Fault Line Forum

Volume 10, Number 2 • 1994

"THANK YOU"

To Lorayne Frank and CEM Staff

The Utah Earthquake Advisory Board (UEAB) formally dissolved on June 30, 1994. Although the UEAB is destined for a phoenix-like renewal as the Utah Seismic Safety Commission, its passing calls for a timely acknowledgment. On behalf of all UEAB members, I would like to offer special thanks to Lorayne Frank and the staff of CEM for shepherding the creation, functioning, and evolution of the UEAB since 1991. Lorayne has ably chaired the board, and we sincerely appreciate her many efforts and her ongoing leadership as part of Utah's state earthquake program. Among the many CEM staff who provided support to the UEAB, Bob Carey and Caryn Johnson made particularly notable contributions to the board's performance. On behalf of all UEAB members_and Utah's state earthquake program, "Thank you!"

Walter Arabasz, Director
University of Utah Seismograph Stations

A Strategic Plan for Earthquake Safety in Utah

Draft Document Now Available

Before disbanding on June 30, 1994, the Utah Earthquake Advisory Board (UEAB) completed work on the draft strategic planning document formally titled *"A Strategic Plan for Earthquake Safety in Utah"* (in past issues of the *Forum*, we have referred to this document by its working title, *"Utah at Risk"*). Copies of the draft document are now available for public comment. This document presents the UEAB's recommendations for actions to improve earthquake safety in Utah. Its strategies represent a long-term "roadmap" of efforts to promote public policy aimed at saving lives, preventing injuries, protecting property, and reducing the social and economic disruption resulting from earthquakes. The document has been adopted by the newly created Utah Seismic Safety Commission (USSC) as a draft interim product for use in further developing a sound strategic plan to present to the 1995 Utah State Legislature, as required of the USSC in its enabling legislation.

The earthquake conference that the UEAB had hoped to convene this fall in order to present the document and solicit broad community input will not be logistically feasible because of the short time-frame and the changeover to the USSC. To receive this input in lieu of the conference, the USSC will mail copies to all involved parties and solicit written comments. In addition, we encourage all interested *Forum* readers to comment as well. Contact Judy Watanabe at the Utah Division of Comprehensive Emergency Management (CEM), 1110 State Office Building, Salt Lake City, UT 84114, (801) 538-3750, fax (801) 538-3770, to obtain a free copy of the draft document. Your comments must be returned to CEM by **September 26, 1994**. As we have pointed out before, *Fault Line Forum* readers represent a diverse group of professionals involved in all aspects of earthquake issues and are therefore uniquely placed to make a significant contribution to this process. Get involved!

Utah Guide for the Seismic Improvement of Unreinforced Masonry (URM) Dwellings

by Bob Carey
Utah EPICENTER

The EPICENTER is currently in the process of publishing a residential retrofit publication which should be available for purchase by the general public sometime late this summer. The publication was prepared for informational purposes, so that the owners of unreinforced masonry structures can gain a better understanding of how to improve the seismic safety of their homes.

The publication, prepared by Reaveley Engineers and Associates, is specifically designed for Utah homes built prior to 1970 and illustrates a variety of retrofit techniques on several different types of home construction. The techniques which are shown are intended to generally improve the seismic performance of an unreinforced masonry structure, but the implementation of these techniques will not make the dwellings "earthquake proof."

Historically, Utah has experienced several damaging earthquakes since the arrival of the pioneers. With this publication, it is hoped that owners of unreinforced masonry homes will be able to improve the seismic resistance of their dwellings.

Fifth U.S. - Japan Workshop on Earthquake Resistant Design of Lifeline Facilities and Countermeasures Against Soil Liquefaction

The *Fifth U.S.-Japan Workshop on Earthquake Resistant Design of Lifeline Facilities and Countermeasures Against Soil Liquefaction* will be held on September 29-October 1, 1994, in Snowbird, Utah. Previous workshops have had a significant effect on research directions, improved engineering practices, and international collaboration to reduce seismic hazards and advance infrastructure management. The recent 1993 Kushiro-Oki and Hokkaido-Nansei-Oki earthquakes in Japan and the 1994 Northridge earthquake in California have increased public awareness of earthquake hazards and placed considerable emphasis on engineering for safer and more reliable lifeline systems.

The purpose of the fifth workshop is to explore lessons learned from recent earthquakes and to develop modeling and practical procedures for the earthquake-resistant design of lifelines and civil infrastructure systems. The workshop will continue the exchange of ideas and experiences which have proven to be of substantial benefit in previous U.S.-Japan collaborations. The main topics to be addressed include:

- Case studies on lifeline performance during earthquakes and liquefaction-related damage to structures.
- Effects of liquefaction on structures including analysis of earthquake damage, numerical simulations, and experimental studies.
- Earthquake-resistant design of lifeline facilities including input ground displacements for design purposes and numerical models.
- Measures to reduce liquefaction and other damaging earthquake effects on lifelines.

The workshop is sponsored by the National Center for Earthquake Engineering Research and the Japanese Association for the Development of Earthquake Prediction. Those seeking information about the workshop who have not received direct invitations should write to Professor Tom O'Rourke, School of Civil and Environmental Engineering, Cornell University, Hollister Hall, Ithaca, NY 14853-3501.

- Reprinted from NCEER Bulletin, April, 1994.

Priorities of Earthquake Research May Be On Shakey Ground

Congressional checks on the effectiveness and direction of earthquake research and development in the United States may mean securing grants for basic research will be tougher in the future, some observers say, that is, unless scientists can do a better job of getting their message out.

The January Northridge earthquake has prompted awareness, as well as criticism of current federal efforts to reduce earthquake hazards. In addition to a study launched in February by the White House, the Office of Technology Assessment recently gave the thumbs up for a study, requested by the House Science, Space and Technology Committee, to evaluate federal efforts in reducing earthquake damage_how best to set research and development priorities and to ensure practical use of research findings.

Meanwhile, the National Earthquake Hazard Reduction Program (NEHRP), born in 1977 law, is up for reauthorization, and the Office of Science and Technology Policy is working on its own re-evaluation of the roughly $100 million, four-agency program, which is due out by the end of the year.

