

A PRIMER ON BEDDING LARGE SIZE TILES

Joe A. Tarver
(U.S.A.)

Joe A. Tarver, has served as executive Director of the National Tile Contractors Association since 1972. He has been closely associated with the tile industry in the United States for the past thirty-eight years and was instrumental in the development of an internationally recognized workshop program for tile contractors.

On behalf of NTCA, he worked diligently with representatives from ASCER, Addopriastrelle, Ceramic Tile Distributors Association (CDTA), and Tile Council of America (TCA) to unite the five organizations in the formation of the International Tile & Stone Exposition. Now preparing for its 6th annual show, ITSE Board of Governors; he served as its 1991 Vice Chairman; and was the Board's Chairman in 1992.

A frequently sought out speaker for industry and allied programs, Mr. Tarver is also the author of numerous tile-oriented articles in national trade publications. Under his guidance, the NTCA has grown from a small regional contractors association into a national entity with world-wide ties.

It is my pleasure, over the next few minutes to provide you with information developed by me and the National Tile Contractors Association Technical Committee for the successful installation of large size tiles. Before we address that subject, however, it is important we remember that tile setting methods, substrates, bonding and grouting materials used in the United States vary substantially from those used in Europe and other parts of the world. Even though thin set or thin bed methods and products are now more widely used throughout Europe, your installations basically use cement bonding products to install tile to ridged cement substrates and cement products for grouting. In the U.S. we are faced with installing tile, vertically and horizontally, with a much broader variety of bonding and grouting materials. Substrates, such as tile over tile, metal, plastic laminates, vinyl tile, various types of backerboards, gypsum board, and a wide variety of wood products and concrete slabs on grade are common. Prestressed and postformed concrete slabs above grade present another set of unique problems. Wood and metal studs are utilized for vertical construction over which gypsum board, plywood, and backerboards are nailed or screwed to receive ceramic tile. Wood joists and laminated trusses are common floor construction methods over which a variety of products are installed to receive tile. Many of these substrates do not meet our specifications for plumb, square and level and are subject to movement and deflection. When these unfavourable conditions exist, it is more difficult, and sometimes impossible to achieve a successful installation of larger size tiles, especially when thin set bonding products are used.

Slide # 2: List of associations.

The National Tile Contractors Association, Inc.
P.O. Box 13629
Jackson, MS 39236 USA
Tel: (601) 939-2071
Fax 601 932-6117

Tile Council of America, Inc.
P. O. Box 1787
Clemson, SC 29633-1787 USA
Tel. (803) 646-8453
Fax 803 -646-2821

Ceramic Tile Distributors Association, Inc.
c/o C.M. Services
Building C, Suite 20
800 Roosevelt Road
Gleen Ellyn. IL 60137 USA
Tel: (708) 545-9415
Fax 708 -790-3095

Materials & Methods Standards Association
P. O. Box 332
Grand Haven, MI 49417 USA
Tel. (616) 842-7844
Fax 616 -842-1547

Slide # 3 - Shot of NTCA Membership Brochure

Slide # 4 - Advantage NTCA - Industry Position - Organized and chartered in 1947, NTCA is a non-profit trade association serving every segment of the industry, and recognized as the largest and most respected national tile contractors association in the world. The entire industry benefits from our efforts - we include manufacturers, distributors, importers, contractors, architects, designers and builders in our programs.

NTCA firmly believes that manufacturers producing quality products, sold by trained and reputable distributors, and professionally installed by qualified contractors for satisfied customers, result in growth and longevity for our industry.

NTCA members take pride in being a part of an association that has spearheaded education for the professional installation of ceramic tile and allied products. NTCA has dedicated itself, its people and its resources to the betterment of the ceramic tile and allied industries and is engaged in a wide variety of activities on behalf of its members and its industry.

Slide # 5- Advantage NTCA - Tileletter - The official Association magazine is a professionally produced publication which is directed solely to the industry. Circulated to more than 15.000 firms each month, TileLetter is faithfully read by approximately 45 to 50.000 individuals within the industry.

Slide # 6- NTCA Help.- You're a phone call away from help in solving technical problems. NTCA also assists in locating products and people when needed. Most request for help are handled while the caller is on the line. Otherwise, the question is researched and the information is called, faxed or mailed as quickly as possible.

