A close-up, high-angle photograph of a waving American flag. The stars are visible in the upper left, and the red, white, and blue stripes are prominent across the rest of the frame, creating a sense of motion and patriotism.

# 2003-2004 Handbook for Ceramic Tile Installation

41<sup>st</sup> Edition



*The Industry's Guide for  
Installation Practices*

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14 New Installation Methods

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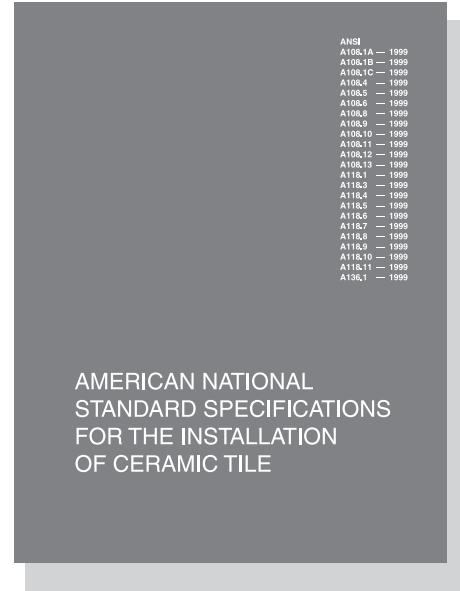
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Tile Council of America wishes to acknowledge the recommendations of the conferees and guests listed above in the preparation of this edition of the Handbook for Ceramic Tile Installation.

## 1999 American National Standard Specifications for the Installation of Ceramic Tile

The ANSI A108 Committee on Ceramic Tile has revised the A108...,A118...,and A136 designations for the installation of ceramic tile. In addition to revising existing specifications, the committee has approved 1) a new specification for the installation of ceramic tile with EGP (Exterior Glue Plywood) latex-portland cement mortar; 2) a new specification for the installation of load bearing, bonded waterproof membranes for thin-set ceramic tile and dimension stone; 3) new specifications for standard cement grouts and polymer modified cement grouts; and 4) a new specification for EGP (Exterior Glue Plywood) latex-portland cement mortar. Contact Tile Council of America for a publication containing all revisions.



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# 2003-2004

## Handbook for Ceramic Tile Installation

The Tile Council of America provides this 2003 HANDBOOK FOR CERAMIC TILE INSTALLATION as a guide to assist in clarifying and standardizing installation specifications for ceramic tile. The Handbook is revised on a regular basis to present architects and specification writers with current, accurate data on ceramic tile installation. The quick-reference details and outlines in the Handbook cover most installation methods and conditions.

The information presented in this Handbook represents a consensus of the national and regional organizations listed on page 2. Each installation recommendation requires a properly designed, constructed, and prepared substructure using materials and construction techniques that meet nationally recognized material and construction standards.

Some installation methods and materials are not recognized and may not be suitable in some geographical areas because of local trade practices, climatic conditions, or construction methods. Therefore, while every effort has been made to produce accurate guidelines, they should be used only with the independent approval of technically qualified persons.

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Note: Revisions in the 2003 Handbook are noted with a "03" in the left margin or column.

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# SPECIFICATIONS

## ANSI Specifications

American National Standards Institute  
11 W. 42nd Street  
New York, N.Y. 10036

## INSTALLATION SPECIFICATIONS

- A108.1A-1999 Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar
- A108.1B-1999 Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar
- A108.1C-1999 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
- A108.4-1999 Installation of Ceramic Tile with Organic Adhesives or Water Cleanable
- A108.5-1999 Tile-Setting Epoxy Adhesive  
Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
- A108.6-1999 Installation of Ceramic Tile with Chemical Resistant, Water Cleanable  
Tile-Setting and -Grouting Epoxy
- A108.8-1999 Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout
- A108.9-1999 Installation of Ceramic Tile with Modified Epoxy Emulsion  
Mortar/Grout
- A108.10-1999 Installation of Grout in Tilework
- A108.11-1999 Interior Installation of Cementitious Backer Units
- A108.12-1999 Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar
- A108.13-1999 Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone

## MATERIAL SPECIFICATIONS

- A118.1-1999 Dry-Set Portland Cement Mortar
- A118.3-1999 Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive
- A118.4-1999 Latex-Portland Cement Mortar
- A118.5-1999 Chemical Resistant Furan Mortars and Grouts for Tile Installation
- A118.6-1999 Standard Cement Grouts for Tile Installation
- A118.7-1999 Polymer Modified Tile Grouts for Tile Installation
- A118.8-1999 Modified Epoxy Emulsion Mortar/Grout
- A118.9-1999 Cementitious Backer Units
- A118.10-1999 Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation
- A118.11-1999 EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar
- A136.1-1999 Organic Adhesives for Installation of Ceramic Tile
- A137.1-1988 Ceramic Tile

## SAFETY

- A10.20-1988 Safety Requirements for Ceramic Tile, Terrazzo, and Marble Work

## Gypsum Association

- 810 First St. NE, #510  
Washington, D.C. 20002
- GA-216-2000 Specifications for the Application and Finishing of Gypsum Board
- GA-230-91 Vapor Retarders Over Water-Resistant Gypsum Backing Board

## National Fire Protection Association

- NFPA  
Batterymarch Park  
Quincy, MA 02269-9101
- 99-1996 Standard for Health Care Facilities

## ASTM Specifications

American Society for Testing and Materials  
100 Barr Harbor Drive  
West Conshohocken, PA 19428-2959

## MATERIAL SPECIFICATIONS/TEST METHODS

- A 653/ Steel Sheet, Zinc-Coated  
A 653M-02A (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- C 36/C36M-01 Gypsum Wallboard
- C 144-02 Aggregate for Masonry Mortar
- C 150-02 Portland Cement
- C 206-84 Finishing Hydrated Lime
- C 207-91 Hydrated Lime for Masonry Purposes
- C 627-93 Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
- C 630/ Water-Resistant Gypsum backing Board
- C 630M-01 Nonstructural Steel Framing Members
- C 920-02 Elastomeric Joint Sealants
- C 1178/ Glass Mat Water-Resistant Gypsum Backing Board
- C 1178M-01 Fiber-Reinforced Gypsum Panels
- C 1288-99 Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets
- C 1325-99 Fiber-Mat Reinforced Non-Asbestos Cement Interior Substrate Sheets
- E 90-02 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- E 119-00a Fire Tests of Building Construction and Materials
- E 336-97 Measurement of Airborne Sound Insulation
- E 413-87 Standard Classification for Rating Sound Insulation
- E 492-90 Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine

All standards and specifications are revised or updated periodically. The current status of any of the above can be confirmed by writing the particular authority.

# MATERIALS FOR SETTING CERAMIC TILE\*

## Introduction:

The following are the most widely used materials for setting ceramic tile. Each possesses specific qualities that make it suitable for installing tile over certain backings or under a given set of conditions.

The conventional portland cement mortar method, including the one-coat method, is the only recognized thick-bed method. All others are thin-bed methods and are covered by existing trade jurisdictional decisions of record. Dry-set mortars and latex-portland cement mortars can be used in lieu of neat cement as a 1/16"-thick bond coat to bond ceramic tile to a portland cement mortar bed that is still workable. They can also be used on a cured portland cement mortar bed (minimum 3/32" thickness after beat-in) according to [ANSI A108.1B](#). A neat cement bond coat can be used only when the portland cement mortar is still workable ([A108.1A](#)). Absorptive ceramic tile must be soaked before setting on a mortar bed that is still workable when using a neat portland cement bond coat. Under normal job conditions, a minimum of 20 hours cure at 70°F is adequate, but longer mortar bed cures of up to 10 days are desirable. When epoxy mortars, epoxy adhesives, furan, or organic adhesives are used, the mortar bed must be dry.

To insure practical and satisfactory installations, the cement mortar bed to receive the tile, whether left workable or allowed to harden, is to be applied by the tile contractor who must establish all the finished dimensions at the time this bed is applied.

Non-cement setting materials such as epoxies and furans offer properties not possible with cement-based mortar; e.g., chemical resistance, quick setting times. However, special skills on the part of the tile setter are required. *The cost of these materials can be appreciably greater than cement-based mortars.*

## Portland Cement Mortar:

**A mixture of portland cement and sand, roughly in proportions of 1:5 for floors; and of portland cement, sand, and lime, in proportions of 1:5:1/2 to 1:7:1 for walls.**

Portland cement mortar is suitable for most surfaces and ordinary types of installation. A mortar bed, up to 2" in thickness, facilitates accurate slopes or planes in the finished tilework on floors and walls.

The mortar bed can be modified with the inclusion of a latex polymer per the manufacturer's directions as part or all of the liquid portion of the mixture to enhance certain performance properties.

There are two equivalent methods recognized for installing ceramic tile with a portland cement mortar bed on walls, ceilings, and floors. They are: (1) the method covered by [ANSI A108.1A](#), which requires that the tile be set on a mortar bed that is still workable, and (2) the method covered by [ANSI A108.1B](#), which requires that the tile be set on a cured mortar bed with dry-set or latex-portland cement mortar. Absorptive ceramic tile must be soaked before setting on a mortar bed that is still workable when using a neat portland cement bond coat.

Portland cement mortars can be: bonded to concrete floors; backed with membranes and reinforced with wire mesh or metal lath; or applied on metal lath over open studding on walls. They are structurally strong, are not affected by prolonged contact with water, and can be used to plumb and square surfaces installed by others.

Suitable backings, when properly prepared are: brick or cement masonry, concrete, wood or steel stud frame, rough wood floors, plywood floors, foam insulation board, gypsum board, and gypsum plaster. The one-coat method may be used over masonry, plaster, or other solid backing that provides firm anchorage for metal lath.

Complete installation and material specifications are contained in [ANSI A108.1A](#), [A108.1B](#), and [A108.1C](#).

*See Pg. 9 note for mortar bed weight.*

## Dry-Set Mortar:

**A mixture of portland cement with sand and additives imparting water retentivity which is used as a bond coat for setting tile.**

Dry-set mortar is suitable for thin-set installations of ceramic tile over a variety of surfaces. It is used in one layer, as thin as 3/32" after tile are beat in, has excellent water and impact resistance, is water-cleanable, non-flammable, good for exterior work, and does not require soaking of tile.

Dry-set mortar is available as a factory-sanded mortar to which only water need be added. Cured dry-set mortar is not affected by prolonged contact with water, but does not form a water barrier. It is not a setting bed and is not intended to be used in truing or leveling the work of others.

Suitable backings, when properly prepared, include plumb and true masonry, concrete, gypsum board, cementitious backer units, cured portland cement mortar beds, brick, ceramic tile, and dimension stone.

Complete installation and material specifications are contained in [ANSI A108.5](#) and [ANSI A118.1](#).

*Note: The term "thin-set" is used to describe the method of installing tile with a bonding material usually 3/32" to 1/8" in thickness. In certain geographical areas, the term thin-set may be used interchangeably for "dry-set" portland cement mortar.*

## Latex-Portland Cement Mortar:

**A mixture of portland cement, sand, and special latex additive which is used as a bond coat for setting tile.**

The uses of latex-portland cement mortar are similar to those of dry-set mortar. Latex additives for use in thin-set portland cement tile setting mortars are designed to improve adhesion, reduce water absorption, and provide greater bond strength and resistance to shock and impact. These additives allow some latitude in time, working conditions, and temperatures. Therefore, latex-portland cement mortar is required for the installation of large-unit porcelain-bodied tile.

When latex-portland cement mortar is used to install ceramic tile in an area that may not thoroughly dry out in use (e.g., swimming pools and gang showers, etc.), it is recommended that the completed installation be allowed to *dry out thoroughly* before exposure to water. This drying period can fluctuate from 14 to over 60 days depending upon the geographical location, the climatic conditions, and whether the installation is interior or exterior. Since latices vary considerably, the directions of the latex manufacturer must be followed explicitly.

Complete installation and material specifications are contained in [ANSI A108.5](#) and [ANSI A118.4](#).

\*The Marble Institute of America, Inc., references this Handbook for the installation of certain dimensional stone. (See Dimensional Stone Design Manual.)

## EGP (Exterior Glue Plywood) Latex Portland Cement Mortar:

A modified portland cement dry-set mortar to which a polymer has been incorporated in latex form or in a powder form for the bonding of ceramic tile to exterior glue plywood in interior dry or limited water exposure areas only. When added in latex form it is added as a replacement for part or all of the gauging water in accordance with the manufacturer's instructions.

Complete installation and material specifications are contained in [ANSI A108.12](#) and [ANSI A118.11](#).

## Epoxy Mortar:

### **A mortar system designed for chemical resistance employing epoxy resin and epoxy hardener portions.**

Epoxy mortar is suitable for thin-set installations of ceramic tile where chemical resistance of floors, high bond strength, and high impact resistance are important considerations. High-temperature-resistant formulas are also available. Acceptable sub-floors, when properly prepared, include concrete, wood and plywood, steel plate, and ceramic tile. Application is made in one thin layer. Pot life, adhesion, water-cleanability before cure, and chemical resistance vary with manufacturer.

Complete installation and material specifications are contained in [ANSI A108.6](#) and [ANSI A118.3](#).

Epoxy grout is also available. See section on grouts.

## Modified Epoxy Emulsion Mortars:

### **A mortar system employing emulsified epoxy resins and hardeners with portland cement and silica sand.**

Modified epoxy emulsion mortars are formulated for thin-set installations of ceramic tile on floors and walls, interior and exterior. Their features include high bond strength, ease of application, little or no shrinkage, and economical epoxy application. **They are not designed for chemical resistance.**

Recommended uses include residential floors, over substrates such as cementitious backer units and concrete. Where complete and firm support under the tiles is mandatory, 95% coverage is required. This material is recommended by most manufacturers as a bond coat or setting material. Some also recommend it for grouting.

Complete installation and material specifications are contained in [ANSI A108.9](#) and [ANSI A118.8](#).

## Furan Resin Mortar:

### **A mortar system designed for chemical resistance consisting of furan resin and furan hardener portions.**

Furan mortar is suitable for thin-set installations of ceramic tile where chemical resistance of floors is an important consideration. Acceptable sub-floors, when properly prepared, include concrete, wood and plywood, steel plate, and ceramic tile.

Complete installation and material specifications are contained in [ANSI IA108.8](#) and [ANSI A118.5](#).

Furan grouts are also available. See section on grouts.

## Epoxy Adhesive:

### **An adhesive system employing epoxy resin and epoxy hardener portions.**

Epoxy adhesive is formulated for thin-setting of tile on floors, walls, and counters. It is designed primarily for high bond strength and ease of application and not for optimum chemical resistance. However, its chemical and solvent resistance tends to be better than that of organic adhesives.

Complete installation and material specifications are contained in [ANSI A108.4](#) and [ANSI A118.3](#).

## Organic Adhesive:

### **A prepared organic material for interior use only, ready to use with no further addition of liquid or powder, which cures or sets by evaporation.**

Organic adhesives are suitable for thin-setting tile on floors, walls, and countertops, where surfaces are appropriate and properly prepared—in accordance with adhesive manufacturers' directions.

Suitably prepared backings for dry areas include gypsum board, gypsum plaster, portland cement mortar, formed concrete, and masonry.

Suitably prepared backings for wet areas include portland cement mortar, formed concrete, and masonry.

Adhesives are applied in one thin layer with a trowel, first using the flat edge for continuous coverage and then the notched edge for uniform thickness. Where leveling or truing is required, an underlayment is used.

Adhesives eliminate soaking of tile. They are not suitable for swimming pools or exteriors. They supply some flexibility to the tile facing. Bond strength varies greatly among the numerous brands available. Solvents in some adhesives are irritating to some persons, and some adhesives are flammable.

Adherence to [ANSI A136.1](#) is the minimum criterion for selecting an organic adhesive. Complete installation specifications are contained in [ANSI A108.4](#). Organic adhesives are not recommended in areas exposed to temperatures exceeding 140°F. Some backing materials may require lower temperatures.

# MATERIALS FOR GROUTING CERAMIC TILE

## Introduction:

Grouting materials for ceramic tile are available in many forms to meet the requirements of the different kinds of tile and types of exposures. Portland cement is the base for most grouts and is modified to provide specific qualities such as whiteness, mildew resistance, uniformity, hardness, flexibility and water retentivity. Complete installation and material specifications are contained in [ANSI A108.10](#), [ANSI A118.6](#), and [A118.7](#). Non-cement based grouts such as epoxies, furans, and silicone rubber offer properties not possible with cement grouts. However, special skills on the part of the tile setter are required. *These materials can be appreciably greater in cost than cement-based grouts.*

## Sand-Portland Cement Grout:

An on-the-job mixture of 1 part portland cement to 1 part fine graded clean sand (ASTM C-144) is used for joints up to 1/8-inch wide; 1:2 for joints up to 1/2-inch wide; and 1:3 for joints over 1/2-inch wide. Up to 1/5 part lime may be added.

Sand-portland cement grout is used with ceramic mosaic, quarry, and paver tiles on floors and walls. Damp curing is necessary.

## Standard Cement Grout:

**Standard Sanded Cement Grout:** A factory prepared mixture of cement, graded sand, and other ingredients to produce a water-resistant, dense, uniformly colored material, meant for joints of 1/8" width or greater.

**Standard Unsanded Cement Grout:** A factory prepared mixture of cement and additive that provide water retentivity, meant for joints 1/8" width or less.

Grouts in this category are suitable for grouting walls and floors subject to ordinary use.

## Polymer Modified Tile Grout:

**Polymer Modified Unsanded Tile Grout:** A factory prepared mixture of cement and other ingredients, including a redispersable, latex/polymer powder (to which only water is added at the jobsite) or a liquid latex admixture. When added in a latex form it is added as a replacement for part or all of the mixing water. These grouts are designed for installation in joints of 1/8" wide or less.

**Polymer Modified Sanded Tile Grout:** A factory prepared mixture of cement, sand, and other ingredients, including a redispersable, latex/polymer powder (to which only water is added at the jobsite) or a liquid latex admixture. When added in a latex form it is added as a replacement for part or all of the mixing water. These grouts are designed for installation in joints 1/8" wide or greater. The maximum allowable joint width is designated by the grout manufacturer.

Grouts in this category provide improved characteristics such as increased color stability, stain resistance, bond strengths, flexural strengths, and lower water absorption to resist frost damage.

## Epoxy Grout for Quarry Tile, Packing House Tile, Ceramic Mosaic Tile, and Paver Tile:

A grout system employing epoxy resin and hardener portions, often containing coarse silica filler, especially formulated for industrial and commercial installations where chemical resistance is of paramount importance. High temperature, chemical-resistant formulas are also available.

These grouts also provide high bond strength and impact resistance. They impart structural qualities to the tile when used both as a mortar and grout, especially over wood subfloors. Their use involves extra costs and special installation skills when compared to portland cement grouts.

Architects should select the type of epoxy grout applicable to the specified exposure. Average joint width less than 1/4" with tile thicker than 1/2" may not allow full penetration of epoxy during grouting operation. Consult epoxy manufacturer. Complete installation and material specifications are contained in [ANSI A108.6](#) and [ANSI A118.3](#).

## Furan Resin Grout for Quarry Tile, Packing House Tile, and Paver Tile:

A grout system consisting of furan resin and hardener portions.

Furan grout is used in industrial and commercial areas requiring chemical resistance. Use of this grout involves extra costs, including waxed tile surface and special installation skills, when compared to portland cement grouts. Architects should select the type of furan grout applicable to the specified chemical and temperature exposure.

Complete installation and material specifications are contained in [ANSI A108.8](#) and [ANSI A118.5](#).

# OTHER INSTALLATION MATERIALS AND METHODS

Proprietary installation specifications and instructions for materials or methods not covered by the recommendations in the Handbook or the specifications listed on [page 4](#) should be obtained from the manufacturers.

## Movement Joints:

**Definitions:** The American Concrete Institute has defined the following joints:

**Construction joint**—The surface where two successive placements of concrete meet, across which it may be desirable to achieve bond and through which reinforcement may be continuous.

**Contraction joint**—Formed, sawed, or tooled groove in a concrete structure to create a weakened plane and regulate the location of cracking resulting from the dimensional change of different parts of the structure.

**Control joint**—See contraction joint.

**Expansion joint**—(1) A separation provided between adjoining parts of a structure to allow movement where expansion is likely to exceed contraction; (2) a separation between pavement slabs on grade, filled with a compressible filler material; (3) an isolation joint intended to allow independent movement between adjoining parts.

**Isolation joint**—A separation between adjoining parts of a concrete structure, usually a vertical plane, at a designated location such as to interfere least with performance of the structure, yet such as to allow relative movement in three directions and avoid formation of cracks elsewhere in the concrete and through which all or part of the bonded reinforcement is interrupted.

**Design:** movement joints are essential for the success of most tile installations. Various methods require proper design and location of movement joints, as shown in Method [EJ171](#) on page 44.

Because of the limitless conditions and structural systems on which tile can be installed, the architect or designer shall show locations and details of movement joints on project drawings.

It is not the intent of this guide to make movement joint recommendations for a specific project. Architects must specify movement joints and show location and details on drawings.

**Materials:** Movement joint sealants include silicone, urethane, and polysulfide. Generally, urethane sealants are recommended for movement joints on exterior vertical surfaces and for movement joints on both exterior and interior horizontal tile surfaces. Because of their abrasion and penetration resistance, urethane sealants are recommended for movement joints in tiled traffic areas.

Silicone sealants may be used in movement joints on both exterior and interior vertical tile surfaces. One-part mildew-resistant silicone sealants are formulated with fungicide for sealing interior joints in ceramic tile showers, around tubs, sinks, and plumbing fixtures.

Sealants are available in both single- and multi-component formulations. Either formulation is generally suitable for movement joints in tilework. Single-component sealants are furnished in pre-packed cartridges, or other forms requiring no job-site mixing. Multi-component sealants require job-site mixing, but cure faster than single-component counterparts, making them advantageous for traffic areas.

Sealants should comply with ASTM C920 as described on [page 44](#).

## SPECIAL PRODUCTS

### Mounted Tile:

#### Tile assembled into units or sheets by suitable material to facilitate handling and installation.

Tile may be face-mounted, back-mounted, or edge-mounted. Face-mounted tile assemblies may have paper or other suitable material applied to the face of each tile, usually by water-soluble adhesives so that it can be easily removed after installation, but prior to grouting of the joints. Back-mounted tile assemblies may have perforated paper, fiber mesh, resin, or other suitable material bonded to the back and/or edges of each tile, which becomes an integral part of the tile installation. Back-mounted and edge-mounted tile assemblies shall have a sufficient exposure of tile and joints surrounding each tile to comply with bond strength requirements. Tile manufacturers must specify whether back-mounted and edge-mounted tile assemblies are suitable for installation in swimming pools, on exteriors, and/or in wet areas.

### Thresholds:

By acting as a transitional piece between two different finished floor levels, thresholds permit the use of the conventional mortar method in rooms

where it would not otherwise be possible. They also can be used with thin-set methods.

### Special Purpose Tile:

#### Special purpose tile are either glazed or unglazed and are designed to meet special physical requirements or to have special appearance characteristics.

They are not required to meet all requirements of ANSI A137.1. Consult the manufacturer's specifications. They are sometimes manufactured to create an architectural effect toward the casual. These tiles vary in size, one tile from the other. Variations in plane may be expected. Larger tiles will usually require greater variations in joint width.

### Cementitious Backer Unit (CBU):

A backing and underlayment designed for use with ceramic tile in wet or dry areas. Available in various lengths, this material can be applied over studs and subflooring. Ceramic tile can be bonded to it with dry-set, latex-portland cement, or modified epoxy mortars. Complete interior installation and material specifications are contained in [ANSI A108.11](#) and [ANSI A118.9](#) or ASTM C-1325.

#### 03 Coated Glass Mat Water-Resistant Gypsum Backer Board:

A backer board conforming to ASTM C-1178. Designed for use on floors, walls, and ceilings in wet or dry areas, this material is applied directly to wood or metal studs. Follow the manufacturer's instructions for installation and joint finishing. Ceramic tile can be bonded to it with dry-set or latex-portland cement mortar or organic adhesive by following the backer board manufacturer's instructions.

### Fiber-Cement Underlays:

A dispersed fiber-reinforced cement backer and underlayment designed for use with ceramic tile in wet or dry areas. Available in various lengths, widths, and thicknesses, this material can be applied over studs on walls and over code-compliant subflooring. Ceramic tile can be bonded to it with latex-portland cement mortar or organic adhesives. General interior installation and material specifications are contained in [ANSI A108.11](#) and ASTM C-1288. Consult the manufacturer's written literature for specific application details.

#### 03 Fiber-Reinforced Gypsum Panel Backer Board/Underlayment:

A backer board/underlayment conforming to ASTM C-1278. Designed for use on floors, walls and ceilings in dry areas, this board is applied directly to wood or metal wall studs or over wood sub-

floors. Follow the manufacturer's instructions for installation and joint finishing. Ceramic tile can be bonded to it with dry-set, latex-portland cement mortar, organic adhesive, or epoxy by following the manufacturer's instructions.

**Note:** The Handbook Conference acknowledged other backer units that are on the market for use as a backing and underlayment with ceramic tile. However, the Conferees felt there was insufficient experience and test data available to consider specific comment as to their use. Follow manufacturer's recommendations.

### Exterior Ceramic Tile Panels:

To reduce construction time, these prefabricated, lightweight, custom-built panels are shipped to the construction site and attached to the building by welding or mechanical fasteners.

Panel size, shape, and thickness are determined by building design. Size, spacing, and gauge of the steel stud framework is also dependent on design but may be related to the climatic conditions of the building location.

Manufacturers of tile, mortars, and backing materials and regional contractor associations can supply guide specifications for panel construction. However, the ceramic tile installation is usually done in accordance with [Method W201](#) (from the membrane out) or [Method W244](#) (bonding directly to solid backing attached to the studs). Tile to be installed per ANSI specifications.

### Waterproof Membranes:

In addition to built-up membranes, single-ply membranes, and non-metallic and lead or copper waterproofing, there are also waterproof membranes available for use with both vertical and horizontal thin-bed ([ANSI A118.10](#)) and thick-bed installations of ceramic tile which may be installed by tile trades.

Among these are: single- or multi-component membranes applied in liquid/paste form, which cure into continuous membranes; and membranes applied in flexible sheet form. Some of these membranes have integral reinforcing fabrics for tensile strength and minor crack-bridging properties. Others are designed to be used as a combination waterproofing and setting material for ceramic tile.

Depending upon the type of waterproofing membrane, manufacturers may require that tile products be installed on a reinforced portland cement mortar bed applied over the membrane; directly on the membrane with a thin-set application of dry-set or latex-portland cement mortar; or thin-set to the membrane using a troweled application of the waterproofing membrane product.

### **03 Crack Isolation Membrane:**

Crack isolation membranes for thin-set ceramic tile and dimensional stone installations act to isolate the tile or stone from minor in-plane substrate cracking. Membranes covered by this definition are bonded to a variety of manufacturer-approved substrates covered by ANSI specifications. In some cases the trowel-applied products can be used as the adhesive for the ceramic tile or dimensional stone as well. Other products within the scope of this category are allowed to cure or are applied as sheet goods and are then used as the substrate for the application of ceramic tiles and dimensional stone by traditional methods and materials.

### **03 Integrated Bonding Flange:**

An integrated bonding flange is designed to provide a large contact area at the top of the drain assembly, which will allow ample surface adhesion to thin, load bearing, bondable waterproof membranes. Drain assemblies of this type are constructed in such a way that the waterproof membrane is bonded to the top of the substrate rather than below it.

