

Q&A

Q. Why Doesn't a Post-Tensioned Slab Buckle? *Is it possible that a post-tensioned garage slab could literally buckle in half when the tendons are tensioned, or does rebar in the slab prevent that from happening? Also, why are these types of slabs so common in Las Vegas? Is it because of the soil?*

A. *Bryan Allred, a structural engineer with Seneca Structural Engineers in Laguna Hills, Calif., responds:* Buckling is a design issue with slender masonry or concrete tilt-up walls that resist vertical loads while supporting their own weight. But with a post-tensioned slab, the weight of the concrete, the weight of the structure, and the supporting soil all act against a buckling-type response. And even though it's theoretically possible to buckle an improperly post-tensioned slab, it's more likely the concrete at the anchors would crush from the extremely high force that would have to be delivered by the tendons before buckling would occur. In fact, this anchorage zone is typically the weak link in the system. In all the slabs I've designed and observed (both slab-on-grade and elevated), I've never witnessed a horizontal post-tensioned element buckle; however, I have seen several concrete blowouts at the anchors.

By the way, in most residential post-tensioned foundations, only a very small amount of rebar is placed. This rebar is typically located in the footings to resist high, concentrated loads from posts and columns, or under shear walls that resist lateral (seismic and wind) forces. The slab itself will typically have only trim rebar around penetrations, re-entrant corners, or any other odd condition.

Las Vegas is indeed a hotbed for post-tensioned concrete, both elevated and slab-on-grade, but it's not necessarily because of the soil. There is some expansive soil in the northern part of Las Vegas, but the majority of the sites are nonexpansive. Las Vegas developers have used post-tensioned foundations for decades because they provide a proven and economical solution even for nonexpansive sites; they minimize pad footings for post loads and interior footings under bearing walls. As a rule of thumb, a properly designed post-tensioned slab can resist a post load of about 1,000 pounds per inch of slab thickness, so a 5-inch-thick slab can resist a 5,000-pound post load. In addition, a post-tensioned slab can resist most residential bearing-wall loads without the use of a down-turned footing.

Q. Best Flooring for a Humid Climate

I'm planning on installing laminate flooring on the first floor of my North Carolina house, which is built on a ventilated crawlspace. But I'm concerned that the laminate finish will trap moisture and eventually lead to rot damage in the subfloor and framing. Is laminate flooring a bad choice for this type of house? If so, what alternative would you recommend?

A. *Larry Elkin, a forensic mechanical engineer with Applied Building Sciences near Charleston, S.C., and author of several articles about floor moisture problems in humid climates, responds:* Under the right conditions, any type of flooring that has a relatively impermeable surface — including laminate flooring, sheet goods, ceramic tile, and even wood flooring with a thick polyurethane finish — can act as a cold-side vapor retarder and lead to the situation you describe.

The problem seems to be more common in colder houses, particularly when the air conditioning is ducted through toe-kick registers rather

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GOT A QUESTION?

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than through wall or ceiling ducts. We've found fan-shaped patterns of rot damage in front of these registers, right where very cool supply air blows across the floor surface; this is caused by condensation, which has the potential to develop in this location for several months of the year in warm, humid climates. However, toe-kick registers are not needed to create this condensation problem. Any home that is very cool and has excessive crawlspace moisture is subject to rot.

JLC has published several good articles about drying and sealing crawlspaces (see "Fixing a Wet Crawlspace," 8/04; "Building a Sealed Crawlspace," 10/03; and "Crawlspace Ventilation Update," 8/99). These articles de-

scribe strategies for reducing crawlspace moisture to levels that will not likely impact the performance of the interior flooring.

But before sealing up the crawlspace, you should consult with local building-code officials, who may need to be convinced a sealed crawlspace is an acceptable (or superior) alternative to a traditional, vented crawlspace; and with a pest-control expert, who may have concerns about inspection and treatment of the crawlspace. These details are best worked out before the project begins.

Finally, be careful about constructing a sealed crawlspace in a flood-prone area. Besides allowing airflow, crawlspace vents are often installed to equalize hydrostatic forces across the foundation, so vent closures must be designed to break away under flood-induced forces. An alternative may be to seal the floor assembly at the bottom of the floor joists.

Q. Getting Rid of That Smoky Smell

In a recently purchased house, one of the bedrooms was used as a smoking room by a previous owner and still smells of cigarette smoke. To get rid of the odor, my clients washed the floors, walls, ceiling, and all the windows and woodwork, then used water-based Kilz on the ceiling, walls, and woodwork, followed by two coats of latex paint — yet the odor persists. What is their best plan of action at this point?

A. Fernando Pagés Ruiz, a contractor specializing in fire restoration in Lincoln, Neb., responds: Smoke smells of any kind can be frustrating to remove, because smoke permeates walls and other porous surfaces and can get trapped in household ducts. If not properly removed or encapsulated, smoke odor reoccurs, especially during warm or damp weather. Although your clients had the right idea to encapsulate the odor with a sealer after a thorough surface cleaning, they used the wrong products. Smoke smells require odor-neutralizing cleaners, and while water-based Kilz has excellent stain sealing power, it doesn't really block odors.

Here's a four-step approach I've found to be effective in getting rid of smoke smells: First, remove and replace any existing porous materials in the room, such as carpeting, pads, and drapes. Second, clean the walls, ceiling, and floor with a chemical designed to mitigate smoke odors, such as Bridgepoint's Smoke Odor

Counteractant (Bridgepoint Systems, 800/794-7425, www.bridgepoint.com) or Chemspec's Air Neutralizer (Chemical Specialties Manufacturing Corp., 800/638-7370, www.chemspecworld.com), along with a heavy-duty wall cleaner like TSP. Don't forget to remove heat registers and clean inside the register boot.

Third, if you have access to a hot fogger (available at many equipment-rental shops and professional carpet-cleaning outlets), thermal fog the room. While there are several "flavors" of odor-eliminating thermal fog, the candy-scented ones tend to mask smoke odors best; I've found Bridgepoint's cherry-scented Thermal Fog to be especially effective. If you can stay out of the house for a few hours, you could also place an ozone generator in the room, and then air out the room after about four hours of treatment. Both hot-fog and ozone treatments will chase away smoke smells in areas that are inaccessible to surface cleaners and sealers.

Finally, apply a smoke and soot sealer to the walls, ceilings, and (if possible) subfloor with a paint sprayer, wet fogger, or garden sprayer. Unlike Kilz, chemically engineered smoke sealers deodorize and encapsulate smoke odors so they don't become airborne. You can also spray these deodorizing sealers into ductwork.

If these steps seem too complicated, consult a professional restorer. You can find one in the phone book under "Fire & Water Damage Restoration."