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Preparing Activity: LANTNAVFACENGCOM Based on UFGS-09410N

ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

SECTION 09420

TERRAZZO TILE
02/03

NOTE: This guide specification is issued by the Atlantic Division, Naval Facilities Engineering Command for regional use in Italy.

NOTE: Monolithic bonded terrazzo is not generally available in Italy. This guide specification covers the requirements for cast marble or granite terrazzo floor tile, precast terrazzo stair treads, and terrazzo wall base of various sizes and thicknesses.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents, including their organization designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

NOTE: On the drawings, show:

1. Floors and stairs to receive terrazzo tile.
2. Bases, thresholds, and treatment at doors and trimmed openings, including thresholds and vertical returns back to door frames.
3. Extent of cleavage membranes or membrane waterproofing.

4. Where a mortar bed is required, and where surface of terrazzo tile is to be flush with adjacent floor, indicate depressed structural slab or sub-floor.

5. Schedule showing terrazzo tile types, sizes, patterns, colors, trim, and built-in accessories required for each room or space. Illustrate precast trim shapes.

6. Slope of floors to drain.

7. Details and locations of expansion and control joints.

8. Treatment at terrazzo tile recesses for radiators, convectors, drinking fountains, lighting fixtures, and other recessed items.

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1	(1992) Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar
ANSI A108.6	(1992) Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile Setting and Grouting Epoxy (Available only as part of ANSI A108.1)
ANSI A118.1	(1992) Dry-Set Portland Cement Mortar (Available only as part of ANSI A108.1)
ANSI A118.3	(1992) Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive (Available only as part of ANSI A108.1)
ANSI A118.4	(1992) Latex-Portland Cement Mortar (Available only as part of ANSI A108.1)
ANSI A118.6	(1992) Ceramic Tile Grouts (Available only as part of ANSI A108.1)

ITALIAN LAWS AND NORMS (D.M.)(LAW)(CIRC.)

NOTE: Italian laws and normatives are the legislative regulations and decrees issued by the Italian government in the form of laws, norms, decrees, circulars, and letters. These Laws and Decrees concur together with Norms and Standards in forming the governing directives for construction.

CNR A.V-N.23 (1971) C.N.R. Bollettino Ufficiale - Aggregate analysis of a soil by means of sieves

ITALIAN NATIONAL ASSOCIATION FOR UNIFICATION OF STANDARDS (UNI)

NOTE: A UNI Norm is a technical normative recognized as Italian Law, submitted by a private organization "Ente Nazionale Italiano di Unificazione" for Italy and is available only in the Italian language. It is the National Standard.

UNI 2332/1 (1979) Test sieves - Test sieves and relevant receivers and lids - Dimensions and tolerances

UNI 8898/5 (1988) Polymeric waterproof sheets - Flexible reinforced plastomeric sheets - Characteristics and acceptance limits

UNI 10532 (1995) Composite stones - Determination of the resistance to abrasion (deep)

ITALIAN/EUROPEAN HARMONIZATION STANDARDS (UNI EN)(UNI ENV)(CEI EN)
(UNI EN ISO)(UNI ISO)

NOTE: A UNI EN, UNI ENV, CEI EN, UNI EN ISO or UNI ISO is a European Standard with a coincident Italian National Standard or International Standard. The two standards are identical, with most (but not all) EN's available in the English language and the UNI available only in the Italian language.

UNI EN 197-1 (2001) Cement - Part 1: Composition, specifications and conformity criteria for common cements

UNI ENV 459-1	(1996) Building lime - Part 1: Definitions, specifications and conformity criteria
UNI ENV 459-2	(1996) Building lime Part 2: Test methods
UNI EN 933-1	(30/04/99) Test for geometrical properties of aggregates. Determination of particle size distribution. Sieving method.
UNI EN 1324	(2000) Adhesives for tiles - Determination of shear adhesion strength of dispersion adhesives
UNI EN 1348	(2000) Adhesives for tiles - Determination of tensile adhesion strength for cementitious adhesives
UNI EN 1465	(30/04/96) Adhesives. Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies.
UNI EN ISO 9653	(2001) Adhesives. Test method for shear impact strength of adhesive bonds.
UNI ENV 10080	(1997) Steel for the reinforcement of concrete - Weldable ribbed reinforcing steel B 500 - Technical delivery conditions for bars, coils and welded fabric
UNI EN 12004	(2001) Adhesives for tiles - Definitions and specifications

1.2 SUBMITTALS

NOTE: Where a "G" in submittal tags follows a submittal item, it indicates Government approval for that item. Add "G" in submittal tags following any added or existing submittal items deemed sufficiently critical, complex, or aesthetically significantly to merit approval by the Government. Submittal items not designated with a "G" will be approved by the QC organization.

