Surface Slopes ◄ ► My Opinion

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Q: As an architect, when doing punch lists, I frequently check for level and/or reverse slopes on stone features such as mantels or tub surrounds by means of a steel ball. If the steel ball doesn't roll, I consider the surface to be level. On a surface that should be sloped, I use the ball to verify that the slope is in the right direction. A contractor recently questioned me about sensitivity of that test method, suggesting that it was too unforgiving, and that the surface would have to be perfectly level to prevent the ball from rolling. Is there a published value for how much a polished stone surface must be sloped to cause the ball to roll?

A: I, like many others, use the steel ball method for a quick check of surface slopes, but it really doesn't have the level of precision that most of us assume it to have. Polished or honed surfaces are not perfectly flat planes. They usually have minute crowns or depressions, which we don't necessarily see with the naked eye. So it is possible that the steel ball rolls in one region of the stone but not in another.

Your question encouraged me to do a rather crude experiment to determine the sensitivity, reliability, and repeatability of using this method to detect slope. I used several stone samples (polished marble, polished granite, and honed limestone) with a ½" diameter steel ball to determine exactly what slope is required to get the ball to roll consistently. Due to varying degrees of flatness among my stone samples, I got widely varying results. To get the ball to consistently roll in the same direction, I had to elevate one edge of a one foot (305 mm) wide stone sample as little as 0.105" (2.67 mm), and as much as 0.155" (3.94 mm), depending on which stone sample and direction I was testing. Since 1/8" (0.125") falls nearly halfway between these extremes, I think we can say that a polished or honed stone needs to be sloped in the neighborhood of 1/8" per foot (±1%, or 10 mm per m) for the slope to be consistently detected with a steel ball. A slope of this magnitude is easily, and more accurately detected by use of a short level. So while I will continue to include a few steel balls in my field tool kit, we need to recognize that this is a quick, imprecise field test only.

Q: We are hoping to be awarded a project installing granite cladding using 30" x 60" slabs. The architect wanted to use a 3/16" caulked joint, which we have no problem doing with the modest size pieces. Now he says he would actually like it smaller yet, which we're not comfortable doing. Is there a minimum joint size?

A: Yes, there is, and you are already below it with the 3/16" (5 mm) wide joint. ASTM C 1193, Standard Guide for Use of Joint Sealants, paragraph 14.1.2 states: "Under no circumstances should a liquid-applied sealant be applied in a joint opening that is less than 6 mm (0.25 in) wide. It is very difficult and impracticable to install sealant effectively in such a small width and is generally not recommended by most sealant manufacturers."

My interpretation of this is that the ¼" (6 mm) minimum is absolute, meaning that the designed width should be greater than ¼" (6 mm), so that when the fabrication and installation tolerances are subtracted, there is still at least ¼" (6 mm) joint remaining.

Q: We have some test data from an overseas vendor listing both porosity and absorption of a limestone. The porosity is more than double the absorption! Shouldn't these numbers be similar, as they are measuring basically the same thing?

A: We don't have an established porosity test for stone in the States, although various methods exist for quantifying it. Commonly, it will be a visual estimation based on review of a thin section of the stone. It is very possible for a small pore to be visible under a microscope, yet too small for water to penetrate it. It is also possible to have a pore structure of large, connected pores, which drain as the submerged sample is removed from the water, so the two values won't necessarily be in exact agreement.

The big discrepancy is in the fact that porosity is measured by volume, and absorption by weight. So if a stone has a specific gravity of 2.5 (meaning its unit mass is 2.5 times that of water), the absorption by volume would be 2.5 times the absorption by weight.