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Calendar of Events

JANUARY 2005

14
 Utah Seismic Safety
 Commission Meeting
 Salt Lake City, Utah

FEBRUARY 2005

25
 Utah DES Quarterly
 Leadership Conference
 Salt Lake City, Utah

MARCH 2005

7-11
 Southeastern HAZUS User
 Group Conference
 Charleston, South Carolina

SEPTEMBER 2005

24-28
 WSSPC Annual Conference
 Pocatello, Idaho

LEARNING ABOUT EARTHQUAKES

BY BARRY WELLIVER, USSC CHAIR

Education is a funny thing. We spend the first part of our lives wondering if we'll ever use the things we're taught in elementary and secondary school. Then, we may look upon our schooling as an endless stream of knowledge that has no bounds. Lastly, we may arrive at the idea that we make differences in our world when we focus our learning and apply knowledge to make this a better place to live and work.

Being an engineer that last statement for me is a defining mantra we become accustomed to and offer as justification for our chosen profession. I have been caught boasting about the practical nature of engineering, yet I know that what this "applied" profession uses as tools are developed by scientists and researchers without whom progress would be greatly slowed.

I was educated on the east coast (New England) and came to understand earthquakes as a natural disaster which essentially opened up the earth and swallowed people. As ridiculous as that sounds, it was about all I knew about earthquakes in 1973 and ultimately was a curiosity which ushered my westward move.

The Utah Seismic Safety Commission (USSC) has adopted a three-pronged look at the earthquake problem. Co-opted from the recent California Seismic Safety Commission strategic plan refinement, **Learning about Earthquakes, Building for Earthquakes, and Living with Earthquakes** has become our action plan for the foreseeable future. This distillation of our strategic plan into three basic categories will help focus attentions and hopefully will translate into "products" which bring home the message.

How we are motivated to learn about the world we live in is a complex question. Some incentive comes from our curious nature. Other motivation stems from our need for protection and survival. Living in an area susceptible to "natural disasters" generally warrants some consideration of the risk. This however is also a function of the last time that something noteworthy can be remembered. When the evidence of danger is in the distant past, the priority adjusts accordingly. Earthquakes in Utah are a vague memory for some and yet are a present danger non-the-less.

LEARNING ABOUT EARTHQUAKES CONTINUED

The struggle shared by persons working in the field of earthquake preparedness and safety is bringing this message to an audience needing to consider the consequences of the destructive and disruptive nature of an earthquake. This message will need to be clearer and free of jargon and technical acronyms if it is to be given more than polite tolerance. Perhaps the immediate question needing an answer is; 'if this really is a problem, how much importance do I need to place on it'?

The USSC will always pursue better public education about earthquakes. Improving student level curriculums, providing teacher workshops, using software tools to better quantify the risk and making a concerted effort to be better communicators of the danger are among the immediate goals of the commission. The benefits of improving our understanding of earthquakes will be reaped after an event. Good preparation is an insurance policy we can't afford to ignore and somehow need to put into proper perspective.

The knowledge about earthquakes will continue to grow. Our building codes will help assure better cost-effective solutions, and perhaps one day we'll be able to "brace" ourselves because we'll have the ability to narrow the window to see future events. Our desire to learn about earthquakes should be heightened not because we've just experienced a catastrophic event, but because we recognize that we can improve our surroundings and make a difference in our world.

So to answer that question about urgency, I'd suggest the following;

"If you don't know enough to make a good decision, then we need to get busy!"

REPRESENTATIVE DON BUSH RETIRES



Barry Welliver, Representative Don Bush, and Mrs. Bush as he accepts his plaque.

Representative Don Bush retired as a representative to the Legislature and a Commissioner on the Utah Seismic Safety Commission (USSC) in October 2004. The USSC presented Representative Don Bush with a plaque for his dedicated service to the citizens of Utah while serving on the USSC. Representative Bush represented the Commission for five years without missing one meeting. Thank you Representative Bush.

USGS FUNDS UTAH EARTHQUAKE STUDIES IN 2005

BY Gary E. Christenson, Utah Geological Survey

The U.S. Geological Survey (USGS) announced awards for 2005 under its National Earthquake Hazards Reduction Program (NEHRP), and Utah scored well. Funding was awarded to the University of Utah (U of U), Utah State University (USU), and Utah Geological Survey (UGS), and to San Diego State University (SDSU) and URS Corporation for cooperative projects with the U of U. Projects include paleoseismic studies of faults, mapping of liquefaction hazards, and evaluating seismic-source and ground-motion parameters used to produce ground-shaking-hazard maps.