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Terrazzo tile

Precast terrazzo stair treads

Precast terrazzo base units

Cleaner

Sealants

Sealer

SD-04 Samples

Terrazzo tile; G

Precast terrazzo stair treads; G

Precast terrazzo base units; G

[Mock-up]

Divider strips

Submit 300 by 300 mm sample tiles of each type finish or color combination of terrazzo. [Submit 300 mm long samples of [base unit] [and] [stair tread].] Submit each type of divider strip.

SD-10 Operation and Maintenance Data

Terrazzo tile, Data Package 1; G

Submit data package in accordance with Section 01781, "Operation and Maintenance Data." Include tile manufacturer's maintenance instructions with recommended sealers, cleaners and ongoing maintenance schedules for materials of this section. Include documented information on product composition, installation information on setting beds, and grouts used in construction.

1.3 QUALITY ASSURANCE

1.3.1 Installer Qualifications

Company specializing in performing the work of this section with minimum 10 years documented experience.

1.3.2 Single Source Responsibility

Provide terrazzo materials produced by a single manufacturer for each terrazzo tile type.

[1.3.3 Mock-up]

Construct mockup of floor area approximately 2000 x 2000 mm, utilizing equal amounts of each color and pattern of terrazzo tile scheduled to be installed and including each type of accessory to be provided. Construct full thickness of terrazzo using mortar bed and grout specified. Locate mock-up within the building area, protected from the weather.

- a. Approved mock-up colors and patterns will serve as the standard for approval of installed work by the Contracting Officer.
- b. [Do not remove the mock-up from the project site until directed by the Contracting Officer.][Approved mock-up area may remain as part of the overall work.]

]1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's original unopened containers marked with the manufacturer's name and brand. Examine content for damaged, chipped or broken tiles, and set aside or identify containers for replacement of defective tiles. Manufactured mortars and grouts (in bags) shall contain manufacturer's recommendation for mix and application. Deliver, handle, and store materials in a manner that will prevent contamination and deterioration.

1.5 ENVIRONMENTAL CONDITIONS

Ambient temperature and temperature of cementitious mixtures shall be not less than 10 degrees C from the time mixtures are placed until completely cured. Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo tile installation. Control and collect dust produced by cutting and grinding operations.

1.6 EXTRA STOCK

Supply an extra 2 percent of each type and color of terrazzo tile units used. Package in clean and marked cartons.

PART 2 PRODUCTS

2.1 SOURCE MANUFACTURERS

2.1.1 Terrazzo Tile, Stair Treads, and Wall Base

The following manufacturers provide terrazzo tile, stair treads, and wall base units that generally comply with these specifications:

BELOTTI TILES
Via Cherio 7
24060 Zandobbio (Bergamo)
Tel: 035.940060
Fax: 035.942791
www.belottitiles.com

AGGLO BAGHIN, S.p.A.

Via Callalta, 24/A
31039 Riese Pio X-TV-Italia
Tel: 39-0423-755339
Fax: 39-0423-755340
web: www.agglobaghin.it

MASPE S.r.l.
Via Balbi, 20
36022 Cassola (VI) - Italy
Tel: 0424-533082
Fax: 0424-533294
web: www.maspe.com

2.1.2 Leveling and Patching Compound

The following manufacturers provide leveling and patching compounds that generally comply with these specifications:

MAPEI, S.p.A.
Via Cafiero, 22
20158 Milano
Tel: 02-376731
Fax: 02-37673214
e-mail: mapei@inferentia.it

KERAKOLL S.p.A.
Via dell'Artigianato, 9
41049 Sassuolo (MO)
Tel: 0536-816511
Fax: 0536-800202
e-mail: info@kerakoll.com
web: www.kerakoll.com

TECHNOKOLLA S.r.l.
Via Radici in Piano, 558
41049 Sassuolo (MO)
Tel: 0536-862269
Fax: 0536-862660
e-mail: info@tecknokolla.com
web: www.technokolla.com

2.1.3 Welded Wire Fabric

The following manufacturers provide welded wire fabric reinforcing that generally complies with these specifications:

CAVATORTA S.p.A.
Via Repubblica, 58
43100 Partia - Italy
Tel: 0521-221411
Fax: 0521-221414
web: www.cavatorta.it

METAD

Metallurgia Adriatics S.p.A.
Via Boccaccio, 23
20123 Milano - Italy
Tel: 02-48193864
Fax: 02-466596

2.1.4 Mortar and Grout

The following manufacturers provide grout materials that generally comply with these specifications:

MAPEI, S.p.A.
Via Cafiero, 22
20158 Milano
Tel: 02-376731
Fax: 02-37673214
e-mail: mapei@inferentia.it

