CHAPTER 25—REINFORCEMENT DETAILS

CODE

25.1—Scope

25.1.1 This chapter shall apply to reinforcement details, including:

(a) Minimum spacing
(b) Standard hooks, seismic hooks, and crossties
(c) Development of reinforcement
(d) Splices
(e) Bundled reinforcement
(f) Transverse reinforcement
(g) Post-tensioning anchorages and couplers

25.1.2 Provisions of 25.9 shall apply to anchorage zones for post-tensioned tendons.

25.2—Minimum spacing of reinforcement

25.2.1 For parallel nonprestressed reinforcement in a horizontal layer, clear spacing shall be at least the greatest of 25 mm, d_b, and $(4/3)d_{agg}$.

25.2.2 For parallel nonprestressed reinforcement placed in two or more horizontal layers, reinforcement in the upper layers shall be placed directly above reinforcement in the bottom layer with a clear spacing between layers of at least 25 mm.

25.2.3 For longitudinal reinforcement in columns, pedestals, struts, and boundary elements in walls, clear spacing between bars shall be at least the greatest of 40 mm, $1.5d_b$, and $(4/3)d_{agg}$.

25.2.4 For pretensioned strands at ends of a member, minimum center-to-center spacing s shall be the greater of the value in Table 25.2.4, and $[(4/3)d_{agg} + d_b]$.

COMMENTARY

R25.1—Scope

Recommended methods and standards for preparing design drawings, typical details, and drawings for the fabrication and placing of steel reinforcement in reinforced concrete structures are given in the *ACI Detailing Manual* (SP-66).

All provisions in the Code relating to bar, wire, or strand diameter (and area) are based on the nominal dimensions of the reinforcement as given in the appropriate ASTM specification. Nominal dimensions are equivalent to those of a circular area having the same mass per meter as the ASTM designated bar, wire, or strand sizes. Cross-sectional area of reinforcement is based on nominal dimensions.

R25.1.1 In addition to the requirements in this chapter that affect detailing of reinforcement, detailing specific to particular members is given in the corresponding member chapters. Additional detailing associated with structural integrity requirements is covered in 4.10.

R25.2—Minimum spacing of reinforcement

The minimum limits are set to permit concrete to flow readily into spaces between bars and between bars and forms without honeycombs, and to ensure against concentration of bars on a line that may cause shear or shrinkage cracking. Use of nominal bar diameter to define minimum spacing permits a uniform criterion for all bar sizes. In 2014, the size limitations on aggregates were translated to minimum spacing requirements, and are provided to promote proper encasement of reinforcement and to minimize honeycombing. The limitations associated with aggregate size need not be satisfied if, in the judgment of the licensed design professional, the workability and methods of consolidation of the concrete are such that the concrete can be placed without creating honeycombs or voids.

The development lengths given in 25.4 are a function of the bar spacing and cover. As a result, it may be desirable to use larger than minimum bar spacing or cover in some cases.

R25.2.4 The decreased spacing for transfer strengths of 28 MPa or greater is based on Deatherage et al. (1994) and Russell and Burns (1996).