

USSC Earthquake Conference Asks: "Will Your Business Survive?"

by Bea H. Mayes Utah Geological Survey

The first Utah Seismic Safety Commission (USSC) Earthquake Conference was held at the State Office Building on September 26, 1996. Over 200 participants heard speakers and joined breakout and plenary sessions which emphasized awareness of earthquake risk and practical steps to earthquake safety taken by businesses and local governments. The 1996 conference was supported by generous donations from: Association for Contingency Planners; Perpetual Storage; Quake Pro; State Farm Insurance Companies; Thiokol Corporation; Utah Disaster Kleenup; Utah League of Credit Unions, Inc.; Utah Urban Search & Rescue Task Force; and Woodward-Clyde Consultants. The following accounts excerpt and summarize highlights of the conference.

The first USSC Earthquake Conference... September 26, 1996

BUSINESS LEADERS AND PUBLIC OFFICIALS EXPERIENCE THE SALT LAKE VALLEY EARTHQUAKE OF 1996

Attendees at the Utah Seismic Safety Commission's 1996 Earthquake Conference, "Earthquakes in Utah: Will Your Business Survive?" heard speakers from sectors of the community responsible for emergency relief, continuance of community functions, and business resumption following a major earthquake. They were part of an expert panel participating in a mock earthquake scenario. The panelists and sectors they represented were:

- Robert Swenson, Chief of the Salt Lake County Fire Department; emergency response;
- Ronald Reaveley, structural engineer,





Ann Becker, organizer of the 1996 Utah Seismic Safety Commission Earthquake Conference, welcomes participants. Panelists are, left to right, Fire Chief Robert Swenson, Ronald Reaveley, PeterMcDonough, Chris Purcell, Charles Fox, Commissioner Mary Callaghan, and David McWilliams.

Reaveley and Associates; engineering and construction;

- Chris Purcell, Insurance Representative from Western Insurance Information Services; insurance;
- Charles Fox, Manager of Corporate Business Recovery Programs, First Security Bank; financial;

THE SCENARIO

In the first hours after the shock, "All power and *communications* are out, including telephones and 911...Sketchy reports of freeway collapses, fires, gas main breaks, collapsed buildings, and landslides in the canyons... One large fire burns in a downtown building."

What can you expect the day a major earthquake hits the Salt Lake Valley? State Geologist M. Lee Allison walked the audience through the hypothetical Salt Lake Valley earthquake of 1996, and the projected state of distress and damage in the valley following a magnitude 6.7 event. Panelists responded to the drama by telling what their groups would be doing immediately after the first shock, at the end of the first day, and one week, one month, and one year after the earthquake. The scenario earthquake occurs at 9:00 a.m., midweek, in early fall. School is in session. In the first hours after the shock:

All power and communications are out, including telephones and 911. One cell-phone line is available for every five phones, and the system is overwhelmed. Two-way radio is the only reliable means of communication.

Information about the earthquake is preliminary; the epicenter is somewhere near Salt Lake City. Sketchy reports of freeway collapses, fires, gas-main breaks, collapsed buildings, and landslides in the canyons reach the command center. Salt Lake County declares a state of emergency.

As the morning progresses, the radio carries reports of the situation. One very large aftershock occurs. Dozens of smaller ones are felt throughout the area. Major freeway damage is reported including at least a few collapses. I-15, I-80, and I-215 are closed as a precaution, and no traffic is allowed over or under interstate-system bridges. The water-supply



Highway bridge destruction, San Fernando earthquake of 1971.

- Commissioners Mary Callaghan and Randy Horiuchi, Salt Lake County; public officials; and
- David McWilliams, Packard Bell NEC (a business damaged in the 1994 Northridge, California earthquake, which recently moved its headquarters to Salt Lake City); the Northridge experience.

system coming from the Wasatch Range has been cut and there is local flooding downstream of pipeline breaks. Water tanks are ruptured and draining, and City Creek is flooding as a result. Cracking is reported at Mountain Dell Dam and the danger of collapse is unknown.

The Capitol rotunda has collapsed and the Capitol building is heavily damaged; some sections have partially collapsed. Two elementary schools, one junior high school, and one high school have partially or totally collapsed. Many children are reported injured and fatalities are certain.

One large fire burns in a downtown building; dozens of smaller fires are rumored in residential areas. Damage to water mains and the quickly draining feeder system limit the ability to fight the downtown fire. Individual fire departments reconnoiter their areas to prioritize emergency-response efforts. Gas leaks are identified as the source of ignition in many fires throughout the county. The gas supply to the city and county is turned off at the request of the mayor. Although there are many injuries, limited calls for ambulances are received because telephones remain out. The few calls received are via radio to fire departments. Schools have asked parents to pick up their children, but children are stranded because their parents cannot reach the schools. At nightfall, many workers have walked home from downtown. Temperatures during the night are expect-

ed to reach 32 degrees Fahrenheit.



Water cascades down street as gas fire blazes after the 1994 Northridge earthquake. Broken water mains and gas lines caused the floods and fire.

Will your business be able to re-open one week after a large earthquake? One week after the earthquake, the scenario continues:

The reality of the extent of disruption to people's lives has become clear. Many are still clearing rubble from their homes and businesses, and have not returned to work. Aftershocks continue, but are beginning to die down.

Clean-up is in full swing. Massive amounts of rubble accumulate and must be disposed of. Search and rescue efforts are complete. Most missing persons are accounted for, and funerals for those killed begin. Power is mostly restored, but some facilities require major repair. Phone service is restored, although lines remain jammed. Emotional distress caused by aftershocks, scarcity of essential goods, and loss of property and loved ones causes short tempers and depression.

Engineers and building officials continue the arduous task of inspecting buildings and red tagging (a red tag means the building cannot be entered) those that are dangerous and uninhabitable. The need for more inspectors becomes apparent and out-of-state help begins to arrive. Many private office and government buildings are too extensively damaged to be re-occupied. Some schools and businesses re-open, but many remain closed.

All fires are out. Many hazardousmaterials spills are being cleaned up, and the long-term environmental conse-



Shelving and storage racks at a homecenter-type store after the 1994 Northridge earthquake.



A large fire burns in the downtown section of Kobe after the January 17, 1995 earthquake.

quences begin to be evaluated. Money is difficult to get. Local price gouging by some vendors of essential goods is reported. Preliminary damage estimates place direct losses at several billion dollars. Fatalities stand at more than 1,000, many of whom are children. Tens of thousands of injuries were treated and tens of thousands remain homeless.

One month after the earthquake fear of aftershocks has subsided, but the long-term financial consequences are becoming evident. Loss of jobs and income, costs of repairs, and lack of insurance coverage have struck many individuals and businesses hard. Winter is coming, and a rush to rebuild and prepare for the cold is underway.