KERAKOLL S.p.A.
Via dell'Artigianato, 9
41049 Sassuolo (MO)
Tel: 0536-816511
Fax: 0536-800202
e-mail: info@kerakoll.com
web: www.kerakoll.com

TECHNOKOLLA S.r.l.
Via Radici in Piano, 558
41049 Sassuolo (MO)
Tel: 0536-862269
Fax: 0536-862660
e-mail: info@tecknokolla.com
web: www.technokolla.com

2.1.5 Divider Strips

The following manufacturers provide metal divider strips for terrazzo tile that generally comply with these specifications:

HALFEN-OROBIA S.r.l.
Via dei Curti, 33
24059 Urganano (BG) - Italy
Tel: 035-893029
Fax: 035-893071
web: www.halfen.it

TECHNOKOLLA S.r.l.
Via Radici in Piano, 558
41049 Sassuolo (MO)
Tel: 0536-862269
Fax: 0536-862660
e-mail: info@tecknokolla.com
web: www.technokolla.com

2.1.6 Latex Additive

The following manufacturers provide latex additives for mortar and grout that generally comply with these specifications:

MAPEI, S.p.A.
Via Cafiero, 22
20158 Milano
Tel: 02-376731
Fax: 02-37673214
e-mail: mapei@inferentia.it

KERAKOLL S.p.A.
Via dell'Artigianato, 9
41049 Sassuolo (MO)
Tel: 0536-816511
Fax: 0536-800202
e-mail: info@kerakoll.com
web: www.kerakoll.com

TECHNOKOLLA S.r.l.
Via Radici in Piano, 558
41049 Sassuolo (MO)
Tel: 0536-862269
Fax: 0536-862660
e-mail: info@tecknokolla.com
web: www.technokolla.com

2.1.7 Sealant

The following manufacturers provide joint sealants that generally comply with these specifications:

MAPEI, S.p.A.
Via Cafiero, 22
20158 Milano
Tel: 02-376731
Fax: 02-37673214
e-mail: mapei@inferentia.it

KERAKOLL S.p.A.
Via dell'Artigianato, 9
41049 Sassuolo (MO)
Tel: 0536-816511
Fax: 0536-800202
e-mail: info@kerakoll.com
web: www.kerakoll.com

2.1.8 Cleaner and Sealer

The following manufacturers provide terrazzo tile cleaner materials that generally comply with these specifications:

ITALNET 2000 (Italgraniti)

Via Virgilio, 48
41100 Modena - Italy
Tel: 059-888411
Fax: 059-848808

Industria Chimica General
Via Rep. di San Marino, 8
41100 Modena - Italy

2.2 TERRAZZO TILE

NOTE: Select the chip requirements and also determine whether flexible or rigid resin is required or either give the Contractor the option.

Coordinate with data of manufacturers of terrazzo tile when determining the patterns, styles, sizes and thicknesses of tiles.

Terrazzo tile shall be of the indicated colors and shall consist of [marble] [or] [granite] chips embedded in a [flexible] [or] [rigid] thermoset resin matrix. Tiles shall be [0.9][1.2][2.0][2.8][3.5][___] mm thick and nominal [250 by 250][300 by 300][400 by 400][___ by ___] mm. Tiles shall have a [polished] [polished and [honed] [textured]] [honed] [textured] finish with uniform color distribution of chips. [Marble chips shall be graded to [16] [6] mm maximum size.] [Granite chips shall be manufacturer's standard gradation.]

2.2.1 Portland Cement

UNI EN 197-1, CEM I, gray or white as required to match sample panel.

2.2.2 Coloring Pigments

Alkali-resistant, non-fading mineral or synthetic pigment.

2.2.3 Marble Chips

Standard quarry products of sizes and colors necessary to match sample panel on display at Office of Resident Officer in Charge of Construction. Abrasive hardness of not less than 10 when tested in accordance with UNI 10532. No deleterious or foreign matter. Dust content less than one percent by weight.

2.3 PRECAST TERRAZZO STAIR TREADS

Terrazzo tread [and riser] units shall be precast terrazzo material [matching terrazzo tile Type ___] [as indicated on the finish schedule]. Reinforce tread [and riser] units with wire wire fabric and reinforcing bars as determined by the manufacturer to meet the performance criteria scheduled below. Tread [and riser] units shall have a [polished] [honed] finish with uniform color distribution of chips. Marble chips shall be

graded to match [the terrazzo floor tile mix] [_____]. Units shall have same properties as the terrazzo tile.

2.3.1 Safety Inserts

Provide each unit with [abrasive nosing strip] [and] [one line] [2 lines] [3 lines] of abrasive safety lines/tread inserts. Position [abrasive nosing strip] tread inserts 1.6 mm higher than terrazzo surface[, on the leading edge of each tread surface].

