FORENSIC TILE CONSULTANTS
GREGORY I. MOWAT, FCSI, CFC, CDT, CTC
9541 Vervain Street • San Diego, CA 92129-3523
Telephone (858) 484-8118 • Fax (858) 484-8302 • E-mail: tile4n6@aol.com

OCTOBER 22, 2008 PRESENTATION ON VENEER TILE CONTRACTORS ASSOCIATION SAN DIEGO "SPECIFICATIONS, CONTRACT ENFORCEMENT AND FIELD COORDINATION OF CERAMIC TILE INSTALLATIONS"

Basic tools used for the specification of ceramic tile and stone installations include the Annual (2008) **Handbook for Ceramic Tile Installation** published by Tile Council of America, Inc., **ANSI A108-08 American National Standard Specifications for the Installation of Ceramic Tile** published by Tile Council of America, Inc., **ANSI A137.1-1988 American National Standard Specifications For Ceramic Tile** published by Tile Council of America, Inc., **Design Manual VII** published by Marble Institute of America, **1997 Uniform Building Code** or **2006 International Building Code**, and **2006 Uniform Plumbing Code** (Check with local building department and verify the current International Building Code and Uniform Plumbing Code in use).

Show on drawings location for tile and/or stone installations to be installed. Locations may be listed and included in these specifications, especially for assemblies using different installation methods or components.

Select proper installation method for ceramic tile and related assemblies from the 2008 Handbook for Ceramic Tile Installation. See guides on pages 14 and 16.

Select tile to be installed. Reference standard is ANSI A137.1-1988 American National Standard Specification for Ceramic Tiles for glazed and unglazed ceramic mosaic tiles, quarry tiles, paver tiles or special purpose tiles.

Select grout to be installed. See pages 9 and 15 from the 2008 Handbook for Ceramic Tile Installation.

Select applicable ASTM **material specifications** and applicable bonding and grouting materials from ANSI A108-08 American National Standard Specifications for the Installation of Ceramic Tile.

Specify materials and preparation **work of other trades** and reference **pre-installation conference** and field coordination required to coordinate tolerances and assemblies required for the underlying substrates in order for the work in this section to be performed. Definitions are on page 10 and 11 for **waterproof membranes and wet area** definition page 13 in the 2008 TCA Handbook and require special attention.

Specify requirements for inspection prior to proceeding with installation in this section.

Specify movement joints including construction joints, contraction joints, expansion joints and isolation joints. Definitions on expansion joints are on pages 9, 10 and 79, 80 of the 2008 TCA Handbook.

Specify installation procedures by referencing applicable ANSI A108-08 American National Standard Specifications for the Installation of Ceramic. Special installation procedures and proprietary installation methods and materials should be specified in accordance with manufacturers' data and installation requirements.

The above specification and decisions are normal for architects and specification writers. The **challenge** is making sure we understand what is necessary to prevent failures and reduce liability

Successful exterior decks including swimming pool decks, roof decks and all walking surfaces above inhabitable spaces are required to be designed for both surface moisture flow to drains, scuppers and/or outfall, and with waterproof membranes underneath the tile assembly sloped at least 1/4" per foot to drains scuppers or outfall. All drains must have open weep holes with the waterproof membrane wrapping into the clamping ring or attaching to the drain assembly. Roof decks subject to debris require a secondary drain such as an overflow scupper, to accommodate water-draining out when the primary drain gets clogged up with leaves, etc., that may prevent proper drainage. All surfaces drain away from building structures. Flashing is necessary at all perimeter walls. Tops of parapet walls are required to be sloped 1" for positive drainage. All penetrations on exterior decks are required to be properly sealed and isolated by expansion joints. Vertical offsets at door thresholds to be properly flashed, waterproofed, and have sufficient height to accommodate the tile assembly to drain all water away from the building structure with at least ¼" per foot. Stucco walls adjacent to deck assemblies should be weeped to drain on top of the tile assembly.

