Q I'm remodeling a bathroom that will need a thick mud floor for a flat, level tile base. It's in an old house and I reinforced the sagging floor with sistered joists and solid bridging. But I'm worried about adding the weight of a traditional mud floor. Could I just lighten the mud mixture with vermiculite and sand?

A Michael Byrne, a veteran tile installer and the moderator of *JLC*'s Ceramic Tile online forum, responds: Because your floor construction is not standard, you need to measure both concentrated and uniform deflection before attempting a tile installation. The measurement for concentrated deflection is taken from the subflooring mid-way between two neighboring joists, while uniform deflection is measured from the bottom of an exposed joist located more or less in the center of the whole floor. If there's no access to the joists from below, uniform deflection can be measured from the subflooring, directly above a joist located near the center of the whole floor.

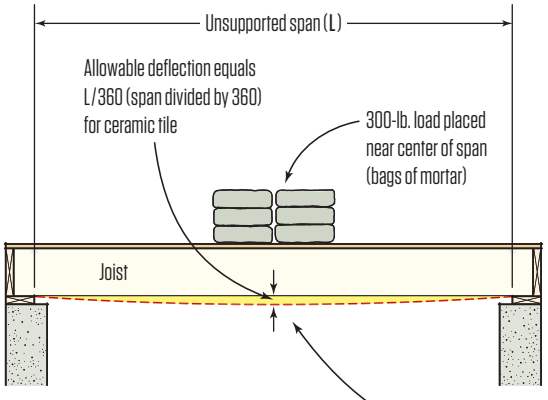
Concentrated deflection should not exceed L/360 of the distance (span) between two adjacent joists; uniform deflection shouldn't exceed L/360 of the longest span of the whole floor that can be measured. If the deflection is less than L/360 of the span (whole floor or between joists), you may safely float a mesh-reinforced mortar bed, according to ANSI A108 specifications for tile.

In the past, I've rigged up a dial indicator for the most precise measurement. But now I use a collimated green laser whose target beam diameter is a bit over 1/32 inch (1 mm) at 50 feet. For "ballpark" guesses, I use a red beam emitted by a laser pointer or laser measuring device. For your floor, I suggest making at least two or three measurements of uniform deflection and a half-dozen or so of concentrated deflection (see illustrations, below).

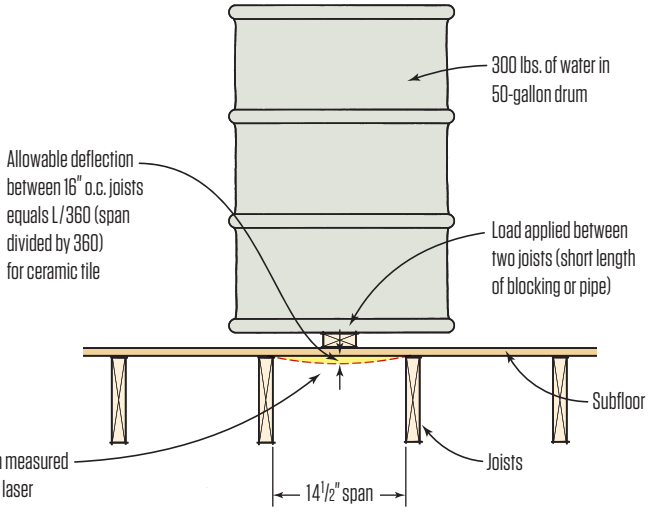
I never recommend using vermiculite, because vermiculite mortar has repeatedly failed in compression tests and is not recommended by the tile industry. And, while you may not mind cracked tiles, I'm sure you would be bothered by respiratory diseases caused by the asbestos found in some stocks of vermiculite.

If your renovated floor isn't level, you can use a self-leveling underlayment such as Levellite, made by Custom Building Products. Designed for use with tile, it is 40% lighter than conventional mortar mixes and can be 2 inches thick. The company also makes a lightweight tile thinset called Megalite.

Testing for Uniform Deflection



Testing for Concentrated Deflection



Q Are ultraviolet (UV) lamps in an HVAC system an effective way to disinfect the air and improve air quality?

A Jeff May, of May Indoor Air Investigations, in Tyngsborough, Mass., responds: Many of you have no doubt seen UV lamps in HVAC systems. There is a lot of hype regarding these lamps, partly because installers and manufacturers are starting to recommend them as a way to improve air quality and, in some cases, to keep a system clean.

Ultraviolet light is a part of a continuous electromagnetic-energy spectrum. It extends from radio waves, microwaves, and infrared (heat) to visible light, UV, X-rays, and gamma rays. UV waves are more energetic than visible light, but not necessarily detected by the human eye.

UV light is divided into three categories: UV-A, UV-B, and UV-C. Typical black lights produce UV-A, which is not particularly harmful. UV-B is more energetic; these rays (from the sun and sun lamps) cause tanning and are associated with skin cancer. UV-C is more energetic still and is referred to as "germicidal" because it destroys the DNA of microorganisms. Human exposure to UV-C can cause burns, blindness, and cancer. Prolonged UV-C exposure destroys many organic compounds—UV-C literally cooks living things. Fortunately, the ozone layer removes nearly all the UV-C rays from sunlight.

The lamps used in HVAC systems are typically the germicidal UV-C type. You should never look at these lamps directly, so it is very important when observing the interior of an HVAC system that any UV lamp be shut down. Even brief exposure can cause eye damage. Another problem with these lamps is that they can degrade polymers, such as the plastic insulation on wires and the adhesive that holds fiberglass together in pleated media filters.

The idea of using UV-C light to disinfect surfaces and air is not new. Studies were done during the 1930s in classrooms in which shielded UV-C lamps were installed in ceilings (to avoid human exposure) and were found to reduce the spread of German measles. More recent studies have also shown that (shielded) ceiling UV-C lamps can help disinfect the air in hospital rooms. But are such lamps useful to disinfect the air moving through a residential HVAC system?

The answer to the question is "no" because air moves through the HVAC system quickly—at about 3 feet per second—which is too fast for the lamps to have much of a germicidal effect. To be effective in killing mold and bacteria, the lamp would have to be a few hundred feet long. So it seems misleading that most germicidal lamps for residential use are sold on the premise that they will improve air quality by destroying microbes in the air.

The most effective use of UV-C is for disinfecting surfaces—not air—but not all installations meet this objective. I've seen some lamps installed with the shields mounted backward, preventing both airflow across the lamp and surface irradiation. Other UV lamps were far too small, and some produced noticeable amounts of ozone gas (which smells like "fresh outdoor air" but is actually a pollutant in its own right).

Proper commercial UV-C installations most often contain several long lamps, installed so that the entire "front side" of the coil (where dust accumulates and provides nutrients for bacterial growth) is irradiated with enough energy to destroy any microorganisms on the coil. The condensate pan should also be irradiated (but make sure that it's made from a UV-resistant material). Because nearly all microbial contamination on coils occurs on the front side, irradiating that side of the coil makes the most sense. Irradiating the back of the coil (as recommended by some manufacturers) is not as useful.

Just as the familiar real-estate mantra is "location, location, location," the HVAC mantra should be "filtration, filtration, filtration." ASHRAE recommends using at least a MERV-8 filter for all air handling systems; MERV-11 is best for families with allergies. Remember, the most important function of the filter is to prevent the accumulation of biodegradable dust on coils. This is what keeps the coil clean and thus prevents microbial contamination. The use of UV is secondary.