Slide # 7 - NTCA Technical Committee - The committee is comprised of over twenty-five carefully selected manufacturer, distributor, and contractor members, all recognized as experts in their field. The committee meets several times a year in keeping with its purpose of recognizing industry problems, developing technical information addressing those problems, and disseminating that information to the industry.

Slide # 8 - NTCA Convention & Exposition - NTCA co-sponsors the international Tile & Stone Exposition with four other associations, ASCER, ASSOPIASTRELLE, CTDA and TCA. ITSE is one of America's «Top 100» trade shows with over a quarter of a million square feet of exhibits, making it the largest collection of ceramic tile, natural stone and related products in the Western Hemisphere. ITSE hosts more than seven hundred (700) exhibitors representing more than forty-six (46) countries: with registered trade and professional attendance from over eighty-two (82) countries. NTCA is also instrumental in the programming for and participation in the «Profit by Design» Conferences portion of ITSE. The NTCA Conventions is held in conjunction with ITSE annually. These are only some of the advantages offered to the industry by NTCA. We do accept international membership and will be happy to provide membership brochures and applications to any interested parties who are a part of the international tile industry.

The Tile Council of America is a trade association of ceramic tile manufacturers, accessories manufacturers, and materials suppliers. They represent the interests of the American ceramic tile

manufacturing industry before Federal and State governments, provide leadership to the industry in developing product standards and remain an industry leader in product testing. TCA is one of the five associations owners of the International Tile & Stone Exposition.

The Ceramic Tile Distributors Association, Inc. is a national trade association representing the interest of the independent wholesale distributors in the United States. They are also one of the five association owners of the International Tile & Stone Exhibition.

The Materials and Methods Association is an association of corporations and individuals engaged in both the manufacture and sale of allied products for the ceramic tile industry. Their objective is to establish standards of quality and performance of materials and methods for installation and use in the ceramic tile and dimensional stone industries.

The publications which these associations produce will be reviewed briefly so that you may be familiar with them. These publications are adopted by the U.S. tile industry and allied products industries after they are promulgated by appointed committees. The committees are comprised of representatives from a broad cross section of the tile and allied products industries and are responsible for reviewing, modifying, and up-dating these publications, in addition to having them reaffirmed at least every five (5) years.

The most important of these publications are

Slide # 9- Shot of cover of handbook. - The Handbook For Ceramic Tile Installation

The Tile Council of America provides the Handbook For Ceramic Tile Installation as a guide to assist in clarifying and standardizing installation specifications for ceramic tile. The Handbook is revised annually to present architects, specification writers and ceramic tile contractors with current, accurate data on ceramic tile installation.

Slide #10- Shot of committees - The information presented in the Handbook represents a consensus of the national and regional organizations listed here. Each installation recommendation requires a properly designed, constructed and prepared substructure using materials and construction techniques meeting nationally recognized material and construction standards.

Not all installation methods and materials are listed. 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 is made to produce accurate guidelines, they should be used only with the independent approval of technically qualified persons. These «qualified persons» are universally recognized as Ceramic Tile Contractors. It is important to remember that the Handbook presents methods and recommendations only and **Is not a Specification**

Slide # 11 Shot of cover of ANSI A-108 - The American National Standard Specifications For the Installation Of Ceramic Tile. Commonly referred to as the ANSI A-108, this is the **SPECIFICATION FOR INSTALLATION OF CERAMIC TILE** used with the Handbook. The two (2) publications are the so-called «Bible» of the installation segment of the U.S. Tile Industry.

Slide # 12 - ANSI A-108 Committee. - The Personnel of ANSI Standards Committee A108, as you can see, is comprised of representation from a broad number of corporations and associations. The American National Standard Institute is not an enforcement group and does not develop or interpret specifications. They do, however, approve a voluntary standard or specification once verification of due process, consensus and other criteria is provided to them by the developer. In this case, the Committee indicated here. The use of American National Standards is completely voluntary: their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing or using products, processes or procedures not conforming to the standards. The Standards may be revised or withdrawn at any time, however, procedures of ANSI require that action be taken to reaffirm, revise, or withdraw standards no later than five years from the date of their approval.

Slide # 13 - Shot of cover of ANSI A137.1 - The American National Standard Specification For Ceramic Tile (Manufacturing).

This American National Standard implies a consensus of those substantially concerned with its scope and provisions. It is intended to aid the manufacturer, the consumer, and the general public. Like the ANSI A108 they are voluntary, not mandatory.

