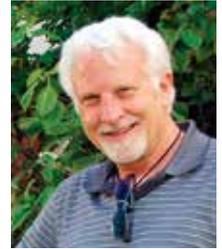


Why movement joints and sealants must be installed in tile and stone installations

Current industry standards and design options

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Many end users don't want movement joints because they think they are distracting and ruin the appearance of their tile installation. So why should tile installers make sure that movement joints are installed in all of their tile installations?

The short answer is because industry standards say that all tile installations must have movement joints. If you don't install movement joints, and there is some problem with the tile installation, then the fingers will be pointing your way and you will be held responsible even if the problem isn't directly related to the lack of movement joints. Lack of movement joints can be a contributing factor to many different types of tile failures, so it's not worth the risk to exclude them from your installations.

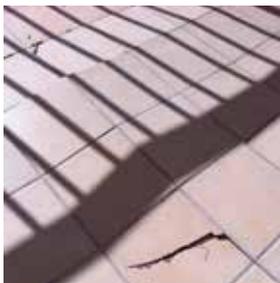
All tile and stone assemblies move in one way or another, whether due to thermal movement, moisture movement, shrinkage, freezing, or dynamic structural movements. To ensure a long-lasting installation, it's important

for architects to specify and provide the requirements for movement-joint design and placement, and to specify the correct type of sealant (caulking) for filling those joints. When there isn't an architect – and the tile installer is determining how to install the tile – then it becomes the tile installer's responsibility to specify and install the movement joints or to find someone else to specify them.

"Movement joint" is a general term used for all types of joints seen in construction materials that control and allow movement. Most commonly we refer to these joints as either "expan-



Cracked grout due to missing transition movement joint.



Tented glazed tile floor.

sion joints” or “control joints,” but there are various categories of movement joints. Generally they contain an appropriate

pliable sealant for the intended application that is often referred to as a soft joint. Movement joints allow for the material in which they are placed to move without restraint, and they control where the movement manifests, avoiding random cracking in finish materials. An example would be the joints or separations in a concrete sidewalk. If there were no movement joints in the concrete sidewalk, then it would crack at some random point as it is subjected to shrinkage (contraction) as it cures, or subjected to expansion when it is exposed to moisture or heat, and then contraction again as it dries and cools.

I have seen tile floors without adequate movement joints where a portion of the floor was literally tented (debonded and raised) several inches off its substrate during the heat of the day, but laid flat at night when it cooled down. To see how small horizontal movements can result in exponentially larger vertical movements, take a 48' (1219 mm) metal ruler and lay it on a horizontal surface. Restrain one end of the ruler and move the other end toward the center 1/8"



(3.2 mm), and you will see a 2" (51 mm) rise at the apex of the ruler. In effect, this is what happens to tile floors when they tent. They are constrained at their perimeters with no movement relief and the tile expands.

Guidelines for movement joints

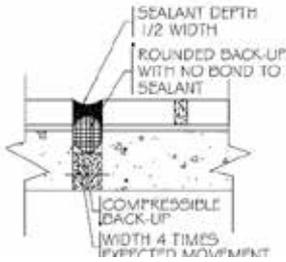
The Tile Council of North America (TCNA) provides general movement joint guidelines for tile and stone applications in its *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*. The guidelines are listed under EJ171 Movement Joint Guidelines for Ceramic, Glass, and Stone section. When there isn't an architect on the job then the tile installer should refer to these standards to determine where to install movement joints. If there is an architect and they haven't specified movement joints, then the tile installer should submit an RFI (request for information) to ask for the movement-joint layout and design.

The general rule is that movement joints should be placed at the perimeters of tile installations and at all transitions of planes or transitions to different materials, as well as within the field of tile. Inside and outside vertical joints on framed walls should have movement joints and should not be hard-grouted. Bathtub or shower receptor to wall transitions should have a movement joint. In wet areas, movement joints are important not only to control movement, but they act as a water-stop at those transitions, providing another layer of protection against potentially costly water damages.

TCNA EJ171 states that movement joints for interior applications should

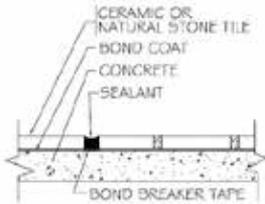
Expansion Joint

EJ171-11



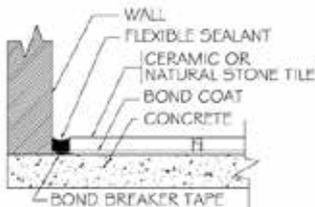
Generic Movement Joint

EJ171F-11



Perimeter Joint

EJ171G-11



be placed at least every 20' to 25' in each direction unless the tile work is exposed to direct sunlight or moisture. In that case, movement joints should be placed at least every 8' to 12' in each direction – the same for exterior applications.