### **Uncoupling Systems**

A system that separates the finished surface from the substrate to allow the independent movement between the two and prevent the transfer of stresses to the tiled surface.

## **NOTES**

### **Subsurface Tolerance:**

Thin-set tile installations have a specified subsurface tolerance, for instance 1/4" in 10', to conform with the ANSI specifications. Should the architect/designer require a more stringent tolerance (e.g., 1/8" in 10'), the subsurface specification must reflect that tolerance, or the tile specification must include a specific and separate requirement to bring the 1/4" subsurface tolerance into compliance with the 1/8" tolerance desired.

### **Lighting:**

#### **Interior Walls and Floors:**

Use of wall-washer and cove-type lighting, where the lights are located either at the wall/ceiling interface, or mounted directly on the wall, are popular techniques of producing dramatic room lighting effects. When proper backing surfaces, installation materials and methods, and location of light fixtures are not carefully coordinated, these lighting techniques may produce shadows and undesirable effects with ceramic tiles. Similar shadows are created from side lighting interior walls and floors when light shines at that angle through windows and doors.

#### **Exterior:**

When natural or artificial light shines on exterior walls and floors at a flat angle almost parallel to tile surfaces, normal and acceptable inconsistencies in the tilework are highlighted by shadows that exaggerate these conditions.

#### **Wet Area Definition:**

**03** Tile surfaces that are either soaked, saturated, or regularly and frequently subjected to moisture or liquids (usually water), such as gang showers, tub enclosures, showers, laundries, saunas, steam rooms, swimming pools, hot tubs, and exterior areas.

#### **Mortar Bed Weight:**

Typically, a 1"- thick mortar bed will weigh 12 lbs. per square foot.

### **Bonding Large-Format Tile for Coverage and Support:**

The following installation techniques are required to ensure proper coverage of the bonding surface of larger tiles and provide full support of edges and corners. Large tiles are generally considered to be 8" x 8" and greater. Select a notched trowel sized to facilitate the proper coverage. Key the mortar into the substrate with the flat side of the trowel. Comb with the notched side of the trowel in ONE DIRECTION. Firmly press tiles into the mortar and move them perpendicularly ACROSS the ridges, forward and back approximately 1/8" to 1/4", to flatten the ridges and fill the valleys. This method can produce maximum coverage, with the corners and edges fully supported, without backbuttering or beat-in. Periodically remove and check a tile to assure proper coverage is being attained.

#### **Coefficient of Friction:**

When coefficient of friction (COF) data are required for a specific project, testing shall conform to ASTM C-1028. However, because **area of use and maintenance by the owner of installed tile directly affect coefficient of friction**, the COF of the manufactured product shall be as agreed upon by manufacturer and purchaser.

#### **Lippage:**

Lippage is a condition where one edge of a tile is higher than an adjacent tile, giving the finished surface an uneven appearance. This condition is inherent in all installation methods and may also be unavoidable due to the tile tolerances, in accordance with ANSI A137.1.

#### **Protecting New Tilework:**

To avoid damage to finished tilework, schedule floor installations to begin only after all structural work, building enclosure, and overhead finishing work, such as ceilings, painting, mechanical, and electrical work, are completed. Keep all traffic off of finished tile floors until they have fully cured; or provide up to 3/4"-thick plywood protection over kraft paper to protect floors before installation materials have fully cured.

Continued on page 10.

### **\*CAUTION**

### **Substrate Limitations:**

The performance of a properly installed thin-set ceramic tile installation is dependent upon the durability and dimensional stability of the substrate to which it is bonded. The user is cautioned that certain substrate materials used in wet areas are subject to deterioration from moisture penetration. (Reference ANSI A108, AN-2.4)

Therefore, while every effort has been made to produce accurate guidelines, they should be used only with the independent approval of technically qualified persons.

**Maintenance:**

All tile installations (especially exterior installations, which include the movement joint sealant) require periodic inspection and maintenance by the owner. Consult material manufacturers and maintenance product manufacturers for recommended procedures.

**03 CAUTION** – Wood-based panels such as particle board, composite panels (veneer faces bonded to reconstituted wood cores), non-veneer panels (wafer board, oriented strand board, and other similar boards), lauan plywood, and softwood plywood expand and contract with changes in moisture content and are not recommended as backing

materials for direct bonding of ceramic tile. Plywood, however, manufactured with fully waterproof adhesive and with an exposure durability rating of Exposure 1 or Exterior may be used on residential horizontal surfaces when installed in accordance to ANSI Specifications for the Installation of Ceramic Tile Section AN-3.4.

## WALL TILING INSTALLATION GUIDE

<b>SERVICE REQUIREMENTS</b>	<b>WALL TYPE (numbers refer to Handbook method numbers)</b>					
	<b>Masonry or Concrete</b>	<b>Page</b>	<b>Wood Studs</b>	<b>Page</b>	<b>Metal Studs</b>	<b>Page</b>
Commercial Construction—Dry or limited water exposure: dairies, breweries, kitchens	W202 W221* W223	26 27 27	W223 W231 W243 W244 W246	27 28 29 29 30	W223 W241 W242 W243, W244 W246	27 28 29 29 30
Commercial Construction—Wet: gang showers, tubs, showers, laundries	W202 W211 W221*	26 28 27	W231 W244 B411 B414 W246	28 29 31 33 30	W241 W244 B411 B414, B415 B425 B426 W246	28 29 31 33 33 34 30
Residential & Light Construction—Dry or limited water exposure: kitchens and toilet rooms, commercial dry area interiors and decoration	W221* W223	27 27	W222* W223 W243 W244 W245 W246	27 27 29 29 30 30	W222* W242 W243 W244 W245 W246	27 29 29 29 30 30
Residential & Light Construction—Wet: tub enclosures and showers	W202 W211 W223	26 28 27	W222* W223 W244 W246 B412, B413 B415 B419, B420 B421, B422 B425, B426	27 27 29 30 32 33 32, 34 34, 35 33, 34	W222* W241 W244 W246 B412, B413 B415 B419, B420 B421, B422 B425, B426	27 28 29 30 32 33 32, 34 34, 35 33, 34
Exterior (See notes on page 27.)	W201 W202	26 26	W231	28	W241 (Refer to page 28.)	

\*Use these details where there may be dimensional instability and possible cracks developing in, or foreign coating (paint, etc.) on, the structural wall since these details include a cleavage membrane (15 lb. felt or polyethylene) between the wall surface and tile installation.

# GROUT GUIDE

These guidelines cannot address every installation. The type and size of tile, service level, climatic conditions, tile spacing, and individual manufacturer's recommendations are all factors that should be considered when selecting the proper grout.

	Grouts Containing Portland Cement							Others		
	W = Wall Use F = Floor Use	Jobsite Mix (Sanded)	Standard Unsanded Cement Grout <b>A118.6</b> (4)	Standard Sanded Cement Grout <b>A118.6</b> (4)	Polymer Modified Unsanded Tile Grout <b>A118.7</b> (4, 9)	Polymer Modified Sanded Tile Grout <b>A118.7</b> (4, 9)	Modified Epoxy Emulsion <b>A118.8</b> (4)	100% Solid Epoxy <b>A118.3</b> (1, 3, 4, 6)	Furan <b>A118.5</b> (1, 3, 4, 6)	Silicone Urethane (2, 4)
TILE TYPE										
Glazed Wall Tile (7)		W	W	W	W		W		W	W
Glazed Floor Tile (7)	W, F	W, F	W, F	W, F	W, F	W, F	W, F			W, F
Ceramic Mosaics	W, F	W, F	W, F	W, F	W, F	W, F	W, F		W	W, F
Quarry, Paver, and Packing House Tile (8)	W, F		W, F		W, F	W, F	W, F	W, F		
Large Unit Porcelain or Vitreous Tile (8)	W, F	W, F	W, F	W, F	W, F	W, F	W, F	F	W	W, F
Dimension Stone (7, 8) (Including Agglomerates)	W, F	W, F	W, F	W, F	W, F	W, F				
USE										
Dry/Limited Water Exposure	W, F	W, F	W, F	W, F	W, F	W, F	W, F	W, F	W, F	W, F
Wet Areas (10)	W, F	W, F	W, F	W, F	W, F	W, F	W, F	W, F	W, F	
Exteriors (8, 9, 10)	W, F	W, F	W, F	W, F	W, F	W, F	W, F (4)	W, F (4)	W, F	
PERFORMANCE	(Note: There are five performance ratings, from Best [A] to Minimal [E])									
Suggested Joint Widths (5)	1/8" to 5/8"	1/16" to 1/8"	1/8" to 5/8"	1/16" to 1/8"	1/8" to 5/8"	1/16" to 5/8"	1/16" to 5/8"	3/8" to 5/8"	1/16" to 1/4"	1/16" to 1/4"
Stain Resistance	E	D	D	C	C	C	A	A	A	B
Crack Resistance	E	D	D	C	C	C	B	C	A	C
Color Availability	D	B	B	B	B	B	B	Black only	B	B

## Notes:

- (1) Mainly used for chemical resistant properties.
- (2) Special tools needed for proper application. Silicone, urethane, and modified polyvinylchloride used in pregrouted ceramic tile sheets. Silicone grout should not be used on kitchen countertops or other food preparation surfaces unless it meets the requirements of FDA Regulation No. 21, CFE 177.2600.
- (3) Special cleaning procedures and materials recommended.
- (4) Follow manufacturer's directions.
- (5) Joint widths are only guidelines. Individual grout manufacturer's products may vary. Consult manufacturers' instructions.
- (6) Epoxyes are recommended for prolonged temperatures up to 140°F, high-temperature-resistant epoxies and furans up to 350°F.
- (7) Some types of glazed ceramic tiles, polished marble, marble agglomerates, and granite can be permanently scratched or damaged when grouted with sanded grout formulas. DO NOT use sanded grout or add sand to grout when grouting polished marble, marbled agglomerates, and ceramic wall tiles with soft glazes. Check the tile or marble manufacturer's literature and test grout on a separate sample area prior to grouting.
- (8) Some types of ceramic tiles and dimension stone may be permanently stained when grouted with pigmented grout of a contrasting color. WHITE GROUT IS BEST SUITED FOR GROUTING WHITE OR LIGHT-COLORED MARBLE OR GRANITE.
- (9) Latex modification may be required in areas subject to freezing temperatures. Consult grout manufacturer for recommended products and methods.
- (10) Colored cementitious grouts may darken when wet.

# FLOOR TILING INSTALLATION GUIDE

## Performance-Level Requirement Guide and Selection Table

Based on results from ASTM Test Method C-627 "Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson Type Floor Tester." All methods are material dependent - performance rating should not exceed rating of weakest component - consult each material manufacturer for individual component rating.

03

<b>SERVICE REQUIREMENTS</b>	<b>FLOOR TYPE</b> —Numbers refer to Handbook Method numbers			
	<b>Concrete</b>	<b>Page</b>	<b>Wood</b>	<b>Page</b>
<b>EXTRA HEAVY:</b> Extra heavy and high-impact use in food plants, dairies, breweries, and kitchens. Requires quarry tile, packing house tile, or tile designated by tile manufacturer. (Passes ASTM C627 cycles 1 through 14.)	F101, F102 F111, F112, F113 F114, F115 F121 F131 F132, F133, F134	14 15, 16 16 17 18 18, 19		
<b>HEAVY:</b> Shopping malls, stores, commercial kitchens, work areas, laboratories, auto showrooms and service areas, shipping/receiving, and exterior decks. (Passes ASTM C627 cycles 1 through 12.)	F103 F111 F112 F113 F121	14 15 15 16 17	F143 <sup>a,g</sup>	22
<b>MODERATE:</b> Normal commercial and light institutional use in public space of restaurants and hospitals. (Passes ASTM C627 cycles 1 through 10.)	F112 F115 F122 <sup>c</sup> RH110, RH115	15 16 17 25, 26		03
<b>LIGHT:</b> Light commercial use in office space, reception areas, kitchens, and bathrooms. (Passes ASTM C627 cycles 1 through 6.)	F122 <sup>c</sup>	17	F121 F141, F145 F143 <sup>a</sup> , F144 <sup>b, e&amp;f</sup> , F146 F150 <sup>h</sup> , F151 RH130 <sup>i</sup> , RH135 <sup>e&amp;f</sup>	17 21 22, 23 22, 24 25, 26
<b>RESIDENTIAL:</b> Kitchens, bathrooms, and foyers. (Passes ASTM C627 cycles 1 through 3.)	F116 TR711 <sup>d</sup> F135	17 40 19	F142, F144 <sup>i</sup> F147, F170 F148, F135 F149, F150 <sup>h</sup> F152, F155 RH130 <sup>i</sup> , RH135 <sup>f</sup>	21, 22 23 24, 19 24, 22 25 25, 26

03

03

03

03

### Notes:

Consideration must also be given to (1) wear properties of surface of tile selected, (2) tile size, (3) coefficient of friction.

Unglazed Standard Grade tile will give satisfactory wear or abrasion resistance in installations listed. Glazed tile or soft body decorative unglazed tile should have the manufacturer's approval for intended use. Color, pattern, surface texture, and glaze hardness must be considered in determining tile acceptability on a particular floor.

### Selection Table Notes:

Tests to determine Performance-Levels utilized representative products meeting recognized industry standards:

- a. ANSI A118.3 epoxy mortar and grout.
- b. Data in Selection Table based on tests conducted by Tile Council of America, except data for F144 Method, which is based on test results from an independent laboratory.
- c. ANSI A118.4 latex-portland cement mortar and grout.
- d. Tile bonded to existing resilient flooring with epoxy adhesive.
- e. 7/16"-minimum-thick cementitious backer unit or minimum 1/4"-thick fiber-cement underlayment tested.
- f. Minimum 1/4" thick cementitious backer unit can be used for residential applications over 19/32" minimum thick subfloor; minimum 1/4" thick cementitious backer unit can be used for light commercial applications over minimum 23/32" thick subfloor.
- g. Requires tile designated by tile manufacturers as suitable for the rating.
- h. Requires minimum 19/32" exterior glue plywood underlayment for light rating; 15/32" exterior glue plywood underlayment may be used for residential rating.

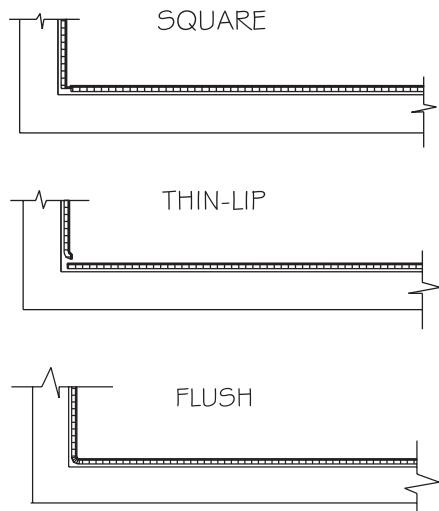
# HOW TO USE HANDBOOK WHEN WRITING SPECIFICATIONS

The Handbook is not a specification. The quick reference details and outlines in the Handbook provide a means of simplifying and standardizing installation specifications for ceramic tile. The following steps are a guide to the proper use of the Handbook in developing job specifications.

**CAUTION:** In addition to referencing Handbook methods, architects and specifiers shall specify tile and installation materials, including specific locations of movement joints on drawings.

Use American National Standards Institute (ANSI) standards for developing specifications. Specifications shall conform to local building codes, ordinances, trade standards and practices, and climatic conditions. All of these, along with variations in materials and labor, influence the final cost of installation. Use of materials and methods, not specifically designated by the architect, will, of necessity, be determined by the tile contractor.

## Base/Cove Alternatives

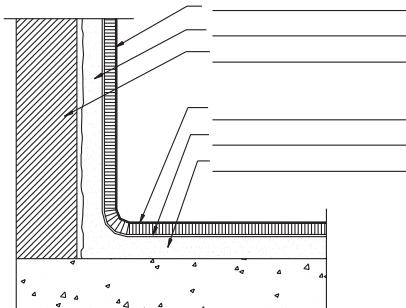


Appropriate trim shapes and details must be specified by the architect, or left to the discretion of the tile contractor.

All details in this Handbook are stylized cross-sectional drawings of typical installations and are not intended to show specific treatments of the transition between vertical and horizontal tile surfaces.

## 1 WALLS, FLOORS Solid Backing

### Tile Installation 2 000-03



#### Recommended Uses: 2

- \_\_\_\_\_
- \_\_\_\_\_

#### Requirements: 2

- \_\_\_\_\_
- \_\_\_\_\_

#### Materials: 3, 4, 5

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

#### Preparation by Other Trades: 6

- \_\_\_\_\_
- \_\_\_\_\_

#### Preparation by Tile Trade: 7

- \_\_\_\_\_
- \_\_\_\_\_

#### Movement Joint (architect must specify type of joint and show location and details on drawings): 8

- \_\_\_\_\_

#### Installation Specifications: 9

- \_\_\_\_\_
- \_\_\_\_\_

1 Show areas to be tiled on drawings.

2 Select proper installation method for given backing; e.g., metal stud walls, masonry walls, concrete slab, wood floors, etc. as shown in various Handbook methods. Text outlines recommended uses, requirements, and pertinent data for developing specifications. Installation guides on pages 10 and 12 should be consulted when selecting installation method.

Reference American National Standard Specifications for Ceramic Tile (ANSI A137.1) for tile types. This standard is the only specification for ceramic tile. It describes qualities necessary for labeling Standard Grade ceramic tile and sets up procedure for issuing Master Grade Certificate.

3 Select and specify bonding material from those listed on pages 5 and 6. Refer to guide on page 12 for floors and to guide on page 10 for walls.

4 Select and specify grout from those listed on page 7 and according to Grout Guide on page 11.

5 Reference applicable ANSI and ASTM Material Specifications and Standards for bonding and grouting materials selected in 3 and 4 above.

6 Specify materials and preparation work of other trades in proper section of job specification. The FOREWORD in the ANSI tile installation specification booklet suggests particular specifications for related trades regarding preparation for tilework and is not a part of the ANSI specifications.

7 Specify preparation by tile trade.

8 Specify movement joints and locations. Show details on drawings. Reference pages 7 and 44.

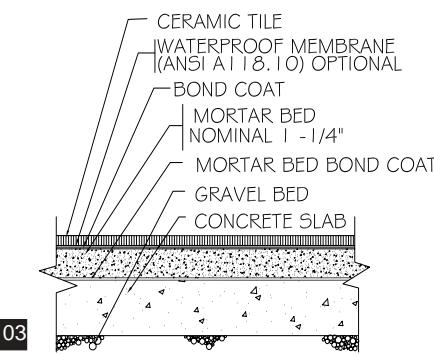
9 Specify installation procedures by referencing applicable ANSI Specifications.

Special installation procedures, proprietary installation methods, and materials should be specified in accordance with manufacturers' data.

# FLOORS, EXTERIOR

## Patios and Walkways

Cement Mortar, Bonded F101-03



### Recommended Uses:

- 03 exterior floors, decks, or patios where cleavage membrane is not used, and where positive drainage below slab is provided.

### Limitations:

- although this is the best known method of installation for a ceramic tile walkway, it is not reliable in areas where the mortar bed will be subjected to freeze-thaw cycles and the application of snow melting chemicals.

### Requirements:

- sloped slab to provide complete surface drainage.
- gravel bed or other means of drainage below slab.
- concrete must be free of cracks.
- movement joints are mandatory.
- cover completed tilework and keep damp for 3 to 7 days.
- seal edges of mortar bed with a trowelable membrane/sealant.

### Materials:

- mortar bed—[ANSI A108.1A](#).
- bond coat—portland cement paste on a mortar bed that is still workable, or dry-set mortar or latex-portland cement mortar on a cured bed.
- grout—[ANSI A118.6](#) or [A118.7](#).
- mortar bed bond coat—portland cement slurry.
- waterproof membrane recommended by manufacturer for exterior applications; specify whether sheet or liquid applied — [ANSI A118.10](#).

### Preparation by Other Trades:

- provide subsurface drainage.
- slope slab for complete drainage.
- slab to have steel trowel and fine broom finish with no curing compounds used. (When used, mechanical scarifying is necessary.)
- max. variation in the slab - 1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

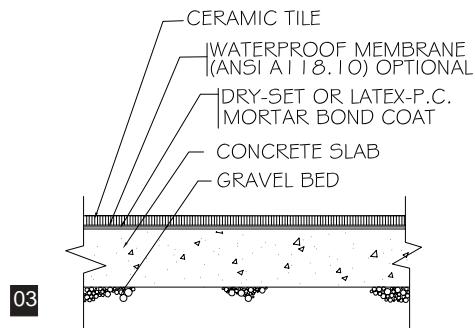
- movement joints - mandatory according to [Method EJ171](#), page 44.

### Installation Specifications:

- tile—[ANSI A108.1A, .1B or .1C](#).
- grout—[ANSI A108.10](#).
- membrane—[ANSI A108.13](#).

**NOTE:** For areas not subject to freeze-thaw conditions, methods [F111](#), [F112](#), [F113](#), [F121](#), [F122](#), [F141](#), and [F144](#) may be suitable for exterior use when appropriate precautions are taken, including expansion joint placement, proper slope to drain, waterproof membrane sloped (1/4" per foot) to drain.

Dry-Set Mortar or F102-03  
Latex-Portland Cement Mortar



### Recommended Uses:

- 03 exterior floors, decks, or patios where positive drainage below slab is provided.

### Limitations:

- 03 if waterproof membrane is not used, positive drainage below slab must be provided.

### Requirements:

- 03 slab to be well cured, dimensionally stable, and free of cracks, waxy or oily films, and curing compounds.
- sloped slab to provide complete surface drainage.
- gravel bed or other means of drainage below slab.
- movement joints are mandatory.
- bond coat 3/32" min.
- cover completed tilework and keep damp for 3 to 7 days.

### Materials:

- dry-set mortar—[ANSI A118.1](#).
- latex-portland cement mortar—[ANSI A118.4](#).
- grout—[ANSI A118.6](#) or [A118.7](#)
- 03 waterproof membrane recommended by manufacturer for exterior applications; specify whether sheet or liquid applied — [ANSI A118.10](#).

### Preparation by Other Trades:

- provide subsurface drainage.
- slope slab for complete drainage.
- slab to have steel trowel and fine broom finish with no curing compounds used. (When used, mechanical scarifying is necessary.)
- max. variation in the slab—1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to [Method EJ171](#), page 44.

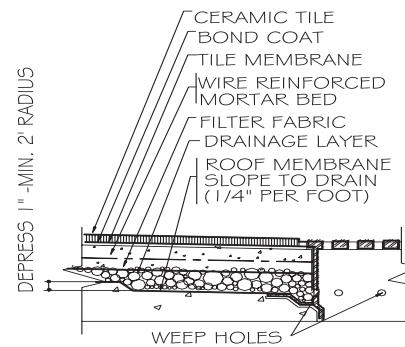
### Installations:

- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#).
- 03 • membrane—[ANSI A108.13](#).

## Roof Deck, Membrane

Cement Mortar

F103-03



### Recommended Uses:

- exterior roofs or decks of concrete, steel, or wood where a waterproof roof membrane is used and sloped min. 1/4" per foot.

### Limitations:

- although this is the best known method of installation for a ceramic tile roof deck, it is not reliable in areas where the mortar bed will be subjected to freeze-thaw cycles and the application of snow melting chemicals.

### Requirements:

- mortar beds in excess of 2"-thick shall be detailed by the architect.
- roof drains by other trades—provide complete drainage at membrane level by use of weep holes as shown or other methods. Tile over flat deck with poor or no drainage will not stand up.
- reinforcing mesh mandatory.
- movement joints mandatory.
- surround roof drain with broken pieces of tile to prevent stone or mortar from blocking weep holes.
- cover completed tilework and keep damp for 3 to 7 days.

### Materials:

- mortar bed and reinforcing—[ANSI A108.1A](#).
- ceramic tile—as approved by manufacturer.
- waterproof membrane—[ANSI A118.10](#)
- crushed stone—max. size 1/2".
- crushed stone bed 1" min. thickness.
- burlap or closely woven cheesecloth.
- manufactured drainage mat—use in place of stone drainage system.
- bond coat—portland cement paste on a mortar bed that is still workable, or dry-set mortar or latex-portland cement mortar on a cured bed.
- grout—[ANSI A118.6](#) or [A118.7](#).

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to [Method EJ171](#), page 44.
- movement joints should not go through the gravel bed; they should extend only to the bottom of the setting bed.

### Installation Specifications:

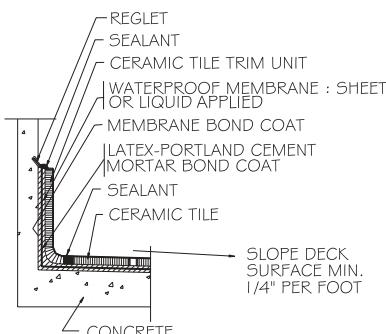
- tile—[ANSI A108.1A, .1B or .1C](#).
- grout—[ANSI A108.10](#).

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

## Balcony Deck

Thin-Set

F104-03



### Recommended Uses:

- exterior balconies or decks of concrete over unoccupied space where waterproof roof membrane is not used, and where slab is sloped min. 1/4" per foot.

### Limitations:

- use F103 where a waterproof roof membrane is used.
- this method may not be reliable in areas where the installation will be subjected to freeze-thaw cycles and the application of snow melting chemicals.

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span, when measured under 300 lb. concentrated load (ASTM C627). Make allowance for live load impact as well as all dead load, including weight of the tile and setting bed.

### Materials:

- specify type of waterproofing: e.g., sheet or liquid applied—ANSI A118.10.
- latex-portland cement mortar—ANSI A118.4.
- polymer modified tile grout—ANSI A118.7.

### Preparation by Other Trades:

- maximum variation in the slab—1/4" in 10'-0" from the required plane.
- slope slab 1/4" per foot.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory in accordance with Method EJ171, page 44.

### Installation Specifications:

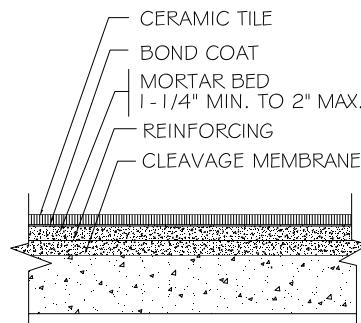
- membrane—ANSI A108.13.
- tile—ANSI A108.5.
- grout—ANSI A108.10.

## FLOORS, INTERIOR

### Concrete Subfloor

Cement Mortar,  
Cleavage Membrane

F111-03



### Recommended Uses:

- over structural floors subject to bending and deflection.
- see [page 14 NOTE](#) for exterior uses.

### Requirements:

- reinforcing mesh mandatory.
- mortar bed thickness to be uniform, 1-1/4" min. to 2" max.
- mortar beds in excess of 2"-thick shall be detailed by the architect.

### Materials:

- mortar bed, reinforcing, and cleavage membrane—ANSI A108.1A.
- bond coat—portland cement paste on a mortar bed that is still workable, or dry-set mortar or latex-portland cement mortar on a cured bed.
- grout—ANSI A118.6 or ANSI A118.7.

