

SECTION 09 30 13
CERAMIC/PORCELAIN TILING

SPEC WRITER NOTES:

1. Delete between // // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
2. Coordinate with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, and Section 01 45 29, TESTING LABORATORY SERVICES.
3. See Tile Council of North America, Inc., "Handbook for Ceramic Tile Installation" for systems and details required.
4. When ceramic tile is used on exteriors, add paragraphs to specify criteria for exterior work.
5. Detail wall, floor, and base edge, joints with other materials, and expansion joint conditions for each system. Show locations of expansion joints on drawings.
6. Separate waterproofing membranes are required under mortar bed in new work specified in Sections 07 12 00, BUILT-UP BITUMINOUS WATERPROOFING, Section 07 13 52, MODIFIED BITUMINOUS SHEET WATERPROOFING, and Section 07 13 00, SHEET WATERPROOFING.
7. Do not use Section 07 13 00, SHEET WATERPROOFING for patient baths, toilets or kitchen areas.
8. Waterproof membranes to which tile is bonded specified in this section are for use on existing buildings only. Do not use for new buildings.
9. In new construction, coordinate with structural engineer that slab depressions have been provided to permit a maximum of a 6.35 per 305 mm (1/4 per ft.) slope to drain in entire bathroom areas.
10. Coordinate paragraphs under Article RELATED WORK with other sections.
11. It is the responsibility of Interior Designer to coordinate colors of floor and wall tiles separately with the accent tiles. Same color tiles may not be available for walls and floors that require slip resistant tiles.
12. Specify tile type, size, and color including grout in Section 09 06 00, SCHEDULE FOR FINISHES.

PART 1 - GENERAL**1.1 DESCRIPTION:**

- A. This section specifies interior ceramic, porcelain and quarry tile, marble thresholds and window stools, terrazzo divider strips, waterproofing membranes for thin-set applications, crack isolation membranes, and tile backer board.

1.2 RELATED WORK:

- //A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS. //
- B. Preformed expansion joints in tile flooring: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- C. Sealing of Joints: Section 07 92 00, JOINT SEALANTS.
- D. Color, Texture, Pattern, and Size of Field Tile and Trim Shapes, and Color of Grout Specified: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Metal and Gypsum Lathing and Gypsum Plaster: Section 09 23 00, GYPSUM PLASTERING.
- F. Lathing and Portland Cement Based Plaster: Section 09 24 00, PORTLAND CEMENT PLASTERING.
- G. Metal and Resilient Edge Strips at Joints with New Resilient Flooring, and Carpeting: Section 09 65 19, RESILIENT TILE FLOORING and Section 09 68 00, CARPETING.

SPEC WRITER NOTE: Delete submittals for products not used.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- //B. Sustainable Design Submittals as described below:
- //1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS. // //
- C. Samples:
1. Base tile, each type, each color, each size.
 2. Mosaic floor tile panels, 228 by 228 mm (9 by 9 inches), each type, color, size and pattern.
 3. Paver tile, each size, type, color and pattern.
 4. Quarry tile, each type, color, and size.
 5. Porcelain tile, each type, color, patterns and size.
 6. Wall (or wainscot) tile, each color, size and pattern.

7. 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.
8. Therapeutic pool tile, panels 305 mm (12 inches) square, each type, size, color, typical lettering and special shapes.

D. Product Data:

1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
2. Chemical resistant mortar and grout (epoxy and furan).
3. Cementitious backer unit.
4. Dry-set portland cement mortar and grout.
5. Divider strip.
6. Elastomeric membrane and bond coat.
7. Reinforcing tape.
8. Leveling compound.
9. Latex-portland cement mortar and grout.
10. Commercial portland cement grout.
11. Organic adhesive.
12. Slip resistant tile.
13. Waterproofing isolation membrane.
14. Fasteners.

