Q I want to tile the ceiling of my client's bathroom, including the shower. How should I detail the setting bed, and how do I keep it from all falling down?

A Michael Byrne, veteran tile installer and consultant, and moderator of *JLC*'s ceramic tile online forum, responds: A tiled ceiling can literally be the crowning glory of a shower stall, but there are a few things you should do to ensure a durable, attractive, practical, and safe installation.

One of the most overlooked aspects of tiling a ceiling in a wet environment such as a bathroom or shower is that the ceiling should be sloped or crowned. The unsightly brown spots that you often see on flat tiled ceilings are actually the beginning of stalactites forming as water vapor condenses on the ceiling tiles and leaches minerals out of them. This problem can be eliminated by drying off the tiles each time the shower is used, which is inconvenient at best. But if the ceiling tiles are sloped, most of the surface moisture simply drains to the walls.

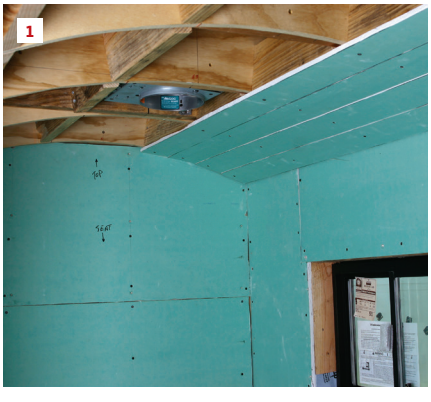
The Tile Council of North America (TCNA) says that the ceiling on a fully enclosed steam shower must be sloped a minimum of 2 inches per foot, and I use this as a good rule of thumb for any tiled ceiling in a wet area. The slope can be angled like a shed roof, peaked, reverse-peaked (so moisture flows toward the center of the shower, which is a common configuration in large steam showers that have benches on opposing walls), or—my favorite—arched.

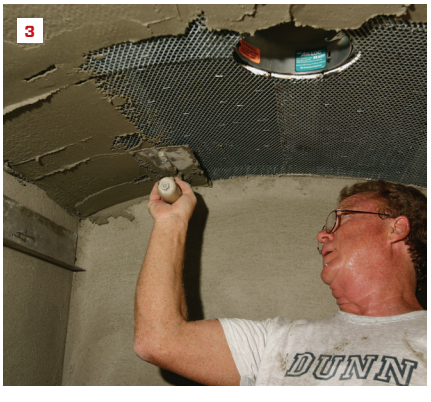
Another important part of tiling a ceiling is providing solid support for the tile. For any of these designs, I begin with framing members spaced 12 inches apart. For an arched ceiling, I make curved joists out of ¾-inch plywood. Then I block between the arches to create a very strong framing grid. I never recommend applying tile directly to greenboard, but I use strips of greenboard attached to the arched framing as a support base for the mortar setting bed **(1)**. I spread a layer of cold-patch roofing tar over the greenboard strips and then staple a layer of 30-pound felt paper over that.

An alternative to greenboard is two layers of ¼-inch cement backerboard screwed into the joists. Attach the backerboard one layer at a time, applying thinset mortar between the layers for added strength and stiffness.

When I did the ceiling in the photos, I let the roofing tar create my moisture barrier; for extra protection, sheet-style waterproofing membrane such as Noble Seal TS can be installed between the mortar bed and the support base, or between the framing and the first layer of backerboard.

I then attach wire mesh to the ceiling **(2)** and trowel on a layer of mortar for the setting bed, smoothing the curve with a flat trowel as I go **(3)**. Finally, I use regular latex-modified thinset and back-butter all ceiling tiles as they go in. Surface tension holds the tiles in place until the mortar cures. When tiling a sloped or curved ceiling, begin at the lowest points and tile toward the highest point. Use spacers as needed to keep the tiles from sliding, which can break the surface tension and cause the tiles to fall.





Photos: Michael Byrne

Q I've seen electricians cram an amazing number of wires and switches into wall boxes—especially for gangs of three or four switches. What are the guidelines for determining box size, and how can you prevent overcrowding in a box?

