Underlayment Spliced Between Joists ◄ ► My Opinion

Have a technical question? Check MIA's Dimension Stone Design Manual VII first. If you can't find the answer there, contact MIA's Technical Director, Chuck Muehlbauer, at technical@marble-institute.com. This FREE service is for MIA members only! (Non-member charge: $85/hour) As a courtesy to other members, please limit phone conversations to ten minutes per call. *All opinions and advice provided by Chuck Muehlbauer or anyone else from MIA are provided as general information only. MIA assumes no responsibility and shall not be liable for any damages resulting from your use of this information. Any information provided by the MIA is the exclusive property of MIA and shall not be disseminated, republished, or reproduced in any manner without the prior written consent of MIA.*

Q: I'm looking at several details in the Tile Council of North America's Installation Handbook, for instance F149 and F152, where the graphic shows the underlayment spliced between the joists. Wouldn't the standard practice be to splice these directly over the joists to gain more rigidity? Are these graphics in error?

A: Standard practice may in fact be to position the seams directly over the joists, but the optimum position is about 25% of the joist spacing away from the joist, as depicted in the referenced details. (see below)
This may seem a bit counterintuitive, but it is based on sound engineering principles, which have been described in detail in other publications (Ref: Woeste & Nielsen, Tile Letter Magazine, June, 2004). The subfloor and the underlayment work together to provide a "beam" over the joists, which carries loads applied within the span between the joists, back to the joists. Wherever we have a seam (or "discontinuity") in either layer, we develop a weakened region that bends easier than surrounding areas. It is somewhat of a "hinge" effect. This hinge effect will be most detrimental if it occurs within the regions of highest bending stresses.

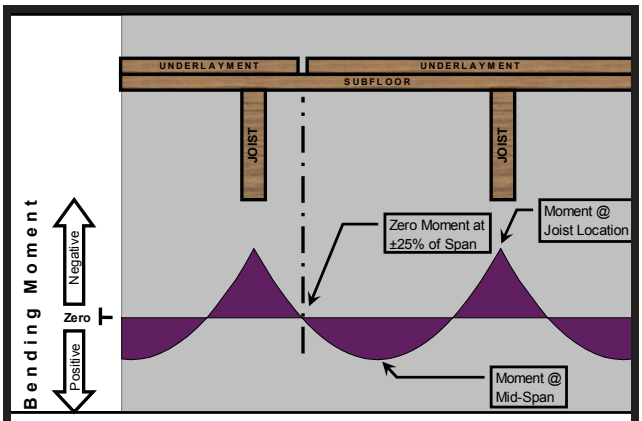

Figure 1: Bending Stress Graph of Uniformly Loaded Subfloor/Underlayment System

If we graph the bending moments in this bi-layer decking as in Figure 1, we see that the maximum negative moment occurs directly over the joist and the maximum positive moment occurs at mid-span between the joists. It is a beam engineering fact that maximum negative moment (over the joist) for a uniform loading condition is always greater than the maximum positive moment (at the center of the spans) for multiple span beams. Since these two bending stresses are in opposite directions, there must exist a transitional region where the bending stress is zero, because one cannot get from negative to positive without crossing zero. This zero bending stress region does exist, and is located at approximately 25% into the span. This is actually the optimum location to seam the underlayment, as it will minimize the effect of the discontinuity.

Q: We installed a marble shower in a residence a year ago. The homeowner is complaining that the surface is deteriorating. They have a water softener, so our suspicion is that the salt in the softened water is attacking the stone. Is this common?

A: It is a belief among many that because one dumps bags and bags of salt into the brine tank of a water softener, the softened water in a home has a high salt content as a result. That isn't how a common residential water softener works. The most common types of water softeners involve an ion exchange, which requires a tank of resin granules that are rich in sodium ions, and as the water passes through this tank, the calcium (and several other) ions of the hard water are replaced with sodium ions. So there are sodium ions added to the water, but that's not the same as sodium chloride, which is common salt.

Where the salt brine comes into the process is in the recharge cycle. At some point, the resin granules become saturated with calcium ions, and depleted of sodium ions. At this point, the softener disconnects itself from the household water system by means of a bypass valve, and the resin granules are flushed with the extremely sodium rich salt brine to restore them to their original condition. The residual brine is purged into the drain during this process, and is gone by the time the bypass valve restores the connection to the household water system.

Unless there was some major malfunction of the appliance, salt (sodium chloride) would not be introduced to the house supply. That's not to say that there couldn't be other water chemistry problems, particularly if the home is served by a private well, so it might still be worthwhile having it tested. Frequently, a surface degradation in shower walls is linked to the use of an inappropriate cleaner. I have also seen cases of resin treated slabs where resin has dislodged either due to being an inappropriate variety or having been incorrectly mixed.