Center for Geotechnical Modeling at UC Davis

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Introduction

The CGM's scientific vision is that our 9-m and 1-m radius geotechnical centrifuges together provide the unique and versatile modeling capabilities required for realizing major scientific and engineering advances in our discipline's ability to predict and improve the performance of soil and soil-structure systems affected by earthquake, wave, wind and storm surge loadings. Centrifuges enable the use of scale models to accurately represent nonlinear, stress-dependent responses of soil masses that are many times larger than is possible on the world's largest 1-g shaking tables. Our centrifuge facilities enable the building of basic science knowledge; the validation of advanced computational models from the component to holistic system level; the validation of innovative mitigation strategies; and the integration of research, education, and outreach activities in the training of a broad and inclusive STEM workforce.

The 9-m radius centrifuge, with its many advanced technologies, has the largest radius of any centrifuge with a shake table worldwide. The 9-m centrifuge provides the unique ability to: (1) construct soil and soil-structure models with holistic system levels of complexity and (2) obtain measurements of complex local mechanisms through inverse analyses of data from dense instrumentation arrays, neither of which are possible on the smaller centrifuges typical throughout the world. The combined power of these capabilities has enabled major scientific and engineering advances for a number of soil and soil-structure systems.

The 1-m radius centrifuge complements the 9-m centrifuge by enabling high throughput of relatively simple (component-level) tests for exploring new ideas and rapid parametric studies. In addition, the 1-m centrifuge provides an effective and economical training ground for users to gain hands-on experience in centrifuge modeling.

The CGM seeks to improve the science of our users at the proposal, design, construction, testing, and interpretation stages through personalized guidance and technical support. We enable our users to integrate their research, education, and outreach activities to contribute to a globally engaged and diverse STEM work force, leverage partnerships between industry and academia, and improve the well-being of U.S. citizens through safer and improved management of infrastructure.

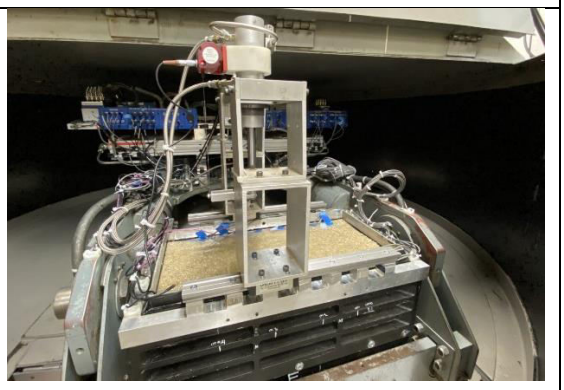
Key Technical Specifications

9m Beam Centrifuge	
Manufacturer	March Metal Works / NASA / UC Davis
Year established	1986
Radius to base of soil container	8.9 m
Maximum acceleration level	75 g
Usable mass capacity for model (exc. container & accessories)	1550 kg of soil plus structures
Capacity (total payload)	300 gton (4 tons @ 75g)
Container baseplate area	2.0 m x 1.0 m
Major equipment	Earthquake simulator 2DOF loading system (e.g., cone penetrometer)

1m Beam Centrifuge	
Manufacturer	Schaevitz Machine Works
Year established	1975 at UC Davis. Previously used at NASA from 1960.
Radius to base of soil container	1.0 m
Maximum acceleration level	100 g (speed limited by motor drive)
Usable mass capacity for model (exc. container & accessories)	55 kg of soil plus structures
Capacity (total payload)	10 gton (0.5 ton @ 100 g)
Container baseplate area	0.56 m x 0.28 m (shaker),
Major equipment	Earthquake simulator 1DOF loading system (e.g., cone penetrometer)

The Center for Geotechnical Modeling (CGM) at UC Davis provides users access to world-class geotechnical modeling facilities, including 9-m and 1-m radius centrifuges with shaking tables, to enable major advances in the ability to predict and improve the performance of soil and soil-structure systems affected by earthquake, wave, wind and storm surge loadings.

9m centrifuge: System level focus using complex boundary-value models with dense instrumentation and detailed realistic geometry.



1m centrifuge: Component level focused tests examining aspects of system with simplified geometries and limited instrumentation.