### Preparation by Other Trades:

- slab depression to be accurate with steel trowel finish.
- slope, when required, to be in subfloor.
- max. variation in the slab—1/4" in 10'-0" from the required plane.
- where radiant heating pipes are laid over the slab, screed fill flush to top of pipes before placing a cleavage membrane and reinforced mortar bed.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

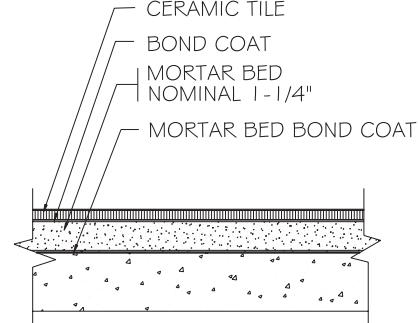
- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

- tile—ANSI A108.1A, .1B or .1C.
- grout—ANSI A108.10.

Cement Mortar,  
Bonded

F112-03



### Recommended Uses:

- on slab-on-grade construction where no bending stresses occur.
- on properly cured structural slabs of limited area.
- see [page 14 NOTE](#) for exterior uses.

### Limitations:

- use Method F111 over precast concrete floor systems, post tensioned concrete floor systems, and other floors subject to movement or deflection.

### Requirements:

- mortar bed thickness to be uniform.
- concrete must be free of cracks.

### Materials:

- mortar bed—ANSI A108.1A.
- bond coat—portland cement paste on a mortar bed that is still workable, or dry-set mortar or latex-portland cement mortar on a cured bed.
- grout—ANSI A118.6 or A118.7.
- mortar bed bond coat—portland cement slurry.

### Preparation by Other Trades:

- slab to have steel trowel and fine broom finish with no curing compounds used. (When used, mechanical scarifying is necessary.)
- slope, when required, to be in subfloor.
- max. variation in the slab shall not exceed 1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

- tile—ANSI A108.1A, .1B or .1C.
- grout—ANSI A108.10.

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

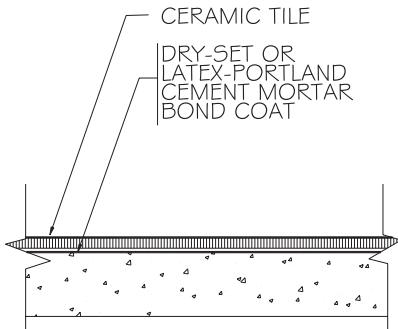
03

NOTES: For tile bonded directly to waterproofing membrane, follow Method F122.

See [page 7](#) for other installation materials and methods.

# FLOORS, INTERIOR-CONCRETE SUBFLOORS

## Dry-Set Mortar or Latex-Portland Cement Mortar



### Recommended Uses:

- on plane, clean concrete.
- on slab-on-grade construction where no bending stresses occur.
- see [page 14 NOTE](#) for exterior uses.
- see note at bottom of page.

### Limitations:

- method F111 is the preferred method over precast concrete floor systems, post tensioned concrete floor systems, and other floors subject to movement or deflection.
- method F113 may be suitable for above-grade structural slab installations when specific mortar and grout products recommended by the manufacturer are specified. Not all modified mortar and grout products are suitable for this application.
- deflection not to exceed 1/360 of span for above-grade structural slabs.

### Requirements:

- slab to be well cured, dimensionally stable, and free of cracks, waxy or oily films, and curing compounds.
- bond coat 3/32" min.

### Materials:

- mortar—use [ANSI A118.1](#) or [A118.4](#) for slab-on-grade installations; use only a manufacturer's designated mortar for above-grade structural slabs.
- grout—use [ANSI A118.6](#) or [A118.7](#) for slab-on-grade installations; use only a manufacturer's designated grout for above-grade structural slabs.

### Preparation by Other Trades:

- slab—steel trowel and fine broom finish free of curing compounds. (When used, mechanical scarifying is necessary.)
- slope, when required, to be in subfloor.
- max. variation in the slab—1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

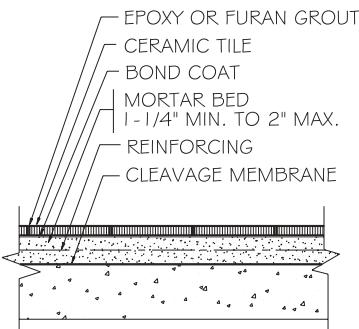
- follow [EJ171](#), page 44, for slab-on-grade installations.
- above-grade structural slabs require: exterior joint spacing; perimeter joints are mandatory.

### Installation Specifications:

- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#).

F113-03

## Cement Mortar, Epoxy or Furan Grout



### Recommended Uses:

- with tile set by [Method F111](#) requiring good stain resistance and resistance to erosion caused by occasional contact with mild chemicals such as found in commercial dining areas, photographic dark rooms, public toilets, public foyers, etc.
- with quarry tile and paver tile.

### Requirements:

- tile surface must be waxed before grouting with furan resin.
- mortar bed thickness—1-1/4" min. to 2" max.
- mortar beds in excess of 2"-thick shall be detailed by the architect.

### Materials:

- mortar bed, reinforcing, and cleavage membrane—[ANSI A108.1A](#).
- epoxy grout—[ANSI A118.3](#).
- furan grout—[ANSI A118.5](#).

### Tile Installation and Movement Joints:

- follow [Method F111](#).

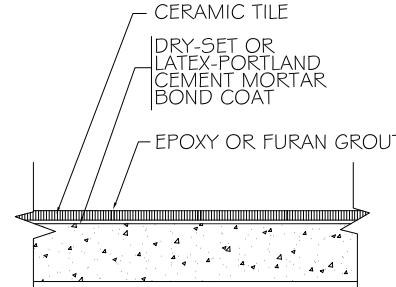
### Installation Specifications:

- tile—[ANSI A108.1A, .1B or .1C](#).
- epoxy grout—[ANSI A108.6](#).
- furan grout—[ANSI A108.8](#).

03 Dry-Set Mortar, Latex-

F115-03

## Portland Cement Mortar, Epoxy, or Furan Grout



03

### Recommended Uses:

- with tile set by [Method F112](#) or [Method F113](#) requiring good stain resistance and resistance to erosion caused by occasional contact with mild chemicals such as found in commercial dining areas, photographic dark rooms, public toilets, public foyers, etc.
- with quarry tile and paver tile.

### Requirements:

- tile surface must be waxed before grouting with furan resin.
- concrete must be free of cracks.

### Materials:

- mortar - use [ANSI A118.1](#) or [A118.4](#) for slab-on-grade installations
- epoxy grout—[ANSI A118.3](#).
- furan grout—[ANSI A118.5](#).

### Preparation by Other Trades:

- slab—steel trowel and fine broom finish free of curing compounds. (When used, mechanical scarifying is necessary.)
- max. variation in the slab—1/4" in 10'-0" from the required plane.

### Tile Installation and Movement Joints:

- follow [Method F112](#) or [F113](#).

### Installation Specifications:

- tile—[ANSI A108.5](#).
- epoxy grout—[ANSI A108.6](#).
- furan grout—[ANSI A108.8](#).

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

03 CAUTION: Special precautions should be taken when tiling over post-tension or pre-stress concrete floor systems. The use of an anti-fracture membrane should be considered.

NOTES: Select Method F131, F132, or F133 for chemical resistance in commercial kitchens, dairies, breweries, food processing plants, etc.

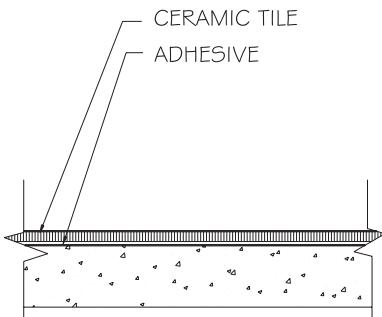
Joints must be clean and completely filled with epoxy or furan. Partial filling with sand or mortar is unacceptable.

See [page 7](#) for other installation materials and methods.

# FLOORS, INTERIOR

## Concrete Subfloor

Organic Adhesive or  
Epoxy Adhesive F116-03

**Recommended Uses:**

- 03 • organic adhesive: for use over concrete floors in residential construction only. For heavier service, select [Method F113](#).
- 03 • epoxy adhesive: same recommended uses as [F113](#).

**Limitations:**

- 03 • organic adhesive will not withstand high-impact or wheel loads.
- 03 • consult organic adhesive manufacturer for installation over floors with radiant heating.
- organic adhesives are not recommended in areas exposed to temperatures exceeding 140°F.
- 03 • epoxy adhesive: same limitations as method [F113](#).

**Requirements:**

- slab to be well cured, dimensionally stable, and free of cracks, waxy or oily films, and curing compounds.

**Materials:**

- organic adhesive—[ANSI A136.1](#) Type 1 floor type.
- epoxy adhesive—[ANSI A118.3](#).
- grout—[ANSI A118.6](#) or [A118.7](#).

**Preparation by Other Trades:**

- slab—steel trowel and fine broom finish free of curing compounds. (When used, mechanical scarifying is necessary.)
- max. variation in the slab—1/4" in 10'-0" from the required plane.

**Movement Joint (architect must specify type of joint and show location and details on drawings):**

- movement joints—mandatory according to [Method EJ171](#), page 44.

**Installation Specifications:**

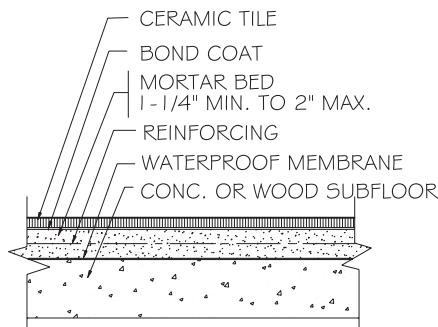
- tile—[ANSI A108.4](#).
- grout—[ANSI A108.10](#).

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# FLOORS, INTERIOR

## Waterproof Membrane

Cement Mortar Bed F121-03

**Recommended Uses:**

- wherever a waterproof interior floor is required in conjunction with ceramic tile installed on a portland cement mortar bed.
- see [page 14 NOTE](#) for exterior uses.

**Limitations:**

- deflection not to exceed 1/360 of span.
- not recommended for severe chemical exposure.

**Requirements:**

- design floor areas over which tile is to be applied to have deflection not greater than 1/360 of the span. Make allowance for live load and impact as well as all dead load, including weight of the tile and setting bed.
- mortar bed thickness—1-1/4" min. to 2" max.
- mortar beds in excess of 2"-thick shall be detailed by the architect.

**Materials:**

- specify type of waterproofing; e.g., sheet or liquid applied—[ANSI A118.10](#).
- mortar—[ANSI A108.1A](#).

**Preparation by Other Trades:**

- maximum variation in subfloor shall not exceed 1/4" in 10'-0" from the required plane.
- slope subfloor 1/4" per foot to drain.

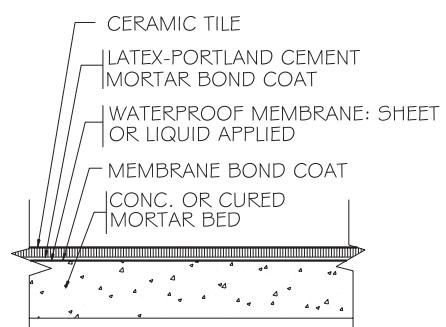
**Preparation by Tile Trade:**

- waterproof membrane—install to comply with pertinent codes and manufacturer's directions.

**Tile Installation and Movement Joints:**

- follow [Method F111](#) or [F141](#).

Thin-Set F122-03

**Recommended Uses:**

- wherever a waterproof interior floor is required in conjunction with ceramic tile installed in a thin-set method.
- see [page 14 NOTE](#) for exterior uses.

**Limitations:**

- deflection not to exceed 1/360 of span.
- not recommended for severe chemical exposure.

**Requirements:**

- design floor areas over which tile is to be applied to have deflection not greater than 1/360 of the span. Make allowance for live load and impact as well as all dead load, including weight of the tile and setting bed.

**Materials:**

- specify type of waterproofing; e.g., sheet or liquid applied—[ANSI A118.10](#).
- latex-portland cement mortar—[ANSI A118.4](#).
- polymer modified tile grout—[ANSI A118.7](#).

**Preparation by Other Trades:**

- maximum variation in subfloor—1/4" in 10'-0" from the required plane.
- slope subfloor 1/4" per foot to drain.

**Preparation by Tile Trade:**

- waterproof membrane—install to comply with pertinent codes and manufacturer's directions.

**Membrane Installation:**

- membrane manufacturer's directions.
- membrane—[ANSI A108.13](#).

**Installation Specifications:**

- tile—[ANSI A108.5](#).

**Movement Joint (architect must specify type of joint and show location and details on drawings):**

- movement joints—mandatory according to [Method EJ171](#), page 44.

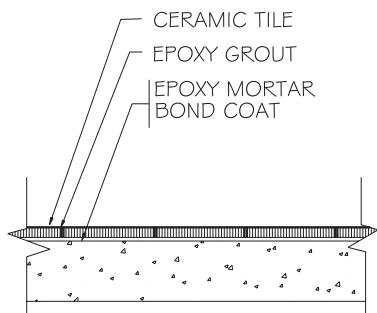
**NOTE:** See [page 7](#) for other installation materials and methods.

**NOTE:** There are sheet and liquid membranes recommended by manufacturers for installation of ceramic and marble tile by a thin-set method over concrete which has cracked or will crack. Follow manufacturer's written specifications and installation instructions precisely. Refer to [Method F122](#) to incorporate membrane.

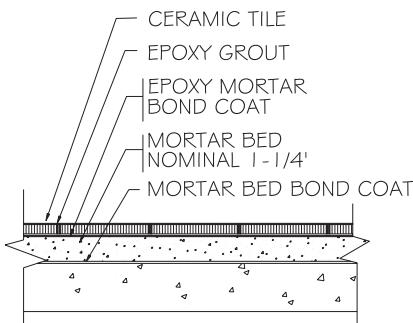
# FLOORS, INTERIOR-CHEMICAL RESISTANT

## Concrete Subfloor

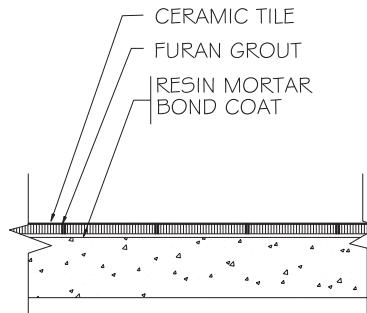
Epoxy Mortar and Grout F131-03



Epoxy Mortar and Grout F132-03



Furan Resin Mortar and Grout



F133-03

### Recommended Uses:

- for setting and grouting ceramic mosaic, quarry, and paver tiles.
- where moderate chemical exposure and severe cleaning methods are used, such as in commercial kitchens, dairies, breweries, food processing plants, etc.
- for tilework exposed to prolonged high temperatures—use high temperature, chemical-resistant epoxy mortar and grout.

### Limitations:

- for severe chemical exposures and where complete protection is needed, refer to [Method F134](#).

### Requirements:

- structurally sound subfloor, carefully finished to proper elevation and slope.
- surfaces to receive epoxy mortar must be free of sealers, curing compounds, oil, dirt, and dust, and must be dry.
- concrete must be free of cracks.

### Materials:

- epoxy mortar and grout—[ANSI A118.3](#).
- high temperature, chemical-resistant epoxy mortar and grout—[A118.3](#) and certified by manufacturer as suitable for intended use.

### Preparation by Other Trades:

- slab—steel trowel and fine broom finish free of curing compounds. (When used, mechanical scarifying is necessary.)
- slope, when required, to be in subfloor.
- max. variation in the slab—1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- directly over joints in structural floors including construction joints or cold joints.

### Installation Specifications:

- tile—[ANSI A108.6](#).

### Recommended Uses:

- where leveling of subfloor is required.
- for setting and grouting ceramic mosaic, quarry, and paver tiles.
- where moderate chemical exposure and severe cleaning methods are used, such as in commercial kitchens, dairies, breweries, food processing plants, etc.
- for tilework exposed to prolonged high temperatures—use high temperature, chemical-resistant epoxy mortar and grout.

### Limitations:

- for severe chemical exposures and where complete protection is needed, refer to [Method F134](#).

### Requirements:

- surfaces to receive epoxy mortar must be free of sealers, curing compounds, coatings, oil, dirt and dust, and must be dry.
- concrete must be free of cracks.
- over structural floors subject to bending and deflection—use cleavage membrane under mortar bed, see [Method F111](#).

### Materials:

- epoxy mortar and grout—[ANSI A118.3](#).
- high temperature, chemical-resistant epoxy mortar and grout—[A118.3](#) and certified by manufacturer as suitable for intended use.
- mortar—[ANSI A108.1A](#)
- mortar bed bond coat—portland cement slurry.

### Preparation by Other Trades:

- slab—steel trowel and fine broom finish free of curing compounds. (When used, mechanical scarifying is necessary.)

### Preparation by Tile Trade:

- for mortar bed over slab-on-grade where no bending stresses occur—[Method F112](#).
- for mortar bed over structural floors subject to bending and deflection—[Method F111](#).
- over a waterproof membrane—[Method F121](#).

### Installations Specifications:

- tile—[ANSI A108.6](#).

NOTES: Joints must be clean and completely filled with epoxy or furan. Partial filling with sand or mortar is unacceptable.

Extreme heat or improper steam cleaning will soften epoxy grouts and wash them out of joints; however, high temperature resistant formulas are available. Therefore, the architect should consult grout manufacturer for special precautions when chemical exposure is severe, or at prolonged temperatures above 140°F.

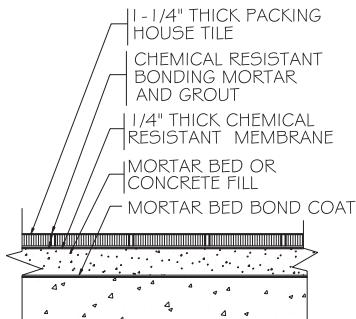
All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# FLOORS, INTERIOR



## Cork Underlayment on Concrete

### Epoxy Mortar and Grout or Furan Resin F134-03



#### Recommended Uses:

- for setting 1-1/4"-thick packing house tiles in areas of continuous or severe chemical exposure, where special protection against leakage or damage to concrete subfloor is required.

#### Requirements:

- requires chemical-resistant membrane.
- structurally sound subfloor, carefully finished to proper elevation and slope.
- for epoxy installation follow [Method F131](#).
- for furan installation follow [Method F133](#).

#### Materials:

- mortar bed bond coat—portland cement slurry.
- mortar—[ANSI A108.1A, .1B, or .1C](#)

#### Preparation by Other Trades:

- slab to have steel trowel and fine broom finish with no curing compounds used. (When used, mechanical scarifying is necessary.)

- 03**
- max. variation in the concrete fill or mortar bed 1/4" in 10'-0" from the required plane.
  - chemical-resistant membrane may be installed by other trades separate from tilework.

#### Movement Joints:

- none in subfloor beneath continuous membrane unless special installation method is designed to accommodate them.

#### Specifications:

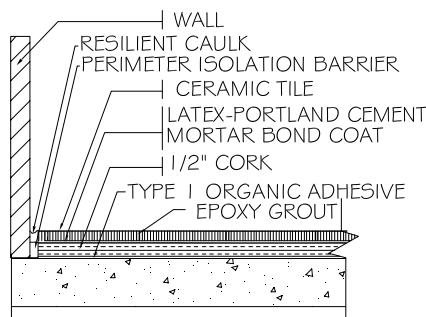
- chemical-resistant membrane—manufacturer's literature.

#### Specifications:

#### Installations Specifications:

- tile—[ANSI A108.5](#).
- epoxy grout—[ANSI A108.6](#).

### Latex-Portland Cement Mortar with Epoxy Grout F135-03



#### Recommended Uses:

- on plane, clean above-grade concrete in residential applications where sound transmission through the floor/ceiling assembly is a concern.
- minimum 6" thick concrete subfloor. Deflection not to exceed 1/360 of the span including live and dead loads.

#### Limitations:

- deflection not to exceed 1/360 of span.
- for interior applications only.
- for 8" x 8" and larger floor tiles only.
- for dry areas only.

#### Requirements:

- slab to be well cured, dimensionally stable, free of cracks, waxy or oily films, and curing compounds.
- tile bond coat 3/32" min.

#### Materials:

- 1/2" thick (+/- .010") cork underlayment sheets. Consisting of a mix of pure cork granules combined with a polyurethane binder, having a density of between 11.8 and 13.6 lbs. per cubic foot.
- organic adhesive—[ANSI A136.1](#) Type 1 (to bond cork underlayment to the subfloor).
- latex-portland cement mortar—[ANSI A118.4](#).
- epoxy grout —[ANSI A118.3](#).

#### Preparation by Other Trades:

- slab - steel trowel or comparable level of finish.
- slope, when required, to be in the subfloor.
- maximum variation in the slab—1/4" in 10'-0" from the required plane.

#### Movement Joint (architect must specify type of joint and show location and details on drawings):

- as required with above - grade structural slabs: exterior joint spacing (8'-12') and perimeter joints are mandatory.
- movement joints—mandatory in accordance with [Method EJ171](#), page 44.

**NOTES:** The entire floor system is usually installed by a specialty ceramic tile flooring contractor and should be so specified.

Joints must be clean and completely filled with epoxy or furan. Partial filling with sand or mortar is unacceptable.

**ARCHITECT:** Consult resin manufacturer for special precautions when chemical exposure is severe or at high temperature.

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# FLOORS, INTERIOR-RADIANT HEAT ON CONCRETE



## Hydronic System

RH110-03

### Recommended Uses:

- on plane, clean concrete.
- on slab-on-grade construction where no bending stresses occur.
- see [page 14 NOTE](#) for exterior uses.

### Limitations:

- [method F111](#) is the preferred method over precast concrete floor systems, post tensioned concrete floor systems, and other floors subject to movement or deflection.
- [method F113](#) may be suitable for above-grade structural slab installations when specific mortar and grout products recommended by the manufacturer are specified. Not all modified mortar and grout products are suitable for this application.
- deflection not to exceed 1/360 of span for above-grade structural slabs.
- crack isolation membrane must be recommended by manufacturer for radiant application.

### Requirements:

- portland cement concrete poured minimum 3/4" over top of tube.
- portland cement concrete slab to be well cured, dimensionally stable, and free of cracks, waxy or oily films, and curing compounds.
- tile bond coat 3/32" min.
- crack isolation membrane and bond layer as recommended by manufacturer.

### Materials:

- mortar—use [ANSI A118.4](#) for slab-on-grade installations; *use only a manufacturer's designated mortar* for above-grade structural slabs.
- grout—use [ANSI A118.6](#) or [A118.7](#) for slab-on-grade installations; *use only a manufacturer's designated grout* for above-grade structural slabs.
- membrane bond layer as recommended by manufacturer
- crack isolation membrane

### Preparation by Other Trades:

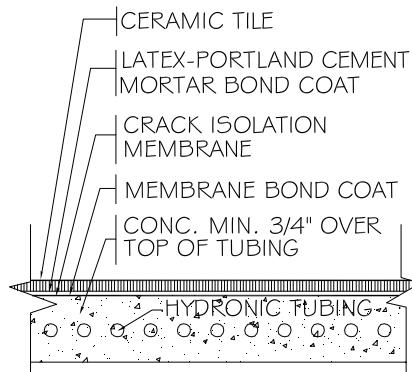
- slab—steel trowel and fine broom finish free of curing compounds. (When used, mechanical scarifying is necessary.)
- slope, when required, to be in subfloor.
- max. variation in the slab—1/4" in 10'-0" from the required plane.
- radiant tubing by others.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- follow [EJ171](#), page 44, for slab-on-grade installations.
- above-grade: structural slabs require exterior joint spacing; perimeter joints are mandatory.

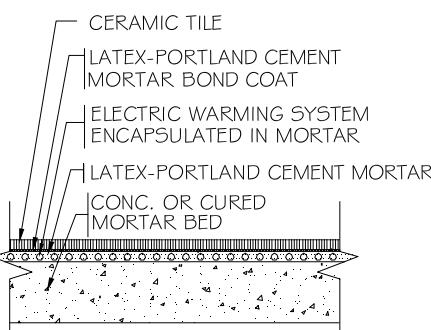
### Installation Specifications:

- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#).
- crack isolation membrane - follow manufacturer's recommendation.



## Hydronic System

RH110-03



## Electric System

RH115-03

## Electric System

RH115-03

### Recommended Uses:

- on plane, clean concrete.
- on slab-on-grade construction where no bending stresses occur.
- see [page 14 NOTE](#) for exterior uses.

### Limitations:

- [method F111](#) is the preferred method over precast concrete floor systems, post tensioned concrete floor systems, and other floors subject to movement or deflection.
- [method F113](#) may be suitable for above-grade structural slab installations when specific mortar and grout products recommended by the manufacturer are specified. Not all modified mortar and grout products are suitable for this application.
- deflection not to exceed 1/360 of span for above-grade structural slabs.

### Requirements:

- slab to be well cured, dimensionally stable, and free of cracks, waxy or oily films, and curing compounds.
- bond coat thickness & application varies, consult floor warming manufacturer for recommendations.

### Materials:

- mortar—use [ANSI A118.4](#) for slab-on-grade installations; *use only a manufacturer's designated mortar* for above-grade structural slabs.

NOTE: most thin-set manufacturers have suggested using latex-portland cement.

- grout—use [ANSI A118.6](#) or [A118.7](#) for slab-on-grade installations; *use only a manufacturer's designated grout* for above-grade structural slabs.

### Preparation by Other Trades:

- slab—steel trowel and fine broom finish free of curing compounds. (When used, mechanical scarifying is necessary.)
- slope, when required, to be in subfloor.
- max. variation in the slab—1/4" in 10'-0" from the required plane.
- electrician or qualified contractor to wire floor warming system to power source.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- follow [EJ171](#), page 44, for slab-on-grade installations.
- above-grade: structural slabs require exterior joint spacing; perimeter joints are mandatory.
- floor warming system should not be installed over building expansion joints.

### Installation Specifications:

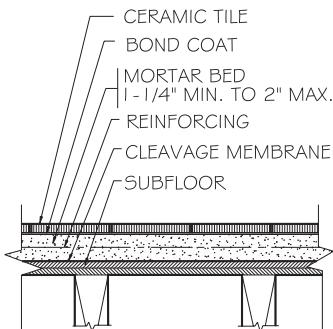
- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#).
- floor warming system UI. (US) 1693; UL (CAN/CAS) C22.2 #217; NEC Article 424

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# FLOORS, INTERIOR-WOOD SUBFLOOR

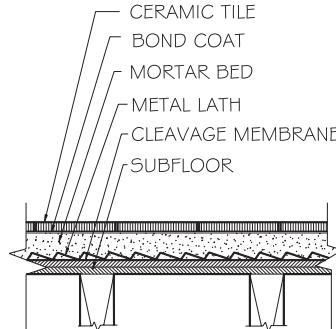
All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

## Cement Mortar



**F141-03**

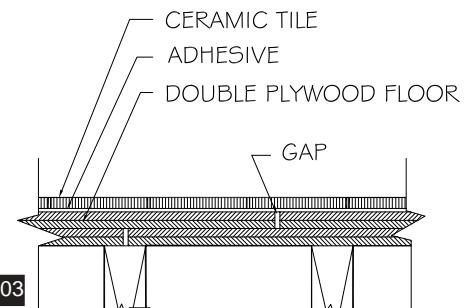
## Cement Mortar Metal Lath



**F145-03**

## Organic Adhesive

\*CAUTION: See Page 9



**F142-03**

### Recommended Uses:

- over all wood floors that are structurally sound.
- where radiant heat pipes are laid over the wood subfloor, screed fill flush to top of pipes before placing a cleavage membrane and reinforced mortar bed.
- see page 14 NOTE for exterior uses.
- where waterproof floor is required, use waterproof membrane meeting ANSI A118.10.
- Contact waterproof membrane manufacturer for specific detail.

