Learning from Earthquakes

EERI LFE Team on Bhuj Recovery Issues

Recognizing that the recovery phase holds many important observations and lessons for the global earthquake engineering community, EERI's Learning from Earthquakes Committee has initiated the first in a series of reconnaissance missions focusing on observations of the post-earthquake recovery process. A multidisciplinary team was asked to investigate rebuilding following the Bhuj, India, earthquake of January 2001. Taking advantage of a small invitational workshop held last month by the government of Gujarat on earthquake reconstruction practices in several countries, a team was put together under the leadership of C. V. R. Murty, professor of structural engineering at the Indian Institute of Technology (IIT), Kanpur. Team members included Marjorie Greene, EERI (urban planner); Sudhir K. Jain, IIT Kanpur (structural engineer); Vipul V. Mehta, Bhuj (consulting structural engineer); and N. Purendra Prasad, University of Hyderabad (social anthropologist). Team members included those familiar with earthquake engineering in India as well as the government of Maharashtra's rebuilding experience.

The reconstruction program for this earthquake holds many important lessons for the United States as well as other countries, particularly with regard to the management of a large rebuilding effort spread over a vast geographic area. An emphasis on mitigation and future disaster preparedness, advances in the use of information technology, innovative planning techniques for rebuilding in urban areas, and creative strategies for involving citizens in their rebuilding are among the relevant lessons emerging from this earthquake.

The 2001 Bhuj, India, earthquake was a devastating event, causing over 13,800 deaths and 167,000 injuries, the loss or damage to 1.2 million housing units and over $4 billion in property losses. The scope and breadth of the reconstruction program are staggering. The government of the state of Gujarat quickly set up the Gujarat State Disaster Management Authority (GSDMA), with direct control over the entire rebuilding program and an explicit mandate to promote long-term disaster mitigation during the recovery phase and into the future. The GSDMA has supported the rebuilding of over 200,000 housing units and the repair of another 900,000. In most cases, owners have participated actively in the rebuilding, assisting in the design and construction of their homes. In 20% of the cases, partnerships between nongovernmental organizations and the government have rebuilt the housing. Little construction work has been done by government agencies themselves. Over 1,000 materials banks were established to supply cement and steel at subsidized prices. The GSDMA has brought in technical assistance to help in the rebuilding process, focusing in particular on promoting earthquake-resistant technology by providing training to almost 30,000 masons and 6,200 engineers. Much of this information can be tracked on the GSDMA web site, where many statistics and other background documents for the project are available (**www.gsdma.org**).

Four towns with substantial damage in the earthquake are developing new town and development plans that will include adjusting property lines and developing a more accessible road system. Even while facing pressures to rebuild quickly, the government is taking the additional time needed to develop these plans in a thoughtful manner. A pilot project has been developed in Bhuj to allow citizens access to information on the earthquake rehabilitation process through interactive computers at several kiosks around the city. A major change in India is taking place in giving greater priority to seismic safety on the national agenda. The central government, the government of Gujarat, and the academic and practicing engineering communities are beginning discussions that will result in higher standards of seismic safety and changes in codes and practice. Social science academics are stimulating discussion on models of disaster recovery and the relationship between earthquake recovery and ongoing development.

A full report from the reconnaissance team documenting its observations on this major reconstruction program will be available in a few months and sent to all EERI members. Further information can be obtained by contacting EERI's LFE Program Manager Marjorie Greene at **mgreene@eeri.org**.

8.3 Earthquake near Hokkaido

The following report was provided by Professor Scott Ashford of the Department of Structural Engineering at the University of California, San Diego. He was joined by his Ph.D. student, Yohsuke Kawamata, who is associated with Japan's Port and Airport Research Institute (PARI). Their trip, consisting of five days on the ground and covering 1,200 km, was funded by EERI's Learning from Earthquakes Program.

A magnitude 8.3 shallow earthquake struck at 4:50 a.m. local time Friday, September 26, 2003, about 60 km offshore from Hokkaido, Japan. The closest city to the epicenter (41.827 N, 143.83 E, depth of focus 33 km) was the port of Tokachi. The focal mechanism and preliminary location of this earthquake indicate that it resulted from thrust faulting on the plate interface between the overriding North American plate (which extends into the northeast corner

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