if it is unlikely that the principal and companion loads will attain their maximum values at the same time. The load factor applied to T should not be taken as less than a value of 1.0.

If only limited data are available to define the magnitude and frequency distribution of the self-straining load, then its value must be estimated carefully. Estimating the uncertainty in the self-straining load may be complicated by variation of the material stiffness of the member or structure under consideration.

When checking the capacity of a structure or structural element to withstand the effects of self-straining loads, the following load combinations should be considered.

When using strength design:

$$1.2D + 1.2T + 0.5L$$
$$1.2D + 1.6L + 1.0T$$

These combinations are not all-inclusive, and judgment will be necessary in some situations. For example, where roof live loads or snow loads are significant and could conceivably occur simultaneously with self-straining loads, their effect should be included. The design should be based on the load combination causing the most unfavorable effect.

C2.3.6 Load Combinations for Nonspecified Loads

Engineers may wish to develop load criteria for strength design that are consistent with the requirements in this standard in some situations where the Standard provides no information on loads or load combinations. They also may wish to consider loading criteria for special situations, as required by the client in performance-based engineering (PBE) applications in accordance with Section 1.3.1.3. Groups responsible for strength design criteria for design of structural systems and elements may wish to develop resistance factors that are consistent with the Standard. Such load criteria should be developed using a standardized procedure to ensure that the resulting factored design loads and load combinations will lead to target reliabilities (or levels of performance) that can be benchmarked against the common load criteria in Section 2.3.2. Section 2.3.6 permits load combinations for strength design to be developed through a standardized method that is consistent with the methodology used to develop the basic combinations that appear in Section 2.3.2.

The load combination requirements in Section 2.3.2 and the resistance criteria for steel in the *AISC Specification* (2010), for structural concrete in ACI 318-05 (2005), for structural aluminum in the *Specification for Aluminum Structures* (2005), for engineered wood construction in *ANSI/AF&PA NDS-2005 National Design Specification for Wood Construction* and in *ASCE Standard 16-95* (1994), and for masonry in *TMS 402/ACI 530/ASCE 5, Building Code Requirements for Masonry Structures*, are based on modern concepts of structural reliability theory. In probability-based limit states design (PBLSD), the reliability is measured by a reliability index, β, which is related (approximately) to the limit state probability by $P_f = \Phi(-\beta)$. The approach taken in PBLSD was to

1. Determine a set of reliability objectives or benchmarks, expressed in terms of β, for a spectrum of traditional structural member designs involving steel, reinforced concrete, engineered wood, and masonry. Gravity load situations were emphasized in this calibration exercise, but wind and earthquake loads were considered as well. A group of experts from the material specifications participated in assessing the results of this calibration and selecting target reliabilities. The reliability benchmarks so identified are *not* the same for all limit states; if the failure mode is relatively ductile and consequences are not serious, β tends to be in the range 2.5 to 3.0, whereas if the failure mode is brittle and consequences are severe, β is 4.0 or more.
2. Determine a set of load and resistance factors that best meets the reliability objectives identified in (1) in an overall sense, considering the scope of structures that might be designed by this standard and the material specifications and codes that reference it.

The load combination requirements appearing in Section 2.3.2 used this approach. They are based on a "principal action–companion action" format, in which one load is taken at its maximum value while other loads are taken at their point-in-time values. Based on the comprehensive reliability analysis performed to support their development, it was found that these load factors are well approximated by

$$\gamma_Q = (\mu_Q/Q_n)(1 + \alpha_Q\beta V_Q) \qquad \text{(C2.3-1)}$$

in which μ_Q is the mean load, Q_n is the nominal load from other chapters in this standard, V_Q is the coefficient of variation in the load, β is the reliability index, and α_Q is a sensitivity coefficient that is approximately equal to 0.8 when Q is a principal action and 0.4 when Q is a companion action. This