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## 5 TILES

### 5.1 GENERAL

#### 5.1.1 Scope

- 1 This Part specifies the requirements for use of ceramic tile products and the installation of such for wall and floor surfaces.
- 2 Related Parts and Sections are as follows:

This Section

Part 1..... General  
Part 2..... Lath and Plaster  
Part 3..... Dry Lining (Wallboard)  
Part 4..... Special Wall Surfaces  
Part 6..... Terrazzo  
Part 7..... Stone Flooring  
Part 8..... Unit Masonry Flooring  
Part 9..... Floor Screeds and Treatments  
Part 10..... Joints, Caulking and Sealants

Section 13 ..... Masonry

#### 5.1.2 References

- 1 The following standards are approved and/ or referred to in this Part:
  - ASTM C119.....Standard Terminology Relating to Dimension Stone
  - ASTM C126.....Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
  - ASTM C212.....Standard Specification for Structural Clay Facing Tile
  - ASTM C1364.....Standard Specification for Architectural Cast Stone
  - ASTM C1731.....Standard Specification for Concrete Floor Tile
  - ASTM C1732.....Standard Practice for Installation of Concrete Floor Tiles
  - ASTM F710 .....Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
  - ASTM F1344 .....Standard Specification for Rubber Floor Tile
  - ASTM F2195 .....Standard Specification for Linoleum Floor Tile
  
  - BS 7956 .....Specification for primers for woodwork
  - BS 8000 .....Workmanship on construction sites
  - BS 8000-11 .....Workmanship on building sites - Internal and external wall and floor tiling. Ceramic and agglomerated stone tiles, natural stone and terrazzo tiles and slabs, and mosaics. Code of practice

- BS 8298-1 .....Code of practice for the design and installation of natural stone cladding and lining – General; (BS 8298-2 Design and installation of natural stone cladding and lining - Traditional handset external cladding. Code of practice; BS 8298-3 Design and installation of natural stone cladding and lining - Stone-faced precast concrete cladding systems. Code of practice; BS 8298-4 Design and installation of natural stone cladding and lining - Stone cladding on rainscreen support systems. Code of practice)
- EN 12004 .....Adhesives for ceramic tiles; (EN 12004-1 Adhesives for ceramic tiles - Part 1: Requirements, assessment and verification of constancy of performance, classification and marking; EN 12004-2 Adhesives for ceramic tiles - Part 2: Test methods)
- EN 12057 .....Natural stone products - Modular tiles - Requirements
- EN 12058 .....Natural stone products - Slabs for floors and stairs - Requirement
- EN 12440 .....Natural stone - Denomination criteria
- EN 13888 .....Grout for tiles - Requirements, evaluation of conformity, classification and designation; (EN 13888-1 Grouts for ceramic tiles - Part 1: Requirements, classification, designation, marking and labelling)
- EN 14411 .....Ceramic tiles - Definition, classification, characteristics, assessment and verification of constancy of performance and marking
- EN 15285 .....Agglomerated stone - Modular tiles for flooring and stairs (internal and external)
- ISO 10545-1 .....Ceramic tiles: Sampling and basis for acceptance
- ISO 10545-2 .....Ceramic tiles: Determination of dimensions and surface quality
- ISO 10545-3 .....Ceramic tiles: Determination of water absorption, apparent porosity, apparent relative density and bulk density
- ISO 10545-4 .....Ceramic tiles: Determination of modulus of rupture and breaking strength
- ISO 10545-5 .....Ceramic tiles: Determination of impact resistance by measurement of coefficient of restitution
- ISO 10545-6 .....Ceramic tiles: Determination of resistance to deep abrasion for unglazed tiles
- ISO 10545-7 .....Ceramic tiles: Determination of resistance to surface abrasion for glazed tiles
- ISO 10545-8 .....Ceramic tiles: Determination of linear thermal expansion
- ISO 10545-9 .....Ceramic tiles: Determination of resistance to thermal shock
- ISO 10545-10 .....Ceramic tiles: Determination of moisture expansion
- ISO 10545-11 .....Ceramic tiles: Determination of crazing resistance for glazed tiles
- ISO 10545-12 .....Ceramic tiles: Determination of frost resistance
- ISO 10545-13 .....Ceramic tiles: Determination of chemical resistance
- ISO 10545-14 .....Ceramic tiles: Determination of resistance to stains
- ISO 10545-16 .....Ceramic tiles: Determination of lead and cadmium given off by glazed tiles
- ISO 13006 .....Ceramic tiles. Definitions, classification, characteristics and marking

