Levee modeling study to provide technical data for rebuilding New Orleans

February 21 2006

To provide essential data for the rebuilding of the ravaged levees in New Orleans, engineers from Rensselaer Polytechnic Institute will be studying small-scale models of sections of the flood-protection system. The researchers will replicate conditions during Hurricane Katrina by subjecting the models to flood loads, supplying important information to help the U.S. Army Corps of Engineers prepare the city for next hurricane season and beyond.

The researchers will build and test models of typical levee sections from several locations in New Orleans, including the 17th Street Canal and the London Avenue Canal.

As part of the Corps' Hurricane Katrina Interagency Performance Evaluation Task Force (IPET), the project will take advantage of the facilities at Rensselaer's Geotechnical Centrifuge Research Center, which is partially funded through the National Science Foundation (NSF). Two Rensselaer engineers will be leading the effort: Tarek Abdoun, principal investigator and associate professor of civil and environmental engineering; and Thomas Zimmie, professor and acting chair of civil and environmental engineering.

"In addition to studying the damaged structures in the aftermath of the hurricane, we also can model the conditions that were occurring during the storm," Abdoun says. "This will provide decision makers with the best scientific information available as they proceed with the rebuilding process."

Zimmie was a member of the NSF-funded team that investigated levee failures in the immediate wake of the storm. In the team's preliminary report, researchers noted that there was not one simple answer as to why the levees failed. The field observations suggested a number of possible causes, according to Zimmie.

At the 17th Street Canal, the foundation is a complex combination of peat and weak clays, which may have caused this levee's failure, Zimmie says. Likewise, at the London Avenue Canal, a section of fine sand under the levee might have been the culprit.

"Until all the physical evidence has been analyzed, we will not have a complete picture of what happened," Zimmie says. "The information we collect from these centrifuge models will provide some hard data to back up our preliminary observations, helping us to better understand how levees respond under extreme conditions."

Rensselaer's 150 g-ton centrifuge, which is one of only four of its kind in the country, has a large mechanical arm that can swing model structures around at 250 miles per hour, exerting forces real structures would face only at catastrophic moments.

"Suppose we want to test a levee that is 100 feet high," Abdoun says. "We can build a model that is only one foot high and then spin it around at 100 g, making it equivalent to a 100-foot-high levee. We can simulate all kinds of structures under just about any failure condition -- earthquakes, explosions, landslides -- and we can do it relatively fast at a very reasonable cost."

A system of advanced sensors will measure the response of the levees in both the vertical and horizontal planes, and cameras will be mounted around the models for visual observations.

The research at Rensselaer will be supplemented by modeling studies at the Army's Centrifuge Research Center in Vicksburg, Miss. The IPET final report, which is scheduled to be completed by June 1, will be validated by an external review panel from the American Society of Civil Engineers (ASCE). The National Academies has assembled a multidisciplinary, independent panel of acknowledged experts to review and synthesize the IPET and ASCE efforts. The National Academies panel will report its findings and recommendations directly to the Assistant Secretary of the Army for Civil Works in the summer of 2006.

Source: Rensselaer Polytechnic Institute

Citation: Levee modeling study to provide technical data for rebuilding New Orleans (2006, February 21) retrieved 19 April 2024 from https://phys.org/news/2006-02-levee-technical-rebuilding-orleans.html