EJ171 states that all underlying movement joints in the substrate need to continue through the tile assembly. This means that in addition to honoring the substrate movement joints, the tile assembly needs additional movement joints within its assembly. If there is a mortar bed over the sub-



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strate, then the movement joint has to be continuous through it to the tile surface, which is considered an expansion joint. If the tile is being bonded directly to the substrate, and there is no substrate movement joint continuing up from beneath, then it is called a generic movement joint. The generic movement joints are often the same width as the grout joints if they were designed to work at that width. The movement joint widths within the tile work should never be narrower than the substrate joint on which it is placed.

Membrane cautions

Some manufacturers of ANSI A118.12 crack-isolation membranes allow their membrane to cover non-structural movement joints (joints that

only move horizontally, but without any vertical displacement) such as saw-cut or cold-control joints, even though TCNA does not recommend it. Structural expansion joints can never be covered with membranes, since the vertical displacement cannot be mitigated with a crack-isolation membrane. Crack-isolation membrane manufacturers require that movement joints are installed within the tile assembly installed over their membrane. Some manufacturers allow the movement joints to not line up exactly over the substrate control joints. Each manufacturer of crack-isolation membranes may have different recommendations and limitations, so it is always important to follow manufacturers' instructions.

TCNA F125-Partial and F125-Full



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Crack Isolation Membrane details provide guidelines for isolating non-structural cracks with an ANSI A118.12 crack-isolation membrane. This detail recommends that a movement joint be placed at one or both ends of the tile, parallel to the crack which is bridging the underlying shrinkage crack or non-structural control joint, as recommended by the membrane manufacturer.

Sealants for soft joints

The type of sealant (caulking) used to fill movement joints is critical to the success of the tile installation. TCNA EJ171 states that an appropriate ASTM C920 sealant must be used to fill movement joints of all types. An ASTM C920 sealant includes high-quality silicone, urethanes, and polysulfide sealants. These types of sealants are normally rated as highly weather resistant with high-elongation properties, and high-adhesion characteristics that come with 20-year commercial warranties. Too often we find installers using some type of acrylic, latex, or siliconized sealant, because they are easier to work with, but these sealants have very low



Using sealants that are not suitable for foot traffic may be dangerous to those who wear high heels.

performance values and basically no warranty.

Different sealants have different physical properties and performance capabilities. EJ171 provides guidelines and the nomenclature for determining the appropriate Type, Grade, Class and Use sealant for the intended application. For instance, some sealants are not suitable for foot or vehicle traffic, so you must use a “Use T” sealant for those applications. A traffic sealant should have a Shore A Hardness of 35 or greater, which is critical because otherwise it would be dangerous to those who wear high heels. Some sealants can’t be used in a submerged application and some can’t be subjected to certain chemicals. Not all ASTM C920 sealants are compatible with natural stone and could cause the stone to stain. Some sealants require the surfaces to be primed after cleaning the joints and prior to installing the sealant.

Movement joint aesthetics

Movement joints are a necessary part of tile and stone installations and can even accentuate design features, rendering the joints unnoticeable, when specifiers take the time to design the movement joints into the installation.

Manufacturers of one-part silicone sealants have a broad range of colors available; custom colors are generally available to match the grout. Two-part urethane sealants can be mixed on the job by experienced sealant installers and can easily match the color of the tile grout. Movement joints placed more frequently in the installation can

be narrower to match the width of the grout, also making them less noticeable. If your tile pattern has staggered joints, you can use the staggered-grout joint (referred to as a saw-tooth joints or zipper joints) as a generic movement joint to make it less noticeable. When done well, movements joints are not noticeable and can enhance the features of the installation.

Summary

All tile and stone assemblies move in one way or the other, whether due to thermal movement, moisture movement, shrinkage, freezing, or dynamic structural movement. To ensure a long-lasting installation, install movement joints and use the correct type of sealant (caulking) for filling those joints. The key to a suc-

cessful tile and stone installation is to follow industry standards.

Donato Pompo, CTC, CSI, CDT, MBA, is the founder of Ceramic Tile and Stone Consultants (CTaSC), and of the University of Ceramic Tile and Stone (UofCTS). He has more than 35 years of experience in the ceramic tile and stone industry from installation to distribution to manufacturing of installation products. Pompo provides services in forensic investigations, quality control (QC) services for products and installation methods, training programs, testing, and onsite quality control inspection services. He received the 2012 Construction Specifier magazine Article of the Year Award. Pompo can be reached at donato@ctasc.com.



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