EARTHQUAKE ENGINEERING RESEARCH INSTITUTE

NEWSLETTER

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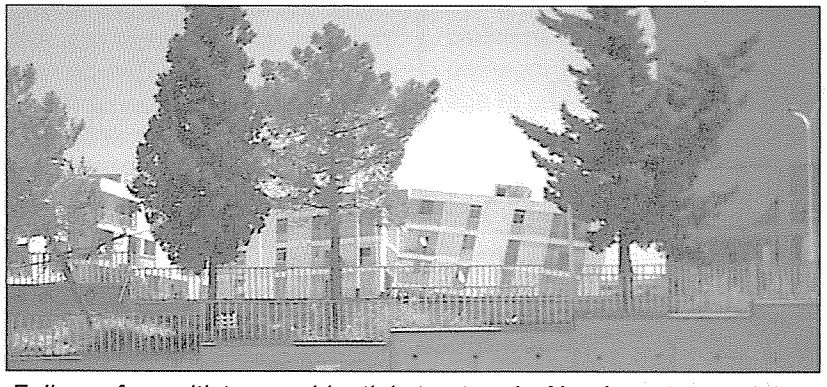
News of the Profession

Algeria Hit by Earthquake on May 21, 2003

At 7:44 p.m. local time on Wednesday, May 21, 2003, a magnitude 6.8 earthquake shook northeastern Algeria, severely damaging the city of Boumerdes (about 60 km east of Algiers), the capital city of Algiers, and a number of small cities in between. The damage also affected several municipalities to the south of the epicenter, which was 10.0 kilometers deep and located at 36.90 N 3.71 E. The event was felt as far away as Monaco and southwestern Spain. A tsunami generated with an estimated wave height of 2 m caused damage to boats and underwater telephone cables off the Balearic Islands, Spain.



Failure of a multistory residential structure in Algeria (photo courtesy of Michel Sandrin).

Under the auspices of EERI's National Science Foundation-funded Learning from Earthquakes program, EERI member Fouad Bendimerad of Risk Management Solutions in Newark, California, is leading an EERI reconnaissance team surveying the damage. Other team members are Omar Khemici of EQECAT in Oakland, California; Allaoua Kartoum of Folsom, California; D.J. Belarbi of the University of Missouri at Rolla; and Jelena Pantelic of the World Bank in Washington, D.C. The team will investigate structural and lifeline performance, emergency response, and other public policy concerns.

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Earthquake off Japan Coast on May 26, 2003

The following report was provided by Professor Masato Motosaka of the Earthquake Disaster Research Laboratory, Tohoku University. He is secretary of the Disaster Committee of the Architectural Institute of Japan.

At 6:24 p.m. local time on Monday, May 26, 2003, a magnitude 7.0 earthquake struck northeastern Japan and rocked buildings as far away as Tokyo, about 450 km to the south. The epicenter, which was 71 kilometers below the sea floor, was located 38.8 N 141.68 E off the coast of northern Miyagi Prefecture. The Pacific plate and Eurasian plates are converging in this region, and the Pacific plate subducts west beneath the northeastern Japan island arc at about 80 mm per year. This was a typical intraplate earthquake that resulted from the release of compressional stresses within the Pacific plate.

The earthquake seriously injured 23 people and slightly injured 148. There were no deaths reported. There was only slight damage to structures and

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Algeria Earthquake

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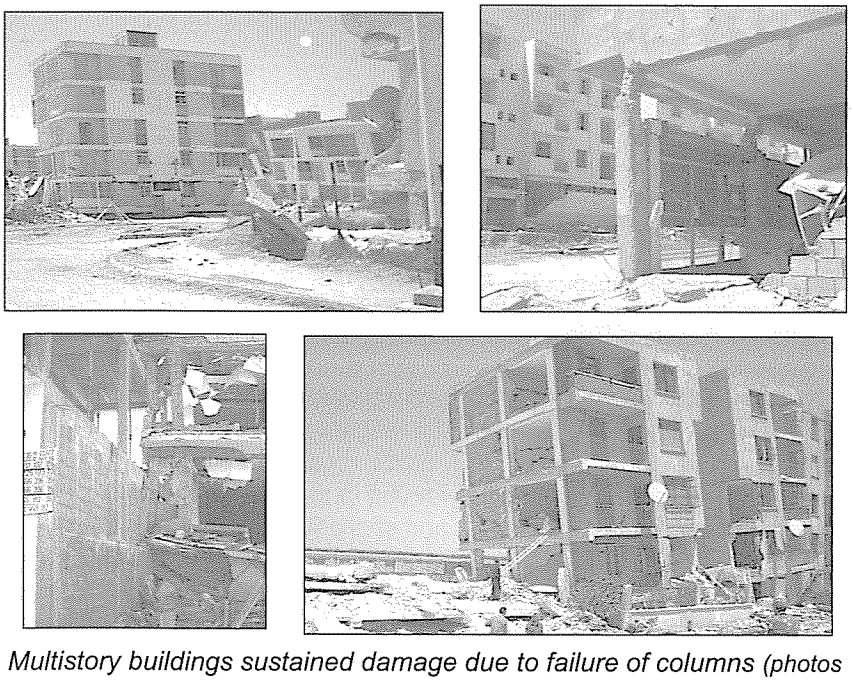
A preliminary report will be issued in a future *Newsletter.*

