

## LETTER FROM MEXICO CITY



# Temblors in the lab

**Mexico's National  
University has an  
earthquake simulator  
that is drawing  
international attention**

by Emil Zubryn

**M**exican engineers claim useful theoretical and practical results from an earthquake test station recently installed at the National University in the capital. Although not the only quake simulator in the world, the Mexican installation is attracting engineers from abroad as well as all over the country, to try out at scale-model size what could happen to their building projects in a real earth-shaker.

According to Jorge Prince, head of the research project, the ability to produce quakes of varying intensities and to study these electronically, as well as gauge effects on construction, has had success in practical applications.

A scale model of the El Infiernillo dam, tested at the earthquake factory, showed how the gigantic original would react in the event of a quake.

Researchers also submitted to test a model of the submarine tunnel which will link the cities of San Francisco and Oakland. And Mexican researchers are also working with the Massachusetts Institute of Technology to gauge the effects a quake would have on heavy construction equipment moving over a soft subsoil such as that of Mexico City.

Practical studies of theories which cannot be handled any other way, or proven, have also been undertaken. One of these is the testing of the new foundation created by engineer Manuel Gonzales Flores, who proposes that buildings be constructed over mattresses of steel balls, so that in the event of a quake the rolling of the balls would act as an isolating and correcting agent that would permit the threatened building to stand.

"I gave a lot of thought to isolating the building from the ground," explains Gonzales Flores, who, in 1965, was awarded the Mexican National Engineering Award for his anti-quake building foundation research, "and while the best way of course would be to somehow hang the building from the sky, this is impossible.

"So the next best thing was to concentrate on a cushion arrangement, which my huge ballbearing sandwiches, making up the steel mattress framework, achieve. Buildings built with this system still rest on the ground, even joined with the earth, but the ballbearing sandwich isolates the structure from earth movements."

In tests of this system at the quake factory, in a series of 50 quakes of varying intensities, it stood up perfectly, resisting shocks up to grade 7 on the Richter scale.

Although the technique has shown some instability in high winds, it is being put to practical test in several buildings now under construction.

The anti-quake research in Mexico was born of the tremendous scare of the heavy July 28, 1967 quake, which damaged buildings, toppled the Angel Monument on Avenida Reforma, and took 54 lives.

The quake simulator is a cement platform approximately 25 yards square, with steel wheels attached to the underpart running on rails. On one side there is a propelling motor, and on the other a spring which returns the platform to its original position. Horizontal movement can be increased to any desired intensity. The platform has no vertical movement.

On the platform the research scientists simulate, by various mixtures, soil conditions of the city or spot to undergo study. On this artificial soil scale models of buildings or structures undergoing study are erected. Then the apparatus is set off and precision registers determine the behavior of the original in similar conditions.

The Mexican experiments have aroused interest in the U.S. and the Engineering Institute has been visited by engineers constructing the San Francisco-Oakland tunnel, for a full test of the project. The platform in this instance was covered with clay, water and other materials, simulating the mud covering the bed of San Francisco Bay, over which the tunnel will be laid. A scale reproduction of the tunnel was placed on top of the muddy substance, and then quakes of various intensities induced. The final decision was that the project will resist "a reasonably heavy earthquake."

Apart from the studies to devise anti-quake systems at the factory, Mexican scientists are also working on theories designed to avoid quakes. One theory holds that if it were possible to pinpoint the moment in which subterranean pressures are building up, perhaps it might be possible to explode an atomic bomb in the subsoil to shake up the earth crust and thus foil the imminent quake.

"We have still a long way to go in this direction, however," admits Prince. "But the idea of a shock treatment of this nature to offset a damaging readjustment of the earth's crust has challenging possibilities for researchers even if the mechanics are beyond us, not to say the possible dangers of damage set off by the counter-quake atomic blast itself."