

CODE

where A_{cr} is the area of that part of the cross section between the flexural tension face and the centroid of the gross section.

7.6.3 Minimum shear reinforcement

7.6.3.1 A minimum area of shear reinforcement, $A_{v,min}$, shall be provided in all regions where $V_u > \phi V_c$. For precast prestressed hollow-core slabs with untopped $h > 315$ mm, $A_{v,min}$ shall be provided in all regions where $V_u > 0.5\phi V_{cw}$.

7.6.3.2 If shown by testing that the required M_n and V_n can be developed, 7.6.3.1 need not be satisfied. Such tests shall simulate effects of differential settlement, creep, shrinkage, and temperature change, based on a realistic assessment of these effects occurring in service.

7.6.3.3 If shear reinforcement is required, $A_{v,min}$ shall be in accordance with 9.6.3.4.

7.6.4 Minimum shrinkage and temperature reinforcement

7.6.4.1 Reinforcement shall be provided to resist shrinkage and temperature stresses in accordance with 24.4.

7.6.4.2 If prestressed shrinkage and temperature reinforcement in accordance with 24.4.4 is used, 7.6.4.2.1 through 7.6.4.2.3 shall apply.

7.6.4.2.1 For monolithic, cast-in-place, post-tensioned beam-and-slab construction, gross concrete area shall consist of the total beam area including the slab thickness and the slab area within half the clear distance to adjacent beam webs. It shall be permitted to include the effective force in beam tendons in the calculation of total prestress force acting on gross concrete area.

COMMENTARY

R7.6.3 Minimum shear reinforcement

The basis for minimum shear reinforcement for one-way slabs is the same as that for beams. Refer to R9.6.3 for additional information.

R7.6.3.1 Solid slabs and footings have less stringent minimum shear reinforcement requirements than beams because there is a possibility of load sharing between weak and strong areas. However, research (Angelakos et al. 2001; Lubell et al. 2004; Brown et al. 2006) has shown that deep, lightly reinforced one-way slabs, particularly if constructed with high-strength concrete or concrete having a small coarse aggregate size, may fail at shears less than V_c calculated from Eq. (22.5.5.1). One-way slabs subjected to concentrated loads are more likely to exhibit this vulnerability.

Results of tests on precast, prestressed hollow-core units (Becker and Buettner 1985; Anderson 1978) with $h \leq 315$ mm have shown shear strengths greater than those calculated by Eq. (22.5.6.3.1a) and Eq. (22.5.6.3.2). Results of tests on hollow-core units with $h > 315$ mm have shown that web-shear strengths in end regions can be less than strengths calculated by Eq. (22.5.6.3.2). In contrast, flexure-shear strengths in the deeper hollow-core units equaled or exceeded strengths calculated by Eq. (22.5.6.3.1a).

R7.6.3.2 The basis for the testing-based strength evaluation for one-way slabs is the same as that for beams. Refer to R9.6.3.3 for additional information.

R7.6.4 Minimum shrinkage and temperature reinforcement

R7.6.4.2 In prestressed monolithic beam-and-slab construction, at least one shrinkage and temperature tendon is required between beams, even if the beam tendons alone provide at least 0.7 MPa average compressive stress as required by 24.4.4.1 on the gross concrete area as defined in 7.6.4.2.1. A tendon of any size is permissible as long as all other requirements of 7.6.4.2 and 7.7.6.3 are satisfied. Application of the provisions of 7.6.4.2 and 7.7.6.3 to monolithic, cast-in-place, post-tensioned, beam-and-slab construction is illustrated in Fig. R7.6.4.2.

Tendons used for shrinkage and temperature reinforcement should be positioned as close as practicable to the mid-depth