

**SECTION 09 30 13**  
**CERAMIC/PORCELAIN TILING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies: Ceramic and porcelain tile, marble thresholds and waterproofing/crack isolation membranes and tile backer boards.

**1.2 RELATED WORK**

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

**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. Latex-Portland cement mortar and grout.
  3. Cementitious backer unit.
- 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. Cementitious backer unit.

**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. Publication Dates: Comply with standards in effect as of date of the Contract

Documents, unless otherwise indicated.

C. American National Standards Institute (ANSI):

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

A108.1C.....Contractors Option; Installation of Ceramic Tile in the  
Wet-Set method with Portland Cement Mortar or  
Installation of Ceramic Tile on a Cured Portland Cement  
Mortar Setting Bed with Dry-Set or Latex-Portland Cement  
Mortar

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

A108.10.....Installation of Grout in Tilework

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

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

A137.1.....Ceramic Tile

A108.11.....Interior Installation of Cementitious Backer Units

A118.9.....Cementitious Backer Units

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

A185.....Steel Welded Wire Fabric, Plain, for Concrete Reinforcing

C109.....Standard Test Method for Compressive Strength of  
Hydraulic Cement Mortars (Using 2 inch. or [50-mm] Cube  
Specimens)

C627.....Evaluating Ceramic Floor Tile Installation Systems Using  
the Robinson-Type Floor Tester

C1027.....Determining "Visible Abrasion Resistance on Glazed  
Ceramic Tile"

C1028.....Determining the Static Coefficient of Friction of Ceramic  
Tile and Other Like Surfaces by the Horizontal  
Dynamometer Pull Meter Method

Tile Council of America, Inc. (TCA):

2009.....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.
    - c. Class IV, 6000 revolutions.
  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 0.6, except 0.8 on ramps as stated above, for wet and dry conditions for other areas.
  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 latex modified mortars.
- B. Glazed Wall Tile: Cushion edges, glazing, as indicated on Drawings.
- C. 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.

D. Trim Shapes:

1. Conform to applicable requirements of adjoining floor and wall tile.
2. 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.

**2.2 CEMENTITIOUS BACKER UNITS**

- A. ANSI A118.9.
- B. Use Cementitious backer units in maximum available lengths.
- C. Backer unit meet or exceed the following additional physical properties:

<u>Property</u>	<u>Test Method</u>	<u>Value</u>
Water absorption	ASTM C948	Less than 20 percent by weight

**2.3 JOINT MATERIALS FOR CEMENTITIOUS BACKER UNITS**

- A. Reinforcing Tape: Vinyl coated woven glass fiber mesh tape, open weave, 50 mm (2 inches) wide. Tape with pressure sensitive adhesive backing will not be permitted.
- B. Tape Embedding Material: Latex-Portland cement mortar complying with ANSI A118.4.
- C. 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 Cementitious Backer Units.
  - 1. Standard screws for gypsum board are not acceptable.
  - 2. Minimum 11 mm (7/16 inch) diameter head, corrosion resistant coated, with washers.
  - 3. ASTM C954 for steel 1 mm (0.033 inch) thick.
  - 4. ASTM C1002 for steel framing less than 0.0329 inch thick.
- B. Washers: Galvanized steel, 13 mm (1/2 inch) minimum diameter.

## 2.5 SETTING MATERIALS OR BOND COATS

- A. Conform to TCA Handbook for Ceramic Tile Installation.
- B. Portland Cement Mortar: ANSI A108.1.
- C. 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.
- D. Dry-Set Portland Cement Mortar: ANSI A118.1. For wall applications, provide non-sagging, latex-Portland cement mortar complying with ANSI A118.4.
- E. Waterproofing/Crack Isolation Membrane:
  - 1. Sheet System TCA F122-09.
  - 2. Optional System to elastomeric waterproof membrane.
  - 3. Composite sheet consisting of ASTM D5109, Type II, Grade I Chlorinated Polyethylene (CM) 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	Points	70-80	ASTM D2240 (10

A			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.

## 2.6 GROUTING MATERIALS

### A. Coloring Pigments:

1. Pure mineral pigments, limeproof 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. Commercial Portland Cement Grout: ANSI A118.6 color as specified.