E. Certification:

1. Master grade certificate, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
 - a. Chemical resistant mortar and grout (epoxy and furan).
 - b. Modified epoxy emulsion.
 - c. Commercial portland cement grout.
 - d. Cementitious backer unit.
 - e. Dry-set portland cement mortar and grout.
 - f. Elastomeric membrane and bond coat.
 - g. Reinforcing tape.
 - h. Latex-portland cement mortar and grout.
 - i. Leveling compound.
 - j. Organic adhesive.
 - k. Waterproof isolation membrane.
 - l. Factory back mounted tile documentation for suitability for application in wet area.

F. Installer Qualifications:

- 1. Submit letter stating installer's experience.

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 QUALITY ASSURANCE:

- A. Installers to be from a company specializing in performing installation of products specified and have a minimum of three (3) years' experience.
- B. Each type and color of tile to be provided from a single source.
- C. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.6 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

SPEC WRITER NOTE: Update applicable publications to current issue at time of project preparation.

1.7 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):
 - A10.20-06(R2011).....Safe Operating Practices for Tile, Terrazzo and Marble WorkA108/A118/A136-14 Installation of Ceramic Tile
 - A108.01-13.....Subsurfaces and Preparations by Other Trades
 - A108.02-13.....Materials, Environmental, and Workmanship
 - A108.1A-14.....Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar
 - A108.1B-10.....Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar
 - A108.1C-10.....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
- A108.4-09.....Ceramic Tile with Organic Adhesives or Water
Cleanable Tile-Setting Epoxy Adhesive
- A108.6-10.....Ceramic Tile with Chemical Resistant, Water
Cleanable Tile-Setting and -Grouting Epoxy
- A108.8-10.....Ceramic Tile with Chemical Resistant Furan
Resin Mortar and Grout
- A108.10-10.....Grout in Tilework
- A108.13-10.....Load Bearing, Bonded, Waterproof Membranes for
Thin-Set Ceramic Tile and Dimension Stone
- A118.1-12.....Dry-Set Portland Cement Mortar
- A118.3-13.....Chemical Resistant, Water Cleanable Tile-
Setting and -Grouting Epoxy and Water Cleanable
Tile-Setting Epoxy Adhesive
- A118.4-12.....Latex-Portland Cement Mortar
- A118.5-10.....Chemical Resistant Furan Mortars and Grouts
- A118.6-10.....Cement Grouts for Tile Installation
- A118.7-10.....High Performance Cement Grouts for Tile
Installation
- A118.9-10.....Cementitious Backer Units
- A118.10-14.....Load Bearing, Bonded, Waterproof Membranes for
Thin-Set Ceramic Tile and Dimension Stone
Installation
- A136.1-13.....Organic Adhesives for Installation of Ceramic
Tile
- A137.1-12.....American National Standard Specifications for
Ceramic Tile
- C. ASTM International (ASTM):
- A666-10.....Annealed or Cold-Worked Austenitic Stainless
Steel Sheet, Strip, Plate and Flat Bar
- A1064/A1064M-14.....Carbon-Steel Wire and Welded Wire
Reinforcement, Plain and Deformed, for Concrete
- C109/C109M-13.....Standard Test Method for Compressive Strength
of Hydraulic Cement Mortars (Using 2 inch. or
[50-mm] Cube Specimens)
- C241/C241M-13.....Abrasion Resistance of Stone Subjected to Foot
Traffic

- C348-14.....Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
- C627-10.....Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
- C954-11.....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 mm) in thickness
- C979/C979M-10.....Pigments for Integrally Colored Concrete
- C1002-14.....Steel Self-Piercing Tapping Screws for the Application of Panel Products
- C1027-09.....Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
- C1127-01(R2009).....Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface
- C1178/C1178M-13.....Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
- C1325-14.....Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units
- C1353/C1353M-09(R2013)..Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform, Double-Head Abraser
- D1204-14.....Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
- D2240-05(R2010).....Test Method for Rubber Property - Durometer Hardness
- D2497-07(R2012).....Tolerances for Manufactured Organic-Base Filament Single Yarns
- D3045-92(R2010).....Heat Aging of Plastics Without Load
- D4397-10.....Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
- D5109-12.....Standard Test Methods for Copper-Clad Thermosetting Laminates for Printed Wiring Boards

D. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

E. Marble Institute of America (MIA): Design Manual III-2007

F. Tile Council of North America, Inc. (TCNA): Handbook for Ceramic Tile Installation (2014)

DCOF AcuTest-2012.....Dynamic Coefficient of Friction Test

PART 2 - PRODUCTS

SPEC WRITER NOTES:

- 1. Make material requirements agree with requirements specified in the referenced Applicable Publications. Update and specify only that which applies to the project. Delete non applicable items.
- 2. Where tile is indicated for installation in swimming pools or in wet areas, do not use back or edge mounted tile assemblies unless tile manufacturer provides certificate that mounting is suitable for these installations and has a list of successful projects and in-service performance.
- 3. Specify slip resistant tile for inpatient bathrooms, tub rooms, and other wet areas.
- 4. Do not use raised profile tile to obtain slip resistance except for porcelain tile.
- 5. Do not use glazed tile for floors.
- 6. Do not edit slip resistant tile paragraph.

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 C1027.
 - 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 ANSI A137.1 and measured per the TCNA DCOF AcuTest.

- 1) Equal to or greater than .42 for level interior tile floors that will be walked on when wet.
- b. Tile Having Abrasive Grains:
 - 1) Unglazed Ceramic Mosaic Tile: Abrasive grains throughout body of the tile.
 - 2) Quarry Tile: Abrasive grains uniformly embedded in face at rate of approximately 7.5 percent of surface area.
- c. Porcelain Paver Tile: Matte surface finish // with raised ridges spaced uniformly over tile surface //.
4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.
5. Back mounted tiles in showers, // therapeutic pools, // // natatorium, // // hydrotherapy, // // whirlpool baths, // // and congregate baths //. Provide certification that the factory mounted tile has been used successfully in service at three (3) projects and is suitable for wet locations.
6. 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 (1) package show the same range in colors as those taken from other packages and match approved samples.

SPEC WRITER NOTE: Use of wax as a temporary protective coating for exposed tile surfaces is required with furan mortars and grouts, latex modified mortars and grouts, and unglazed paver tile.
7. 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 hot applied petroleum paraffin wax.
 - b. Do not coat unexposed tile surfaces.
 - c. Pre-wax tiles set or grouted with // furan or epoxy // // or latex modified mortars //.
- B. Unglazed Ceramic Mosaic Tile: Nominal 6 mm (1/4 inch) thick with cushion edges.
- C. Unglazed Quarry Tile: Nominal 13 mm (1/2 inch) thick, square edges.
- D. Glazed Wall Tile: Cushion edges, glazing.

- E. Porcelain Paver Tile: Nominal 8 mm (5/16 inch) thick, with cushion edges. Porcelain tile produced by the dust pressed method are to be made of approximately 50% feldspar; the remaining 50% is to 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 176 to 181 kg (390 to 400 lbs.).

SPEC WRITER NOTES:

1. Coordinate trim shape requirements with tile sizes scheduled in Section 09 06 00, SCHEDULE FOR FINISHES.
2. Coordinate tile sizes when combined with ANSI A137.1 that rounded trim shapes, will produce complete wall or floor tile patterns as per color design.
3. Rounded, cove and bullnose shapes are mandatory shapes.
4. At top of tile wainscot that finish flush with wall surfaces above use flat cap (top) shape.
5. Bullnose cap pieces of internal corner at top of wainscot set by thin set method is available only in 108 by 108 mm (4-1/4 by 4-1/4 inch) size; coordinate with Section 09 06 00, SCHEDULE FOR FINISHES.
6. Assure details show trim shape lay out when trim shape is not the size of adjoining tile cove and bullnose trim shapes.
7. Square internal and external corners are not acceptable. Do not change requirements.