**03**

### Requirements:

- 03**
- cleavage membrane—ANSI A108, A-2.1.8.
  - reinforcing mandatory.
  - design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
  - mortar beds in excess of 2"-thick shall be detailed by the architect.

### Materials:

- mortar bed, reinforcing, and cleavage membrane—ANSI A108.1A.
- bond coat—portland cement paste on a mortar bed that is still workable, or dry-set mortar or latex-portland cement mortar on a cured bed.
- grout—ANSI A118.6 or A118.7.

### Preparation by Other Trades:

- subfloor—19/32" plywood or 1" nominal boards when on joists 16" o.c.
- depressing floor between joists on ledger strips permissible in residential use.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

- tile—ANSI A108.1A, .1B or .1C.
- grout—ANSI A108.10.

### Recommended Uses:

- for residential use over wood floors that are structurally sound.
- where waterproof floor is required, use waterproof membrane meeting A118.10. Contact membrane manufacturer for specific detail.

### Limitations:

- 03**
- 3/4" min. mortar thickness

### Requirements:

- cleavage membrane
- 2.5 lbs/yd<sup>2</sup> metal lath (min.), nailed or stapled.
- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).

### Materials:

- mortar bed, metal lath, and cleavage membrane—ANSI A108.1A.
- bond coat—portland cement paste on a mortar bed that is still workable, or dry-set mortar or latex-portland cement mortar on a cured bed.
- grout—ANSI A118.6 or A118.7.

### Preparation by Other Trades:

- subfloor—23/32" exterior glue plywood on joists at 16" o.c.
- max. variation in plywood surface shall not exceed 1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

- tile—ANSI A108.1A, .1B or .1C.
- grout—ANSI A108.10.

### Recommended Uses:

- over wood floors exposed to residential traffic only. For heavier service, select Methods F141, F143, or F144.

### Limitations:

- will not withstand high-impact or wheel loads.
- not recommended in wet areas.

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- double plywood floor—clean and free of dirt, dust, and oily film.

### Materials:

- organic adhesive—ANSI A136.1 Type 1 floor type.
- grout—ANSI A118.7 or A118.3.

### Preparation by Other Trades:

- subfloor—19/32" plywood or 1" nominal boards when on joists 16" o.c.
- underlayment—19/32" min. exterior glue plywood with 1/8" gap between sheets.
- max. variation in the plywood surface—1/4" in 10'-0" from the required plane. Adjacent edges of plywood sheets—max. 1/32" above or below each other.
- offset end and edge joints of the underlayment panels by at least two inches from the joints of subfloor panels; they should not coincide with framing below.
- underlayment fasteners should not penetrate joists below

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

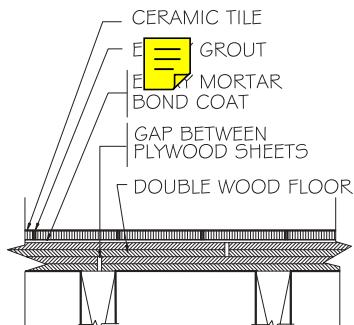
- tile—ANSI A108.4.
- grout—polymer modified, ANSI A108.10; epoxy, ANSI A108.6.

NOTE: See Page 9 notes for mortar bed weight and substrate.

# FLOORS, INTERIOR

## Wood Subfloor

Epoxy Mortar and Grout F143-03



### Recommended Uses:

- over wood floors where resistance to foot traffic in residential, light commercial, and light institutional use is desired with thin-set construction.
- where water, chemical, and stain resistance is desired.
- for tilework exposed to prolonged high temperatures, use high-temperature, chemical-resistant epoxy mortar and grout.
- where waterproof floor is required, use waterproof membrane meeting [ANSI A118.10](#).

**03** Contact waterproof membrane manufacturers for specific detail.

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300lb. concentrated load (see ASTM C627).
- double plywood floor—clean and free of dirt, dust, and oily film.
- gap in top layer of exterior-grade plywood.
- gap between exterior glue plywood sheets to be filled per setting material recommendations.

### Materials:

- epoxy mortar—[ANSI A118.3](#).
- epoxy grout—[ANSI A118.3](#).

### Preparation by Other Trades:

- subfloor—19/32" plywood or 1" nominal boards when on joists 16" o.c.
- underlayment—19/32" exterior glue plywood with gap of 1/4" between sheets.
- residential use—15/32" exterior glue plywood underlayment. Maintain 1/4" gap between sheets.
- max. variation in the plywood surface—1/4" in 10'-0" from the required plane. Adjacent edges of plywood sheets—max. 1/32" above or below each other.
- underlayment fasteners should not penetrate joists below.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- required over structural joints.

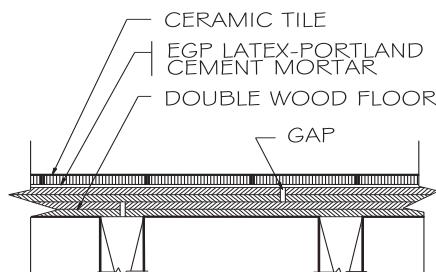
### Installation Specifications:

- epoxy mortar/grout—[ANSI A108.6](#).

## Wood Subfloor

EGP (Exterior Glue Plywood) F150-03

Latex-Portland Cement Mortar



### Recommended Uses:

- over wood floor where resistance to foot traffic in residential or light commercial use is desired with thin-set construction.
- for interior, dry areas only.
- membranes for waterproofing may be utilized with this detail.

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- double plywood floor—clean and free of dirt, dust, and oily film.
- gaps between plywood sheets to be treated per setting material manufacturer's recommendations.
- where waterproof floor is required, use membrane meeting [ANSI A118.10](#).

### Materials:

- EGP (Exterior Glue Plywood) latex-portland cement mortar—[ANSI A118.11](#).
- grout—[ANSI A118.6, A118.7](#), or [A118.3](#).

### Preparation by Other Trades:

- subfloor—19/32" exterior-glue plywood on joists at 16" o.c.
- underlayment: light commercial—19/32" exterior-glue plywood.
- underlayment: residential—15/32" exterior-glue plywood underlayment.
- max. variation in the plywood surface—1/4" in 10'-0" from the required plane. Adjacent edges of plywood sheets—max. 1/32" above or below each other.
- underlayment fasteners should not penetrate joists below.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory in accordance with [Method EJ171](#), page 44.

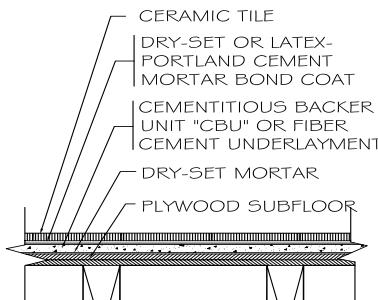
### Installation Specifications:

- tile—[ANSI A108.12](#).
- grout—[ANSI A108.10](#) or [ANSI A108.6](#).

## Cementitious Backer Unit/Fiber Cement Underlayment

Thin-Set

F144-03



### Recommended Uses:

- over structurally sound plywood where lightweight construction is a factor.
- where water resistance is desired.
- eliminates necessity of recessing subfloor to accommodate portland cement mortar bed.
- follow manufacturer's recommendations.
- see page 14 NOTE for exterior uses.

### Limitations:

- 03** where a waterproof floor is required, use membrane meeting [ANSI A118.10](#). Follow manufacturer's installation recommendations.

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- maximum spacing of floor joists is 16" o.c.
- treat joints as per manufacturer's directions.
- use dry-set portland cement mortar to establish the supporting plane of the backer board per backer board manufacturer's directions.
- fasten units with corrosion-resistant fasteners per manufacturer's directions.
- surface of units—clean and free of dirt, dust, or oily film.

### Materials:

- cementitious backer unit—[ANSI A118.9](#) or [ASTM C-1325](#).
- fiber cement underlayment—[ASTM C-1288](#).
- dry-set mortar—[ANSI A118.1](#).
- latex-portland cement mortar—[ANSI A118.4](#).
- grout—[ANSI A118.6, A118.7](#) or [A118.3](#).

### Preparation by Other Trades:

- subfloor—19/32" exterior-glue plywood on joists at 16" o.c.
- max. variation in plywood surface shall not exceed 1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory in accordance with [Method EJ171](#), page 44.

### Installation Specifications:

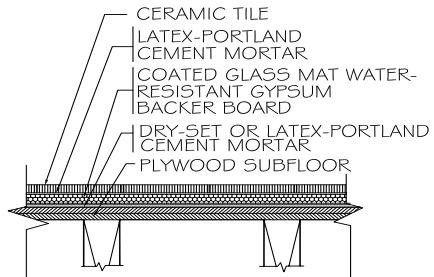
- 03** tile—[ANSI A108.5](#).
- 03** grout—[ANSI A108.10](#) or [A108.6](#).
- 03** backer units—[ANSI A108.11](#) or manufacturer's directions.

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# FLOORS, INTERIOR

## 03 Coated Glass Mat Water-Resistant Gypsum Backer Board

Latex-Portland Cement Mortar F146-03



03

### Recommended Uses:

- over structurally sound exterior-glue plywood.
- where water resistance is desired.
- eliminates necessity of recessing subfloor to accommodate portland cement mortar bed.
- follow manufacturer's recommendations.

### Limitations:

- indoor use only
- 2" x 2" and larger tile only
- not for areas subject to continuous water immersion such as shower floors.

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- maximum spacing of floor joists is 16" o.c.
- use latex-portland cement mortar to set tile to coated glass mat backer board.
- fasten backer board through subfloor with galvanized nails or other corrosion-resistant fasteners.
- surfaces of units—clean and free of dirt, dust, or oily film
- set tiles on positive side moisture barrier coating.

### Materials:

- coated glass mat backer board—ASTM C-1178.
- latex-portland cement mortar—[ANSI A118.4](#).
- dry-set mortar—[ANSI A118.1](#).
- grout—[ANSI A118.7](#) or [A118.3](#).

### 03 Preparation by Other Trades:

- subfloor—19/32" exterior-glue plywood on joists at 16" o.c.
- max. variation in the plywood surface shall not exceed 1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to [Method EJ171](#), page 44.

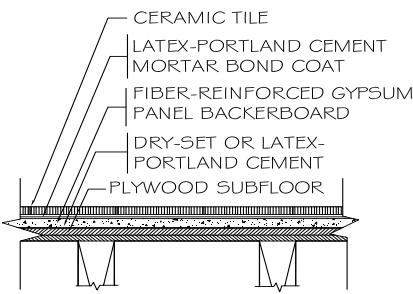
### Installation Specifications:

- coated glass mat backer board—in accordance with manufacturer's literature.
- tile - [ANSI A108.5](#).
- grout - [ANSI A108.10](#) or [ANSI A108.6](#).

03

## Fiber-Reinforced Gypsum Panel Backer Board

Latex-Portland Cement Mortar F170-03



03

### Recommended Uses:

- over structurally sound exterior-glue plywood.
- for dry areas.
- eliminates the necessity of recessing the sub-floor to accommodate portland cement mortar bed.

### Limitations:

- indoor use only

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627)
- maximum spacing of floor joists is 16" o.c.
- use latex-portland cement mortar to set tile to fiber-reinforced gypsum panel backer board.
- fasten backer board through sub-floor with galvanized nails, screws, or other corrosion-resistant fasteners per manufacturer's directions.
- treat joints per manufacturer's directions.
- surfaces of units - clean and free of dirt, dust, or oily film.

### Materials:

- fiber-reinforced gypsum panel backer board - ASTM C1278.
- latex-portland cement mortar - [ANSI A118.4](#).
- dry-set mortar - [ANSI A118.1](#).
- grout—[ANSI A118.7](#) or [A118.3](#).

03

### Preparation by Other Trades:

- subfloor—19/32" exterior glue plywood on joists at 16" o.c.
- maximum variation in the plywood surface shall not exceed 1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory in accordance with [Method EJ171](#), page 44.

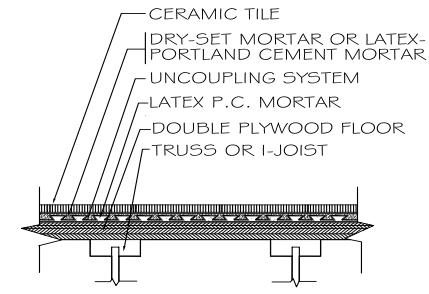
### Installation Specifications:

- fiber-reinforced gypsum panel backer board - in accordance with manufacturer's literature.
- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#) or [A108.6](#).

03

## Wood Subfloor, 24" o.c. Joist Spacing, with Uncoupling System

Latex-Portland Cement Mortar F147-03



03

### Recommended Uses:

- over structurally sound wood floors subject to residential traffic with 24" o.c. floor joist spacing.
- interior dry or wet areas.

### Limitations:

- requires specialty uncoupling system.
- 4" x 4" and larger tile only

### Requirements:

- maximum spacing of floor trusses or I-joists is 24" o.c.
- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300lb. concentrated load (ASTM C627).
- double plywood floor—clean and free of dirt, dust, and oily film.
- face grain of plywoods should run perpendicular to joists for maximum stiffness.
- 1/8" gap between plywood sheets.
- in accordance with manufacturer's literature.

### Materials:

- latex-portland cement mortar—[ANSI A118.4](#).
- dry-set mortar—[ANSI A118.1](#).
- polymer modified tile grout—[ANSI A118.7](#)

### Preparation by Other Trades:

- trusses or I-joists with minimum 2-1/4" top flange (1-1/2" top flange permissible with 8" x 8" and larger tile); cross-bracing recommended.
- subfloor—23/32" tongue & groove exterior glue plywood with 1/8" gap between sheets

03

- underlayment—3/8" minimum exterior glue plywood with 1/8" gap between sheets
- maximum variation in plywood surface shall not exceed 1/4" in 10'-0" from the required plane.

03

- underlayment fasteners should not penetrate joists below

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory in accordance with [Method EJ171](#), page 44.

### Installation Specifications:

- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#).
- uncoupling system—follow manufacturer's directions.

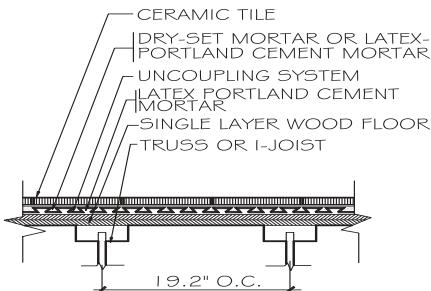
**03 NOTE:** See [page 7](#) for other installation materials and methods. See [Floor Tiling Installation Guide](#) on [page 12](#) for system service rating and materials tested. The Marble Institute of America references this Handbook for the installation of certain dimensional stone. (See Dimensional Stone Design Manual.)

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# FLOORS, INTERIOR

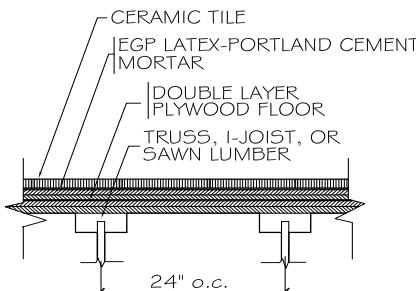
## Wood Subfloor, 19.2" o.c. Joist Spacing, with Uncoupling System

Latex-Portland Cement F148-03



## Wood Subfloor, 24" o.c. Joist Spacing

EGP (Exterior Glue Plywood) F149-03  
Latex-Portland Cement Mortar



03

### Recommended Uses:

- over structurally sound wood floors subject to residential traffic with 19.2" o.c. floor joist spacing.
- interior dry or wet areas.

### Limitations:

- requires specialty uncoupling system.
- 4" X 4" and larger tile only.

### Requirements:

- maximum spacing of floor trusses or I-joints is 19.2" o.c.
- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- plywood floor—clean and free of dirt, dust, and oily film.

### Materials:

- latex-portland cement mortar—[ANSI A118.4](#).
- dry-set mortar—[ANSI A118.1](#).
- polymer modified tile grout—[ANSI A118.7](#).

### Preparation by Other Trades:

- subfloor—23/32" tongue & groove exterior-glue plywood with 1/8" gap between sheets.
- maximum variation in plywood surface shall not exceed 1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory in accordance with [Method EJ171](#), page 44.

### Installation Specifications:

- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#).
- uncoupling system—follow manufacturer's directions.

### Recommended Uses:

- over structurally sound wood floors subject to residential traffic with 24" o.c. floor joist spacing.
- interior, dry areas only.

### Requirement:

- maximum spacing of floor trusses or I-joints is 24" o.c.
- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- double plywood floor—clean and free of dirt, dust, and oily film.
- face grain of plywood should run perpendicular to trusses or I-beams for maximum stiffness.
- gaps between plywood sheets to be treated per setting material manufacturer's recommendations.
- tile 8" x 8" or larger.

### Materials:

- EGP (Exterior Glue Plywood) latex-portland cement mortar—[ANSI A118.11](#).
- grout—[ANSI A118.6](#), [A118.7](#), or [A118.3](#).

### Preparation by Other Trades:

- trusses or I-beams with minimum 1-1/2" top flange or sawn lumber joists; cross bracing recommended.
- subfloor—23/32" exterior-glue plywood with 1/8" gap between sheets.
- underlayment—19/32" exterior-glue plywood with 1/8" gap between sheets.
- max. variation in the plywood surface—1/4" in 10'-0" from the required plane; adjacent edges of plywood sheets—max. 1/32" above or below each other.
- underlayment fasteners should not penetrate joists below.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

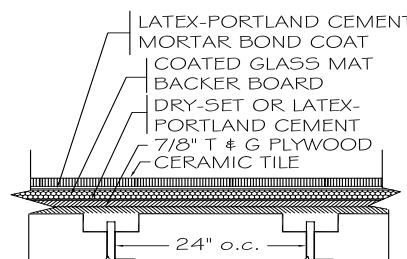
- movement joints—mandatory in accordance with [Method EJ171](#), page 44.

### Installation Specifications:

- tile—[ANSI A108.12](#).
- grout—[ANSI A108.10](#) or [ANSI A108.6](#).

## Coated Glass Mat Water-Resistant Gypsum Backer Board, 24" o.c. Joist Spacing

Latex-Portland Cement Mortar F151-03



### Recommended Uses:

- over structurally sound 7/8" tongue and groove plywood.
- eliminates necessity of recessing subfloor to accommodate portland cement mortar bed.
- follow manufacturer's recommendations.

### Limitations:

- indoor use only
- 8" x 8" or larger tile only
- not for areas subject to continuous water immersion such as shower floors.

### Requirement:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- maximum spacing of floor joists is 24" o.c.
- use 7/8" or thicker T&G plywood.
- use latex-portland cement mortar to set tile.
- fasten backer board through subfloor with galvanized roofing nails or corrosion resistant screws.
- surfaces of units—clean and free of dirt, dust or oily film.
- set tiles on moisture barrier coating.

### Materials:

- coated glass mat backer board—ASTM C-1178.
- latex-portland cement mortar—[ANSI A118.4](#).
- grout—[ANSI A118.7](#) or [A118.3](#).

### Preparation by Other Trades:

- subfloor—7/8" exterior-glue T & G plywood on joists 24" o.c. max.
- maximum variation in the plywood surface shall not exceed 1/4" in 10'-0" from the required plane.
- install T&G plywood according to manufacturers installation instructions for tiled floors.

### Installation Specifications:

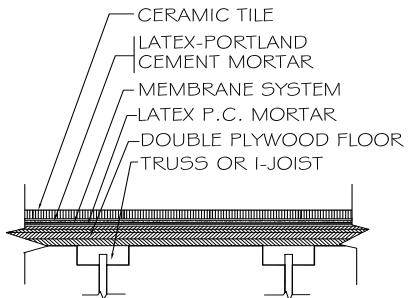
- coated glass mat backer board—in accordance with manufacturer's literature.
- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#) or [A108.6](#).

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# FLOORS, INTERIOR, RADIANT HEAT

## Wood Subfloor, 24" o.c. Joist Spacing, Membrane System

Latex-Portland Cement Mortar F152-03



### Recommended Uses:

- over structurally sound wood floors subject to residential traffic with 24" o.c. floor joist spacing.
- interior dry or wet areas.

### Limitations:

- membrane meets ASTM C-627 test method "residential" with 24" o.c. joist spacing.
- 4" x 4" and larger tile only

### Requirements:

- maximum spacing of floor trusses or I-joists is 24" o.c.
- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300lb. concentrated load (ASTM C627).
- double plywood floor—clean and free of dirt, dust, and oily film.
- face grain of plywoods should run perpendicular to joists for maximum stiffness.
- 1/8" gap between plywood sheets.
- in accordance with manufacturer's literature.

### Materials:

- latex-portland cement mortar—ANSI A118.4.
- polymer modified tile grout—ANSI A118.7
- membrane system recommended by manufacturer.

### Preparation by Other Trades:

- trusses or I-joists with minimum 2-1/4" top flange (1-1/2" top flange permissible with 8" x 8" and larger tile); cross-bracing recommended.
- subfloor—23/32" tongue & groove exterior glue plywood with 1/8" gap between sheets
- underlayment - 3/8" minimum exterior glue plywood with 1/8" gap between sheets
- maximum variation in plywood surface shall not exceed 1/4" in 10'-0" from the required plane.
- underlayment fasteners should not penetrate joists below

### Movement Joint (architect must specify type of joint and show location and details on drawings):

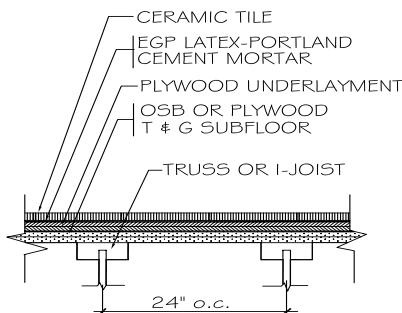
- movement joints—mandatory in accordance with Method EJ171, page 44.

### Installation Specifications:

- tile—ANSI A108.5.
- grout—ANSI A108.10.
- membrane manufacturer's installation instructions.

## OSB Subfloor 24" o.c. Joist Spacing

EGP (Exterior Glue Plywood) F155-03  
Latex-Portland Cement Mortar



### Recommended Uses:

- over structurally sound wood floors subject to residential traffic with 24" o.c. floor joist spacing.
- interior, dry areas only.

### Requirement:

- maximum spacing of floor trusses or I-joists, or sawn lumber is 24" o.c.
- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- double wood floor—clean and free of dirt, dust, and oily film.
- face grain of plywood should run perpendicular to trusses, I-joists, or sawn lumber for maximum stiffness.
- gaps between plywood sheets to be treated per setting material manufacturer's recommendations.
- tile 8" x 8" or larger

### Materials:

- EGP (Exterior Glue Plywood) latex-portland cement mortar—ANSI A118.11.
- grout—ANSI A118.6, A118.7, or A118.3.

### Preparation by Other Trades:

- trusses or I-beams with minimum 1-1/2" top flange or sawn lumber joists; cross bracing recommended.
- subfloor—23/32" tongue & groove OSB with 1/8" gap between sheets.
- underlayment—19/32" exterior-glue plywood with 1/8" gap between sheets
- max. variation in the wood surface—1/4" in 10'-0" from the required plane; adjacent edges of wood sheets—max. 1/32" above or below each other.
- underlayment fasteners should not penetrate joists below.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

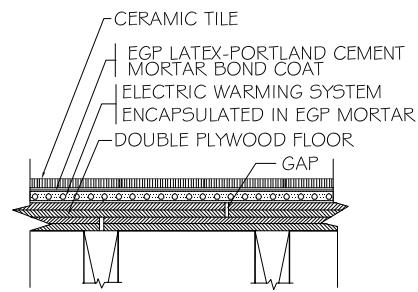
- movement joints—mandatory in accordance with Method EJ171, page 44.

### Installation Specifications:

- tile—ANSI A108.12.
- grout—ANSI A108.10 or ANSI A108.6.

## Electric System

### EGP (Exterior Glue Plywood) RH130-03 Latex-Portland Cement Mortar



### Recommended Uses:

- over wood floor where resistance to foot traffic in residential or light commercial use is desired with thin-set construction.
- for interior, dry areas only.
- membranes for waterproofing may be used with this detail.

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- double plywood floor—clean and free of dirt, dust, and oily film.
- gaps between plywood sheets to be treated per setting material manufacturer's recommendations.
- where waterproof floor is required, use membrane meeting ANSI A118.10.
- latex-portland cement mortar & application varies, consult floor warming manufacturer for recommendations.

### Materials:

- EGP(Exterior Glue Plywood) latex-portland cement mortar—ANSI A118.11.
- grout—ANSI A118.6, A118.7, or A118.3.

### Preparation by Other Trades:

- subfloor—19/32" exterior-glue plywood on joists at 16" o.c.
- underlayment: light commercial—19/32" exterior-glue plywood.
- underlayment: residential—15/32" exterior-glue plywood.
- max. variation in the plywood surface—1/4" in 10'-0" from the required plane. Adjacent edges of plywood sheets—max. 1/32" above or below each other.
- underlayment fasteners should not penetrate joists below.
- electrician or qualified contractor to wire floor warming system to power source.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory in accordance with Method EJ171, page 44.
- floor warming system should not be installed over building expansion joints.

### Installation Specifications:

- tile—ANSI A108.12.
- grout—ANSI A108.10 or ANSI A108.6.
- floor warming systems UI (US) 1693; UL (CAN/CSA) C22.2 #217; NEC Article 424

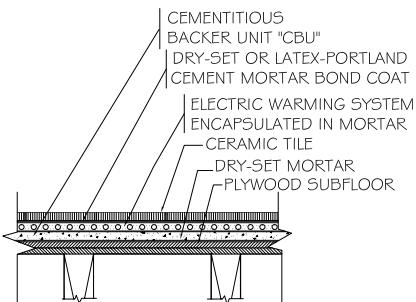
All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.



# WALLS, EXTERIOR & INTERIOR

## Electric System

Cementitious Backer Unit/ RH135-03  
Fiber Cement Underlayment



### Recommended Uses:

- over structurally sound plywood where lightweight construction is a factor.
- where water resistance is desired.
- eliminates necessity of recessing subfloor to accommodate portland cement mortar bed.
- follow manufacturer's recommendations.
- see [page 14 NOTE](#) for exterior uses.

### Limitations:

- waterproof membrane shall be provided where a waterproof floor is required. Follow manufacturer's installation recommendations.

### Requirements:

- design floor areas over which tile is to be applied to have a deflection not greater than 1/360 of the span when measured under 300 lb. concentrated load (see ASTM C627).
- maximum spacing of floor joists is 16" o.c.
- treat joints as per manufacturer's directions.
- use dry-set mortar to establish the supporting plane of the backer board per backer board manufacturer's directions.
- fasten units with corrosion-resistant fasteners per manufacturer's directions.
- surface of units—clean and free of dirt, dust, or oily film.
- bond coat thickness & application varies, consult floor warming manufacturer for recommendations.

### Materials:

- cementitious backer unit—ANSI A118.9 or ASTM C-1325.
- fiber cement underlayment—ASTM C-1288.
- dry-set mortar—[ANSI A118.1](#). (Note: Most thin-set manufacturers have suggested using latex-portland cement.)
- latex-portland cement mortar—[ANSI A118.4](#).
- grout—[ANSI A118.6](#) or [A118.7](#).

