CODE

8.6.2 *Minimum flexural reinforcement in prestressed slabs*

8.6.2.1 For prestressed slabs, the effective prestress force $A_{ps}f_{se}$ shall provide a minimum average compressive stress of 0.9 MPa on the slab section tributary to the tendon or tendon group. For slabs with varying cross section along the slab span, either parallel or perpendicular to the tendon or tendon group, the minimum average effective prestress of 0.9 MPa is required at every cross section tributary to the tendon or tendon group along the span.

8.6.2.2 For slabs with bonded prestressed reinforcement, total quantity of A_s and A_{ps} shall be adequate to develop a factored load at least 1.2 times the cracking load calculated on the basis of f_r defined in 19.2.3.

8.6.2.2.1 For slabs with both flexural and shear design strength at least twice the required strength, 8.6.2.2 need not be satisfied.

8.6.2.3 For prestressed slabs, a minimum area of bonded deformed longitudinal reinforcement, $A_{s,min}$, shall be provided in the precompressed tension zone in the direction of the span under consideration in accordance with Table 8.6.2.3.

Table 8.6.2.3—Minimum bonded deformed longitudinal reinforcement $A_{s,min}$ in two-way slabs with bonded or unbonded tendons

Region	Calculated f_t after all losses, MPa	$A_{s,min}$, mm^2	
Positive moment	$f_t \le 0.17\sqrt{f'_c}$	Not required	(a)
	$0.17\sqrt{f'_c} < f_t \le 0.5\sqrt{f'_c}$	$\frac{N_c}{0.5f_y}$	(b)[1],[2]
Negative moment at columns	$f_t \le 0.5\sqrt{f'_c}$	$0.00075A_{cf}$	(c)[2]

[1]The value of f_y shall not exceed 420 MPa.

[2]For slabs with bonded tendons, it shall be permitted to reduce $A_{s,min}$ by the area of the bonded prestressed reinforcement located within the area used to determine N_c for positive moment, or within the width of slab defined in 8.7.5.3(a) for negative moment.

COMMENTARY

Commentary on size effect factor is provided in R22.5.5.1 and R22.6.5.2.

R8.6.2 *Minimum flexural reinforcement in prestressed slabs*

R8.6.2.1 The minimum average effective prestress of 0.9 MPa was used in two-way test panels in the early 1970s to address punching shear concerns of lightly reinforced slabs. For this reason, the minimum effective prestress is required to be provided at every cross section.

If the slab thickness varies along the span of a slab or perpendicular to the span of a slab, resulting in a varying slab cross section, the 0.9 MPa minimum effective prestress and the maximum tendon spacing is required at every cross section tributary to the tendon or group of tendons along the span, considering both the thinner and the thicker slab sections. This may result in higher than the minimum f_{pc} in thinner cross sections, and tendons spaced at less than the maximum in thicker cross sections along a span with varying thickness, due to the practical aspects of tendon placement in the field.

R8.6.2.2 This provision is a precaution against abrupt flexural failure developing immediately after cracking. A flexural member designed according to Code provisions requires considerable additional load beyond cracking to reach its flexural strength. Thus, considerable deflection would warn that the member strength is approaching. If the flexural strength were reached shortly after cracking, the warning deflection would not occur. Transfer of force between the concrete and the prestressed reinforcement, and abrupt flexural failure immediately after cracking, does not occur when the prestressed reinforcement is unbonded (ACI 423.3R); therefore, this requirement does not apply to members with unbonded tendons.

R8.6.2.3 Some bonded reinforcement is required by the Code in prestressed slabs to limit crack width and spacing at service load when concrete tensile stresses exceed the modulus of rupture and, for slabs with unbonded tendons, to ensure flexural performance at nominal strength, rather than performance as a tied arch. Providing the minimum bonded reinforcement as stipulated in this provision helps to ensure adequate performance.

The minimum amount of bonded reinforcement in two-way flat slab systems is based on reports by Joint ACI-ASCE Committee 423 (1958) and ACI 423.3R. Limited research available for two-way flat slabs with drop panels (Odello and Mehta 1967) indicates that behavior of these particular systems is similar to the behavior of flat plates.

For usual loads and span lengths, flat plate tests summarized in Joint ACI-ASCE Committee 423 (1958) and experience since the 1963 Code was adopted indicate satisfactory performance without bonded reinforcement in positive moment regions where $f_t \le 0.17\sqrt{f'_c}$. In positive moment regions where $0.17\sqrt{f'_c} \le f_t \le 0.5\sqrt{f'_c}$, a minimum bonded