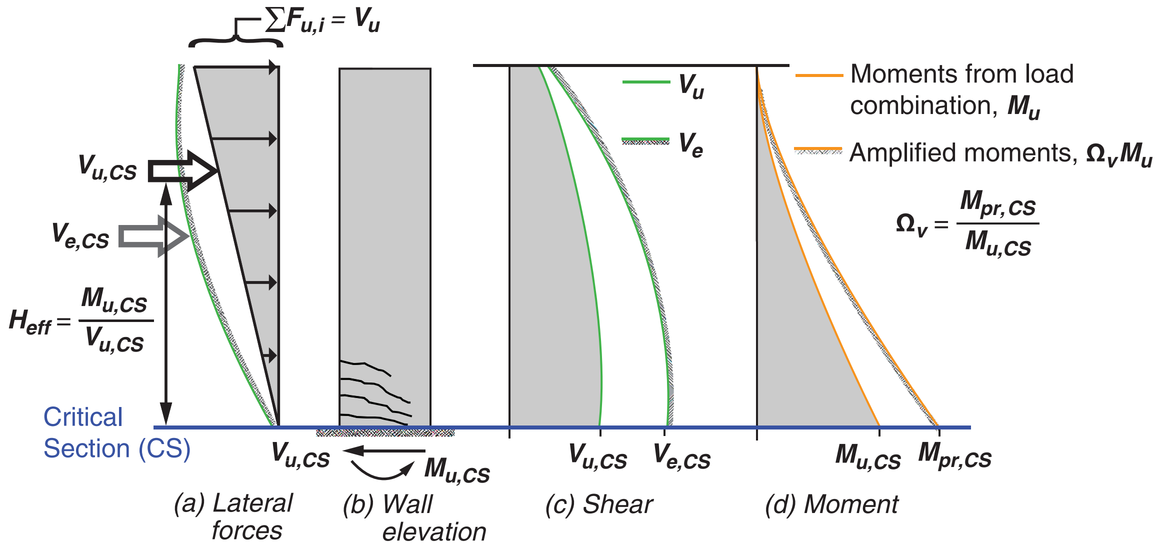

Fig. R18.10.3.1—Determination of shear demand for walls with $h_w/\ell_w \geq 2.0$ *(Moehle et al 2011).*

CODE

18.10.4 *Shear strength*

18.10.4.1 V_n shall be calculated by:

$$V_n = (\alpha_c \lambda \sqrt{f_c'} + \rho_t f_{yt}) A_{cv} \qquad (18.10.4.1)$$

where:
$\alpha_c = 0.25$ for $h_w/\ell_w \leq 1.5$
$\alpha_c = 0.17$ for $h_w/\ell_w \geq 2.0$
It shall be permitted to linearly interpolate the value of α_c between 0.25 and 0.17 for $1.5 < h_w/\ell_w < 2.0$.

18.10.4.2 In 18.10.4.1, the value of ratio h_w/ℓ_w used to calculate V_n for segments of a wall shall be the greater of the ratios for the entire wall and the segment of wall considered.

18.10.4.3 Walls shall have distributed shear reinforcement in two orthogonal directions in the plane of the wall. If h_w/ℓ_w does not exceed 2.0, reinforcement ratio ρ_ℓ shall be at least the reinforcement ratio ρ_t.

18.10.4.4 For all vertical wall segments sharing a common lateral force, V_n shall not be taken greater than $0.66\sqrt{f_c'}A_{cv}$. For any one of the individual vertical wall segments, V_n shall not be taken greater than $0.83\sqrt{f_c'}A_{cw}$, where A_{cw} is the area of concrete section of the individual vertical wall segment considered.

18.10.4.5 For horizontal wall segments and coupling beams, V_n shall not be taken greater than $0.83\sqrt{f_c'}A_{cv}$, where A_{cw} is the area of concrete section of a horizontal wall segment or coupling beam.

COMMENTARY

R18.10.4 *Shear strength*

Equation (18.10.4.1) recognizes the higher shear strength of walls with high shear-to-moment ratios (Hirosawa 1977; Joint ACI-ASCE Committee 326 1962; Barda et al. 1977). The nominal shear strength is given in terms of the gross area of the section resisting shear, A_{cv}. For a rectangular section without openings, the term A_{cv} refers to the gross area of the cross section rather than to the product of the width and the effective depth.

A vertical wall segment refers to a part of a wall bounded horizontally by openings or by an opening and an edge. For an isolated wall or a vertical wall segment, ρ_t refers to horizontal reinforcement and ρ_ℓ refers to vertical reinforcement.

The ratio h_w/ℓ_w may refer to overall dimensions of a wall, or of a segment of the wall bounded by two openings, or an opening and an edge. The intent of 18.10.4.2 is to make certain that any segment of a wall is not assigned a unit strength greater than that for the entire wall. However, a wall segment with a ratio of h_w/ℓ_w higher than that of the entire wall should be proportioned for the unit strength associated with the ratio h_w/ℓ_w based on the dimensions for that segment.

To restrain the inclined cracks effectively, reinforcement included in ρ_t and ρ_ℓ should be appropriately distributed along the length and height of the wall (refer to 18.10.4.3). Chord reinforcement provided near wall edges in concentrated amounts for resisting bending moment is not to be included in determining ρ_t and ρ_ℓ. Within practical limits, shear reinforcement distribution should be uniform and at a small spacing.

If the factored shear force at a given level in a structure is resisted by several walls or several vertical wall segments of a perforated wall, the average unit shear strength assumed for the total available cross-sectional area is limited to $0.66\sqrt{f_c'}$ with the additional requirement that the unit shear strength assigned to any single vertical wall segment does not exceed $0.83\sqrt{f_c'}$. The upper limit of strength to be assigned to any