

Charles Lee Powell Structural Systems Laboratory to be dedicated on May 4

April 28, 1986

The University of California, San Diego will become the nation's center for full-scale testing of earthquake resistance of buildings, bridges and other structures with the dedication of the \$4 million Charles Lee Powell Structural Systems Laboratory on May 4.

A key feature of the laboratory will be a 50-foot high concrete wall, called a reaction strong wall, to which structures as tall as five stories will be connected by up to 15 hydraulic actuators, similar to car jacks.

The testing process involves subjecting the structure to simulated earthquakes generated by computer models linked to the actuators and programmed on the San Diego Supercomputer located on campus near the lab.

"With our lab we can actually get the behavior of the building as it reacts to a simulated earthquake over time. That is the key point," said Frieder Seible, assistant professor of structural engineering and co-principal investigator of the project. "This type of information is extremely difficult to obtain from scaled-down model tests."

According to Seible, the system acts as a loop. A simulated earthquake is generated from a model in the supercomputer, and the effects of that quake are observed on an actual structure built in the laboratory. Researchers can observe cracks or other damage to the structure as they occur during the quake, and this data is fed back into the computer model of the building. This new data helps refine and improve the computer model of structural behavior.

"The kind of large-scale testing we will be able to do here just can't be done in this country right now," said Dr. Gil Hegemier, professor of applied mechanics and engineering sciences and director of the laboratory. "To find a similar facility, one has to go all the way to Tsukuba City in Japan.

"The reason we're excited is that this will be the first time in this country that there will be full-scale testing of buildings up to five stories tall," Hegemier said.

Although Hegemier and Seible will be testing buildings, they will also be testing the accuracy of computer modeling of structural behavior during an earthquake.

In the past, engineers could test for potential structural damage by either building a scale model of a building and subjecting it to earthquake-like movements, or by modeling the building on a computer. But, neither alternative is as accurate as testing a full-scale structure.

"We have very little data to go on to tell us whether our theoretical computer modeling is doing the job or not," said Hegemier. "These big tests are intended to validate our theoretical procedures. The question is: how are these simulation models doing? Are they doing a good job or are they totally off the mark?"

"Structural engineers might disagree how a building or a bridge might perform under certain circumstances, but after you do a full-scale test, that disagreement is reduced to a minimum," he said.

Tests to be conducted upon completion of the laboratory range from simulated earthquake loadings of full-scale reinforced concrete masonry wall panels, wall floor connections and five story test structures, to the traffic, overload and failure behavior of bridge components such as freeway over-passes.

The Charles Lee Powell Foundation of San Diego contributed \$1 million toward construction of the lab, the National Science Foundation added another \$835,000 and the University of California contributed \$165,000. Other funding sources for outfitting the laboratory are being sought, and gifts have already been received from four San Diego businesses: The Daley Corp., H.G. Fenton Construction Co., James R. Libby of James R. Libby and Associates, and Fontana Steel Corp.

Powell was a Los Angeles engineer who died in 1959 at the age of 96. He left the bulk of his large estate to create the foundation for the furtherance of education in the engineering and scientific fields.

Media Contact: Paul Lowenberg, 452-3120

(April 28, 1986)