

**National Earthquake Hazards Reduction Program
Advisory Committee on Earthquake Hazards Reduction
National Institute of Standards and Technology
Gaithersburg, Maryland
March 15–16, 2010**

Meeting Summary

Advisory Committee Members:

Chris Poland, Chair	Degenkolb Engineers
Walter Arabasz	University of Utah
James Beavers**	University of Tennessee
Jonathan Bray**	University of California, Berkeley
Richard Eisner	Fritz Institute
James Harris	J. R. Harris and Company
John Hooper	Magnusson Klemencic Associates
Michael Lindell	Texas A&M University
Thomas O'Rourke*	Cornell University
Paul Somerville**	URS Corporation
Susan Tubbesing	Earthquake Engineering Research Institute
Anne vonWeller	Chief Building Official, Murray City, Utah
Yumei Wang	Oregon Department of Geology and Mineral Industries
Sharon Wood	University of Texas at Austin
Brent Woodworth	Global Crisis Services, Inc.
Mark Zoback**	Stanford University (SESAC <i>ex-officio</i> liaison)

*participated via conference call **not in attendance

NEHRP ICC Member-Agency Representatives and NIST Support:

Shyam Sunder	NIST, BFRL Director, <i>Designated Federal Official</i>
Jack Hayes	NIST, NEHRP Director
Edward Laatsch	FEMA
Joy Pauschke	NSF
David Applegate	USGS
William Leith	USGS
Tina Faecke	NIST, NEHRP Secretariat
Michelle Harman	NIST, NEHRP Secretariat
John Filson	NEHRP Secretariat
Francoise Arsenault	NEHRP Secretariat

Guests:

David Butry	NIST, BFRL
Robert Chapman	NIST, BFRL

William Grosshandler	NIST, BFRL
Darren Lowe	NIST, BFRL
James Rossberg	ASCE, SEI
Garrett Salto	Lewis-Burke Associates, LLC

Summary of Discussions

I. Welcome and Review of Meeting Goals and Agenda

Chris Poland, Chair of the Advisory Committee on Earthquake Hazards Reduction (ACEHR), welcomed everyone to the meeting and reviewed the goals and agenda for the meeting.

II. Welcome and Opening Remarks

Shyam Sunder welcomed the members and thanked them for their contributions. He discussed recent post-earthquake reconnaissance to Haiti and Chile, including the Earthquake Engineering Research Institute (EERI) Learning from Earthquakes (LFE) team sent to Chile this week and a team to be sent to Chile under the auspice of the American Society of Civil Engineers (ASCE). NIST has representatives on both teams. The EERI LFE team now in Chile is the first team deployed to an earthquake with at least one staff member or agency-supported representative from each NEHRP agency. Sunder added that the NEHRP Interagency Coordinating Committee (ICC) has been impressed with the commitment and hard work of ACEHR and wants to continue the practice of direct communication with the ACEHR Chair.

III. Meeting Logistics and Membership

Jack Hayes introduced staff and reviewed meeting logistics. He reported that the terms of four Committee members (Poland; Walter Arabasz; Richard Eisner; and Sharon Wood) will expire this spring. He will speak with them about their intent to remain on the Committee.

IV. NEHRP Program Update

A. NEHRP Reauthorization

Hayes and Sunder provided an update on the NEHRP reauthorization. The House passed House Resolution (H.R.) 3820, cited as the Natural Hazards Risk Reduction Act of 2009, on March 3. Action by the Senate is pending. Most of the language in H.R. 3820 is unchanged since November. The authorized funding levels are changed. Poland stated that ACEHR may provide the NIST Director with its thoughts on authorization levels via the ICC.

B. NEHRP Agency Budgets

Hayes reviewed enacted budgets for the NEHRP agencies for Fiscal Year (FY) 2005 through 2010 and requested budgets for FY 2011. Three NEHRP agencies (NSF, USGS, and NIST) received funds under the American Recovery and Reinvestment Act (ARRA) of 2009 (these funds are not portrayed in the budget table).