Many businesses that relied on "discretionary" spending have not re-opened. Many small, one-outlet businesses have failed. The cost of labor for repairs and/or rebuilding is rising. Many out-ofstate contractors move in. Planning and building departments are swamped with permit applications and inspectors can't keep up. Much of the area's manufacturing capacity is still below normal and buyers are seeking other suppliers. Market share is being lost. Demolition has resulted in massive piles of rubble awaiting disposal. Tourism has ceased. The final direct-loss estimate approaches \$10 billion, and the final death count is more than 1,000. Indirect losses from loss of tourism, businesses, and tax revenues mount.

One week after the earthquake..."The reality of the extent of disruption to people's lives has become clear...Most missing persons are accounted for, and funerals for those killed begin... Emotional distress...causes short tempers and depression."

One month later, "Many businesses that relied on 'discretionary' spending have not reopened...Out-ofstate contractors move in...The area's manufacturing capacity is still below normal and buyers are seeking other suppliers." **One year later** the direct effects of the earthquake are very much evident. A number of buildings were abandoned by their owners due to insufficient insurance coverage and insufficient equity, and are now boarded up. Most severely damaged, older, brick, commercial buildings in the downtown area ultimately were demolished. Several square blocks in an area west of I-15 were completely abandoned and are now disintegrating. One-fourth of the retail businesses in the area hardest hit in Salt Lake City have closed. Many more are in severe financial trouble. Ultimately one-third are predicted to fail. The building boom has resulted in the creation of many low-paying jobs, but much of the economic benefit has gone to construction companies from outside the Salt Lake Valley, as area contractors initially struggled to get materials and workers, and missed opportunities to bid on projects.

PANELISTS' RESPONSES

Chief Swenson: During the first day, 911 and dispatch are not operational...

Reaveley: Initial structural and safety evaluations are expected to take about three weeks... Structurally many buildings survive, but the finishes are all down, lying on the floor...

The seven panelists responded by outlining what they and their groups would be doing in response to the scenario. The first day after the initial shock, Fire Chief Robert Swenson said that 911 and dispatch are not operational. Crews are doing damage assessments to determine response needs, including observing essential facilities (schools, hospitals, other large gathering places), train yards, hazardous materials storage areas, alternative water supplies, and roads for use by emergency vehicles. They are also assessing the need for additional resources. Because of the large areas suitable for helicopter landings and temporary medical facilities, senior high schools have been designated as casualty-collection points. The Salt Lake Valley has only about 70 fire-engine companies, whereas southern California in the Northridge earthquake had about 500, so priorities are being set up, and not all fires will be fought. Outside resources will be coming from Reno and Las Vegas. Emergency response will request Urban Search and Rescue Teams from FEMA.

Ron Reaveley, representing the engineering and construction sector, responded that during the first 24 hours after the shock, Salt Lake City and Salt Lake County are setting up reconnaissance and evaluation teams. The initial structural and safety evaluations are expected to take about three weeks. Structural engineers will be working 16-18 hours a day, but are not able to meet the demand. Schools and churches are looked to for central ser-

Fire Chief Robert Swenson (left) tells of disaster assessment to determine response needs. To his left are panelists Ron Reaveley, Pete McDonough, and Chris Purcell.

vices and refuge in a disaster, but many older buildings did not survive the earthquake. Older office buildings made of brick have the most damage; approximately 40 percent of the older buildings are moderately to severely damaged. About 30 percent of the homes in Salt Lake County are unreinforced masonry construction and have sustained moderate to severe damage. Thirty percent of the remainder suffer moderate damage. Homes with brick veneer are stripped of some or all of the brick. Most frame and stucco homes built within the last 20 years survive with little structural damage. Most repair and replacement costs, however, occur in non-structural components of a building, such as furnishings, glass, and doors. Books, computers, and other office equipment have been strewn about the floors. Unbraced ceilings, lights, and wall decorations have fallen. Immediately after the shock, overturned storage shelves and file cabinets make exit from office buildings and warehouses difficult. Interior finishes come down. Structurally many buildings survive, but the finishings are all down, lying on the floor, so that they look like unfinished buildings.

Pete McDonough of Mountain Fuel, representing the lifelines sector (surface transportation, railroads, electric power, water, sewage, natural gas, telephone, and airports), reported massive traffic jams affecting surface transport. Bridge collapses isolated the east and west sides of Salt Lake City. Local roads are out where they cross the fault, and liquefaction has caused buckling of many others. Damage to areas of collocation (where of gas lines, power lines, water mains, and other lifelines are in the same area) has shut off all services to some areas. The many breaks in water lines are causing loss of water supply, and as much as 20 percent of sewer lines may be damaged. Breaks in natural-gas lines and connections to falling water heaters have resulted in a persistent gas odor throughout the valley. At the Salt Lake airport up to 20 percent of the buildings and 5 percent of the runways have sustained some damage. Although telephone service as been restored by the end of the first week, extensive dial-tone delays are common. Cellular phones are used extensively. Prior

McDonough: Massive traffic jams affect...surface transport...

to an earthquake, Pete recommends finding your water and gas meters. Have an appropriate wrench handy to turn off the line should you smell gas after an earthquake.

Chris Purcell, representing the insurance sector, sees agents doing field surveys of damage the first day, but warns that assessments can be complicated. Agents are making damage estimates and trying to establish contact with the outside world. They set up portable claims offices and ask for outside help, which may have to fly in to Hill Air Force Base, Las Vegas, or even Los Angeles. After one week, the majority of insurance carriers have their claims operations up and running, and individual companies will have established reserves based on their estimated losses. Insurance companies are issuing temporary living-expense drafts to their policyholders, but very few appraisals of structural damage are complete. Only about 10 percent of the homeowners and a smaller percentage of business owners carry earthquake insurance. The limited homeowners' coverage is not nearly enough to help most people put their lives back together.

Charlie Fox of First Security Bank, representing the financial sector, said that communities have complex financial requirements. Following the earthquake, limited financial transactions are possible. No on-line communications are operational; no ATMs, no direct deposits, and no automatic payments. Where necessary, financial facilities are relocating locally to other sites. The emphasis is on maintaining customer files and information. In the first 48 to 72 hours following a large earthquake, "Cash is King." Regular banking operations are out until main data lines can be restored, and cash is scarce. Banks are cooperating to move cash to devastated areas. Critical facilities, electronic transfers, and checking account access are expected to be restored in about 72 hours. Fox notes that required business continuity plans for financial institutions include back-up electrical power, redundant data-processing capability for critical functions, backup data storage in secure and accessible locations, and hot-site mainframe processing capability in remote locations. Since it's impossible to know in advance the severity or location of a damaging earthquake, proper preparations must consider and prepare for any eventuality. This kind of preparation is a monumental and very expensive on-going effort. He urged:

The best plan for families and individuals, is to have some cash on hand in the 72-hour emergency kit. And, you can expect to be fingerprinted if you go to a financial institution during the first several days following an earthquake. Get to know local merchants, and have cash.

