EARTHQUAKE OBSERVATION ON SOFT GROUND AND DATA ANALYSES

by

T. Noji[I] and M. Yokoyama[II]

The peculiar physical properties of soft ground are said to greatly increase amplitudes of incident seismic waves and damage suffered in great earthquakes in the past by structures built on such ground has been prominent. From such a viewpoint, the authors have been continuing earthquake observation at typical soft ground where alluvium has been thickly deposited. The observation site is located at ground developed by filling at the delta of a river facing Tokyo Bay and the thickness on the alluvium is approximately 60 m. Underground seismometers are set at three points, GL -1.0 m, -7.5 m and -66 m.

The earthquake records obtained are divided into two groups according to epicentral distances and magnitudes, and statistical analyses are performed. As a result, distinct amplification characteristics of the surface subsoil are obtained by means of averaging out power spectra and amplification ratios. These amplification characteristics have sharp peaks even at higher modes indicating that internal damping of the surface subsoil is unexpectedly small. Also, the acceleration amplitudes of observation results increase suddenly near the surface of the ground, as shown in Fig. 1, and this is found to be due to seismic waves independently showing multiple reflections within the layer of fill. This, along with the small damping of the ground in higher modes, presents a serious problem for lower buildings and wooden buildings.

Based on the travel times obtained from the observation results, a structural model of the surface subsoil is prepared and a comparison is made between theoretical analysis results according to the S-wave multiple reflection theory and amplification spectra in observation results. An example of the results is shown in Fig. 2. On the whole there is good agreement when Q is 30 or 3ω indicating that internal damping of the ground is small.

BIBLIOGRAPHY

Noji, T., Yokoyama, M., et al., "Earthquake Observation on Soft Ground", The Fourth Japan Earthquake Engineering Symposium, 1975.

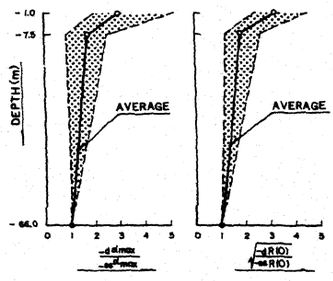

Fig.1

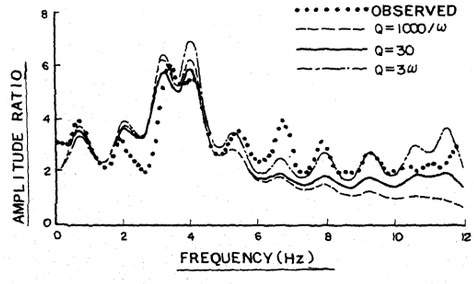

Fig.2

I. Research Engr., Technical Research Lab., Mitsui Construction Co., Ltd.
II. Deputy Director, Technical Research Lab., Mitsui Construction Co., Ltd.