



Deflection

TDS 123

Every tile or stone installation is only as good as the surface over which it is installed. Tile and stone are very rigid materials and do not accommodate movement well. They may crack or delaminate from the substrate if it bends excessively under load. No visible movement should be present. Every installation requires a firm, stable surface. With that in mind, one of the most important considerations is deflection.

The Tile Council of North America (TCNA) states in the TCNA Handbook for Ceramic, Glass, and Stone Tile Installation that tile installation systems, whether wood-framed or concrete, shall be in conformance with the International Residential Code (IRC) for residential applications, the International Building Code (IBC) for commercial applications, or other applicable building codes. Maximum allowable floor member live load and concentrated load deflection shall not exceed $L/360$ (for ceramic tile), where "L" is the clear span length of the supporting member, per applicable building code.

In addition to deflection considerations, above-ground installations are inherently more susceptible to vibration. Consult the grout, mortar, and membrane manufacturer to determine appropriate installation materials for above-ground applications. The use of crack isolation membranes and higher-quality setting materials can improve performance in above-ground installations. However, upgraded materials cannot compensate for structural deficiencies, including floors that do not meet code requirements or installations subjected to loads or conditions exceeding design parameters.

Surfaces must be structurally sound, stable, and rigid enough to support ceramic or stone tile, thin brick, and similar finishes. Substrate deflection under all live, dead, and impact loads, including concentrated loads, must not exceed $L/360$ for thin-bed ceramic tile or brick installations, or $L/480$ for thin-bed stone installations, where L = span length (except where local building codes specify more stringent requirements). The Marble Institute of America (MIA) suggests a more stringent standard of $L/720$ for stone installations.

The tile industry has adopted the following position regarding deflection: The owner shall communicate in writing to the project design professional and general contractor the intended use of the tile installation, including in-service loads. This enables the design professional and general contractor to make the necessary allowances for expected live loads, concentrated loads, impact loads, and dead loads, including the weight of the tile and setting bed. The tile installer shall not be responsible for floor framing or subfloor installation that is not compliant with applicable building codes, unless the tile installer or tile contractor designs and installs the floor framing or subfloor per ANSI A108.01 (Section 2.3).

How can this deflection value be determined? To calculate the maximum allowable movement, divide the span length by the allowable deflection ratio. (In this case 360).

For example (tile):

L = length of the span

If the span length is 288 units (inches, centimeters, etc.), then:

$288 \div 360 = 0.8$ units of allowable deflection under total anticipated load.

For the installation of stone or agglomerate using LATICRETE® or LATAPOXY® installation materials, deflection should not exceed $L/480$. To calculate, divide the span length by 480.

For example (stone):

L = length of the span

If the span is 288 units, then:

$288 \div 480 = 0.6$ units of allowable deflection under total anticipated load.

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TDS 123.doc R PA 09 July 2026

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