### Preparation by Other Trades:

- subfloor—19/32" exterior-glue plywood on joists at 16" o.c.
- max. variation in plywood surface shall not exceed 1/4" in 10'-0" from the required plane.
- electrician or qualified contractor to wire floor warming system to power source.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory in accordance with [Method EJ171](#), page 44.
- floor warming system should not be installed over building expansion joints.

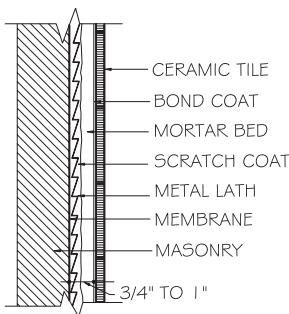
### Installation Specifications:

- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#).
- backer units—[ANSI A108.11](#) or manufacturer's directions.
- floor warming system—UL (US) 1693; UL (CAN/CSA) C22.2 #217; NEC Article 424

## Masonry

### Cement Mortar

W201-03



### Recommended Uses:

- over masonry or concrete on exteriors.

### Requirements:

- flashing—excludes moisture from mortar bed.
- membrane ([ANSI A.2.1.8](#)), prevents passage of moisture.
- apply membrane, metal lath (self-furring lath preferred), and scratch coat.
- movement joints mandatory.
- cut lath at all movement joints.
- require a plumb scratch coat if thickness of mortar bed to exceed 3/4".

### Materials:

- mortar bed, lath, and membrane—[ANSI A108.1A](#).
- bond coat—portland cement paste on a mortar bed that is still workable. Dry-set or latex-portland cement mortar permissible with wall tile. (For dry-set or latex-portland cement mortar on a cured bed, follow [Method W202](#).)
- grout—[ANSI A118.6](#) or [A118.7](#).

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to [Method EJ171](#), page 44.

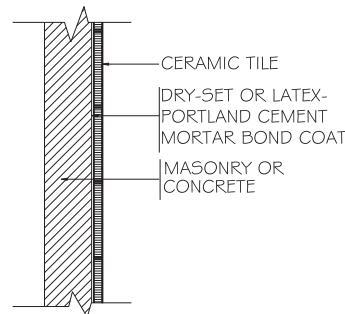
### Installation Specifications:

- tile—[ANSI A108.1A](#).
- grout—[ANSI A108.10](#).

### Dry-Set Mortar or

W202-03

### Latex-Portland Cement Mortar



### Recommended Uses:

- over clean, sound, dimensionally stable masonry or concrete.

### Limitations:

- do not use over cracked or coated surfaces. Select [Method W201](#).

### Materials:

- dry-set mortar—[ANSI A118.1](#).
- latex-portland cement mortar—[ANSI A118.4](#).
- grout—[ANSI A118.6](#) or [A118.7](#).
- when chemical resistance is required for interior installations, specify epoxy mortar and grout complying with [ANSI A118.3](#).

### Preparation by Other Trades:

- surface must be free of coatings, oil, wax.
- all concrete should be bush-hammered or heavily sand-blasted.
- max. variation in the masonry surface—1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints mandatory—according to [Method EJ171](#), page 44.

### Installation Specifications:

- tile—[ANSI A108.5](#).
- grout—[ANSI A108.10](#).
- epoxy mortar/grout—[ANSI A108.6](#).

**NOTES:** A waterproof membrane meeting [ANSI A118.10](#) may be installed on the front face of the mortar bed directly beneath the tile in lieu of the membrane installed on the substrate surface.

For prefabricated exterior panels, refer to page 8.

**NOTE:** Waterproof membrane required for exterior installations. Consult membrane manufacturers for appropriate installation directions.

**NOTE:** Methods [W211](#), [W221](#), [W222](#), [W231](#), [W241](#), and [W244](#) may be suitable for exterior use when appropriate precautions are taken including flashing, expansion joint placement, and consideration for the particular climatic conditions and exposure.

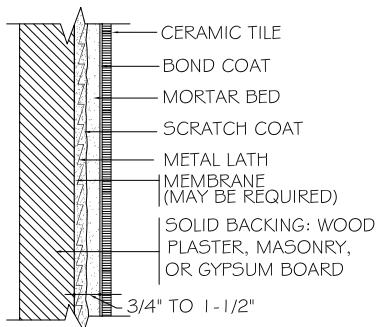
All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# WALLS, INTERIOR-SOLID BACKING

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

## Cement Mortar

W221-03



### Recommended Uses:

- over masonry, plaster, or other solid backing that provides firm anchorage for metal lath.
- ideal for remodeling or on surfaces that present bonding problems.

### Requirements:

- require a leveling coat if variation in scratch coat exceeds 1/4" in 10'-0" from the required plane or if thickness of mortar bed exceeds 3/4".
- apply membrane (ANSI A.2.1.8), metal lath (self-furring lath preferred), and scratch coat.
- cut lath at all movement joints.

### Materials:

- mortar bed, lath, and membrane—[ANSI A108.1A](#).
- bond coat—portland cement paste on a mortar bed that is still workable. Dry-set or latex-portland cement mortar permissible with wall tile. (For dry-set or latex-portland cement mortar on a mortar bed cured for a minimum of 20 hours at 70°F or above, follow [Method W202](#).)
- grout—[ANSI A118.6](#) or [A118.7](#).
- when chemical resistance is required for interior installations, specify epoxy mortar and grout complying with [ANSI A118.3](#).

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to [Method EJ171](#), page 44.

### Installation Specifications:

- tile—[ANSI A108.1A](#), [.1B](#) or [.1C](#).
- grout—[ANSI A108.10](#).
- epoxy mortar/grout—[ANSI A108.6](#).

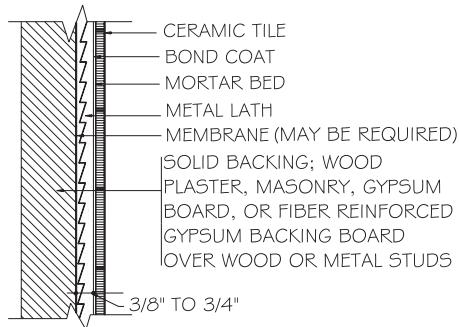
**NOTE:** Use furring strips ([Method W231](#)) if lath cannot be attached directly to backing.

**03** **NOTE:** When waterproofing is desired, use a waterproof membrane meeting [ANSI A118.10](#). Install membrane per manufacturer's instructions and [ANSI A108.13](#). May be installed on the front face of the mortar bed directly beneath the tile in lieu of the membrane installed on the substrate surface.

**NOTE:** Methods [W211](#), [W221](#), [W222](#), [W231](#), [W241](#), and [W244](#) may be suitable for exterior use when appropriate precautions are taken including flashing, expansion joint placement, and consideration for the particular climatic conditions and exposure.

## One-Coat Method

W222-03



### Recommended Uses:

- over masonry, plaster, or other solid backing that provides firm anchorage for metal lath.
- ideal for remodeling or on surfaces that present bonding problems.
- ideal for remodeling where space limitations exist.
- preferred method of applying tile over gypsum plaster or gypsum board in showers and tub enclosures.

### Requirements:

- max. variation in the backing surface—1/4" in 10'-0" from the required plane.
- apply membrane (when required) and metal lath.
- cut lath at all movement joints.

### Materials:

- mortar bed, lath, and membrane—[ANSI A108.1A](#).
- bond coat—portland cement paste on a mortar bed that is still workable. Dry-set or latex-portland cement mortar permissible with wall tile. (For dry-set or latex-portland cement mortar on a mortar bed cured for a minimum of 20 hours at 70°F or above, follow [Method W202](#).)
- grout—[ANSI A118.6](#) or [A118.7](#).

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to [Method EJ171](#), page 44.

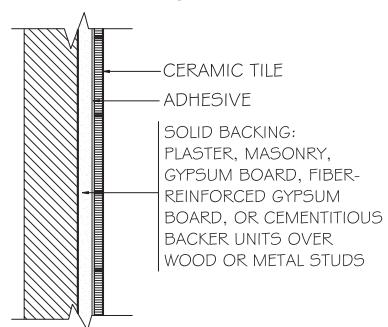
### Installation Specifications:

- tile—[ANSI A108.1A](#), [.1B](#) or [.1C](#).
- grout—[ANSI A108.10](#).

## Organic Adhesive

\*CAUTION: See page 9

W223-03



### Recommended Uses:

- interiors over gypsum board, plaster, cementitious backer units, dimensionally stable masonry, or other smooth surfaces.

### Limitations:

- organic adhesives are not recommended in areas exposed to temperatures exceeding 140° F. Some backing materials may require lower temperatures.
- not for areas subject to continual water saturation.

### Requirements:

- refer to [Methods W242](#) or [W244](#) for metal stud construction.
- in wet areas use a water resistant substrate.

### Materials:

- organic adhesive—[ANSI A136.1](#). Type I organic adhesives are recommended for tub surrounds; Type II for dry areas only. Over cementitious backer units use Type I adhesives only when approved by adhesive manufacturer.
- water-resistant gypsum backing board (ASTM C630), cementitious backer unit ([ANSI A118.9](#)), coated glass mat water-resistant gypsum backer board (ASTM C-1178), fiber cement underlayment (ASTM C-1228), or fiber-reinforced gypsum panel backer board (ASTM C-1278).
- gypsum board ASTM C36 (suitable for dry areas only).
- movement joints—mandatory according to [Method EJ171](#), page 44.
- grout—[ANSI A118.6](#) or [A118.7](#).

### Preparation by Other Trades:

- max. variation in the backing surface—1/4" in 10'-0" from the required plane.
- gypsum board joints—treat with tape and joint compound in accordance with Level 1 of GA-214; bedding coat only (no finish coats).
- fastener heads—treated with one coat of joint compound in accordance with Level 1 of GA-214. Treatment of corrosion-resistant fasteners is optional.
- treatment of joint compound—joint compound shall be treated with a water-resistant material.

### Preparation by Tile Trade:

- follow adhesive manufacturer's instructions.
- allow minimum of 24 hrs. after tile is set before grouting.

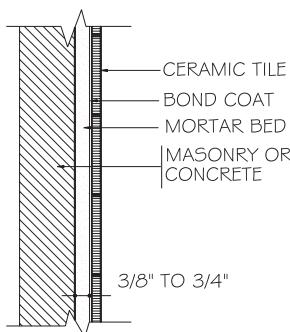
### Installation Specifications:

- gypsum board - GA-216.
- tile - [ANSI A108.4](#).
- grout - [ANSI A108.10](#).

# WALLS, INTERIOR

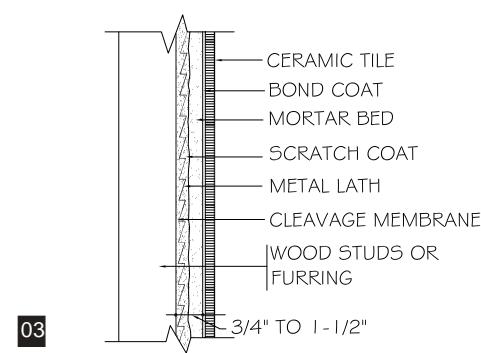
## Masonry or Concrete

Cement Mortar, Bonded W211-03



## Wood Studs or Furring

Cement Mortar W231-03



### Recommended Uses:

- over clean, sound, dimensionally stable masonry or concrete.

### Limitations:

- do not use over cracked or coated surfaces. Select Method W221 or W222 for such surfaces.

### Requirements:

- require a scratch coat over properly scarified concrete if surface is irregular or if thickness of mortar bed to exceed 3/4".

### Materials:

- mortar bed—ANSI A108.1A.
- bond coat—portland cement paste on a mortar bed that is still workable. Dry-set or latex-portland cement mortar permissible with wall tile. (For dry-set or latex-portland cement mortar on a mortar bed cured for a minimum of 20 hours at 70°F or above, follow Method W202).
- grout—ANSI A118.6 or A118.7.
- when chemical resistance is required for interior installations, specify epoxy mortar and grout complying with ANSI A118.3.

### Preparation by Other Trades:

- surface must be free of coatings, oil, wax.
- concrete—bush-hammered or heavily sand-blasted.
- max. variation in the masonry surface—1/4" in 10'-0" from the required plane.

### Preparation by the Tile Trade:

- max. variation in the scratch coat—1/4" in 10'-0" from the required plane.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

- tile—ANSI A108.1A, .1B or .1C.
- grout—ANSI A108.10.
- epoxy mortar/grout—ANSI A108.6.

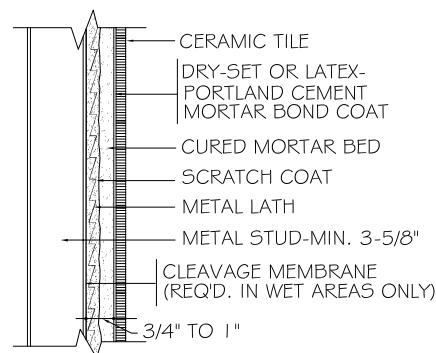
**03** NOTE: When waterproofing is desired, use membrane meeting ANSI A118.10. Install membrane per manufacturer's instructions and ANSI A108.13.

## Masonry or Concrete

Cement Mortar W231-03

## Metal Studs

Cement Mortar W241-03



### Recommended Uses:

- over metal studs.

### Requirements:

- set tile in dry-set or latex-portland cement mortar on a mortar bed cured for a minimum of 20 hours at 70°F or above.
- scratch coat and mortar bed must not be richer than specified below.
- do not exceed 1" total thickness of mortar and scratch coat.
- stud spacing not to exceed 16" o.c.
- 3-5/8" minimum recommended stud depth.
- studs—20 gauge (0.039") or heavier.

### Materials:

- 03**
- membrane (ANSI A2.1.8)—15 lb. roofing felt or 4-mil polyethylene film (required in wet areas only).
  - portland cement—ASTM C-150 Type 1.
  - lime—ASTM C-206 Type S or ASTM C-207 Type S.
  - sand—ASTM C-144.
  - water—potable.
  - scratch coat—1 part portland cement, 1/2 part lime, and 4 parts dry sand to 5 parts damp sand or 1 part portland cement, 3 parts dry sand to 4 parts damp sand.
  - mortar bed—1 part portland cement, 1/2 part lime and 5 parts damp sand up to 1 part portland cement, 1 part lime and 7 parts damp sand, by volume.
  - dry-set mortar—ANSI A118.1.
  - latex-portland cement mortar—ANSI A118.4.
  - metal lath—galvanized or painted expanded metal lath 3.4 lbs./sq. yd. Do not use rib lath.
  - metal studs—ASTM C-645.
  - grout—ANSI A118.6 or A118.7.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

- cured mortar bed—ANSI A108.1B.
- tile—ANSI A108.5.
- grout—ANSI A108.10.

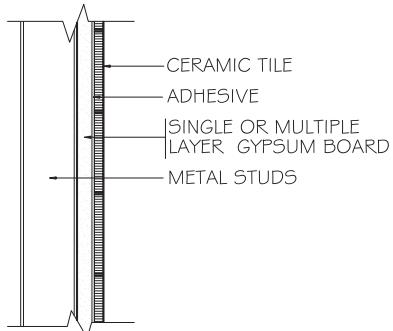
**03** NOTE: When waterproofing is desired, use a waterproof membrane meeting ANSI A118.10. Install membrane per manufacturer's instructions and ANSI A108.13. May be installed on the front face of the mortar bed directly beneath the tile in lieu of the membrane installed on the substrate surface.

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# WALLS, INTERIOR

## Metal Studs

Gypsum Board  
Organic Adhesive



### Recommended Uses:

- for dry areas only.
- over gypsum board screwed to metal studs, single or double layer installed according to GA-216.
- where a gypsum board, non-load-bearing partition is desired with durable, low-maintenance finish.
- for fire-resistant, sound-insulated, ceramic tiled walls. (Fire-resistance and sound-insulation ratings calculated on partitions before tiling.)

### Limitations:

- see Method W223.

### Requirements:

- maximum stud spacing—16" o.c.
- minimum recommended stud depth—3-5/8".
- studs—20 gauge (0.039") or heavier.
- minimum recommended single layer gypsum board thickness—1/2".

### Materials:

- organic adhesive—ANSI A136.1.
- metal studs—ASTM C-645.
- water-resistant gypsum backing board—ASTM C-630.
- gypsum board—ASTM C-36.
- movement joints—mandatory according to EJ171, page 44.
- grout—polymer modified tile grout—ANSI A118.7.

### Preparation by Other Trades:

- max. variation in the gypsum board surface - 1/4" in 10'-0" from the required plane nor more than 1/16" per foot. Corners, door jambs, etc. must be plumb within 1/8" in 8'-0".
- gypsum board face layer joints - treated with tape and joint compound, bedding coat only (no finish coats). Nail heads, one coat only.

### Preparation by Tile Trade:

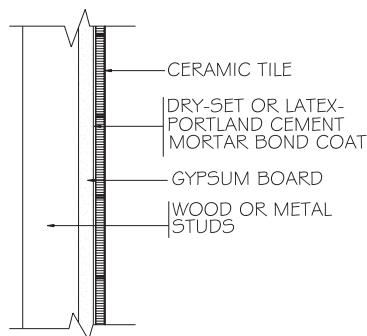
- follow adhesive manufacturer's instructions.
- allow minimum of 24 hrs. after tile is set before grouting.

### Installation Specifications:

- gypsum board—GA-216.
- tile—ANSI A108.4.
- grout—ANSI A108.10.

## Wood or Metal Studs

Gypsum Board -Thin-Set      W243-03



### Recommended Uses:

- 03
- dry interiors over gypsum board.
  - for dry areas only.
  - over dry, well-braced wood studs or furring.
  - over well-braced metal studs.

### Limitations:

- in wet areas such as tub enclosures, use Method B413.
- do not use in areas where gypsum board is exposed to temperatures above 125°F.

### Requirements:

- maximum stud spacing—16" o.c.
- minimum recommended metal stud depth—3-5/8".
- metal studs—20 gauge (0.039") or heavier.

### Materials:

- gypsum board—ASTM C-36 or C-630.
- dry-set mortar—ANSI A118.1.
- latex-portland cement mortar—ANSI A118.4.
- grout—ANSI A118.6 or A118.7.

### Preparation by Other Trades:

- max. variation in the gypsum board surface—1/4" in 10'-0" from the required plane.
- gypsum board joints—treated with tape and joint compound, bedding coat only (no finish coats). Nail heads, one coat only.

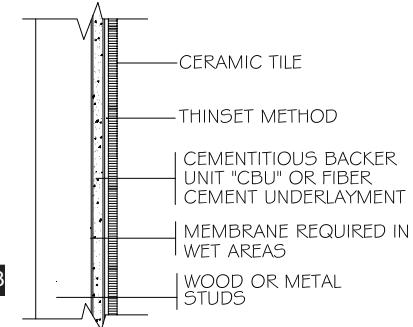
### Installation Specifications:

- gypsum board—GA-216.
- tile—ANSI A108.5.
- grout—ANSI A108.10.

## 03 Cementitious Backer Unit/Fiber Cement Underlayment

Thin-Set

W244-03



### Recommended Uses:

- 03
- in wet or dry areas.
  - over dry, well-braced wood studs or furring.
  - over well-braced metal studs.

### Requirements:

- set tile in dry-set or latex-portland cement mortar.
- stud spacing—maximum 16" o.c.
- minimum recommended stud depth—3-5/8".
- metal studs—20 gauge (0.039") or heavier.

### Materials:

- cementitious backer units—ANSI A118.9 or ASTM C-1325.
- fiber cement underlayment—ASTM C-1288.
- 2" glass fiber mesh tape.

- 03
- membrane (ANSI A.2.1.8)—(when required) 15 lb. roofing felt or 4-mil polyethylene film.
  - fasteners—non-corrosive and non-oxidizing.
  - hot-dipped fasteners meeting ASTM A653-96 required in wet areas.
  - dry-set mortar—ANSI A118.1.
  - latex-portland cement mortar—ANSI A118.4.
  - grout—ANSI A118.6, A118.7, or A118.3.
  - when chemical resistance is required for interior installations, specify epoxy mortar and grout complying with ANSI A118.3.

### Preparation by Backer Unit Installers:

- maximum variation in the backing surface -1/4" in 10'-0" from the required plane.
- horizontal and vertical joints and corners - 1/8" spacing filled solid with dry-set or latex-portland cement mortar.
- 2" glass fiber mesh tape - embed in a skim coat of the mortar over joints and corners.

### Preparation by Other Trades:

- membrane, if required.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

- cementitious backer units—ANSI A108.11.
- tile—ANSI A108.5.

- 03
- grout—ANSI A108.10 or A108.6.

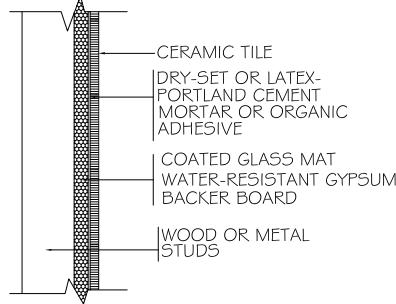
- 03
- NOTE: When waterproofing is desired, use a waterproof membrane meeting ANSI A118.10. Install membrane per manufacturer's instructions and ANSI A108.13. May be installed on the front face of the mortar bed directly beneath the tile in lieu of the membrane installed on the substrate surface.

# WALLS, INTERIOR

## 03 Coated Glass Mat Water-Resistant Gypsum Backer Board

Thin-Set

W245-03



03

### Recommended Uses:

- in wet or dry areas.
- over dry, well-braced wood studs or furring.
- over well-braced metal studs.

### Requirements:

- set tile in dry-set or latex-portland cement mortar or organic adhesive.
- stud spacing—maximum 16" o.c. or 24" o.c. with blocking at all joints, ends, and edges
- minimum recommended stud depth—3-5/8".
- metal studs—20 gauge (0.039") or heavier for tile applications.

### Materials:

- coated glass mat backer board—ASTM C-1178.
- 2" glass fiber mesh tape.
- fasteners—non-corrosive and non-oxidizing.
- dry-set mortar—ANSI A118.1.
- latex-portland cement mortar—ANSI A118.4.
- organic adhesive—ANSI A136.1. Type I for wet areas and Type I or Type II for dry areas.
- grout—ANSI A118.6, A118.7, or A118.3.

### Preparation by Other Trades:

- maximum variation in the wood or metal studs—not to exceed 1/4" in 10'-0" from the required plane.

### Preparation by Backer Board Installers:

- 2" glass fiber mesh tape—embed in material used to set tiles on all joints and corners that are to receive tile. Caulk or seal penetrations and abutments to dissimilar materials.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints—mandatory according to Method EJ171, page 44.

### Installation Specifications:

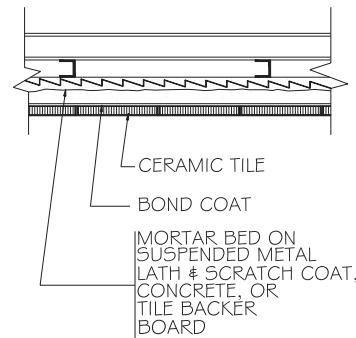
- follow manufacturer's instructions.
- tile—ANSI A108.4 or ANSI A108.5.
- grout—ANSI A108.10 or A108.6.

03

# CEILINGS, SOFFITS

General

C311-03



## Cementitious-Coated Foam Backer Board

Dry-set Mortar or Latex W246-03  
Portland Cement Mortar

### Recommended Uses:

- in wet or dry areas.
- over dry, well-braced wood studs or furring.
- over well-braced metal studs.
- where waterproof properties are required.

### Requirements:

- set tile in dry-set or latex-portland cement mortar.
- stud spacing—maximum 16" o.c.
- minimum recommended stud depth—3-5/8".
- metal studs—20 gauge (0.039") or heavier.
- Fasten units to studs per manufacturer's recommendations.

### Materials:

- cementitious coated foam backer board.
- waterproofing for seams and fastener heads - ANSI A118.10.
- fasteners—non-corrosive and non-oxidizing.
- dry-set mortar—ANSI A118.1.
- latex-portland cement mortar—ANSI A118.4.
- grout—ANSI A118.6, A118.7, or A118.3
- Metal studs - ASTM C-645.

### Preparation by Cement Backer Board Installers:

- Maximum variation in the backing surface - 1/4" in 10'-0" from the required plane.
- Horizontal and vertical joints and corners - butt tightly together, after placing a bead of flexible caulking (or other waterproofing) in joints and corners.

### Movement Joint (architect must specify type of joint and show location and details on drawings):

- movement joints - mandatory according to Method EJ171, page 44.

### Installation Specifications:

- cementitious-coated foam backer board - install according to manufacturer's instructions.
- tile - ANSI A108.5.
- grout - ANSI A108.10 or A108.6.

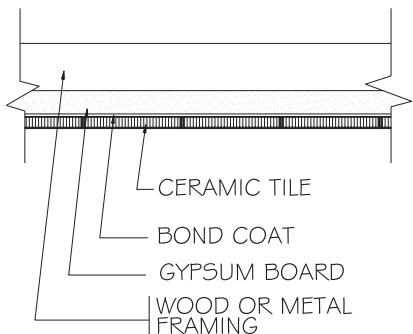
All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# CEILINGS, SOFFITS

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

## Gypsum Board

### C312-02



#### Recommended Uses:

- dry interiors over gypsum board.
- for other applications, see GA-216.

#### Limitations:

- ceiling framing must be capable of supporting the weight of backing and tile.
- the weight of overlaid unsupported insulation shall not exceed 1.3 psf for 1/2"-thick gypsum board with framing spacing 24" o.c.; 2.2 psf for 1/2" gypsum board with framing spacing 16" o.c.; and 5/8" gypsum board with framing spacing 24" o.c.
- minimum thickness of gypsum board—1/2"-thick.

#### Requirements:

- surface—free of coatings, oil, and wax.
- maximum variation in the backing surface—1/4" in 10'-0" from the required plane.

#### Materials:

- gypsum board—ASTM C-36 or C-630.
- dry-set mortar—[ANSI A118.1](#).
- latex-portland cement mortar—[ANSI A118.4](#).
- organic adhesive—[ANSI A136.1](#).
- grout—[ANSI A118.6](#) or [A118.7](#).

#### Preparation by Other Trades:

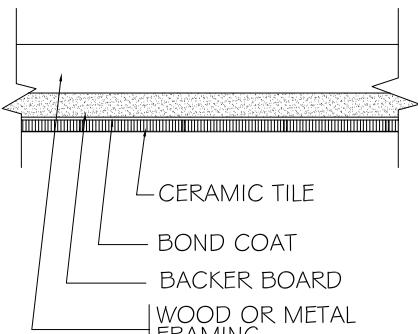
- gypsum board joints—treated with tape and joint compound, bedding coat only (no finish coats). Fastener heads, one coat only.

#### Installation Specifications:

- gypsum board—GA-216.
- tile—[ANSI A108.4](#), or [ANSI 108.5](#).
- grout—[ANSI A108.10](#).
- epoxy mortar/grout—[ANSI A108.6](#).

## Backer Board

### C315-03



#### Recommended Uses:

- in wet or dry areas.
- over dry, well-braced wood studs or furring.
- over well-braced metal studs.

#### Limitations:

- ceiling framing must be capable of supporting the weight of backer board and tile.
- the weight of the tile shall not exceed 5 psf for 1/2" backer board with framing spacing 24" o.c.; 6 psf for 1/2" backer board with framing spacing 16" o.c.
- minimum thickness of backer board—1/2" thick.