Commissioners Mary Callaghan and Randy Horiuchi, representing the local government sector, said that agencies including Fire, Law Enforcement, Solid Waste, Health, and Aging Services are active in responding to the crisis. Local agreements among cities, counties, and adjacent states regarding disaster cooperation are already in place. A policy group of government officials working with two-way radios and/or cell phones has been set up to receive status reports and use the information to make emergency declarations. Paper work for the federal government has begun. One month later all phases of government are back in systematic operation, notably planning, housing, and funding resources. Many employees have been working double shifts and are now reaching a state of exhaustion and lowered morale. Stations have been set up to receive refuse and debris. Rebuilding of facilities has been prioritized with highest priorities going to jails, senior centers, and public works, and lower priority to, for example, the Salt Palace and the arts. Federal assistance will be needed to rebuild the infrastructure, and there is concern about funds for snow removal in the coming months. After the first full year, the private sector is booming, but the loss of tax base may require tax increases. Government is re-assessing building codes, longrange planning, and long-range emergency-management plans.

David McWilliams of computer manufacturer Packard Bell NEC, experienced the 1994 Northridge, California, earthquake at Packard Bell. McWilliams shared some of his experiences and observations. Packard Bell had a two-story facility and a warehouse, with shelves of computers and other merchandise. The Northridge earthquake occurred at 4:29 a.m., so few employees were at work when it hit. Part of the ceiling had come down and you could see into the second floor from the first floor and damage was widespread. Packard Bell had a response team which set up a medical facility for the injured. Fortunately, no one was in the production area at the time of the earthquake. Those who were in the building left, but two employees who subsequently returned to the building were injured. In the warehouse, formerly shelved items littered the floor. Inside the main building, ceilings collapsed, computers and desk and file contents were strewn about the floor. In some places live electric wires hung swaying from the ceiling. Video footage presented during a breakout session documented these kinds of damage. As one session participant noted, "If my management could see this [video], they wouldn't hesitate to pay for earthquake preparedness."

Purcell: The limited coverage available from homeowners policies is not nearly enough to help people put their lives back together.

Fox: In the first 48 to 72 hours...CASH IS KING....regular banking operations are out...

Commissioner Callaghan: Government officials...make emergency declarations. Commissioner Horiuchi: After the first full year of budget, the private sector is booming, but loss of tax base may require tax increases...

McWilliams: Now, before anything happens, set up a telephone arrangement with your family who live outside your telephone area. McWilliams left the audience with a caveat and a suggestion: (1) once you leave a damaged building, don't go back. Those who went back at Packard Bell were injured; and (2) now, before anything happens, set up a telephone arrangement with family who live outside of your telephone area. In this way your family will have a message center, and anyone who gets to a phone can give and get information.

...two joint winners of the **Annual Award** for Outstanding **Contributions** to **Earthquake** Safety in Utah: The Salt Lake **Tribune** and Lee Siegel, science reporter. "The Tribune editors feature... Mr. Siegel's reports... and take forceful editorial stances supportive of earthquake safety "

LT. GOVERNOR OLENE WALKER TELLS VIEWS ON EARTHQUAKE SAFETY IN UTAH, PRESENTS USSC AWARDS

The Honorable Olene Walker, Lieutenant Governor of Utah, addressed the USSC Conference audience on behalf of the Leavitt Administration. "The administration recognizes that improving earthquake safety is important," she said. "We need to make a long-term commit-



Lt. Governor Olene Walker presents USSC awards for "Outstanding Contributions to Earthquake Safety in Utah" to Lee Siegel and the Salt Lake Tribune.

ment to think about safety and make our buildings as safe as possible." Lt. Governor Walker said the administration appreciates the work of the Utah Seismic Safety Commission in developing a "Strategic Plan for Earthquake Safety in Utah," and supports the commission's efforts to implement the plan. Lt. Governor Walker then personally presented the Utah Seismic Safety Commission awards and certificates to the awardees.

USSC Chairman Youd gave the award citations. Nominations for the award for "Outstanding Contributions to Earthquake Safety in Utah" were evaluated by a selection committee consisting of the chairs of USSC Standing Committees. The evaluations led to the choice of two joint winners of the USSC Annual Award. In addition, three other nominees were selected to receive USSC "Certificates of Excellence."

The USSC Annual Award for "Outstanding Contributions to Earthquake Safety in Utah" was given jointly to the Salt Lake Tribune and to Lee Siegel, Tribune Science Reporter. Chairman Youd said,

For the past several years, the Salt Lake Tribune has taken bold and assertive steps to report on earthquakerelated activities in Utah. They have made a very important contribution to increasing awareness and promoting earthquake safety among Utah's citizens, businesses, and decision-makers.

As science reporter, Mr. Siegel spearheads the reporting of earthquake issues. His technical and political understanding of these issues is the foundation for his articulate, insightful reports. The Tribune editors feature these reports and other earthquake-related articles prominently, and take forceful editorial stances supportive of earthquake safety. The USSC believes that earthquake safety begins with awareness, and these two recipients have made a most significant contribution in this arena.

Lee Siegel accepted the awards.

A USSC Certificate of Excellence was awarded to Brigham Young University for "comprehensive campus-wide and community-wide earthquake safety efforts," including: (1) providing earthquake awareness and preparedness information to all students and staff, (2) providing Community Emergency Response Training (CERT) for 118 employees, (3) developing an emergency communications system and comprehensive disaster-response plan, (4) maintaining 72-hour food and water supplies for all students, and (5) creating an on-going seismic upgrade plan for existing facilities. "All BYU's actions are coordinated to provide backup support to the surrounding communities," Youd said. Kerry Baum, Emergency Preparedness Coordinator at BYU, accepted the award.

USSC awarded a second Certificate of Excellence to the Salt Lake City School District "for their pioneering efforts and initiative in upgrading their older schools to improve earthquake safety." Salt Lake City was the first public school district in Utah to commission a districtwide evaluation of their buildings, and based on that evaluation, the district has implemented a plan to retrofit and replace the schools that need to be upgraded. Stephen Harmon, Salt Lake City School District Director of Buildings and Grounds, accepted the award. Mr. Harmon was accompanied by School Board President Mary Jo Rasmussen.