President Clinton has requested a 9 percent boost for the program, but the House had already reauthorized only a 2.7 percent increase before he released his budget. NEHRP's fate now rests in the Senate.

Some critics have charged that the current program favors basic research over applied research and does little in the way of technology transfer or to educate the population.

George Lee, director of the National Center for Earthquake Engineering Research, says funding as a whole for earthquake engineering — designing new "intelligent" structures and retrofitting existing ones — has been "minimal." Traditionally, engineering research has made up an estimated 30 percent of NEHRP's budget.

Yet Lee would not cut basic research, as some in Congress may be intimating: "The answer is very simple. We need both."

Susan Hough, a seismologist with the U.S. Geological Survey in Pasadena, California, observes, "Some groups within the earth science community could be seen as guilty of not paying enough attention to societally relevant concerns."

In a sense, Hough says, "The community has shot itself in the foot by defining what is interesting" largely in terms of what is happening on the cutting edge of basic research. "Go outside the ivory tower, and no one appreciates the need for it."

The earth science community needs to balance basic research with societally relevant research, says Hough. "There's a place for exciting research to be done on relevant issues."

Part of the problem, says Steve Malone, a geophysicist at the University of Washington, is that the community did a "great disservice" by promising in the 1970s and the 1980s that earthquake prediction would become a reality and that society would be reaping the benefits of the results.

During the past decade, however, the science has shown just how tricky prediction really is. For example, the discovery of hidden faults and discrepancies between geologic and historical forecasts has made the puzzle all the more intriguing, Malone says.

Yet, others point a finger at the administration of the NEHRP program. They remain hopeful that the OTA study, to be released in fall 1995, may lead to a restructuring of the program or even the naming of a new lead agency for the enterprise.

Tom Henyey, executive director of the Southern California Earthquake Center (SCEC), says generally there has been "a lack of leadership at the top end of the program." He would like to see the Federal Emergency Management Agency (FEMA) removed as the lead agent because it is not primarily a research-oriented agency.

Hough agrees that there is "room to criticize the way some elements of the (NEHRP) program have been carried out."

But participating agency heads maintained at a May Senate reauthorization hearing that the agencies, including FEMA, the U.S. Geological Survey, National Science Foundation (NSF), and National Institute of Standards and Technology have been team players.

Says Joseph Bordogna, NSF's assistant director for engineering, the state of federal earthquake efforts is really a "holistic problem" that springs from the entire civilian infrastructure, though he notes the agencies could "improve the vision."

SCEC's Henyey sums, "We need to look for better ways of getting information into the public arena. We need to get research out of the file cabinets, off of hard disks, and moving into a product that can be used for societal relevance. It's reasonable for Congress to ask for that."

- Reprinted with permission from EOS, Transactions of the American Geophysical Union, v. 75, no. 22, p. 249-250.

"Some groups within the earth science community could be seen as guilty of not paying enough attention to societally relevant concerns."

RESPONSE 93 After-Action Report

> *"RESPONSE 93 was extremely successful, and paid big dividends in improving disaster and emergency response preparedness..."*

In June of 1993, the Wasatch Front was the site of the largest full-scale, federal earthquake exercise ever undertaken in the U.S. (see *Wasatch Front Forum,* v. 8, no. 4, p. 12-16). The culmination of six years of effort by federal regional and state planners, Response 93 was designed to test the policies and procedures of the Federal Response Plan (FRP) and the federal and state coordination mechanisms for responding to a catastrophic disaster. The Federal Emergency Management Agency (FEMA) recently released its After-Action Report for the exercise. In the foreword, James L. Witt, Director of FEMA states:

Exercise RESPONSE 93 demonstrated the capability of numerous organizations and levels of government to respond to a catastrophic disaster. As a result of this exercise, participants gained a greater appreciation of the need for pre-event team building, coordination, and information sharing during response operations...Exercise RESPONSE 93 helped participants focus on intergovernmental and interagency coordination. This coordination required local emergency response managers to focus vertically with state and federal assistance efforts, and horizontally through various emergency services, support functions, agencies, and organizations. The observations made in this document reflect the perspectives of individuals who are committed to improving the field of emergency management, as well as the concerns and recommendations of participating organizations, agencies, and units of government...The next step is to use this report at all levels of government to identify and implement improvements that need to be made in response preparedness...

The introduction from the Executive Summary and the list of major lessons learned during the exercise are reproduced below. Xerox copies of the full report can be obtained by contacting Bob Carey at the Utah EPICENTER (Utah Division of Comprehensive Emergency Management) at (801) 538-3400.

INTRODUCTION

RESPONSE 93 simulated a 7.5 magnitude earthquake along the Wasatch fault in northern Utah. The Federal Emergency Management Agency (FEMA) and the Utah Division of Comprehensive Emergency Management (CEM) conducted the exercise on June 7-11, 1993. Approximately 5,100 personnel participated at various federal national and regional, state, and local facilities. RESPONSE 93 achieved exercise objectives and provided an opportunity for state and federal disaster response personnel to work together under simulated response conditions. As a result, all levels of government improved their ability to respond quickly and effectively to a catastrophic disaster.

RESPONSE 93 planners applaud everyone involved in the exercise for their work in designing and conducting this full-field exercise. RESPONSE 93 was extremely successful, and paid big dividends in improving disaster and emergency response preparedness, as noted in the federal response to the Midwest and Mississippi River floods and other subsequent disasters.

MAJOR LESSONS LEARNED

Federal response planners need to evaluate the requirement to physically collocate federal and state response staffs.

RESPONSE exercises provide an excellent training opportunity for senior officials who play a key role in managing and coordinating response operations.

There needs to be a structured way of identifying objectives in time to allow adequate budgeting for their play in exercises.

Exercise designers should consider separate Emergency Response Team-Advance Element deployment exercises or should accommodate the time and resources required to exercise this crucial area of the initial response.

The Regional Operations Center needs to continue to anticipate requirements, as information emanating from a disaster scene often is inadequate to support situation report development and dissemination in the early stages of response.

Exercise planners need to devise a way to play the Emergency Support Team and Catastrophic Disaster Response Group functions without relying solely on onscene exercise play to drive play at the national level.

Federal response planners should evaluate the effectiveness of the new External Relations plan and incorporate it into the Federal Response Plan, if appropriate.

