EXECUTIVE SUMMARY

This guide provides information on current best practices for earthquake-resistant house design and construction for use by builders, designers, code enforcement personnel, and potential homeowners. It incorporates lessons learned from the 1989 Loma Prieta and 1994 Northridge earthquakes as well as knowledge gained from the FEMA-funded CUREE-Caltech Woodframe Project. It also introduces and explains the effects of earthquake loads on one- and two-family detached houses and identifies the requirements of the 2003 *International Residential Code (IRC)* intended to resist these loads. The stated purpose of the *IRC* is to provide:

> . . . minimum requirements to safeguard the public safety, health, and general welfare, through affordability, structural strength, means of egress facilities, stability, sanitation, light and ventilation, energy conservation and safety to life and property from fire and other hazards attributed to the built environment.

Because the building code requirements are minimums, a house and its contents still may be damaged in an earthquake even if it was designed and built to comply with the code. Research has shown, however, that earthquake damage to a house can be reduced for a relatively small increase in construction cost. This guide identifies **above-code** techniques for improving earthquake performance and presents an estimate of their cost. Note that the information presented in this guide is not intended to replace the *IRC* or any applicable state or local building code, and the reader is urged to consult with the local building department before applying any of the guidance presented in this document.

The information presented in this guide applies only to one- and two-family detached houses constructed using the nonengineered prescriptive construction provisions of the *IRC*. Applicable *IRC* limits on building configuration and construction are described.

A typical model house is used to illustrate the concepts discussed and to identify approximate deflections under earthquake loading, which permits performance to be compared for various building configurations using the minimum code requirements and the **above-code** techniques. The **above-code** recommendations are based on an analysis of the model house as well as comparative tests performed by various researchers and the lessons learned from investigation of residential building performance in past earthquakes. A nonlinear time-history analysis was performed for the model building using the SAWS computer program developed as part of the CUREE-Caltech Woodframe Project (Folz and Filiatrault, 2002). Details of the analysis are presented in Appendix A.

Additional appendices feature checklists for builders, designers, and plan checkers; explain significant differences between the 2003 and 2006 editions of the *IRC*; and present a list of reference materials.