

CODE

17.3.3 For adhesive anchors with embedment depths $4d_a \leq h_{ef} \leq 20d_a$, bond strength requirements shall be considered satisfied by the design procedure of 17.6.5.

17.3.4 For screw anchors with embedment depths $5d_a \leq h_{ef} \leq 10d_a$, and $h_{ef} \geq 40$ mm, concrete breakout strength requirements shall be considered satisfied by the design procedures of 17.6.2 and 17.7.2.

COMMENTARY

R17.3.3 **ACI 355.4M** limits the embedment depth of adhesive anchors to $4d_a \leq h_{ef} \leq 20d_a$, which represents the theoretical limits of the bond model (Eligehausen et al. 2006a).

R17.3.4 Screw anchor research by Olsen et al. (2012) is based on the nominal screw anchor diameter corresponding to the nominal drill bit size (for example a 16 mm screw anchor installs in a hole drilled by a 16 mm ANSI drill bit). This definition of screw anchor size is approximately the diameter of the core or shank of the screw rather than the size of the larger external diameter of the thread. This definition differs from the diameter of standard anchors with **ASME B1.1** threads that have a reduced shaft area and smaller effective area. The effective area of the screw anchor, as with other post-installed mechanical anchors, is provided by the manufacturer.

The Olsen et al. (2012) empirical design model was derived from a database of tests in cracked and uncracked concrete on metric-sized screw anchors tested in Europe and inch-sized anchors tested by independent laboratories in accordance with **ICC-ES AC193**.

For concrete screw anchors, the effective embedment depth, h_{ef} , is determined as a reduction from the nominal embedment based on geometric characteristics of the screw. The effective embedment is verified during the qualification testing under **ACI 355.2** and provided by the manufacturer for use in design. Using the reduced, effective embedment depth with the concrete capacity design (CCD) method is shown to adequately represent the behavior of concrete screws in the current concrete screw database and also validates the effects and limitations of certain relevant parameters, such as the effective embedment depth and spacing of anchors (17.9).

17.3.5 Anchors shall satisfy the edge distances, spacings, and thicknesses in 17.9 unless supplementary reinforcement is provided to control splitting failure.

17.4—Required strength

17.4.1 Required strength shall be calculated in accordance with the factored load combinations in **Chapter 5**.

17.4.2 For anchors in structures assigned to SDC C, D, E, and F, the additional requirements of 17.10 shall apply.

17.5—Design strength

17.5.1 For each applicable factored load combination, design strength of individual anchors and anchor groups shall satisfy $\phi S_n \geq U$. Interaction between load effects shall be considered in accordance with 17.8.1.

17.5.1.1 Strength reduction factor, ϕ , shall be determined in accordance with 17.5.3.

R17.5—Design strength