The tile trade is **not specific which membranes** are installed beneath the wire-reinforced mortar bed specified using **ANSI A108.1**. The tile trade is very specific as to which membranes will work in a thin load-bearing application where tile work is bonded directly to the thin load-bearing membrane. ANSI A118.10-1993 is the American National Standard for Load-Bearing, Bonded, and Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations. The International Conference of Building Officials adopted the same requirements in ICBO Evaluation Service AC115 July 1996, Acceptance Criteria for Waterproof Membranes Used as Ceramic Tile Underlayment (Proprietary). ICBO Evaluation Service AC39 adopted

Acceptance Criteria for Walking Decks September 1991. Waterproof membranes used on exterior walking decks must conform to ICBO requirements and/or be tested and approved as equivalent. The International Building Code treats waterproof membranes for decks different than showers. The Uniform Plumbing Code has jurisdiction for Tile-Lined Shower Receptors and Tile-Lined Roman Bathtubs installation assemblies and includes three layers of hot mopped membrane or equivalent as tested and approved through the listing service with the International Association of Plumbing And Mechanical Officials.

Special Purpose Tiles: Special purpose tile defined and included in ANSI A137.1-1988 American National Standard Specifications For Ceramic Tile includes "tile, either glazed or unglazed, made to meet or to have special physical design or appearance characteristics such as size, thickness, shape, color, or decoration; keys or lugs on back or sides; pregrouted assemblies or sheets; special resistance to staining, frost, alkalies, acids, thermal shock, physical impact, or high coefficient of friction." This authors personal experience adds: Agglomerated tiles made from quarry waste of natural stones; Catalan pavers made in Spain; Concrete tiles either extruded or poured/layered; Glass tiles; Granite tiles; Limestone tiles; Marble tiles; Metal tiles; Mexican pavers; Onyx tiles; Plastic tiles; Quartz-based stone tiles (Adoquin quarried in Mexico) (Bluestone) (Brownstone) (Cantera quarried in Mexico) (Flagstone tiles) (Sandstone tiles); Saltillo pavers; Slate tiles; Simulated Stone tiles; Smalti mosaic tiles; Soapstone tiles; Terrazzo tiles; Thin brick tiles; and Wood tiles.

For each special purpose tile being chosen, review any special installation guidelines. All natural stones should be washed to remove dust from the backside prior to installation. Tiles with epoxy or polyester as components or on the backs of the tiles should be set with epoxy unless the

tiles are submitted to an adhesive manufacturer with written directions supplied by the adhesive manufacturer. Portland cement will not bond to epoxy, polyester, resins, or mastic where epoxy will bond to Portland cement, epoxy, polyester, resins or mastic. Moisture sensitive stones may need to be set with epoxy. For large stone tile floor installations, verify the color range expected. Caution against using quartz based stones or type C and type D marbles in areas where constant wetting and drying will occur. All stones are not equal. Marble Institute of America recommends a waterproofing barrier between all stones and concrete slabs on grade.

Be extremely cautious when cost-cutting or value engineering natural stone assemblies.

In stone selection, the function of the design professional is to determine the suitability of a stone for a particular use in a project. Dimension stone is defined as ¾" thick and thicker. For rules of dimension stone for flooring or veneer, consult with the Marble Institute of America Design Manual.

By **definition,** all ceramic tiles include materials even up to 1-1/4" thick. Brick, tile and stone are classified as ceramic tile for these rules of expansion joints. Expansion joints for dimension stone may allow for thinner expansion joints due to thicker mass, consult with the Marble Institute of America Design Manual VII.

Normal cleaning of ceramic tile installations includes using clean water. If cleaners are needed, using a neutral base soap. If an acid cleaning is needed, ANSI A108 requires waiting 10 days after the completed grouting of the installation, then using sulfamic acid for removal of cementitious debris like grout, thin set, and cement residues or efflorescence. Never use muriatic acid! The only other acid ever recommended is phosphoric acid for working with small areas or moisture-absorbent tiles or rust stains.

Chapter 14 Exterior Wall Coverings (1997 Uniform Building Code, 2006 International Building Code)

Veneer is nonstructural facing of brick, concrete, stone, tile, metal, plastic, or other similar approved material attached to a backing for the purpose of ornamentation, protection or insulation. **Adhered veneer** is veneer secured to and supported through adhesion to an approved bonding material applied over an approved backing. **Anchored veneer** is veneer secured to and supported by approved connectors attached to an approved backing. Veneer requirements apply to all wainscots above 4 feet in height measured from the adjacent ground elevation. Exterior veneer shall not be attached to wood frame construction at a point not more than 30 feet (9144mm) in height above the non-combustible foundation, except the 30-foot limit may be increased when special construction is designed to provide for differential movement and when approved by the building official.

