

CODE

25.9.4.4.6 For monostrand anchorage devices for 12.7 mm or smaller diameter strands in normalweight concrete slabs, reinforcement satisfying (a) and (b) shall be provided in the anchorage zone, unless a detailed analysis in accordance with 25.9.4.3 shows that this reinforcement is not required:

(a) Two horizontal bars at least No. 13 in size shall be provided within the local zone parallel to the slab edge ahead of the bearing face of the anchorage device. They shall be permitted to be in contact with the bearing face of the anchorage device, the center of the bars shall be no farther than 100 mm ahead of the bearing face of the device, and the bars shall extend at least 150 mm either side of the outer edges of the device.

(b) If the center-to-center spacing of anchorage devices is 300 mm or less, the anchorage devices shall be considered as a group. For each group of six or more anchorage devices, at least $n + 1$ hairpin bars or closed stirrups at least No. 10 in size shall be provided, where n is the number of anchorage devices. One hairpin bar or stirrup shall be placed between adjacent anchorage devices and one on each side of the group. The hairpin bars or stirrups shall be placed with the horizontal legs extending into the slab perpendicular to the edge. The center line of the vertical leg of the hairpin bars, or the vertical leg of stirrups closest to the anchorage device, shall be placed $3h/8$ to $h/2$ ahead of the bearing face of the anchorage device. Hairpin bars or stirrups shall be detailed in accordance with 25.7.1.1 and 25.7.1.2.

COMMENTARY

R25.9.4.4.6 For monostrand slab tendons, the anchorage-zone minimum reinforcement requirements are based on the recommendations of Breen et al. (1994) and confirmed based on analysis of other test results by Roberts-Wollmann and Wollmann (2008). Typical details are shown in Fig. R25.9.4.4.6. For slabs not thicker than 200 mm, with groups of anchors requiring hairpins, the bars parallel to the loaded face can satisfy 25.9.4.4.6(a) and also provide anchorage for the hairpin bars. Thicker slabs require two bars for 25.9.4.4.6 (a) and two additional bars to provide anchorage for the hairpins in accordance with 25.7.1.2. The horizontal bars parallel to the edge required by 25.9.4.4.6(a) should be continuous where possible.

The tests on which the recommendations of Breen et al. (1994) were based were limited to anchorage devices for 12.7 mm diameter, Grade 1860 strand, and unbonded tendons in normalweight concrete. For larger strand anchorage devices or for use in lightweight concrete slabs, ACI Committee 423 recommends that the amount and spacing of reinforcement should be conservatively adjusted to provide for the larger anchorage force and smaller splitting tensile strength of lightweight concrete (ACI 423.3R).

ACI 423.3R and Breen et al. (1994) both recommend that hairpin bars also be furnished for anchorages located within 300 mm of slab corners to resist edge tension forces. The meaning of “ahead of” in 25.9.4.4.6 is illustrated in Fig. R25.9.1.1b.

In those cases where multistrand anchorage devices are used for slab tendons, all provisions of 25.9.4 are to be satisfied.