



# **Study on Vibration Characteristics of a High-rise Building using results of Microtremor, Manpower Excitation Measurements, Earthquake Observations and Simulations of a 3D Moment-frame structure**

HOSHI Yukio <sup>1)</sup>, HISADA Yoshiaki <sup>2)</sup>, YAMASHITA Tetsuo <sup>3)</sup>,  
MASUZAWA Yoe <sup>4)</sup>, SHIMAMURA Kenta <sup>5)</sup>

- 1) Member, Hazama Corporation, M.Eng.  
(Ex- Graduate Student, Graduate School of Engineering, Kogakuin University)
- 2) Member, Prof., Department of Architecture, Kogakuin University, Dr.Eng.
- 3) Assoc Prof., Department of Architecture, Kogakuin University, Dr.Eng.
- 4) Member, Engineering & Risk Services Corporation, Dr.Eng.
- 5) Graduate Student, Graduate School of Engineering, Kogakuin University

## **ABSTRACT**

In the Tokyo metropolitan area, high-rise buildings will suffer strong ground motions in near future. In order to estimate damage of the buildings and to carry out counter measures for reducing the damage, it is necessary to know the accurate vibration characteristics of the buildings during the strong ground motions. The purpose of the paper is to investigate vibration characteristics of the Shinjuku Campus building of the 28th floors in Shinjuku, Tokyo, which is a steel structure of moment frames with 143 m height. First, we constructed a 3D moment frame model and compared vibration characteristics, such as the natural periods and the corresponding mode shapes, with those obtained by microtremors measurements and manpower excitations. We obtained excellent agreements between them. Second, we compared the observed building response during earthquakes with those of the simulations; we again obtained agreements.

**Key Words:** *High-rise building, Microtremor survey, Manpower excitation, Earthquake observation, Earthquake response analysis*