Seismic hazard and design spectra for Mexico

Luis Eduardo Pérez Rocha, Javier avilés López and Ulises mena Hernández
Instituto de Investigaciones Eléctricas, Cuernavaca Morelos, México

Keywords : Seismic design Spectrum, collapse-prevention, peak accelerations, site effects

Abstract

A new version of the seismic design chapter of the Manual of Civil Structures Design of CFE (CDS-MDOC-CFE) was released. One of the major changes in this new version (MDOC-2008) with respect to the previous one (MDOC-1993) is the concept of the seismic zonation. In the MDOC-93 code, Mexico was divided into four seismic zones, for which there were three different soil profile types: firm soils, transition soils, and soft soils. In the MOC-2008 code, seismic hazard in Mexico is defined as a continuum function where peak accelerations in rock are defined. These peak accelerations were obtained using an optimization design criterion for standard occupancy structures. All known earthquakes sources for the different regions of seismic risk in Mexico, as well as their maximum credible earthquake scenarios expected using updated information, were taken into account.

The elastic acceleration design spectrum for MDOC-2008 code is a direct consequence of deciding to define the seismic hazard as a continuum. This major conceptual change was made for the following reasons: (1) important progress has been made in the fields of seismology and seismicity, where more reliable information is available, (2) practicing engineers and researchers in Mexico often noted that the definition of seismic forces for design for different structures across Mexico cannot be done in a rational and transparent way using the collection of 12 design spectra in MDOC-93 because relevant information about site effects and structural dynamics are lost, unless site-specific design spectra were allowed for design, and (3) the rapid development in computer technology and its availability to practically anyone in the workplace now allows a new approach using user-friendly software to define the design spectrum for any given site, as planned for MDOC-2008.

The proposed elastic acceleration design spectrum is transparent as modification factors are defined exclusively in terms of the seismic hazard and site effects. Spectral amplifications and nonlinear effects due to the characteristics of the soil profile and its relation to the seismic intensity incidence are considered in site-effect modeling. A soil model based on a homogeneous layer with nonlinear behavior supported by an elastic half space was used for such purpose. There are several steps to define the elastic acceleration design spectrum for a given site for the collapse-prevention performance level. These steps will be discussed in this work.