04 Apr 1995, 1:30 pm - 2:30 pm

General Report —Session VIII: Seismology: Predicting Strong Ground Motion for Design

Bagher Mohammadioun
France

D. M. Rosa
Switzerland

M. I. Todorouska
U.S.A.

Z. P. Liao
China

Proceedings: Third International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics
April 2-7, 1995; Volume III, St. Louis, Missouri

General Report - Session VIII
Seismology: Predicting Strong Ground Motion for Design

Bagher Mohammadioun
France

D.M. Rosa
Switzerland

M.I. Todorouska
U.S.A.

Z.P. Liao
China

Papers 8.04, 8.05, 8.06, and 8.11 provided a framework for discussion of the most important technical issues. They included the following:

1. Scaling of Ground Motion Parameters. Trifunac (Paper 8.05) showed why peak ground acceleration (PGA), the most commonly used parameter in seismic design, is insufficient by itself for most applications and that other physical factors (such as frequency, peak velocity (PGV), duration, aspects of wave propagation, and social factors (such as the design application), should also be incorporated into the design process.

2. Shape of the Design Response Spectrum. Todorovska (Paper 8.06) performed a parameter sensitivity study to determine the effect of physical parameters, such as soil, distance, magnitude, fault characteristics, etc. on the shape of the spectrum and concluded that the shape should be based on more than the local soil conditions, the typical approach in building codes. The simultaneous influence of all contributing parameters should be considered for realistic shapes and the calculation of a uniform hazard spectrum.

3. Variability of Ground Motion. Lubkowski and Pappin (Paper 8.04) pointed out the strong correlation of variability with attenuation. They suggested that the dispersion decreases with frequency, causing the hazard to increase for low frequencies.

4. Use of Small Earthquakes as Green's Functions to Simulate Large Events. Heuze and others (Paper 8.11) combined basic seismology (linearity) and geotechnical (non-linearity) engineering techniques to create a new method for predicting strong ground motion. They used data from small and large magnitude earthquakes recorded in 1992 at the Painters Street bridge in Rio Dell, California in their simulations.

Participants in the audience contributed their insights and experience on these four issues and expanded the scope of the discussion to include the following concepts:

1. Analysis. Be careful when scaling small earthquakes to simulate large events because their physical parameters may differ markedly (Pierre Yves Bard).

2. Data Acquisition. Collect all of the empirical data (such as aftershock measurements) you can (Les Youd).

3. Conservatism. Variability and lack of data force us to be reasonable, yet conservative in design. However, try not to accumulate the margins of safety at each step of the process (Greg Hempen).

4. Design Procedures. For ordinary buildings, a carefully thought out and well detailed design will usually compensate for lack of empirical data, or under conservatism (Mehmet Celebi).

5. Improvements in the State of Knowledge and State or Practice. The profession has a much better understanding of the geologic, seismological, and geotechnical aspects of ground motion and design than ten years ago (John Ferrito, Les Youd, and Andy Velez.sos).

Much remains to be learned about attenuation and PGV, however.