CODE

18.10.3.1 The design shear force V_e shall be calculated by:

$$V_e = \Omega_v \omega_v V_u \le 3V_u \qquad (18.10.3.1)$$

where V_u, Ω_v, and ω_v are defined in 18.10.3.1.1, 18.10.3.1.2, and 18.10.3.1.3, respectively.

18.10.3.1.1 V_u is the shear force obtained from code lateral load analysis with factored load combinations.

18.10.3.1.2 Ω_v shall be in accordance with Table 18.10.3.1.2.

Table 18.10.3.1.2—Overstrength factor Ω_v at critical section

Condition	Ω_v	
$h_{wcs}/\ell_w > 1.5$	Greater of	M_{pr}/M_u[1]
		1.5[2]
$h_{wcs}/\ell_w \le 1.5$	1.0	

[1] For the load combination producing the largest value of Ω_v.

[2] Unless a more detailed analysis demonstrated a smaller value, but not less than 1.0.

18.10.3.1.3 For walls with $h_{wcs}/\ell_w < 2.0$, ω_v shall be taken as 1.0. Otherwise, ω_v shall be calculated as:

$$\omega_v = 0.9 + \frac{n_s}{10} \quad n_s \le 6$$
$$\omega_v = 1.3 + \frac{n_s}{30} \le 1.8 \quad n_s > 6 \qquad (18.10.3.1.3)$$

where n_s shall not be taken less than the quantity $0.00028h_{wcs}$.

COMMENTARY

R18.10.3.1 Design shears for structural walls are obtained from lateral load analysis with appropriate load factors increased to account for: (i) flexural overstrength at critical sections where yielding of longitudinal reinforcement is expected; and (ii) dynamic amplification due to higher mode effects, as illustrated in Fig. R18.10.3.1. The approach used to determine the amplified shear forces is similar to that used in New Zealand Standard 3101 (2006). Because M_n and M_{pr} depend on axial force, which varies for different load combinations, and loading direction for flanged and coupled walls, the condition producing the largest value of Ω_v should be used. Although the value of 1.5 in 18.10.3.1.2 is greater than the minimum value obtained for the governing load combination with a ϕ factor of 0.9 and a tensile stress of at least $1.25f_y$ in the longitudinal reinforcement, a value greater than 1.5 may be appropriate if provided longitudinal reinforcement exceeds that required. Dynamic amplification is not significant in walls with $h_w/\ell_w < 2$. A limit of $0.007h_{wcs}$ is imposed on n_s to account for buildings with large story heights. The application of Ω_V to V_u does not preclude the application of a redundancy factor if required by the general building code.