2.3.2 Honed Finish

Finish stair tread surfaces to produce a smooth, nonreflective surface similar to that produced by grinding with a 400 to 1200 grit abrasive; with a gap not exceeding 0.13 mm, when faces are tested for flatness with a 600 mm straightedge. Do not vary facial dimensions from specified dimensions by more than plus or minus 0.4 mm for tiles with polished or honed faces; or plus or minus 0.8 mm.

2.4 PRECAST TERRAZZO BASE UNITS

[Straight] [Coved with 19 mm radius] type, [150 mm] [100 mm] height, [polished] [honed] finish with uniform color distribution of chips. Marble chips shall be graded to match [the terrazzo floor tile mix] [_____]. Units shall have same properties as the terrazzo tile.[Provide finished returned edges at outside corners.]

2.5 SETTING MATERIALS

2.5.1 Hydrated Lime

UNI ENV 459-1 and UNI ENV 459-2.

2.5.2 Aggregate

CNR A.V-N.23, UNI 2332/1, and UNI EN 933-1, except sand for grout shall have a maximum granulometry of 2 mm diameter.

2.5.3 Water

Clean, potable.

2.5.4 Portland Cement

UNI EN 197-1, CEM I, white for grout, gray for other uses.

2.5.5 Membrane or Cleavage Membrane

UNI 8898/5, polyethylene sheeting, 0.10 mm thick.

2.5.6 Latex Additive

NOTE: Retain subparagraph below if latex additive is

required to improve flexibility and other properties
of mortar setting bed.

Styrene butadiene rubber latex additive (water emulsion), serving as replacement for part or all of gaging water, of type specifically recommended by latex additive manufacturer for use with job-mixed Portland cement and aggregate mortar bed and grout. Add at project site during mixing operations in accordance with manufacturers recommendations.

2.5.7 Reinforcing Wire Fabric

UNI ENV 10080, [50 by 50 mm standard fabric, 1.59/1.59 wire] [75 by 75 mm standard fabric, 2.32/2.32 wire] [38 by 50 mm standard fabric, 1.59/2.32 wire], in flat sheets only.

2.5.8 Mortar Setting Materials

Mortars shall have a minimum shear strength of 3.5 N/sq. mm and a minimum compressive strength of 8.0 N/sq. mm.

NOTE: The epoxy systems included in this specification are to be used where chemical resistance may not be the primary or only performance criterion desired. They can be used where good stain resistance, water resistance, and mild chemical resistance are required in areas such as dining rooms, public toilets and foyers. Epoxy grout and mortar should not be used in environments where temperature is over 54 degrees C.

NOTE: Designer shall refer to Table 6 in UNI EN 12004 for additional classifications and designations as required for the project.

- a. Portland Cement Mortar: ANSI A108.1 or UNI EN 12004, Type C, Class 1, gray. Mix proportions: 1-part cement, 5 to 6-parts damp sand, and optionally, up to 1/10-part hydrated lime by volume.
- b. Dry-set Portland Cement Mortar: ANSI A118.1 or UNI EN 12004, Type C, Class 1, factory sanded.
- c. Latex-Portland Cement Mortar: ANSI A118.4 or UNI EN 12004, Type D, Class 1.
- c. Chemical-resistant, Water-cleanable, Tile-setting Epoxy: ANSI A118.3 or UNI EN 12004, Type R, Class 1.

2.5.9 Grout Materials

Factory prepared mixtures requiring only the addition of water at the job-site prior to application. The product density is of at least 1.30 g/cu. cm with a bonding strength after 28 days of 1.4 N/sq. mm, flexural strength of 3.5 N/sq. mm and compressive strength 8.0 N/sq. mm. Where manufacturer's standard grout products are scheduled, provide colors to match.

NOTE: Grout should be compatible with mortar system. Hot or windy weather may cause latex-Portland cement mortar to prematurely skin over, resulting in loss of bond to the tile. If environmental conditions are warranted, provide Contractor the option of using either dry-set Portland cement mortar or latex-Portland cement mortar.

- a. Commercial Portland Cement: ANSI A108.6 or UNI EN 12004, Type C, Class 1.
- b. Sand Portland Cement: ANSI A108.6 or UNI EN 12004, Type C, Class 1. Mix proportions: 1-part portland cement to 2-parts fine graded sand
- c. Dry set: ANSI A118.6 or UNI EN 12004, Type C, Class 1, factory sanded.
- d. Latex-portland cement: ANSI A118.4 or UNI EN 12004, Type D, Class 1.
- e. Chemical-resistant, water-cleanable, tile-setting and grouting epoxy: ANSI A118.3 or UNI EN 12004, Type R, Class 1.