The earthquake occurred in the boundary region between the Eurasian plate and the African plate. Along this section of the boundary, the African plate is moving northwestward against the Eurasian plate at about 6 mm per year, creating a compressional tectonic environment. Analysis of seismic waves generated by this earthquake shows that it resulted from thrust-faulting.

As of June 4, 2003, 2,266 people were confirmed dead, about 1,200 missing, and about 10,000 injured. The earthquake left approximately 100,000 people homeless and seeking refuge in tents and improvised shelters. While the exact economic cost of this disaster is difficult to assess at this time, it is close to US$2 billion. The Council of Ministers of the Algerian Government was reported to have allocated US$1.8 billion for the reconstruction of the affected areas. It is expected that international finance organizations may be officially contacted for loan assistance to cover the cost of recovery. The most seriously affected sector is housing, followed by health and education. Transportation, energy, telecommunications, water, and sanitation have also been affected, but to a lesser degree.

Up to 60 buildings are believed to have collapsed in Algiers. The tragedy of this earthquake was the failure of multistory apartment buildings (usually up to six stories high, including the ground floor). They are rental apartment buildings, built by the state, cooperatives (similar to condominiums), and privately built and owned houses. Structurally, the most frequent failure occurred to reinforced concrete frames with hollow brick infill walls, with complete collapse of ground floors supporting the heavy loads of the buildings above. While the quality of soil (mostly alluvium in the vicinity of the seashore and in the dry beds of numerous old creeks and small rivers that cover the area) definitely contributed to the structural behavior of buildings, poor building materials, inadequate detailing, and apparently a lack of proper supervision appear to be the main causes.



Multistory buildings sustained damage due to failure of columns (photos courtesy of Michel Sandrin).

Japan Earthquake

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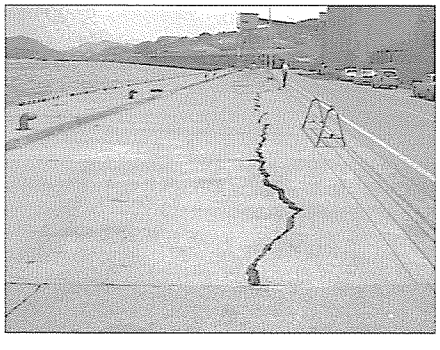
lifelines in spite of high PGA values (1.1g at MYG011, 1.0g at IWT007) and high seismic intensity (about IX on the MMI scale). The acceleration time history and damped pseudo-velocity response spectra of ground accelerations show that this earthquake mainly generated high-frequency waves. The resulting ground motion was not powerful enough to cause moderate or major structural damage. The most common damage to concrete buildings was minor shear cracks in walls and columns, especially in old buildings. The earthquake caused four fires, broke water pipes, and disrupted the local telephone network.

Also observed were some large cracks in roads, several landslides, and rock and debris falls. Damage occurred from foundation settlement and liquefaction. There was also interior and exterior nonstructural damage, including damage in many cemeteries. A typical failure was tombstone rotation or toppling. The economic loss is estimated at US$97.3 million. The Tohoku Earthquake Disaster Investigation Committee will investigate ground motion, performance of buildings and lifelines, injuries, and damage to historical buildings. A link to Motosaka's full report can be found at EERI's home page at **www.eeri.org.**



Damage caused by foundation settlement in Ofunato (photo courtesy of National Research Institute for Earth Science and Disaster Prevention).