Slide # 14 - Shot of cover of MMSA Bulletins - The Materials & Methods Standards Association Bulletins

The MMSA Bulletins are prepared to promote standards of quality and performance of materials and methods of installation and use in the ceramic tile and dimensional stone industries. These Bulletins are intended to be filed and used along with ANSI A108, the TCA Handbook, and the Marble Institute of America Design Manual for more successful ceramic tile and dimensional stone installation.

Slide # 15 - Shot of cover of NTCA Reference Manual. - The NTCA Reference Manual is a one-of-a-kind publication comprised of data developed by NTCA's twenty-five (25) member Technical Committee. Bound in a three inch three-ring binder, the manual is written in easy-to-understand language and formatted in tabbed sections for quick location of vital technical information. The sections cover: Grouts - Thin-Bed Method Installations - Underlayments - Substrates - Specific Installation Procedures - Marble and Granite Tiles (covering maintenance procedures and stain removal) Manufacturers' Products by Type - Maintenance - Glossary - Industry Specifications and Bulletins (includes methods and specifications above and more). The NTCA Technical Committee constantly researches and adds new subjects; and existing ones are revised as needed to keep up with ever-changing industry technology. Each manual is registered - and personalized - to its owner and is maintained in a current status by NTCA.

Slide # 16 - Materials For Setting Ceramic Tile - The following are the most widely used materials for setting ceramic tile. Each possesses specific qualities that make it suitable for installing tile of certain backings or under a given set of conditions.

Slide # 17 - Handbook Method F-112. - The conventional portland cement mortar method (Handbook Method F-112) is the thick bed method utilizing up to two inches of mortar.

Slide # 17A - Handbook Method F-113 - All other methods (Example - Handbook Method F-113) are thin-bed methods utilizing mortar beds of approximately three thirty seconds of an inch (3/32") and organic adhesive beds of one thirty second of an inch (1/32") after proper bedding.

Slide # 18 - Portland Cement Mortar. - A mixture of portland cement and sand, roughly in proportions of 1:5 on 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 two inches (2") in thickness, facilitates accurate slopes of planes in the finished tile work on floors and walls. The mortar bed can be modified with the inclusion of a latex additive as a part of or all of the liquid portion of the mix. Portland cement mortars can be reinforced with metal lath or mesh, can be backed with membranes and can be applied on metal lath over open studding on walls, or on rough floors. They are structurally strong, are not affected by prolonged contact with water, and can be used to plumb and square surfaces installed by others.

Slide # 19 - 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 three thirty seconds of an inch (3/32") after tiles are bedded, has excellent water and impact resistance, is water-cleanable, non-inflammable, 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 levelling the work of others.

Slide # 20 - 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. It is less rigid than portland cement mortar and has superior bonding characteristics. Therefore, latex portland cement mortar is recommended for the installation of large unit porcelain bodied tile.

Slide # 21 - 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.

Slide # 22 - 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, an economical epoxy application. **They are not designed for chemical resistance.**

Slide # 23 - 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.

Slide # 24 - 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.

Slide # 25 - 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 counters where surfaces are appropriate and properly prepared - in accordance with adhesive manufacturers' directions. Organic adhesives are limited use products not suitable for bonding button back or large size tiles.

Slide # 26 - Materials For Grouting Ceramic Tile. - Grouting materials for ceramic tile are available in many forms to meet the requirements of the different kinds of tile and types of exposure. Portland cement is the base for most grouts and is modified to provide specific qualities such as whiteness, mildew resistance, uniformity, hardness, flexibility and waterretentivity. Non-cement based grouts such as epoxies, furan and silicone rubber offer properties not possible with cement grouts. However, special skills on the part of the tile setters are required. These materials can be appreciably greater in cost than cement-based grouts. Complete installation and material specifications are contained in ANSI A108.10 AND ANSI A118.6. Both specifications are contained in the American National Standards Specifications For The Installation Of Ceramic Tile discussed earlier.

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These existing methods, specifications, and products were and are adequate to successfully and professionally install tiles 8 inches by 8 inches and smaller. **That unfortunately is not true for larger size tiles.** The introduction of tiles 12 inches by 12 inches and larger presented the world tile industry with new problems that heretofore had not existed. Failures of large size tile installations using thin set products began to reveal numerous problems that had to be addressed. Substrate preparation adequate for smaller tile installations were not suitable for installation of larger tiles.