A cohesive, documented, and trained Information and Planning plan and procedures are sorely needed. Federal response officials should consider a functional exercise dedicated to Information and Planning to test their effectiveness, once adopted and trained.

Federal financial managers should evaluate the results from RESPONSE 93 and make appropriate changes to the mission assignment procedures.

It is clear from RESPONSE 93 that, if the concept is retained, the four Operations Section Branch Chiefs need support staff.

A logistical support concept needs to be developed and documented for identifying, tasking, transporting, tracking, and distributing response resources. Also, response managers need a logistics tracking and distribution system.

To effectively execute emergency response plans, national, regional, and state staffs need to share a common understanding of how things are to be done and where responsibility lies for specific requirements.

Systematic, interagency Federal Response Plan training is needed for disaster response teams, as well as periodic tabletop or other exercises to focus on coordination roles.

The exercise planning structures which proved effective should be documented and disseminated as Federal Response Exercise Planning Guidance.

Participant comments indicated a need to have significant information plotted, displayed, and exchanged using standard Geographic Information System techniques.

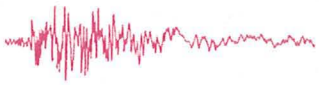
Architects Secure Grant Funding

by Bob Carey
Utah EPICENTER

The Utah Chapter of the American Institute of Architects (AIA) has received funding from the National AIA 1993 Disaster Preparedness Grant Program. The Grant Program makes matching funds available to AIA chapters for the establishment of state and local disaster preparedness programs. The Utah Chapter received $5,000.00, the maximum award available. Matching funding came from the Utah Division of Comprehensive Emergency Management's (CEM) EPICENTER.

As part of the Earthquake Program at CEM, the EPICENTER sponsors annual workshops dealing with pre- and post-earthquake safety evaluation of buildings. One of the goals of these workshops is to establish a pool of trained volunteers willing to perform damage assessments on buildings after an earthquake. The grant funding to the Utah Chapter of AIA will be used to establish and maintain this list of volunteers.

The Utah Chapter of the AIA will make this roster available to the Utah Division of Facilities Construction and Management (DFCM). DFCM is responsible for organizing the volunteer architects into two-person damage assessment teams. These teams will be made available to local jurisdictions after an earthquake to assist them in the mammoth task of performing damage assessments on their building stocks.



FEMA Reorganizes; All-Hazards Mitigation Directorate Replaces Office of Earthquakes

On November 28, 1993, Director James Lee Witt put in place a reorganization of the Federal Emergency Management Agency (FEMA) to accomplish a three-prong goal of creating new partnerships, emphasizing mitigation, and offering a strong all-hazards approach to emergency management. Witt defined an all-hazards approach as the ability to bring to bear on any disaster, all of FEMA's resources.

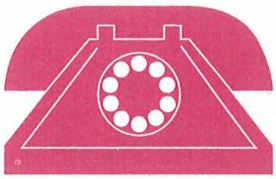
Under the reorganization, FEMA will be comprised of four Directorates and two Administrations. The **Mitigation Directorate** will work towards a national mitigation strategy to reduce the impact of disasters, regardless of the cause. The **Preparedness, Training, and Exercises Directorate** will integrate efforts of the agency to build an all-hazards capability at all levels of government. The **Response and Recovery Directorate** will coordinate activities in times of disaster, although the work will cut across authority lines throughout the agency. The **Operations Support Directorate** will handle logistical needs and technological systems.

Two other parts of FEMA, the U.S. Fire Administration and the Federal Insurance Administration, were retained but modified to conform with overall agency goals.

FEMA's NEHRP responsibilities will become part of the Mitigation Directorate. Other programs in the Mitigation Directorate will be Hurricanes, Flood Plain Management, Flood Mapping, and Dam Safety. Richard T. Moore, a state legislator from Massachusetts, has been nominated to be the Associate Director of the Mitigation Directorate.

- Reprinted from EERI Newsletter, January, 1994

Lifeline Collocation Impacts Analysis



communication

water & waste treatment

In 1993, the Federal Emergency Management Agency (FEMA) sponsored a study on earthquake impacts on utility systems in the Salt Lake City area. The final report submitted to FEMA, *Lifeline collocation impacts analysis - application to urban areas (the Wasatch Front fault in Salt Lake City, Utah)*, by Phillip A. Lowe, Po Lam, and Don Ballantyne, is excerpted below. A limited number of copies of the full report can be obtained from Phillip Lowe, Intech, (301) 670-8978, Fax (301) 670-8979. The report will be published by FEMA and is presently in press.

Background

In response to the National Earthquake Hazards Reduction Act of 1977, FEMA's National Earthquake Hazards Reduction Program is developing programs that will mitigate damage to and loss of lifelines during and after an earthquake. In this context, lifelines are defined as the essential community services and systems (e.g., communication, power and fuel, transportation, water and waste treatment, etc.). As a part of this comprehensive program, FEMA initiated a program to examine in detail the impacts of collocation and the use of utility routing corridors upon lifeline vulnerability and to disseminate the information to the lifeline stakeholders.

The resulting reports and technical papers document a screening method that can be used to identify the potential impacts of collocation or close proximity upon the time required to return a lifeline back to service following an earthquake. The analysis method was based upon using a previous FEMA-developed database originally developed for use with lifelines sited in California, and it was applied to a series of lifelines routed in a somewhat remote rural area, the Cajon Pass. The new analysis provided improved methods to estimate the vulnerability of highway and railroad bridges and buried pipelines to earthquake forces, however, it was only tested on conditions representative of those found in rural California.

