Additive combinations:

Strength: $1.2D + 0.5L + 0.2S + 1.0E \leq \phi \times$ Strength
ASD: $1.0D + 0.75 \times (1.0L + 1.0S + \alpha E) \leq$ Allowable Stress and
$1.0D + \alpha E \leq$ Allowable Stress

Counteracting combinations:

Strength: $0.9D + 1.0E \leq \phi \times$ Strength
ASD: $0.6D + \alpha E \leq$ Allowable Stress

For any given material and limit state, the factor α depends on the central factor of safety between the strength and the allowable stress, the resistance factor ϕ, and ratios of the effects of the various loads. Table C11-1 summarizes several common cases of interest, including those where the designer opts to use the one-third increase in allowable stress permitted in various reference standards.

The bold entries indicate circumstances in which the 0.7 factor in the ASD equations will result in a structural capacity less than required by strength design. Given the current basis of the earthquake load provisions, such situations should be carefully considered in design. For wood, equivalency factors greater than 0.7 identify conservatism in wood LRFD) resistance values rather than potential overstress when using ASD.

The amplification for Method 2 is accomplished by the introduction of two sets of factors to amplify conventional allowable stresses to approximate the equivalent yield strength: one is a stress increase factor (1.7 for steel, 2.16 for wood, and 2.5 for masonry) and the second is a resistance or strength reduction factor (less than or equal to 1.0) that varies depending on the type of stress resultant and component. The 2.16 factor is selected for conformance with the new design standard for wood (*Load and Resistance Factor Standard for Engineered Wood Construction*, ASCE 16-95) and with an existing ASTM standard. It should not be taken to imply an accuracy level for earthquake engineering.

Although the modification factors just described accomplish a transformation of allowable stresses to the earthquake strength limit state, it is not conservative to ignore the provisions in the standard as well as the supplementary provisions in the appendix that deal

Table C11-1

		Ratio of Load Effects (Moment, Axial Load, Etc.) in the Load Combination Being Considered		Equivalency Factor
Structural Element and Limit State	ASD Rules	D/E	L/E	α
Steel girder; bending	per Section 2.4.1	0	0	0.67
		0.5	0.25	0.65
		1	0.5	0.48
Steel brace, tension	per Section 2.4.1	0	0	0.67
		1	0	0.67
Steel brace, compression	per Section 2.4.1	0.25	0.25	0.66
		0.5	0.5	0.45
Masonry wall, reinforcement for in-plane bending	per Section 2.4.1	0	0	0.50
		1.11	0	0.64
	1/3 increase per reference standard	0	0	0.67
		1.11	0	0.67
Masonry wall, in-plane shear (reinforced, with $M/Vd \geq 1$)	per 2.4.1	0	0	0.47
	1/3 increase per reference standard	0	0	0.63
Wood shear panel	per 2.4.1 (1/3 increase not permitted in reference standard)	0	0	0.63
Wood collector, tension		0	0	**0.74**
		–1	0	0.67
Bolts in wood		0	0	**0.74**
		0.25	0.5	0.70