Fault studies include a cooperative project between the UGS and USGS to determine the late Holocene earthquake history of the Nephi segment of the Wasatch fault zone, and to determine whether ruptures on the Provo segment overlap onto the Nephi segment. Trenches will be excavated near Santaquin (UGS) and Nephi (USGS) to compare results on the northern and southern ends of the segment. In addition, the UGS will look at the Collinston and Clarkston Mountain segments of the northern Wasatch fault zone to determine the timing of most recent earthquakes and long-term slip rates. Using the consensus paleoearthquake histories developed by the Utah Quaternary Fault Parameters Working Group for the six active central segments of the Wasatch fault zone, the UGS will also assess the likelihood and develop a model for multi-segment ruptures, that is, earthquakes that may rupture more than one segment and therefore be larger than expected.

Funding was provided to complete an on-going collaborative effort among the U of U, USU, and UGS to develop probabilistic liquefaction-potential and ground-displacement maps in a pilot project in northern Salt Lake Valley. Liquefaction-hazard-mapping techniques developed during the pilot project are intended for use in mapping liquefaction potential elsewhere along the Wasatch Front. To prepare for future mapping, funding was also provided to begin compiling a geotechnical database for southern Salt Lake Valley.

Regarding earthquake ground shaking, the Utah Ground Shaking Working Group has set a goal to produce detailed probabilistic and scenario ground shaking maps for the Wasatch Front that reflect geologic site conditions. A critical step in the process is to produce a "community velocity model." Such a model allows us to determine the likely shear-wave-velocity profile of soils down to bedrock at any location along the Wasatch Front based on geologic mapping of near-surface site conditions and the depth to semi-consolidated sediments and rock. SDSU and the U of U will be cooperating to develop such a model similar to that developed for the Los Angeles basin in southern California.

In a project to better understand the range of stress drops associated with earthquakes in Utah, how seismic waves decay with distance as they move through geologic materials along the Wasatch Front, and how ground motions amplify or deamplify near the ground surface, the U of U and URS Corporation will use recordings of small local and regional earthquakes obtained by instruments in their new Advanced National Seismograph System. The results of the study can then be used by engineers and seismologists to more accurately estimate expected levels of ground shaking.

Finally, the UGS will again convene Utah's earthquake working groups for meetings in March 2005 to discuss completed 2004 work, plan the new 2005 projects listed above, and set goals for 2006. Planning is also underway at the UGS to convene a Basin and Range Province Earthquake Working Group to look at the larger, province-wide issues regarding fault behavior (regularity of recurrence, time-dependence), magnitude-frequency distributions (characteristic vs. exponential models), rupture characteristics (magnitude-length and -displacement relations), and seismological parameters (attenuation relations, stress drops) common to extensional terrains in the western U.S.

Utah has benefited greatly from USGS NEHRP funding over the years, and continues to do so. Seismologists, engineers, and geologists in Utah have again joined forces to cooperate on many very important projects, and we look forward to another productive year.

JOINT SEISMIC SAFETY COMMISSIONS WORKSHOP

BY RICK ALLIS

The theme of the September 27, 2004, St Louis Joint Seismic Safety Commissions Workshop was to discuss ways to make commissions more effective and to improve communications between commissions. The first half of the morning meeting focused on how active commissions operate, and the second half on products and initiatives. The meeting was attended by at least 40 people from more than 10 different commissions and agencies.

Key issues and points raised were:

- Compared to similar California workshops in 1996, about half of the commissions and boards are now inactive. Heighten commission activity may be the result of the major earthquakes of Loma Prieta (1989) and Northridge (1994) that raised awareness of the potential damage and cost of earthquakes in the mid 1990s. Tight state budgets during the last five years may also be a factor.
- There has been a large turnover in staff in emergency management agencies, commissions and Geological Survey upper management – only 3 participants attended the 1996 workshop. There is an ongoing need to educate those in the seismic risk reduction area of past initiatives to avoid “reinventing the wheel”.
- “Windows of opportunities” exist after damaging earthquakes for reaching out to the public with messages about earthquake safety and preparedness. Other forms of natural disasters may also present opportunities. The window may be only last about a year or less.
- Even although it is tough to get earthquake safety messages heard and acted upon during long intervals between damaging earthquakes (like the last 10 years), it is still important to be active with mitigation initiatives – don’t get disheartened.
- Identify your target audience: general public, industry, legislators, professional societies (e.g. engineers, architects), and tailor the message/initiative accordingly.
- A key factor to the sustained operation of several commissions was the underpinning support of state agencies (Emergency Management, Geological Surveys, Seismological Observatories...). Involve a cross-section of people/stakeholders in the commission activities (not just state or federal government people) such as engineers, architects... Legislators, or their liaisons, lobbyists, can be important for advising on strategies for commission initiatives with the legislature, in addition to helping bills succeed.
- It is much easier to get legislation stopped than it is to get new legislation passed!
- Commissioners should speak with one voice.
- Someone should sit in on important government/agency meetings, even if uninvited (e.g. building board meetings). There may be an opportunity to raise the issues of seismic mitigation or retrofitting.
- Investigate other commissions for ideas of products or initiatives that could be duplicated in your own state (see Action below). FEMA has many reports that are useful.
- All active commissions are independent of any one state agency. This is an issue in California, where the Governor’s panel has recommended restructuring their commission and having it reside within a Department.
- Hazard events can present opportunities for businesses that are prepared for earthquakes and survive largely unscathed. Get this message out.
- HAZUS scenarios can be a powerful way of reaching out to decisionmakers
- Non-earthquake hazard examples can be used to promote greater awareness of the potential for earthquake damage.
- There is a need for cost-benefit analyses that are simplified and are targeted for the private sector; the cost of business interruption is usually under-estimated.

EVALUATING OUR PROGRESS

BY BOB CAREY

What is the yardstick that we use to determine our progress? We can develop surveys that illustrate what other organizations and jurisdictions have been accomplishing over the past few years taking comfort in our perception that somehow we made them happen. Either by direct interaction with these groups or indirectly by our perseverance of telling the state that earthquakes will happen. The Utah Seismic Safety Commission (USSC) is again looking at their progress in protecting the states citizens.

Another measurement of how far we have progressed is to compare ourselves to other commissions. At first glance, we see ourselves behind the curve with the California Seismic Safety Commission, funding notwithstanding. Maybe a better comparison is the Nevada Earthquake Safety Council (NESC). Like Utah, their earthquakes do not occur that often. A closer look is needed, so 'Road Trip.'

As I walked into the meeting room, it seemed familiar, like the USSC meetings, those pre-meeting logistics going on all around you, a warm handshake from a colleague and friend. There were some familiar faces, but most were new. The first noticeable difference is there are more participants and no doughnuts.

The NESC is comprised of two groups, one from Las Vegas, and the other from Reno. The meetings, alternating between the two cities, will have their own atmosphere and flavor. The agenda looks similar to the USSC, but longer. The NESC will meet all day. There will be committee reports, agency updates and other commission information. This part of the agenda, the information part, will be 75% of the meeting's agenda with the balance being presentations.

As I watch the proceedings, I wondered whose voice is being heard? Will it be the engineers, emergency management, geoscience, or some other group? Our leaders like to lead to their strengths. Nevada leaders and strengths are in geoscience as opposed to the USSC which has a strong engineering tone. Even with this geoscience tone, the NESC Chair is a building official from Las Vegas.

But the major player of the Council is the Nevada Bureau of Mines and Geology at the University of Nevada at Reno. This is the group that makes things happen. They are involved with preparedness, education, hazard identification, public awareness and about every other Council activity.

The Utah delegation of two, Barry Welliver and myself, was acknowledged to the Council and participated in the discussions. The USSC's position on Duck, Cover, and Hold was greatly appreciated by the Council's during its discussions of the subject matter. The Council was surprised at the size of the URM inventory in Utah and interested in our Existing Building Initiative. We seemed to have common issues and a desire to know how each other will deal with them.

At the end of the day, it was very apparent that both organizations have common issues with different solutions. The difference in solutions is all about knowing your audience. The NESC strength is in their numbers. They seem to help rather than hinder. There is a definite interest from various levels of government and they frequently present at NESC meetings.

It is very apparent to me that our journey in preparing and protecting the state starts with the people that want to make a difference, and those who have a strong desire to seek out others who share this same passion and are willing to make it happen no matter what it requires.