2.5.10 Leveling and Patching Compound for Concrete

Trowelable cementitious compound made for leveling and patching concrete floors and acceptable to setting material manufacturer.

2.5.11 Divider Strips

NOTE: When material and thickness of divider strips and color of plastic strips vary, depending on location in the project, material thickness and color should be shown on the drawings and specified.

Formed of [half-hard brass], [white alloy of 99 percent zinc] [plastic of a color [as approved] [as shown]], not less than 25 mm deep, in types indicated. Standard type one-piece divider strips shall [be not lighter than 1.5 mm thick] [be of thickness indicated]. Heavy-top strips may be either one- or two-piece strips with a solid top section, [not less than 6 mm nor more than 10 mm in depth and not less than [3] [6] mm thick] [of

thickness shown]. Expansion type strips shall consist of two metal strips enclosing a 6 mm [white] [black] neoprene filler.

2.6 ACCESSORY MATERIALS

2.6.1 Terrazzo Cleaner

A type with a pH factor between 7 and 10 specially prepared for use on terrazzo.

2.6.2 Sealer

Penetrating type, free from harmful alkali or acid content. Sealer shall not discolor terrazzo tile surface nor leave a tacky or sticky finish film on the surface after buffing and shall produce a slip resistant surface.

2.6.3 Sealants and Calkings

Provide sealants and calking in joints between tile and adjacent substrates as specified in Section 07920, "Joint Sealants."

PART 3 EXECUTION

3.1 EXAMINATION

Do not start terrazzo floor tile work until roughing in for plumbing, heating, ventilating, air conditioning, and electrical work has been installed and tested; and membrane waterproofing have been installed and tested. Verify that joints and cracks in substrates are coordinated with tile joint locations.

3.2 PREPARATION

3.2.1 Concrete Subfloor Preparation

Do not begin terrazzo floor tile installation in areas receiving wall tile until wall tile installation has been completed. Clean substrates of substances that might impair terrazzo floor tile bond, including oil, grease, and curing compounds. Provide clean, dry, and neutral substrate; determine dryness characteristics by performing moisture tests recommended by setting material manufacturer.

- a. Use trowelable leveling and patching compounds per setting material manufacturer's written instructions to fill cracks, holes, and depressions.
- b. Remove protrusions, bumps, and ridges by sanding or grinding.

3.2.1.1 Structural Slabs Subject to Bending

NOTE: Reinforced mortar setting and precast concrete floor beds with cleavage membrane should be used over structural floors subject to bending and

deflection.

Use reinforced mortar setting bed with cleavage membrane.

3.2.1.2 Structural Slabs With Limited Bending

NOTE: The curing and finishing requirements for concrete surfaces that are to be tiled should be included in Section 03300, "Cast-In-Place Concrete."

NOTE: Designer shall specify expansion joints and show location and details on drawings.

Before applying terrazzo tile with dry set mortar, test structural concrete floor for levelness or uniformity of slope by using straightedges. Fill and patch areas where the floor does not meet the required tolerances and level in accordance with tile manufacturer's written recommendations and Section 03300, "Cast-In-Place Concrete".

3.2.1.3 Sub-Surface Tolerance Requirements

Sub-surface to receive tile shall be level and true with square corners. Provide complete sub-surface inspection to assure that the following maximum variations from required plane have been met by sub-surface construction prior to the start of the installation.

- a. Portland Cement Mortar/Sub-floor Surface: 6 mm in 3 m.
- b. Dry-set or Latex Portland Cement Mortar Bed/Sub-floor Surface: 3 mm in 3 m.
- c. Epoxy Adhesive/Sub-floor Surfaces: 2 mm in one m abrupt. Irregularities of more than one mm will not be acceptable.

3.2.2 Preparation of Mortar Mixes

Measure mortar materials in approved containers to ensure that proportions of materials will be controlled and accurately maintained. Measuring materials with shovels is not permitted. Unless specified otherwise, mix mortar in proportions by volume in approved mixing machines or mortar boxes. Control the quantity of water accurately and uniformly.

3.3 INSTALLATION

3.3.1 General

Comply with parts of UNI EN 1324, UNI EN 1348, UNI EN 1465, UNI EN ISO 9653, UNI EN 12004, and ANSI A118.3 that apply to types of setting and grouting materials and to methods indicated.

- a. Extend terrazzo floor tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- b. Accurately form intersections and returns. Perform cutting and drilling of terrazzo units without marring visible surfaces. Fit terrazzo closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap terrazzo. Where cut edges will be visible after installation, finish to match factory-fabricated edges.
- c. Match terrazzo components within each space by selecting terrazzo to achieve uniformity of color and pattern. Reject or relocate tiles that do not match color and pattern of adjacent terrazzo surface. Mix terrazzo to achieve a uniformly random distribution of color shadings and patterns.
- d. Orient terrazzo floor tile units with grain direction as indicated or, if not indicated, as directed by Contracting Officer.
- e. Wipe backs of terrazzo units with a damp cloth to remove dirt and dust before units are installed.