F. Trim Shapes:

1. Conform to applicable requirements of adjoining floor and wall tile.
2. Use slip resistant trim shapes for horizontal surfaces of showers // congregate baths, // // natatorium, // // hydrotherapy, // // therapeutic pool, // 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 on construction documents or specified otherwise.
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 portland cement mortar setting bed, use cove and bullnose shapes as applicable. When ceramic mosaic wall and base tile is required, use C Series cove and bullnose shapes.
- i. 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.
- j. For quarry tile work, use cove and bullnose shapes as applicable.
- k. Provide cove and bullnose shapes // for countertops, // stools, // // saddles, // // where indicated in construction documents, // and required to complete tile work.

2.2 BACKER UNITS:

- A. Cementitious Backer Units:
 - 1. Use in showers or wet areas.
 - 2. Conform to ASTM C1325; Type A.
 - 3. Use in maximum lengths available to minimize end to end butt joints.
- // B. Glass Mat Water Resistant Backing Board:
 - 1. Use in showers or wet areas.
 - 2. Conform to ASTM C1178/C1178M.
 - 3. Use in maximum lengths available to minimize end to end butt joints. //

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 A108.01.

- C. Joint material, including reinforcing tape, and tape embedding material, are to 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 TCNA Handbook for Ceramic Tile Installation.
- B. Portland Cement Mortar: ANSI A108.02.
- 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 A118.1.
- E. Organic Adhesives: ANSI A136.1, Type 1.
- F. Chemical-Resistant Bond Coat:
1. Epoxy Resin Type: ANSI A118.3.
 2. Furan Resin Type: ANSI A118.5.

SPEC WRITER NOTES:

1. Use either elastomeric waterproofing membrane and bond coat or waterproofing isolation membrane for existing buildings when depressed structural slab does not occur and a raised floor with curb is not acceptable for handicapped. Do not use on new buildings.
2. Use ANSI A118.10 for tile embedded in topcoat of urethane waterproofing.
3. Detail termination and joints with other materials.
4. Elastomeric waterproofing membrane and bond coat or waterproofing isolation

membrane systems do not provide for slopes to drain and will follow profile of floor.

G. Elastomeric Waterproofing Membrane and Bond Coat:

1. TCNA F122-14 (on ground concrete) and TCNA F112A-14 (above ground concrete).
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 .27 - .41 Newton per square millimeter (40-60 pounds per square inch gauge).
 - //d. No volatile compounds (VOC). //
4. Coal tar modified urethanes are not acceptable.

H. Waterproofing Isolation Membrane:

1. Sheet System TCNA F122-14 (on-ground concrete) and TCNA F122A-14 (above-ground concrete).
2. Composite sheet consisting of ASTM D5109, Type II, Grade I Chlorinated Polyethylene (CM) sheet reinforced on both sides with a non-woven polyester fiber.
3. 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.
4. 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 (-35 degrees F)	ASTM D2497 13 mm (1/2-inch) Mandrel Bend
Retention of Properties after Heat	Percent of original	80 Tensile 80 Breaking	ASTM D3045, 90 degrees C (194 degrees F)

Aging		80 Elongation	for 168 hours
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5. Manufacturer's standard sheet size with prefabricated or preformed inside and outside corners.
6. Sheet manufacturer's solvent welding liquid or xylene and edge sealant.

2.6 GROUTING MATERIALS:

A. Coloring Pigments:

1. Pure mineral pigments, lime proof and nonfading, complying with ASTM C979/C979M.
2. Coloring pigments may only be added 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. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated. // Zero VOC content. //

C. Standard Cement Grout: ANSI A118.6.

D. High Performance Tile Grout: ANSI A118.7 // with a VOC content of 65 g/L or less when calculated according to 40 CFR 59 (EPA Method 24) //.

1. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
2. Polymer Type: // Acrylic resin // // or // // styrene-butadiene rubber // in liquid-latex form for addition to prepackaged dry-grout mix.

E. Water-Cleanable Epoxy Grout: ANSI A118.3 //, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59 (EPA Method 24) //.

1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 60 and 100 degrees C (140 and 212 degrees F), respectively, and certified by manufacturer for intended use.

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. Provide a patching and leveling compound with the following minimum 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 - 4.1 MPa (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 101 mm (4 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.

