



## Making Sure Dead Load Doesn't Kill Your Installation

Part 2 of a 3-part series: Changes to the 2011 TCNA Handbook

All floor tile installation methods in the *2011 TCNA Handbook* will include a new category of information: Typical Weight of Tile Installation. Under this subhead, the *Handbook* user will find the estimated weight of the tile installation. This section also refers the reader to Appendix B, which provides the assumptions that were made in calculating the estimated weight and the weights of the individual installation components. With all of this information now at hand, design professionals can design for the weight of the installation, including when actual components weigh more or less than the typical weights provided.

### Why does the weight of a floor tile installation matter?

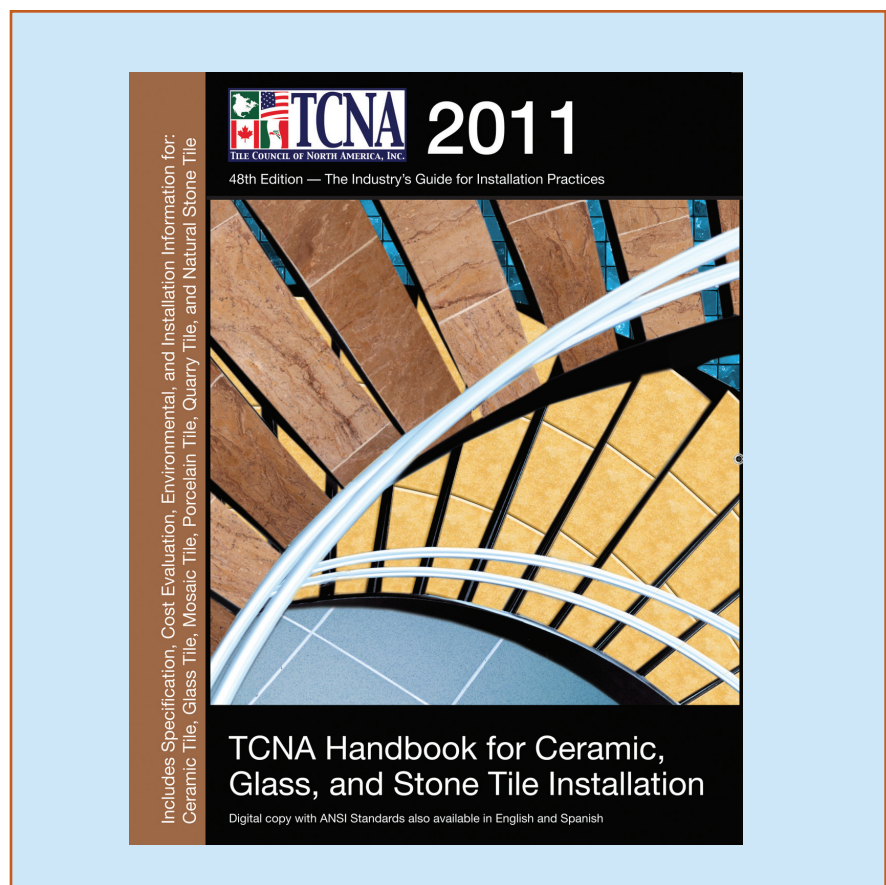
The dead load of a building is defined in the 2009 International Building Code (IBC) as “the weight of materials

of construction incorporated into the building, including but not limited to walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, cladding and

other similarly incorporated architectural and structural items, and the weight of fixed service equipment ...”

Design professionals calculate dead load and factor it into building plans, primarily to ensure building safety by ensuring the structure can support the known and planned weights, or loads, that will be introduced.

Is this important for the tile installation? You bet! Commonly, residential structures have to meet a code minimum where they can support a 10-lb. dead load and 40-lb. live load. Lawsuits have been reported where builders underbuilt relative to the weight of the materials used, resulting in cracked floors and even catastrophic floor failures.



**Right: The 2011 TCNA Handbook for Ceramic, Glass, and Stone Installation.**

While the *TCNA Handbook* now provides typical tile installation weights per square foot, based on the typical weight of each material used in a given installation method, the provided weight addresses only the materials installed above the substrate. The design professional must also account for the weight of the substrate itself when calculating total dead load.

### So how much does a tile installation weigh?

That depends, with the weight varying considerably based on the method chosen. Consider the difference between

For any material listed as optional, like a waterproof or crack isolation membrane, the estimated weight does not include the weight of the optional material; however, if used, the additional weight of those materials must be included by the design professional.

installing a 1-1/4" thick unbonded mortar bed versus directly adhering tile to a concrete substrate. The mortar bed and reinforcing together weigh 15.25 pounds/square foot with a typical total installation weight of 23 pounds/square foot when natural stone tile is used or 21 pounds/square foot for ceramic tile. By comparison, a direct bond of tile to concrete weighs 5 pounds/square foot for ceramic tile and 7 for stone tile. Most *Handbook* methods lie somewhere in between, with membranes, levelers, and underlayments weighing more than a direct bond method, but less than sand, cement and reinforcing mesh.