NOTE: Procedure in paragraph below is considered necessary if full contact between backs of tiles and setting bed is to be achieved.

- f. Butter backs of terrazzo units with setting material before setting, and place units before back buttering and setting bed have skinned over.

NOTE: Delete paragraph below if tile joint locations are shown on Drawings.

- [c. Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out terrazzo tile work and center tile fields in both directions in each space. Adjust to minimize tile cutting.]

3.3.2 Joints

Make parallel, level, and in alignment. Make end joints in broken-joint work on center lines of adjoining tiles, as far as practicable. Set square tiles with straight joints, and set oblong tiles with offset joint pattern, except in special arrangements and design, where indicated. Saw cut terrazzo units to form floor patterns indicated; do not scribe and break.

3.3.2.1 Joint Width

Utilize plastic shims to make joints uniform in width and space to accommodate tile with a minimum of cutting. Make joint widths of approximately 1.5 mm.

3.3.2.2 Grouting and Pointing Joints

Provide factory premixed colored grout[, colors as scheduled on drawings]; provide latex-Portland cement grout for floor tile; provide epoxy grout for stair treads, wall base, trim and other miscellaneous terrazzo units.

3.3.2.3 Expansion and Control Joints

NOTE: Indicate expansion joints and show location and details on drawings.

Provide expansion and control joints where indicated and in tile work aligned with structural joints in the substrate or provide a cleavage membrane between the substrate and tile to offset from the structural joint.

3.3.3 Metal Dividing Strips

Install dividing strips in mortar setting bed while bed is in a plastic state. Set dividing strips where indicated in straight, unbroken lines, flush with unfinished floor surface. Provide dividing strips at joints where tile units abut and are flush with other types of floor finishes, except at doors where thresholds are provided.

3.3.4 Thresholds

Align edges with faces of trim on both sides of openings. Fit thresholds neatly and bed properly in cement mortar flush with adjoining floors. Grout all intersections with vertical surfaces.

[3.3.5 Portland Cement Mortar

NOTE: In lieu of the conventional mortar method, floor tile may be installed by the dry-set mortar method, the epoxy mortar method, or the latex-Portland cement method. However, these methods are not recommended for use directly over precast concrete flooring systems.

NOTE: Bonded mortar setting beds should only be used on slab-on-grade construction where no bending stresses occur or on structural slabs of limited area.

Portland Cement Mortar: Reinforced mortar bed and cleavage membrane. Recess, or depress setting bed where indicated. Provide for terrazzo floor tile where recessed substrate is provided.[Waterproofing for [____] is specified in Section [____, "____"].]

- a. Mortar Bed: Provide a depressed floor slab to level surface of tile with adjoining floor surfaces unless otherwise indicated. Make the mortar bed water-resistant by using an admixture. Mix and use this material in strict accordance with manufacturers directions.
 - (1) After mixing with water, the mortar shall be of such consistency and workability that will allow maximum compaction during tamping of the mortar bed.
 - (2) Place reinforcement in the center of the mortar bed. Reinforcement shall not butt against vertical surfaces.
 - (3) Provide minimum thickness of mortar bed of 44 mm at drains or as required by local plumbing code.
 - (4) The high point to the floor shall be not less than 50 mm or more than 225 mm below the top of a finished dam and the mortar fill, waterproof membrane and finished floor shall be a minimum of 21 mm/m pitch toward the drain.
 - (5) When hand mixing, thoroughly mix dry mortar ingredients before adding water to obtain proper consistency. When machine mixing, add water first. Discard mortar when it has reached its initial set.
- b. Application of Mortar to Concrete Floors and Decks: Unless otherwise specified, place and bond the mortar bed to concrete slab as follows:
 - (1) Dampen clean, properly prepared concrete surface with water immediately prior to placing the bonded mortar bed. Concrete surface to be completely free of standing water.
 - (2) Before placing mortar bed, spread a very thin continuous coating of pure Portland cement slurry on the concrete surface or dust a thin layer of dry Portland cement on the concrete and wet it. Broom the pure Portland cement slurry of the wetted Portland cement dust to completely coat the concrete surface with a thin and uniform coating.
 - (3) Immediately apply mortar bed over the pure cement coating. Firmly tamp and screed mortar bed. Mortar bed thickness shall be a nominal 32 mm.