C. Implementation of the NEHRP Strategic Plan

Hayes reported on some agency initiatives to achieve goals outlined in the NEHRP Strategic Plan. FEMA, with the Building Seismic Safety Council, has completed the 2009 *NEHRP*

Recommended Provisions (FEMA P-750). FEMA P-750 is available online at www.fema.gov and www.nehrp.gov and will be available in print in the next few weeks from the FEMA Publications Warehouse. The USGS has instituted major upgrades to its Advanced National Seismic System (ANSS) with ARRA funding and the NSF has awarded a new contract to Purdue University to operate the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES), now known as NEES*comm*. NIST continues to build its staff and will support post-earthquake reconnaissance and database management with a proposed 2011 initiative, Disaster Resilient Buildings and Infrastructure. NIST and FEMA also have established a process for coordinating research and knowledge transfer activities.

D. National Research Council (NRC) Study

Hayes reported that the study on a 20-year road map for the Nation's earthquake needs, which is to serve as an update to a 2003 report by EERI, should be released by late spring or early summer 2010.

E. ACEHR Resilience White Paper

The white paper on resilience was reviewed by the NIST Director, presented to the ICC last month, and then transmitted to Richard Reed, Special Assistant to the President and Senior Director for Resilience. The ICC has asked the Program Coordination Working Group (PCWG) to respond to the seven recommendations in the paper, five of which are focused on the NEHRP agencies. The PCWG will begin work on the responses next week.

F. NEHRP Annual Reports

Hayes informed the Committee that John Filson is working on an abbreviated report on NEHRP agency activities for FY 2009, consistent with the language of the draft reauthorization legislation. Work will begin this summer on the next full biennial report, scheduled for release in early 2011.

V. NEHRP Agency Program Updates

A. USGS

David Applegate reviewed major activities and events since his report at the November 2009 ACEHR meeting: the release of the President's budget and the earthquakes in Haiti and Chile. For FY 2011, USGS has requested \$56.9 million for its earthquake hazards program, including funds for supporting a volcano watch capability at the National Earthquake Information Center. Funding for the Global Seismographic Network (GSN) was increased in FY 2010 to \$5.8 million (the FY 2011 request is \$5.4 million).

USGS is responding to two NEHRP strategic priorities in FY 2010: fully implement the ANSS via modernization with American Recovery and Reinvestment Act (ARRA) funds (\$30 million) and the development of earthquake scenarios. USGS is on target for awarding most of its ARRA funds by this spring. *NetQuakes*, which has been a very successful product, will be expanded using regular funds.

Applegate reported that the USGS National Earthquake Information Center's Prompt Assessment of Global Earthquakes for Response (PAGER) product produced situational

awareness within 20 minutes of the Haiti earthquake. This was made possible as a result of investments made after the Sumatra earthquake and tsunami through which USGS deployed a sub-network of the Global Seismographic Network (GSN) in the Caribbean to support a National Oceanic and Atmospheric Administration (NOAA) tsunami warning capability there. USGS also issued statements on probability of aftershocks and future damaging earthquakes, which were translated into French, Spanish, and Creole. USGS has collaborated with the U.S. Agency for International Development (USAID) to establish an Earthquake Disaster Assistance Team (EDAT), which has been deployed several times to conduct seismic hazard investigations and aftershock recordings. A conference will be held in Miami, FL, on March 22-23 on rebuilding for resilience in Haiti, specifically how science and engineering can inform reconstruction. About 100 participants have registered for the conference, including representatives from NSF, FEMA, and USGS. Applegate added that USGS is assessing how information was used and misused in Haiti, particularly with respect to aftershock warnings and response.

B. FEMA

Ed Laatsch reported on staffing changes at FEMA. Dr. Sandra Knight, the new Deputy Assistant Administrator for Mitigation, has directed research programs at the National Oceanic and Atmospheric Administration and the U.S. Army Corps of Engineers Waterways Experiment Station. The Administration has not yet proposed an appointment for Assistant Administrator for Mitigation. On his own staff, Cathleen Carlisle will soon leave FEMA HQ for FEMA Region II and Larry Hultengren will retire this spring. Claudette Fetterman has joined the earthquake staff from FEMA Disaster Operations to work on state earthquake grants and other programs. FEMA Region II and Region VI also have lost earthquake staff and Region IX must fill two vacancies.