UNIVERSITY OF UTAH QUARTERLY SEISMICITY SUMMARY

EARTHQUAKE ACTIVITY IN THE UTAH REGION

January 1 – March 31, 2004

by R. Burlacu and P. M. Roberson
with contributions by W. J. Arabasz, S. J. Nava, J. C. Pechmann, J. E. Hoffman, J. M. Hale, and K. L. Pankow
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During the three-month period January 1 through March 31, 2004, the University of Utah Seismograph Stations (UUSS) located 355 earthquakes within the Utah region (Figure 1). The total includes six earthquakes in the magnitude 3 range and 53 earthquakes in the magnitude 2 range. Earthquakes of magnitude 3.0 or larger (plotted as stars and specifically labeled on Figure 1) are listed below. Ten earthquakes were reported felt during the report period (see Table 1, a cumulative tabulation of felt earthquakes in the Utah Region during 2004). Additional information on earthquakes within the Utah region is available from the University of Utah Seismograph Stations.

Online Information

A complete copy of this report, including maps and the earthquake catalog, is available on the UUSS Web site at <http://www.seis.utah.edu/catalog/quarterly.shtml>. ShakeMaps—computer maps of the ground shaking produced by an earthquake—are automatically produced by UUSS for earthquakes of magnitude 3 and larger within the Wasatch Front urban area. The ShakeMaps are accessible on the UUSS Web page at <http://www.seis.utah.edu/shake>. Earthquakes during the report period for which ShakeMaps are available are indicated below and in Table 1. For earthquakes of magnitude 3 and larger in the Utah region, the U. S. Geological Survey automatically posts a Community Internet Intensity Map (CIIM) on its "Did You Feel It?" Web page at <http://pasadena.wr.usgs.gov/shake/imw>. We urge anyone who feels an earthquake to report their observations on this interactive Web site; felt information is available by zip code on the CIIM site or can be obtained from UUSS directly. Felt earthquakes during the report period for which intensity maps are currently available are indicated in Table 1.

Earthquakes of Magnitude 3.0 or Larger

- ML 3.0 Feb 23 02:20 MST 12 mi W of Gunnison, UT (felt; see Table 1)
- ML 3.4 Feb 24 17:41 MST 1 mi SSW of Franklin, ID and along the Utah border (felt; see Table 1)
- ML 3.2 March 13 06:04 MST 7 mi SW of Nephi, UT (felt; see Table 1)
- ML 3.3 March 18 07:58 MST 7 mi SW of Nephi, UT (felt; see Table 1)
- ML 3.0 March 18 22:39 MST 7 mi SW of Nephi, UT (felt; see Table 1)
- ML 3.0 March 19 07:23 MST 7 mi SW of Nephi, UT (felt; see Table 1)

Other Notable Seismicity

During the report period, there were three notable spatial clusters of earthquake activity (labeled A–C in Figure 1). For reporting purposes, we define a cluster as ten or more earthquakes occurring within a 10-km (6-mile) radius during the report period. Referring to the epicenter map (Figure 1), these include the following—from north to south (all dates below are UTC unless otherwise noted): A. A cluster of 12 earthquakes ($1.1 \leq M \leq 3.4$) occurred about two miles S of Franklin, ID (~18 miles N of Logan) along the Utah-Idaho border. Six of the events, including the magnitude 3.4 event, occurred between February 21 and 28. B. Thirty-one earthquakes ($0.1 \leq M \leq 2.4$) clustered about sixteen miles NW of Garland, UT (~31 miles WNW of Logan). Eleven events, including the magnitude 2.4 event, occurred on March 7. C. Ninety-five earthquakes ($1.0 \leq M \leq 3.3$) clustered about seven miles SW of Nephi, UT (~42 miles S of Provo). Sixty-six of the events occurred in a three-day period between March 18 and 20. In Figure 1, the locally clustered seismic events within a radius of approximately 30 miles of Price, together with a localized cluster about 50 miles to its southwest, are associated with known areas of underground coal mining and are interpreted to be mining-related. These include a total of 56 located shocks ($0.8 \leq M \leq 2.4$) that occurred throughout the report period.