SPEC WRITER NOTE: Include marble when limited to items specified and no other marble is used on project. Include marble in new section on marble if other marble items occur. Do not use synthetic marble unless abrasive hardness is 10 or more.

//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 C1353/C1353M or ASTM C241/C241M.
2. Honed finish on exposed faces.

SPEC WRITER NOTES:

1. See MIA Design Manual for thin stock.
 2. Coordinate details for beveled edges where marble thresholds project above adjacent flooring with 19 mm (3/4 inch) minimum thickness and 6 mm (1/4 inch) minimum thickness at beveled edge.
 3. Detail joint with other materials, and show on drawings where used.
 4. Detail thresholds 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 at existing floor slabs provide 13 mm (1/2 inch) above ceramic tile surface with beveled edges.
3. Thickness and contour as indicated in construction documents.

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 doorjambs. //

//C. Window Stools:

1. Group A or B.
2. Polished finish on exposed faces.
3. Size and thickness as indicated in construction documents.// //

SPEC WRITER NOTE: Coordinate with details to show joints with other materials and show location where used.

2.9 METAL DIVIDER STRIPS:

- A. Terrazzo type divider strips.
- B. Heavy top type strip with 5 mm (3/16 inch) wide top and 38 mm (1 1/2 inch) long leg. Height to match tile and setting-bed thickness.
- C. Embedded leg perforated and deformed for keying to mortar.
- D. // Half-hard brass // // white zine alloy // // nickel silver // // stainless-steel, ASTM A666, 300 Series // exposed-edge material.

2.10 WATER:

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

2.11 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 are not acceptable.

2.12 FLOOR MORTAR BED REINFORCING:

- A. ASTM A1064/A1064M welded wire fabric without backing, MW3 x MW3 (2 x 2-W0.5 x W0.5).

SPEC WRITER NOTE: Use polyethylene sheet to minimize joints and to cover walls in showers and wet areas.

2.13 POLYETHYLENE SHEET:

- A. Polyethylene sheet conforming to ASTM D4397.
- B. Nominal thickness: 0.15 mm (6 mils).

PART 3 - EXECUTION

SPEC WRITER NOTES:

1. Modify and edit setting bed materials to suit job conditions.
2. For new work set floor tile on mortar bed minimum thickness of 32 mm (1-1/4 inches), increased to provide positive slopes to drains.
3. Use with reinforcing over cleavage or waterproof membranes.
4. Tile in depressed slab areas may also be set in epoxy or furan mortar, dry-set or latex-portland cement mortar over "set-up" mortar fills.
5. 75 mm (3 inches) depressed floor slabs are required for floor mortar beds.
6. For existing areas where floors cannot be cut for depressed mortar beds and a waterproof membrane is required, consider an elastomeric bond coat over an elastomeric membrane with waterproof isolation membrane system option.
7. Note requirement for drying period (14 to over 60 days) for latex-portland cement mortar setting beds. Latex (except acrylic) will re-emulsify if exposed to water when not thoroughly dry. Do not use latex-portland cement in water pools.
8. Wall tile for wet areas such as showers and washing areas: Set tile over metal lath base with portland cement mortar scratch and leveling coats or over cementitious backer unit. Use portland cement mortar, dry-set portland cement mortar or latex-portland cement mortar, setting or bond coat as specified.
9. Coordinate to show on drawing, details of each different method of setting at wall, cap strip and base. Show details and extent of expansion joints, waterproofing, and location of areas to be sloped and differences in

elevation of floors, top of drains, curbs, and similar features.

10. Clearly define, or show on drawings, where each different setting method is to be used if not clearly defined in Section 09 06 00, SCHEDULE FOR FINISHES finish schedule remarks.
11. For design of various systems see TCNA.
12. Thin-set tile can only follow slope of sub-floor or contour of walls as only a minimum amount of adjustment can be made.
13. Do not install building expansion joints in ceramic tile floors over water-proof membranes.

