

## Bending Moment ◀ ▶ My Opinion

*Have a technical question? Check MIA's Dimension Stone Design Manual 7.2 first. If you can't find the answer there, contact MIA's Technical Director, Chuck Muehlbauer, at [technical@marble-institute.com](mailto: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.*

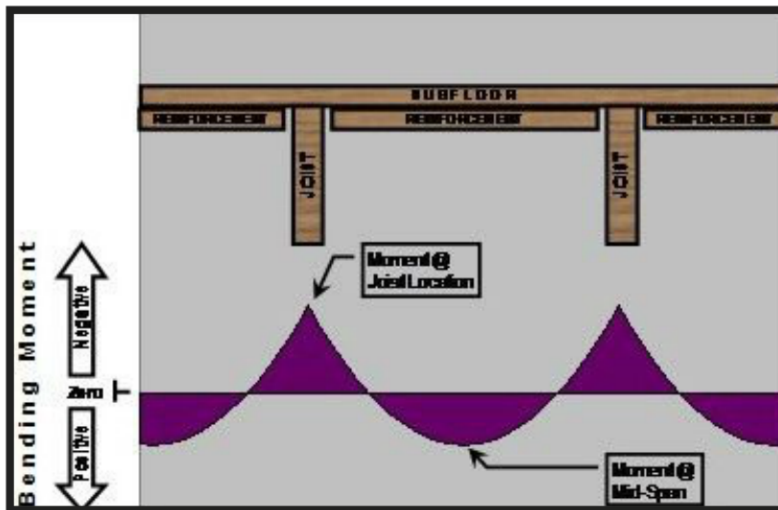
**Q:** We are installing a limestone tile over an existing subfloor. The joists seem to be more than adequate, but the subfloor does not. Looking in the cutouts for floor registers, we can see that the subfloor is a single layer of about 3/4" OSB. We don't want to add a layer above it, because this would make the finished floor too high for the door thresholds. We have full access below the floor in unfinished space. We're thinking of cutting plywood strips that fit between the joists, and gluing & screwing them to the underside of the subfloor. Will this be good enough?

**A:** This is a very common problem, although I must admit that your proposed solution is not common. Modifying door thresholds, particularly an exterior door, to accommodate the raised floor is indeed a daunting task, and involves different tradespeople to perform the work. Yet, that still might be the necessary path. Fitting plywood strips between the joists from the underside of the floor is likely to be far more labor intensive than one imagines.

There will be a lot of electrical and mechanical components to work around, and there usually is some number of fasteners poking through the bottom of the subfloor that would

have to be ground flush to achieve proper fit. Then, after all of that work, you still don't truly have a double layer floor. The subfloor has two different bending moments: one that results from the span between the joists, and a second moment in the opposite direction that occurs right over the joists.

The bending moment over the joists is actually greater and more concentrated than the one that occurs between them. Yes, stiffening the floor between the joists will reduce the bending at both locations, but you will still have the single layer over the joists, which is a critical region. Will it stiffen the floor enough to prevent the tile from cracking? Maybe, or maybe not. What we do know is that it is not the same rigidity as having a double layer floor system.



**Q:** What should actually be used for the "spots" when setting with wire tie anchors? I've always heard this referred to as "wire and plaster", but I've also seen references that say

that plaster isn't allowed, and it should be mortar. Which should it be?

**A:** Obviously plaster is much easier for the mechanic doing the installation, taking advantage of its very rapid set time. And obviously mortar has an advantage in moisture resistance.

There are several documents that address this. In Chapter 14 of the Marble Institute of America's *Dimension Stone Design Manual*, there is a simple prohibition against the use of plaster in any exterior installation, or any interior installation that is subject to potential moisture infiltration. A technical bulletin issued by the MIA in Q1 2010 says essentially the same thing. ASTM C1242, Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems, goes a step further in this discussion. This document agrees with the MIA documents as far as where plaster is allowed and where portland cement based mortar is required, but it also cites a potential galvanic reaction between portland cement based mortars and either copper or aluminum wire.

Being the most conservative of the three documents, C1242 requires the use of ductile stainless steel wire with portland cement based mortars on exterior/wet area installations. Interior dry areas are allowed to have wire/spot combinations of stainless with mortar, stainless with plaster, copper with plaster, or aluminum with plaster.