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## Smart Buildings

A NEW type of building construction uses special technology to absorb vibrations that occur in earthquakes or extreme weather. To build such buildings in the past, engineers and architects teamed up to design massive structures that could withstand the seismic impact of an earthquake, gale-force wind, or hurricane. Today, building designers arc using an entirely new approach, and the resulting buildings are called "smart buildings." In what way are they smart? The are built to react to the motion caused by an earthquake or other phenomenon.

Under stress from high winds or the rolling of an earthquake, these buildings "sense" the problem and take action to return the structure to balance. To understand what the building is doing, imagine an Olympic ice skater during a routine. Skaters make all of those amazing moves without falling down by controlling the motion of their muscles. These new buildings use old construction techniques and sensors and computers to accomplish a similar balancing act.

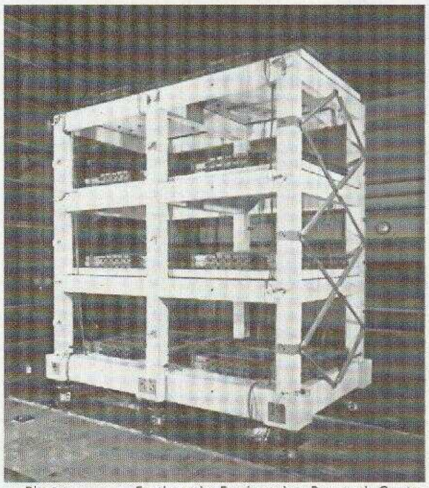

Photo courtesy Earthquake Engineering Research Center

**Building model on shake table**

In one system, cables with very large counterweights run the length of the building. Another system uses flexible cables and braces. Both of these systems canbe activated to counteract changing building stress. When the building starts to shake, computer sensors relay information to the cable systems. The cables and weights begin a controlled motion to counteract (he movement ofthebuilding. )ust as a skater moves muscles to counteract force, the building cables counteract the force of the quake or storm.

In another system, water- or air-powered jet thrusters work in place of the cables. In all of these systems, sensors throughout the stress points of the building constantly send data about building stress to the central computer, which then determines when to engage counterforces.

The Kyobashi Seiwa building in Tokyo was built using smart building technology seven years ago. The 11-story building looks like any other glass and steel structure. Who would know that the building has a computer prepared to tell it when to counteract stress forces?

The accompanying photo shows the largest of the shake tables in the Earthquake Engineering Research Center at the University of California-Berkeley. The test model on the table—the Shimizu building in Japan—is a conventional structure under student research. The shake table's digital controller can simulate the motion of earthquakes that have occurred or simulate new ones. Models on this table can be 40' high and weigh up to 140,000 lbs.

Students can get more information on earthquake engineering through the Internet. A good place to start is the home page of the Earthquake Engineering Research Center at http://www.eerc.berkeley.edu.

### Recalling the Facts

1. What is a smart building?
2. Describe three active systems for counteracting seismic stress.
3. Explain how information gets from an area under stress to a smart building's counteracting system. TD

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