

## SECTION 093013 – CERAMIC TILING

### PART 1 - GENERAL

#### 1.1 M.S.U. ISSUES

- A. Typical locations for dry area ceramic tile installation include areas subject to heavy traffic, such as entrance lobbies and main hallways, where impermeability, stain and water resistance, and easy cleaning are foremost requirements. For installation of ceramic tile in areas where usage or anticipated cleaning process calls for waterproof installation, refer to Section 093400 – WATERPROOFING MEMBRANE TILING.
- B. When installing tile as part of rehabilitation or repair of existing tiled surfaces, match existing type, texture, size, thickness, edge shapes and variations in color. Submit samples for selection.
- C. When a tile system is installed, M.S.U. will expect a special warranty as follows:
  - 1. Warranty must be provided by the setting materials manufacturer and shall cover the complete flooring system, including all labor and materials. Warranty period shall be for a period of five years from date of installation, and shall warrant the installed assembly to be free from manufacturing and installation defects.
  - 2. During the warranty period, M.S.U will require defective work to be restored to the standard of the Contract Documents, including labor and materials and other costs incidental to the Work. Within 24 hours after receipt of notice from the Owner, the Work must be inspected. Work found defective as defined in the contract documents will be restored within 10 days after receipt of notice from the owner.
- D. It is the intent of MSU that all ceramic tile installation used on its projects will comply with LEED™ NC 3 Credit Requirements MR Credit 4.1: Adhesives and Sealants.
- E. It is the intent of MSU that all ceramic tile, materials, and methods of installation shall meet the latest ICC/ANSI A117.1 standards for slip resistance and provide barrier free access for mobility and physically impaired users.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Ceramic mosaic tile.
  - 2. Glazed wall tile
  - 3. Paver tile.
  - 4. Crack-suppression membrane for thin-set tile installations.
  - 5. Metal edge strips installed as part of tile installations.
- B. Related Sections include the following:
  - 1. Division 03 Section CAST-IN-PLACE CONCRETE for monolithic slab finishes specified for tile substrates.

2. Division 07 Section JOINT SEALANTS for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
3. Division 09 Section GYPSUM VENEER PLASTERING for cementitious backer units.
4. Division 09 Section PORTLAND CEMENT PLASTERING for portland cement scratch coat over metal lath on wall surfaces.
5. Division 09 Section WATERPROOFING MEMBRANE TILING for tile installation in swimming pools, showers, toilets, kitchens, or surgeries where usage or anticipated cleaning process calls for waterproof installation.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
  1. Level Surfaces: Minimum 0.6.
  2. Step Treads: Minimum 0.6.
  3. Ramp Surfaces: Minimum 0.8.

### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: If requested, show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Projects involving replacement of existing tile floors will be mapped in accordance with Section 3.1 A.3, and the resulting document submitted to the Project Representative prior to demolition of the old floor.
- D. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- E. Samples for Verification, if requested:
  1. Full-size units of each type and composition of tile and for each color and finish required.
  2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
  3. Full-size units of each type of trim and accessory for each color and finish required.
  4. Stone thresholds in 6-inch lengths.
  5. Metal edge strips in 6-inch lengths.
- F. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- G. Product Certificates: For each type of product.

- H. Qualification Data: For Installer. Provide documentation that the installer is approved or licensed by the setting bed manufacturer and demonstrating experience with the floor system being installed.
- I. Material Test Reports: For each tile-setting and -grouting product.
- J. Maintenance instruction for each type of tile.
- K. Provide extra tile for future replacement of damaged tile. The type and amount should be verified with the M.S.U. Project Manager.
- L. Submit printed VOC statement and product data for adhesives, grout and sealant in accordance with the General Administrative Requirements of the MSU Construction Standards 01300.1.2. Maximum VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, effective July 1, 2005 and amended January 7, 2005:
  - 1. Adhesives 65 g/l
  - 2. Epoxy Grouts 65 g/l
  - 3. Elastometric Sealants 250 g/l

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
  - 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer. Grout, setting bed, and underlayments shall be by the same manufacturer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
  - 1. Joint sealants.
  - 2. Metal edge strips.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquid latexes in unopened containers and protected from freezing.

- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- C. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

### 2.2 TILE PRODUCTS

- A. Tile will be solid body porcelain ceramic. Large tiles should be limited to flat areas. Tile on floors sloped to drain should be 6" X 6" or smaller. Avoid glazed or textured floor tile in all but lowest traffic situation installation.
- B. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
  - 1. Base for Portland Cement Mortar Installations: Coved, module size to match with adjoining flat tile.
  - 2. Base for Thin-Set Mortar Installations: Straight, module size to match with adjoining flat tile.
  - 3. Wainscot Cap for Portland Cement Mortar Installations: Bullnose cap, module size to match with adjoining flat tile.
  - 4. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size to match with adjoining flat tile.
  - 5. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.

