

SECTION 09 30 13
CERAMIC/PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies ceramic, porcelain tile, marble thresholds, waterproofing membranes for thick-set applications, and tile backer board.

1.2 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. Paver tile, each size, type, color and pattern.
 - 3. Porcelain tile, each type, color, patterns and size.
 - 4. Wall (or wainscot) tile, each color, size and pattern.
 - 5. 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. Tile backer board.
 - 3. Dry set Portland cement mortar and grout.
 - 4. Elastomeric membrane and bond coat.
 - 5. Reinforcing tape.
 - 6. Leveling compound.
 - 7. Latex Portland cement mortar and grout.
 - 8. Commercial Portland cement grout.
 - 9. Slip resistant tile.
 - 10. 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. Modified epoxy emulsion.
 - b. Commercial Portland cement grout.
 - c. Tile backer board.
 - d. Dry-set Portland cement mortar and grout.

- e. Elastomeric membrane and bond coat.
- f. Reinforcing tape.
- g. Latex Portland cement mortar and grout.
- h. Leveling compound.
- i. Waterproof isolation membrane.

1.3 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.

1.4 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):
 - A108.5-05Installation of Ceramic Tile with Dry-Set
Portland Cement Mortar or Latex-Portland Cement
Mortar
 - A108.6-05Installation of Ceramic Tile with Chemical
Resistant, Water Cleanable Tile-Setting and
Grouting Epoxy
 - A108.10-05Installation of Grout in Tile work
 - A118.1-05Dry-Set Portland Cement Mortar
 - A118.4-05Latex-Portland Cement Mortar
 - A118.6-05Standard Cement Grouts for Tile Installation
 - A137.1-88Ceramic Tile
- C. American Society For Testing And Materials (ASTM):
 - C109/C109M-07Standard Test Method for Compressive Strength
of Hydraulic Cement Mortars (Using 2 inch. or
50-mm Cube Specimens)
 - C348-02Standard Test Method for Flexural Strength of
Hydraulic-Cement Mortars
 - C627-93(R2007)Evaluating Ceramic Floor Tile Installation
Systems Using the Robinson-Type Floor Tester
 - C954-07Steel 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
mm) in thickness
 - C979-05Pigments for Integrally Colored Concrete

- C1002-07Steel Self-Piercing Tapping Screws for the
Application of Panel Products
- C1028-07Determining the Static Coefficient of Friction
of Ceramic Tile and Other Like Surfaces by the
Horizontal Dynamometer Pull Meter Method
- C1127-01Standard Guide for Use of High Solids Content,
Cold Liquid-Applied Elastomeric Waterproofing
Membrane with an Integral Wearing Surface
- C1178/C1178M-06Standard Specification for Coated Glass Mat
Water-Resistant Gypsum Backing Panel
- D5109-99(R2004)Standard Test Methods for Copper-Clad
Thermosetting Laminates for Printed Wiring
Boards

D. Tile Council of America, Inc. (TCNA):

- 2011Handbook 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.
 - b. Tile Having Abrasive Grains:
 - c. Porcelain Paver Tile: Matte surface finish with raised ridges
spaced uniformly over tile surface.
 - 4. 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.

5. 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 furan or epoxy or latex modified mortars.

B. Porcelain Paver Tile: Nominal 8 mm (5/16 inch) thick, with cushion edges. Porcelain tile produced by the dust pressed method shall be made of approximately 50% feldspar; the remaining 50% shall be made up of various high-quality light firing ball clays yielding a tile with a water absorption rate of 0.5% or less and a breaking strength of between 390 to 400 pounds.

C. 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.
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 glazed wall tile installed in Portland cement mortar setting bed, use cove and bullnose shapes as applicable. When ceramic base tile is required, use C Series cove and bullnose shapes.

- i. For glazed wall tile installed in dry set Portland cement mortar, and latex Portland cement mortar, use cove and surface bullnose shapes as applicable.

2.2 GLASS MAT WATER RESISTANT GYPSUM BACKER BOARD

Conform to ASTM C1178/C1178M.

2.3 JOINT MATERIALS FOR TILE BACKER UNITS

- A. Reinforcing Tape: Glass fiber mesh tape, alkali resistant, 2 inches wide.
- B. Joint material, including reinforcing tape, and tape embedding material, shall be as specifically recommended by the backer unit manufacturer.

2.4 FASTENERS

- A. Screws for Tile Backer Board: Noncorroding and non-oxidizing.
 1. Standard screws for gypsum board are not acceptable.

2.5 SETTING MATERIALS OR BOND COATS

- A. Conform to TCNA Handbook for Ceramic Tile Installation.
- B. Portland Cement Mortar: ANSI A108.1.
- C. Cementitious Bond Coat: ANSI A118.4 and recommended by manufacturer for above ground use.
- D. Cleavage Membrane: ANSI A108.1A.
- E. Latex Portland Cement Mortar: ANSI A118.4.
 1. 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.
- F. Elastomeric Waterproofing Membrane and Bond Coat:
 1. ANSI A118.10.
 2. 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.
 3. Coal tar modified urethanes are not acceptable.