Purpose of the Present Study

FEMA commissioned the present study to:

1. *examine if the previous collocation analysis methods could:*
   - *be applied to urban areas, and to determine if the analysis methods*
   - *are meaningful to non-California locations*
2. *develop information that could be used to increase the lifeline communities' awareness and general understanding of the potential impacts of lifeline collocation during earthquakes and other natural disaster events.*

Conclusions

1. *The analysis method is suitable for performing screening evaluations of lifelines which are collocated or otherwise in close proximity. It may be applied with equal confidence in urban or rural areas.*
2. *For lifelines other than bridges and buried pipelines, the 1985 database may be applied without modification throughout the U.S. For bridges and buried pipelines, the improved analysis methods described in Appendix D can be applied throughout the U.S.*
3. *The current U.S. practice of collocating lifelines in a utility corridor has increased the potential vulnerability of the newer lifelines compared to their being routed isolated from other older lifelines.*
4. *The current U.S., lifeline route, permitting process does not adequately address the potential impacts that can result from other lifelines which are in close proximity to the lifeline being permitted.*
5. *In general, officials responsible for responding during the emergency period to a natural regional disaster do not have readily available, detailed, lifeline routing maps and descriptions. This could hinder their effectiveness during the initial emergency recovery period.*
6. *In general, lifeline owners have unrealistic expectations about the ability of their lifelines to withstand the impacts of an earthquake, especially for the portions of their lifeline systems that are in close proximity to other lifeline systems.*
7. *The information dissemination and education activities which define the potential impacts and consequences of regional natural disasters such as earthquakes upon lifeline systems and components would benefit by being focused on communicating directly to execu-*

tives in lifeline owner/operator organizations.

8. *Bridge damage has the greatest potential to cause additional damage to collected lifelines. Pipelines also have a significant potential to damage other collocated lifelines or to impede the repair rate for other damaged lifelines. Damage to electric power systems primarily impacts the ability to control other lifelines. In collocated situations, a major potential impact of power system failures is that they may become an ignition source for spilled fuel. The present recovery plans for railroads (e.g., the immediate dragging of debris off of the track beds) can be a significant source of damage to lifelines collocated in the railroad rights-of-way.*

Recommendations

Based upon the current and the previous study, the following recommendations are made:

1. *The collocation analysis method developed in this FEMA-sponsored study is widely applicable to collocated lifelines throughout the U.S. However, its primary purpose is for use in screening studies to identify the lifeline collocations of greatest potential vulnerability. Once those locations are known, more detailed analyses can be performed when more refined information is needed.*

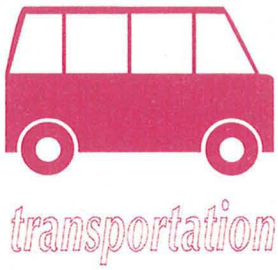
2. *FEMA should continue to support lifeline collocation vulnerability analyses at other potential earthquake locations. Such studies would highlight specific lifeline high risk locations which will be important information for emergency responders and planners. But perhaps more importantly, the actual process of conducting the study will provide a powerful means for focusing the local lifeline community on the issues associated with collocated lifeline routing.*

3. *Additional means should be sought to provide for information transfer to the lifeline community. Additional emphasis on transferring the information directly to the executives of lifeline owner/operator companies would be especially beneficial.*

4. *FEMA should sponsor a study of local and regional utility "one-call systems" (this is the system that is used to inform constructors if utilities are located in areas where the constructors are planning to conduct excavations) to see if their procedures and information database could be used in planning for earthquake or other natural disaster response.*

5. *FEMA should sponsor a study to examine means that might be employed to help assure that the potential impacts from existing lifelines are considered when routing decisions are made for new lifelines.*

6. *Because of the crowded conditions that exist at a communications collocation site, the communications industry has begun to examine how they can work together during natural disasters to most effectively bring the entire fiber optic networks back to service. FEMA should examine their approaches to see if they are relevant for other collocated lifelines and to evaluate if industry-wide or nation-wide approaches would be appropriate for other lifeline systems.*



Concrete Bridges: Call for Papers

American Concrete Institute (ACI) Committee 341, Earthquake Resistant Concrete Bridges, is sponsoring two technical sessions during the ACI spring convention (March 5-11, 1995, Salt Lake City, Utah), one on developments in seismic design of concrete bridges since the Loma Prieta earthquake, and the other on seismic retrofit of bridge components. Presentations on new approaches or findings related to the testing, analysis, design, and retrofit of concrete bridge components or systems subjected to moderate or strong earthquakes are sought. The subject may be based on laboratory tests, field observations, analytical studies of bridges, or a combination of these.

Applications consisting of (1) paper title, (2) author(s) name, title, affiliation, address, telephone and fax numbers, and (3) abstracts of no less than 200 words and no more than 300 words are due by September 1, 1994. Send submissions to M. Saiidi Saiidi, Civil Engineering Department (258), University of Nevada, Reno, NV 89557. For more information, contact M. Saiidi at 702-784-6937.

- Reprinted from EERI Newsletter, June, 1994.

Earthquake Activity in the Utah Region

by Susan J. Nava
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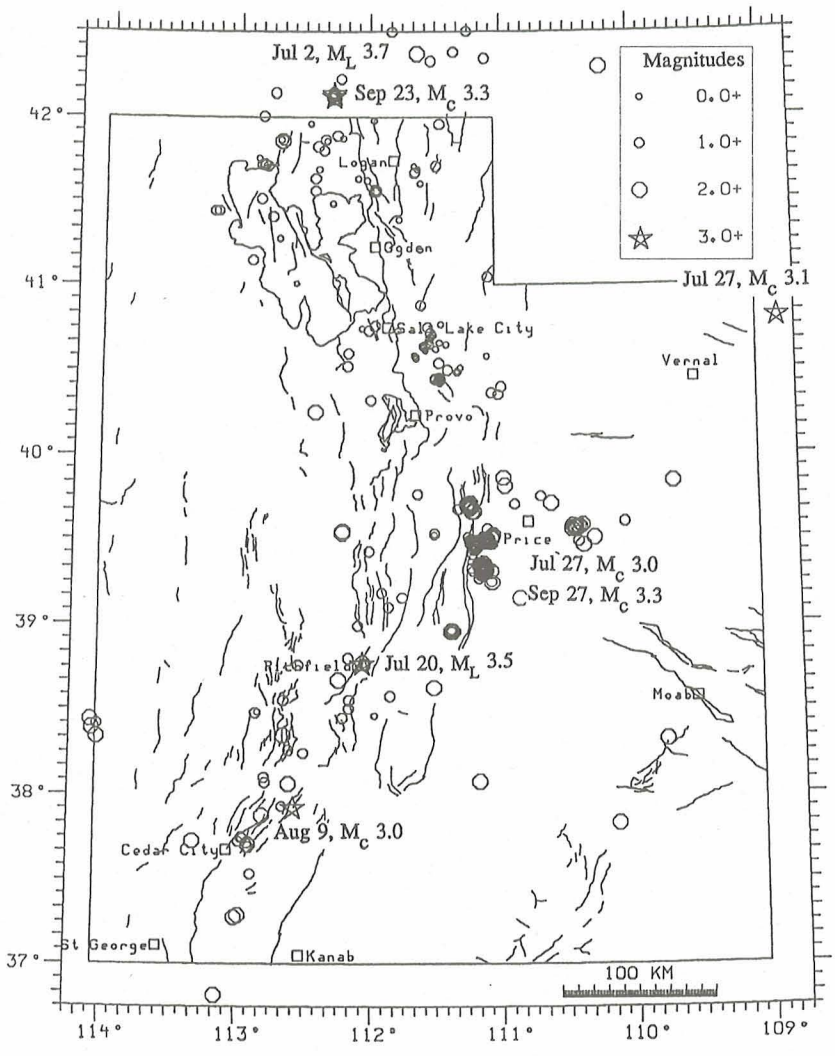