Hyde Park City was the recipient of the third USSC Certificate of Excellence. Hyde

Park City Mayor Mark Daines accepted the award. The city has involved the community in disaster planning, has provided CERT training and held mock disaster exercises, replaced or relocated the city office building and water-system components to safer structures and locations, and included seismic hazards in their master plan and ordinances.

ROBERT GROW GIVES KEYNOTE ADDRESS

Keynote speaker Robert J. Grow, president and chief operating officer at Geneva Steel, explained how and why Geneva Steel made the decision to construct and retrofit their facilities to higher building-code standards (seismic zone 4) than the required minimum (seismic zone 3).

Grow said when Geneva Steel made the decision to upgrade their facilities, he insisted that they build and renovate to meet seismic zone 4 standards. Geneva's experience has shown that on any one project, the additional cost to upgrade from seismic zone 3 to seismic zone 4 standards was no more than 1.5 percent. The average per-project cost of the additional upgrade was 0.5 to 0.75 percent. He says an additional cost of 1.5 percent is very little when compared to the potential cost to human health and safety, and the business risk involved if your operations are shut down for even a short period of time. To insure against a lengthy shutdown, he requires that not only Geneva Steel's facilities, but also those of essential suppliers, such as Geneva's oxygen supplier, meet seismic zone 4 building-code requirements. Developers and lenders generally pay little attention to seismic risk, but for the relatively small extra costs involved, it pays businesses to



Robert Grow explains Geneva Steel's reasons for upgrading to seismic zone 4.

make facilities resistant to a strong jolt. After an earthquake, Grow said, "I want to be one of the suppliers people pay in order to get back in business." For the relatively small extra costs involved, it pays businesses to make facilities resistant to a strong jolt. After an earthquake, "I want to be one of the suppliers people pay...in order to get back in business."

LEADERS IN EARTHQUAKE SAFETY

Business and government leaders conducted six "how-to" breakout sessions that dealt with practical solutions to earthquakepreparation problems. In each session, the presenter built on personal experiences with earthquake safety. Topics included:

- how small and large companies have addressed earthquake safety,
- introduction to Community Emergency Response Teams (CERT),
- business recovery myths and realities,

- employee preparedness at work and home,
- building construction for earthquake safety, and
- raw video footage of office damage in the 1994 Northridge earthquake.

In concluding the conference, M. Lee Allison, Director of the Utah Geological Survey, summarized actions businesses and local governments can take (see boxes), and highlighted the many earthquake-safety measures already being implemented. In addition to the actions

WHAT BUSINESSES CAN DO

- 1) Assess your earthquake vulnerability.
- 2) Develop response and recovery plans.
- 3) Inform employees of the company's plans, and encourage
- employee awareness and personal preparedness.
- 4) Improve the earthquake resistance of your facilities.
- 5) Support responsible actions by government.

taken by USSC award winners and Geneva Steel, he cited the following other actions by industry and government.

- The State PTA Emergency Preparedness Committee has provided PTA organizations statewide with information gathered during a visit to the Northridge earthquake site. They produced and distributed 1,000 audio tapes, and distributed an earthquake-training video for schools.
- Industries and hospitals, notably the Utah Transit Authority, Mountain Fuel Supply Company, Thiokol, National Semiconductor, Unisys, Salt Lake City Airport Authority, and Intermountain Health Care, have educated their employees about emergency procedures in the work place.
- The Utah Transit Authority trained Community Emergency Response Teams (CERTs) at its five operating divisions, one each in Weber County and Orem, and the remainder in Salt Lake County.
- Franklin Quest company trained 50 CERT team members.
- Harmon's, Inc. is establishing one trained CERT team in each of its eight supermarkets.
- Disaster communication capabilities have been upgraded by Thiokol, National Semiconductor Corporation, and Mountain Fuel Supply.
- Hospital disaster communications have been upgraded by Columbia Mountain View Hospital and Intermountain Healthcare (IHC) Hospitals of Utah County.
- The Salt Lake City Airport Authority has established a mobile command post and Emergency Operations Center (EOC).
- Mountain Fuel's table-top and bi-annual full-scale exercises emphasize earthquakereaction procedures.

- Mountain Fuel Supply Company has constructed a new seismic zone 4 essentialfacilities building in Salt Lake City and relocated critical company operations to the new site.
- Harmon's has upgraded five of its supermarket stores to meet parapet/roof-anchor code.
- The Salt Lake City Airport has added lateral bracing and roof diaphragm slabs to its Concourse B.
- Centerville City has exceeded seismic standards in its seismic zone 4 construction of a new city hall and a community center.
- Hill Air Force Base has completed analysis and prioritization of a 20-year retrofit program of all buildings on the base.
- Significant replacement or upgrading of school buildings is either completed or in progress in Salt Lake City, Granite, Morgan, Tooele, Beaver, Murray, Grand, Provo, and Jordan School Districts.
- The historic Governor's mansion was seismically upgraded as part of its renovation.
- The Cathedral of the Madeline, an historic building, received seismic strengthening.
- The State Capitol was given a seismic evaluation.
- Seismic retrofit plans are being designed for numerous water-supply dams throughout the state in response to Utah's 1990 Dam Safety Act.
- The Utah Department of Transportation (UDOT) is funding liquefaction evaluations of highway bridges statewide.
- UDOT has completed a seismic hazard analysis to specify seismic design parameters for the reconstruction of I-15 in the Salt Lake Valley.

A summary of actions being taken by Utahns and business and community leaders to improve

The State PTA Emergency Preparedness Committee... produced and distributed 1,000 audio tapes, and distributed an earthquaketraining video for schools.

Industries and hospitals have educated their employees about emergency procedures in the work place earthquake safety has been published by the Utah Seismic Safety Commission in a report entitled "Earthquake Safety in Utah, a progress report of activities from July 1994 - June 1996." The report covers the period of existence of the USSC, and was compiled for the USSC from results of a mail survey questionnaire by F. Bruce Funk, an intern with the University of Utah Center for Public Policy and Administration.

WHAT LOCAL GOVERNMENTS CAN DO

- 1) Assess your earthquake vulnerability.
- 2) Develop response and recovery plans.
- 3) Improve earthquake resistance of existing public facilities, particularly those providing essential services, and lifeline systems.
- 4) Perform plan reviews, enforce building codes, and adopt and enforce geologic-hazards ordinances for new construction.
- 5) Provide public information.

USSC's "Earthquake Safety in Utah, a progress report of activities from July 1994 -June 1996" now available.