This means using metal-stud assembly, masonry, or poured-in-place or tilt-up concrete for veneer above 30-feet in height.

Veneer shall support no load other than its own weight and the vertical dead load of veneer above. Surfaces to which veneer is attached shall be designed to support the additional vertical and lateral loads imposed by the veneer. Consideration shall be given for differential movement of supports, including that caused by temperature changes, shrinkage, creep and deflection. Adhered veneer and its backing shall be designed to have a bond to the supporting element sufficient to withstand a shearing stress of 50 psi (345kPa). Permitted backing shall be continuous and may be of any material permitted by this code. It shall have surfaces prepared to secure and support the imposed loads of veneer. Exterior veneer, including it's backing, shall

provide a weatherproof covering. The height and length of veneered areas shall be unlimited except as required to control expansion and contraction or the 30-foot height limitation for wood framed construction. Adhered veneer units shall not exceed 36 inches (914mm) in the greatest dimension or more than 720 square inches (0.46m squared) in total area and shall not weigh more than 15 pounds per square foot (psf) (73.2 kg/m squared) unless approved by the building official. Exception: veneer units weighing less than 3 psf shall not be limited in dimension or area. Adhered veneer may be applied by one of the following applications:

1. A paste of neat Portland cement shall be brushed on the backing and the back of the veneer unit. Type S mortar then shall be applied to the backing and the backing unit. Sufficient mortar shall be used to create a slight excess to be forced out the edges of the units. The units shall be tapped into place so as to completely fill the space between the units and the backing. The resulting thickness of mortar in back of the units shall not be less than ½ inch (12.7mm) or more than 1 ¼ inches (32mm).

2. Units of tile, masonry, stone or terra cotta, not over 1 inch (25mm) in thickness, shall be restricted to 81 square inches (52 258mm squared) in area unless the back side of each unit is ground or box screed to true up deviations from plane. These units and glass mosaic units of tile not over 2 inches by 2 inches by 3/8 inch (51mm by 51 mm by 9.5mm) is size may be adhered by means of Portland cement. Backing may be of masonry, concrete or Portland cement plaster on metal lath. Metal lath shall be fastened to the supports in accordance with the requirements of Chapter 25. Mortar as described in Table 14-A shall be applied to the backing as a setting bed. The setting bed shall be a minimum of 3/8 inch (10mm) thick and a maximum of ¾ inch (19mm) thick. A paste of

neat Portland cement or one half Portland cement and one-half graded sand shall be applied to the back of the exterior veneer units and to the setting bed and the veneer pressed and tapped into place to provide complete coverage between the mortar bed and veneer unit. A cement mortar shall be used to point (grout) the veneer.

Notes:

Using any other backing surface then defined above including exterior ceramic tile panel systems and cementitious backer units, requires approval through an evaluation service agency as an equal to Chapter 14 Section 1403.]

The Ceramic Tile Institute of Northern California cautions against using cementitious backer units as part of an adhered ceramic tile exterior veneer.

All approved assemblies include installation of adhered veneer with grout.

There is nothing in Chapter 14, or related tables, which permits plastic cement to be used in the brown coat of a mortar-bed application.

A number of different materials up to 1-1/4 inch thick may be installed as adhered veneer like split brick, but coordination may be necessary for support of heavier pieces of tile until a bond is established.

Thin-brick tiles are treated as adhered veneer.

1-1/4 inch granite, limestone, marble, quartz based stone, and slate are more often treated as anchored veneer. Granite, limestone, marble, quartz based stone, and slate tiles not exceeding ½ inch thick are usually treated as adhered veneer. For information on anchoring ½ inch thick granite, limestone, marble, quartz based stone, and slate tiles, contact the Marble Institute of

America for details. California requires all veneer ½ inch and thicker above doors at hospitals and schools to be anchored veneer.