July 1 - September 30, 1993

From July 1 through September 30, 1993, the University of Utah Seismograph Stations located 432 earthquakes in the Utah region. Earthquakes of magnitude 3.0 or larger are plotted as stars. Three earthquakes were reported felt during this period. Magnitude indicated here is either local magnitude, M_L, or coda magnitude, M_C. All times are Mountain Daylight Time.

• Eastern Wasatch Plateau-Book Cliffs area near Price (coal-mining related): Five clusters of seismic events (magnitude 0.9 to 3.3) make up 56% of the shocks that occurred in Utah. These clusters are located: (a) 20 miles E of Price, (b) 25 miles WNW of Price, (c) 20 miles SW of Price, (d) 25 miles SSW of Price, and (e) 35 miles NE of Richfield. Significant shocks:

M_C 3.0	July 27	4:00a.m.	Part of cluster (d)
M_C 3.3	Sept. 27	5:21a.m.	Part of cluster (d)

• Northern Utah: A cluster of eight earthquakes occurred five miles SSW of Malad City, Idaho (30 miles NW of Logan). Most of these earthquakes occurred in late September.

During July and August, a series of 15 earthquakes occurred five miles NW of Park City (15 miles SE of Salt Lake City). The majority of these shocks were less than magnitude 1.0. Seismic activity is sporadic in this area.

Throughout the report period, a series of earthquakes occurred five miles W of Midway (15 miles NE of Provo), in the general vicinity of Deer Creek Reservoir, and ranging in magnitude from 0.2 to 1.6. Seismic activity is sporadic in this area.

• Southern Utah: A cluster of six earthquakes occurred in late August, five miles S of Summit (five miles E of Cedar City). Earthquakes in this cluster ranged in magnitude from 1.5 to 2.2.

Significant earthquakes:

M_L 3.7	July 2	6:16 p.m.	5 miles SSW of Malad City, ID Felt in Malad City, ID
M_C 3.3	September 23	4:04 p.m.	6 miles S of Malad City, ID Felt in Malad City, ID
M_C 3.1	July 27	9:21 p.m.	39 miles N of Dinosaur, CO
M_L 3.5	July 19	9:57 p.m.	2 miles E of Richfield Felt in Annabella, Aurora, Elsinore, Glenwood, Kanosh, Koosharem, and Richfield
M_C 3.0	August 9	1:25 p.m.	10 miles WNW of Panguitch

Additional information on earthquakes within the Utah region is available from the University of Utah Seismograph Stations.

Earthquake Basics Series from EERI

The Earthquake Engineering Research Institute (EERI) Committee on Innovative Technology Transfer (CITT), acting upon an initiative of Walter Hays, its Chairman, has developed a project entitled *Earthquake Basics*. The project involves creating a series of brief pamphlets and slide sets with the intention of advancing the methods of technology transfer, and of improving earthquake risk management policies and practices.

The first in the *Earthquake Basics* series has been finalized, and is now available from EERI. The topic is **Liquefaction** and consists of a six-page brief and two slide sets. Slide set I describes the physics of liquefaction – a common phenomenon in most earthquakes of M5.5 or greater – throughout the world, and shows examples of damage from 11 selected earthquakes; slides in set II illustrate ways to mitigate damage caused by liquefaction. The sets are annotated and may be purchased separately. It is recommended that they be bought as a package, since the sets and the brief complement each other, forming an integrated whole.

Liquefaction-I, Physics of Liquefaction and Examples of Damage. Twenty slides with notes. $30 for members, $35 non-members.

Liquefaction-II, Liquefaction Mitigation - Ground Improvement. Twenty slides with notes. $30 for members, $35 non-members.

Liquefaction Brief: What it is and what to do about it. Six-page *Earthquake Basics Brief #1* will accompany the slides.

All EERI members will have received the pamphlet with the February EERI Newsletter. Others can obtain single copies from the EERI office free of charge. The second in the *Earthquake Basics* series, on **Prediction and Warning** (Dennis Mileti, lead), will be available soon. Other themes packages being proposed by CITT include **Landslides** (J.P. Singh, lead), **Strong Ground Motion** (Walter Silva, lead), **Tsunami Flood Waves** (Jane Preuss, lead), **Buildings** (Walter Hays and Chris Arnold, leads), **Lifelines** (Ron Eguchi, lead), **Disaster Reduction Planning Cycle** (Marjorie Greene, lead), **Insurance** (Richard Roth, lead), and **Sources of Information** (Katie Frohmberg, lead).

Orders for slides have to be prepaid by check, VISA or MasterCard. Please add 8.25 percent tax, if you are in California, and orders from outside the U.S. must include 10 percent for shipping. For more information on these and other slide sets, or to obtain a free publications catalog, please contact the Earthquake Engineering Research Institute, 499 14th Street, Suite 320, Oakland, CA 94612-1902, (510) 451-0905, fax (510) 451-5411.

California Publishes Two Earthquake Safety Guides

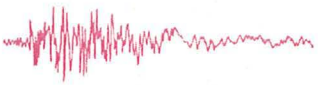
The California Seismic Safety Commission has published two guides to earthquake safety in buildings. State law requires sellers of certain properties to provide potential buyers with copies of the booklets.

