



EARTHQUAKE ENGINEERING
RESEARCH INSTITUTE
NEWSLETTER

Managing Editor: Gerald Brady
Production Manager: Nancy Donovan Segal
Associate Editors: Richard Meehan
Joe Litehiser
Graphics: Roosevelt Studios
ISSN 0270-8337

Earthquake Engineering Research Institute
6431 Fairmount Avenue, El Cerrito, CA 94530
(415) 525-3668

LETTER ON P-WAVE PHENOMENON

Donald Libby (with James R. Libby, EERI, 1978) writes:

A point of interest arose from the earthquake of July 13, 1986 epicentered off the coast of Southern California.

At the time of the earthquake I was in a small boat approximately 3 miles west of Mission Bay. Only two people were in the boat; both felt a motion of the boat. Immediately following the quake we investigated for any malfunction, finding none. We assumed that the motion was caused by an earthquake or some sort of U.S. Navy operation. We later learned of the earthquake.

I can describe the motion as a lifting feeling.

I was not aware that an earthquake could be felt while on

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EERI RESPONSE TO EARTHQUAKE IN EL SALVADOR

Roger Scholl Technical Director EERI

NEIS INFORMATION

NEIS reported the earthquake on October 10 with the following particulars:

Date: October 10, 1986
Time: 11:49 a.m. MDT
Magnitude: 5.4
Location: 13.8°N, 89.3°W

More recent reports from Dave Harlow (USGS) and Roberto Linares in San Salvador indicate the focus to be 2.2 km south of downtown San Salvador at 13.673°N, 89.203°W.

INVESTIGATION TEAM

With the initial reporting of the earthquake as a magnitude 5.4, it did not appear that an investigation would be warranted. On Saturday morning Bob Olson reported severe damage in San Salvador and expressed interest in going down to investigate heavy rescue. He also described the situation to Frank McClure and the decision was made to send a team with Bob Olson as Team Leader.

By early afternoon on Saturday, October 11, 1986, a small team of 4 or 5 persons was formed in cooperation with Riley Chung of the National Research Council. In a discussion with Fred Cole of the Office of Foreign Disaster Assistance (OFDA) at AID/State Department, he reported that OFDA had sponsored the installation of a strong motion instrumentation network that included 10 stations in San Salvador.

(Editor's note: Jim Jordan and Chuck Knudson had helped set up this sponsorship. Besides OFDA, two groups, represented by the following people, deserve recognition for the existence of these records: 1, Roberto Linares, Chief, Seismology Department, Centro de Investigaciones Geotecnicas, Ministerio de Obras Publicas, and his predecessor Jose

Gonzalez, for the administration, management and maintenance of the instruments; 2, David Harlow and Dick Maley (USGS) for encouraging the initial installation and for the supply of spares, film, accessories, technician training and advice. Roberto Linares supplied most of the information on the strong motion records. David Harlow also supervised the installation of the telemetered seismic net.)

Thereafter the team was expanded to include a more complete coverage of all the disciplines involved in the earthquake problem. By mid-Monday the complete team was formed except for geology. Later in the week, David Russ and Tom Hanks of the USGS strongly encouraged that a geologist be sent.

The total contingent of 12 persons who went to El Salvador and who have expressed a willingness to cooperate with EERI in preparing a report on the earthquake are listed.

The basic team departed from the U.S. at various times on Tuesday October 14, rendezvoused at the Mexico City airport on Wednesday, and flew to San Salvador together Wednesday afternoon.

EARLY OBSERVATIONS

The earthquake has provided significant potential for furthering our understanding of earthquakes and earthquake effects on man-made works. Following are some highlights:

- o There are approximately 10 mid-rise (3-10 story) engineered buildings in San Salvador that are either severely damaged or collapsed.

- o There are approximately 30 other mid-rise engineered buildings in San Salvador that are less severely damaged.

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o A total of 9 3-channel strong motion records from the main shock were recorded. Mete Sozen was instrumental in having these records brought to the U.S. The records are currently being processed at CDMG in Sacramento.

Three of the nine stations are a time-correlated recording of the motion in the 10-story R/C Camino Real hotel which was only damaged lightly. PGA's at the basement, 2nd floor, and roof are 0.5 g, 0.65 g, and 0.92 g, respectively.

The PGA at the Urban Housing Institute was 0.78 g, and the PGA at the Geotechnical Institute was 0.71 g. The strong motion was about 3 to 4 seconds in duration, and a predominant period was apparent, of about 0.5 seconds.

o The U.S. Embassy building sustained severe damage to exterior columns and the building has been evacuated.

o It is estimated that the final death toll will be about 1400.

o There are about 7000 injured.

o Damaged housing left 200,000 homeless. This is in addition to the several hundred thousand homeless because of the war.

o Team Leader Bob Olson reports that more detailed follow-up studies may be warranted in connection with: 1) A few selected structures, 2) Site response in filled areas of the city, and 3) Reconstruction, including the possible relocation of government offices. Government buildings were heavily damaged.

COOPERATING INVESTIGATORS

<u>Investigator</u> <u>Specialty</u>	<u>Funding</u> <u>Sponsor</u>
Robert A. Olson VSP Associates Team Leader/Heavy Rescue	EERI
Raymond W. Anderson Agbabian Assoc. Structural Engineering	USDOS

Franz F. Sauter Franz Sauter & Assoc. Structural Engineering	NRC
Mete A. Sozen University of Illinois Structural Engineering	USDOS
Robert Chieruzzi LeRoy Crandall & Assoc. Geotechnical Engineering	LCA
John Hopkins City of Belmont, CA Civil Engineering	Personal
Anne S. Kiremidjian Stanford University Ground Motion Hazard	SU
Sam Swan EQE, Inc. Power & Industrial Facilities	EPRI
James R. Morgan Texas A&M University Lifelines	ASCE
David Harlow USGS, Menlo Park Seismology	USDOS
Michael Rymer USGS, Menlo Park Geology	NRC
Michael Durkin Michael Durkin & Assoc. Casualties	NSF
Mauricio A. Lara MLA, San Salvador Structural Engineering	MLA

Legend

- EERI - Earthquake Engineering Research Institute
- USDOS -U.S. Department of State and/or Agency for International Development and/or Office of Foreign Disaster Assistance
- NRC - National Research Council
- LCA - LeRoy Crandall Associates
- SU - Stanford University
- EPRI - Electric Power Research Institute
- ASCE - American Society of Civil Engineers
- MLA - Mauricio Lara and Associates

NEWS OF THE PROFESSION

PUBLIC IMAGE OF ENGINEERS

You may have read recently newspaper reports of the esteem in which the engineering profession is held by the public. Here is a summary by writer S. W. in the News Report, of the National Research Council.

The American public holds engineers in high esteem, but has only a vague idea of what they do, a report commissioned by the National Academy of Engineering (NAE) has found.

Public attitudes toward engineers, engineering, and technology include the following:

- Engineers have an unusually high degree of integrity and are generally not to blame for technological accidents, mishaps, or disasters such as the explosion of the space shuttle.
- Policymakers and government officials should hear more directly from engineers about the development and use of new or risky technology, but the technical experts should not have the final say in whether to proceed with the technology.
- Engineers typically cannot communicate well with non-engineers, and many have "poor social skills."
- Engineering is a desirable and high-prestige career, and most people would not mind if their son or daughter married an engineer or became one themselves.
- American engineers, with the possible exception of auto engineers, are the best in the world, possibly exceeded only by the Japanese.
- Americans have great faith in technology and believe it has done more good than harm.
- Legislative leaders mistakenly believe that Americans define