Special purpose tiles may require chemical adhesion not listed in these approved paragraphs. Agglomerated tiles made from quarry waste of natural stones; Catalan pavers made in Spain; Concrete tiles either extruded or poured/layered; Glass tiles; Granite tiles; Limestone tiles; Marble tiles; Metal tiles; Mexican pavers; Onyx tiles; Plastic tiles; Quartz-based stone tiles (Adoquin quarried in Mexico) (Bluestone) (Brownstone) (Cantera quarried in Mexico) (Flagstone tiles) (Sandstone tiles); Saltillo pavers; Slate tiles; Simulated Stone tiles; Smalti mosaic tiles; Soapstone tiles; Terrazzo tiles; Thin brick tiles; and Wood tiles.

For each special purpose tile being chosen, review any special installation guidelines from manufacturer or trade association. All natural stones should be washed to remove dust from the backside prior to installation. Tiles with epoxy or polyester as components or on the backs of the tiles should be set with epoxy unless the tiles are submitted to an adhesive manufacturer with written directions supplied by the adhesive manufacturer. Portland cement will not bond to epoxy, polyester, resins, or mastic where epoxy will bond to Portland cement, epoxy, polyester, resins or mastic. Moisture sensitive stones may need to be set with epoxy. For large area stone tile veneer installations, verify the color range expected. Blending of stone tiles may need to be specified where shade range is normal and expected. Caution against using quartz based stones or type C and type D marbles in areas where constant wetting and drying will occur. All stones are not equal.

The 2008 Handbook For Ceramic Tile Installation includes veneer installation assemblies approved for exterior usage include W201 and W202, with note at bottom of page 23 adding methods W211, W221, W222, W231 and W241 and W244F may be suitable for exterior

usage when appropriate precautions are taken including flashing, expansion joint placement and consideration for the particular climatic conditions and exposure. Prefabricated exterior panels are defined on page 10.

Epoxies and organic adhesives are not suitable for high-heat areas and exterior conditions. If you need to bond tile over plywood or metal-backing surfaces in an exterior condition, then mechanically fasten metal lath over appropriate membrane systems that protect the wood, and install with a wire-reinforced mortar bed following ANSI A108.1-2008. Emphasis is to not bond directly to wood or metal surfaces. Epoxy and silicone will bond to clean unpainted metal.

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 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 Paragraph 3.4.

ANSI A108.1: The tile trade calls the mortar bed a wire-reinforced mortar bed. The lath and plastering trades call the setting materials as a scratch and brown coat. Both are the same installation as long as the material and installation requirements conform to ANSI A108.1.

Section 1402 - Weather Protection Section 1402.1 Weather-resistive Barriers. All weather-exposed surfaces shall have a weather-resistive barrier to protect the interior wall covering. Weather-resistive barrier shall be equal to that provided for in International Building Code Standard 14-1 for kraft waterproof building paper or asphalt saturated rag felt. Building paper and felt shall be free from holes and breaks other than those created by fasteners and construction system due to attaching of the building paper, and shall be applied over studs or sheathing of all exterior walls. The saturated rag felt or waterproof building paper shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51mm). Where vertical joints occur, saturated rag felt or waterproof building paper shall be lapped not less than 6 inches (152mm).

Understanding vertical membranes requires understanding the end usage of the veneer application. Normal veneer is treated as an intermittent water usage. Intermittent membranes are weather resistive barrier papers such as 15-pound roofing felt and 30-30-30-paper type D. Intermittent membranes are required as specified above, or approved as an equal through one of the evaluation service agencies. This speaker/author cautions against using 4 or 6 mil polyethylene films anywhere in our industry due to the condensation that occurs due to temperature or pressure differentials resulting in water forming and sheeting on the polyethylene film. Two layers of paper are required to protect vertical shear wall panels. When the veneer includes usage under constant water, a membrane system under the veneer is mandatory to protect the underlying structure. Waterproof membranes, not weather resistive barrier papers, are required for membrane protection of the underlying structure when the veneer application is in a steam room, gang shower, fountain, planter, swimming pool, or any constant water area including exposure to sprinklers from landscaping.