Bonding products have to be more carefully selected, prepared and applied for large size tile installation. Over ninety-five percent of tiles installed in the United States today are bonded with a thin set bonding product such as dry-set mortar, mixed with water or modified with dry polymers or liquid latexes, organic adhesives and epoxies. The careful attention to methods of applying bonding products and movement of tiles in the bedding process are now critical considerations. Proper selection, care and use of trowels and other tools plays a very major and important role in installing larger size tiles. Notched trowels of various sizes are common to the installation of ceramic tile in the U.S. Their purpose is to apply a specific gauged amount of bonding material to the substrate. To accomplish this, the manufacture of the trowels must take into consideration the human element. In other words, it is not comfortable or productive for the human wrist to hold a trowel at a 90 degree angle. It is more comfortable and natural for the trowel to be held at a 45 degree angle. Taking that into consideration, if we use a 1/4 inch by 1/4 inch square notched trowel, held at a 45 degree angle, what is the depth of the mortar applied to the substrate? One half of the notch depth, or 1/8 inch of

mortar is applied. The U.S. ANSI Specifications calls for 3/32 inch of mortar between the tile and substrate after proper bedding. The requirements for organic adhesive is 1/32 inch. It becomes very obvious that preparation of substrates by other trades to receive ceramic tile is a major concern of the tile contractor. The finished tile job, using a thin-set method, will only be as good as the substrate to which it is applied. Larger sized trowels and «medium bed mortars» can be used to alleviate some of the problems alluded to above. In other words, the introduction of tile sizes as large as 36 inches by 36 inches presented installation problems that we had never encountered and were not prepared to deal with.

However, Necessity Is The Mother Of All Inventions - and suddenly we were faced with the «Necessity» of solving problems that we didn't know existed. It was a surprise to a lot of people that the same methods and products used in our normal installation procedures would not work with large size tiles. We could not eliminate voids and air pockets in the dry-set mortar and get uniform coverage using the normal twist and beat in procedures. Hollow sounding tiles resulted. Lippage was the rule and not the exception, resulting in aesthetically unacceptable installations. Cracked tiles and broken corners were commonplace. Exhaustive experimentation provided little if any relief from these oppressive problems that prohibited satisfactorily performing and aesthetically pleasing installations. The foremost industry experts and consultants were baffled by our inability to quickly and efficiently address and solve these problems.

Finally, I resorted to substituting 24 inches by 24 inches by 1/2 inch thick piece of glass for the same size tile in my experimentation. This allowed me to see through the glass and observe the mortar as I tried to bed the glass tile. I used different sizes of notched trowels. I mixed the mortar to different consistencies. I tried twisting the tile. I tried beating blocks and mallets. I tried vibrators with only limited success. Nothing worked. One night after several hours of experimentation, tired and discouraged, I was ready to clean up my glass tiles and tools and go home. I had enough mortar to try one last application. Without thinking, I spread the mortar onto the backerboard in one direction. In other words, in a straight line. When I placed the glass tile onto the mortar, and still without thinking, moved it perpendicular to the trowel ridges I suddenly had 95 percent coverage with very few voids. Mortar now fully supported the perimeter of the tile. I did not realize exactly what I had done until the next day when I resumed testing and duplicated the procedure. I discovered that by trowelling in one direction and moving the tile perpendicular to the trowel ridges that it took very little movement to collapse the peaks into the valleys. The valleys allowed air to escape and the mortar to disperse uniformly. Lippage was drastically reduced if not eliminated. Viola! Such a common sense solution to a nagging problem. Why had we not thought about this before? Until now it had not been necessary for us to think about it. The need was not there, therefore, the problem did not exist. Once the problem existed, ultimately someone would provide a solution.

My Father, who is one month away from 92 years young, was and is my friend and willing teacher. During my early years he had infinite patience in sharing this knowledge and experience with me. Of the many things he taught me, two specifically remains with me and are prominent in my everyday life: ...

If something is worth doing, it is worth doing well.

You can solve ninety-five percent of your problems by using common sense.

Both observations apply to our subject today. Large size tiles are worth the time and effort to install them well. A common sense approach now allows their successful and professional installation.

Since a picture is worth a thousand words, I trust the following brief video tape will visually attest to what I have just imparted to you verbally.

I appreciate the opportunity to share this time with you. I sincerely hope the information will be of value to you in your pursuit of making the ceramic tile industry, world wide, a better place for all of us.