The Utah Seismic Safety Commission (USSC) met on October 1, 1996, several days after the 1996 Earthquake Conference (see related articles, this issue). The USSC continued the discussion begun at their last meeting on finding more effective ways to implement the Strategic Plan for Earthquake Safety in Utah. Senate majority leader Craig Peterson, who represents the Senate on the USSC, had recommended that the USSC concentrate early efforts on the legislative fiscal analysts for affected state agencies and the legislative committees that oversee the budget requests for those agencies. However, Lee Allison and Lorayne Frank indicated it is unlikely that any USSC recommendations will make it to the top of their departmental budget requests this year because of the new money that the recommendations would require. The Governor is requiring that 50% of any new agency funding request come from savings in the agency's existing budget, effectively precluding most new funding requests. In light of this, Senator Peterson suggested that the USSC might approach the 1997 Legislature directly to pursue funding for their highest priority initiatives: a long-term program to improve the seismic safety of state buildings; a long-term commitment to building a strong-ground-motion instrumentation network; and improving earthquake education and awareness targeting schools, business, industry, local governments, professional groups, and citizens.

Chairman Youd and Bill Juszcak reported that the USSC made a presentation to the Utah State Building Board during their September 1996 meeting, focusing on the USSC's request that \$10.5 million per year be added to the budget of the Division of Facilities Construction and Management (DFCM) to inventory the seismic vulnerability of state buildings and begin to retrofit the most critical of them. The presentation was favorably received. The Board Chairman believed the request deserved a high ranking, which is very important for the request to move forward in the budget process. The Building Board will vote to prioritize DFCM's funding requests at their October 1996 meeting. Additionally, Senator Peterson reported that DFCM made a presentation to the bi-partisan management committee of the House and Senate this summer on the condition of the State Capitol building with respect to earthquake vulnerability. Committee members were surprised at the high level of vulnerability and at the cost to even begin to retrofit the structure; the estimated cost to properly evaluate the condition of the State Capitol building is \$3 million, and to retrofit the structure to prevent collapse roughly \$100 million. Senator Peterson believes that this further increases the likelihood that the 1997 Legislature

Utah Seismic Safety Commission News

by Janine L. Jarva Utah Geological Survey

USSC to Approach 1997 Legislature on Top Priorities will take seriously the urgent need to begin the process of evaluating all state buildings and approve appropriations to do so.

Carl Eriksson and the Engineering and Architecture Standing Committee went forward after the last USSC meeting to develop a white paper addressing building-code enforcement and plan review in Utah. This was presented to the Utah Advisory Council on Intergovernmental Relations (UACIR) in July 1996 by Carl and Jim Bailey. The presentation was well received but it was unclear how the UACIR may be involved in moving forward with legislation. Carl developed some proposed amendments to state law based on the white paper and presented these proposals to the Inspector Licensing Board of the Uniform Building Code Commission. The Inspector Licensing Board suggested some changes to Carl's proposals and then endorsed them in concept. The USSC voted unanimously to adopt the white paper on building-code enforcement as their official position. Senator Peterson reported that he had opened a bill file for possible buildingcode amendments in the 1997 Legislature as promised at the last USSC meeting. Carl's proposed amendments will now be used to draft language for this bill.

Chairman Youd reported that in May 1996, the National Science Foundation (NSF) issued a request for proposals to fund up to three earthquake-engineering research centers in the United States. Each center that NSF decides to fund is expected to receive up to \$2 million in federal funds per year, over an initial five-year period, with a possible extension of three years, if nonfederal dollar-for-dollar matching funds are provided. Chairman Youd then introduced Matthew Mabey, who recently left his position with the Oregon Department of Geology and Mineral Industries (DOGMI) to accept a position in the Geology Department at Brigham Young University (BYU). Mabey will develop and submit a proposal for an NSF earthquake-engineering research center in Utah. He reported that consortia in California, Illinois, Texas, and New York were also submitting proposals. The proposed Utah center would have a geotechnical-engineering rather than a structura- engineering emphasis. The center would engage in research to develop and implement methods for supplying geotechnical-engineering design parameters for the costeffective reduction of losses. Another goal of the center would be to advance our ability to quickly identify the most vulnerable structures, leading to more cost-effective expenditures to increase the benefit-to-cost ratio for mitigation. Mabey indicated that participants in the Utah proposal

include BYU, Utah State University, the University of Utah, Portland State University, the Oregon DOGMI, and the UGS. Mabey would like to encourage participation by Idaho, Nevada, and Montana as well, if the Utah center is funded. The USSC suggested that state agencies like DFCM and the Utah Department of Transportation could participate and provide matching funds, as could industries like Geneva Steel and utilities like Mountain Fuel. Walter Arabasz thought that the proposal was a worthwhile pursuit even if only from the standpoint of bringing together a Utah consortium. The USSC voted unanimously to prepare a letter of support for the Utah proposal to NSF, offering their assistance and cooperation to the center, if funded.

In other news, Lee Allison made a brief report on the 1996 Earthquake Conference. Response from attendees was overwhelmingly positive, and Chairman Youd suggested repeating the conference in other locations around the state, such as Logan, Ogden, and St. George. The USSC agreed to have the organizing committee for this year's conference make recommendations on any changes to format, theme, and approach for future conferences.

Allison also reported on the winners of the first annual USSC Award for Achievement in Earthquake Safety (see related article, this issue). The USSC was impressed by the number and quality of nominations, and was encouraged to see that, without government mandate, many local governments, private businesses, school districts, and individuals are making significant commitments to improving seismic safety in Utah.

Chairman Youd introduced Bruce Funk who has prepared the report *Earthquake Safety in Utah*, the first USSC progress report to document activities by government, business, industry, academic institutions, community and service groups, professional organizations, and others throughout Utah to improve seismic safety and preparedness. The report should be available in December 1996. Funk has spent the summer interning for the USSC.

The next meeting of the USSC will be on Thursday, January 9 at 9:00 a.m. in room 1112 in the State Office Building. Anyone interested in attending is welcome. Please contact staff for more details: Janine Jarva, Utah Geological Survey, (801) 537-3386, fax: (801) 537-3400, or Brenda Edwards, Utah Division of Comprehensive Emergency Management, (801) 538-3752, fax: (801) 538-3770.

might...pursue funding directly for highest priority initiatives: a long-term program to improve seismic safety of state buildings; a long-term commitment to building a strong-groundmotion instrumentation network; and improving earthquake education and awareness targeting schools, business, industry, local governments, professional groups, and citizens.

Senator Peterson

suggested USSC



The Western States Seismic Policy Council (WSSPC) held its annual meeting in Polson, Montana, September 18-21. Delegates from all member states attended, including several state emergency management directors and state geologists. The theme of the conference was "Pursuing Partnerships."