Laatsch reviewed eligible activities for the FEMA state earthquake grant program, qualification criteria for funding (\$2.3 million total a year), and the allocation criteria for the 33 states that will receive FY 2010 funds. A matching fund requirement may be added in FY 2011.

FEMA P-750 is now available online. FEMA also has released supporting publications: FEMA P-751, *Nontechnical Introduction*; FEMA P-752, *Design Examples*; and FEMA P-753, *Training Materials*. Other noteworthy activities since the November ACEHR meeting include the pilot studies in Seattle and Portland as part of the HAZUS and USGS *ShakeMap* project and the dialogue with potential business partners for the QuakeSmart project. Last week, Laatsch met with Service Master, a potential partner with more than 30,000 employees. Home Depot also has indicated interest in in-store promotions.

C. NSF

Joy Pauschke discussed post-earthquake reconnaissance activities, including **E**ARly-Concept **G**rants for **E**xploratory **R**esearch (EAGER) and Rapid Response Research (RAPID) awards. This has been the focus of NSF work since the last meeting. By early fall, NSF will hold a workshop to learn about results from NSF-funded investigations to Haiti. There has been significant interest in societal issues arising from the Haiti earthquake. NSF also is transferring IT from the previous NEES operations contractor to Purdue University, which will create a new NEEShub.

A Committee member asked if the Incorporated Research Institutions for Seismology (IRIS) will undergo the same transition process as NEES. Pauschke stated that there is discussion of a plan for accomplishing this on the NSF web site. She challenged ACEHR to identify research frontiers for NSF.

D. NIST

Hayes reviewed the FY 2010 NIST budget for NEHRP leadership and research activities. He acknowledged the contributions of John Filson, who provides in-kind support to NIST from USGS. He reviewed staff hired since November. Matthew Speicher, who joined NIST about a month ago, is a recent Georgia Tech graduate with a background in supplemental energy dissipation materials research. He will work with Jay Harris and Jeff Dragovich on building code issues. Anna Long is a cooperative student working on a Ph.D. on the performance of structures in Third World countries. Current staff will probably remain at the same level for the next year.

Hayes updated members on the ARRA grants awarded in January by NIST. More than 40 proposals were received in the earthquake area. Two proposals were funded for a total of \$2 million out of the \$35 million received by NIST in ARRA funds.

NIST is investing \$22 million to build a fire testing facility which will have relevance to earthquakes. The design is complete and the award should be made later this year. Construction is scheduled to be completed in 2012.

Robert Chapman provided an overview of the Standard Methods to Assess the Resilience of the Built Environment project. NIST is working on the project with the Multidisciplinary Center for Earthquake Engineering Research (MCEER). The goal of the project is to understand resilience and how resilience affects buildings and structures. As part of the project, NIST will develop a NIST Special Publication on resilience which will include a survey of literature on resilience-related issues, data and management challenges and solutions, and a guide to resources. Chapman added that the project is considering more than the built environment. The initiative is taking into account the social fabric and networks that keep communities together.

Hayes informed the Committee that NIST has gone live with the NEHRP Clearinghouse (2,000+ documents). Recently, NIST discovered that the National Technical Information Service database, which NIST is using to populate the new clearinghouse, does not include all earthquake publications, including a number of critical FEMA resources, and most of the NSF-funded and USGS reports related to NEHRP.

VI. Draft 2010 Annual Report

A. Report Contents and Format

The members agreed on the following content and format for the annual report:

- The **Trends and Developments** section will remain an appendix to the report. Each discipline area in the section will include an introduction describing the scope of the subsection; developments, which will include general statements of success written for audiences such as the Office of Management and Budget and Congress; and trends. The

final section, to be called *Areas of Increased Emphasis*, will address priorities, what should be accomplished by the agencies, and what is not being accomplished by them at present.

