

December 2000

NAHB Research Center

Whole House Tests in Australia Aimed at Advancing Wind & Earthquake Design Methods for U.S. Homes

A breakthrough in the efficient design of homes to resist wind and earthquake forces is close at hand, according to Jay Crandell, director of the Structures and Materials Division at the NAHB Research Center.

Study began a year ago on a U.S.-built, single-story, ranch-style home in Melbourne, Australia, to validate and refine a sophisticated computer model for the structural analysis of wood frame homes. "Ultimately we want to develop a simplified and accurate design method for use in the efficient design of homes to resist wind and earthquake forces," Crandell said.

In collaboration with the National Association of Home Builders (NAHB) and the U.S. Department of Housing and Urban Development, the Research Center has assembled a strong and experienced team, including CSIRO-Australia and North Carolina State University, "to give the most thorough treatment of load-distribution in a wood frame home ever," said Crandell.

The study was commissioned by NAHB because current engineering design methods for homes are not as efficient and accurate as is implied by their recognition in current building codes and design standards, according to Crandell. These design methods are frequently used in high-hazard areas of the U.S., such as the eastern coastline (hurricanes) and the West Coast (earthquakes). As suspected, the whole-building test data indicates that current design methods for determining loads on shear walls, the building's main resistance to collapse from wind or earthquake loads, can produce very erratic results—tending either to uneconomical or unsafe designs, depending on various factors. In many cases, the error for a single shear wall can be more than 50 percent in terms of the calculated design load, Crandell said.

Crandell pointed out that this finding is not necessarily recent news, as whole-building tests from more than 20 years ago yielded evidence that engineering design methods do not account for all of the redundant structural and non-structural systems in houses. In many cases, a house may actually exhibit more than twice as much strength against lateral loads from wind and earthquakes than predicted by current code-approved engineering methods.

"This type of observation has bewildered many researchers and has remained an uncomfortable mystery to code developers and engineers," Crandell said.

The study is one of many activities underway through NAHB's Housing Affordability Through Design Efficiency (HATDE) program. This program is aimed at conducting practical research

activities that support the development and implementation of innovative and efficient engineering principles and construction practices for reasonably affordable and safe housing in all hazard conditions.

A report on the initial phase of the research project is available through the NAHB Research Center's Online Bookstore at www.nahbrc.org. Look at the A-to-Z listing for Whole Structure Testing and Analysis of a Light-Frame Wood Building, Phase I - Test House Details and Preliminary Results. A final report and preliminary design procedure are expected by fall 2000.

The NAHB Research Center is the not-for-profit research arm of the National Association of Home Builders, and is located in Upper Marlboro, MD. In its nearly 40 years of service to the home building industry, the Research Center has provided product research and building process improvements that have been widely adopted by home builders in the United States. Through testing and certification services, the NAHB Research Center seal is recognized throughout the world as a mark of product quality and an assurance of product performance.

[SBC HOME PAGE](#)

Copyright © 2000 by Truss Publications, Inc. All rights reserved. For permission to reprint materials from SBC Magazine, call 608/310-6706 or email editor@sbcmag.info.

The mission of Structural Building Components Magazine (SBC) is to increase the knowledge of and to promote the common interests of those engaged in manufacturing and distributing of structural building components to ensure growth and continuity, and to be the information conduit by staying abreast of leading-edge issues. SBC will take a leadership role on behalf of the component industry in disseminating technical and marketplace information, and will maintain advisory committees consisting of the most knowledgeable professionals in the industry. The opinions expressed in SBC are those of the authors and those quoted solely, and are not necessarily the opinions of any of the affiliated associations (SBCC, WTCA, SCDA & STCA).