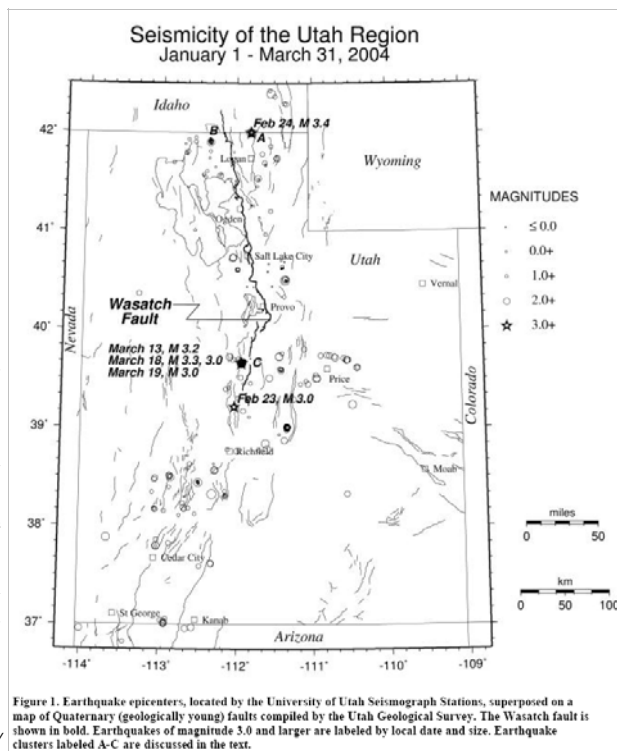


Figure 1. Earthquake epicenters, located by the University of Utah Seismograph Stations, superposed on a map of Quaternary (geologically young) faults compiled by the Utah Geological Survey. The Wasatch fault is shown in bold. Earthquakes of magnitude 3.0 and larger are labeled by local date and size. Earthquake clusters labeled A-C are discussed in the text.

UNIVERSITY OF UTAH QUARTERLY SEISMICITY SUMMARY

EARTHQUAKE ACTIVITY IN THE UTAH REGION

April 1 – June 30, 2004

by R. Burlacu and P. M. Roberson

with contributions by W. J. Arabasz, S. J. Nava, J. C. Pechmann, J.

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During the three-month period April 1 through June 30, 2004, the University of Utah Seismograph Stations (UUSS) located 290 earthquakes within the Utah region (Figure 1). The total includes one earthquake in the magnitude 3 range and 35 earthquakes in the magnitude 2 range. Earthquakes of magnitude 3.0 or larger (plotted as stars and specifically labeled on Figure 1) are listed below. Two earthquakes were reported felt during the report period (see Table 1, a cumulative tabulation of felt earthquakes in the Utah Region during 2004). Additional information on earthquakes within the Utah region is available from the University of Utah Seismograph Stations.

Online Information

A complete copy of this report, including maps and the earthquake catalog, is available on the UUSS Web site at <http://www.seis.utah.edu/catalog/quarterly.shtml>. ShakeMaps—computer maps of the ground shaking produced by an earthquake—are automatically produced by UUSS for earthquakes of magnitude 3 and larger within the Wasatch Front urban area. The ShakeMaps are accessible on the UUSS Web page at <http://www.seis.utah.edu/shake>. Earthquakes during 2004 for which ShakeMaps are available are indicated in Table 1. For earthquakes of magnitude 3 and larger in the Utah region, the U. S. Geological Survey automatically posts a Community Internet Intensity Map (CIIM) on its "Did You Feel It?" Web page at <http://pasadena.wr.usgs.gov/shake/imw>. We urge anyone who feels an earthquake to report their observations on this interactive Web site; felt information is available by zip code on the CIIM site or can be obtained from UUSS directly.

Earthquakes of Magnitude 3.0 or Larger

ML 3.0 Jun 04 02:41 MST 3 mi NNE of Saint Charles, ID (felt; see Table 1)

Other Notable Seismicity

During the report period, there were four notable spatial clusters of earthquake activity (labeled A–D in Figure 1). For reporting purposes, we define a cluster as ten or more earthquakes occurring within a 10-km (6-mile) radius during the report period. Referring to the epicenter map (Figure 1), these include the following—from north to south (all dates below are UTC unless otherwise noted): A. A cluster of 32 earthquakes ($0.2 \leq M \leq 2.7$) occurred about sixteen miles NW of Garland, UT (~30 miles WNW of Logan). Fifteen events, including the magnitude 2.7 event, occurred on May 15. B. Twenty-four earthquakes ($0.6 \leq M \leq 2.3$) clustered about twenty eight miles W of Garland, UT (~44 miles W of Logan). C. Twelve earthquakes ($1.0 \leq M \leq 2.3$) clustered about three miles SE of Ephraim, UT (~44 miles SW of Price). All events occurred on April 26. D. This cluster contains two clusters whose centers are separated by ~6 km (~4 miles). They contain 20 and 22 events, respectively, 18 of which are shared by the two clusters. The clusters ($1.0 \leq M \leq 2.3$) are about 5 miles NW of Panguitch, UT (~34 miles NE of Cedar City). In Figure 1, the locally clustered seismic events within a radius of approximately 30 miles of Price, together with a localized cluster about 50 miles to its southwest, are associated with known areas of underground coal mining and are interpreted to be mining-related. These include a total of 46 located shocks ($1.2 \leq M \leq 2.1$) that occurred throughout the report period.