- **Recommendations** to the NEHRP agencies are valuable and will be continued. Each agency will receive no more than three recommendations focusing on activities and substantive issues.
- **Funding issues** will be addressed in the Management, Coordination, and Implementation section.

B. Trends and Developments in Science and Engineering

Social Sciences

Michael Lindell reviewed developments and trends since the last report, citing *QuakeSmart* as an example of what should be occurring in this area. Formative and summative evaluations of *QuakeSmart* and similar programs are needed to demonstrate their effectiveness, and to make it more difficult to cut or reduce funding for the programs. He stated that hazard vulnerability analysis is needed, particularly for low-income, minority heads of household. Although there is now some research into why people do not take action, such as bolting houses to foundations, barriers to mitigation actions must be further identified and analyzed. Inducements to influence or incentivize people to adopt measures also must be studied. In addition, response and recovery must focus on neglected populations. The emphasis has been on stereotypical families.

Committee input on the draft section included the following: make the case that social science research is not being used to guide programs; address economics, psychology, and public policy; explore trends in greater detail; and address policy decision-making by communities. Yumei Wang, Sharon Wood, and Anne vonWeller will draft the public policy portion of the section and the section will be renamed *Social, Policy, and Economic Research*.

Earth Science

Arabasz reported that the earth science section will be slightly revised from the last report. Important developments include episodic tremor and slip; multi-hazard demonstration projects; the new National Seismic Hazard Maps; ARRA funds for ANSS and other seismic and geodetic products; ground motion prediction modeling; and earthquake early warning products. Important trends include networking and the engagement of young people on Facebook, YouTube, podcasts, and other tools; Twitter-based earthquake detection systems; earthquake exercises; earthquake information products, including PAGER, ShakeMap, and HAZUS; EarthScope and USArray; and partnerships. Jim Harris will provide information for the new section on National Seismic Hazard Maps. Areas of emphasis will include funding for ANSS; human resources; NSF geosciences synergy with USGS; and seismological Grand Challenges.

Poland remarked that the developing link between structural engineering and earth sciences should be addressed (John Hooper and Harris will contribute to the write-up on this trend). Committee members suggested a possible discussion of Smartphone technology and the use of

new technology, *i.e.*, how does an emergency manager deal with incoming tweets in the hundreds of thousands? It was noted that Twitter was used extensively in Haiti by those trapped in the rubble and those nearby. A team at the University of Colorado-Boulder translated the messages non-stop and sent them back to save lives and allocate resources. Much more of this will occur in the future.

The members also discussed the questioning of the earthquake hazard in the Central United States. This has affected the code development process in Shelby County, Tennessee. Filson commented that the issue should be aggressively dealt with by the USGS. The issue also exists in the Pacific Northwest, although not to the same degree. Other issues to consider include ShakeMap and the interpretation of aftershock probabilities/warnings. Arabasz agreed that communicating with the public during an emergency is an important issue.

Geotechnical Engineering

Jonathan Bray was not able to attend the meeting. He will submit his section via e-mail.

Structural Engineering

Hooper reviewed highlights, including the ATC-58 project; FEMA P-695, *Quantification of Building Seismic Performance Factors*, which he cited as a seminal project; NIST Tech Briefs; the National Seismic Hazard Maps; and NEES. He asked for advice on how much information to include on FEMA P-695.

Recommendations were made to clarify the bullet on design intent and to explain that NSF no longer sponsors the Earthquake Engineering Research Centers (EERCs). Another suggestion was to advocate for greater dialogue between the engineering and seismological communities. An EERC could facilitate this dialogue.