- ISO 13007-1.....Ceramic tiles. Grouts and adhesives: Terms, definitions and specifications for adhesives
- ISO 13007-2.....Ceramic tiles. Grouts and adhesives: Test methods for adhesives
- ISO 13007-3.....Ceramic tiles. Grouts and adhesives: Terms, definitions and specifications for grouts
- ISO 13007-4 .....Ceramic tiles. Grouts and adhesives: Test methods for grouts

ANSI A108 / A118 / A136.1 American National Specifications for the Installation of Ceramic Tile

The Tile Council of America TCA Handbook for Ceramic Tile Installation (The Tile Council of North America TCNA Handbook for Ceramic, Glass, and Stone Tile Installation)

## 5.2 TILE ADHESIVES AND GROUTS

### 5.2.1 Adhesive Types

- 1 Adhesives used for fixing ceramic tiles to comply with ISO 13007-1 or EN 12004.

### 5.2.2 Grout Types

- 1 Grouts used for ceramic tiles to comply with ISO 13007-3 or EN 12888.

## 5.3 CERAMIC TILES

### 5.3.1 General

- 1 This specification includes ceramic wall tiles used in standard applications for floor and wall surfaces.
- 2 Tile products for walls and floors shall comply with EN 14411 or ISO 13006 or ANSI A108 /A118 / A136.1 Material Specifications.
- 3 Application shall comply with BS 8000, Part 11 or ANSI A108 or TCNA Handbook for Ceramic.

### 5.3.2 Glazed Ceramic Wall Tiles

- 1 Glazed ceramic wall tiles for internal use shall comply with the approved references and for external use must be recommended for the purpose by the manufacturer.
- 2 Grout for wall tiling to be an approved proprietary grout.

### 5.3.3 Floor Tiles

- 1 Ceramic floor tiles and clay floor quarry tiles shall comply with the approved references.
- 2 Tiles designated as fully vitrified clay on the drawings shall have a water absorption below 0.5%.

## 5.4 PREPARATION

- 1 Remove coatings that are incompatible with tile-setting materials from substrates, including curing compounds and other substances that contain soap, wax, oil, or silicone.

- 2 For concrete substrates for tile floors installed with adhesives or thin-set mortar, correct conditions that do not comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
  - (a) Fill cracks, holes, and depressions with trowel able leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
  - (b) Remove protrusions, bumps, and ridges by sanding or grinding.
- 3 Apply primer-sealer to wood and plywood subfloors when recommended by tile-setting material manufacturer.
- 4 Lay out tile patterns by marking joint lines on substrates to verify joint placement at edges, corners, doors, and other critical elements.
  - (a) Notify Architect seven days in advance of dates and times when layout will be done.
  - (b) Obtain Architect's approval of layout before starting tile installation.

## 5.5 INSTALLATION

### 5.5.1 GENERAL

- 1 Installation standards shall comply with requirements of ANSI A108 or TCNA or BS 8000-11.
- 2 ANSI Tile Installation Standards: Comply with requirements of ANSI A108 that apply to types of setting and grouting materials and to methods indicated.
  - (a) For stone tile floors, follow procedures in ANSI A108 for providing 95 percent mortar coverage.
  - (b) For stone tile walls, follow procedures in ANSI A108 series for the materials being used.
  - (c) For stone threshold, follow procedures in ANSI A108 series for the materials being used
  - (d) For stone countertops, follow procedures in ANSI A108 series for the materials being used
- 3 TCA Installation Guidelines or TCNA Handbook: Comply with TCA's "Handbook for Ceramic Tile Installation" and TCA installation methods indicated.
- 4 Wipe backs of tiles with a damp cloth to remove dirt and dust before units are installed.
- 5 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.
- 6 Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- 7 Finish cut tile edges that will not be concealed by other construction by grinding and honing cut surfaces and easing edges to match factory-fabricated edges, unless otherwise indicated.
- 8 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.
- 9 Match tiles within each space by selecting tiles to achieve uniformity of color and pattern. Reject or relocate tiles that do not match color and pattern of adjacent tiles.
- 10 Mix tiles to achieve a uniformly random distribution of color shadings and patterns.

- 11 Pattern Orientation: For stone varieties with directional pattern, orient pattern as directed by Architect.
- 12 Expansion Joints: Locate expansion joints and other sealant-filled 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.
  - (a) Locate joints in tile surfaces directly above joints in concrete substrates.
  - (b) Use single-component, non sag polyurethane for joints in walls.
  - (c) Use single-component, non sag polyurethane for joints in floors.