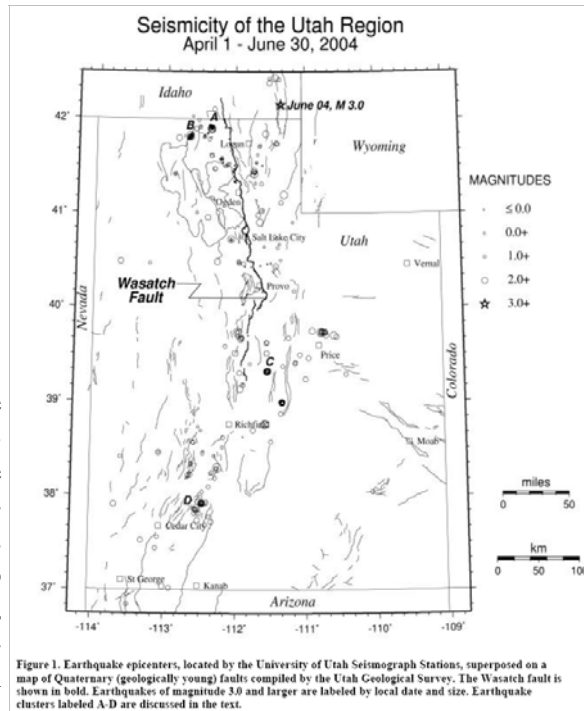


Figure 1. Earthquake epicenters, located by the University of Utah Seismograph Stations, superposed on a map of Quaternary (geologically young) faults compiled by the Utah Geological Survey. The Wasatch fault is shown in bold. Earthquakes of magnitude 3.0 and larger are labeled by local date and size. Earthquake clusters labeled A–D are discussed in the text.

UTAH SEISMIC SAFETY COMMISSION MEETING NOTES

OCTOBER 22, 2004 BY AMISHA LESTER

The Utah Seismic Safety Commission (USSC) held its October meeting at the State Office Building in Salt Lake City, Utah.

The Commission discussed the Triangle of Life issue. The individual behind the Triangle of Life has stated that people who Drop or Duck, Cover, and Hold will die from the collapse of buildings. After a brief discussion, the Commission decided that the best resolution to this issue would be to get guidance from FEMA. Bob Carey stated that FEMA had been given several opportunities to comment on this matter and had not done so. Bob indicated that DES was moving forward on the issue and wanted the Commission to be part of the press release. He said that a letter to the State Superintendent of Schools was also needed. After further discussion, two motions were made by Walter Arabasz.

The first motion was for the Commission to adopt the following as its working policy: Until advised otherwise by a national safety organization, the Commission – based on provisional guidance from the Federal Emergency Management Agency and its own technical judgment – recommends continuation of ‘Duck, Cover and Hold’ as an appropriate earthquake safety measure in Utah.

The second motion placed was that given public attention and concern about the relative merits of the “Duck, Cover and Hold” verses the “Triangle of Life” earthquake safety procedures, that the Commission seek written guidance from the Federal Emergency Management Agency for resolving which procedure should be advocated for earthquake safety in Utah.

Barry Welliver reported on the inventory, education, and mitigation of unreinforced masonry buildings (URM’s) in Utah. URM’s within our communities are a danger and should be a high priority for retrofit or demolition. Mandating the retrofit of URM’s and identifying dangerous URM’s are some available options. Beginning an inventory to identify URM’s within the state and going to the legislature with this information is one recommendation made by Barry. After further discussion by the Commission, they may consider going to the Legislature with a plan of action that suggests how to deal with the problem and how much it is going to cost.

