomeric bond coat as recommended by the manufacturer of the grout and bond coat.

3.12 PROTECTION

A. Keep traffic off tile floor, until grout and setting material is firmly set and cured.

B. Where traffic occurs over tile floor, cover tile floor with not less than 9 mm (3/8 inch) thick plywood, wood particle board, or hardboard securely taped in place. Do not remove protective cover until time for final inspection. Clean tile of any tape, adhesive

and stains.

3.13 TESTING FINISH FLOOR

A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.

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