



CONTRACTION JOINTS IN RESIDENTIAL SLABS-ON-GROUND—TechNote

Keywords: contraction joints; control joints; joint spacing; post-tensioned residential slabs; residential slabs.

Question

Are contraction joints necessary in residential slabs-on-ground, whether for plain, reinforced, or post-tensioned (PT) concrete; and, if so, are there special considerations to installing joints in residential slabs?

Answer

ACI 332 requires contraction joints in plain and reinforced concrete slabs-on-ground. For post-tensioned (PT) residential slabs-on-ground, PTI DC10.1 permits contraction joints to minimize and conceal random cracks. The layout of contraction joints in residential slabs does require special considerations, which will be discussed in the following.

Discussion

For residential slabs, contraction joint layout can be challenging because complications arise with interior footings, re-entrant corners, and other factors. These considerations are rare in warehouse slabs, where joint spacing is at and between column lines, which provide uniform spacing. In residential slabs, the layout of joints may be unconventional in appearance, where joints can be variably spaced, angled, or curved. Aesthetics related to joint layout are generally not a concern because most residential slabs receive floor coverings, which hide the joints. Mitigating random cracks is the primary focus. Several parameters influence joint spacing and layout.

Plain and reinforced slabs-on-ground

Joint spacing—ACI 332 residential code criteria for contraction joint spacing is reproduced herein as Table 1. This table is based on recommendations from ACI 360R, which provides the maximum joint spacing for plain and lightly reinforced slabs containing up to 0.1% reinforcement.

Many residential slabs are designed with a slab thickness of 4 in. (100 mm), where the concrete contains aggregate of 3/4 in. (19 mm) maximum size. For these conditions, the maximum joint spacing is 11.5 ft (3.5 m) when using Table 1 with direct interpolation. This spacing can be rounded down to 11 ft (3.4 m), as joint spacing is not a precise determination. To facilitate discussion, a 4 in. (100 mm) thick slab will be used herein as the exemplar when presenting factors that influence joint layout.

Table 1—Specified maximum contraction joint spacing for slab-on-ground (ACI 332-14)

Slab thickness, <i>h</i> , in. (mm)	Contraction joint spacing, ft (m)	
	Specified maximum size of aggregate less than 3/4 in. (19 mm)	Specified maximum size of aggregate 3/4 in. (19 mm) and larger
3.5 (90)	8 (2.4)	10 (3.0)
4.5 (115)	10 (3.0)	13 (4.0)
5.5 (140)	12 (3.7)	15 (4.6)

Note: This table applies to plain and lightly reinforced slabs containing up to 0.1% reinforcement. For slabs of thickness greater than 5.5 in. (140 mm), use ACI 360 recommendations.

Perimeter footings—Design drawings for the foundation system may show the slab as being independent, or isolated, from the perimeter footings, or the slab may be cast monolithic with the perimeter footings. This variation in design affects the contraction joint spacing. When the slab is isolated from the footing (Fig. 1), the spacing of the first joint away from the footing should be equal to, or less than, that given in Table 1. However, in the case of monolithic construction (Fig. 2), additional joints will be required because the first contraction joint away from the footing should be no more than one-half the maximum distance, as recommended by ACI 224.4R. Also, at interior footings, the first joints away from the footing should be less than or equal to one-half the distance given in Table 1.

Examples of contraction joint layouts are provided in Fig. 3 and 4 to demonstrate the difference between slabs cast isolated and those cast monolithic with the perimeter footings. For the isolated design, Fig. 3 shows the first joint away from the perim-

eter footing at distances less than 11 ft (3.4 m). For the monolithic design, Fig. 4 shows the first joint away from the perimeter footing at distances of 5.5 ft (1.7 m) or less. An alternate layout is shown in Fig. 5, where the first joint is approximately 1 ft (0.3 m) from the perimeter footing. By placing a joint close to the footing, the joint layout for the remainder of the slab may be simplified.

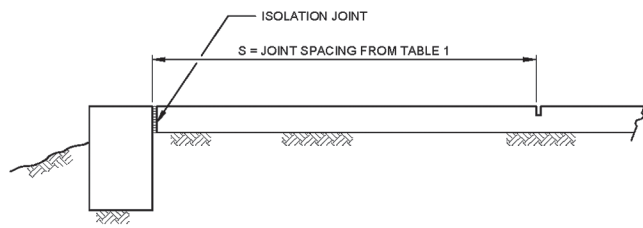


Fig. 1—Contraction joint spacing for residential slab-on-ground where slab is isolated from footing.

