US Army Corps of Engineers®
Engineer Research and Development Center

Earthquake Engineering Research Program

Problem

In spite of major advances over the last 25 years, serious gaps still exist in the areas of earthquake hazard predictions, site characterization for seismically sensitive parameters, constitutive behavior and material properties of rock, soils, and composite (reinforced) materials under seismic loads, and the stress and deformation responses of sites and facilities to seismic loading. Economical remediation and defensive design techniques are needed, in addition to careful calibration of fast-advancing numerical methods to actual field performance.

Description of Research

The U.S. Army Corps of Engineers (USACE) funds a consistent research program, the Earthquake Engineering Research Program (EQEN), which is managed by the ERDC Geotechnical and Structures Laboratory (GSL). The research program objective is to reduce damage from a potentially devastating earthquake by advancing state-of-the-art knowledge of earthquake hazard assessment, seismic design, and remediation of Corps infrastructure and by developing technical capabilities to improve rapid Corps response to earthquake-induced life-threatening emergencies.

Expected Products

One of the basic problems to be solved by geotechnical engineers in regions where earthquake hazards exist is to estimate the site-specific dynamic response of a layered soil deposit under a level ground surface. This problem is commonly referred to as a site-specific response analysis or soil amplification study.

GSL researchers have developed and are continually enhancing the software called WESHAKE. This computer program has been used for more than 15 years to calculate site response for level-ground soil sites and has been applied to a number of USACE projects.

The original version of the software, designed for use on a personal computer, was obtained from the University of California at Berkeley around 1985. The current version, WESHAKE5, reflects the many changes that have been made to keep pace with state-of-the-art technology, to provide for needs of Corps users, and to provide a user-friendly interface. These adaptations facilitate transfer technology to, and widespread use among, USACE personnel.

The WESHAKE manual in HTML format and instructions for downloading the self-extracting zip file for the software are available online.

Potential Users

Primary users of EQEN technology are USACE Division and District geotechnical engineers in regions where earthquake hazards exist. Coordination is maintained with many national and international agencies and academic organizations.

Projected Benefits

This research is producing design tools and criteria that incorporate innovative measures for increasing the seismic safety of Corps and other public facilities.

ERDC Program Manager(s)

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