

Learning from Earthquakes

The Southern Turkey Earthquake of June 27, 1998: A Photo Spread

An earthquake measuring Ms6.2 struck at 4:56 pm on June 27, 1998, near Ceyhan (population 100,000) in southern Turkey. The tremor was also strongly felt and caused damage in the nearby provincial capital, Adana (population 1.2 million). The epicenter was located about 30 km east of Adana and 15 km west of Ceyhan. The main shock was followed by a large number of aftershocks. Over 140 people were killed and more than 1500 were injured.

EERI member Mehmet Celebi was able to travel to Adana and Ceyhan a few days after the quake, using LFE funds that EERI receives from NSF. Although he has not had time to write up his observations, he e-mailed photos of damaged buildings to EERI to share with the membership. Some of the photos appear on these pages. EERI member Polat Gulkan, of the Earthquake Engineering Research Center of Middle East Technical University in Ankara, also traveled to Adana and Ceyhan with a UN disaster management team and sent a brief report. A more detailed assessment will appear as a special insert in an upcoming *EERI Newsletter*.

The majority of the deaths and damage was in Ceyhan, where nearly 1000 buildings collapsed or were damaged beyond repair. In Adana, at least 30 homes, some apartment blocks, and five work places collapsed; three hospitals, six schools, and a bridge were damaged.

According to Gulkan, many of the structural failures happened because "They use cinder block-filled joist floors widely. The resulting flat beams have little rotation/energy absorption capacity. Added



The "ever-present ground story shops compound the issue." (photo: Celebi)



Ceyhan apartment building (photo: Celebi)

factors such as poor details, poor concrete quality, and the ever-present ground story shops compound the issue." Gulkan says that the earthquake called attention to "problems endemic in Turkey in building quality control, poor planning, and insistent repetition of known errors." In Celebi's opinion, many failures were attributable to "clear design and/or construction errors in detailing of reinforcements around beam-column connections." Celebi reports that six contractors in Ceyhan were arrested within days of the quake and charged with "causing death by negligence and lack of care."

On July 4, 1998, a Mb5.1 aftershock struck at 5:15 am local time; it caused much alarm and more damage and injuries. About 700 people were injured, many in the process of running from their homes, or jumping from the second and third floors, in panic.

Get digitized records of the earthquake, registered in several locations, at:

<http://angora.depren.gov.tr/>

This site contains records for the main shock as well as aftershocks.

More qualitative information is available on two web sites:

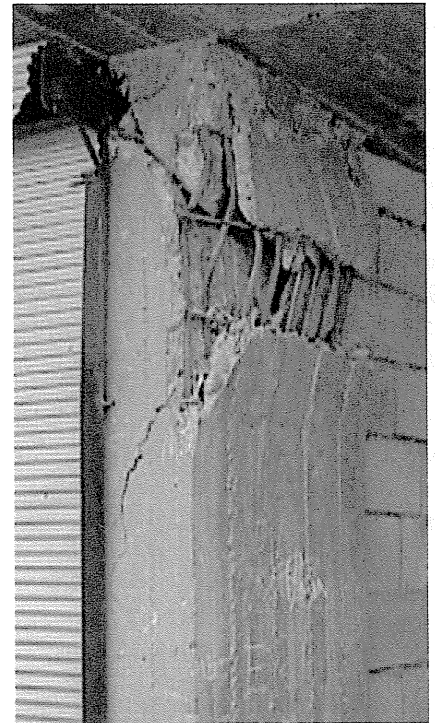
<http://www.metu.edu.tr/home/wwwdmc> &

<http://www.nemrut.mam.gov.tr>

To view all the photos of the earthquake damages, visit the EERI web site:

<http://www.eeri.org>

Additional photos will be added as they are received.



Typical damage (photo: Celebi)



Ceyhan apartment building detail (photo: Celebi)