#### Requirements:

- surface—free of coatings, oil, and wax.
- maximum variation in the backing surface—1/4" in 10'-0" from the required plane.
- fasten backer board to the studs using methods recommended by the manufacturer.

#### Materials:

- cementitious backer units—[ANSI A118.9](#).
- coated glass mat backer board—ASTM C-1178.
- cementitious coated foam backer board.
- fasteners—non-corrosive and non-oxidizing.
- organic adhesive—[ANSI A136.1](#).
- dry-set mortar—[ANSI A118.1](#).
- latex-portland cement mortar—[ANSI A118.4](#).
- grout—[ANSI A118.6](#), [A118.7](#) or [A118.3](#).
- metal studs—ASTM C-645.

#### Installation Specifications:

- backer board—[ANSI A108.11](#) or according to manufacturer's instructions.
- tile—[ANSI 108.5](#).
- grout—[ANSI A108.10](#) or [A108.6](#).

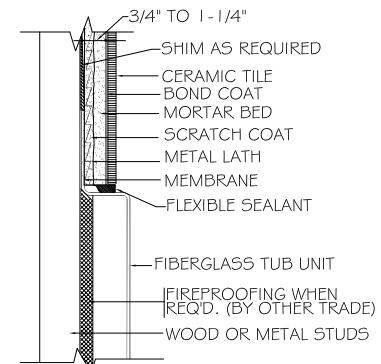
**NOTE:** When waterproofing is desired, use membrane meeting [ANSI A118.10](#). Install membrane per manufacturer's instructions and [ANSI A108.13](#).

# BATHTUB WALLS

## Wood or Metal Studs

### Cement Mortar

### B411-03



#### Recommended Uses:

- over dry, well-braced wood studs, furring, or metal studs.
- preferred method of installation over wood studs for bathtubs.

#### Requirements:

- protect wood studs or furring from moisture with membrane.
- over metal studs, see [Method W241](#).
- apply membrane, metal lath, and scratch coat.
- require a leveling coat if variation in scratch coat exceeds 1/4" in 10'-0" from the required plane or if thickness of mortar bed to exceed 3/4".

#### Materials:

- mortar bed, lath, and membrane—[ANSI A108.1A](#).
- bond coat—portland cement paste on a mortar bed that is still workable. (For dry-set or latex-portland cement mortar on a mortar bed cured for a minimum of 20 hours at 70°F or above, follow [Method W202](#).)
- grout—[ANSI A118.6](#) or [A118.7](#).
- elastomeric caulking—silicone rubber—after tilework and grout are dry.
- metal studs—ASTM C-645.

#### Preparation by Other Trades:

- over metal studs—see [Method W241](#).
- studs—install square and plumb
- stud spacing—not to exceed 16" o.c.
- opening for recessed bathtubs—not to exceed 1/2" more than total length of tub.
- bathtub—install level and support with metal hangers or on end grain wood blocks.
- fireproofing behind tub when required.

#### Installation Specifications:

- tile—[ANSI A108.1A](#).
- grout—[ANSI A108.10](#).

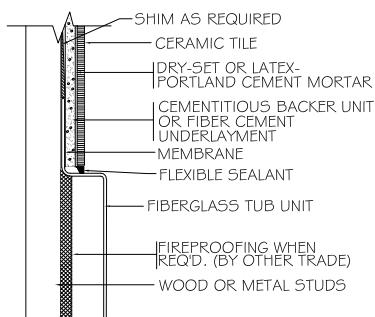
# BATHTUB WALLS

## Wood or Metal Studs

### 03 Cementitious Backer Unit/Fiber

#### Cement Underlayment

B412-03



03

#### Recommended Uses:

- in tub enclosures and tub showers over dry, well-braced wood studs, furring, or metal studs.

#### Requirements:

- use in conjunction with [Method W244](#).
- stud spacing not to exceed 16" o.c.
- minimum stud depth—3-5/8".
- metal studs—20 gauge (0.039") or heavier.

#### Materials:

- cementitious backer units—[ANSI A118.9](#) or [ASTM C-1325](#).
- fiber cement underlayment—[ASTM C-1288](#).
- 2"-wide glass fiber mesh tape.
- dry-set mortar—[ANSI A118.1](#).
- latex-portland cement mortar—[ANSI A118.4](#).

03 • grout—[ANSI A118.6](#), [A118.7](#), [A118.3](#)

- elastomeric caulking—mildew-resistant silicone rubber.
- metal studs—[ASTM C-645](#).

03 • membrane ([ANSI A.2.1.8](#)).

03 • organic adhesives—[ANSI A136.1](#).

#### Preparation by Other Trades:

- over metal studs—see [Method W244](#).
- studs—install square and plumb.
- opening for recessed tub—not to exceed 1/2" more than length of tub.
- bathtub—install level and support with metal hangers or on wood framing members.
- Fire and sound ratings—extend gypsum board required for ratings down to the floor behind the tub so that construction will be the same as the tested assembly. Cementitious backer units may be part of, or installed over, the rated assembly.

#### Preparation by Tile Trade:

- provide a 1/8" spacing at horizontal and vertical joints and corners of cementitious backer units and fill space solid with dry-set or latex-portland cement mortar.
- embed 2"-wide glass fiber mesh tape in a skim coat of the same mortar over joints and corners.

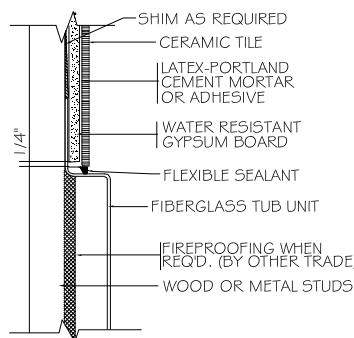
#### Installation Specifications:

- cementitious backer units - [ANSI A108.11](#).
- tile - [ANSI A108.5](#)
- grout - [ANSI A108.10](#) or [A108.6](#).

03

### Gypsum Board

\*CAUTION: See page 9



03

#### Recommended Uses:

- in tub enclosures over water-resistant gypsum backing board on wood or metal studs.
- gypsum wallboard and water-resistant gypsum backing board shall not be used in critical exposure areas. (See [ANSI AN-3.5.1.1](#))

#### Requirements:

- to be used in conjunction with Methods [W223](#), [W242](#), or [W243](#).
- apply water-resistant gypsum backing board; single-layer thickness shall be minimum 1/2"-thick over studs spaced at maximum 16" o.c.
- apply water-resistant gypsum backing board horizontally with the factory paperbound edge spaced a minimum of 1/4" above the lip of the tub.

#### Materials:

- see Methods [W223](#), [W242](#), or [W243](#).

#### Preparation by Other Trades:

- bathtub—install level and support with metal hangers or on end grain wood blocks.
- fireproofing behind tub when required.
- all openings cut in backing board for plumbing and all cut joints between adjoining pieces—seal with adhesive or other materials recommended by manufacturer of backing board.
- gypsum backing board joints—treated with tape and joint compound, bedding coat only (no finish coats). Nail heads, one coat only.

#### Preparation by Tile Trade:

- follow adhesive manufacturer's instructions.

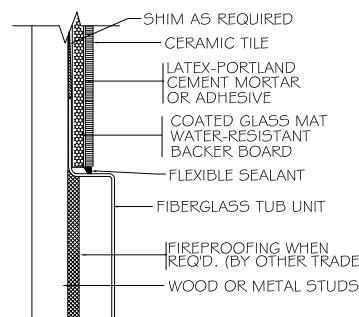
#### Tile Installation:

- organic adhesive—Methods [W223](#) or [W242](#).
- latex-portland cement mortar—Method [W243](#).

03 Note: Not to be used at bathtub walls incorporating showerheads.

### 03 Coated Glass Mat Water-Resistant Gypsum Backer Board

B419-03



03

#### Recommended Uses:

- in tub enclosures over dry, well-braced wood studs, furring, or metal studs.

#### Requirements:

- set tile in dry-set or latex-portland cement mortar or organic type I adhesive on the coated surface.
- stud spacing not to exceed 16" o.c.
- minimum recommended stud depth is 3-1/2" for wood and 3-5/8" for metal.
- metal studs shall be 20 gauge (0.039") or heavier.
- maximum variation in the backing surface shall not exceed 1/4" in 10'-0" from the required plane.
- follow manufacturer's methods for attachment.

#### Materials:

- coated glass mat backer board [ASTM C-1178](#)
- 2"-wide glass fiber mesh tape.
- dry-set mortar—[ANSI A118.1](#).
- latex-portland cement mortar [ANSI A118.4](#).
- organic adhesive—[ANSI A136.1](#).
- grout—[ANSI A118.3](#), [A118.6](#) or [A118.7](#).
- flexible caulking.
- metal studs—[ASTM C-645](#).

#### Preparation by Other Trades:

- studs—install square and plumb.
- opening for recessed tub not to exceed 1/2" more than length of tub.
- bathtub—install level and supported with metal hangers or on wood framing members.
- fire and sound ratings—extend gypsum board required for rating down to the floor behind the tub so that construction will be the same as the tested assembly.

#### Preparation by Backer Board Installers:

- 2" glass fiber mesh tape shall be embedded in a skim coat of the tile setting material over joints, corners, and fasteners.

#### Tile Installation:

- install according to manufacturer's instructions.
- do not install a vapor barrier behind the tile backer board.

#### Installation Specifications:

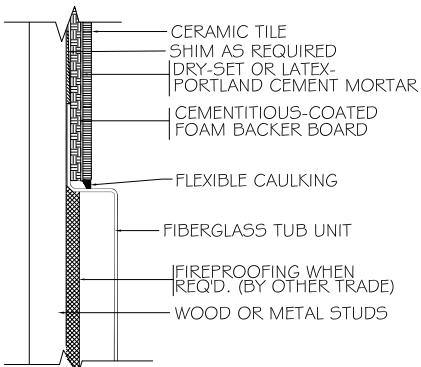
- tile—[ANSI A108.4](#) or [ANSI A108.5](#).
- grout—[ANSI A108.10](#) or [A108.6](#).

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# SHOWER RECEPTORS, WALLS

## Wood or Metal Studs

### Cementitious-Coated Foam Backer Board B425-03



All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

#### Recommended Uses:

- in wet or dry areas.
- in tub enclosures and tub showers over dry, well-braced wood studs, furring, or metal studs.

#### Requirements:

- use in conjunction with [Method W246](#).
- stud spacing not to exceed 16" o.c.
- minimum recommended stud depth is 3-5/8".
- metal studs—20 gauge (0.039") or heavier.
- apply backer board tight to the lip of the tub using waterproof caulk in the joint.
- fasten units to studs per manufacturer's recommendations.

#### Materials:

- cementitious coated foam backer board.
- waterproofing for seams and fastener heads - [ANSI A118.10](#).
- fasteners - non-corrosive and non-oxidizing.
- dry-set mortar - [ANSI A118.1](#).
- latex-portland cement mortar [ANSI A118.4](#).
- grout—[ANSI A118.6](#), [A118.7](#), or [A118.3](#).
- flexible caulking - mildew-resistant silicone rubber or water based caulk.
- metal studs—ASTM C-645.

#### Preparation by Other Trades:

- bathtub-install level and support with metal hangers or on wood framing members.
- opening for recessed tub not to exceed 1/2" more than length of tub.
- all openings cut in backer board for plumbing and all cut joints between adjoining pieces - seal with waterproofing as recommended by backer board manufacturer.
- maximum variation in the backing surface - 1/4" in 10'-0" from the required plane.

#### Preparation by Backer Board Installers:

- horizontal and vertical joints and corners-but tight together, after placing a bead of flexible caulking (or other waterproofing) in joints and corners.

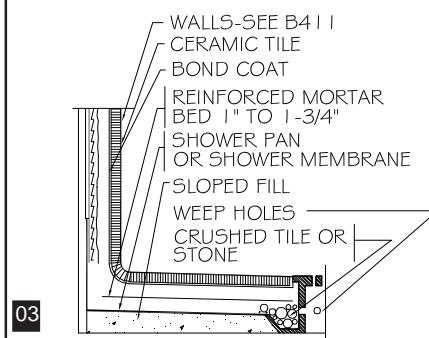
#### Installation Specifications:

- cementitious-coated foam backer board - install according to manufacturer's instructions.
- tile - [ANSI A108.5](#).
- grout - [ANSI A108.10](#) or [A108.6](#).

NOTE: See Notes on page 9.

### Cement Mortar

### B414-03 03 Cementitious Backer Unit/Fiber Cement Underlayment B415-03



#### Recommended Uses:

- over wood or concrete subfloors.

#### Requirements:

- to be used in conjunction with Methods [W201](#), [W221](#), [W231](#), or [W241](#).
- slope required under membrane. Provide slope 1/4" per ft. to top of drain body flange or collar.
- membrane or pan to turn up wall at least 3" above shower curb (6" above floor in showers without curbs).
- shower floor membrane, as required by local authority having jurisdiction.

#### Materials:

- mortar bed and reinforcing—[ANSI A108.1A](#).
- bond coat—portland cement paste on a mortar bed that is still workable, or dry-set mortar or latex-portland cement mortar on a cured bed.
- grout—[ANSI A118.6](#) or [A118.7](#).

#### Preparation by Other Trades:

- form slope for membrane with cement mortar or preformed liners.

#### Preparation by Tile Trade:

- surround drain with broken pieces of tile or crushed stone to prevent mortar from blocking weep holes.

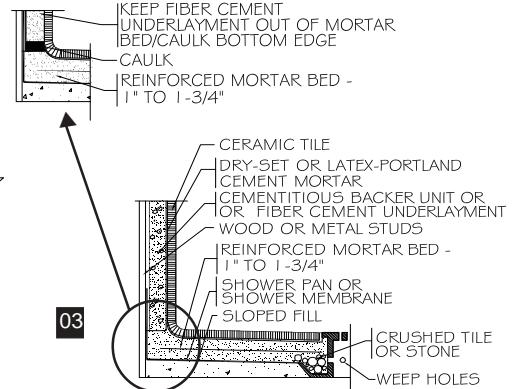
#### Installation Specifications:

- tile—[ANSI A108.1A](#), [.1B](#) or [.1C](#).
- grout—[ANSI A108.10](#).

*NOTES: Showers for the handicapped may eliminate the shower curb with required slope from entry of shower to drain. The minimum distance between the door, or entry, to the drain opening shall be 4'-0".*

*Materials adversely affected by moisture in areas immediately adjacent to showers, tubs, and roman tubs shall be properly protected with a membrane.*

*A sloped portland cement mortar fill or approved preformed slope may be used under shower pan when subfloor is not sloped to drain.*



03 Wall membrane laps over shower pan membrane.

#### Recommended Uses:

- over wood or concrete subfloors.
- in showers over dry, well-braced wood studs, furring, or metal studs.

#### Requirements:

- to be used in conjunction with [Method W244](#).
- form slope for shower pan membrane with portland cement mortar.
- slope shower pan membrane 1/4" per ft. to weep holes in drain.
- turn shower pan membrane up walls a minimum of 3" above shower curb (6" above floor in showers without curbs).
- Fur studs with 1/4", or thicker, furring strips above the top of the shower pan membrane to allow the top of the membrane to be flush with the face of the furring strips.
- shower floor membrane, as required by local authority having jurisdiction.

#### Materials:

- cementitious backer units—[ANSI A118.9](#) or [ASTM C-1325](#).
- fiber cement underlayment—[ASTM C-1288](#).
- 2"-wide glass fiber mesh tape.
- dry-set mortar—[ANSI A118.1](#).
- latex-portland cement mortar—[ANSI A118.4](#).
- grout—[ANSI A118.6](#) or [A118.7](#).
- metal studs—ASTM C-645.
- wall membrane ([ANSI A.2.1.8](#))

#### Preparation by Other Trades:

- over metal studs—see [Method W244](#).
- studs—install square and plumb.
- provide a 1/8" spacing at horizontal and vertical joints and corners of cementitious backer units and fill space solid with dry-set or latex-portland cement mortar.
- embed 2"-wide glass fiber mesh tape in a skim coat of the same mortar over joints and corners.
- apply blocking between the studs to support the waterproofing membrane.
- shower pan or waterproof membrane to be installed per [ANSI AN 3.6](#).
- test shower receptor and drainage fitting for leaks before commencing tile work.

#### Preparation by Tile Trade:

- surround drain with broken pieces of tile or crushed stone to prevent mortar from blocking weep holes.

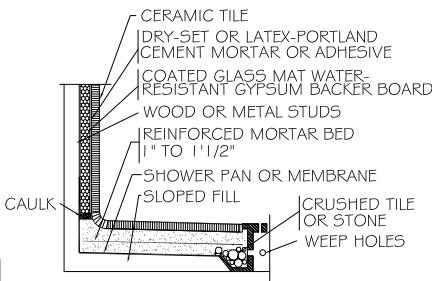
#### Installation Specifications:

- cementitious backer units - [ANSI A108.11](#).
- tile - [ANSI A108.5](#).
- grout - [ANSI A108.10](#).

# SHOWER RECEPTOR-WOOD OR METAL STUDS

## Wood or Metal Studs

03 Coated Glass Mat Water-Resistant Gypsum Backer Board B420-03



03

### Recommended Uses:

- in showers over dry, well-braced wood studs, furring, or metal studs.

### Requirements:

- to be used in conjunction with Assembly W245.

- 03 • slope shower pan membrane 1/4" per ft. to weep holes in drain.
- turn shower pan membrane up walls 4" ±1" above shower curb (6" above floor in showers without curbs).
- fur studs with 1/4", or thicker, furring strips above the top of the waterproof membrane to allow the top of the membrane to be flush with the face of the furring strips.
- shower floor membrane, as required by local authority having jurisdiction.

### Materials:

- coated glass mat backer board ASTM C-1178
- 2" glass fiber mesh tape.
- dry-set mortar—ANSI A118.1.
- latex-portland cement mortar ANSI—A118.4.
- grout—ANSI A118.6 or A118.7.
- metal studs—ASTM C-645.
- flexible caulking.

### Preparation by Other Trades:

- over studs—see Design W245.
  - studs—install square and plumb, deflection less than L/360.
  - form slope for waterproof membrane with portland cement mortar.
- 03 • apply blocking between the studs to support the waterproofing membrane.
- 03 • shower pan or waterproof membrane to be installed per ANSI AN 3.6.
- 03 • test shower receptor and drainage fitting for leaks before commencing tile work.

### Preparation by Tile Trade:

- surround drain with broken pieces of tile or crushed stone to prevent mortar from blocking weep holes.

### Preparation by Backer Board Installers:

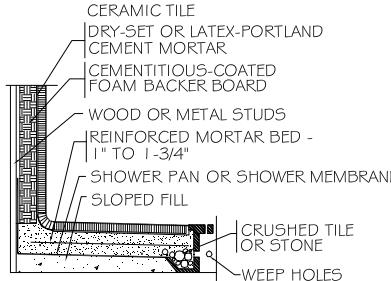
- 2" glass fiber mesh tape - embed with material used to set tiles on all joints and corners that are to receive tile.

### Installation Specifications:

- follow manufacturer's instructions.
- tile - ANSI A108.4 or A108.5
- grout - ANSI A108.10.

## Cementitious-Coated Foam Backer Board

B426-03 03 Solid Backing  
Thin-Set



### Recommended Uses:

- over wood or concrete subfloors.
- in showers over dry, well-braced wood studs, furring or metal studs.
- where waterproof properties are required.

### Requirements:

- use in conjunction with Method W246
- slope shower pan membrane 1/4" per foot to weep holes in the drain.
- turn waterproof membrane up walls a minimum of 3" above shower curb (6" above floor in showers without curbs).
- use furring strips above the membrane to allow the top of the membrane to be flush with the face of the furring strips.
- shower floor membrane, as required by local authorities having jurisdiction.
- fasten units to studs per manufacturer's recommendations.

### Materials:

- cementitious coated foam backer board.
- waterproofing for seams and fastener heads - ANSI A118.10
- fasteners - non-corrosive and non-oxidizing
- dry-set mortar - ANSI A118.1
- latex-portland cement mortar - ANSI A118.4
- grout - ANSI A118.6, A118.7, or A118.3
- metal studs - 20 gauge (0.039") or heavier - ASTM C-645

### Preparation by Other Trades:

- over metal studs - see Method W246.
- studs - install square and plumb.
- apply blocking between studs to support the waterproof membrane.
- shower pan or waterproof membrane to be installed per ANSI AN 3.6
- test shower receptor and drainage fittings for leaks before commencing tile work.
- all openings cut in backer board for plumbing and all cut joints between adjoining pieces - seal with waterproofing as recommended by backer board manufacturer.

### Preparation by cement backer board installers:

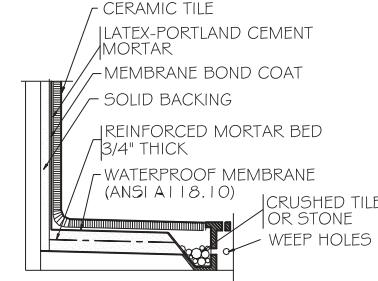
- horizontal and vertical joints and corners - butt tightly together, after placing a bead of flexible caulking (or other waterproofing) in joints and corners.

### Preparation by Tile Trade:

- surround drain with broken pieces of tile or crushed stone to prevent mortar from blocking weep holes.

### Installation Specifications:

- cementitious - coated foam backer board - install according to manufacturer's instructions.
- tile—ANSI A108.5.
- grout—ANSI A108.10 or A108.6.



### Recommended Uses:

- over wood or concrete subfloors.
- in showers over solid backing: mortar bed, approved tile backer board.

### Requirements:

- to be used in conjunction with Methods W201, W241, W243, or W244. These methods to be used in conjunction with ANSI A118.10 bonded waterproof membrane.
- 03 • slope waterproof membrane 1/4" per ft. to weep holes in drain.
- 03 • membrane meets ANSI A118.10.
- 03 • drain must permit adjustment of the strainer to required height.

### Materials:

- see Methods W201, W241, W243, or W244.
- specify type of waterproofing; e.g., sheet or liquid applied—ANSI A118.10. Membrane shall comply with local plumbing code.
- latex-portland cement mortar—ANSI A118.4.
- grout—ANSI A118.6 or A118.7.

### Preparation by Other Trades:

- see Methods W201, W202, W211, W221, W223, W241, W242, W243, W244 for preparations.

### Preparation by Tile Trade:

- follow membrane manufacturer's instructions.

### Installation Specifications:

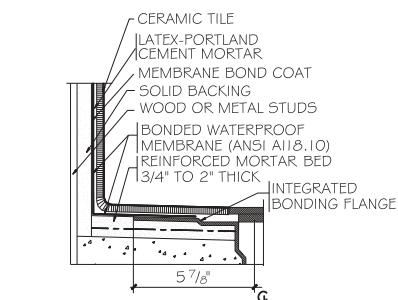
- follow membrane manufacturer's instructions.
  - membrane—ANSI A108.13.
  - tile—ANSI 108.5.
  - grout—ANSI A108.10.
- 03 • allow minimum of 24 hrs. after tile is set before grouting.

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# SHOWER RECEPTOR-RENOVATION



## Solid Backing with Integrated Bonding Flange for Bonded Waterproof Membranes



### Recommended Uses:

- over wood or concrete subfloors.
- in showers requiring wheelchair accessibility

### Limitations:

- requires integrated bonding flange for bonded waterproof membranes.

### Requirements:

- to be used with Methods [W201](#), [W241](#), [W243](#), or [W244](#). These methods to be used in conjunction with [ANSI A118.10](#) bonded waterproof membrane.
- slope mortar bed 1/4" per ft. to drain collar.
- bonded waterproof membrane ([ANSI A118.10](#)).

### Materials:

- see Methods [W201](#), [W241](#), [W243](#), or [W244](#).
- integrated bonding flange for bonded waterproof membranes.
- elastomeric caulk.

### Preparation by Other Trades:

- all openings cut in backing board for plumbing and all cut joints between adjoining pieces shall be sealed with adhesive or other materials recommended by manufacturer of backing board.
- gypsum backing board joints—treated with tape and joint compound, bedding coat only (no finish coat), nail heads, one coat only.
- see Methods [W201](#), [W241](#), [W243](#), or [W244](#) for additional preparations.

### Preparation by Tile Trade:

- follow adhesive manufacturer's instructions.
- allow minimum of 24 hrs. after tile is set before grouting.

### Tile Installation:

- see Methods [W201](#), [W241](#), [W243](#), or [W244](#).

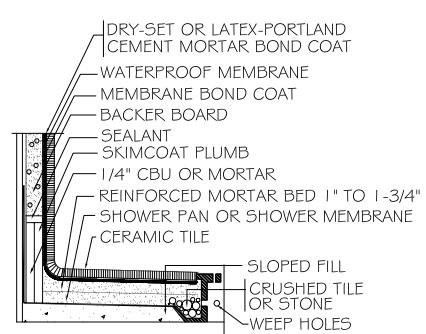
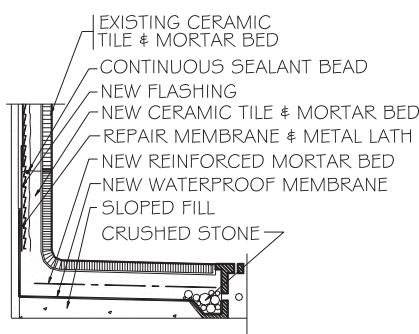
All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

## Cement Mortar

## TR418-03

## Thin-Set

## TR420-03



### Recommended Uses:

- over wood or concrete subfloors; where old showerpan has failed.

### Requirements:

- remove existing shower receptor, waterproof membrane, and wall tile, as required, to install new waterproof membrane.
- replace damaged wall or floor substrate materials.
- new membrane—slope slab 1/4" per foot to weep holes in drain.
- new membrane to turn up wall at least 3" above shower curb (6" above floor in showers without curbs).
- new flashing of 15 lb. roofing felt placed behind existing membrane, cut over new waterproof membrane, and fastened to studs.
- place continuous bead of sealant on existing mortar with new mortar brought up tight against it.

### Materials and Installation:

- shower receptor, see [Method B414](#).
- mortar bed walls, see Methods [W222](#), [W231](#), or [W241](#).
- refer to [B415](#) for thin-bed method.

### Recommended Uses:

- over wood or concrete subfloors; where old shower pan has failed.

### Requirements:

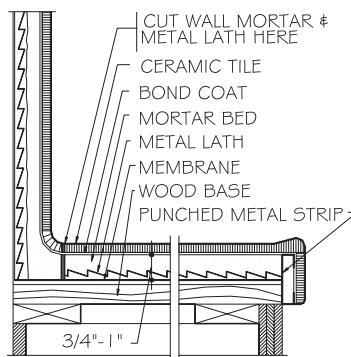
- remove existing floor tile; shower liner and wall tile one row above failed pan liner.
- replace damaged wall or floor substrate materials.
- verify code required slope is under shower membrane or provide slope 1/4" ft. to drain flange under new membrane or use pre-formed slope.
- shower floor membrane as required by local authority having jurisdiction.
- new membrane to turn up wall at least 3" above curb or flood point.

### Materials and Installation:

- refer to [B415](#) for thin-bed method.
- walls, see [W244](#).

# COUNTERTOPS-WOOD BASE

## Cement Mortar



### Recommended Uses:

- on countertops, drainboards, lavatory tops, etc.
- preferred method where sink or lavatory is to be recessed.