The Homeowner's Guide to Earthquake Safety guides sellers and buyers through types of weaknesses, how to discover them, and choices for upgrading the structure. Some of the weaknesses covered are unbraced water heaters, unanchored foundations, weak cripple walls, and pier-and-post foundations.

The Commercial Property Owner's Guide to Earthquake Safety will help buyers and sellers spot and understand potential weaknesses in tilt-up and masonry buildings. Some of the weaknesses covered in the booklet are walls poorly anchored to the floors and roof, unreinforced masonry walls, and poorly reinforced concrete walls or columns.

The booklets may be ordered from the California Seismic Safety Commission, 1900 K Street, Suite 100, Sacramento, CA 94814-4186, (916) 322-4917, for $2.25 (homeowner's) and $3.25 (commercial).

- Reprinted from EERI Newsletter, March, 1993.

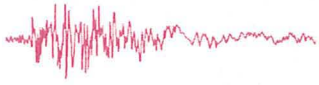


ATC-35: Ground Motion Estimation and Design Implication

ATC-35-1, *Proceedings of ATC-35 Seminar on New Developments in Earthquake Ground Motion Estimation and Implications for Engineering Design Practice*, is available for $45 from the Applied Technology Council (ATC), 555 Twin Dolphin Drive, Suite 550, Redwood City, CA 94065, (415) 595-1542, fax (415) 593-2320. Add $5 for shipping to destinations outside the United States.

The 478-page report documents state-of-the-art technical information pertaining to regional earthquake risk, estimation of ground shaking, and implications for engineering design practice in five seismic-prone regions of the country. The information was presented and discussed at one-day seminars given in Los Angeles, San Francisco, Seattle, New York City, and Memphis in January-February 1994. Approximately 1,200 structural and geotechnical engineering professionals registered for the seminars. The events were sponsored by ATC and funded by the U.S. Geological Survey as part of the ongoing ATC-35 project to "Transfer U.S. Geological Survey Research Results into Engineering Design Practice."

- Reprinted from EERI Newsletter, June, 1994.



Expected Seismic Performance of Buildings

In the aftermath of damaging earthquakes, concerns are often raised about the performance of damaged structures and the adequacy of current building codes.

In order to help building owners, code administrators, and others involved in building maintenance programs understand how seismic design provisions and quality of construction affect earthquake performance, the Earthquake Engineering Research Institute (EERI) has issued a new publication, ***Expected Seismic Performance of Buildings***.

This 20-page booklet focuses on the expected performance of new buildings in Seismic Zone 4 that have been built to the recent 1991 Uniform Building Code (UBC), and older unreinforced masonry buildings that have been rehabilitated under the Uniform Code for Building Conservation (UCBC). Seismic Zone 4 is the area of highest seismic activity and includes, among other areas, Los Angeles and San Francisco.

This non-technical publication provides a clear explanation of the limitations of current codes and practices. It is hoped that the document will generate interest in a better understanding of the goals of seismic provisions in building codes, and that additional studies will be made to extend the coverage of projected performance to other seismic codes and other zones. It should be required reading for educators, policy makers, and others who are concerned about earthquake safety.

The publication and distribution is made possible through the support of the EERI membership. All current EERI members will receive the document free-of-charge. Additional copies may be ordered from EERI at $4 a copy at 499 14th Street, Suite 320, Oakland, CA 94612-1902, (510) 451-0905, fax (510) 451-5411. A discount price is available for orders or 20 copies or more.

- Reprinted from EERI Newsletter, March, 1994

Proceedings of the NRC/EERI Symposium on Practical Lessons from the Loma Prieta Earthquake

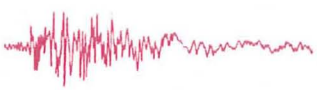
The Loma Prieta earthquake struck the San Francisco area on October 17, 1989, causing the loss of 63 lives and $10 billion of damage. As research conducted in response to the earthquake progressed over the following three years, the need to know how the results of this research could be applied to other earthquake-prone areas of the country became a matter of some urgency.

To examine the results of the research, the National Research Council's (NRC) Geotechnical Board and Board on Natural Disasters together with the Earthquake Engineering Research Institute (EERI) organized a major symposium on practical lessons from the Loma Prieta earthquake. The symposium, sponsored by the U.S. Geological Survey, the National Science Foundation, the Federal Emergency Management Agency, and the National Institute of Standards and Technology, took place in San Francisco on March 22-23, 1993, and was attended by over 400 individuals.

A report based on the proceedings of the Symposium has been put together by the NRC's Geotechnical Board and is expected to be published by the National Academy Press in late May or early June 1994. The publication consists of six keynote papers presented at the major sessions of the Symposium: geotechnical; buildings; emergency preparedness and response; lifelines; highway bridges; and recovery, mitigation, and planning. Selected remarks on the applicability of lessons to other areas of the country are included following each paper. The report also contains the opening presentation by L. Thomas Tobin, the Executive Director of the California Seismic Safety Commission.

Drawing on the keynote papers and discussions at the symposium, an overview chapter has been written to present a summary of the principal lessons learned from the Loma Prieta earthquake. In addition, the overview chapter contains recommendations to improve seismic safety and earthquake awareness in parts of the country vulnerable to earthquakes, but not as well prepared as California.

The report on ***Practical Lessons from the Loma Prieta Earthquake*** will be available for sale in June 1994. Copies may be ordered form EERI for $25. To order, please send payment to EERI, 499 14th Street, Suite 320, Oakland, CA 94612-1902, (510) 451-0905, fax (510) 451-5411. Orders from California must include 8.25 percent sales tax. For orders outside the U.S., add $2.50 for surface shipping for the first copy and $.50 for each additional copy.



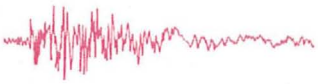
NCEER Establishes Highway Seismic Research Council

The National Center for Earthquake Engineering Research (NCEER) has established a Highway Seismic Research Council to provide technical and operational advice on the center's highway and bridge program, and specifically, on those aspects of the program that fulfill the requirements of the two Federal Highway Administration (FHWA) contracts that the center was awarded last fall. The contracts, totaling $14.2 million, are for seismic vulnerability studies of the national highway system.

