CODE

16.4.4.1 If $V_u > \phi(3.5b_v d)$, V_{nh} shall be taken as V_n calculated in accordance with 22.9, where b_v is the width of the contact surface, and d is in accordance with 16.4.4.3.

16.4.4.2 If $V_u \le \phi(3.5b_v d)$, V_{nh} shall be calculated in accordance with Table 16.4.4.2, where $A_{v,min}$ is in accordance with 16.4.6, b_v is the width of the contact surface, and d is in accordance with 16.4.4.3.

COMMENTARY

R16.4.4.2 The permitted horizontal shear strengths and the requirement of 6 mm amplitude for intentional roughness are based on tests discussed in Kaar et al. (1960), Saemann and Washa (1964), and Hanson (1960).

Table 16.4.4.2—Nominal horizontal shear strength

Shear transfer reinforcement	Contact surface preparation[1]	V_{nh}, N		
$A_v \ge A_{v,min}$	Concrete placed against hardened concrete intentionally roughened to a full amplitude of approximately 6 mm	Lesser of:	$\lambda\left(1.8 + 0.6\frac{A_v f_{yt}}{b_v s}\right) b_v d$	(a)
			$3.5 b_v d$	(b)
	Concrete placed against hardened concrete not intentionally roughened	$0.55 b_v d$		(c)
Other cases	Concrete placed against hardened concrete intentionally roughened	$0.55 b_v d$		(d)

[1]Concrete contact surface shall be clean and free of laitance.

16.4.4.3 In Table 16.4.4.2, d shall be the distance from extreme compression fiber for the entire composite section to the centroid of prestressed and nonprestressed longitudinal tension reinforcement, if any, but need not be taken less than $0.80h$ for prestressed concrete members.

R16.4.4.3 In composite prestressed concrete members, the depth of the tension reinforcement may vary along the member. The definition of d used in Chapter 22 for determining the vertical shear strength is also appropriate for determining the horizontal shear strength.

16.4.4.4 Transverse reinforcement in the previously cast concrete that extends into the cast-in-place concrete and is anchored on both sides of the interface shall be permitted to be included as ties for calculation of V_{nh}.

16.4.5 *Alternative method for calculating design horizontal shear strength*

R16.4.5 *Alternative method for calculating design horizontal shear strength*

16.4.5.1 As an alternative to 16.4.3.1, factored horizontal shear V_{uh} shall be calculated from the change in flexural compressive or tensile force in any segment of the composite concrete member, and Eq. (16.4.5.1) shall be satisfied at all locations along the contact surface:

$$\phi V_{nh} \ge V_{uh} \qquad (16.4.5.1)$$

Nominal horizontal shear strength V_{nh} shall be calculated in accordance with 16.4.4.1 or 16.4.4.2, where area of contact surface shall be substituted for $b_v d$ and V_{uh} shall be substituted for V_u. Provisions shall be made to transfer the change in compressive or tensile force as horizontal shear force across the interface.

16.4.5.2 Where shear transfer reinforcement is designed to resist horizontal shear to satisfy Eq. (16.4.5.1), the tie area to tie spacing ratio along the member shall approxi-

R16.4.5.2 The distribution of horizontal shear stresses along the contact surface in a composite member will reflect the distribution of shear along the member. Horizontal