2.6 GROUTING MATERIALS

- A. Coloring Pigments:
 1. Pure mineral pigments, lime-proof and nonfading, complying with ASTM C979.

2. Add coloring pigments to grout by the manufacturer.
3. Job colored grout is not acceptable.
4. Use is required in Commercial Portland Cement Grout, Dry-set Grout, and Latex Portland Cement Grout.

B. White Portland Cement Grout:

1. ANSI A118.6.
2. Use one part white Portland cement to one part white sand passing a number 30 screen.
3. Color additive not permitted.

C. Commercial Portland Cement Grout: ANSI A118.6 color as indicated.

D. Dry-set Grout: ANSI A118.6 color as indicated.

E. Latex Portland Cement Grout: ANSI A118.6 color as indicated.

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.

2.7 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.

2.8 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 indicated.

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.

2.9 WATER

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

2.10 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.

2.11 FLOOR MORTAR BED REINFORCING

ASTM A185 welded wire fabric without backing, MW3 x MW3 (2 x 2-W0.5 x W0.5).

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).
- 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 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. 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 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. Cleavage Membrane:
 - 1. Install cleavage membrane in depressed slab.
 - 2. Turn up at edge of depressed floor slab to top of floor.
- D. Walls:
 - 1. 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.
- E. Existing Floors and Walls:
 - 1. Remove existing composition floor finishes and adhesive. Prepare surface by grinding, chipping, self-contained power blast cleaning

or other suitable mechanical methods to completely expose uncontaminated concrete or masonry surfaces. Follow safety requirements of ANSI A10.20.

2. Remove existing concrete fill or topping to structural slab. Clean and level the substrate for new setting bed and waterproof membrane or cleavage membrane.

3.4 GLASS MAT WATER-RESISTANT GYPSUM BACKER BOARD

- A. Install in accordance with manufacturer's instructions.
- B. Treat joints with tape and latex-Portland cement mortar or adhesive.

3.5 MARBLE

- A. Secure thresholds 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 TCNA detail TR611-09.

3.6 METAL DIVIDER STRIPS

- A. Install metal divider strips in floor joints between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise.
- B. At preformed sealant joint:
 1. Comply with recommendations in TCNA "Handbook for Ceramic Tile Installation" Vertical and Horizontal Joint Design Essentials. TCNA System EJ 171-09.
 - a. Locate joint in tile surfaces directly above joint in sub-floor or where indicated when used with isolation membranes to allow off-setting of joint location from sub-floor joint.
 - b. Fasten full length to sub-floor using a construction adhesive.
 - c. Trowel setting material with full coverage over the entire leg.
 2. Set tile up against the joint ensuring that the top edge of the joint is flush or slightly below the top of the tile.

3.7 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 TCNA Installation Guidelines.
- C. Installing Mortar Beds for Floors:

1. Install mortar bed to not damage cleavage membrane; thickness as indicated.
2. Install floor mortar bed reinforcing centered in mortar fill.
3. Screed finish to level plane or slope to drains where shown, float finish.
4. For tile set with Portland cement paste over plastic mortar bed, coordinate to set tile before mortar bed sets.

D. Setting Beds or Bond Coats:

1. Floors: Where recessed or depressed floor slabs are filled with Portland cement mortar bed, set ceramic mosaic floor tile in cementitious bond coat over bonded waterproof membrane over reinforced Portland cement mortar bed over cleavage membrane, per to TCNA System F121-09.
2. Walls: Set wall tile using coated glass mat water resistant gypsum backer board in cementitious bond coat, per TCNA System W245.
 - a. Provide complete waterproofing.
 - b. Connect membrane to floor drains.
 - c. Provide base flashing and flashing at all floor penetrations.
3. Set trim shapes in same material specified for setting adjoining tile.

E. 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 work.
 - c. 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 installed with chemical-resistant mortars and grouts.
 - b. Tile wall installations composed of tiles 200 by 200 mm (8 by 8 inches or larger).

3.8 PORCELAIN TILE INSTALLED WITH LATEX PORTLAND CEMENT BONDING MORTAR

Due to the denseness of porcelain tile use latex Portland cement bonding mortar that meets the requirements of ANSI A118.4. Bonding mortars shall be mixed in accordance with manufacturer's instructions.

Improper liquid ratios and dwell time before placement of bonding mortar and tile shall affect bond.

3.9 CERAMIC AND PORCELAIN TILE INSTALLED WITH ELASTOMERIC BOND COAT

- A. Surface Preparation: Prepare surfaces as specified.
- B. Installation of Elastomeric Membrane: ANSI A108.13 and TCNA F122-09.
 - 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.

3.10 GROUTING

- A. Grout Type and Location:
 - 1. Grout for glazed wall and base tile, and paver tile Portland cement grout, 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. Epoxy Grout: ANSI A108.6.
 - 4. Dry-set grout: ANSI A108.5.

3.11 MOVEMENT JOINTS

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

- B. TCNA details EJ 171-09.
- 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.

3.12 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.

3.13 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.

3.14 TESTING FINISH FLOOR

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

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