The Commission presented a plaque to Representative Don Bush for his dedicated service to the citizens of Utah through the Utah Seismic Safety Commission. Representative Bush gave 5 years of service to the Commission.

Other meeting notes...

Barry Welliver, Rick Allis, Bob Carey, and Walter Arabasz reported on the National Earthquake Conference. There is a need for better communication between the western states seismic commissions. A website will be established for commissions to post information about their activities. The Metro Water District received an award for their seismic policy.

Peter McDonough discussed the Lifelines Committee-UDOT seismic policy. Pete stated that Todd Jensen has replaced Dave Nazare due to his promotion at UDOT. Todd Jensen is the State Bridge Engineer with UDOT. The AASHTO Bridge Code subcommittee is comprised of representatives from the DOT’s of the 50 states. The subcommittee discusses seismic provisions, updating seismic acceleration maps, technical differences between eastern and western states and changes and updates. Each new bridge built is designed to the AASHTO Bridge Code. FEMA has supported the subcommittee since 1998. Todd Jensen will speak at the next

Cont. on Page 9

UTAH SEISMIC SAFETY COMMISSION MEETING NOTES CONT.

USSC meeting.

Walter Arabasz and Bob Carey gave a brief report on the Scientific Earthquake Study Advisory Council (SESAC) Meeting held in Jackson Hole in September. SESAC is a congressionally mandated advisory committee to the U.S. Geological Survey. Seismic monitoring in the Jackson Hole area was one focus of this particular meeting. Two keynote speakers, Bennett Racey, Assistant Secretary for Water and Science, Department of Interior, and the Chip Groat, Director of the U.S. Geological Survey, gave presentations at the meeting. Other speakers included Walter Arabasz and Bob Carey.

Barry Welliver gave a presentation on the Utah Facilities Operation Maintenance Association (UFOMA) in Moab. Barry handed out copies of his presentation to the Commission. USSC delivered a message of concern and need to deal with their existing building stock, Utah's earthquake risks and making the schools safe against earthquakes. A copy of the presentation will be placed on the USSC website.

BUILDING CODES AND EARTHQUAKES

BY BARRY WELLIVER, USSC CHAIR

Structural engineering is a pretty exact science...when it comes to gravity. That natural force is fairly constant wherever you go and predicting how buildings and materials behave under those conditions is something of a "no-brainer" so to speak.

But take a building or structure and rotate it 90 degrees, and shake it...then comes the quandary that engineers have puzzled over and struggled with for some time. And don't forget to bounce that building up and down for good measure. These are the challenges structural engineers need to address when buildings are subject to the non-boring natural forces of earthquakes. It's an exciting challenge and well beyond the comfort zone of just pure gravity and one building codes try to address with better precision as time goes forward.

The history of building regulations for lateral design of structures is fairly short. In fact, design for earthquake forces in the United States probably doesn't make significant inroads until after the 1933 Long Beach, California earthquake where schools buildings showed significant damage. It's interesting to note however, that even after the 1906 San Francisco earthquake, building codes were reluctant to make seismic force design mandatory and instead assumed that wind forces would adequately mimic the lateral capacity needs of structures.

In the 1950's and 1960's the engineering community in California took it upon themselves to do a better job of defining what these earthquake forces really were and how buildings could be designed to resist them. Making note of damage to buildings after an event was perhaps the single most important way that regulations could be formulated. Observing structure weaknesses and projecting building behavior was and continues to be a primary source for code development of lateral force design.

Today's approach is built upon a growing body of knowledge however there is still much to learn. A significant amount of interdisciplinary work has allowed geologists, structural engineers, seismologists and others to better model the effects of earthquakes in our communities. As we proceed, the level of confidence continues to grow and while there may never be an earthquake "proof" building, the danger posed by such events should become less and less.



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JOINT SEISMIC SAFETY COMMISSIONS WORKSHOP CONTINUED

ACTIONS

There is an ongoing need to improve communications between commissions and to improve awareness of products and initiatives of other commissions. A centralized website was recommended, perhaps with FEMA or as part of the WSSPC web site. There may be modest costs involved. However, it is up to individual commissions to compile a list or bibliography of its own popular/successful material. This can then be forwarded to whoever coordinates the material.

Participants offered to sign a communal letter in support of the California Seismic Safety Commission retaining its independence. Apparently a letter was sent by WSSPC before the September 30 deadline.

Assuming communications are improved through a website with information and commission activities, another workshop such as this one may not be needed for a few years.