SKLGP Geotechnical Centrifuge Laboratory

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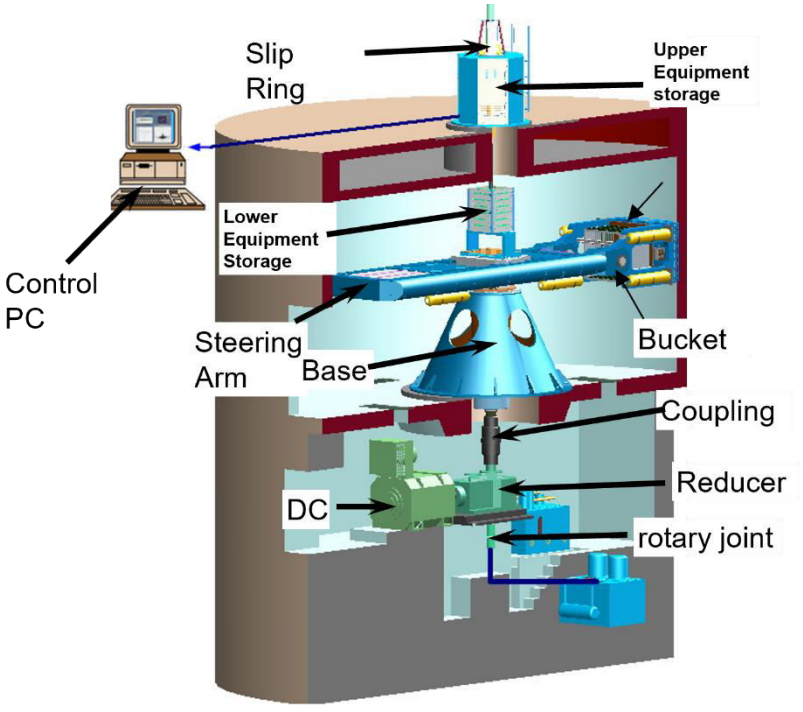
Location: Chengdu, China

Introduction

Geotechnical Centrifuge Model Test is to place the model, which is 1/n of the prototype, into the centrifuge apparatus, and experiment with it in the space of N times of "g" acceleration. Since the inertia force absolutely equals gravity, and high acceleration does not change the nature of engineering materials, which makes the stress and strain of models and prototypes equal, and similar in deformation, plastic zone development, and process of destruction, thus we can acquire the physical simulation techniques about the prototype's deformation and failure mechanism as well as the process. This system is more and more widely used because it can reproduce the self-weight stress field and the process of deformation related to the self-weight, reveal deformation and failure mechanisms in the way of direct viewing, and provide reliable parameters for other analytical approaches. TLJ—500 Geotechnical centrifuge machine is mainly combined with the centrifugal main engine, 900KW DC, reducer, digital speed regulation, acceleration measurement and control system, control panel, slip ring, measure system, TV monitoring system, model box, and manipulator (Controlled Tooling Systems, CTS).



3-D model of the TLJ-500 geotechnical centrifuge

Key Technical Spefications

Beam Centrifuge

Manufacturer	China Academy of Engineering Physics
Year established	2010 State Key Laboratory of Geo-hazard Prevention and Geo-environment protection (Chengdu University of Technology)
Radius to base of soil container	4.5 m
Capacity	500 gton (5 tons @100g, max G-level: 250g)
Bucket area	1.4m×1.5m×1.5m
Major equipment	The system of rainfall and water level variation The CTS system

The TLJ - 500 Geotechnical centrifuge

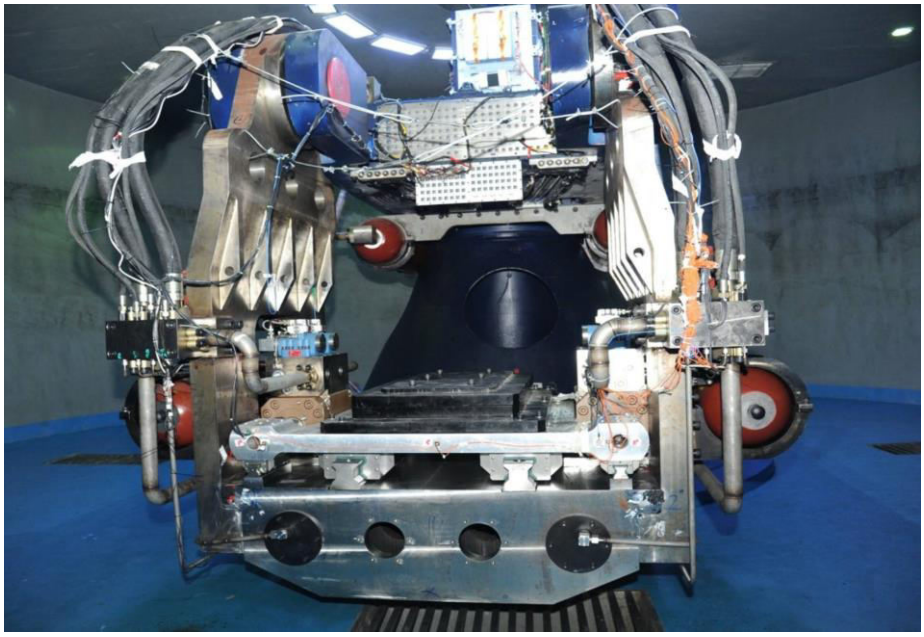
TLJ—500 Geotechnical centrifuge machine is mainly combined with the centrifugal main engine, 900KW DC, reducer, digital speed regulation, acceleration measurement and control system, control panel, slip ring, measure system, TV monitoring system, model box, and manipulator (Controlled Tooling Systems, CTS). With an effective diameter of 9 m, the centrifuge can be accelerated up to 250g carrying a payload of 2 tons (or equivalently 5 tons at 100g). Each swing has a platform of 1.4×1.5m, where the modelling box is placed. The TLJ—500 Geotechnical centrifuge Machine, installed and put into use in 2010, was developed from the joint research of the State Key Laboratory of Geo-hazard Prevention and Geo-environment protection (Chengdu University of Technology) and China Academy of Engineering Physics.

The centrifuge apparatus at SKLGP.

Earthquake Simulator

Earthquake simulator is designed for the TLJ-500 centrifuge. The earthquake simulator is capable of delivering horizontal seismic ground motions of any target waveform (including recorded and artificial motions) at up to 32 g peak ground acceleration on packages of up to 2t over a frequency range from 20 Hz to 350 Hz, at a maximum centrifugal acceleration of 100g. The maximum vibration speed is ± 0.75 m/s; the maximum vibration displacement is ± 5 mm. The model box adopts an alloy

aluminum assembled structure with high strength (the box deformation controlled within 2mm) and light weight (the weight less than 1 ton).



The earthquake simulator.

Main application areas

Modelling the deformation and failure process of geo-hazard, e.g. Landslide, thus studying its development law. Modelling the deformation and failure mechanism of geo-hazard, and researching the main factors that affect it. Verify the feasibility of disaster prevention engineering design. Simulate the characteristics of rock and soil under special conditions, for instance, slope stability in rainfall process, with the water level fluctuating; deformation and failure process during the underground chamber digging; pile-soil stress variation during the pile foundation construction engineering; deformation characteristics of high slope. Large bucket volume and modelling box, which can simulate large geological bodies.