The council is comprised of recognized academic, public, and private sector leaders in the fields of seismology, earthquake engineering, and highway and bridge design, and include representatives from the FHWA, American Association of State Highway and Transportation Officials (AASHTO), Transportation Research Board (TRB), United States Army Corps of Engineers (USACE), and the National Earthquake Hazards Reduction Program (NEHRP) agencies which include the Federal Emergency Management Agency (FEMA), National Institute of Standards and Technology (NIST), National Science Foundation (NSF), and the U.S. Geological Survey (USGS). The council members are divided into a technical group, which will advise on technical or scientific issues, and a coordination group, which will provide input on issues of technology transfer and coordination with end-users, including state transportation agencies and federal agencies involved in reducing earthquake hazards.

NCEER's highway and bridge program was initiated in September, 1989, to examine the seismic vulnerability of short and medium span bridges in regions of low-to-moderate seismicity, and to develop design, retrofit, and repair methodologies for such bridge structures. In September, 1992, the program was expanded to include highways, tunnels, and long span bridges, as a result of NCEER's receipt of the two FHWA contracts.

- Reprinted from EERI Newsletter, June, 1993



Volume 22 of Abstract Journal is Out

The National Information Service for Earthquake Engineering (NISEE) announces the publication, in two issues, of Volume 22 of the *Abstract Journal in Earthquake Engineering* (AJEE). The new volume offers a comprehensive collection of more than 2,500 abstracts and citations of 1992 world literature relevant to earthquake engineering and earthquake hazards mitigation, covering, among other items, *Proceedings of the Tenth World Conference on Earthquake Engineering* and studies of the October 17, 1989, Loma Prieta earthquake. To produce this collection, abstracts of technical papers, research reports, books, codes, and conference proceedings were drawn from 110 technical journals and the publications of academic, professional, and governmental organizations of 24 countries.

More than 90 percent of the references cited in the AJEE are contained in the collection of the EERC Library. Many of these publications can be borrowed by users residing in the United States. To users outside the U.S., many EERC holdings are made available through a limited copying service, also extended to U.S. residents. Subscription inquiries regarding Volume 22 and back issues may be sent to: Abstract Journal in Earthquake Engineering, EERC, 1301 South 46th Street, Richmond, CA 94804, (510) 231-9413, fax (510) 231-9461, e-mail ruthw@eerc.berkeley.edu.

- Reprinted from EERI Newsletter, April, 1993

Multimedia CD-Rom Presents Earthquake Preparedness Program

A multimedia software package entitled *Earthquakes: Be Prepared!* has been developed by Farzad Naeim and is available from John A. Martin and Associates (JAMA), the National Information Service for Earthquake Engineering (NISEE), and the National Center for Earthquake Engineering Research (NCEER). The software illustrates how individuals, schools, and businesses can develop plans to limit earthquake damage. Video clips, illustrations, and text on how to strengthen houses and how to prepare emergency plans are included.

This disk includes modules on earthquake preparedness for schools and child care facilities; how home owners can strengthen houses themselves; how to mitigate the potential dangers posed by file cases, computers, light fixtures and other contents in offices; and a module called *Understanding Earthquakes*, which shows how earthquakes occur and how they affect buildings. The Federal Emergency Management Agency and the California Office of Emergency Services have ordered the software for distribution to all public schools, public libraries, and universities in the three counties affected by the recent Northridge earthquake. Microsoft Windows 3.1 or higher is required to run the software. The CD-ROM disc is available for $54 from the following sources: JAMA Earthquake Project, (213) 483-5571; NISEE, University of California at Berkeley, (510) 642-5113; and NCEER, State University of New York at Buffalo, (716) 645-3377.

- Reprinted from EERI Newsletter, April, 1993

Design in Retrofit and Repair

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New Theme Issue of Earthquake Spectra

The impetus for the February 1994 theme issue of *Earthquake Spectra*, the professional journal of the Earthquake Engineering Research Institute (EERI), was the U.S./Italy workshop on "Learning from practice: a review of architectural design and construction experience," held in Orvieto, Italy, in October 1992. The focus of the workshop – that brought American and Italian architects, planners, engineers, and social scientists together to review their experience in seismic rehabilitation and reconstruction – was on the relationship between architectural and engineering design, specifically, the problems of conflicting requirements, and the special circumstances presented by existing buildings.

Although the buildings discussed by the Italian and American participants were built centuries apart, numerous common problems were found in the design of seismic rehabilitation. These common concerns arising from direct design and construction experience led to a solicitation of papers, not only from workshop participants but from practitioners and researchers with some insight into solutions to design problems. As such, this issue of *Earthquake Spectra* is intended to open the discussion on the relationship between architectural and structural design, as well as on research applications and code issues affecting design decisions. By raising questions, posing solutions, and describing case studies, the papers will serve as an important resource for the practicing design professional working in the challenging area of seismic retrofit.

Edited by Mary C. Comerio, Professor of Architecture at the University of California in Berkeley, this theme issue on "Design in retrofit and repair," is the fourth in a series. Previous theme issues covered seismic isolation (May 1990), public policy (February 1992), and passive energy dissipation (August 1993). EERI members and *Earthquake Spectra* subscribers receive the quarterly issues of the journal as part of their membership or subscription deal. Extra copies of the special theme issues, as well as all back issues of *Spectra*, are available from EERI for $15 each. Orders need to be prepaid by check or VISA/MasterCard. California residents must add 8.25 percent sales tax; for surface shipping outside the USA, please add $2.50.

For more information, or to receive a free catalog of the EERI publications please contact: EERI, 499 14th Street, Suite 320, Oakland, CA 94612-1902, (510) 451-0905, fax (510)451-5411.

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• September 11-15, 1994, **Annual Conference of the Association of State Dam Safety Officials**, Park Plaza Hotel, Boston Massachusetts. Recognized as the leading conference in the nation focusing on dam safety, general sessions will address the effects of recent natural disasters on dams and legal liability for dam safety, among other issues. For registration information, contact the Association of State Dam Safety Officials, 450 Old East Vine, 2nd Floor, Lexington, KY 40507, (606) 257-5146.

