



CERAMIC TILE INSTITUTE OF AMERICA, INC.

12061 Jefferson Blvd., Culver City, CA 90230-6219

Phone (310) 574-7800 * Fax: (310) 821-4655 * Email: ctioa@earthlink.net

Fed. I.D. #95-4401962

www.ctioa.org

www.thetiledoctor.com

CTIOA REPORT 96-8-1

SUBJECT: INSTALLATION OF LARGE FORMAT TILES

INTRODUCTION

With the increasing introduction of larger size tiles by ceramic tile manufacturers, it is necessary to address the specialized installation requirements demanded by these larger products in order to insure successful floor systems. As with any other floor tile products, the proper laying of large format floor tiles requires compliance with the most fundamental methods of inspection, preparation, and installation, and yet these larger size tiles can also demand specialized methods necessary to insure satisfactory results, as will be discussed in the following sections.

Proper care and diligence, of course, must always be exercised in evaluating job conditions, with particular study focused upon:

- Is there a proper substrate surface texture?
- Is the surface free of curing compounds or other contaminants?
- Is the floor sound and free of cracks?
- Are expansion joints properly spaced and installed?
- Do the tiles themselves present any potential bond problems?

Earlier field reports have addressed these issues and the proper methods to address deficiencies in each category, and should be referenced for guidance and recommendation whenever sub-standard conditions are encountered.

DISCUSSION

Perhaps the most critical evaluation specific to larger format tiles regards the requirement for a level surface, not only of the substrate prior to installation, but also in the finished work. The Tile Council of America *Handbook for Ceramic Tile Installation* call for the maximum substrate variation to be no more than 1/4" in 10' 0" from the required plane for conventional thin-set applications, but, unfortunately, with current construction trade practices, many floors are found to be deficient in this aspect, and are excessively uneven.

This excessive variation, and even the allowable 1/4" variation established by the *Handbook*, can cause substantial difficulty in completing a satisfactory installation, especially when

combined with large format tiles which themselves may be warped and uneven, yet fall within **allowable** standards.

The following chart illustrates the allowable warpage for large format tiles by category as specified by ANSI:

GLAZED & UNGLAZED QUARRY TILE
(1.5% maximum warpage along any edge)

Tile Size	Allowable Variation
16" x 16"	.24"
18" x 18"	.27"
24" x 24"	.36"

GLAZED & UNGLAZED PAVER TILE
(1.0% maximum warpage along any edge)

Tile Size	Allowable Variation
16" x 16"	.16"
18" x 18"	.18"
24" x 24"	.24"

As indicated, many of these **allowable** tolerances for warpage of large-format tiles can themselves independently exceed the 3/32" to 1/8" adhesive thickness recommended by most thinset manufacturers after beat-in, and, when combined with even the slightest substrate variation, can make a proper installation impossible without specialized methods.

It is frequently the case with many floor installations that the mandated 1 1/4" to 2" mortar bed thickness required to alleviate sub-standard slab conditions can not be utilized, due to the impracticality of the added floor height, especially in residential applications. Resultingly, materials manufacturers have found it necessary to develop and introduce specialty products which are designed to contend with both the prevalence of deficient slab surfaces, and the tile warpage conditions which can be presented by larger format tiles. Proper utilization of these products can prove the difference between an acceptable and an unacceptable floor installation being achieved.

SELF-LEVELING UNDERLAYMENTS

Self-leveling underlayment products are effectively utilized in circumstances where the slab variation exceeds the tolerances set out by TCA, yet the 1 1/4" to 2" thickness (plus tile) resulting from a mortar bed application is not practical due to other design considerations. These cementitious products are installed in a liquid form, and, due to their fluid nature, seek their own true level before hardening into a tileable surface. Specialized additives are blended to minimize shrinkage and cracking upon final cure, allowing these products to be spread from a feather edge to a full 1" build-up thickness, depending upon the manufacturer, and leave a surface that is perfectly level and ready for tile. As an added benefit, when the sub-floor is properly primed in advance, these self-leveling materials can even be placed over sub-standard surfaces, such as improperly textured concrete and cutback adhesive, improving the bondable surface.

Self-leveling products can prove extremely useful not only for large format installations, but for any floor installation where the levelness of the substrate is of particular concern, such as with marbles, granites, and other natural stone products, and where the height requirements of the mortar bed method are not practically effective.

MEDIUM-BED MORTARS

Medium-bed mortar products have resulted from further development and enhancement of adhesive technology, differing from standard thinset products specifically in their ability to be utilized in far greater thicknesses than the 3/32" to 1/8" limitation stipulated by most thinset manufacturers. Medium-bed products have been developed which can be utilized in thicknesses ranging up to a full 1" which allows for a substantial amount of compensation during installation when uneven conditions are encountered, either in the substrate or with the specific tiles to be installed. This versatility can serve to alleviate both the leveling and the back-buttering methods of utilized to insure an effective bond, as well as to provide increased support beneath larger tile modules.

Specialized round-notch trowels are often recommended for placement of medium-bed mortar products, which allows for increased surface contact upon initial tile placement, as well as for more effective compression of the mortar upon bedding, insuring adequate coverage.

MORTAR APPLICATION AND TILE PLACEMENT

Large format tiles are often considered to present bonding problems due to the difficulty of achieving full mortar coverage with traditional methods. Inadequate mortar coverage can then result in cracked tiles, lippage, and bond failure, even under ideal circumstances of tile and substrate flatness.

In order to determine solutions to this problem, the Technical Committee of the National Tile Contractors Association has recently conducted testing which seems to indicate the need for specialized methods of mortar and tile placement. According to the NTCA findings, traditional random "swirl" applications of mortar, whereby the mortar is troweled and combed upon the floor without regard for pattern or direction, can make adequate adhesive coverage nearly impossible to achieve, even with beat-in of the tiles, due to uneven disbursement of the mortar and air entrapment beneath tile tiles. Insufficient support at corners and edges can also frequently result from this random method.

As a result of their testing, the NTCA now endorses the following specific method for mortar troweling and tile placement to insure maximum adhesive coverage and bonding with large format tiles:

1. Key the mortar into the substrate with the flat edge of the trowel.
2. Next, comb the mortar in one uniform horizontal direction.
3. Place the tiles by moving them 1/8" to 1/4" across the mortar ridges back and forth in perpendicular direction.

A trowel with half inch deep oval notches spaced 1/4" apart is recommended for 12" x 12" tiles, with other trowel requirements determined by the tile size to be installed. This method alleviates the need for both back-buttering and beat-in of the tiles, while still resulting in maximum mortar contact and coverage, including at corners and along tile edges.

CONCLUSION

As is the case with any quality floor installation, proper evaluation and preparation are the key to success. Large format tile installations, although presenting specific conditions that may seem problematic at first encounter, can successfully be achieved with a comprehensive understanding of their characteristics, and a current knowledge of the installation materials and methods discussed here which are available to contend with their specific requirements. Self-leveling underlayments and medium bed mortars provide effective and affordable alternatives to mortar bed installations, and, when combined with the NTCA recommendations, allow a versatility of method which can result in a superior installation under a wide range of conditions, contributing to the improved market acceptance of larger sized tile products as they are increasingly introduced by manufacturers and demanded by consumers.