### What about materials that are optional or those that can vary in weight or thickness?

For any material listed as optional, like a waterproof or crack isolation membrane, the estimated weight does not include the weight of the optional material; however, if used, the additional

weight of those materials must be included by the design professional. Weights for all optional materials are available in Appendix B.


For materials that can be applied in different thicknesses, like mortar beds, cementitious self-leveling underlayments and poured gypsum underlayments, the



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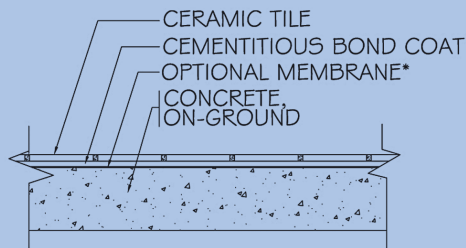
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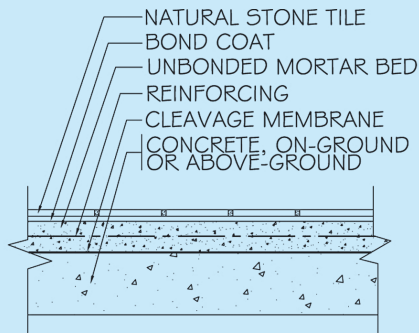
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\*USE OF A MEMBRANE IS OPTIONAL. SEE MEMBRANE OPTIONS.

### Typical Weight of Tile Installation

- 5 pounds/square foot.
- Does not include weight of substrate. See Appendix B for assumptions, included materials, and their individual weights.



### Typical Weight of Tile Installation

- 23 pounds/square foot with 1-1/4" mortar bed. Add 3 pounds/square foot for each additional 1/4" of mortar bed.
- Does not include weight of substrate. See Appendix B for assumptions, included

Top: Method F113, a direct bond method.

Above: Method F111 Stone, a mortar bed method.

*Handbook* provides the typical weight of the installation based on the minimum application thickness, and the weight for each additional 1/4" of thickness. For example, 3 pounds/square foot should be added for each additional quarter inch of mortar bed, 2-1/4 pounds for each additional 1/4" of poured gypsum, and 2-3/4 pounds for cementitious self-leveler. For materials like backer boards, which are available in multiple standard thicknesses, separate weights are provided for the various thicknesses available.

For all materials, weights can vary from manufacturer-to-manufacturer. The typical weights provided in the *Handbook* are derived from manufacturer literature and generally averaged for the industry, however the actual products used should always be considered.

### Why are the stone installations heavier?

The estimated weights assume ceramic tiles weighing 4 pounds/square foot and stone tiles weighing 6 pounds/square foot. But, because stone tiles are readily available in a wider range of densities and thicknesses, both of which affect the weight of the tiles, design professionals should check the weight of the stone tiles selected and adjust the installation weight if needed.

For perspective, a high-porosity limestone (120 pounds/cubic foot) supplied in 10 mm thickness would weigh 3.9 pounds/square foot. Whereas a low-porosity granite (200 pounds/cubic foot) supplied in 15 mm thickness would weigh 9.8 pounds/square foot. The standard 6 pounds/square foot for stone tiles is based on the assumption that higher-density stones are not as likely to be fabricated in the thicker dimensions, and the lower-density stones are not as likely to be fabricated in the thinnest dimensions, giving a common (versus theoretical) range of 5 to 7 pounds/square foot.

### When it comes to tile installations, is it a case of "less is more"?

No. While direct bond methods offer the lightest options, lighter is not always better. The heaviest methods, the self-leveling and mortar bed methods, offer the contractor the greatest opportunity to create a flat substrate. This is especially important for large-format tile and areas where installation flatness is imperative, such as handicap accessible areas. The unbonded mortar bed methods are also recognized as the preferred methods for installing ceramic tile on above-ground concrete slabs and are the only methods for installing ungauged stone with significant thickness variation. Thus, the design professional should use the typical weights listed to design appropriately for the installation method desired, and not allow the method's dead load to outweigh its recommended uses and limitations. **TILE**



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### About the Author

Stephanie Samulski is an instructor at the Ceramic Tile Education Foundation (CTEF) and a project manager for the Tile Council of North America (TCNA). She entered the tile trade in 1999 as an apprentice with the Bricklayers and Allied Craftworkers (BAC)

Local 32 in Detroit, and she went on to install tile as an independent contractor. Ms. Samulski received her BA in Journalism from Wayne State University.