][3.3.6 Dry-Set and Latex-Portland Cement Mortar

3.3.6.1 Mixing Dry-Set and Latex-Portland Cement Mortars

- a. Mixing Dry-Set Mortars: Mix dry-set mortars in accordance with the following directions, unless mortar manufacturer's instructions differ.
 - (1) Add dry ingredients to recommended amount of water. Mix slowly and thoroughly and let mortar stand for 15 minutes, then remix. Do not speed mix. Do not add water, additional mortar, or other ingredients after slaking period.
 - (2) Mortar consistency shall be such that when applied with the recommended notched trowel to the backing the ridges formed in the mortar shall not flow or slump.
 - (3) During use, remix mortar occasionally. Do not add water or fresh materials shall not be added after initial mixing. Mortar shall not be remixed and used after initial set.
- b. Latex-Portland Cement Mortar: Mix latex-Portland cement mortars in accordance with latex manufacturer's instructions or as modified herein.
 - (1) Use the brand of prepacked dry mortar mix specified by the latex manufacturer.
 - (2) Add dry mortar mix to amount of latex specified by manufacturer and mix thoroughly to obtain complete and visually uniform wetting of the dry mortar mix. Slake for 15 minutes and remix before using.
 - (3) Latex-Portland cement thin-set mortars are available in two forms. Both are dry mixes with one requiring the addition of liquid latex when mixing. In this instance, follow the liquid latex manufacturer's instructions. The second form is a factory blend of dry power and dry polymers that requires only water be added when mixing. In this case, follow the mortar manufacturer's instructions.
 - (4) The proper mortar consistency is such that when applied with the recommended notched towel to the backing, the ridges formed in the mortar will not flow or slump.
 - (5) During use, remix mortar occasionally. Do not add water or fresh materials after initial mixing. Mortar shall not be remixed and used after initial set.

3.3.6.2 Installation of Floor Tile with Dry-Set or Latex-Portland Cement Mortar

Install of floor tile over a Portland cement mortar bed, properly prepared concrete slabs or properly prepared cementitious backer units.

a. Mortar Bed

- (1) Clean surface thoroughly. Dampen if very dry, but do not

saturate.

(2) Apply mortar with flat side of trowel over an areas no greater than can be covered with tile while mortar remains workable. Using a notched trowel of type recommended by mortar manufacturer, comb mortar to obtain even setting bed without scraping backing material. Cover surface uniformly with no bare spots with sufficient mortar to insure a minimum mortar thickness of 2 mm between tile and backing after tile has been beaten into place. Tile shall not be applied to skinned over mortar.

b. Setting Tile Units

(1) Press tile units into freshly combed mortar, insuring mortar contact with tile while maintaining accurate joint alignment and spacing. Keep a minimum of 2/3 of joint depth open for grouting.

(2) Thoroughly beat all tile units into place to obtain maximum contact of bonding mortar on the back of each tile, or back of each tile and back mounting material. Average uniform contact area shall be not less than 80 percent except on exterior or shower installations where contact area shall be 100 percent when no less than three tiles or tile assemblies are removed for inspection. The 80 percent coverage shall be sufficiently distributed to give full support to the tile with particular attention to this support under all corners of the tile.

(3) Obtain 100 percent contact with tile units by trowelling a layer of mortar on the back of each tile prior to placing on the combed mortar bed.

][3.3.7 Chemical-Resistant Water-Cleanable Tile-Setting and Grouting Epoxy

Chemical-resistant, water-cleanable, tile setting and grouting epoxy:
Provide for stair treads, wall base, trim and other miscellaneous terrazzo units.

3.3.7.1 Mixing Chemical Resistant Water Cleanable Tile-Setting and Grouting Epoxy

- a. Store epoxy material at a temperature of 20 to 32 C for a period of 48 hours prior to use.
- b. Epoxies are supplied as two or more separate parts that shall be mixed together on the job at the time of use. Separate parts shall be proportioned exactly and mixed thoroughly.
- c. Follow the manufacturer's directions for proportioning and mixing of the epoxy, including pre-mixing of separate parts before combination, when required.

3.3.7.2 Installation of Tile with Epoxy

- a. Tile shall not be set in epoxy on wet surface unless specifically

authorized by the epoxy manufacturer.

- b. Apply epoxy with flat side of trowel to completely cover substrate. Using a notched trowel of type recommended by epoxy manufacturer, comb epoxy to obtain an even setting bed without scraping substrate.
- c. Apply only amount of epoxy that can be covered with tile before initial set. Temperature affects set times. Test sections should be tried before tiling large areas.
- d. Spacing mix shall not be used between tiles.
- e. Comply with epoxy manufacturer's written directions.
- f. Unless otherwise specified, press tile firmly into position and beat-in or vibrate to obtain at least 80 percent coverage of epoxy on the back of each tile.
- g. Use spacers when necessary on vertical backings to maintain even joint width.
- h. Prior to installing tile, remove epoxy from the substrate that has taken an initial set and replace with fresh epoxy.
- i. Immediately remove any epoxy from the face of tile.

