RESEARCH in Progress

Forest Products Laboratory

Understanding the Behavior of Mid-Rise Light-Frame Wood Buildings

Mid-rise wood-frame construction provides many benefits, ranging from rapid and economical construction to sustainable and resilient construction. A design philosophy recently developed in the NEESWood (Network for Earthquake Engineering and Simulation in mid-rise wood-frame construction) project enables this type of construction for six-story multi-family buildings in high seismic regions of the United States. In this project, such a building will be tested on the world's largest earthquake shake table in Miki, Japan. The building has over 14,000 ft^2 of living space in 23 units, with a total of 36 bedrooms.

First shipment recently delivered.

Background

The development of a new design philosophy is typically based on existing test data and experience. In this case, test data are completely lacking because buildings of this type and size typically do not exist, and practitioners and researchers have almost no related experience. Thus, the results of these tests will provide the first-ever data set on a mid-rise light-frame wood building subjected to a large earthquake.

Objective

The two major objectives of this research are (1) to demonstrate that a mid-rise light-frame wood building designed using the performance-based design approach of the NEESWood project performs as expected under a series of large three-dimensional earthquakes and (2) to examine how a mid-rise wood-frame building similar to the four-story buildings found in the western United States performs under large earthquake ground motion.

Approach

The research involves designing the building using the new design philosophy and developing detailed design drawings. Seventeen 8- by 8- by 40-ft shipping containers of wood and wood products are being shipped from the U.S. west coast to Osaka, Japan. The building will be constructed and instrumented by June 2009. FPL researchers are working closely with Colorado State University to optimize instrumentation and ensure that key measurements are gathered during testing.

Expected Outcomes

Results of this project will provide key information to the light-frame wood seismic design community for safely increasing the height of this type of construction in seismic zones of the United States. A new design philosophy for mid-rise light-frame wood buildings will likely be discussed for adoption.

Timeline

All U.S. products arrive in Japan	February 2009
Construction begins	February 2009
Framing complete	March 2009
Rough drywall complete	May 2009
Drywall finishing complete	June 2009

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Shake table in Japan with two full-scale Japanese houses.

Move to shake table	June 2009
Instrumentation complete	June 2009
Testing begins	June 2009
Final large test/media day	July 2009

Cooperators

Colorado State University
U.S. Forest Service, Forest Products Laboratory
Simpson Strong-Tie
Texas A&M University
University at Buffalo
Rensselaer Polytechnic Institute
University of Delaware
FPInnovations
Maui Homes USA

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