

Recent Seismic Technology of Tokyo Electric Power Company

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Electric power system must be built to withstand various natural disasters, particularly earthquakes in Japan. Tokyo Electric Power Company (TEPCO) has continuously prepared for great earthquakes and carried out many studies concerning seismic design and earthquake countermeasures. In our software available at present, there exists 2 important codes, which have high practicality and are on the market. One is 'EQSMART' and the other is 'InfoRisk'.

EQSMART is developed with the high quality technology accumulated through the construction of nuclear power plants. They are useful in the design and analysis of important structures. EQSMART consists of seven subprograms which have specialized function; (1) Earthquake Search Program (selecting the earthquakes for design use with the database). (2) Spectrum Plotting Program (calculating the design spectra at the bedrock for a site). (3) Earthquake waveform Generating Program (calculating artificial earthquake waveforms based on the design spectra). (4) Soil Response Analysis Program. (5) Soil-Structure Interaction Analysis Program. (6) Structure Response Analysis Program. (7) Wave Analysis Program (providing various information concerning the earthquake waveform, for example response spectrum, Fourier spectrum, etc.)

InfoRisk is developed for the purpose of estimating earthquake damage comprehensively over a wide area. InfoRisk is based on seismology, seismic design research by TEPCO and Geographical Information System (GIS) technology. TEPCO uses this system in order to study effective countermeasures before earthquakes occur and to estimate the seismic damage immediately after an earthquake has struck. The core function of InfoRisk is simulating the spatial distribution of seismic ground motion intensities over the whole of TEPCO's service area and presenting them in a visually identifiable form. Databases on earthquakes such as historical earthquakes and active faults and on soil amplification factors are necessary to estimate ground motion intensities. And preparing databases of an optional study area, InfoRisk can estimate the earthquake damage of any area.

In addition to these two codes we have another topic of recent studies. We obtained excellent results for the estimation of long-period ground motion generated by a great earthquake. This methodology depends on source model and subsurface structure model that covers wide scope area. We adopt the characterized source model with two-dimensional fault plane. The characterized source model is the fruit of recent seismology and consists of asperity, which is the area of strong sticking, and back ground area. We use the three-dimensional sediment-filled basin model that causes the excitation of long-period ground motions. Wave propagation from the source is calculated using three-dimensional finite difference method. With this method the intensity of long-period ground motion of a great earthquake is obtained and we can estimate the response of long-period structures, such as an oil tank.