This was the first meeting since WSSPC was reorganized with a full-time executive director, Steven Ganz, and leadership by a Board of Directors composed of directors of state emergency mangement offices and geological surveys. Lorayne Frank, director of the Utah Division of Comprehensive Emergency Management, is the Board Chairwoman.

A highlight of the meeting was a session on implementation of the new "HAZUS" national earthquake-loss estimation tool developed by the National Institute for Building Sciences (NIBS) for the Federal Emergency Management Agency (FEMA). The goal of "HAZUS" is to make earthquake loss estimates that can be used by local, state, and regional officials for planning and stimulating mitigation efforts to reduce losses from earthquakes and prepare for emergency response and recovery following earthquakes. The method is presently being tested in Portland and Boston, and will be ready for release early next year. FEMA will train state and local officials to use the method and develop the databases (building and bridge inventories, hazard maps, etc.) needed to run it.

Other highlights of the meeting relevant to Utah included discussions of: (1) the new Earthquake Information Providers Group (EqIP), a national group formed to improve earthquake information technology transfer; (2) results of a U.S. Department of

The Utah Civil Air Patrol (CAP) and the Utah National Guard (UNG), in cooperation with the Utah Division of **Comprehensive Emergency Management** (CEM), conducted an earthquake exercise, "RAP'96, Rapid Situation Assessment," on August 17, 1996, to investigate needs and capabilities in rapidly assessing the effects of a disaster, such as a large earthquake. The all-day exercise, which showcased recently available capabilities of the CAP and the UNG, included representatives from Weber, Davis, Salt Lake, and Utah Counties; Utah Geological Survey; Utah Office of Dam Safety; and Amateur Radio Emergency Services (ARES), in addition to CAP, UNG, and CEM.

Transportation-funded study by WSSPC focusing on seismic threats to the transportation infrastructure in the western U.S.; (3) comprehensive post-earthquake information management and operation of the Northridge "clearinghouse;" (4) seismiczonation mapping projects by various states; (5) earthquakes and hazard insurance; and (6) earthquake information on the World Wide Web and the new EQNET web site (http://www.eqnet.org).

This year for the first time WSSPC gave Awards of Excellence to recognize particularly effective state programs. For mitigation efforts, Oregon and British Columbia received awards for their earthquake hazards mapping projects. For outreach to schools, California, Idaho, and New Mexico were recognized for various workshops and publications. For outreach to the general public, Oregon and the Yukon were recognized for their publicawareness programs.

The Basin and Range Committee of WSSPC, headed by Craig dePolo of the Nevada Bureau of Mines and Geology, is still planning a summit to discuss earthquake-hazards issues unique to the Basin and Range states. The meeting is planned for May 1997 and full-scale planning is now underway. Both technical issues and user needs will be addressed at the conference, and funding has been acquired to bring invited speakers from member WSSPC states.

WSSPC is presently developing a strategic plan to map out the direction of the organization for the next several years. James Davis, California State Geologist, is chair of the strategic planning committee. The next annual meeting is scheduled for October 1997 in Victoria, British Columbia.

As UNG helicopters and CAP planes flew predetermined routes from the southern end of Utah County to the northern end of Weber County, and from the west side of the Stansbury Mountains to the Strawberry Valley, personnel viewed "mock" damages and relayed their messages to CEM's Emergency Operations Center (EOC). In addition to relaying messages from the CAP planes, the ARES operators also established real-time video broadcasting from Farnsworth Peak in the Oquirrh Mountains and from an airborne plane. Within a few minutes of being shot, CAP was able to transmit static imagery to CEM's EOC. The UNG demonstrated its Forward-Looking Continiued page 13... WSSPC Annual Meeting

by Gary E. Christenson Utah Geological Survey

The Basin and Range Committee of WSSPC is planning a summit to discuss earthquake-hazards issues unique to the Basin and Range states.



Civil Air Patrol and National Guard in RAP'96 Earthquake Exercise

by Robert D. Carey CEM EPICenter Manager

Earthquake Activity in the Utah Region



by Susan J. Nava University of Utah Seismograph Stations Department of Geology and Geophysics Salt Lake City, UT 84112-1183 (801) 581-6274

January 1 - March 31, 1996

During the three-month period January 1 through March 31, 1996, the University of Utah Seismograph Stations located 350 earthquakes within the Utah region (see accompanying epicenter map). The total includes one earthquake in the magnitude 4 range, nine earthquakes in the magnitude 3 range, and 168 earthquakes in the magnitude 2 range. Earthquakes which have magnitudes of 3.0 or larger (plotted as stars and specifically labeled on the epicenter map) are described below. There were two earthquakes reported felt during the report period. (Note: Magnitudes listed are coda magnitude, M_C. All times indicated below are local time, which was Mountain Standard Time during the report period.)

Significant Main Shocks and Clusters of Earthquakes

 Eastern Wasatch Plateau-Book Cliffs Area near Price (coal-mining related): Seismic events in the region (magnitude 0.9 to 3.5) make up 52% of the shocks that occurred in the Utah region during the period. Significant shocks include:

M _C 3.0	January 16	2:43 a.m.	11 miles NE of
			Fairview
M _C 3.5	February 1	7:11 p.m.	13 miles ESE of
			Mt.Pleasant
$M_{C} 3.0$	February 10	11:21 p.m.	13 miles NW of
C			Huntington
$M_{C} 3.0$	March 18	12:24 a.m.	11 miles ENE
C			of Fairview

• Central Utah: A cluster of 16 earthquakes ($M \le 2.9$)

occurred about 5 miles ESE of Holden, Utah, primarily in early January and late March. Significant shocks include:

M _C 4.2	January 6	5:55 a.m.	10 miles ESE of Castledale. Felt in Moab, Price, Clawson, Utah, and Grand Junction, Colorado
M _C 3.1	January 9	12:40 a.m.	9 miles ESE of Castledale
M _C 3.1	February 1	7:09 a.m.	4 miles ESE of Holden
Southwester	n Utah: Significant e	earthquakes include	:
M _C 3.1	January 4	1:15 a.m.	15 miles SW of Cedar City, Utah
M _C 3.3	February 15	3:41 p.m.	10 miles N of Mesquite, Nevada
$M_{C}^{2.9}$	March 12	10:43 p.m.	7 miles E of Fredonia, Arizona. Felt at
~			

Pipe Springs National Monument, Arizona, and Kanab, Utah

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

...Continued from page 11

Infrared-Radar (FLIR) capabilities that will be used if an earthquake occurs at night.

In an after-action meeting, participants identified problems that occurred during the exercise and areas in which the participating agencies can improve their information-collecting and communication capabilities. Each of the participating agencies now has new information with which to update its emergency-operation plan.