### Requirements:

- set the bottom edge of the countertop trim the proper distance above the finish floor material to allow clearance for dishwashers, compactors, etc.
- cut lath off at corner as shown.

### Materials:

- mortar bed, lath, and membrane—[ANSI A108.1A](#).
- bond coat—portland cement paste on a mortar bed that is still workable, or dry-set mortar or latex-portland cement mortar on a cured bed.
- grout—[ANSI A118.6](#) or [A118.7](#).

### Preparation by Other Trades:

- wood base—1" x 6" boards with 1/4" gap between boards or 3/4" exterior-glue plywood with dot and dash saw cuts 6" to 8" on center through the length of the plywood board to prevent warping.
- where overhangs or cantilever counters are used, adequate support must be provided to prevent movement.

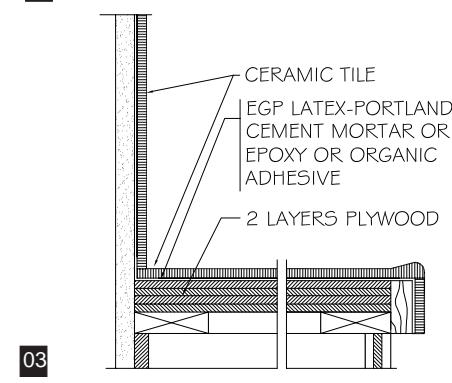
### Preparation by Tile Trade:

- a punched metal strip attached to the front edge of the cabinet is used in some geographical areas as a screed and support for the countertop trim. It is filled with wall mortar.

### Installation Specifications:

- tile—[ANSI A108.1A](#), .1B or .1C.
- grout—[ANSI A108.10](#).

## C511-03 03 Thin-Set



### Recommended Uses:

- on countertops where thin-set method is desired.

### Requirements:

- 03 • double plywood layer-clean and free of dirt, dust, and oily film.
- 03 • gaps between plywood sheets to be treated per setting material manufacturer's recommendations.
- set the bottom edge of the countertop trim the proper distance above the finish floor material to allow clearance for dishwashers, compactors, etc.

### Materials:

- 03 • epoxy mortar - [ANSI A118.3](#).
- 03 • EGP Latex-Portland Cement Mortar - [ANSI A118.11](#).
- 03 • organic adhesive - [ANSI A136.1](#) Type I.
- 03 • grout - [ANSI A118.6](#), [A118.7](#) or [A118.3](#).

### Preparation by Other Trades:

- when tile is set with epoxy, leave 1/4" gap between sheets of plywood. Apply batten to underside of sheets to cover gap.
- wood base—1" x 6" boards with 1/4" gap between boards or 3/4" exterior-glue plywood with dot and dash saw cuts 6" to 8" on center through the length of the plywood board to prevent warping.
- where overhangs or cantilever counters are used, adequate support must be provided to prevent movement.

03 • bottom layer—19/32" exterior-glue plywood

03 • underlayment—19/32" exterior-glue plywood.

### Preparation by Tile Trade:

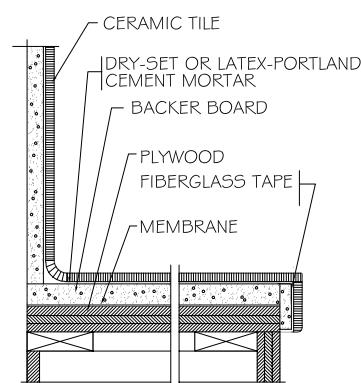
- when tile is set with epoxy, completely fill gap between sheets of plywood with epoxy.
- protect plywood from exposure to water and high humidity.

### Installation Specifications:

- adhesive—[ANSI A108.4](#).
- epoxy mortar/grout—[ANSI A108.6](#).
- grout—[ANSI A108.10](#).

03 • EGP latex-portland cement mortar—[ANSI A108.12](#).

## C512-03 03 Backer Board



### Recommended Uses:

- preferred thin-set mortar method where self-rimming sinks and lavatories are desired on countertops, drainboards, lavatory tops, etc.

### Requirements:

- install plywood base flat and level.
- set the bottom edge of countertop trim the proper distance above the finish floor material to allow clearance for dishwashers and compactors.

### Materials:

- 03 • 23/32" exterior-glue plywood base.
- 03 • cementitious backer units—[ANSI A118.9](#) or [ASTM C-1325](#).
- 03 • fiber cement underlayment—[ASTM C-1288](#).
- nails—1-1/4" galvanized roofing type: preferably screw shank, or other corrosion-resistant fasteners, applied 6" on center.
  - mortar—latex-portland cement [ANSI A118.4](#).
  - grout—polymer modified tile grout [ANSI A118.7](#) or epoxy [ANSI A118.3](#) (see pages 7 & 11).

03 • Membrane—A2.1.8.

03 • coated glass mat water-resistant gypsum backer board [ASTM C-1178](#).

03 • dry-set mortar [ANSI A118.1](#).

### Preparation by Other Trades:

- provide support on overhangs or cantilever counters to prevent movement.
- maximum variation in plywood surface—1/8" in 10'-0" from the required plane.

### Preparation by Tile Trade:

- install backer board per manufacturer's specifications.
- use a liquid trowel-applied waterproof membrane to seal edge and bottom of plywood overhang at face of counter and all other plywood surfaces and edges that will be exposed to water or moisture.

### Installation Specifications:

- cementitious backer units—[ANSI A108.11](#).
- tile—[ANSI A108.5](#).
- grout—polymer modified tile grout, [ANSI A108.10](#); epoxy, [ANSI A108.6](#).

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

**03 Caution:** Use tile recommended by manufacturer for countertop applications.

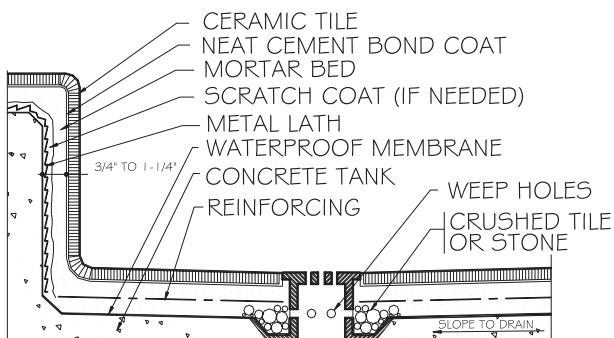
# TILE TUBS, FOUNTAINS, & CURBS

## Waterproof Membrane

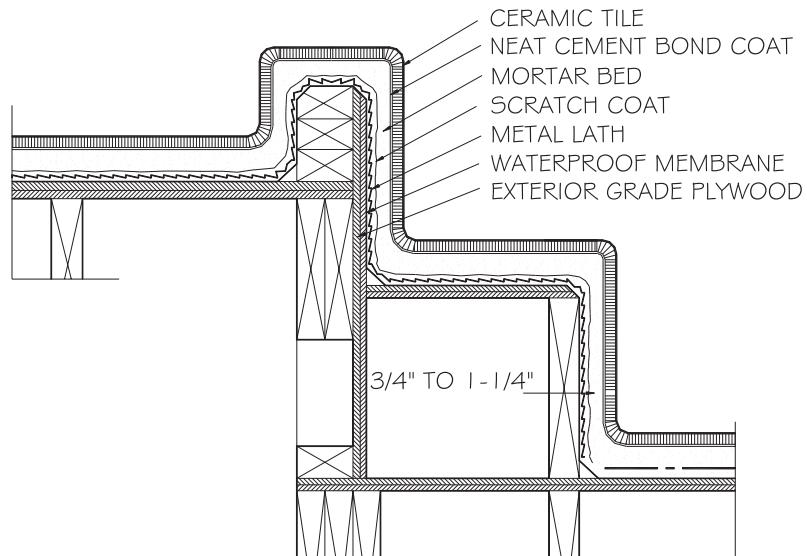
Cement Mortar

B417-03

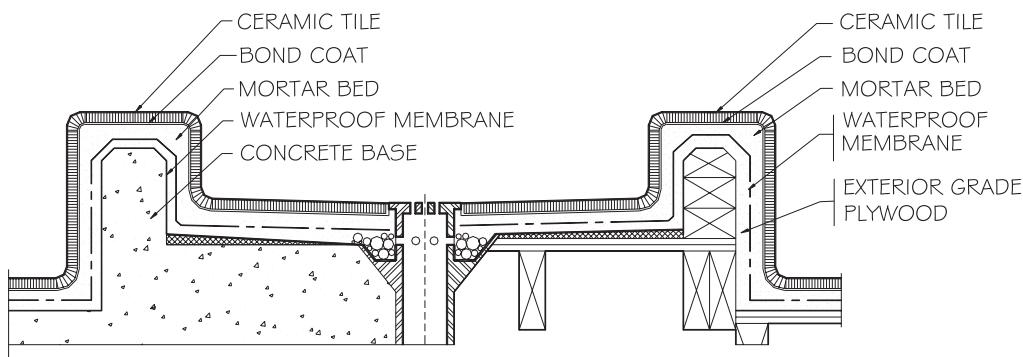
All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.



Concrete Tank



Wood Form



Concrete

Wood

## Curbs

NOTES: This detail reflects both concrete and wood substrates. Specify one or the other.

Preformed curbs acceptable.

NOTE: Use waterproof membrane meeting ANSI A118.10 for thin-set method.

### Requirements:

- waterproof membrane—slope membrane 1/4" per foot to weep holes in drain.
- wood framing, when used, should be pressure treated and designed to resist deflection and movement.

### Preparation by Other Trades:

- test tank, membrane, and drainage fittings for leaks before starting tile work.

### Installation Methods:

- attach metal lath only above water line.
- floor—follow Method F121.
- walls—follow Method W221.

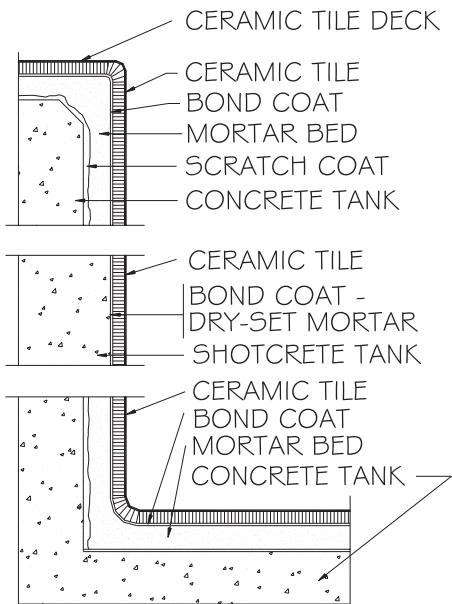
### Installation Specifications:

- tile—ANSI A108.1A.
- grout—ANSI A108.10.

# SWIMMING POOLS

P601-03

**NOTE:** This detail reflects both a mortar-bed type installation and, as an alternative, a thin-set type installation. Specify one or the other.



#### Recommended Uses:

- all interior and exterior pools.

#### Requirements:

- concrete tank must be watertight.

#### Materials:

- tile—ANSI A137.1 and certified by manufacturer for use in pools.
- portland cement—ASTM C-150 Type 1.
- sand—ASTM C-144.
- lime—ASTM C-206 Type S or ASTM C-207 Type S.
- water—potable.
- mortar bed (pool bottom)—1 part portland cement, 4 parts damp sand by volume.
- scratch coat and mortar bed (pool walls and gutter)—1 part portland cement, 1/2 part lime, and 4 parts dry sand or 5 parts damp sand; or 1 part portland cement, 3 parts dry sand or 4 parts damp sand.
- bond coat—portland cement paste.  
Alternate: dry-set mortar or latex-portland cement mortar (see information on page 5) on a cured bed (7-day cure recommended); 95% coverage of the back of the tile or tile sheet required—ANSI A108.5.
- grout—ANSI A118.6 or A118.7.
- metal lath (gutter reinforcing)—3.4 lb. galvanized diamond mesh tied to reinforcing rods.

#### Preparation by Other Trades:

- concrete tank to be finished with medium-rough bush-hammer finish or with aggregate exposed.
- deviations from dimensions, contours, slopes must not exceed 1/2" or encroach on the 1-1/2" minimum thickness of the tilework in order to provide exact dimensional requirements in length and width and specified tolerances.
- concrete tank shall be watertight. Before tile work is started, test by filling with water.

#### Preparation by Tile Trade:

- inspect tank for requirements included in Preparation by Other Trades above.
- check dimensions before starting tilework.
- report any defects to architect in writing.
- submit shop drawing for all details, lettering, and markings.
- after approval of the concrete tank, wash with hose under high pressure and sweep with a stiff broom. Surface to be free of grease, oil, wax, or other coatings.

#### Movement Joint (architect must specify type of joint and show location and details on drawings):

- directly over any joints in the concrete tank.
- exterior pools require expansion joints in tilework on 12' to 16' centers.

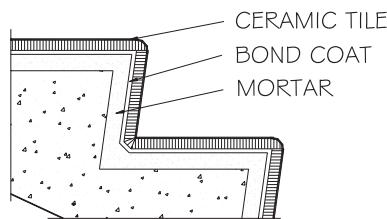
#### Installation Specifications:

- tile—ANSI A108.1A, .1B or .1C.
- grout—ANSI A108.10.

# STAIRS

Cement Mortar

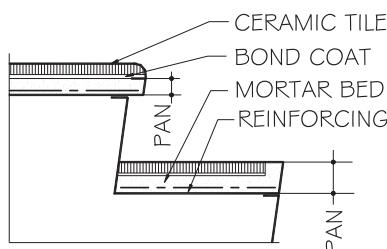
S151-03



#### CONCRETE STAIRS

##### Concrete Stairs:

- concrete to be finished with medium-rough bush-hammer finish and be free of cracks, waxy or oily films, and curing compounds.



#### METAL STAIRS

##### Metal Stairs:

- reinforcing mesh mandatory. Attach to metal by tack welds or other means.
- metal stair riser may be tiled. Cut mortar bed and reinforcing at juncture of tread and riser.



#### WOOD STAIRS

##### Wood Stairs:

- waterproof membrane for exterior and wet area installations; 15 lb. roofing felt for interiors.

##### Design Considerations—all stairs:

- use cove tile at junction of riser and tread for easy maintenance. Quarry or paver tile cove can be set horizontally or vertically to facilitate layout.
- finished step nosings are available in specially shaped quarry and paver tile pieces.
- use full radius ceramic mosaic bullnose tile for nosings.
- slip-resistant tile should be specified on stair treads.

##### Tile Installation—all stairs:

- metal stairs—Method F111. Membrane not required.
- concrete stairs—Method F112; risers—W211.
- wood stairs—Method F141; risers—W231.

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

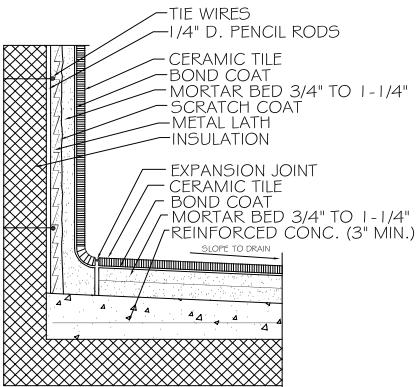
# REFRIGERATOR ROOMS

## Insulation

Cement Mortar

R612-03

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.



# STEAM ROOMS

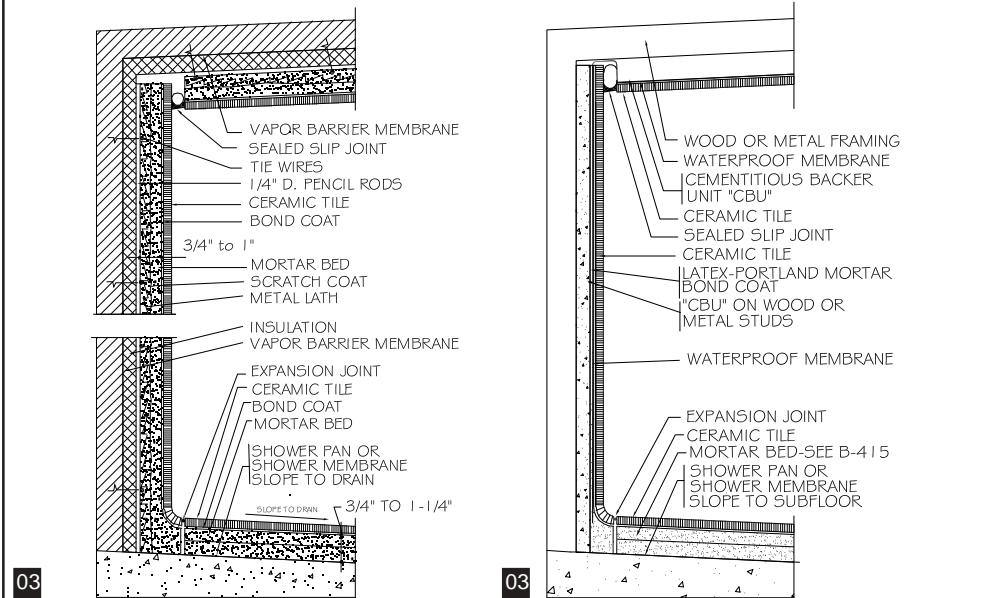
## Membrane

Cement Mortar

SR613-03

03 Thin-Set

SR614-03



### Requirements:

- use tile designated as frostproof by the manufacturer in all rooms subject to freezing temperatures.
- provide reinforced concrete slab over floor insulation to resist wheel load of hand and mechanical trucks. (3" minimum; 4" or more for fork-lift trucks.)

### Material and Tile Installation:

- attach four equally spaced tie wires to the supporting members and through the insulation. Attach 1/4" D steel pencil rods vertically over the insulation.
- attach metal lath to pencil rods and follow [Method W222](#) or install on a mortar bed meeting the requirements of [Method W241](#).
- floors and movement joints may be installed in accordance to [Method F112](#) (cement mortar), [F113](#) (dry-set mortar or latex-portland cement mortar), or [F131](#) (epoxy mortar and grout).

### Requirements:

- 03
- steam rooms require a waterproofing membrane on all surfaces to prevent moisture from penetrating adjoining spaces. Vapor barrier membrane shall be designed for relative temperature exposure.
  - all steam rooms will require adequate insulation on walls and ceilings to reduce moisture condensation at temperature variations.
  - slope ceilings (2" per ft. minimum) to avoid condensation from dripping onto occupants (sometimes sloped to center to minimize rundown on walls).

### Material and Tile Installation:

- 03
- attach four equally spaced tie wires to the supporting members and through the insulation. Attach 1/4" D steel pencil rods vertically over the insulation. Attach metal lath to pencil rods on both walls and ceilings.
  - install open slip joints in all corners between walls and ceilings and to divide areas that exceed 16'-0" in length.
  - floors—follow [Method B414](#).
  - walls and ceilings—follow [Method W221](#).

### Requirements:

- 03
- steam rooms require a waterproofing membrane on all surfaces to prevent moisture from penetrating adjoining spaces.
  - slope ceilings (2" per ft. minimum) to avoid condensation from dripping onto occupants (sometimes sloped to center to minimize rundown on walls).
  - waterproof membrane must be capable of withstanding heat exposure.
  - all steam rooms will require adequate insulation on walls and ceilings to reduce moisture condensation at temperature variations.

### Material and Tile Installation:

- 03
- tile—A137.1 and certified by manufacturer for wet environment.
  - cementitious backer units—[ANSI A108.11](#) and [A118.9](#).
  - reference and follow membrane manufacturer's installation directions for placement of membrane and treatment of the slip joint.
  - install open slip joints in all corners between walls and ceilings.
  - waterproof membrane—[ANSI A118.10](#).
  - floors—follow [Method B415](#) or [B422](#).

*NOTE: Any penetration of the membrane should be sealed with appropriate sealant before installing tile.*

# RENOVATION

## Tile Over Other Surfacing Materials

### Walls and Floors

Ceramic tile may be considered as a surfacing material over existing wall finishes such as paint, wood paneling, cold glazes (sprayed on plastic), plastic laminates, and steel plate, or existing floor surfacing such as epoxy coatings, paint, vinyl or asphalt tile, seamless flooring\*, exposed concrete†, hardwood flooring, and steel plate. Ideally, existing finishes should be completely removed so that the tilework can be placed on the substructure following Handbook Methods in the F, W, B, and C series. However, this is not always practical. The following, therefore, is intended as a general guide for renovation with ceramic tile. In all cases consult the setting material manufacturer or his literature before starting the work. Consideration should be given to covering the existing surface with a more suitable base. For example: badly cracked or irregular walls should be overlayed with firmly attached gypsum board or cementitious backer units (CBU) to provide a sound tile-setting base.

\*WARNING: Do not sand existing resilient flooring. Certain older resilient floor coverings, including sheet vinyl floor covering and vinyl tile, may contain asbestos fibers that are not readily identifiable. Inhalation of asbestos dust may cause serious bodily harm. Smoking greatly increases any such risk of serious bodily harm.

03 CAUTION: Mechanical or chemical abrasion of tile can release fine particles which could cause harm if inhaled or ingested. Mineral analysis of the tile and glaze should be performed before performing any operation. Appropriate safety equipment should be worn at all times.

† Special installation precautions are necessary when installing thin-set tile over old concrete floors in bakeries, kitchens, and meat-processing areas. Fats and greases penetrate into concrete floors and cannot be completely neutralized. Note preparation sections below.

### Organic Adhesive, Interiors Only

#### Suitable Backings:

- smooth walls of all types including plaster, gypsum board, cementitious backer units, and masonry.
- smooth floors of all types including wood, concrete, and terrazzo in residences or areas of equivalent residential performance requirements (see page 12). Deflection not to exceed 1/360 span.
- new gypsum board nailed and/or adhesively applied over existing walls.
- plastic laminate countertops & walls.

#### Requirements:

- backing surface must be sound, clean, and dry.
- max. variation in backing surface shall not exceed 1/4" in 10'-0" from the required plane.
- abrupt irregularities, such as trowel marks, ridges, and grains, shall be less than 1/32" above adjacent area.

#### Preparation:

- roughen surfaces which are glossy, painted, or which have loose surface material by sanding or scarifying.\*
- surface material must be removed if not compatible with adhesive.
- use primer when recommended by the adhesive manufacturer for particular backings.
- clean thoroughly to remove all oil, dirt, and dust.
- apply underlayment as needed according to manufacturer's directions.

#### Installation Specifications:

- tile—ANSI A108.4.
- grout—ANSI A108.10.

### Dry-Set or Latex-Portland Cement Mortar, Interior & Exterior

#### Suitable Backings:

- prepared portland cement plaster, concrete, concrete masonry, structural clay tile, or brick.
- cementitious backer units applied over existing walls or floors.
- new gypsum board applied over properly furred existing wall in dry areas. Use water-resistant gypsum backer board in wet areas.

#### Requirements:

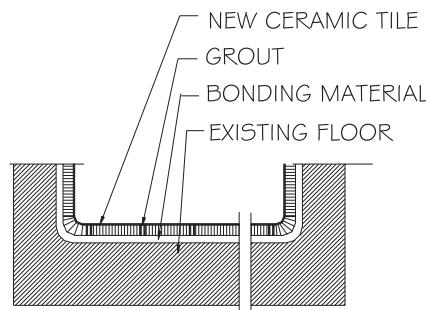
- the backing surface must be sound, clean, and dry.

### TR711-03

## Tile Over Tile

### Interior Floors

### TR712-03



#### Recommended Uses:

- for alteration of ceramic-tiled areas where modernization or a change of design is desired in residences, motels and hotels, restaurants, public rest rooms, malls, etc.
- also applicable to smooth floors of terrazzo, stone, slate, etc.

#### Requirements:

- existing installation must be sound, well-bonded, and without structural cracks.
- when possible, remove floor-mounted plumbing and heating fixtures before beginning work.
- threshold required to adjust between adjacent floors (see Method TR611, page 41).

#### Preparation:

- remove soap scum, wax, coatings, oil, etc. from existing tile surfaces. Mechanical abrasion with a Carborundum disk followed by a clear water wash is recommended. Other cleaning methods involve use of soapless detergents, commercial tile cleaners, and, in special cases, solvents or acids. Solvents and acids should be used with care and only when necessary because of their hazardous nature. (Appropriate safety equipment should be worn at all times.)
- installation must be thoroughly rinsed and dry before setting the new tile.

#### Materials, Grouting, Movement Joints, Installation Specifications:

- epoxy mortar installation—ANSI A108.6.
- dry-set mortar or latex-portland cement mortar installation—ANSI A108.5.
- organic adhesive installation—ANSI A108.4 and follow manufacturer's directions.
- require current certification from adhesive manufacturer that adhesive conforms with ANSI A136.1.
- grout—ANSI A108.10.

NOTES: Use Ceramic Tile Floor Performance-Level Requirement Guide, page 12, to select adequate installation method.

If existing installation is not structurally sound, Methods F111 and F141 may be applicable.

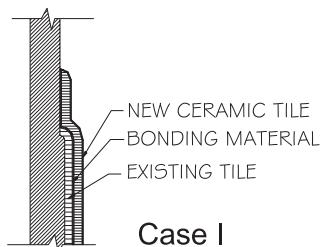
See page 7 for other installation materials and methods.

# RENOVATION

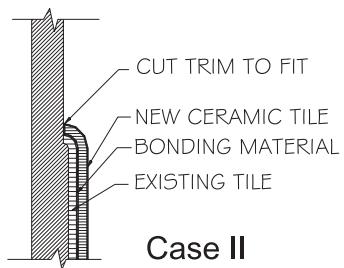
## Tile Over Tile

Interior Walls

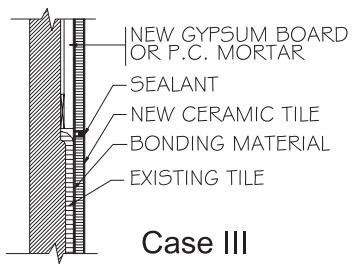
TR713-03



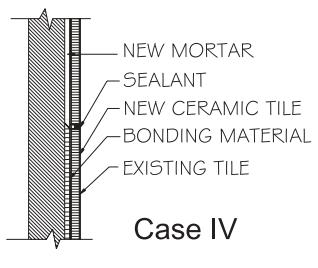
Case I



Case II



Case III



Case IV

### Recommended Uses:

- for alteration of ceramic-tiled areas where modernization or a change of design is desired in residences, motels and hotels, malls, restaurants, public rest rooms, etc.
- also applicable to smooth walls of marble, stone, slate, etc.

### Requirements:

- existing installation must be sound, well-bonded, and without major structural cracks.

### Materials, Grouting, Movement Joints, Installation Specifications:

- for organic adhesive installation see [Method W223](#).
- for dry-set or latex-portland cement mortar installation, see [Method W202](#).
- for epoxy adhesive installation, refer to manufacturer's literature.

### Preparation:

- remove soap scum, wax, coatings, oil, etc. from existing tile surfaces. Mechanical abrasion with a Carborundum disk followed by a clear water wash is recommended. Other cleaning methods involve use of soapless detergents, commercial tile cleaners, and, in special cases, solvents or acids. Solvents and acids should be used with care and only when necessary because of their hazardous nature.
- installation must be thoroughly rinsed and dry before setting the new tile.
- CASE I—prepare wall above tile to receive trim tile as shown.
- CASE II—cut trim tile to fit over existing trim.

- CASES III & IV—apply new gypsum board above existing wainscot tile to prepare for full wall tiling.