6. External Corners for Portland Cement Mortar Installations: Bullnose shape with radius of at least 3/4 inch, unless otherwise indicated.
  7. External Corners for Thin-Set Mortar Installations: Surface bullnose.
  8. Internal Corners: Field-buttet square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.
- C. Accessories for Glazed Wall Tile: Provide vitreous china accessories of type and size indicated, in color and finish to match adjoining wall tile, and intended for installing by same method as adjoining wall tile.

## 2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes. Use granite threshold in lieu of marble in high traffic openings.

## 2.4 FLOOR SYTEM

### A. UNDERLAYMENTS

1. Thin Mortar Bed Underlayments (0 to 3/4" thick).
  - a. Thin underlayments will be factory pre-blended mixes of graded sand aggregates, Portland cement, and an acrylic/latex admixture. Products will be designed for the thickness to be installed. These products will also be used as a mortar bed on top of the membrane around floor drains and other areas that may require additional grading.
  - b. Products:
    - 1) LATACRETE International Inc., Latacrete 226 & 3701.
    - 2) MAPEI Corporation, Mapecem Premix and Planicrete AC.
    - 3) MER-KRETE Systems: Underlay-L or Underlay M.
    - 4) Or approved equal.
2. Thick Mortar Bed Underlayment (greater than 3/4" thick).
  - a. These materials may be the same as the thin mortar bed underlayment materials above, or site mixed of graded sand, Portland cement, and an acrylic/latex admixture. Mixture shall exceed the following properties:
    - 1) Compressive Strength/ASTM 190 4500 psi
    - 2) Tensile Strength/ASTM 190 350 psi
    - 3) Flexural Strength/ASTM C348 1800 psi
    - 4) Shear Bond Strength 470 psi
  - b. Site mixed underlayment shall be:
    - 1) 3 parts sand and 1 part cement with 1 part Acryl 60 and 1 part water, or
    - 2) 3 parts sand and 1 part cement with 1 part Planicrete AC.
  - c. Reinforcing Wire Fabric: Galvanized welded wire fabric, 2 inches by 2 inches complying with ASTM A185 and ASTM A82.

### B. Crack Suppression Membrane:

1. Fabric reinforced two-part liquid rubber membrane to provide crack bridging over concrete shrinkage cracks and other non-structural cracks.
2. Products:
  - a. LATICRETE International Inc., Laticrete Blue 92 Anti-Fracture Membrane.
  - b. MAPEI Corporation, Mapelastic L.
  - c. MER-KRETE Systems, Hydrosshield 6000.
  - d. Or approved equal.

C. Thin Setting Mortar:

1. Manufactured graded sand aggregate and Portland cement, and acrylic latex admixture exceeding ANSI A118.4.
2. Products:
  - a. LATICRETE International Inc., Laticrete 272 & 3701.
  - b. MAPEI Corporation, Keralastic with Kerabond.
  - c. MER-KRETE Systems, Mer-Krete 720 with Mer-Krete 150 Acrylic/Latex.
  - d. Or approved equal.

D. Waterproofing membrane:

1. If indicated, see Section 093400 – WATERPROOFING-MEMBRANE TILING.

E. Grout:

1. 100% solid epoxy grout exceeding ANSI A118.3, chemical resistant and water cleanable.
2. Products:
  - a. LATICRETE International Inc., Latipoxy.
  - b. MAPEI Corporation, Kerapoxy.
  - c. MER-KRETE Systems, Mer-Poxy.
  - d. Or approved equal.

2.5 WALL SYSTEM:

A. Portland Cement Mortar Base:

1. Use at existing walls and irregular wall conditions.
2. Products:
  - a. 2 parts graded sand to 1 part Portland cement.
  - b. MAPEI Corporation – Scratch Coat Mortar
  - c. Or approved equal.
3. Expanded metal lath: Provide diamond mesh lath complying with ASTM C847 for requirements as follows:
  - a. Fabricate lath from zinc-coated steel sheet
  - b. Self-furring.
  - c. Weight:  $\frac{3}{4}$  lb/sq. ft.

4. Cleavage Membrane: Asphalt felt – 15 lb., ASTM D226, Type I.
5. Vapor Barrier: 6-mil polyethylene sheeting.

B. Thin Setting Mortars

1. Use at new walls and other clean concrete surfaces (same as for floor systems.)
2. Manufactured graded sand aggregate and Portland cement, and acrylic/latex admixture exceeding ANSI A118.4.
3. Products:
  - a. LATICRETE International Inc., Laticrete 272 & 3701.
  - b. MAPEI Corporation, Mapecem Premix & Planicrete AC.
  - c. MER-KRETE Systems, Mer-Krete 720 with Mer-Krete 150 Acrylic/Latex.
  - d. Or approved equal.
4. When installing new tile over the ground masonry surface of old wall tile, use a rubber based setting adhesive.

