CODE

COMMENTARY

$$\frac{A_v}{s} = \frac{(V_u - \phi V_c)}{\phi f_{yt} d} \qquad \text{(R22.5.8.5)}$$

22.5.8.5.2 Inclined stirrups making an angle of at least 45 degrees with the longitudinal axis of the member and crossing the plane of the potential shear crack shall be permitted to be used as shear reinforcement in nonprestressed members.

R22.5.8.5.2 Although inclined stirrups crossing the plane of the potential shear cracks are permitted, their use is not appropriate where the direction of net shear reverses due to changes in transient load.

22.5.8.5.3 V_s for shear reinforcement in 22.5.8.5.1 shall be calculated by:

$$V_s = \frac{A_v f_{yt} d}{s} \qquad \text{(22.5.8.5.3)}$$

where s is the spiral pitch or the longitudinal spacing of the shear reinforcement, and A_v is given in 22.5.8.5.5 or 22.5.8.5.6.

22.5.8.5.4 V_s for shear reinforcement in 22.5.8.5.2 shall be calculated by:

$$V_s = \frac{A_v f_{yt} (\sin\alpha + \cos\alpha) d}{s} \qquad \text{(22.5.8.5.4)}$$

where α is the angle between the inclined stirrups and the longitudinal axis of the member, s is measured parallel to the longitudinal reinforcement, and A_v is given in 22.5.8.5.5.

R22.5.8.5.4 To be effective, it is critical that inclined stirrups cross potential shear cracks. If the inclined stirrups are generally oriented parallel to the potential shear cracks, the stirrups provide no shear strength.

22.5.8.5.5 For each rectangular tie, stirrup, hoop, or crosstie, A_v shall be the effective area of all bar legs or wires within spacing s.

22.5.8.5.6 For each circular tie or spiral, A_v shall be two times the area of the bar or wire within spacing s.

R22.5.8.5.6 Although the transverse reinforcement in a circular section may not consist of straight legs, tests indicate that Eq. (22.5.8.5.3) is conservative if d is taken as defined in 22.5.2.2 (Faradji and Diaz de Cossio 1965; Khalifa and Collins 1981).

22.5.8.6 *One-way shear strength provided by bent-up longitudinal bars*

R22.5.8.6 *One-way shear strength provided by bent-up longitudinal bars*

22.5.8.6.1 The center three-fourths of the inclined portion of bent-up longitudinal bars shall be permitted to be used as shear reinforcement in nonprestressed members if the angle α between the bent-up bars and the longitudinal axis of the member is at least 30 degrees.

To be effective, it is critical that the inclined portion of the bent-up longitudinal bar cross potential shear cracks. If the inclined bars are generally oriented parallel to the potential shear cracks, the bars provide no shear strength.

22.5.8.6.2 If shear reinforcement consists of a single bar or a single group of parallel bars having an area A_v, all bent the same distance from the support, V_s shall be the lesser of (a) and (b):

(a) $V_s = A_v f_y \sin\alpha$ (22.5.8.6.2a)

(b) $V_s = 0.25\sqrt{f_c'} b_w d$ (22.5.8.6.2b)