

Building Foundation and Geotechnical Laboratory

Outlines

The Building Foundation and Geotechnical Laboratory is a facility for conducting experiments on foundation structures and soil mechanics. In the laboratory, we perform research and development activities to contribute keeping seismic structural and geotechnical safeties of building foundations from the viewpoint of property preservation and functional continuity of buildings.



Outer view of the laboratory

At the end of September 2020, we removed a shaking table with a large-scaled (10-m long x 3.6-m wide x 5-m depth) shear box and have then constructed a 3.5-m radius dynamic geotechnical centrifuge possessing a 1-m squares shaking table. Furthermore, we have a large-scaled triaxial cyclic loading test equipment, that can measure strength parameters of soils under realistic ground constrain conditions.

Research Contents

Our research topics mainly follows.

- (1) Damage to pile foundations during huge earthquakes and their structural performances
- (2) Design methods of building foundations against strong ground motions
- (3) Design methods of ground improvement for seismic strong motions and their application to the remained piles problems
- (4) Soil liquefaction at housing land
- (5) Seismic performances of housing land and retaining wall at slope

Facilities

(1) 3.5-m dynamic geotechnical centrifuge

Our 3.5-m centrifuge has been constructed to understand dynamic response characteristics and damage procedures of building foundations including soil-structure interaction effects during earthquakes and to develop remedial or preventive measures against structural and geotechnical earthquake disasters. The 1-m squares shaking table installed on the centrifuge can simultaneously be forced in both horizontal and vertical directions. Typical specification of the centrifuge system follows.

Loading capacity	100tG
Max. centrifugal acceleration	50G
Max. velocity of shaking table	100cm/s horizontally 30cm/s vertically
Max. acceleration of shaking table	50G horizontally 25G vertically

(G is gravity acceleration = 980cm/s²)



Outer view of the centrifuge



Test pit



1-m squares shaking table



Machine pit



Shear box for the centrifuge



Control room of the centrifuge

(2) Large-scaled triaxial cyclic loading test equipment

This equipment can reproduce natural confining state of soil at a maximum depth of about 20 m. Dynamic soil stress situation during earthquakes can be made by using the equipment, and the soil liquefaction test can also be performed. This apparatus is a pressure chamber in which a specimen having a diameter of 1.5 m and a height of 3 m is constructed. There are four tubes that get into the upperpart of the chamber, and some kinds of ground investigation tests can be conducted. The automatic management system enables us to adjust various test conditions such as cell pressure, axial loads, and backpressure. Typical specification of the equipment follows.



Max. cell pressure	0.6MN/m ²
Max. backpressure	0.2MN/m ²
Stroke	250mm

Max. axial load	2MN/m ²
Max. loading thrust	4MN
Max. loading speed	130mm/s