A David Herres, a licensed electrician in Clarksville, N.H., responds: When a box is overfilled to a point where excessive force is needed to push the devices (switches or receptacles) into place, you're asking for trouble. Wires can loosen or spring free of wire nuts, causing the circuit to fail, or the insulation on the wires may become damaged. In the latter case, if you're lucky, the breaker trips; if not, a partial arc fault can occur, creating a fire hazard. Also, an overcrowded box may be unable to properly dissipate heat, which will shorten the lives of the devices.

Most electricians know by experience what size box to choose for each application, but with larger devices with lots of wiring or in borderline cases, it may be necessary to perform box-fill calculations. These are covered in 2014 National Electrical Code (NEC) sections 314.16(A) and 314.16(B). It is a two-stage process in which the volume of the box is determined first, followed by the volume of the contents, or the fill calculation. (These sections also address required volume for conduit.) The code states that in no case is the volume of the box to be less than the fill calculation. The box volume is often stamped on the box; if not, it can be determined by measuring the inside of the box. The process for determining the required volume involves adding up the conductors and devices in the box and consulting the box-size table.

Here are several ways to avoid overcrowding electrical boxes. Use deep wall boxes where appropriate. Use grounding crimp connector sleeves instead of wire nuts—which occupy more space—for grounding splices. Choose the right size wire nut in critical situations—for example, a yellow or a red wire nut can accommodate two 12-AWG conductors or three 14-AWG conductors, but a yellow one takes up less space. Ground-fault circuit interrupters are bulkier than standard receptacles, so mount them in deep wall boxes if possible. Instead of octagonal junction boxes, use deep 4x4 square boxes, which have more space. "Pack" the box wisely. For example, if there are two or more wire nuts in the same box along with a wiring device, such as a switch, carefully lay the wire nuts side by side in the box—if stacked, they can interfere with placing the device.

Q I'm building a house with a loft accessed by a code-approved stair. The client also wants a ship's ladder to the loft for the kids. Does code allow unorthodox stairs if a legal one is in place to access the same area?

A Glenn Mathewson, a building official in Westminster, Colo., replies: Unorthodox stair designs, such as ship's ladder stairs, aren't specifically addressed by the IRC. So acceptance would be up to the individual authority—and some authorities may trump any kind of justification with a simple "not in my town" response. But let's see how I might approach approving this secondary means of ascent.

The IRC regulates "stairs" and defines them as a change in elevation from one level to the next, and it generally follows a philosophy of "if you build it, they will come"—meaning no matter how many stairs you provide, people will use them all and they must all provide the safety we have come to expect. This means that if you build a stairway and it looks and feels like a stairway, folks will use that stairway. If a home has two stairways to the second floor, both must comply, as both have equal opportunity to be used. Both are considered "means of egress."

However, the IRC does provide for some variety in stairways, such as for winder treads or spiral stairs. The geometry on spiral stairs is more forgiving than standard stairs, but the stair user is also well aware that they are not on normal stairs; thus, their attention is heightened to the stair's more claustrophobic design. That would be my philosophical approach to a ship's ladder stair—you know when you're on a ladder, and you won't expect it to work like a stairway.

To the potential user of a ship's ladder stair to a loft, it's clear that extra consideration needs to be taken that is quite different from the innocent choice to use one stairway rather than another only to find it's not what you expected. There is always some occupant responsibility to be assumed.

While the IRC doesn't regulate ship's ladder stairs, the IBC does for commercial applications (IBC 2012 1009.14). Minimum tread depth is 5 inches, with each tread extending out at least 3 ½ inches from the step above. The maximum riser height is 9½ inches, with handrails required on each side. As a reality check, this ladder is safer and less steep than the maximum ladder slope permitted by OSHA (1 foot in 4 feet), and certainly not as steep as the bunk bed ladder your little superhero climbs up every night.

No matter what kind of ladder is installed, there's still a very real fall hazard at the top of the ladder. But perhaps an in-swinging gate in the railing at the top of the ladder would take care of that issue.