determined. Where the maximum scaled base shear predicted by the analysis, V_i, is less than 85 percent of the value of V determined using the minimum value of C_s set forth in Eq. 12.8-5 or when located where S_1 is equal to or greater than 0.6g, the minimum value of C_s set forth in Eq. 12.8-6, the scaled member forces, Q_{Ei}, shall be additionally multiplied by $\frac{V}{Vi}$ where V is the minimum base shear that has been determined using the minimum value of C_s set forth in Eq. 12.8-5, or when located where S_1 is equal to or greater than 0.6g, the minimum value of C_s set forth in Eq. 12.8-6. Where the maximum scaled base shear predicted by the analysis, V_i, is less than $0.85C_sW$, where C_s is from Eq. 12.8-6, drifts shall be multiplied by $0.85\frac{C_sW}{V_i}$.

If at least seven ground motions are analyzed, the design member forces used in the load combinations of Section 12.4.2.1 and the design story drift used in the evaluation of drift in accordance with Section 12.12.1 are permitted to be taken respectively as the average of the scaled Q_{Ei} and Δ_i values determined from the analyses and scaled as indicated in the preceding text. If fewer than seven ground motions are analyzed, the design member forces and the design story drift shall be taken as the maximum value of the scaled Q_{Ei} and Δ_i values determined from the analyses.

Where this standard requires consideration of the seismic load effects including overstrength factor of Section 12.4.3, the value of $\Omega_0 Q_E$ need not be taken larger than the maximum of the unscaled value, Q_{Ei}, obtained from the analyses.

16.1.5 Horizontal Shear Distribution

The distribution of horizontal shear shall be in accordance with Section 12.8.4 except that amplification of torsion in accordance with Section 12.8.4.3 is not required where accidental torsion effects are included in the dynamic analysis model.

16.2 NONLINEAR RESPONSE HISTORY PROCEDURE

Where nonlinear response history procedure is performed the requirements of Section 16.2 shall be satisfied.

16.2.1 Analysis Requirements

A nonlinear response history analysis shall consist of an analysis of a mathematical model of the structure that directly accounts for the nonlinear hysteretic behavior of the structure's elements to determine its response through methods of numerical integration to suites of ground motion acceleration histories compatible with the design response spectrum for the site. The analysis shall be performed in accordance with this section. See Section 12.1.1 for limitations on the use of this procedure.

16.2.2 Modeling

A mathematical model of the structure shall be constructed that represents the spatial distribution of mass throughout the structure. The hysteretic behavior of elements shall be modeled consistent with suitable laboratory test data and shall account for all significant yielding, strength degradation, stiffness degradation, and hysteretic pinching indicated by such test data. Strength of elements shall be based on expected values considering material overstrength, strain hardening, and hysteretic strength degradation. Linear properties, consistent with the requirements of Section 12.7.3, are permitted to be used for those elements demonstrated by the analysis to remain within their linear range of response. The structure shall be assumed to have a fixed-base, or alternatively, it is permitted to use realistic assumptions with regard to the stiffness and load-carrying characteristics of the foundations consistent with site-specific soils data and rational principles of engineering mechanics.

For regular structures with independent orthogonal seismic force-resisting systems, independent 2-D models are permitted to be constructed to represent each system. For structures having a horizontal structural irregularity of Type 1a, 1b, 4, or 5 of Table 12.3-1 or structures without independent orthogonal systems, a 3-D model incorporating a minimum of three dynamic degrees of freedom consisting of translation in two orthogonal plan directions and torsional rotation about the vertical axis at each level of the structure shall be used. Where the diaphragms are not rigid compared to the vertical elements of the seismic force-resisting system, the model should include representation of the diaphragm's flexibility and such additional dynamic degrees of freedom as are required to account for the participation of the diaphragm in the structure's dynamic response.

16.2.3 Ground Motion and Other Loading

Ground motion shall conform to the requirements of Section 16.1.3. The structure shall be analyzed for the effects of these ground motions simultaneously with the effects of dead load in combination with not less than 25 percent of the required live loads.