Section 1402.2 Flashing and Counter flashing. Exterior openings exposed to the weather shall be flashed in such a manner as to make them weatherproof. All parapets shall be provided with coping of approved materials. All flashing, counter flashing and coping, when of metal, shall have a minimum thickness of 0.019-inch (0.48mm) (No. 26 galvanized sheet metal gage) corrosion-resistant metal.

1402.3 Waterproofing Weather-exposed Areas. Balconies, landings, exterior stairways, occupied roofs and similar surfaces exposed to the weather and sealed underneath shall be waterproofed and sloped a minimum of ¼ unit vertical in 12 units horizontal (2% slope) for drainage.

1402.4 Dampproofing Foundation Walls. Unless otherwise approved by the Building Official, foundation walls enclosing a basement below finished grade shall be dampproofed outside by approved methods and materials.

1402.5 Window Wells. All window wells shall extend below the windowsill height.

The 2008 Handbook for Ceramic Tile Installation does not address the interfacing of veneer with horizontal surfaces. Horizontal surfaces include door thresholds, handrails, tops of walls, planters, pot shelves, bellybands, windowsills and all conditions where the vertical surface changes to a horizontal surface. All exterior horizontal surfaces are treated as exterior horizontal surfaces and require **waterproof membranes** protection, not with just weather resistive barrier paper. Horizontal wood framing as the substrate requires a membrane system followed by the wire-reinforced mortar bed with no penetrations through the horizontal waterproof membrane. Unacceptable would be a weather resistive barrier paper or paper-backed wire coming up under the veneer and turned over the cap of the wall with staples fastening the paper to the wood

framing. The first time moisture flow is present; water will flow down through the tile assembly, through the stapled paper and swell the wood framing. The swelling typically shows up as a cracked tile installation or cracked grout joints. Fountains installed without a waterproof membrane system behind the veneer all failed with moisture intrusion into the wall assemblies, with many of these fountains having been two-story on interiors of offices. If you're not going to specify and enforce a membrane system at fountain locations, please delete the fountains out of the contract and protect your liability. The same theory applies to door thresholds and horizontal windowsills. All horizontal and vertical tile and stone tile assemblies in planters should include waterproof membrane and the design should incorporate drainage for excess water from the planter into a drain system.

Flashing of caps of veneer installations is necessary to prevent moisture flow excessively through the top of the tile installation. With excessive moisture flow, leaching will occur through the grout joints, and the owner may absorb additional clean-up costs or search to find a party of the contract to pay for the clean up of the leaching.

The Tile Council of America Handbook does not address expansion joint screeds for exterior veneer. The reason is included in ANSI A108.1 which allows the tile contractor to use wood float strips, remove the wood float strips at the expansion joint locations, and fill with the appropriate caulking. Coordination is necessary to specify the expansion joint screed for installation done by the lath and plastering contractor. The best screeds in ideal conditions are double casing beads on double studs. The studs are laid out and installed at the proper expansion joint locations. The next best is using number 40 screeds or a number 40 Frye Reglet. The screeds are preferably attached at the double stud location to allow for maximum movement of the assembly from moisture and thermal expansion. If not over double stud, then single metal

stud. Creating a weakened plane joint with saw cutting in the expansion joint location at stud conditions is better than using number 15 screeds. The number 15 screed does not allow for sufficient expansion and contraction of the tile installation assembly with moisture and thermal expansion and contraction. If a case is made that #15 screeds must be used, then install on 8' centers for moisture and thermal expansion and contraction. Weather resistive barrier paper should be continuous behind the screeds, but all 3.4 or 2.5 expanded metal lath should stop on both sides of the screeds. Solid backing where used should stop on both sides of the screeds. Expansion joints in tile work over tilt up concrete must never be thinner then the expansion joints in the tilt up concrete. All tilt up concrete must be scarified to remove bond breakers when tile is directly bonded to the tilt up concrete.

Plastic cement is not acceptable anywhere in the tile trade. Plastic cement is not recommended in the brown coat of the mortar bed. Reasons included:

A. Plastic cement is not approved in the tables approving the mortar for exterior usage for veneer applications Chapter 14 IBC.

B. Plasticizers may leach back out through the grout joint with any moisture flow present prior to the curing of the plasticizers.