Building Codes and Quality Assurance

vonWeller reviewed developments and trends. An important issue is the development of a single set of comprehensive model building codes (vs the current need for having numerous separate but related standards documents on hand). The basics of what is required in a building code must be provided; drawings alone frequently are not specific enough. A member noted that this is a very important issue with significant repercussions, because separate entities (*e.g.*, American Concrete Institute) generate the various documents and also market their sales. Another member remarked that it would be difficult to include everything in one document; there could be different documents for different types of buildings. Another possibility is a guide for inspectors or a checklist. Poland suggested looking at the issue from the other side: what are the classes of buildings for which this is needed? It was agreed that a workshop on standards may be appropriate.

Lifelines Engineering

Tom O'Rourke reviewed updates, including the focus on national security and resilience. He agreed with the suggestion to convene a workshop on lifelines that would consider how to replace work no longer carried out by the American Lifelines Alliance (ALA), new initiatives with the stakeholder community, and short-, medium-, and long-term priorities in this area. The ACEHR members also discussed the issues of developing regulations versus developing

standards. There has been an effort by NIST and the Applied Technology Council (ATC) to develop a standard for the seismic safety of piers and wharves. Work on this project has gone slowly. O'Rourke noted that some groups, such as those in the water distribution industry, communicate well. Other groups, such as those in the communications industry, have been less proactive. The members also agreed that it was not the intent of the last report to state that regulatory oversight is required.

Resilience

The members agreed that the section on resilience, as taken from the letter to the White House, should be incorporated into the introduction. The recommendations may be recast because they were written to the White House. Overarching recommendations will go to the NEHRP Office. The letter will be included as an appendix to the report.

Disaster Preparedness, Response, and Recovery

Richard Eisner stated that the wording in most of the bullets included in the last report will be strengthened. The issue of guidance will be taken on, as well as recovery planning at the state and local levels, enhancing public awareness, and the need for evaluation of programs such as *ShakeOut* and *QuakeSmart*. Also needed is a better understanding of the infrastructure mission, the integration of tsunami and earthquake risk mitigation, and the preparedness of the private sector. The section will include successes and examples of interagency cooperation, such as HAZUS and the tsunami standards for vertical evacuation. In terms of needs, progress must be made with HAZUS.

The members discussed the establishment of measurable goals to assess long-term progress and possible measures to gauge the resilience of a community, such as certification of states and cities. For businesses, there are standards such as those established by the Institute for Building and Home Safety. The isolation of small communities also is an issue. The American Red Cross advises preparation for three days after a disaster. However, seven days may be more realistic, which the Chilean earthquake demonstrated is typical for small towns.

C. Review of NEHRP Agency Effectiveness and Needs

NIST

Harris complimented NIST on its Extramural Research Program and its work in developing staff competencies. Hayes noted that NIST has funded two multi-disciplinary projects in the past year with ATC and the Consortium of Universities for Research in Earthquake Engineering (CUREE). NIST is building expertise in the behavior of structures. The members discussed agency responsibilities for lifelines at NIST, FEMA, across all agencies, and within the NEHRP Office. Whichever agency takes on lifeline responsibilities, in-house support is not necessarily required; work can be contracted out. One recommendation will be for NIST to acquire multi-disciplinary expertise (NIST can determine how best to acquire the expertise).

The members also discussed staffing needs in the social science research and policy arenas. The NEHRP Office may need this type of expertise to address gaps between research and technology transfer to standards organizations. Codes are written by a segment of the community which may lack the public policy perspective. Poland commented on the need to understand building

performance by occupancy type, with the move to resilient communities. ATC-58 will provide the ability to choose performance levels. Sunder suggested a workshop to address issues in this area, including the research component and the FEMA component. The second recommendation for NIST will be to acquire more resources for carrying out its applied research activities in the codes and standards area. The members also agreed on a recommendation for the NEHRP Office, see below, that NIST begin focusing on lifelines via a workshop and consider ways to revitalize the ALA.

Poland asked if ACEHR should advise NIST on research areas it believes NIST should pursue. Sunder responded that this would be appropriate. Two areas in the out-year are existing buildings and lifelines; these areas need to grow. ACEHR should state if more work is needed in a certain area. NIST can provide ACEHR with information on current research topics.

