

EERI's Learning From Earthquakes Program Report

MEXICO EARTHQUAKE OF APRIL 25, 1989

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INTRODUCTION

On the morning of April 25, 1989, a strong earthquake was felt throughout a large area of Mexico. The origin was located on the Pacific Coast, approximately 50 km south-east of Acapulco, in the Guerrero Gap. The magnitude was estimated by NEIS at $M_s=6.9$, $m_b=6.3$.

Maximum intensities were on the order of VI on the modified Mercalli scale in some parts of Mexico City, where it produced some damage. It was also strongly felt in Acapulco.

PEAK ACCELERATIONS

The motion was recorded on 68 strong-motion digital accelerometers of the new seismic array installed in Mexico City after the 1985 earthquakes. Maximum recorded accelerations were 0.07g (all amplitudes are approximate) in the zone of soft soil of the city, diminishing to 0.01g - 0.02g in the hard soil zones. Maximum spectral acceleration ordinates for 5% damping were 0.25g in soft soil and 0.05g in the hard soils of Mexico City.

The motion was also recorded near the epicenter by more than 25 accelerographs of the Guerrero array established jointly by the University of California, San Diego and the Institute of Engineering, UNAM. (It is now a project of the Mackay School of Mines, University of Nevada, Reno, and UNAM). It was also recorded by six newly-installed accelerometers in Acapulco. Maximum acceleration recorded by the Guerrero array was 0.35g, 31.6 km from the epicenter; the station closest to the epicenter (21.4 km) recorded a maximum of only 0.18g.

The differences may be due to

site effects. In Acapulco the maximum recorded acceleration was 0.32g, leading to maximum spectral ordinates, for 5% damping, of 1.5g for short periods (0.3 sec).

DAMAGE CAUSED BY THE EARTHQUAKE

Fortunately, damage in Mexico City was slight and mainly in non-structural elements; however, some of the structures that were damaged in September 1985 and were not retrofitted suffered partial collapse; these were not occupied. Some of the buildings that were repaired after the 1985 earthquakes had minor non-structural damage, mainly associated with large displacements. The old Cathedral also suffered some damage.

Two deaths were reported, one from a heart attack and other from stepping on a collapsed electric cable. 130 persons were injured, many from panic situations that forced them to try to escape from buildings. Some jumped from windows and others fell in stairways.

Electricity failed in several areas of the city but it was shortly reestablished; some easily repairable damage to aqueducts was also caused by the earthquake. Telephone lines did not fail, but were saturated for several hours.

In Acapulco damage was also negligible. Some cracks in non-structural elements were observed. No casualties were reported and only 30 injured persons who fell trying to escape. Landslides that occurred on roads were rapidly removed. In Chilpancingo, capital of the state of Guerrero, some buildings had cracks and the electricity failed in several areas.

REPORTS DESCRIBING RECORDS

One of the positive consequences of the earthquake is the large number of good strong-motion records that were

obtained near the epicenter as well as in populated areas like Acapulco and Mexico City. These records are under study to get a better picture of the differences in the soil motion, especially in Mexico City; this study will help to improve microzonation.

Several reports on the measured accelerations have been published by different organizations: Fundacion ICA, A.C., (FICA), with 30 strong motion accelerometers installed in the city (29 of which recorded the motion); Fundacion Javier Barros Sierra, A.C., (FJBS), with 40 free-field accelerometer surface stations, and three more with down-hole sensors (obtaining 31 records); and Instituto de Ingenieria, (UNAM), recording motion at eight stations.

REPORTS PUBLISHED (Summarized English titles. -Ed.)

1. FICA 3.1. Preliminary information on four records, FICA, 25 April 1989.
2. FICA 3.2. Records. FICA, 29 April 1989.
3. FICA 3.3. Fourier and Response Spectra. FICA, 5 May 1989.
4. FICA 3.4. Peak horizontal accelerations FICA, 24 May 1989.
5. RA-DF-4. Mexico City records. FJBS, 2 May 1989.
6. IPS-12-A. Records from 4 stations. UNAM, 25 April 1989.
7. IPS-12-B. Records, volume 2. UNAM, 27 April 1989.
8. IPS-12-C. Records, volume 3. Peaks and response spectra. UNAM, 4 May 1989.
9. Report GAA-6. Accelerograms from the Guerrero, Mexico, strong motion array. John Anderson, et al, (UNR Seismological Laboratory), and UNAM, 5 May 1989.