C. Plastic cement is a weaker mortar than approved in ANSI A108.1. Plastic cement is cheaper, but the pennies saved threaten the integrity of the tile installation. Plastic cement is subject to more cracking and may affect the color of lighter colored stone tiles and grout joint colors.

D. If plastic cement is used with plasticizers to blow the plastic cement mortar onto a veneer-backing installation, the mortar bed will be considerably weaker than ANSI A108.1 and the tile contractor or general contractor and/or architect should reject the

mortar bed using these materials. Rejection includes complete removal and replacement with enforcement of the original contract documents. Where a lath & plastering contractor refuses to proceed due to the manual labor for large veneer projects, additives may be used for additional strength in the scratch and or scratch and brown coat installation.

ANSI A108.1A is the installation of ceramic tile in the wet-set method with Portland cement mortar. **ANSI A108.1B** is the installation of ceramic tile on a cured mortar bed with dry-set or latex Portland cement mortar. **ANSI A108.1C** is the contractors' option to use ANSI A108.1A or ANSI A108. **Latex Portland cement mortar** does have some advantages and some disadvantages. Laboratory testing shows the latex bonding mortar does achieve higher bonding strengths and is less rigid than Portland cement mortar. (See definitions on page 7 in the TCA Handbook.) Latex Portland cement mortar does require longer cure time. The emphasis here is if a latex Portland cement mortar is used, protection from moisture flow is needed during the curing process of the latex Portland cement mortar. As an example, latex Portland cement mortar bond coat should not be used in a swimming pool veneer, fountain or on exterior veneer not protected from moisture flow during wet weather conditions. Specifying dry set or latex Portland cement mortar leaves the responsibility of any problems occurring on the party that chooses to use either mortar. If moisture flow is present prior to curing of the latex mortar, loss of bond or latex leaching may occur. The term "latex leaching" is really the soaps and surfactants used in the latex that may leach out through the moisture flow and leave leaching stains on the veneer application. Again, the question comes up as to that is financially responsible for the clean up of the soaps and surfactants from the latex. If cleaning is needed, use a product in the solvents category. Sulfamic acid will not clean up the soaps and surfactants

from latex leaching. There are certain conditions where using a latex bonding mortar is recommended by the tile manufacturer. Porcelain tile manufacturers usually recommend installation of their porcelain tile with latex bonding mortar. The additional bonding strength and chemical adhesion may be needed with impervious tiles. When latex-bonding mortar is used during wet weather conditions, allow for some form of protection during curing of the latex Portland cement mortar. Likewise, a number of different types of stones, including slates, may require using the latex bonding mortar. If in doubt, check with the tile representative (manufacturer, distributors or contractor) or adhesive manufacturer and verify the proper mortar recommended for bonding the tile chosen.

All of the ICC and NER approvals of evaluation reports for Uniform Building Code and International Building Code Chapter 14 include tile **installations with grout**. There is no approval nor is there any disapproval of installation of ceramic tile without grout. The emphasis here is if a thin-brick tile is used to give the look of a full-brick installation by using no grout at all, then quality assurance is mandatory and must be specified to back butter each and every piece of tile to assure 100% bond coverage. Ungrouted veneer without 100% bond coverage may lead to individual tiles popping off of the building. Moisture collects in the voids behind the tile, when hit with heat, become similar to steam or hydrodynamic pressure pushing outward on the back of the tile surface away from the bonding mortar.

Special inspection may be required if ungrouted installation is selected by the owner. Caution is urged anytime ungrouted veneer is used. Contractors are encouraged to obtain waivers in writing, releasing responsibility for future failures of ungrouted veneer falling from the building structure. Thin brick veneers may be susceptible to curling, warping and successive

delamination when exposed to weather and direct sunlight without the perimeter grout to hold the veneer in place. Expansion joints are still necessary to control shrinkage cracks where the veneer is installed over lath and plaster. Cracking of the lath and plaster can cause the veneer to crack and fall from the structure where the installation is ungrouted.

ANSI A108.10 specifies the installation of **grout.** Grout manufacturers may have changed the formulation of their grout or may recommend additives to be used with their grout. Do not mix additives from one company with a grout supplied by another company. As an example, Polyblend is already a latex-modified grout manufactured by Custom Building Products. It is not appropriate to

add any grout additive to this grout by a different grout manufacturer, as additional additives would create problems. With ANSI A108.10, you will receive a flush grout joint with a square-edge tile and recessed to the edge of a cushion with a cushioned-edge tile. If you want any other grout joint, you must specify the grout joint, i.e., weathered, tooled, concave, etc.

