EARTHQUAKE ENGINEERING RESEARCH INSTITUTE

NEWSLETTER

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MAGNITUDE 8.1 EARTHQUAKE IN MEXICO SEPTEMBER 19, 1985

C. ARNOLD

Collapsed St. Regis Hotel

NEWSLETTER INFORMATION WANTED

The Newsletter welcomes articles, interesting anecdotes, etc., at any time. Announcements for meetings or other Calendar-sensitive items in the second half of a month, or in the first half of the month after that, must be sent to the Newsletter (or Editor Gerald Brady) early in the previous month. If you'd prefer that one to be explained differently: The deadline for material to the EERI Newsletter office is the Monday, four weeks earlier than the first Monday of the month of issue. This issue arrives in your mail during the second week of the month.

MEETING ANNOUNCEMENTS

A session on Structural Instability Under Seismic Loading is planned for the Structural Congress V in New Orleans, September 15-18, 1986. Send your abstract before December 31, 1985 to Dr. Franklin Y. Cheng, Professor of Civil Engineering, University of Missouri-Rolla, Rolla, MO 65401.

EERI Sends Investigation Team

Magnitude 8.1 Mexico Earthquake of September 19, 1985.

Technical Director Roger Scholl's memo dated September 21 announcing the dispatch of a team of investigators:

To Whom It May Concern:

This is to advise and acknowledge that the Earthquake Engineering Research Institute (EERI) in cooperation with the U.S. National Academy of Sciences (NAS), the American Society of Civil Engineers Technical Committee on Lifeline Earthquake Engineering (TCLEE), the National Science Foundation (NSF), and the Seismic Qualification Utilities Group (SQUG) has dispatched a team of earthquake scientists to investigate the effects of the Mexico earthquake of September 19, 1985.

Members of the team are as follows:

Dr. Mete Sozen (Team Leader);

Dr. James Brune
Specialty: Seismology

Mr. Edwin Johnson
Specialty: Structural Engineering

Dr. Ellis Krinitzsky
Specialty: Geotechnical Engineering

Mr. Samuel Swan
Specialty: Industrial Facilities

Mr. Paul Flores
Specialty: Social Sciences/Emergency Response

Mr. Luis Escalante
Specialty: Lifelines

The specific purpose of the investigation in Mexico by the scientific team is to determine what can be learned about the earthquake and its effects on structures and on man. The information gathered by the team will be used for the purpose of

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M. CELEBI, USGS

Damage to the Ministry of Communications and Transportation building. Accompanying ground-level records at this site.

MEXICO from p. 1

reducing future earthquake losses, specifically in the United States. These scientific investigations of earthquakes are being conducted as part of a comprehensive earthquake hazards reduction program currently underway in the United States.

Memo dated September 27, prior to the expected return of the reconnaissance team:

1. An Overview of Observations

1.1 Although Mexico City has been hit by a devastating earthquake, only one percent of the city has been materially affected by the earthquake. About 400 buildings, mostly 5 to 15 story, have collapsed. Because of the large population of the city (18 million), there are many tens of thousands of buildings of this category in the city, thus the 400 failures represent only a small part of the total building count in Mexico City. Early reports have indicated that major damage in Mexico City is concentrated in the "dountown" area. A rough characterization of damage in the area is that 30% of the buildings are damaged, and of the damaged buildings, 80% have collapsed (repeating, this is approximate).

1.2 Along the Pacific Coast near the epicenter, the following has been reported:

- The two dams that are instrumented were mininally affected by the earthquake.
- The steel mill is generally OK, but there is a two-story R/C frame building with infilled walls that is severely damaged and has been evacuated.
- In the town of Lazaro Cardenas, about 25% of the buildings are visibly damaged.
- In the town of Ixtapa, there are 10 to 12 modern high-rise buildings which are all damaged. Most are severely damaged and have been evacuated.