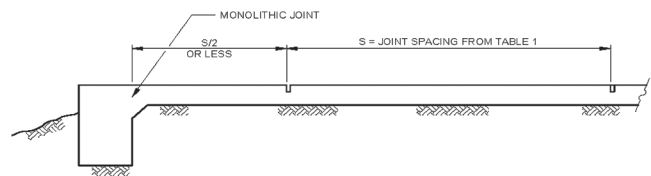


Fig. 2—Contraction joint spacing for residential slab-on-ground where slab is cast monolithic with footing.

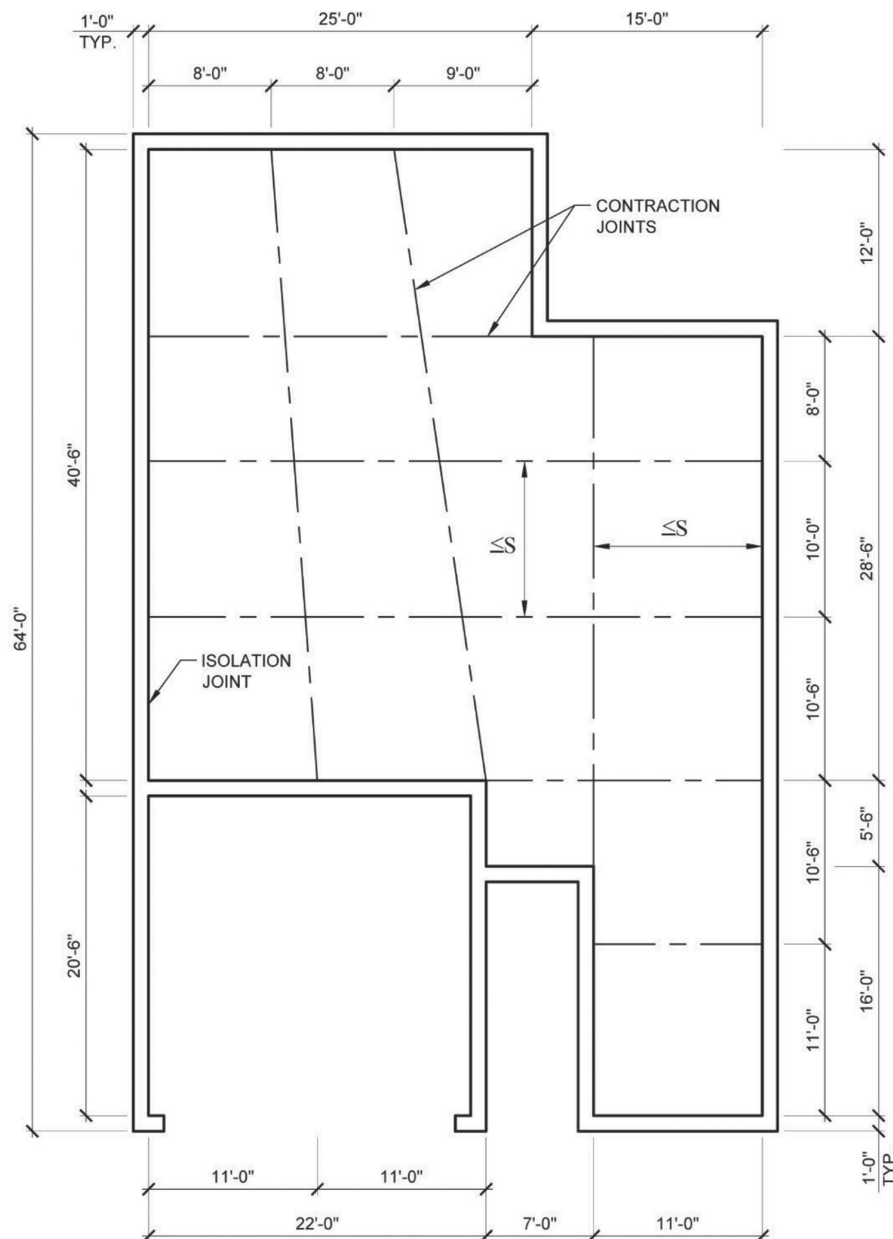


Fig. 3—Contraction joint layout for plain and lightly reinforced concrete residential slab-on-ground of 4 in. (100 mm) thickness, where the slab is isolated from the footing. The symbol $\leq S$ means joint spacing of less than or equal to the value given in Table 1. (Note 1: 1 in. = 25.4 mm.)