Rectangular Tiles: How to "Offset" Certain Installation Challenges

By Bill Griese

When 8" x 8" tiles were considered large and mosaics were common, rectangular tiles enjoyed great popularity. As 12" x 12" tiles came to dominate, rectangular tiles were less often seen. Today, due to continuing advances in manufacturing technology, there has been a surge and rejuvenation of their popularity. Tile suppliers now regularly offer "rectangular versions" in many of their product lines. Common layouts include rectangular tiles set in brick or running bond patterns, and very long and skinny rectangular tiles set in plank-like patterns. Another popular trend involves the new availability of very large rectangular tiles, such as 24" x 48", which can help achieve slab-like looks, similar to natural stone.

Do rectangular tiles present unique challenges?

Rectangular tiles can present unique challenges to installers when running bond patterns are used. Manufacturers strive to produce perfectly flat tiles, but when that's not possible, they opt to produce tiles that are slightly "domed." While such curvature is usually minimal, any time the center of one tile is beside the edge of another, there could be lippage. Also, because the length and width are different on rectangular tiles, flat installations can be a challenge when any substrate unevenness occurs, especially when the unevenness is along the tile's longer edge.

When these issues arise in conjunction with very large rectangular tiles, such as 24" x 48", one can imagine the difficulty in achieving successful, lippage-free installations. That being said, very large rectangular tiles are installed successfully every day when suitable arrangements for a flat substrate have been made and the critical design issues: grout joint width, type of lighting, and amount of offset, have been properly considered and addressed. These issues will each be discussed in this article.

Scenarios where natural daylight travels parallel to a tiled surface can exacerbate the effects of lippage. It's best to orient patterns such that potentially noticeable lippage is not perpendicular to the direction of late afternoon or early morning lighting.

Potential ANSI A137.1 revisions to evaluate tiles based on individual measurements of edge warpage could further improve the way rectangular tiles are measured and reported.

Are most rectangular tiles sufficiently flat?

Rectangular tiles in compliance with ANSI A137.1 (American National Standard Specifications for Ceramic Tile) are sufficiently flat for successful lippage-free installations. In fact, the ANSI A137.1 specifications for flatness are far more stringent than current European and ISO specifications. However, not all ANSI-compliant tiles can be used with a 50% offset. Even fewer can be used with a 50% offset and a narrow grout joint, and none should be used under these circumstances if installed with wall-wash lighting.

ANSI A137.1 defines acceptable edge warpage in terms of a percentage of the tile's edge length, and also sets a maximum warpage amount in millimeters that cannot be exceeded, regardless of tile size. This maximum value serves as a "cap," so that allowable warpage does not exceed a reasonable amount, even for the largest tiles. Because allowable warpage is the lesser of the allowable percentage or maximum cap, the allowable warpage for a smaller tile is generally limited by the percentage criteria and is well below the maximum cap. For example, a 6" rectified porcelain tile's maximum allowable warpage, based on the allowable edge warpage percentage criteria, is 0.6 mm, while a 24" calibrated tile's maximum allowable warpage "caps out" at 1.3 mm, or nearly 1/16". Therefore, patterns and grout joint accommodations that work well with smaller tiles would not work with larger tiles exhibiting the maximum allowable warpage. Such tiles that are just barely within ANSI tolerances are not generally recommended for offset patterns and can be highly problematic when installed with a 50% offset and a narrow grout joint.

What challenges are commonly encountered with offset and modular patterns?

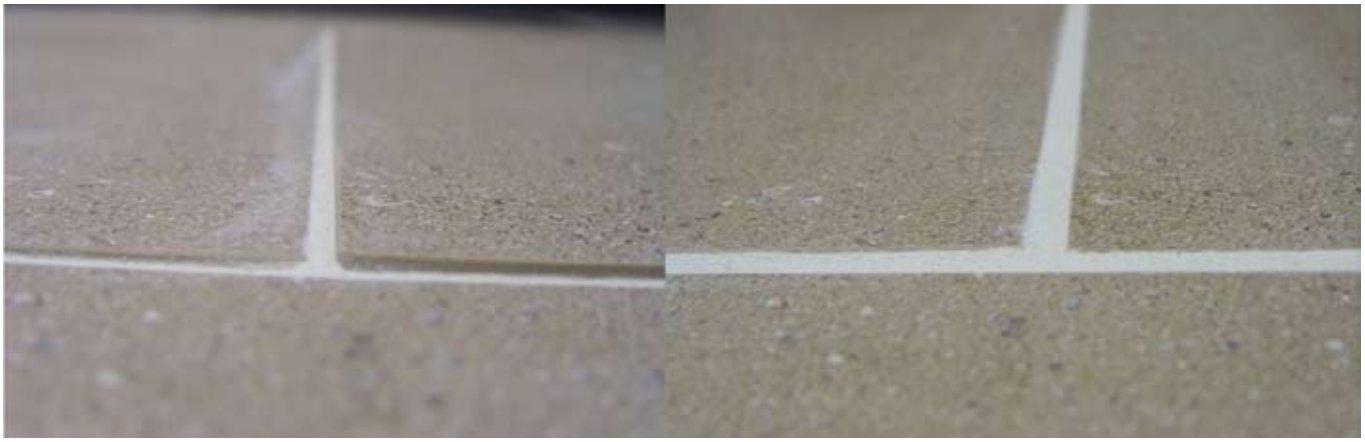
An offset pattern includes any pattern in which the end of one tile does not line up with the end of another. As noted earlier, problems are most common where 50% offsets are used, or wherever the center of one tile is beside the end of another (for example, in a common brick pattern). When such is the case, even minimal warpage can create lippage, because the highest point on the surface of one tile is directly beside the lowest point on another.