1.3 Preliminary reports indicate that there will be a substantial number of strong motion records from Mexico City and from the Pacific coast area near the epicenter. This, in combination with the damage and lack of damage makes this earthquake very important for earthquake research.

2. Reconnaissance Team

We are expecting the seven member joint EERI, NAS, TCLEE reconnaissance team to return from Mexico on September 27 or 28, 1985. The principal charges for the team were:

1. To make a rough assessment of the effects of the earthquake,

2. To identify research opportunities in connection with the earthquake, and

3. To contact the Mexican research community (The Earthquake Engineering Institute of UNAM) to determine if we in the U.S. could be of assistance in connection with investigating the earthquake.

3. Future EERI Action

Presently, EERI is in a hold mode with regard to sending any additional persons or teams to Mexico. Recommendations from the Team, with subsequent evaluation by the Board of Directors, will determine if and/or when there will be any additional EERI investigative involvement. A decision on EERI future actions is expected in a week or two.

A report from this reconnaissance team is envisioned in the near future.

MEXICAN EARTHQUAKE BRIEFING

A technical briefing on the September 19, 1985 earthquake in Mexico was held October 14, 1985 at the Meridien Hotel, 50 Third Street, San Francisco, California, under the sponsorship of FEMA, NBS, NOAA, NSF and the USGS. An all-day program led the 500 attendees through the following issues, presented, where appropriate, by members of the EERI/NAS reconnaissance team:

1. The U.S. Earthquake Hazard Mitigation Program and the earthquake's influence,
2. Geology and Strong-Motion Seismology (in the epicentral region),

3. The digitally recorded strong motion accelerograms in Mexico City (Jorge Prince, EERI 1979, Mexico),
4. Observed damage in various categories:
   a. geotechnical areas
   b. structures in Mexico City (with Roberto Quaas, Mexico)
   c. lifelines
   d. industrial facilities
   e. epicentral area
   f. postearthquake fires.
5. Architectural features and associated dynamic behavior,
6. Emergency response.

Recorded Ground Motions

The accompanying plots are reproduced from one of four preliminary reports produced by the Instituto de Ingenieria, of UNAM (the Autonomous National University of Mexico) within a few days of the earthquake:

ACELEROGRAMA EN EL CENTRO SCOP DE LA SECRETARIA DE COMUNICACIONES Y TRANSPORTES. SISMO DEL 19 DE SEPTIEMBRE INFORME IPS-10B, Sep 21, 1985.