With special-purpose tile, specifically **thin-brick tile** not meeting the TCA A137.1 standards for quarry tile, a grout release may be necessary to prevent the grout from absorbing into the surface of the brick veneer. Many tile contractors will automatically use a grout release with thin-brick tile, but then it is the tile contractor's responsibility to notify the other parties involved in the contract what grout release is being used.

Waterproof coatings typically used with anchored brick veneer are not necessary with thin-brick tile veneer applications. Be cautious of using other coatings unless you have information in writing recommended by the tile manufacturer that the coating is suitable for the intended usage. If a coating/sealer is used, again, this is coordination or specification item to verify any sealer or coating on top of the grout release used is compatible. As an example, if a

tile contractor uses a grout release, then the painter applies a waterproof coating that does not penetrate the surface of the tile, and the waterproof coating turns white, exposed to sunlight, who is financially responsible for the clean-up of the waterproof coating left on the tile surface?

Glass-mesh mortar units are now called **"cementitious backer units"** and are the generic name for backer boards for usage with tile bonded directly to the backer board. If you use a backer board for backing as an exterior veneer, verify the backer board has approval via an evaluation report with ICC or NER. See method W244 in the TCA Handbook. Expansion joints must carry through the cementitious backer units. Design must include allowing water to get out of the wall assembly at the base of the building. The assembly when installed by other trades needs to be checked for taping, correct anchorage, and acceptable tolerances for flatness and proper installation of weather resistive barrier papers or waterproof membranes. Many drywall contractors refuse to install weather resistive barrier papers prior to installation of the cementitious backer units. Reject installations until acceptable and corrected prior to proceeding with the tile installation. Fire ratings may be important when changing from vertical to horizontal assembly. As an example, Wonder board carries a fire rating for both vertical and horizontal usage and may be used at a windowsill on the exterior of a building. Durock has only a vertical fire rating. A windowsill would require additional gypsum board for horizontal fire rating when using Durock. Weather resistive barrier paper or waterproof membranes are still necessary behind the cementitious backer boards and properly flashed at windows, base of building, etc. The Ceramic Tile Institute of Northern California and the Lathing & Plastering Institute of Northern California **caution against using a cementitious backer unit** for the exterior veneer assembly due to the many failures that have occurred in Northern California with this type of an assembly.

When using assembly methods W244-01 check with waterproofing requirements and allowances for expansion and contraction for exterior veneer applications. All expansion joints must go through the cement backer unit. Solid backing may be required over wood-stud assembly if tolerances are not required for the placement of the wood studs. Follow the manufacturer's directions.

Confusion exists between the tile trade and the masonry trade with the terms **"grout"** and **"mortar."** In the tile trade, the "grout" is the material between the tile, and the "mortar" is the bonding material to the backing surface. These terms are reversed in the masonry trades. The "mortar" is between the brick or block, and the "grout" is the fill in the block or the cored holes in the reinforced brick.

If **acid rain** protection is needed, please contact the Tile Council of America, Ceramic Tile Institute of America, Inc. or sealer manufacturers. Sealers are available but recommended only for specific uses.

When the design for the building has specific conditions, **specify a pre-tiling** meeting and include all trades necessary at the meeting to discuss the specific conditions requested. An example is the design of the building is to accommodate only full tile. No cut tile is permitted. Then a pre-tiling meeting for a veneer application would require the framers, the lath and plastering contractors, the tile contractor, the architect or owner's representative and the general contractor. Drawings need to coordinate exact locations of expansion joints, stud placement and tolerances of each trade. Then enforce the contract documents and inspect and reject all surfaces not conforming to the contract documents and requirements as stated at the coordination meeting.

Where tile is being used both interior and exterior, **show the transition on drawings**. If window frames are being installed, show the window frame or tile going in first. At thresholds from exterior to interior, show the transition and preferably use an expansion joint at the threshold location.