A modular pattern is any pattern where multiple sizes are used in a repeating combination, for example when 24" x 24" tiles are installed with 12" x 24", 12" x 12", 6" x 12", and 6" x 6" tiles. In such a pattern, the center of the rectangular tiles regularly lines up next to the edge of the square tiles. Typically, each modular pattern comes with a recommended grout width from the manufacturer for all the tiles to line up. While these patterns are precisely calculated, all too often they are specified with grout joints that are too narrow to minimize the effects of any warpage or installation related lippage. While such patterns can be very appealing, with many imported tiles, they may require varying and larger grout widths than specified by the manufacturer to achieve the most attractive installations with the least lippage.

How can noticeable lippage be reduced if an offset pattern or modular pattern is desired?

When offset or modular patterns are desired, strong consideration should be given to the amount of offset. For large tiles exhibiting the maximum allowable warpage, 50% offsets are guaranteed to exhibit lippage. To address this on a practical basis, some manufacturers recommend against any patterns with offsets in excess of 33%, if the tile being used has any edge larger than 18 inches. When considering large tiles and offsets greater than 33%, consumers are encouraged to consult with manufacturers for specific recommendations.

For all tile installations, but especially ones with offset patterns, extra precautions should be taken if a narrow grout joint is desired. A narrow grout joint is generally considered to be less than 1/8 of an inch. While rectangular tiles are often rectified, or ground to precise sizing, such grinding does not remove any



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warpage that is present. Even slight lippage caused by minimally warped tiles can become increasingly noticeable as grout joints get smaller. When opting for an offset pattern, it is important to consider a wider grout joint to reduce noticeable lippage.

Special consideration should also be given in scenarios where light travels parallel to a tiled surface. For walls, this most commonly occurs with wall wash lighting. For floors, this can occur in the early morning or late afternoon in buildings with floors adjacent to windows facing to the east or west. Such lighting can make any existing lippage more noticeable. With artificial lighting, it's best to move lights away from the wall. With natural lighting, it's best to orient patterns such that offsets are not perpendicular to the direction of late afternoon or early morning lighting.

As always, special precautions should be taken regarding preparation of a sufficiently flat substrate, proper mortar selection, and setting adequate and reasonable lippage expectations for the tile used and offset selected.

How are accepted practices for evaluating warpage being addressed in North America?

Although many desired patterns can be successfully installed with rectangular tiles currently in compliance with ANSI A137.1, North American tile manufacturers are in favor of making warpage requirements even more stringent.

Currently, ANSI A137.1 states, "the warpage of each tile in the sample shall conform to the value listed in the appropriate table for that specific tile type." While square and rectangular tiles have four edge warpage measurements (one for each side), the standard, as written, implies that the criteria are defined by a single value for "each tile," or an average of all four sides. There have been discussions among North American tile manufacturers to revise ANSI A137.1 to evaluate tiles based on each individual measurement of edge warpage, as opposed to the currently implied average of all four edges for each tile. This could help further improve the way warpage, especially for rectangular tiles, is measured and reported. In fact, most domestic tile manufacturers already measure all four sides of each tile exiting their kilns for edge warpage, and reject tiles based on any single edge exceeding the allowable edge warpage values specified in ANSI A137.1. Even with such improvements, it is important to continue taking precaution when dealing with certain layouts, especially if a narrow grout joint is desired.

In Summary

Rectangular tiles are regularly used in offset and modular patterns. Such designs are very popular and, in general, can be successfully achieved with tiles currently in compliance with ANSI A137.1. While most rectangular tiles are sufficiently flat to achieve successful, lippage-free installations, manufacturers are working to make tile warpage specifications even more stringent. However, even with tiles well within ANSI tolerances, certain precautions should be taken if a 50% offset pattern and/or narrow grout joint is desired, and special attention should always be paid to lighting conditions. **TILE**

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About the Author

Bill Griese, Standards Development and Green Initiative Manager for the Tile Council of North America, is involved in the development and revision of ASTM, ANSI, ISO, and other industry-specific standards, and the coordination of TCNA's environmental efforts. He serves as Chairman for the ASTM C21 Committee on Ceramic Whitewares and Related Products, and also works closely with TCNA's Product Performance Testing Laboratory. Griese is a LEED Accredited Professional and earned a Bachelor of Science degree in Ceramic and Materials Engineering from Clemson University in Clemson, SC.