3.1 ENVIRONMENTAL REQUIREMENTS:

- A. Maintain ambient temperature of work areas at not less than 16 degrees C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three (3) 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 third 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 6 mm in 3048 mm (1/4 inch in 10 feet) from required elevation where portland cement mortar setting bed is used.
 2. Not more than 3 mm in 3048 mm (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 6 mm in 2438 mm (1/4 inch in 8 feet) from required plane where portland cement mortar setting bed is used.

2. Not more than 3 mm in 2438 mm (1/8 inch in 8 feet) where dry-set or latex-portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION:

SPEC WRITER NOTES:

1. Read the requirements of the "Forward, Explanation and Notes" of ANSI A108.01, A and B and the referenced ANSI specifications for the installation of ceramic tiles.
2. Coordinate specifications and details for existing conditions.
3. Clarify and use the term "thin set" on drawings and in the specifications.
4. Details are required to show interface conditions and joints with other materials, especially for different conditions such as new construction and existing conditions.

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 on construction documents.
 - 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. Mortar Bed for Slopes to Drains:
1. Slope compound to drain where drains are shown on construction documents.
 2. Install mortar bed in depressed slab sloped to drains not less than 3.2 mm in 305 mm (1/8 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 (7) days. Do not use curing compounds or coatings.
 6. Perform flood test to verify mortar bed slopes to drain before installing tile. Contracting Officer Representative (COR) to be present during flood test.
- D. Additional preparation of concrete floors for tile set with epoxy, or furan-resin is to 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. In showers or other wet areas cover studs with polyethylene sheet.

SPEC WRITER NOTES:

1. Where full height tile walls or tile wainscots are required on new metal lath surfaces, specify scratch and leveling coats applied as specified below.
2. Coordinate with specification Section 09 23 00, GYPSUM PLASTERING and 09 24 00, PORTLAND CEMENT PLASTERING for metal lath installation for tile set in portland cement, scratch and leveling coat on metal lath.
3. Use of cementitious backer unit is preferred in showers or other wet areas.

4. Where isolated tile panels are required on plaster or gypsum board walls apply adhesives.
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.
 4. Apply metal lath to framing in accordance with ANSI A108.1:
 - a. Use fasteners specified in paragraph "Fasteners." Use washers when lath opening is larger than screw head.
 - b. Apply scratch and leveling coats to metal lath in accordance with ANSI A108.1C.
 - c. Total thickness of scratch and leveling coats:
 - 1) Apply 9 mm to 16 mm (3/8 inch to 5/8 inch) thick over solid backing.
 - 2) 16 mm to 19 mm (5/8 to 3/4 inch) thick on metal lath over studs.
 - 3) Where wainscots are required to finish flush with wall surface above, adjust thickness required for flush finish.
 - d. Apply scratch and leveling coats more than 19 mm (3/4 inch) thick in two (2) coats.

SPEC WRITER NOTE: Use paragraph below when alterations occur in existing work and removal of existing finish flooring and walls occurs.

G. 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. Where new tile bases are required to finish flush with plaster above or where they are extensions of similar bases in conjunction with existing floor tiles, cut channel in floor slab and expose rough

wall construction sufficiently to accommodate new tile base and setting material.

SPEC WRITER NOTE: See TCNA. Details for plumbing items, expansion joints, and where waterproof membranes occur.

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 A118.9 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 203 mm (8 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 (7) 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 GLASS MAT WATER-RESISTANT BACKING BOARD:

- A. Install in accordance with manufacturer's instructions.
TCNA Systems W245-1.
- B. Treat joints with tape and latex-portland cement mortar or adhesive. //

//3.6 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 13 mm (1/2 inch) above ceramic tile floor unless shown otherwise on construction documents, with bevel edge joint top flush with adjacent floor similar to TCNA detail TR611-14. //

3.7 METAL DIVIDER STRIPS:

- A. Install metal divider strips in floor joints between ceramic and quarry tile floors and between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise on construction documents.
- B. Set divider strip in mortar bed to line and level centered under doors or in openings.
- //C. At preformed sealant joint: Refer to Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
 - 1. Comply with recommendations in TCNA for Vertical and Horizontal Joint Design Essentials. TCNA Systems EJ 171.
 - 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. //

