

Q Most of the homes I work on are slab on grade. Occasionally I need to break a large hole in the slab for a drain or to repair a hole where some penetration such as a drain has been removed. What is the best way to repair a hole in a concrete slab before tiling over?

A Michael Byrne, a veteran tile installer and consultant, and the moderator of *JLC's* Ceramic Tile forum, replies:

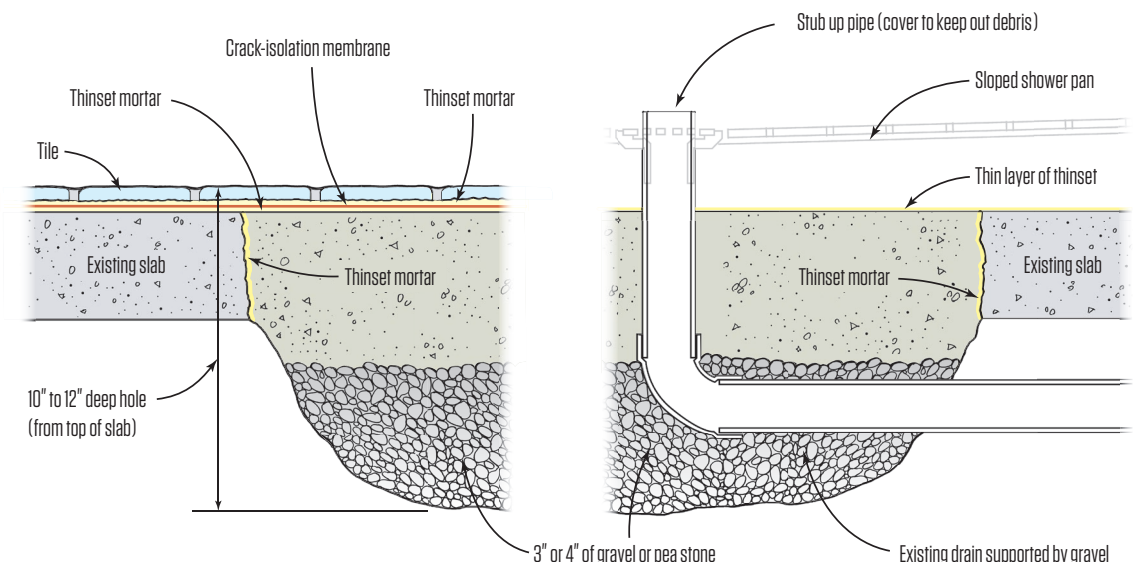
With a hole in the slab like you describe, you have one of two conditions: The hole is to be covered up by something (such as a shower pan), or it will be covered directly with floor tile. Either way, dig the hole down, removing soil to a depth of 10 to 12 inches from the top of the slab. Then add back 3 or 4 inches of gravel or pea stone so that the hole is around 6 inches deep from the top of the slab to the top of the gravel. If you have excavated under a drain in the hole, be sure that the gravel fills the space below the drain and supports the drain completely.

If the hole you're repairing is around a drain, be sure that the pipe is high enough to clear the top of the slab.

If not, add a stub and then cover the pipe to keep out debris. Prepare the hole by scrubbing away any soil from the concrete along the inside of the hole, then rinse with clean water. When the rinse water has drained away from the concrete, but the concrete is still damp, spread a thin layer of thinset mortar over the concrete. Pour in the fresh concrete immediately to fill the hole, and let that cure. The thinset has better adhesive quality than regular concrete and that thin layer helps the new concrete knit with the existing slab.

If the hole you repaired is in the middle of a floor that you are tiling over, install a crack-isolation membrane over the entire floor before putting down the tile. If the area around the repaired hole is part of the footprint of a shower stall, wait until after the shower walls are framed. Then clean the concrete in the shower area with a sponge

Slab Repair Before Tiling



and clean water. While the concrete is still damp, spread a thin layer of thinset mortar over it, and immediately float the mud layer for the shower floor, sloped $\frac{1}{4}$ inch per foot toward the drain. Again, the layer of thinset helps adhere the mud layer to the concrete slab. When the mud layer cures, install the shower pan, water test it, and you're ready to tile.

If I'm building in a heating climate on frost walls, with an uninsulated crawlspace and a dirt floor, how deep do I need to place my footings for the posts supporting the center beam?

A Steve Baczek, a residential architect from Reading, Mass., who specializes in building science, replies:

Typically the footings for the center support posts are placed at an elevation similar to that of the perimeter frost-wall footings. But this placement is not necessarily because of frost protection; rather, it's done

because the hole for the crawlspace is usually excavated to that depth. If the depth of the frost-wall footings meets the code requirements for frost protection (Section R403.1.4.1 in the IRC), then the footings for the support posts at the center of the crawlspace—being at the same elevation—will meet those requirements by default. Even when the foundation walls are trenched and the crawlspace floor is not excavated to the same depth as the footings, most building officials are likely to require the footings for center supports to be at frost depth as well.

With a vented crawlspace, there is a chance that the crawlspace air could get very cold. But the risk of the ground freezing in the center of the crawlspace is still minimal. In most cases heat loss from the floor above would keep the crawlspace temperature above freezing. Only if you went to great lengths to air seal and insulate the framed floor above—without insulating the crawlspace—would the air in the crawlspace be completely unconditioned and the risk of freezing increase. But insulating a floor,

with all the pipes, wiring, and penetrations, is very difficult to do well. It is much easier, and uses less material, to create a sealed crawlspace by insulating the foundation walls and air sealing, so the entire crawlspace is brought inside the conditioned volume of the house. This is the strategy I recommend for most crawlspaces. It also requires covering the dirt floor, and of course, closing any crawlspace vents. By conditioning the air in a crawlspace—whether the heat source is the house above or the ambient temperature of the earth below—the floor of the crawlspace should not be at risk of freezing, and the soil supporting the footings in the center of the crawlspace (at any depth) should not be in danger of freezing.

Regardless of the climate you build in, you should never leave the dirt floor of a crawlspace open and uncovered. At a minimum the dirt floor should be covered with a 6- to 10-mil polyethylene sheeting ballasted in place with stone or covered with a 2-inch to 3-inch concrete "rat" slab.

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