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SEISMIC PERFORMANCE FACTORS FOR STAND-ALONE TIMBER FRAME STRUCTURES

by

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In Equation 5.3.1, R represents the recommended response modification factor, and B_I is a numerical coefficient outlined in Table 18.7-1 of ASCE 7-16 for effective damping, β_I, and period, T. For the analyses conducted, the effective damping was assumed to be 5%, which is typical for most building structures. Based on this effective damping, the numerical coefficient, B_I, was equal to 1.0. Therefore, the deflection amplification factor, C_d, is effectively equal to the response modification factor, R, at a value of 3.0. However, it may be argued that many stand-alone timber-framed structures do not include many of the non-structural components (mechanical, cladding, etc.) typical in most buildings, such that the effective damping of the structure is probably less ($\leq$ 2%) than the damping used in the analyses. Under these circumstances, the B_I factor would be decreased to 0.8, quantifying the use of a larger deflection amplification factor, C_d = 3.75 for design calculations. This C_d value is appropriate for use in design unless the individual structure design justifies a larger system effective damping. Given the uncertainty inherent in predicting the drift of wood systems, however, a C_d value of 4, as a minimum, is recommended.

5.4 Summary of Preliminary Values

This chapter has discussed the performance evaluation of the modeled archetypes and based on the results and analyses, preliminary seismic performance factors for one-story and two-story timber-framed structures with relatively light gravity loading, utilizing pegged knee-braces as the primary seismic force resisting system (SFRS) have been determined. Table 5.4.1 summarizes these values as well as current code values presented in ASCE 7-16.

Table 5.4.1 – Summary of final seismic performance factor recommendations

Factor	Current Code Provision	Recommendation
Response Modification - **R**	1 ½	**3**
System Overstrength - $\boldsymbol{\Omega_o}$	1 ½	**3**
Deflection Amplification - $\mathbf{C_d}$	1½	**4**