C. Waterproofing membrane:

1. If indicated, see Section 093400 – WATERPROOFING-MEMBRANE TILING.

D. Grout.

1. 100% solid epoxy grout exceeding ANSI A118.3, chemical resistant and water cleanable.
2. Products:
  - a. LATICRETE International Inc., Latipoxy.
  - b. MAPEI Corporation, Kerapoxy.
  - c. MER-KRETE Systems, Mer-Poxy.
  - d. Or approved equal.

## 2.6 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- C. For non-traffic surfaces provide One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
  1. Available Products:
    - a. Dow Corning Corporation; Dow Corning 786.
    - b. GE Silicones; Sanitary 1700.

- c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
  - d. Tremco, Inc.; Tremsil 600 White.
- D. Chemical-Resistant Sealants: For chemical-resistant floors, provide chemical-resistant elastomeric sealant of type recommended and produced by chemical-resistant mortar and grout manufacturer for type of application indicated, with proven service record and compatibility with tile and other setting materials, and with chemical resistance equivalent to mortar/grout. Include primer and backer rod recommended by manufacturer.
- E. Chemical-Resistant Sealants: For chemical-resistant floors, provide chemical-resistant elastomeric sealant of type recommended and produced by chemical-resistant mortar and grout manufacturer for type of application indicated, with proven service record and compatibility with tile and other setting materials, and with chemical resistance equivalent to mortar/grout. Include primer and backer rod recommended by manufacturer.

## 2.7 MISCELLANEOUS MATERIALS

- A. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic base, designed specifically for flooring applications, stainless steel; ASTM A 666, 300 Series exposed-edge material.
- 1. Products:
    - a. Schluter Systems DILEX\_AKWS.
    - b. Or approved equal.
- B. Control Joints: Aluminum legs and flanges with thermoplastic rubber movement zone.
- 1. Products:
    - a. Schluter Systems DILEX-AKWS.
    - b. Or approved equal.
- C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
- 1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers. Emene cleaners will be used sparingly as approved by the setting bed manufacturer. These cleaners will be used as soon after installation as practical to make cleaning easier.

## 2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile have been completed before installing tile.
  - 3. Installer shall map out all existing cracks in existing floor finishes before demolition begins so that the structural slab can be examined and investigated for the cause of such tracing in the mapped locations after demolition is complete.
  - 4. To preclude an unacceptable level of moisture in or being emitted from substrates, verify that substrate is acceptable for installation of setting bed and tile as determined by respective manufacturer's moisture testing procedure for concrete slabs or other substrates.
  - 5. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
  - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
  - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
  - 3. On renovation projects where existing setting bed material is being removed, no soft or unbonded or otherwise unsound material will be left in place.

- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.
- E. Protect the work and adjacent construction against damage during progress of the work until completion.

### 3.3 INSTALLATION, GENERAL

- A. Install wall tile first, then floor tile. Start installation of the wall tile at the lowest point of floor slopes so that the grout joint between wall tile and floor tile will be on the horizontal surface.
- B. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- C. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Unless otherwise specified, comply with TCA installation methods indicated in ceramic tile installation schedules.
- D. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- E. Avoid laying patterns of accent tiles near adjacent walls that would accent wall irregularities.
- F. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- G. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- H. Lay out tile wainscots to next full tile beyond dimensions indicated.
- I. Expansion Joints: Locate expansion joints and other joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.

J. Grout tile to comply with requirements of the following tile installation standards:

1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

### 3.4 CRACK-SUPPRESSION MEMBRANE INSTALLATION

A. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

### 3.5 FLOOR TILE INSTALLATION

1. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

a. Tile floors composed of tiles 8 by 8 inches or larger.

B. With the approval of the project representative that the structural slab is ready for new work, repair or prepare all cracks with the appropriate method.

C. Joint Widths: Install tile on floors with the following joint widths unless otherwise indicated:

1. Ceramic Mosaic Tile: 1/16 inch.

2. Porcelain Ceramic Tile: 1/8 inch.

D. Stone Thresholds: Install stone thresholds set in same type of setting bed as abutting field tile, unless otherwise indicated.

E. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

### 3.6 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Set tile in a bond coat of latex Portland cement mortar in compliance with ANSI A108.5 and mortar manufacturer's instructions.

C. Where wall substrate irregularities exceed 1/4" in 8 feet, apply a leveling bed.

1. Clean and roughen wall surfaces as require to thoroughly bond leveling bed.

2. Apply mortar to required thickness and carefully screed surface to true, accurate plane. Cure under vaporproof membrane or other approved method for not less than 3 days before installing tile.

D. Joint Widths: Install tile on walls with the following joint widths unless otherwise indicated:

1. Ceramic Mosaic Tile: 1/16 inch.
2. Porcelain Ceramic Tile: 1/8 inch.

### 3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  1. Remove grout residue from tile as soon as possible.
  2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
  3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- C. Post suitable notices to prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Protect waterproof membrane prior to and during the installation.
- E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.
- F. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. No other trades will work on tile floors until epoxy grout is fully cured and cleaned from the surface of the tile.

END OF SECTION 093013