"The Utah Guide for the Seismic Improvement of Unreinforced Masonry Dwellings," published by Comprehensive Emergency Management's Earthquake Preparedness Information Center (EPICenter), illustrates methods for strengthening unreinforced masonry (URM) homes. The booklet focuses on three main areas of concern: (1) attaching the roof to the walls, (2) attaching floors and the foundation to the walls, and (3) strengthening and bracing of special features. Designed to be used by contractors, repair specialists, and homeowners who possess construction skills above the typical "handyman" level, the booklet shows several types of home construction used prior to 1970 that can benefit from reinforcement and retrofitting.

Reaveley Engineers and Associates, Inc. developed the URM guide which is available for \$7.25, plus \$3 shipping and handling for mail orders, from the Department of Natural Resources (DNR) Bookstore, (801) 537-3320. The DNR Bookstore accepts checks, VISA, or Master Card. The URM guide is also available directly from the Division of Comprehensive Emergency Management, (801) 538-3400, for \$7.25. Utah Guide to Retrofitting URM Homes Available

by Robert D. Carey CEM EPICenter Manager



- Rescheduled: December 3 5, 1996, ASCE International Conference and Exposition on Natural Disaster Reduction, Washington, D.C. Sponsored by the American Society of Civil Engineers. For information contact Natural Disaster Reduction '96, ASCE, 345 47th Street, New York, NY 10017; (800) 548-2723; (212) 705-7285; fax: (212) 705-7975; e-mail: conf@ny.asce.org
- December 8 11, 1996, Society for Risk Analysis Annual Meeting, New Orleans, Louisiana. For information, contact Society for Risk Analysis, 1313 Dolley Madison Boulevard, Suite 402, McLean, VA 22101; (703) 790-1745.
- January 31 February 1, 1997, EERC-CUREe Symposium in Honor of Vitelmo V. Bertero, Richmond, CA. Info: EERC, (510) 231-9554, fax (510) 231-9471, e-mail: admin@eerc.berkeley.edu
- February 12 15, 1997, **EERI Annual Meeting**, Austin, Texas. For information call the EERI office at (510) 451-0905.
- May 5 7, 1997, 1997 National Conference on Delivering Health and Medical Services in Catastrophic Disaster, National Disaster Medical System (NDMS) annual conference, Tampa, Florida. For information contact NDMS at 1-800-USA-NDMS, ext 444.
- May 21 23, 1997, CPM '97 Contingency Planning and Management Conference and Exhibition, Orlando, Florida. Sponsored by Contingency Planning and Management magazine. For information on attending or contributing: Brad Kent, Contingency Planning and Management, Witter Publishing Corporation, 84 Park Avenue, Flemington, NJ 08822; (908) 788-0343, ext 134; fax (908) 788-3782.

 June 25 - 27, 1997, STREMAH 97 - Fifth International Conference on Structural Studies, Repairs, and Maintenance of Historical Buildings, San Sebastian, Spain. Information: Sue Owen, Conference Secretariat, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK; phone 44 (0) 1703 293223; fax 44 (0) 1703 292853; e-mail:

sue@wessex.witcmi.ac.uk; www: http://www.witc-mi.ac.uk

- March 9 14, 1998, 4th International Conference on Case Histories in Geotechnical Engineering, St. Louis, MO. Info: fax 573-341-4729; e-mail: prakash@novell.civil.umr.edu
- May 31 June 4, 1998, 6NCEE Sixth U.S. National Conference on Earthquake Engineering, Seattle, WA. Information: Earthquake Engineering Research Institute (EERI), 510-451-0905.
- July 18 23, 1998, Structural Engineers World Congress, San Francisco, CA. Information: 916-497-1040; fax 916-569-0677; e-mail: sewc@aol.com

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September, 1998, World Forum on Seismic
Safety of Big Cities, Istanbul, Turkey. Information and announcement: Turkish Earthquake Foundation (TDV), c/o Hasan Boduroglu, Technical University of Istanbul, Faculty for Civil Engineering, 80626, Ayazaga/Istanbul, Turkey; tel: 90-212-2856655; fax 90-212-2856656; e-mail: inbodur@tritu.bitnet; or International Center for Earthquake Prognostics, c/o Andreas Vogel; tel: 49-30-7792268; fax: 49-30-7757083; e-mail: 101744.1577@compuserve.com

Meetings and Conferences

FEMA - EMI Courses

The Federal Emergency Management Agency Emergency Management Institute's (EMI) catalog of courses for October 1996 through September 1997 is available by contacting EMI, National Emergency Training Center, 16825 South Seton Avenue, Emmitsburg, MD 21727; (301) 447-1000 or (800) 238-3358. EMI offerings soon will be listed on the FEMA World Wide Web site (http://www.fema.gov/EMI/emi. htm).

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Recent Publications

Abstract Journal in Earthquake Engineering, v. 26, no. 1 (Fall 1996). Subscription to Volumes [sic] 1 and 2 costs \$100.00 (California residents add 8.25% sales tax). Order from Abstract Journal in Earthquake Engineering, Earthquake Engineering Research Center, 1301 South 48th Street, Richmond, CA 94804-4698. Make checks payable to "Regents of the University of California." Visa and Mastercard also accepted.

- American Red Cross, 1996, Pets in Disaster: Get Prepared, 4 p. \$4.25 for 25 copies. Available from American Red Cross, Salt Lake Area Chapter, 1391 South Park St., P.O. Box 526279, Salt Lake City, UT 84152-6279; (801) 467-7339.
- Center for Urban and Regional Studies, University of North Carolina, 1996, Natural Hazard Working Paper Series. Fifteen papers covering research on hazard mitigation efforts are available at a cost of \$5.00 each, including postage, from the Center for Urban and Regional Studies, C.B. 3410, University of North Carolina at Chapel Hill, Chapel Hill, NC 27514-3410; (919) 962-3074; World Wide Web: http://www.unc.edu/home/basolov/curs001.html. Make checks to "Center for Urban and Regional Studies." Titles of general interest are:
 - **Godschalk, D.R.**, 1996, Assessing planning and implementation of hazard mitigation under the Stafford Act—Study approach: WP1.
 - Healey, M., and Berke, P., 1996, Opinions of state hazard mitigation officers about mitigation planning and implementation—Report of a survey: WP2.
 - Kaiser, E.J., and Goebel, M., 1996, Analysis of content and quality of state hazard mitigation plans under Section 409 of the Stafford Act: WP3.
 - Bohl, C.C., and Godschalk, D.R., 1996, Analysis of Section 404 hazard mitigation grants under the Stafford Act: WP4.
 - **Young, K.**, 1966, Opinions of federal hazard mitigation officers about mitigation planning and implementation—Report of a survey: WP5.

