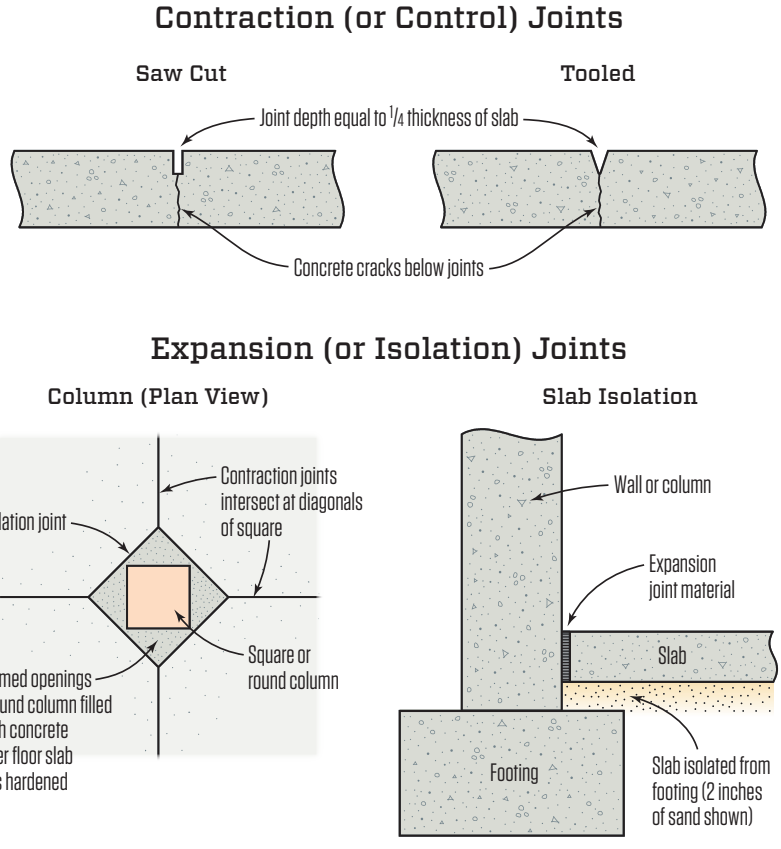
Q My clients want a finished basement in their new home, and they hope to use the concrete slab as a finished floor. How can I detail the slab to minimize cracking?

A The staff at *JLC* responds: A wise man once said that nothing is certain except death and taxes, but perhaps cracks in concrete can be added to that list. The simple truth is that concrete cracks are inevitable—especially when the concrete is spread in a relatively thin layer, as in a slab. The National Ready Mix Concrete Association (NRMCA) has published an excellent series of articles called "Concrete in Practice." One of those articles, "CIP 6—Joints in Concrete Slabs on Grade," thoroughly explains how and why concrete slabs crack, as well as how to control that cracking. Most of this answer has been sourced from that article.

Concrete moves—expands and contracts—with changes in moisture and temperature and as part of the curing process. It is weak in tension, and as it shrinks, the stresses become greater than its tensile strength, resulting in cracks. This cracking occurs even when a slab is reinforced with wire mesh, which does not prevent cracking, but works to keep cracks tightly closed. Left to its own devices, a slab will crack uncontrolled in irregular patterns, and that is precisely what your clients are trying to avoid.

We can control cracks in concrete by using two different types of joints: expansion (or isolation) joints and contraction



Having the proper joints in a slab can prevent uncontrolled cracking. Contraction joints cut into the surface give a slab a weakened point to crack as it shrinks during the curing process. Expansion joints allow a slab to move horizontally and vertically without being in contact with parts of the structure such as the foundation walls, footings, or structural columns. Strips of compressible foam or asphalt sheeting make good expansion joints, and a 2-inch layer of sand can isolate a slab from the footing.

Illustration by Tim Healey

(or control) joints (see illustration, previous page).

Expansion joints separate the slab from structures such as foundation walls, footings, and structural support columns, and allow the slab to move unrestrained both horizontally and vertically. These joints can be strips of asphalt-impregnated sheeting, compressible foam, or other materials that are put in place before the slab is poured. A layer of sand at least 2 inches thick can also serve to isolate a slab from the footing. For a column, the NRMCA recommends forming a box around its base with the joint material. It says to turn the box 45 degrees into a diamond configuration and then have the contraction joints intersect with the points of the diamond. The box stays in place during the pour and is filled afterward in a separate pour.

Contraction joints are lines cut or formed into a slab that create a weak point in the slab profile, forcing a place for the cracking to occur. In other words, when you cut a contraction joint into a slab, the cracking should happen below the joint where the slab is the weakest. Think of these joints as scoring the slab, not unlike scoring drywall to control where it breaks.

Contraction joints can be formed into a slab with a jointing tool early in the finishing process. These joints can also be cut into a slab with a circular saw equipped with a concrete-cutting blade. Saw-cut joints should be made four to 12 hours after finishing. Another option is to insert hardboard or plastic joint strips into the surface of a slab when the concrete is still wet. Contraction joints should be one-fourth the depth of the concrete, so for a 4-inch-thick slab, the contraction joint should be 1 inch deep.

For a floor in a finished basement, the goal would be to control the cracking as much as possible while making the joints as inconspicuous as possible. The expansion joints along the foundation walls will most likely be covered with whatever wall framing you install. If a slab is to be used as a finished floor, a good choice for the contraction joints would be saw-cut joints, which are probably the least visible of the choices. If your client intends to divide the finished basement into rooms, you may be able to hide some or all of the contraction joints under partition walls.

Before the concrete is delivered, locate all of the contraction joints on the finished basement plan. The NRMCA offers a few rules of thumb for positioning contraction joints. First, the joints should be spaced no more than 24 to 36 times the thickness of the slab; for a 4-inch slab, for instance, contraction joints should be 8 to 12 feet apart. The NRMCA states further that spacing should never exceed 15 feet.

Lay out the contraction-joint pattern to form panels that are close to square. The length of each panel should not be more than 1.5 times the width. If the basement is L-shaped, use a contraction joint to isolate the leg of the L. With careful, creative planning, you should be able to conceal most of the joints in the finished basement, and properly-placed joints should all but eliminate any irregular and uncontrolled cracking in the slab.