USC Geotechnical Centrifuge Facility

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Website: Under Construction
Owner: Dept of Civil and Environmental Engineering, University of South Carolina (USC)
Location: Columbia, South Carolina, USA

Background

The USC centrifuge is a Genisco 1230-1 model designed and manufactured by Genisco systems. The centrifuge equipment was originally used by NASA and then relocated to the University of Maryland in 1982. The centrifuge device was transferred to and reinstalled at the USC geotechnical research facilities in 2011. In 2014-2017, the USC centrifuge facility was upgraded with a new drive system, a new rotary joint, and new data acquistion system. In 2018, a new earthquake simulator custom designed and built for the USC centrifuge was commissioned.

Key Technical Specifications

Beam Centrifuge	
Manufacturer	Genisco
Year established	2014 USC (1982 University of Maryland)
Radius to base of soil container	1.5 m
Capacity	15 g-ton (max G-level: 200g)
Bucket area	0.5 m x 0.5 m
Major equipment	Earthquake Simulator

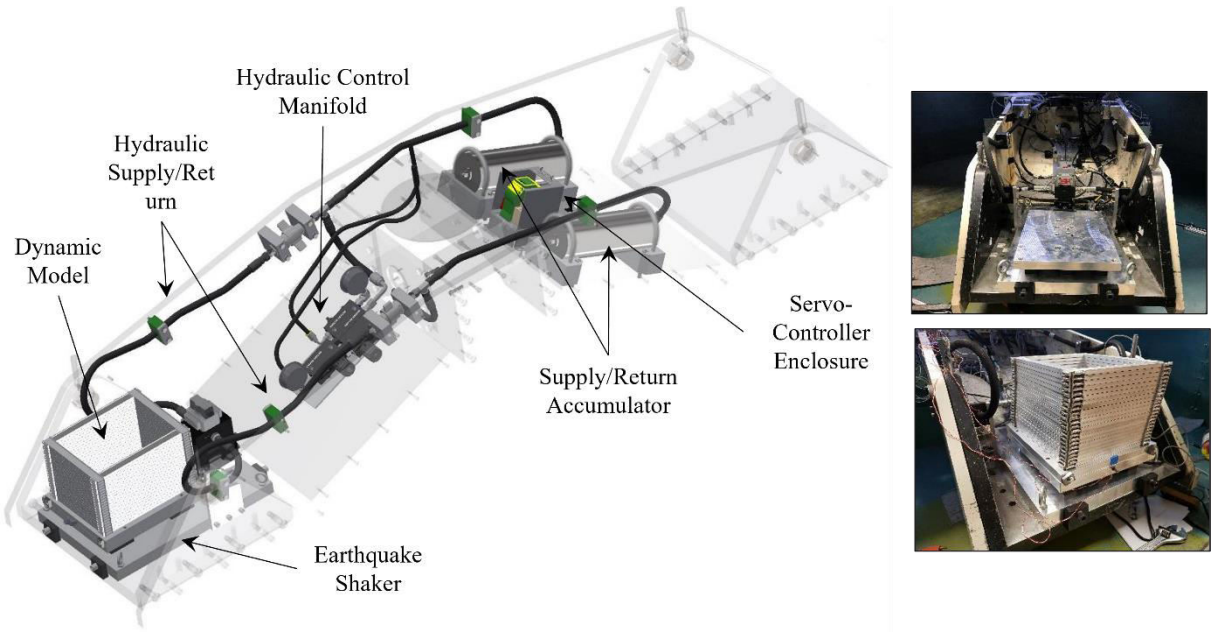
Centrifuge

The USC centrifgue has a symmetrical spinning design with two platforms that allows testing of two identical models at the same time. The system has a 1.5 meter radius arm and two platforms, each with 0.125 cubic meters usable volume (500 mm width x 500 mm length x 500 mm height). Each platform is rated at 15 g-ton capacity with an approximate payload mass of 136 kg at an acceleration of 100 g and 68 kg at 200 g. The centrifuge is housed inside a steel chamber with a bottom bearing. The driving system of the cetrifuge located underneath of the centrifuge is a 15-HP electrical motor. The centrifuge includes a fiber optic communication system, a 4-channel rotary joint capable of transmitting high pressure fluid and air, an in-flight onboard camera system, and a National Instruments data acquisition system., Testing is suppoted by a customized LabView data acquisition software, , miniature sensors, CPT and T-bar tools, an earthquake simulator, a laminar container, and various rigid containers.

USC geotechnical centrifuge refurbished and installed at University of South Carolina

Earthquake Simulator

Custom-designed for the USC centrifuge, the earthquake simulator is the ES-7-U manufactured by PVL technologies, Inc. It is capable of perform 1-D horizontal shaking of a model with a maximum capacity of of 12 kN and a maximum stroke of the slip-table of 12.7 mm at a frequency range between 0 and 200 Hz of any target waveform. The earthquake simulator can be operated at a maximum 75 centrifuge g level. Rigid and laminar containers have been designed for use with this shaker system. The dimensions of both containers are approixmatley 200 mm in width, 300 mm in length, and 200 mm in height.



Schematic and photos of the USC earthquake simulator and laminar container.