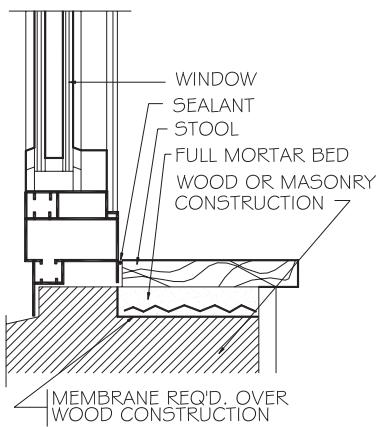
03 Use portland cement mortar, or cementitious tile backer units in tub enclosures and shower stalls.

In wet areas, the application of water-resistant gypsum backer board over any base which creates a vapor barrier, such as old tile or paint, will lead to failure unless such barrier is vented.

*NOTE: If installation is not structurally sound, Methods [W221](#) and [W222](#) may be applicable.*

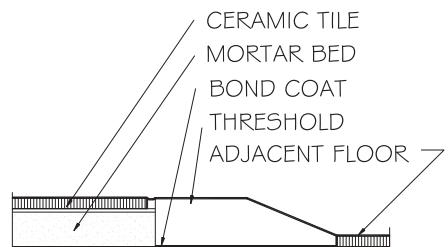
## WINDOW STOOLS

WS610-03



## THRESHOLDS

TR611-03



*NOTES: Thresholds adjust levels between adjacent floors. Commercial and residential thresholds and window stools are available in tile, marble, stone, slate, etc. and can be made in virtually any size and shape to fit special conditions.*

*Use 95% coverage of bonding material between threshold and floor or window stool and substrate.*

# WALLS, INTERIOR-SOUND RATED/FIRE RATED

## Wood or Metal Studs

Portland Cement Mortar or Cementitious Backer Units (CBU)/Assemblies or Gypsum Board

RW800-03

WALL METHOD	FIRE AND SOUND RATINGS														
	811	812	813	814	815	816	817	818	819	RW 820	RW 821	RW 822	RW 823	RW 824	RW 825
Fire Resistance Rating ASTM E 119 (hours)	2	2	1	1	1	1	2	2	1	1	2	2	1	-	2
Field Sound Transmission Class FSTC ASTM E336, E413					51	53	50	52	61	60					
Sound Transmission Class STC ASTM E90, E413														$\frac{48}{52^{(14)}}$	

### Recommended Uses:

- wood stud load bearing—[RW813](#) & [RW814](#).
- wood stud load-bearing chase wall—[RW817](#) & [RW818](#).
- metal stud nonload bearing—3-5/8" stud width: [RW811](#), [RW812](#), [RW815](#), [RW816](#), [RW823](#), & [RW825](#).
- metal stud nonload-bearing—2-1/2" stud width: [RW824](#).
- metal stud nonload-bearing chase wall—[RW819](#), [RW820](#), [RW821](#), and [RW822](#).

### Limitations:

- stud spacing not to exceed 16" o.c.
- 3/32" minimum bond coat thickness.
- cementitious backer units—maximum screw or nail spacing, 8" o.c.
- gypsum board—maximum screw or nail spacing, 8" o.c. at edges and 12" o.c. in field for face layer; 24" o.c. for base layer.

### Design Requirements: (Test Reports)

- [RW811](#) & [RW812](#)—ULI 443 & 443 alt.
- [RW813](#) & [RW814](#)—ULI U329 & U329 alt.
- [RW815](#) & [RW816](#)—ULI 442 & 442 alt. (Fire Resistance). USG 840321 & 840313 (Sound Transmission).
- [RW817](#) & [RW818](#)—WHI 495-0505 & 495-0508 (Fire Resistance). USG 840523 & 840516 (Sound Transmission).
- [RW819](#) & [RW820](#)—ULI 445 & 445 alt. (Fire Resistance). USG 840524 & 840515 (Sound Transmission).
- [RW821](#) & [RW822](#)—ULI 444 & 444 alt.
- [RW823](#)—WHI-694-0189.
- [RW824](#)—NG C3086 & C3087
- [RW825](#)—WHI-694-0400.11.

ULI—Underwriters Laboratory Inc.

USG—United States Gypsum.

WHI—Warnock Hersey International.

NG—National Gypsum.

### Materials (Refer to Details):

- (1) glazed ceramic wall tile—ANSI A137.1.
- (2) bond coat—latex-portland cement mortar [ANSI A118.4](#) or organic adhesive [ANSI A136.1](#), Type 1.
- (3) bond coat—dry-set mortar [ANSI A118.1](#).
- (4) 1/2"-thick cementitious backer units—certified by manufacturer as suitable for intended use.
- (5) 7/16"-thick cementitious backer units—certified by manufacturer as suitable for intended use.
- (6) metal studs—25 gauge, 3-5/8" x 1-1/4" ASTM C-645. Floor and ceiling tracks, 3-5/8" x 1-1/4".
- (7) metal studs—25 gauge, 2-1/2" ASTM C-645. Floor and ceiling tracks, 2-1/2" x 1-1/4".
- (8) metal studs—20 gauge, 3-5/8" ASTM C-645. Floor and ceiling tracks, 3-5/8" x 1-1/4".
- (9) wood studs—3-1/2" x 1-1/2". Floor and ceiling plates 3-1/2" x 1-1/2".
- (10) mineral fiber insulation—3" minimum thickness.
- (11) mineral fiber insulation—3-1/2"-thick.
- (12) mineral fiber insulation—3-5/8" x 6" blanket, 2.5 lbs./cu. ft.
- (13) mineral fiber insulation—1-1/2" minimum thickness.
- (14) mineral fiber insulation—2"-thick. Required for STC rating of 53.
- (15) gypsum board—5/8"-thick, Type X, ASTM C-36.
- (16) cross brace—1/2" x 12" x chase width gypsum panel spaced 48" o.c. horizontally and vertically.
- (17) 4-mil polyethylene film (when required as moisture barrier).
- (18) metal lath—self-furring, galvanized or painted, expanded metal lath, 3.4 lbs./sq. yd.
- (19) mortar bed—1 part portland cement, 1 part lime, 6 parts sand.
- (20) 7/16"-thick fiber-cement underlayment—certified by the manufacturer as suitable for the intended use.

- 4-mil polyethylene film (when required as moisture barrier).
- standard tile grout.
- 2" glass fiber mesh tape.
- screws—1-1/4" Type S; 1-5/8" screw for double layer gypsum board.
- nails—1-1/2" galvanized roofing for cementitious backer units; 1-3/8" ring shank for gypsum wall board; 1-7/8" nail for double layer gypsum board.

### Preparation by Other Trades:

- gypsum board face layer joints must be taped and finished with minimum of two coats of joint compound. Finish fastener heads.
- offset studs on each side of chase walls.

### Preparation by Tile Trade:

- installation of cementitious backer units:  
—closely fit horizontal and vertical joints and corners without touching, leaving a maximum space of 1/8".  
—embed 2"-wide glass fiber mesh tape in a skim coat of the setting material over joints and corners.

### Tile Installation:

- [RW823](#)—any Method over solid backing.
- [RW824](#)—see Method [W222](#).
- [RW825](#)—see Method [W244](#).
- all others—see Methods [W223](#) or [W244](#).

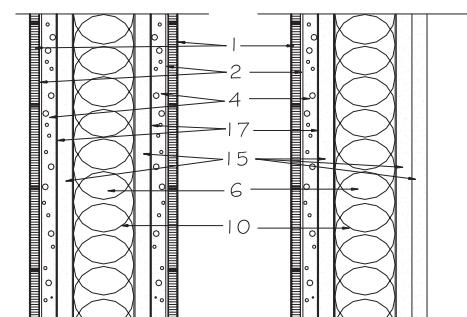
All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

# WALLS, INTERIOR-SOUND RATED/FIRE RATED

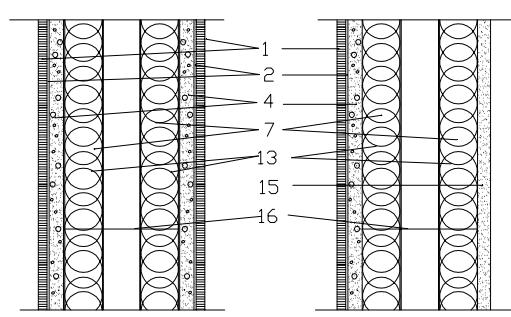
## Wood or Metal Studs

Portland Cement Mortar or Cementitious Backer Units (CBU)/Assemblies or Gypsum Board

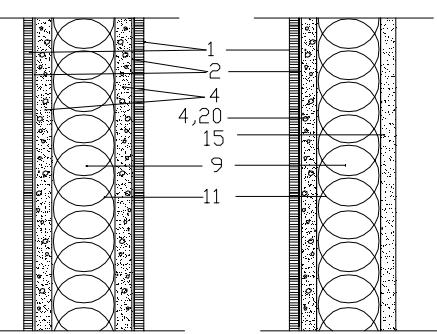
RW800-03



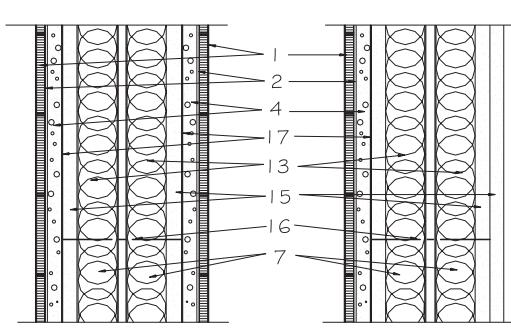
RW811-03



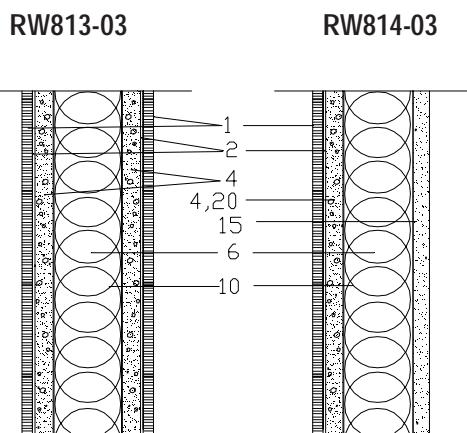
RW819-03



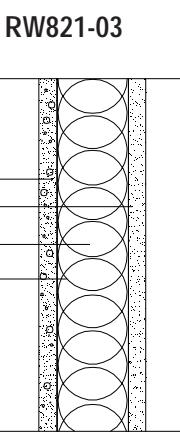
RW812-03



RW820-03



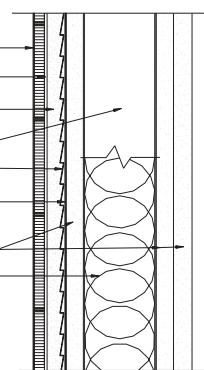
RW813-03



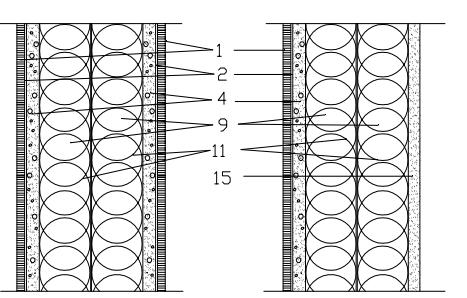
RW821-03



RW814-03



RW822-03



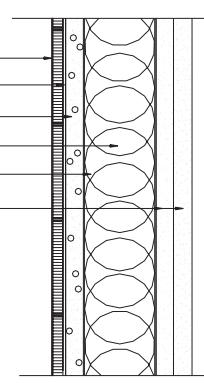
RW815-03



RW823-03



RW816-03



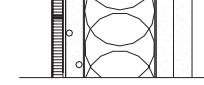
RW824-03



RW817-03



RW818-03



RW825-03

All specifications for ceramic tile installations must conform to local building codes, ordinances, trade practices, and climatic conditions.

NOTE: Fire Side—Both sides of all methods are classified as the fire side except Method RW824, which is sound-rated only.

# MOVEMENT JOINTS-VERTICAL & HORIZONTAL

It is not the intent of this guide to make movement joint recommendations for a specific project.

## Movement Joint Design Essentials EJ171-03

Use These Details for Control, Contraction, and Isolation Joints (Ref. pg. 7).

### Recommendations:

- interior—24' to 36' in each direction.
- exterior—8' to 12' in each direction.
- interior tilework exposed to direct sunlight or moisture—8' to 12' in each direction.
- where tilework abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes, ceilings, and where changes occur in backing materials.
- all expansion, control, construction, cold, and seismic joints in the structure should continue through the tilework, including such joints at vertical surfaces.
- joints through tilework directly over structural joints must never be narrower than the structural joint.

### Expansion Joint Width (Vertical & Horizontal):

- exterior (all tile)—minimum 3/8" for joints 12' on center, minimum 1/2" for joints 16' on center. Minimum widths must be increased 1/16" for each 15°F tile surface temperature change greater than 100°F between summer high and winter low. (Decks exposed to the sky in northern U.S.A. usually require 3/4"-wide joints on 12' centers.)
- interior for quarry tile and paver tile—same as grout joint, but not less than 1/4".
- interior for ceramic mosaic tile and glazed wall tile—preferred not less than 1/4", but never less than 1/8".

### Preparation:

- tile edges to which the sealant will bond must be clean and dry. Sanding or grinding of these edges is recommended to obtain optimum sealant bond.
- primer on these tile edges is mandatory when recommended by the sealant manufacturer. Care must be taken to keep primer off tile faces.

### Materials:

- backup strip shall be a flexible and compressible type of closed-cell foam polyethylene, butyl rubber, or open cell and closed cell polyurethane, rounded at surface to contact sealant, as shown in details above, and as recommended by sealant manufacturers. It must fit neatly into the joint without compacting and to such a height to allow a sealant depth of 1/2 the width of the joint. Sealant must not bond to the backup material.
- suitable sealants include silicone, urethane, and polysulfide. Generally, urethane sealants are recommended for exterior vertical tile surfaces and both exterior and interior horizontal tile surfaces, including tiled traffic areas. Sealants in traffic areas require a Shore A hardness of 35 or greater.
- silicone sealants may be used on both exterior and interior vertical tile surfaces. Single-component, mildew-resistant silicone sealants are formulated with fungicide for sealing interior joints in ceramic tile showers, and around tubs, sinks and plumbing fixtures.
- use sealants complying with ASTM C-920, which designates sealants according to Type, Grade, Class, and Uses. The following are suitable for use in tilework:
  - Type S—single-component sealant.
  - Type M—multicomponent sealant.
  - Grade P—sealants for joints on horizontal surfaces.
  - Grade NS—non-sagging sealants for joints in vertical surfaces.
  - Class 25 and 12½—identifies sealants which can withstand an increase and decrease of +/-25% or +/-12½% of joint width.
  - Use T—use in joints subjected to pedestrian and vehicle traffic.
  - Use NT—sealants for nontraffic exposures.
  - Uses M and G—sealants that will remain adhered to mortar (M) and glass (G) are suitable for use with tilework.
  - some sealants require edge priming. Consult manufacturer's specifications.
  - manufactured/pre-formed joint profiles are available. Consult manufacturer.

### Cold Joints:

- cold joints are formed primarily between slab pours where the size of a concrete slab may be too large to be poured at one time. The remainder of the slab would be poured at a later time, forming a cold joint between the two sections. Such joints should be shown on architectural drawings.
- a cold joint becomes a weakened joint that, upon movement, will crack, permitting leakage or buckling and cracking of a tile floor set over the slab.
- some large slabs on-grade are poured monolithically, then later saw-cut at intervals, providing control/contraction joints to allow for cracking at these weakened points.

### Installation:

- movement joints in tile should be located over all cold joints and saw-cut control joints.
- joints in tile and setting materials shall never be less than the width of the saw-cut control joint width. Preparation and installation shall be as required for movement joints.
- to insure that location of joints in tilework align with existing joints in substrate, joints in tilework should be constructed during installation of mortar beds and/or tile, rather than saw-cutting joints after installation.
- keep movement joint cavities open and free of dirt, debris, grout, mortar, and setting materials.
- set compressible backup strip when mortar is placed or utilize removable wood strip to provide space for backup after mortar has cured.
- install sealant after tilework and grout are dry. Follow sealant manufacturer's recommendations.
- refer to sealant section in ANSI tile installation specification.

Architect must specify movement joints and show location and details on drawings.

Note: Preparation of openings left by the tile contractor and installation of backup strip and sealant should be specified in the Caulking and Sealant section of the job specification.

The performance requirements of certain special locations, such as exterior swimming pools, dairies, food plants, etc., may exceed the minimum requirements of the sealant specifications given above. Therefore, follow recommendations of experienced manufacturers as to specific sealants suitable in the job environment. In some severe environments, a program for regular maintenance of sealant in joints may be required.

# MOVEMENT JOINTS- VERTICAL & HORIZONTAL

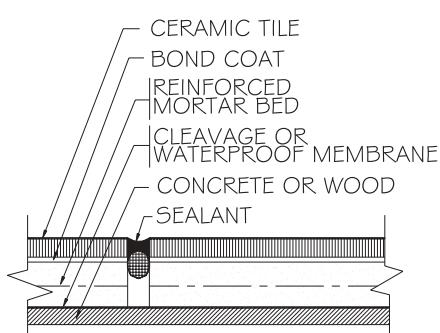
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Movement Joint Design Essentials EJ171-03

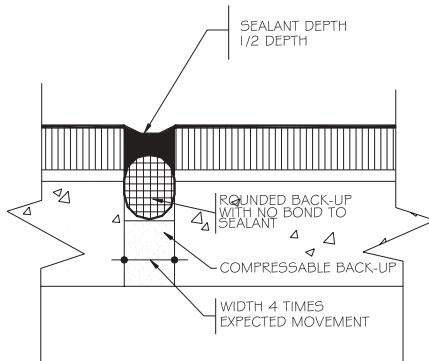
Use These Details for Control, Contraction,  
and Isolation Joints (Ref. pg. 7).

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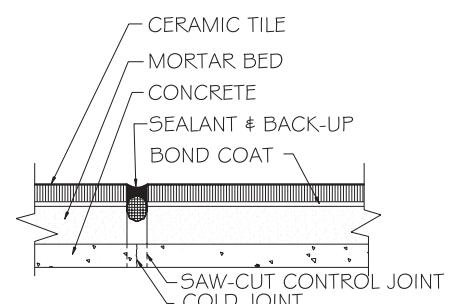
## Expansion Joint



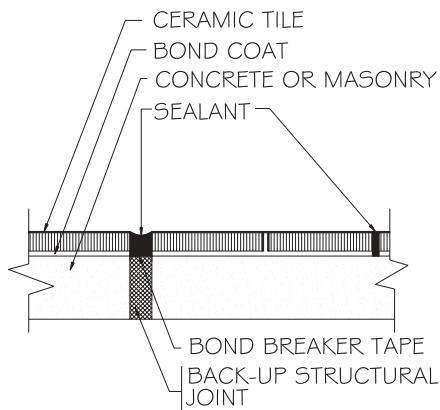
## Expansion Joint



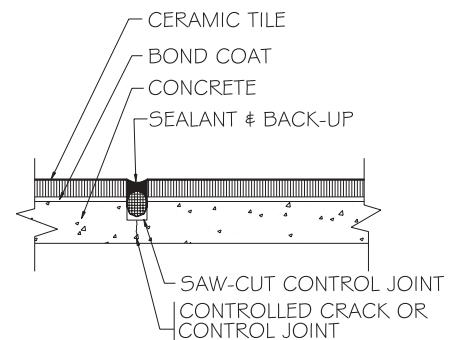
## Construction Joint



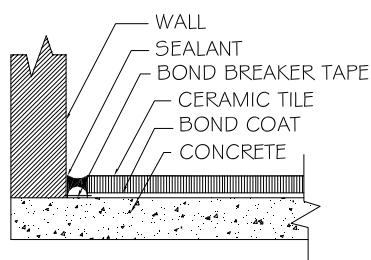
## Isolation/Expansion Joint



## Contraction Joint

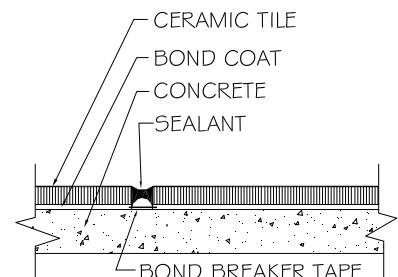


## Perimeter Joint



03

## Generic Movement Joint



03

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Phone: 870-492-5031  
Fax: 870-492-4754

##### FRESH FISH CERAMIC TILES

Phone: 612-824-3325  
Fax: 612-824-1235

##### FURNACE HILL TILE

Phone: 610-965-2374  
Fax: 610-965-2374

##### GLASS WAVE

Phone: 830-980-2519  
Fax: 830-438-8671

##### HOUSE ON THE HILL STUDIO

Phone: 404-982-9419  
Fax: 404-982-9419

##### ILLAHE TILEWORKS

Phone: 541-488-5072  
Fax: 541-488-2741

##### J. L. CREATIONS

Phone: 803-739-1018  
Fax: 803-739-1018

##### KIBAK TILE, LLC

Phone: 541-923-0039  
Fax: 541-923-1410

##### KOAN TILE CONCEPTS

Phone: 206-463-0048  
Fax: 208-955-5303

##### LA JOLLA STYLE

Phone: 858-456-2528  
Fax: 858-454-9140

##### LENABURG UNLIMITED

Phone: 626-915-6558  
Fax: 626-915-6558

##### LIGHTSTREAMS, INC.

Phone: 650-566-1543  
Fax: 650-329-8144

#### LUTZ TILE

Phone: 253-840-5011  
Fax: 253-840-8545

##### MARIN DESIGNWORKS, LLC

Phone: 415-884-2605  
Fax: 415-884-9401

##### MOTAWI TILEWORKS, INC.

Phone: 734-213-0017  
Fax: 734-213-2569

##### NANCY DEYOUNG STUDIO, INC.

Phone: 616-285-1906  
Fax: 616-285-1297

##### NOCERA ART TILE STUDIO

Phone: 570-729-7946  
Fax: 570-729-7317

##### NORTH PRAIRIE TILEWORKS

Phone: 612-871-3421  
Fax: 612-871-2923

##### OLD HANCOCK GLASS TILE

Phone: 603-588-4000  
Fax: 603-371-1303

##### PAYNE CREATIONS TILE

Phone: 816-452-8660  
Fax: 816-452-0070

##### PHENIX GLASS ART, INC.

Phone: 206-768-1683  
Fax: 206-768-9604

##### PRESTIGE ART TILE

Phone: 609-396-7588  
Fax: 609-989-9343

##### RONALD J. GOEKE STUDIO

Phone: 609-397-8469  
Fax: 609-397-8469

##### ROWE POTTERY WORKS

Phone: 800-356-7687  
Fax: 608-423-4273

##### S.J. STUDIOS

Phone: 561-649-3778

##### SALT MARSH POTTERY, LTD.

Phone: 508-636-4813  
Fax: 508-636-3622

##### STATUS, INC.

Phone: 206-282-0181  
Fax: 206-284-0927

##### STRATFORD TILEWORKS

Phone: 609-259-8453  
Fax: 609-259-4119

##### SUMMERHOUSE TILE, INC.

Phone: 770-795-0544  
Fax: 770-795-0545

##### SURVING STUDIOS

Phone: 800-768-4954  
Fax: 845-355-1517

##### TERRA FIRMA, LTD.

Phone: 803-643-9399  
Fax: 803-643-9164

##### TILE ARTISANS, INC.

Phone: 530-534-3563  
Fax: 530-534-1290

##### TIMELESS TILES

Phone: 215-249-4848  
Fax: 215-249-4849

##### TRIKEENAN TILEWORKS

Phone: 603-352-4299  
Fax: 603-352-9843

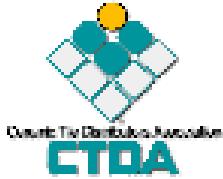
##### VITRIUM CORPORATION

Phone: 215-766-3095  
Fax: 215-766-3098

##### WISEMAN SPAULDING DESIGN

Phone: 207-862-3513  
Fax: 207-862-4513

## Industry Links



Ceramic Tile Distributor Association  
**CTDA**



Ceramic Tile Education Foundation



National Tile Contractor's Association



Tile Heritage Foundation



## Ceramic Tile Show Link



27-30, April 2004 • Orlando, Florida USA  
Orange County Convention Center

## TCA MEMBER COMPANIES

For more than 50 years, Tile Council of America has been serving the U.S. markets for ceramic tile. Our member companies help sustain the publication of this "Installation Handbook"—look for the Tile Council's symbol on their products. Visit our web site at [www.tileusa.com](http://www.tileusa.com) for further member product information.

### A.C. PRODUCTS, INC.



Phone: 330-698-1105  
Fax: 330-698-5292

### AS&C



Phone: 877-497-4273  
Fax: 330-484-4880

### CERAMIC EXPRESSIONS



Phone: 800-425-2115  
Fax: 509-536-4072

### CROSSVILLE PORCELAIN STONE/USA



Phone: 931-484-2110  
Fax: 931-456-3993

### DIRK ELLIOT TILE



Phone: 888-245-7248  
Fax: 877-874-5672

### ENDICOTT TILE, LLC



Phone: 402-729-3323  
Fax: 402-729-5804

### EPRO, INC.



Phone: 614-882-6990  
Fax: 614-882-4210

### FLORIDA BRICK & CLAY CO., INC.



Phone: 813-754-1521  
Fax: 813-754-5469

### FLORIDA TILE



INDUSTRIES, INC.  
Phone: 863-687-7171  
Fax: 863-284-4007

### FLORIM, USA



Phone: 931-645-5100  
Fax: 931-647-5974

### GAINY CERAMICS



Phone: 909-593-3533  
Fax: 909-596-9337

### GILMER POTTERIES, INC.



Phone: 800-330-9588  
Fax: 903-843-3310

### HUNTINGTON TILE GROUP



Phone: 817-838-2323  
Fax: 817-831-7168

### INTERSTYLE CERAMIC AND GLASS, LTD.



Phone: 604-421-7229  
Fax: 604-421-7544

### IRONROCK CAPITAL, INC.



Phone: 330-484-4887  
Fax: 330-484-4880

### LAUFEN CERAMIC TILE



Phone: 918-428-3851  
Fax: 918-428-0693

### LONE STAR CERAMICS MFG. CO.



Phone: 972-247-3111  
Fax: 972-247-3113

### M.E. TILE CO., INC.



Phone: 219-554-1877  
Fax: 219-554-1880

### MEREDITH COLLECTION



Phone: 330-484-1656  
Fax: 330-484-9380

### METOPOLITAN CERAMICS



Phone: 330-484-4887  
Fax: 330-484-4880

### MICHELLE GRIFFOUL STUDIOS, INC.



Phone: 805-688-9631  
Fax: 805-688-9965

### OCEANSIDE GLASSTILE CO.



Phone: 760-929-4060  
Fax: 760-929-5860

### QUARRY TILE COMPANY



Phone: 509-536-2812  
Fax: 509-536-4072

### SENECA TILES, INC.



Phone: 800-426-4335  
Fax: 419-426-1735

### SUMMITVILLE TILES, INC.



Phone: 330-223-1511  
Fax: 330-223-1414

### UNITED STATES CERAMIC TILE CO.



Phone: 800-321-0684  
Fax: 330-866-5340

### WESTMINSTER CERAMICS, LLC



Phone: 770-938-8360  
Fax: 770-938-8312



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