

Figure 9-4: Improper construction. No isolation joint, or only a partial isolation joint, will allow cracking.

### Slab Construction

The subgrade must be uniformly compacted, free from debris and well drained, or the slab might settle and/or crack. Remove all organic material, large rocks and building debris from the site. Excavate the ground to grade line and level it. Dig out soft or mucky spots and fill them with soil similar to the rest of the subgrade. If similar soil is not available, use granular backfill. Compact these areas thoroughly with a hand tamper or compactor. Loosen and tamp hard spots so they provide the same support as the rest of the subgrade. Compaction should be 95%.

Use the surrounding soil type to backfill utility trenches that run under the slab. Compact soils used for backfill in layers about 6 inches/15 cm thick. Where necessary, use sand, gravel, crushed stone or slag to bring the subgrade to uniform load bearing capacity and final grade. Compact these granular fills in layers a maximum of 6 inches thick. Extend the fill at least 1 foot/30 cm beyond the slab edge to prevent rain from undercutting the slab.

Undisturbed, firm soil provides the best support for concrete slabs. Don't over-excavate the subgrade, then fill the area with granular material to bring it to design grade. Though this practice is common, it can cause serious problems. If the subgrade is not drained properly, it can collect water. When this water freezes, the slab may rise, or it may settle when the saturated natural soil settles.

Good quality natural soil that has been excavated must be compacted if it is used as fill to bring the subgrade to design grade. Use mechanical rollers or vibratory compactors.

Dry subgrade areas absorb more water from the concrete than wet areas. This can create dark and light spots in the surface of the hardened concrete. An extremely dry subgrade can absorb so much water from the fresh concrete that the concrete stiffens before it can be finished. Shrinkage cracks may develop, especially if wind and low humidity are present. Obviously, the subgrade should not be too dry, or unevenly moist. It is



10–12 feet/3–3.7 m, construct a longitudinal contraction joint down the center. Don't offset or stagger joints; keep them in continuous lines.

If possible, space control joints so that they form panels that are approximately square. Panels with a length-to-width ratio of more than 1½:1 are likely to crack near mid-length. In general, smaller panels are less prone to random cracking.

### Construction Joints

Install a construction joint (cold joint) wherever work is stopped for an extended period of time. Try to locate and construct them to act as contraction or isolation joints. Use a construction joint for thicker slabs and use smooth steel dowel bars or a tongue and groove joint, to provide load transfer across the joint, and to keep the adjoining slabs level. For thick, heavily loaded slabs, smooth steel dowel bar joints are preferred. Saw the joint or edge the concrete along the joint with a hand tool so that the joint will look like a contraction joint.

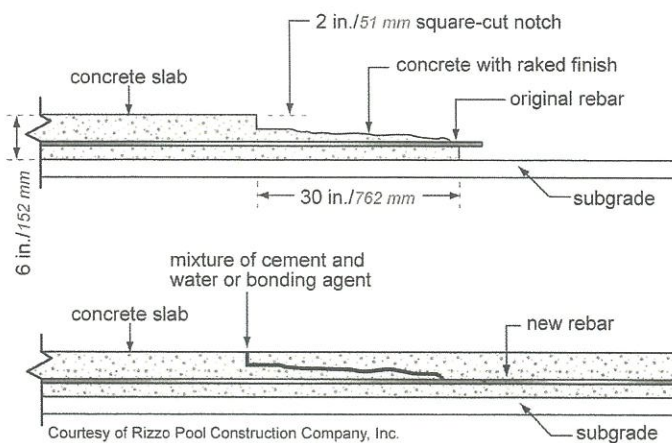


Figure 9-2: Construction joint (cold joint). Typical overlap for wet or dry shotcrete for an interrupted shoot (not to scale)

A 2-inch/5 cm-deep, square-cut notch is formed at the edge of the shoot, and then the concrete is feathered to meet the sub-grade over 30 inches/76 cm. This feathered area is given a raked finish to roughen its surface which

helps to ensure a good mechanical bond between the two applications.

Figure 9-2: Construction joint (cold joint). Typical overlap for wet or dry shotcrete for an interrupted shoot (not to scale)

The reinforcing steel is left protruding past the end of the feathered concrete. Before the shooting is resumed, a mixture of cement and water can be splashed on the roughened surface to create a better bond. Or you can use an acrylic or epoxy bonding agent. Make sure the steel is cleaned from the previous day before shooting the new concrete.

When the shoot is resumed, the new reinforcing steel is tied to the steel from the previous day's shoot. The new concrete shoot begins at the 2-inch/5 cm deep square-cut edge of the previous day's shoot. The resulting joint may be left "concrete to concrete" or, as an option, may be caulked.

The use of an overlapping joint works equally well for walls or floors. This method should not be used in place of expansion or control joints.

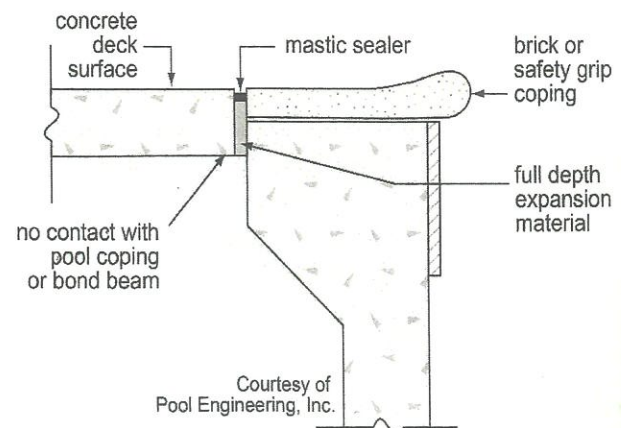


Figure 9-3: Concrete deck adjacent to pool coping. Isolation joint properly separates the slab from the bond beam and coping.