#### 5.5.2 Fixing Internal Ceramic Wall Tiles

- 1 Ceramic wall tiles shall be fixed by bedding in an approved adhesive on cement rendering. The rendering shall be applied in accordance with Part 2 of this Section except where modified by the requirements of this Part.
- 2 All backgrounds are to receive the spatterdash treatment described in Clause 2.9.1 – 3(b) of Part 2 of this Section before the surfaces are rendered.
- 3 The rendering is to be in one coat, except where applied to metal lathing when two coats are to be used, and be left with a wood float finish. It is to be as uniformly thick as possible and not less than 8 mm or more than 13 mm thick in any part.
- 4 Mesh reinforcement is to be incorporated in the rendering in accordance with Clause 2.8 of Part 2 of this Section where:
  - (a) the structure is out of line and the thickness of render required exceeds 13 mm
  - (b) the rendering is to be applied over differing structural materials (See Clause 2.9 of Part 2 of this Section)
  - (c) the surface of the structural wall will be subject to excessive movement.
- 5 Where the tiling is to be bedded in a thin-bed adhesive, the trueness of the rendering is to be such that when tested with a 3 m straightedge, no gap exceeds 3 mm. Where the gap exceeds 3 mm but is less than 6 mm, or if the walls are out of plumb by not more than 6 mm, the Engineer may permit a thick-bed adhesive to be used or may direct that the defective areas are cut back and made good. Deviations from true or plumb in the surface of the rendering exceeding 6 mm are to be made good.
- 6 Thin-bed adhesive should not be used for fixing tiles with backs incorporating deep keys or frogs; for these thick-bed adhesives must be used.
- 7 The tiles are to be set out before the work commences so that:
  - (a) cut tiles are kept to a minimum and where they do occur, are as large as possible
  - (b) joints are horizontal and vertical, with horizontal joints aligning in walls that are adjacent.
- 8 The tiles shall be neatly and accurately cut to a close fit where necessary at abutments and around outlets, pipes and the like.
- 9 Movement joints not less than 6 mm wide are to be provided:
  - (a) at all internal vertical corners
  - (b) at all angles with structural walls and ceilings
  - (c) to give bays not greater than 3000 x 4500 mm
  - (d) over all structural movement joints.

- 10 The joints are to be carried through the rendering to the structural wall and shall be partially filled with an approved joint filler and finished flush with an approved sealant recommended by the manufacturer for the situation in which it will be used.
- 11 Glazed edge tiles to be used where edges are exposed.
- 12 The adhesive is to be prepared and applied with a trowel to dry rendering in the manner recommended by the manufacturer. The tiles are to be pressed firmly into the adhesive with a twisting/sliding action, tapped firmly into position and cleaned as soon as the bedding is complete.
- 13 It is essential that the tiles are fixed in position before the surface of the adhesive dries and the work is to be carried out in small areas of not more than 1m<sup>2</sup> at a time.
- 14 The finished surface of the tiles should be plumb and true such that when checked with a 3 m straightedge no gap exceeds 3 mm.
- 15 The joints are to be even, approximately 2 mm wide and where tiles without spacer lugs are used, spacer pegs of suitable and even thickness to be inserted between the tiles as the work proceeds.
- 16 The joints are to be grouted after the adhesive has set and not less than 48 hours after fixing. The grout should be well worked into the joints so that they are completely filled, and finished flush. Surplus grout is to be cleaned off as the work proceeds using a damp cloth and the joints tooled smooth.

### 5.5.3 Fixing External Ceramic Tiles

- 1 The ceramic wall tiles are to be fixed by bedding in an approved adhesive or cement rendering. The adhesive must be suitable for external application and the Contractor is to obtain confirmation from the manufacturer that it is suitable for the type of tile to be fixed and in the climatic conditions prevalent in Qatar and provide the Engineer with copies of the correspondence.
- 2 The tiling is to be carried out generally in accordance with Clause 5.3.3 of this Part describing internal work except that the rendered backing is to be reinforced with galvanized welded fabric reinforcing mesh and except where modified by this Clause.
- 3 Stainless steel reinforcing mesh to be used where shown on the drawings or as directed by the Engineer.
- 4 The mesh is to be fixed, with the horizontal wires outwards by means of 25 mm stainless steel anchors or by drilling holes in which plastic anchors are inserted to receive 38 mm stainless steel, slotted head, countersunk wood screws. It is essential that the fixings extend into the structural wall by a minimum of 25 mm after passing through any dubbing etc.
- 5 The fixings are to be set at maximum 450 mm centers in both directions and staggered, located so that the horizontal wires of the mesh rest on the screws. The vertical wires of the mesh shall be spaced 3 mm from the structure by stainless steel washers placed as the screws are inserted.
- 6 The mesh should be secured to the screws by stainless steel binding wire of softened quality and 1.22 mm in diameter, twisted tightly and with its ends turned inwards.
- 7 The mesh is to be cut off at all movement joints leaving 40 mm free space on either side.
- 8 All cut edges of the mesh are to receive a coating of bitumen solution.