### C. Dry-Set Grout: ANSI A118.6 color as specified.

### D. Chemical-Resistant Grout:

1. Epoxy grout, ANSI A118.3.

## 2.7 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.

## **2.8 METAL DIVIDER STRIPS**

- A. Heavy top type strip with 5 mm (3/16 inch) wide top and 38 mm (1-1/2 inch) long leg.
- B. Embedded leg perforated and deformed for keying to mortar.
- C. Material: As indicated on Drawings.

## **2.9 WATER**

- A. 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.

## **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 500 (1/4 inch in 10 feet) from required elevation where Portland cement mortar setting bed is used.
  - 2. 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 400 (1/4 inch in eight feet) from required plane where Portland cement mortar setting bed is used.
  - 2. 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:
  - 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.
    - 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. Mortar Bed for Slopes to Drains:
1. Slope compound to drain where drains are shown.
  2. Install mortar bed in depressed slab sloped to drains not less than 1 in 200 (1/16 inch per foot).
  3. Allow not less than 50 mm (2 inch) depression at edge of depressed slab.
  4. Screed for slope to drain and float finish.
  5. Cure mortar bed for not less than seven days. Do not use curing compounds or coatings.
- D. Additional preparation of concrete floors for tile set with epoxy, or furan-resin shall be in accordance with the manufacturer's printed instructions.
- E. Cleavage Membrane:
1. Install polythene sheet as cleavage membrane in depressed slab when waterproof membrane is not scheduled or indicated.
  2. Turn up at edge of depressed floor slab to top of floor.
- F. 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.

### **3.4 CEMENTITIOUS BACKER UNITS**

- A. Remove polyethylene wrapping from cementitious backer units and separate to allow for air circulation. Allow moisture content of backer units to dry down to a maximum of 35 percent before applying joint treatment and tile.
- B. Install in accordance with ANSI A108.11 except as specified otherwise.
- C. Install units horizontally or vertically to minimize joints with end joints over framing members. Units with rounded edges; face rounded edge away from studs to form a V joint for joint treatment.
- D. Secure cementitious backer units to each framing member with screws spaced not more than 200 mm (eight inches) on center and not closer than 13 mm (1/2 inch) from the edge of the backer unit or as recommended by backer unit manufacturer. Install screws so that the screw heads are flush with the surface of the backer unit.
- E. Where backer unit joins shower pans or waterproofing, lap backer unit over turned up waterproof system. Install fasteners only through top one-inch of turned up waterproof systems.
- F. Do not install joint treatment for seven days after installation of cementitious backer unit.
- G. Joint Treatment:
  - 1. Fill horizontal and vertical joints and corners with latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.
  - 2. Leave 6 mm (1/4 inch) space for sealant at lips of tubs, sinks, or other plumbing receptors.

### **3.5 MARBLE THRESHOLDS**

- 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 METAL DIVIDER STRIPS**

- A. Install metal divider strips in floor joints between ceramic tile floors and between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise.

- B. Set divider strip in mortar bed to line and level centered under doors or in openings.
- C. Movement Joints:
  - 1. Comply with recommendations in TCA "Handbook for Ceramic Tile Installation" Vertical and Horizontal Joint Design Essentials. TCA 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 TCA Installation Guidelines
  - 1. Set tile installed over cementitious backer boards, TCA System W244-02.
  - 2. Set trim shapes in same material specified for setting adjoining tile.
- C. 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.
  - 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. 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.  
Paver tile, porcelain type; maximum 3 mm (1/8 inch) wide.

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

- A. Installation of Tile: ANSI A108.5 and in accordance with applicable TCA methods as follows:
  1. Floors: TCA F115-09.
  2. Walls: TCA 245-09.
- B. Slope tile work to drains not less than 1 in 100 (1/8 inch per foot).

### **3.9 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH CHEMICAL-RESISTANT BOND COAT**

- A. Epoxy Resin Type: Install tile in accordance with Installation of Tile with Epoxy Mortar; ANSI A108.6.

### **3.10 GROUTING**

- A. Grout Type: Epoxy
- B. Workmanship:
  - 1. Install and cure grout in accordance with the applicable standard.
  - 2. 3. Grout Joints: Shall not exceed 1/8 inch.

### **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. TCA 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.

### **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 cycles 1 through 10.

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