Beatley, T., 1996, National trends in mitigation policy—An evolving framework: WP6.

Berke, P, and Bohl, C.C., 1996, Policy, capacity, and commitment in hazard mitigation— Intergovernmental linkages: WP7.

- Beatley, T., 1996, Ethical dilemmas in hazard mitigation: WP8.
- Godschalk, D.R., and Kaiser, E.J., 1996, Lessons from six mitigation case studies: WP15.
- Department of Civil Engineering and Engineering Mechanics, Columbia University, 1996, Proceedings: International Conference on Retrofitting of Structures, March 11 - 13, 1996. Cost is \$35. Contact Prof. Raimondo Betti, Department of Civil Engineering and Engineering Mechanics, Room 610, S.W. Mudd Building, Columbia University, New York, NY 10027; fax (212) 854-6267; e-mail: betti@civil.columbia.edu
- Earthquake Engineering Research Institute, 1995, Proceedings of the technical seminar on the Kobe earthquake impact on Executive Order 12941, *Seismic Safety of Existing Federally Owned or Leased Buildings*. A limited number of Proceedings are available for \$15 each plus \$5 for shipping and handling (California residents add 8.25% sales tax). Send payment to EERI, 499 14th Street, Suite 320, Oakland, CA 94612-1934; phone (510) 451-0905; fax (510) 451-5411; e-mail: earscott@eeri.org
- 1996, Post-earthquake investigation field guide (replaces 1991 Earthquake response plan and field guide). Copies \$15 each plus \$5 shipping and handling (California residents add 8.25% sales tax).
 Send prepaid orders to Earthquake Engineering Research Institute, 499 14th Street, Oakland, CA 94612-1934, or contact EERI, phone (510) 451-0905, fax (510) 451-5411, for more information.
- Hall, John F., editor, 1995, Northridge earthquake of January 17, 1994, reconnaissance report, Volume 1: Earthquake Engineering Research Institute, 523 p. Copies are \$30 each plus 10% shipping and handling (California residents add 8.25% sales tax) from EERI, 499 14th Street, Suite 320, Oakland, CA 94612-1934; phone (510) 451-0905; fax (510) 451-5411.
- Holmes, William T., and Somers, Peter, editors, 1996,

Northridge earthquake of January 17, 1994, reconnaissance report, Volume 2: Earthquake Engineering Research Institute, 280 p. Copies are \$15 each plus 10% shipping and handling (California residents add 8.25% sales tax) from EERI, 499 14th Street, Suite 320, Oakland, CA 94612-1934; phone (510) 451-0905; fax (510) 451-5411.

Koehler, G.A., editor, 1996, What disaster response management can learn from chaos theory: California Research Bureau, 222 p. Copies available free from Gus Koehler, California Research Bureau, P.O. Box 942837, Sacramento, CA 94237-0001; e-mail: gkoehler@library.ca.gov. Also available via World Wide Web at:

http://library.ca.gov/california/State_Library/ National Institute of Standards and Technology (NIST), 1996, State of the art report on seismic design requirements for nonstructural building components: NISTIR 5857 The report focuses

components: NISTIR 5857. The report focuses on damage to nonstructural components, especially ceiling-located components. To receive a copy mail or fax to Long Phan, NIST, 226 - B158, Gaithersburg, MD 20899; fax (301) 869-6275.

- Natural Hazards Research and Applications Information Center, University of Colorado, 1996, 1996 Annual Hazards Research and Applications Workshop: Session summaries and abstracts. Information: publications clerk, Natural Hazards Research and Applications Information Center, Campus Box 482, University of Colorado, Boulder, CO 80309-0482; (303) 492-6819; fax (303) 492-2151; e-mail: jclark@spot.colorado.edu
- Seismic Safety Commission, 1996, Northridge building case studies: SSC 94-06, 440 p. Cost is \$50. To order, send check to Seismic Safety Commission, 1900 K St., #100, Sacramento, CA 95814, (916) 322-4917.
- Seismological Society of America (SSA), 1996,
 Bulletin of the Seismological Society of America: Northridge special issue, v. 86, no. 1B, 368 p. Cost is \$30 (California residents add 8.25% sales tax).

For ordering details contact SSA Office, 201 Plaza Professional Building, El Cerrito, CA 94530, (510) 525-5474, fax (510) 525-7204.

- Shinozuka, Masanobu, editor, 1996, The Hanshin-Awaji earthquake of January 17, 1995, performance of lifelines: National Center for Earthquake Engineering Research (NCEER) Technical Report 95-0015. To order, contact NCEER, SUNY Buffalo, Red Jacket Quadrangle, Buffalo, NY 14261, (716) 645-3391, fax (716) 645-3399.
- Transportation Research Board, National Research Council, 1996, Landslides: Investigation and mitigation: Special Report 247, 672 p. \$65.00 hardcover; \$45.00 paperback. Order from Transportation Research Board, National Research Council, P.O. Box 289, Washington, DC 20055.
- U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, National Mental Health
 Services Knowledge Exchange Network, 1995, Women and children in disasters: Biblio-des No. 19, 20 p. Free from U.S. Department of Health and Human Services, P.O. Box 42490, Washington, DC 20015; (800) 789-2647; fax (301) 656-4012.
 - 1996, Construction and disasters: Biblio-des No. 20, 151 p. Free from U.S. Department of Health and Human Services at the address, phone, and fax numbers above.
- U.S. Geological Survey, 1996, USGS response to an urban earthquake — Northridge '94: USGS Openfile Report 96-263, 100 p. Re-issued as General Interest Publication 93-0471. Single copies are free from USGS Information Services, Denver, CO, 303-202-4200, fax (303) 202-4693. Electronic versions are currently available on World Wide Web at: http://geohazards.cr.usgs.gov/ northridge/
- Wellington Earthquake Lifelines Group, 1995, Images of Kobe: Prospects for Wellington, lessons for New Zealand: Wellington Earthquake Lifelines Group Report, 166 p. \$50.00 (U.S.). Order from Wellington Earthquake Lifelines Group, P.O. Box 10-804, Wellington, New Zealand; tel: (04) 499 7256; fax: (04) 499-7253.

Applied Technology Council (ATC) to publish Guidelines for the Seismic Rehabilitation of Buildings

A FEMA-funded three-volume document (consisting of **Guidelines**, **Commentary**, and **Example Applications**) is undergoing a balloted consensus review process by the member organizations of the Building Seismic Safety Council (BSSC). The finalized documents will be published in 1997. **Guidelines** is an update of FEMA 178, NEHRP Handbook for the Seismic Evaluation of Existing Buildings.

Volume 12, Number 3

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- Martin Martin



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