• September 19-23, 1994, **Ninth International Seminar on Earthquake Prognostics**, San Jose, Costa Rica. Topics will include earthquake source processes, hazard assessment and prediction of ground motion characteristics, risk analysis, earthquake resistant design and construction, and measures of protection against earthquake damage and for loss reduction. In conjunction with the seminar, special workshops will be held on repair work, structural strengthening and seismic upgrading of existing buildings, and earthquake dynamic control networks. For more information, contact Mr. Ing. Edwin Moya, Executive Director, 9th International Seminar on Earthquake Prognostics, Apartado 192, 1005 San Jose (Barrio Mexico), Costa Rica, fax 506-232-02-70, e-mail wmontero@ucr.vm2.bitnet.

• September 26-29, 1994, **Western States Seismic Policy Council Annual Meeting**, Olympus Hotel, Salt Lake City, Utah. See article in *Wasatch Front Forum*, 1993, v. 9, no. 3-4, p. 14-15. For further meeting information, contact Fred May, Utah Division of Comprehensive Emergency Management, 1110 State Office Building, Salt Lake City, UT 84114, (801) 538-3758, fax (801) 538-3770.

• September 29 - October 2, 1994, **Fifth U.S. Japan Workshop on Lifelines and Liquefaction**, Snowbird, Utah. See article, this issue.

October 2-7, 1994, **Association of Engineering Geologists Annual Meeting, "Engineering Geology: Past, Present and Future,"** Williamsburg, Virginia. For information, contact AEG, Suite 2D, 323 Boston Post Road, Sudbury, MA 01766, (508) 443-4639.

• October 24-27, 1994, **Geological Society of America Annual Meeting, "Geology At the Leading Edge,"** Washington State Convention and Trade Center, Seattle, Washington. The theme emphasizes both the geographical position of Seattle, situated on the leading edge of a convergent plate margin, and the application of "leading edge" theoretical approaches to and technological advances in the elucidation of geological problems. Theme sessions and symposium proposals are sought in all aspects of Pacific Rim and convergent-margin geology, with particular emphasis on the utilization of new technology. For information, call the GSA Meetings Department, Boulder, Colorado, (303) 447-2020.

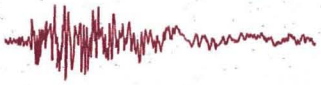
• December 14-16, 1994, **Fifth Symposium on Current Issues Related to Nuclear Power Plant Structures, Equipment, and Piping, "Operation, Maintenance, and Cost Reduction,"** Hilton at Walt Disney World Village, Lake Buena Vista, Florida, sponsored by the Center for Nuclear Power Plant Structures, Equipment, and Piping; U.S. Nuclear Regulatory Commission; and the Electric Power Research Institute. Seminar topics include: fragility evaluation for seismic probabilistic risk assessments for nuclear power plants, cost effective methods of procurement and seismic qualification, and new developments in response spectrum method and applications to nuclear power plant structures, equipment, and piping.. To receive further registration information, contact Cheryl Miskell, Office of Continuing Education and Professional Development, Box 7401, North Carolina State University, Raleigh, NC 27695-7401, (919) 515-2261, fax (919) 515-7614.

• April 2-7, 1995, **Third International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics**, St. Louis, Missouri. Researchers from Japan, Canada, Italy, Switzerland, Germany, Mexico, and the U.S. have been invited to make special presentations. Themes include liquefaction and ground failure, dynamic earth pressures and seismic design of earth retaining structures, soil structures interaction under dynamic loading, stability of slopes and earth dams under earthquakes, soil amplification during earthquakes and microzonation, predicting strong ground motion for design, wave propagation in soils, and geotechnical analysis of recent earthquakes. For more information, contact Shamsher Prakash, Department of Civil Engineering, University of Missouri-Rolla, Rolla, MO 65401, (314) 341-4489, fax (314) 341-4729, e-mail prakash@novell.civil.umr.edu.

• May 15-17, 1995, **Second International Conference on Seismology and Earthquake Engineering**, Tehran, Iran. The conference will be organized around seven technical divisions: seismicity and seismotectonics, earthquake engineering, geotechnical earthquake engineering, vulnerability and safety, risk mitigation and planning, earthquake education and public awareness, and IDNDR activities. For information, contact Dr. Fariborz Nateghi -A, SEE 2 Organizing Committee, P.O. Box 19395/3913, Tehran, I.R., Iran, phone 00-98-21-801-4038, fax 00-98-21-258-8732.

• May 24-26, 1995, **Seventh International Conference on Soil Dynamics and Earthquake Engineering**, Crete, Greece. The conference will provide a forum for the presentation and discussion of new and advanced ideas in soil dynamics and earthquake engineering in theory and practice. Themes will include excitation and propagation of dynamic waves in the ground, the determination of dynamic properties of soils and rocks, and the behavior of structures under dynamic loading. For further information, contact the Conference Secretariat, SDEE 95, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO4 2AA, UK, phone 44-0-703-293223, fax 44-0-703-292853, international e-mail cmi@ib.rl.ac.uk.

• June 5-7, 1995, **Seventh Canadian Conference on Earthquake Engineering**, Montreal, Canada. Topics include seismicity and strong ground motion, seismic hazard and risk, lifelines, seismic analysis of structures, design of structures and components, experimental methods and testing, soil dynamics, liquefaction, slope stability, foundations, observations of behavior during earthquakes, characteristics and impact of earthquakes in eastern North America, seismic code provisions, planning of emergency response, and repair and retrofitting of structures. For information, contact the Organizing Secretary, 7CCEE, Department of Civil Engineering, Ecole Polytechnique, University of Montreal Campus, P.O. Box 6079, Station "Centre-Ville", Montreal, Quebec, Canada H3C 3A7, (514) 340-3713, fax (514) 340-5881, e-mail judd@music.polymtl.ca.



The Fault Line Forum (formerly Wasatch Front Forum) is the newsletter of the Utah Earthquake Advisory Board. It is published quarterly by the Utah Geological Survey (UGS). It makes information available to the public which may be preliminary or unavailable in other published form, but is considered to be of value. It may not necessarily conform to UGS policy, technical review, or editorial standards. Information, contributions, questions, and suggestions concerning future issues may be sent to the Editor at the following address:

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Deadlines for Future Issues

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