Know what tolerances of **shade variation** of tile material are and are not acceptable. Substitutions may include better materials consistent in color and may include materials not acceptable to ranges of the specified materials. Be aware all stones vary in shade variation, and this is the nature of stones. If color is of mandatory importance to the owner, you may want to specify owner-supplied materials. Where possible, colors should be included in specifications or drawings of all tile materials. Grout colors should also be included. The more information known by the bidding parties, the bidders will bid more cost effectively when the contractors require less coordination.

Given a choice, include the **monuments** and signage as part of the scope of the work of the contract.

Atrium courtyards above inhabitable space require constant membrane systems interfaced with all materials through the entire courtyard.

Masonry walls as retaining walls or planter walls may require a waterproof membrane system on one side or within the assembly. Water flow where no membrane systems occur will leave leaching deposits on veneer installations, with or without ceramic tile installations.

Rules for exterior veneer are even more critical when applied to **shower assemblies**. A standard shower used once a day for 12 minutes is equal to 8760 inches of rain per year in a shower.

Anchored Veneer is a separate subject. See the requirements in the Chapter 14 of the 1997 Uniform Building Code and/or 2006 International Building Code, Marble Institute of America Design Manual, Indiana Limestone Institute, Brick Institute of America, Masonry Institute of America or details supplied through the anchored veneer manufacturer or distributor.

Successful projects include complete contract documents with detailing and coordination that may be needed, material selections and assemblies properly specified, with pre-tiling meetings for specific coordination of design requirements, and enforcement of contract documents. Encourage owner payment for lump-sum delivery to job site or storage in insured bonded warehouses to assure color consistency of materials specified. Use consultants, if needed, before, during and after installation. Specify inspections' services in the contract documents if needed. Successful projects make happy owners that build more projects and sell more buildings and projects. Doing the system right the first time saves expensive, costly litigation later. Solution finding is the fastest way to prevent problems going to court. If a problem exists, address the correct solution first, and then seek the source of payment, which hopefully is through enforcement of the existing contract documents.

Sources:

Tile Council of America, Inc. 100 Clemson Research Boulevard, Anderson, SC 29625 (864) 646-8453, Fax: (864) 646-2821, E-mail: **literature@tileusa.com**, Website: wwwtileusa.com

Ceramic Tile Institute of Northern California, 10408 Fair Oaks Boulevard, Fair Oaks, CA 95628 (916) 965-8453, Fax (916) 965-8454, E-mail **ctinc@jps.net**

Ceramic Tile Institute of America, Inc. 12061 Jefferson Boulevard, Culver City, CA 90230-6219 (310) 574-7800, Fax: (310) 821-4655, E-mail: **ctioa@earthlink.net**, Website: www.ctioa.org

Marble Institute of America, Inc. 30 Eden Alley, Suite 301, Columbus, OH 43215 (614) 228-6194, Fax: (614) 461-1497, E-mail: **stoneassociations@hotmail.com**, Website: www.marble-institute.com

The Masonry Institute of America, 2550 Beverly Boulevard, Los Angeles, CA 90057-1085 (310) 328-4400 –Marble & Stone Slab Veneer-has details for anchorage.

Brick Industry Association, 11490 Commerce Park Drive, Suite 300, Reston, VA 20191-1525 (703) 620-0010, Fax (703) 620-3928, E-mail borchelt@bia.org

Indiana Limestone Institute of America, Inc. Stone City Bank Building Suite 400, Bedford, IN 47421 (812) 275-4426, Fax (812) 279-8682, Website www.iliai.com -Indiana Limestone Handbook

Plastering Information Bureau, 21243 Ventura Boulevard, Suite 115, Woodland Hills, CA 91364 (818) 340-6767, Fax (818) 640-7637

Sacramento Lath & Plaster Bureau, 1400 S Street, Suite 203, Sacramento, CA 95814 (916) 444-2397

International Code Council, 5360 Workman Mill Road, Whittier, CA 90601-2298, (562) 699-0541, **Northern California** (925) 734-3080, Fax (925) 463-3295

International Association of Plumbing & Mechanical Officials, 20001 East Walnut Drive South, Walnut, CA 91789-2825, (800) 85-IAPMO, E-mail: **www.iapmo.org**