3.8 CERAMIC TILE - GENERAL:

- A. Comply with ANSI A108/A118/A136 series of tile installation standards applicable to methods of installation and TCNA Installation Guidelines.
- B. Installing Mortar Beds for Floors:
 - 1. Install mortar bed in a manner that does not damage cleavage or waterproof membrane; 32 mm (1-1/2 inch) minimum thickness.
 - 2. Install floor mortar bed reinforcing centered in mortar fill.
 - 3. Screed finish to level plane or slope to drains shown on construction documents, float finish.
 - 4. For thin set systems cure mortar bed not less than seven (7) days. Do not use curing compounds or coatings.
 - 5. For tile set with portland cement paste over plastic mortar bed coordinate to set tile before mortar bed sets.
- C. Setting Beds or Bond Coats:

1. Where recessed or depressed floor slabs are filled with portland cement mortar bed, set ceramic mosaic floor tile in either portland cement paste over plastic mortar bed or latex-portland cement mortar over cured mortar bed except as specified otherwise, ANSI A108-1C, TCNA System F121-14 or F111-14.
2. Use quarry tile in chemical-resistant bond coat //, except in floor of walk-in refrigerator rooms use: TCNA System R612-11 //.
 - a. Portland cement paste over plastic mortar bed. ANSI A108.1A.
 - b. Dry-set portland cement mortar over cured mortar bed.
ANSI A108.1B.
3. Pools Holding Water: ANSI A108.1C. Do not use latex portland cement mortar.

SPEC WRITER NOTES:

1. List or specify locations where elastomeric bond coat systems occurs by room number and name and coordinate with specification Section 09 06 00, SCHEDULE FOR FINISHES.
 2. Use only for existing buildings where a depressed slab cannot be installed and a curb is not acceptable.
 3. Insure details show and identify these system including joints with adjacent materials.
 4. Do not use in new buildings.
4. Set floor tile in elastomeric bond coat over elastomeric membrane per ANSI 108.13, TCNA System F122-14 where indicated on construction documents.
 5. Set wall tile installed over concrete or masonry in dry-set portland cement mortar, or latex-portland cement mortar, ANSI 108.1B and TCNA System W211-14, W221-14 or W222-14.
 6. Set wall tile installed over concrete backer board in latex-portland cement mortar, ANSI A108.1B.
 7. Set wall tile installed over portland cement mortar bed on metal lath base in portland cement paste over plastic mortar bed, or dry-set portland cement mortar or latex-portland cement mortar over a cured mortar bed, ANSI A108.1C, TCNA System W231-14, W241-14.
 8. Set tile over concrete in therapeutic pools in portland cement paste or dry set portland cement mortar, ANSI A108.1C, TCNA System P601MB-14.
 9. Set tile installed over gypsum board and gypsum plaster in organic adhesive, ANSI A108.1, TCNA System W242-14.

10. 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 on construction documents.
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 is to 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 indicated in construction documents.
 - c. In areas where floor drains occur, slope tile to drains.
 - d. Push and vibrate tiles over 203 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 as indicated in construction documents with tile.
 - b. Finish reveals of openings with tile, except where other finish materials are indicated in construction documents.

- //c. At window openings, provide tile stools and reveals. //
- 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 on construction documents.
- 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/A118/A136 series of tile installation standards:

- a. Tile wall installations in wet areas, including showers, tub enclosures, laundries and swimming pools.
- b. Tile installed with chemical-resistant mortars and grouts.
- c. Tile wall installations composed of tiles 203 by 203 mm (8 by 8 inches) or larger.
- d. Exterior tile wall installations.

3.9 CERAMIC TILE INSTALLED WITH PORTLAND CEMENT MORTAR:

SPEC WRITER NOTES:

1. Slope mortar fill to floor drains.
2. Mortar bed thickness should be the same thickness throughout where no drains occur.
3. Mortar and other requirements for shower receptors are specified in ANSI A108.1. Coordinate with details indicated in construction documents.
4. Clearly detail fills for minimum and maximum thickness required by slopes.

