

## ***Lippage of Stone Tile Installations***

by

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Lippage of stone tile edges has become an increasingly contentious issue in the tile industry. Yet interestingly enough, tile contractors and owners rarely discuss the owner's expectations and the practical realities of construction facing the tile contractor in advance of construction. For owners, a stone floor is synonymous with a luxurious, continuous, and very flat surface. Stone tile is often a less expensive alternative for owners who desire to replicate large slabs of stone by tightly butting stone tile edges. Tile contractors, on the other hand, are faced with numerous practical realities which can contribute to stone tile lippage, such as uneven floor substrates (a.k.a. flatness and level), stone fabrication dimensional irregularities, and installation related errors. More subtle issues, such as accentuation of acceptable lippage from lighting, or increased moisture sensitivity or hysteresis (temperature expansion) of certain varieties of stone when fabricated into thin 3/8 inch (10 mm) tiles can further complicate lippage.

### **Standards for Stone Tile Lippage**

Lippage is defined as a difference in elevation between the edges of adjacent tiles which affects the flatness of the tile surface, often giving the finished surface an irregular, uneven appearance.

There since the introduction of thin stone tiles, there has always been some confusion over whether ceramic tile and stone industry standards apply to stone tile; the answer is both. The Marble Institute of America (MIA) and American Society for Testing Materials (ASTM) differentiates between "thin, modular stone tile", and dimension stone. Modular stone tile is defined by ASTM standard C119

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as not greater than 24 inches in either face direction, no greater than 4 square feet in area, and no greater than 3/4 inch in thickness. MIA standards generally recommend installation of modular stone tile using the "thin-set method", and defers to tile industry standards, specifically Tile Council of North America TCNA and ANSI 108 standards for proper installation recommendations.

However, because stone tiles are somewhat of a "hybrid" product, certain stone industry standards and recommendations also apply, specifically minimum joint width of 3/32 inch (or no less than double the square tolerance of the stone tile), and a finished surface flatness tolerance of 1/8 inch in 10 feet, with no greater than 1/32 inch lippage or elevation variance between individual tiles. Unfortunately, there is no distinction in this recommendation between lippage caused by variations in installation of lippage caused by stone tile dimensional irregularities.

On the other hand, lippage tolerances contained in ANSI 108 standards for ceramic tile installation contain similar lippage recommendations of no greater than 1/32 inch for tiles with grout joints 1/8 inch or less. The difference is that ANSI A108 standards clearly state the lippage recommendations as an installation tolerance, and is in addition to inherent warpage or dimensional variation of the tile. This recommendation is more reasonable, but owners and tile contractors must examine and assess potential for stone tile dimensional variations prior to construction in order to arrive at a practical and mutually agreeable allowable lippage for that particular installation.

INSERT PHOTO OF MEASURING LIPPAGE

**Precise measurement of tile lippage with digital offset depth gauge**

### **What Factors Affect Lippage of Stone Tile ?**

Flatness of the floor or wall substrate – this is arguably the most important factor from the tile contractor's perspective. Substrates often are not suitably flat to achieve both the owner's qualitative expectations, as well as the quantitative tolerances contained in industry standards. The size of the stone tile can further reflect an uneven floor or wall substrate. The tile contractor should discuss the additional costs and time required for substrate correction using appropriate levelling products (do not use excessive thinset to correct substrate flatness !), or in some cases where the substrate can not be remedied, the owner must accept conditions, or perhaps agree to extra costs for re-constructing walls or grinding and re-hone/polish of the finished installation to correct unavoidable lippage (unlikely !).

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Narrow grout joints – it is typically desirable to replicate a large slab of stone by installing stone tile with minimal width joints. The closer the edges of adjacent stone tile modules, the more lippage is accentuated by any abrupt change in plane between the tiles. While tightly butted grout joints may be most desirable, joints should not be less than the minimum recommended width of 3/32 inch, this condition not only accentuate even acceptable lippage, but also present problems in preventing proper filling of the joint with grout to prevent accumulation of moisture and dirt, but may also restrain the more pronounced expansion and contraction of natural stone that is adhered using the thinset method.

Fabrication dimensional variations - The fabrication of stone tile can have a significant affect on lippage. Stone tile, like porcelain tile, must be fabricated with consistent thickness and dimensional tolerances. Edge treatment is also important. Some stone tiles are manufactured with a square edge, and some with a slight chamfered edge. Square edge treatment can accentuate lippage, and can lead to other problems such as chipping of edges.

Moisture sensitivity of stone varieties – certain varieties of stone are known to be dimensionally unstable when exposed to moisture in cement-based adhesives, and other stone varieties not known for moisture sensitivity may become unstable from either temperature or moisture when fabricated into thin 3/8 inch (10 mm) stone tile. While this problem can contribute to tile lippage, the increased lippage is often a symptom of an underlying problem.

Lighting – certain lighting conditions, especially notorious “wall washer” effect lighting or uneven, glare from windows can accentuate otherwise acceptable stone tile lippage.

Joint design – certain joint patterns, such as running bond patterns, can exacerbate actual or perceived lippage.

INSERT PHOTO OF WALL LIGHTING / LIPPAGE  
**Position of overhead lighting can affect perception of tile lippage**

## **Conclusion**

Tile contractors need to be aware of the unique factors that can contribute to lippage in stone tile installations. In order to avoid disputes, conduct appropriate

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research of the stone tile characteristics, assess substrate conditions prior to construction, and most important, have candid discussions with owners / customers to recognize what additional steps or costs might be necessary to meet their expectations and industry standards.

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