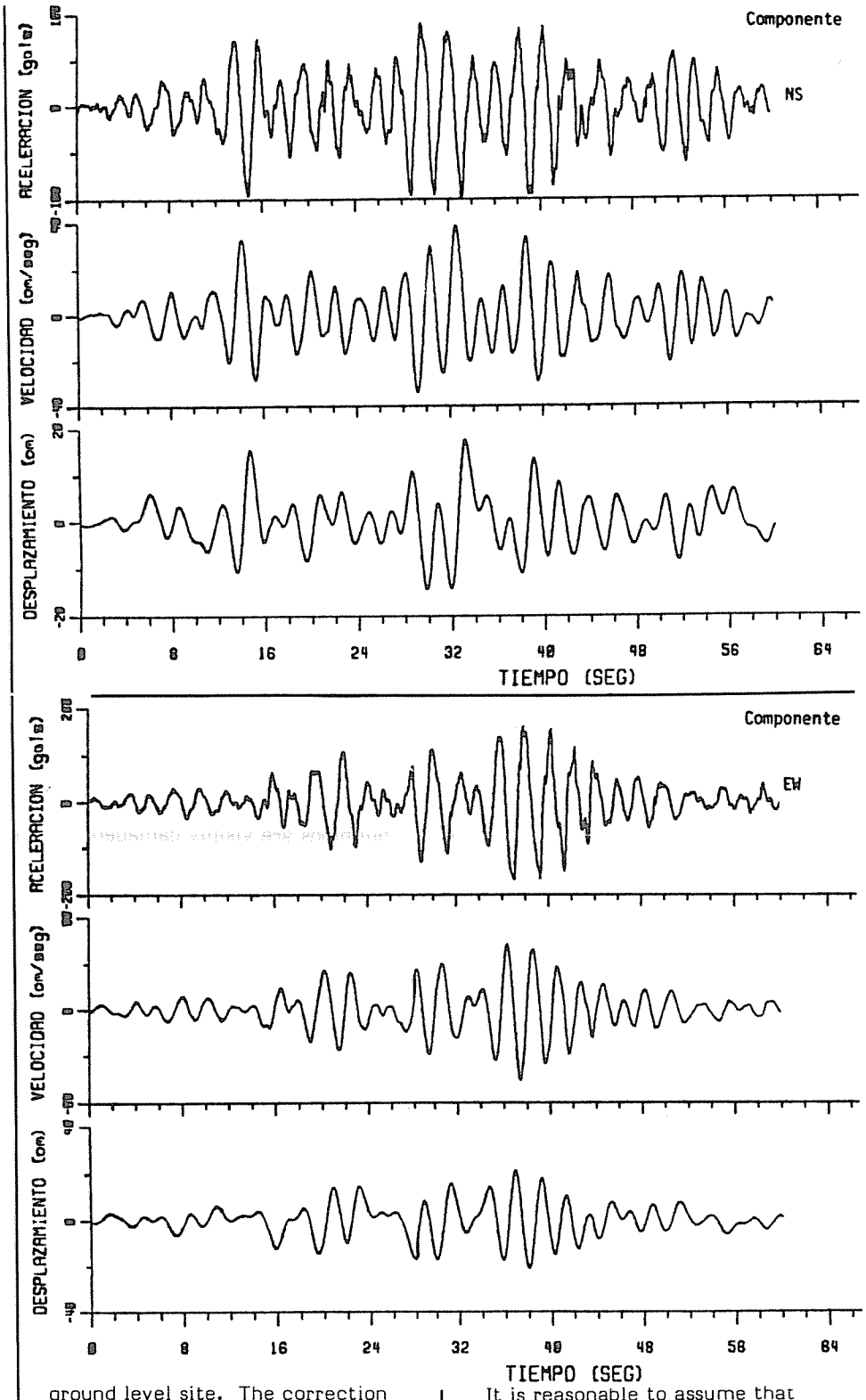
We are indebted to the authors, Senors Mena, Quaas, Prince, Almora, Perez, Carmona, Torres, Delgado, Chavez, Alcantara, and Onate; and to all the various Mexican authorities that have played active roles in strong-motion instrumentation in Mexico, resulting in a fine collection of records, rapidly disseminated.

This accelerogram was recorded by a Terra Technology digital strong-motion instrument located in the NW corner of the grounds of the Ministry of Communications and Transportation, where the buildings are founded on the soft lacustrine clays typical of the central area of Mexico City.

The peak acceleration recorded at this station is 168 cm/sec^2 (0.17 g).

The structure was seriously damaged, with many portions of the upper floors collapsing, and the damage was the primary reason why communications with Mexico after the earthquake were impossible.

The figures show the corrected acceleration, velocity and displacement for the two horizontal components at the ground level site. The correction procedure used is the standard Caltech program, with a pass band between 0.1 Hz and 23 Hz. Sixty seconds of motion were recorded, consisting primarily of oscillations with 2 sec period. Peak values of acceleration, velocity and displacement were 98 cm/sec^2, 39 cm/sec and 17 cm in the NS direction; and 168 cm/sec^2, 61 cm/sec and 21 cm in the EW direction.



It is reasonable to assume that most of the seriously damaged area of Mexico City, on these soft lacustrine clays, suffered ground motion similar to that pictured here. Some buildings of 5 to 15 stories height, with periods in the 0.5 to 1.5 second range, will have lengthened their period to 2 seconds due to the initial cracking of concrete, and found themselves self destructing as they resonated to this input.