- A. Mortar Mixes for Floor, Wall and Base Tile (including Showers //, and Therapeutic Pools //): ANSI A108.1A. except specified otherwise.
- B. Installing Wall and Base Tile: ANSI A108.1A, except specified otherwise.

- C. Installing Floor Tile: ANSI A108.1A, except as specified otherwise. Slope mortar beds to floor drains at a minimum of 3 mm in 305 mm (1/8 inch per foot).

3.10 PORCELAIN TILE INSTALLED WITH LATEX PORTLAND CEMENT BONDING MORTAR:

- A. Due to the denseness of porcelain tile use latex portland cement bonding mortar that meets the requirements of ANSI A108.01. Mix bonding mortars in accordance with manufacturer's instructions. Provide liquid ratios and comply with dwell times during the placement of bonding mortar and tile.

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

- A. Installation of Tile: ANSI A108.1B, except as specified otherwise.
- B. Slope tile work to drains at not less than 3 mm in 305 mm (1/8 inch per foot).

3.12 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH ORGANIC ADHESIVE

- A. Installation of Tile: ANSI A108.4.

3.13 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.
- B. Furan Resin Type: Proportion, mix and place in accordance with the manufacturer's printed instructions. Set tile in accordance with ANSI A108.8.

SPEC WRITER NOTE: Use paragraph above and below only for existing slabs where depressed floor slab is not possible.

3.14 CERAMIC AND PORCELAIN TILE INSTALLED WITH ELASTOMERIC BOND COAT:

- A. Surface Preparation: Prepare surfaces as specified.
- B. Installation of Elastomeric Membrane: ANSI A108.10 and TCNA F122-14 (on ground concrete) and F122A-14 (above-ground concrete).
 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 0.76 to 1.3 mm (30 to 50 mils).
 3. Extend material over flashing rings of drains and turn up vertical surfaces not less than 101 mm (4 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 (1 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.

3.15 GROUTING:

A. Grout Type and Location:

1. Grout for glazed wall and base tile, paver tile and unglazed mosaic tile // except for therapeutic pool // portland cement grout, latex-portland cement grout, dry-set grout, or commercial portland cement grout.

SPEC WRITER NOTE: List all high heat appliances continuously giving off heat in contact with floors in the "edit" area below.

2. Grout for quarry tile floor and base:
 - a. Grout for floors of walk-in refrigerated rooms: Epoxy grout.
 - b. Therapeutic pool areas: Portland cement grout.
 - c. Grout for Kitchens:
 - 1) Chemical-resistant grout as specified and recommended by manufacturer of bond coat.
 - 2) Use only furan resin grout within 609 mm (2 feet) of ovens, steam kettles, water heaters, steam pipes, and // // in rooms.
 - 3) Epoxy grout designed for equivalent heat resistance to furan resin grout may be used for furan resin grout.
3. Grout for tile of therapeutic pools: Portland cement grout.

B. Workmanship:

1. Install and cure grout in accordance with the applicable standard.
2. Sand Portland Cement Grout: ANSI A108.10.
3. Standard Cement Grout: ANSI A118.6.
4. High Performance Grout: ANSI A118.7.

5. Epoxy Grout: ANSI A108.6.
6. Water-Cleanable Epoxy Grout: ANSI A118.3.
7. Furan and Commercial Portland Cement Grout: ANSI A118.5 and in accordance with the manufacturer's printed instructions.

3.16 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 171-14.
- 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, // tub, // // service sink, // // at toe of base, // // and where indicated in construction documents // not less than 6 mm (1/4 inch) deep.

3.17 CLEANING:

- A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.
- B. Methods and materials used are not permitted to 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.

3.18 PROTECTION:

- A. Keep traffic off tile floor, until grout and setting material is fully set and cured.
- B. Where traffic occurs over tile floor is unavoidable, 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.

3.19 TESTING FINISH FLOOR:

- A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.
- //B. Test kitchen and storage rooms. //

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