

Shimizu Geotechnical Centrifuge

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Owner: Shimizu institute of technology

Location: Koto-ku, Tokyo, Japan

Introduction

In Shimizu geotechnical laboratory, we conduct experiments related to ground and structures. The behavior of actual ground and structures can be simulated in small-scale models by applying centrifugal force. Using the centrifuge, we are able to simulate liquefaction, slope failure, and other ground-related disasters, and based on the test results, we develop countermeasures against them. We also work on the development of practical foundations such as piled raft foundations and soil improvement.



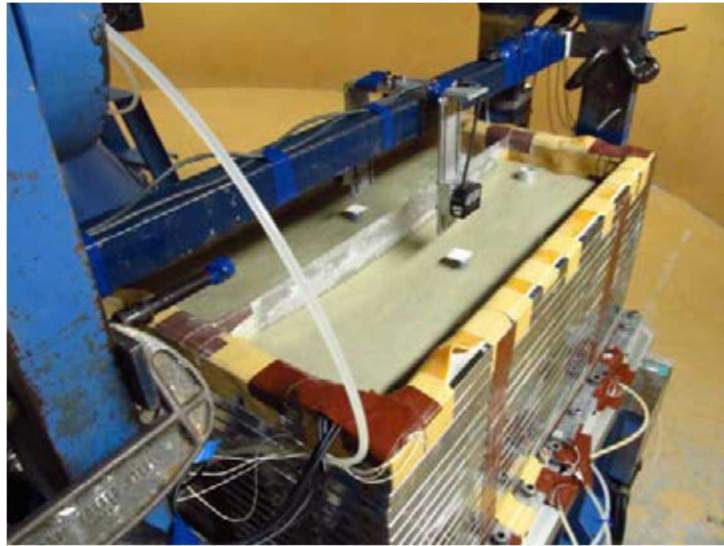
Shimizu Geotechnical Centrifuge

Key Technical Specifications

Beam Centrifuge	
Manufacturer	Seikensya
Year established	1991
Radius to base of platform	3.1m
Capacity	up to 100 G, payload capacity of 300 kg (shaking test)
Bucket area	1.15 m x 0.5 m
Major equipment	Shaking table Gate-type loading jack (50kN, 100kN, long stroke(300mm)) Rigid / laminar / observation soil container (box / cylinder) Measuring instruments (64ch) Image devices (Digital camera, etc.)

Laminar soil container on shaking table

The laminar soil container is used to simulate a ground behavior in earthquakes, which consists of laminated rectangular frames. Each frame is connected to both upper and lower frames by ball bearings, allowing the container to deform in shear.



(Nakai et al. 2015)

Observation soil container on centrifuge

The observation soil container is used to observe a ground behavior in soil-structure interaction experiments. The container has an observation window, through which photos are captured by a digital camera. Captured photos are processed by Digital Image Correlation (DIC), which visualize a ground displacements and strains.



(Kiryama et al. 2022)

Related paper

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S. Nakai, T. Sekiguchi, A. Ishikawa, H. Mano: A feasibility study of dewatering and recovering as a liquefaction countermeasure for existing residential areas, Proceedings of the Tenth Pacific Conference on Earthquake Engineering, Sydney, Australia, 2015.

N. Nigorikawa, Y. Asaka and M. Hasebe: Centrifuge model test on seismic behavior of sliding base isolation system by leveraging buoyancy for spread foundation structure, Journal of technical and design, Architectural Institute of Japan, 23(55), 851-856, 2017. (in Japanese)

K. Urabe, K. Tokimatsu, H. Suzuki and Y. Asaka: Effects of shaft and wing diameters of a wing pile on bearing capacity and pull-out resistance under alternately cyclic vertical loading, Journal of structural and construction engineering, Architectural Institute of Japan, 80(713), 1113-1122, 2015. (in Japanese)