3.3.7.3 Grouting of Tile with Epoxy

- a. Before grouting, all tiles must be firmly set, all paper and glue removed from face of mounted tiles, and all spacers, strings, ropes and pegs removed.
- b. Grouting shall be done in accordance with manufacturer's written instructions.
- c. Allow 16 hours curing time for tile before grouting tile set in epoxy.
- d. Force epoxy into joints using a hard rubber grouting trowel or other suitable tool recommended by epoxy manufacturer. Use sufficient pressure and flow epoxy in progressively to avoid air pockets or voids.
- e. Remove all excess epoxy from surface of tile with a squeegee or rubber trowel before it loses its plasticity or begins to set. Immediately perform final clean-up in accordance with epoxy manufacturer's directions.
- f. Epoxy shall not be allowed to harden on face of tile.

3.3.8 Curing

Cure tiled areas in accordance with the requirements of UNI EN 197-1, and

UNI EN 12004. Cover floors with 1.45 kg/sq m natural kraft paper with joints overlapping at least 100 mm and tape-sealed or held down with planks or other weights. Allow to damp cure for at least 72 hours before permitting foot traffic on tiled floor.

[3.3.8.1 Curing of Tile with Epoxy Grout

Keep installation at a temperature of 18 to 29 deg. C during the first 8 hours of cure. Shade area completely from sun during this period.

]3.4 INSTALLATION TOLERANCES

3.4.1 Variation in Surface Plane of Flooring

Do not exceed 3 mm in 3 m from level or slope indicated when tested with a 3 meter straightedge.

3.4.2 Variation in Plane between Adjacent Units (Lipping)

Do not exceed 1.5 mm difference between faces of adjacent units as measured from a straightedge parallel to the finished surface.

3.4.3 Variation in Joint Width

Do not vary joint thickness more than 1.5 mm or 1/4 of nominal joint width, whichever is less.

3.5 INSTALLATION OF PRECAST STAIR TREADS

Tread [and riser] units shall be installed in accordance with the manufacturer's approved installation instructions, with Portland cement setting bed. Install treads [and risers] symmetrical about centerline of stairway. Joints shall be tight, inconspicuous as possible, and in alignment. Tread units shall be cut to fit snugly at vertical surfaces and all joints sealed with [grout] [joint sealant]. Remove spots or smears of [grout] [sealant] immediately. Entire surface of finished tread [and riser] units shall be smooth and straight. Damaged tread [and riser] units shall be removed and replaced.

3.6 INSTALLATION OF PRECAST BASE UNITS

Base units shall be installed in accordance with the manufacturer's approved installation instructions, with [Portland cement] [epoxy] setting bed. Joints shall be tight, inconspicuous as possible, and in alignment. Base units shall be cut to fit snugly at vertical surfaces and all joints sealed with [grout] [joint sealant]. Remove spots or smears of [grout] [sealant] immediately. Entire surface of finished base units shall be smooth and straight. Damaged base units shall be removed and replaced.

3.7 CLEANING AND SEALING

3.7.1 Cleaning

Clean soiled surfaces with cleaning solution as recommended by

fabricator/supplier.

- a. At all stages of the erection process, the terrazzo tile must be kept clean of setting materials, sealants and dirt. Remove excess sealant upon completion of work.
- b. After completing installation of terrazzo tile, clean tile units to remove all dirt and stains. No wire brushes, harsh abrasives, or acids which might harm the terrazzo tile shall be used. Use non-metallic tools in cleaning operations.

3.7.2 Floor Tile Polishing

Apply top-dressing paste wax as recommended by fabricator to prevent staining and water spotting. Clean and polish all exposed tile surfaces. Provide Contracting Officer with specific maintenance instructions and procedures to be utilized during the progress of the work and after completion of the work. Include cleaning materials that will prevent staining and water spotting to the greatest extent possible. Include frequency of normal maintenance to be utilized, and other special conditions to prevent staining of material.

3.8 PROTECTION

Keep installation at a temperature of 18 to 29 deg. C during the first 8 hours of cure. Shade area completely from sun during this period. Before, during and after grouting, the area must be kept clean, dry and free from foreign materials such as construction, dirt, cement, plaster and other contaminants which could interfere with the setting and curing of the grout. Cover finished terrazzo tile floor surfaces with clean, 1.45 kg/sq m natural kraft paper before permitting foot traffic. Place board walkways on floors that are to be continuously used as passageways by workers. Protect tiled corners, external angles, with board corner strips in areas used as passageways by workers.[Cover finished terrazzo stair treads with kraft paper.]

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