



Protecting Manufactured Homes from Floods and Other Hazards

A Multi-Hazard Foundation and Installation Guide

FEMA P-85, Second Edition / November 2009



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Preface

The Federal Emergency Management Agency (FEMA) first published *Manufactured Home Installation in Flood Hazard Areas* (FEMA 85) in 1985. Since then, manufactured homes have become better built, and natural hazards like flood, wind, and earthquake (seismic) events are better understood.

To benefit from the advances made in the last 24 years, FEMA 85 has been updated to reflect the requirements of the most current codes and standards and to provide a *best practices* approach in reducing damages from natural hazards. While the original version of FEMA 85 concentrated on flood and wind events, this version also addresses seismic hazards and recommends several multi-hazard resistant foundation designs. Designs are included for wood-framed foundations, conventional concrete and masonry pier foundations, and ground anchors. The ground anchor foundations are based on results from a series of first-of-its-kind saturated and dry soil anchor tests. The anchor tests were conducted with the support of the U.S. Department of Housing and Urban Development (HUD), the Manufactured Housing Institute (MHI), the Systems Building Research Alliance (SBRA, formerly the Manufactured Housing Research Alliance [MHRA]), and several ground anchor manufacturers. A detailed example showing step-by-step procedures on how to design a foundation for a manufactured home is also included.

This guidance is also valuable to designers of alternate foundations allowed by the HUD 24 CFR 3285 *Model Manufactured Home Installation Standards*, especially for homes located in Special Flood Hazard Areas (SFHAs) for which certain 24 CFR 3285 foundation designs are not applicable (24 CFR 3285.303, Table 1, Note 4, et al.).

The foundation designs discussed in Chapter 10 and shown in Appendix H of this guide are but one group of acceptable foundation solutions. They should not be considered mandatory or all inclusive. Alternative foundation systems, designed to resist equivalent loads and provide equivalent performance, should be considered equally acceptable.

Limitations of the Guide

This manual has been prepared to assist in protecting manufactured homes from floods and other hazards. Builders, installers, architects, and engineers using this guide assume responsibility for the resulting designs and the performance during a natural hazard event.

The foundation designs and analyses presented in the guide are based on load combinations contained in the American Society of Civil Engineers (ASCE 7-05) and the 2006 version of the International Residential Code® (IRC®).

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