- 9 A slurry coat of neat cement is to be brushed on the background and the mesh. Whilst the slurry coat is still wet, the rendering is to be applied, working around and through the wires and ensuring that it is fully bonded to the background and that the wire is covered by a thickness of 7 mm.
- 10 Joints in tiled areas are not to be less than the width of the joints in the tiling and be provided in positions to be agreed with the Engineer, generally:
  - (a) over all structural movement joints.
  - (b) to give bays not greater than 3000 by 4500 mm.
  - (c) at all internal and external vertical corners.
  - (d) at each storey height level coinciding with the bottom of the floor slab.

#### 5.5.4 Laying Ceramic Floor Tiles by the Semi-Dry Mix Method

- 1 The areas of concrete substrata to be tiled are to be brushed clean and dampened until absorption ceases and the finished floor level is to be established by means of dots and rules.
- 2 The mortar for bedding the tiles is to be to the thickness shown elsewhere in the Project Documentation. It shall consist of 1 part of cement to 4 parts of sand by volume, mixed semi-dry in a mechanical mixer with only sufficient water added to give a crumbly consistency that retains its shape when squeezed in the hand.
- 3 The minimum thickness of bedding with this system of laying is to be 40 mm. Where a bedding thickness in excess of 70 mm is required a maximum 10 mm aggregate is to be incorporated in the proportion of 1 part cement, 1.5 parts dry sand and 3 parts dry coarse aggregate, by weight, laid in two applications of approximately equal thickness. The lower layer is to be roughly compacted, but not allowed to stiffen, before the final layer is placed on top.
- 4 The mix is to be spread to a thickness approximately 10 mm greater than that actually required for the bed and be thoroughly compacted by tamping and drawing off to the required level with a screed board. Only sufficient mortar is to be mixed and spread as can be covered with tiles before it has attained its initial set.
- 5 A slurry of 1 part cement and 1 part sand, by volume, is to be poured over the surface of the semi-dry mix bedding and spread with a trowel until it is approximately 2 mm thick. Dry tiles are then to be laid on the slurry and beaten firmly into position with a wooden beater to ensure a true surface and contact between the tiles and bedding is complete.
- 6 The tiles must be correctly positioned at the time they are placed and laid with joints of about 3 mm.
- 7 Grouting of the joints to be carried out within a period of 4 hours of the completion of the laying of the tiles so that the grout will attach itself firmly to the bedding. Care is to be taken to avoid disturbing the tiles and walking boards are to be used during the grouting operation.
- 8 The grouting mix is to either consist of 1 part cement to 1 part fine, dry sand by volume, or an approved proprietary grout may be used.
- 9 The tiles are to be neatly and accurately cut to a close fit where necessary at abutments and around outlets, pipes and the like.
- 10 Tiles are to be laid level or to 1% falls in "wet" areas, as may be required. Localised variations in level for a nominally flat floor are to be a maximum of  $\pm 3$  mm under a 3 m straightedge. Particular care is to be taken in "wet" areas to prevent low spots and the pooling of water.
- 11 Skirtings of the same tile size as the floor are to be fixed in such a manner that their vertical joints coincide with the horizontal joints of the floor tiles.



**5.5.5 Laying Ceramic Floor Tiles by the Direct Mortar Bedding Method**

- 1 The areas of concrete substrata to be tiled should be brushed clean and dampened until absorption ceases and the finished floor level is to be established by means of dots and rules.
- 2 The mortar for bedding the tiles is to consider of 1 part of cement to 4 parts of sand by volume, mixed in a mechanical mixer to a stiff plastic consistency so that when tamped and fully compacted into place free water does not bleed to the surface.
- 3 The bedding mortar is to be laid on the concrete substrata 15 to 25 mm thick, except where tiles 10 mm thickness or less are used in which case the bedding is not to exceed 15 mm, and shall be levelled and tamped with a straightedge board.
- 4 The tiles are to be soaked in clean water for 15 to 30 minutes before fixing and allowed to drain for 10 minutes to remove all surplus water. Fully vitrified tiles do not require soaking.
- 5 The bedding mortar is to be lightly dusted with dry cement sprinkled from a flour sieve and lightly trowelled level until the surface becomes damp. The tiles are then to be laid on the bedding and beaten firmly into position with a wooden beater to ensure a true surface and that contact between the tiles and bedding is complete.
- 6 Grouting and the other requirements of the semi-dry mix method described in Clause 5.3.6 of this Part of this Section also apply to the direct mortar bedding method.

END OF PART