Department of Architecture and Civil Engineering

Department of Architecture and Civil Engineering	Key words	Damage prediction, Strong motion, Ground amplification, Liquefaction, Pile foundation analysis, Seismic isolated foundation, Earthquake simulation, 3D-finite element method, Seismic retrofitting

Doctor of Engineering / Professor

Yuji Miyamoto

Education

Department of architecture, Kyoto University
Graduate School of Science and Technology, Kobe University(Thesis Doctor)

Professional Background

Kajima Technical Research Institute, Kobori Research Complex, Kajima Corporation, Visiting Researcher, University of California, Davis, Lecturer(part-time), Tokyo University of Science, Lecturer(part-time), Disaster Prevention Research Institute Kyoto University, Professor of Osaka University, Professor Emeritus of Osaka University, AIJ Young Researcher Award 2006, AIJ Prize 2017

Consultations, Lectures, and Collaborative Research Themes

Earthquake and structure, Earthquake disaster prevention, New technique of response reduction of structure, Nonlinear pile foundation response

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Main research themes and their characteristics

「Investigation of seismic motions from epicenter to structures and earthquake countermeasures」

It is important to minimize the damage of each building that constitutes a city in order to become a resilient city that is resistant to earthquake disasters. Our research purposes are to predict the ground motions at construction sites, analyze how buildings behave due to the ground motions, and improve the earthquake resistance of buildings, cities, and regions for disaster prevention and mitigation. Looking back the past great earthquakes, it is recognized that it is important to make earthquake-resistant design more precise considering the construction site conditions and the propagation characteristics of seismic waves from the epicenter to the construction site.

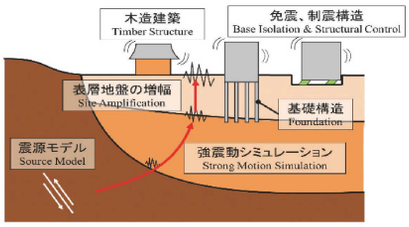
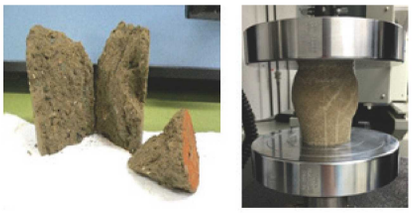


Fig.1 Investigation of ground motion and earthquake countermeasures

「Improvement of earthquake resistance of underground structures in extreme earthquakes」

Large-scale social infrastructures and pile foundations that support buildings are often built on soft ground. Therefore, when a large earthquake occurs, they are greatly damaged by ground failure, liquefaction and fault displacement, and become fatal for buildings. In addition, the development of earthquake-resistant technology for underground structures has been delayed compared to superstructure, and the seismic design is uneconomical. In order to rationally design structures on soft ground, we conduct both model experiments using the shaking table and three-dimensional nonlinear FEM analysis with the aim of clarifying the nonlinear behavior of pile foundation in extreme earthquakes. In addition, since the natural ground is brittle for deformation and lacks earthquake resistance, we study artificial improved ground itself and develop a foundation ground that is resistant to earthquakes. Its improved ground is a new composite ground material mixed with different materials of the polymer system, which has strength and deformation performance.



(Comparison of cemented soil and composite material)
Fig.2 Improvement of earthquake resistance of underground structure using new composite ground material

「Development of a new isolated foundation from ground to reduce earthquake response」

We are developing a structure that minimizes damage and maintains building functions against Nankai megathrust earthquake and near field earthquake that exceed the design level. There is a limit to suppressing the response deformation of the building due to even in seismic isolation and structural control. New developing foundation is isolated the foundation bottom from the ground by magnetism, and its surrounding is supported and stabilized by a displacement control material with toughness and high damping. At present, the effectiveness of insulating the foundation by the force of a magnet is confirmed using model tests by shaking table, and the applicability to a real house is being examined by analyses.

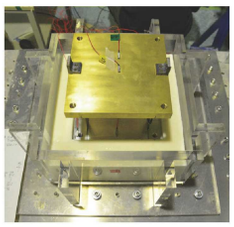


Fig.3 Development of new foundation isolated from ground to reduce earthquake response

Major academic publications

Miyamoto Y et al.: Earthquake Response of Pile Foundation in Nonlinear Liquefiable Soil Deposit. Journal of Structural and Construction Engineering, Architectural Institute of Japan, No.471, 41-50, 1995.5

Yuji Miyamoto et al.: A fundamental study on the earthquake response reduction of base-isolated foundation backfilled using an improved compound geomaterial, Japan Architectural Review, Architectural Institute of Japan, Volume 1-No.1, pp.56-66, 2018.1

Yuji Miyamoto et al.: Simulation Analysis of Response of Seismic Isolated Tsutenkaku Tower during the 2018 Osaka North Earthquake, Journal of Japan Association for Earthquake Engineering Volume(20) No.2, pp.79-89, 2020.2

Learn seismic vibration of building -From earthquake to base isolation and structural control-(Author and editor), Rikoh tosho, 2014.3