Department of Homeland Security (DHS)/FEMA

Eisner stated that two recommendations in the last report are, for the most part, still appropriate. These relate to increased support for the state earthquake program and the continued development of guidance to improve the effectiveness and reduce the cost of seismic protection for lifelines and new and existing buildings. The recommendation in the last report on funding will be replaced by a recommendation that FEMA develop and promote state and local level guidance related to shelter, housing, and reconstruction. The text of the section will encourage FEMA to continue to develop and enhance HAZUS and assess the effectiveness of its projects and programs.

Laatsch noted that FEMA distributes significant funds to state and local governments (\$362 million for all programs) and DHS awards several billion dollars a year in grants to state and local governments. The Committee agreed that it would help to specify that DHS grant funds can be used for earthquakes. The members also discussed a possible recommendation to expand QuakeSmart. Laatsch stated that FEMA does not currently have the resources to expand QuakeSmart.

NSF

Wood stated that without a strong transition plan, the “graduation” of NEES in 2014 could present a threat to NEHRP, if no comparable capability is supported. Pauschke noted that the November 2009 NSF presentation described a plan to transition NEES beyond 2014. She encouraged the members to view the November presentation. She remarked that the most important questions relate to research frontiers; ACEHR should make the science case. This is a primary interest of the Interagency Coordinating Committee (ICC). Wood stated that from a national perspective, ACEHR should have a voice in the future of NEES. There is a critical need for testing research. Given that need, sustained funding for NEES should be assured. A recommendation for NSF will focus on the need for national testing facilities (not necessarily NEES).

The second recommendation for NSF will address the continued sharing of data and observations post-earthquake. A clearer definition of outreach efforts and coordination post-event between the NEHRP agencies is needed. Outreach beyond reconnaissance to influence U.S. practice is necessary and must be sustained.

USGS

Arabasz stated that a recommendation for USGS should encourage increased interaction with the engineering community on products developed under the National Seismic Hazard Mapping Program. The members also agreed that ACEHR should encourage USGS to expand the mapping program beyond new building standards.

With regard to the second recommendation in the last report, a member commented that the Pacific Northwest should no longer be cited as a good example. She advised replacing this recommendation with one on providing clearer information on probabilities and hazard to the public, particularly in the Central U.S., and for better engagement with social scientists.

The four Scientific Earthquake Studies Advisory Committee (SESAC) recommendations included in the last report are still applicable. A report from SESAC is expected this spring.

NEHRP Office

Tubbesing reviewed proposed changes to this section, including a recommendation to foster collaboration with agencies such as the Department of Transportation (DOT). The last report stated that this could be accomplished via the Interagency Committee on Seismic Safety in Construction (ICSSC).

The members discussed staffing resources for reaching out to new stakeholders. Sunder stated that additional staffing for the NEHRP Office must be considered in the context of the agency mission. The members discussed the role of ACEHR in advising on staffing. Poland stated that although ACEHR should not dictate how NIST is to carry out its work, it can advise that additional staff are needed to fulfill the NEHRP mission.

Recommendations for the NEHRP Office will address resources to carry out the lead agency role; increased focus on lifelines and existing buildings (see NIST above); the need to take the lead in post-earthquake investigations, and the desirability of taking advantage of the expertise of the Interagency Committee on Seismic Safety in Construction (ICSSC).

Management, Coordination, and Implementation

Poland reviewed two recommendations for this section: funds to fully implement the NEHRP Strategic Plan and enhanced cooperation and collaboration with non-NEHRP agencies that conduct earthquake mitigation and research and development. These agencies may include DOT, DHS, the Nuclear Regulatory Commission, the Department of Energy, the Federal Energy Regulatory Commission, and the National Aeronautics and Space Administration.

Sunder described the meeting with some ICSSC agencies last August. The meeting was well attended and there was interest in a follow-up meeting. However, the ICSSC agencies have lost much of their internal expertise in earthquake engineering and are looking for resources to re-establish or otherwise provide the expertise.

Executive Summary

Wang stated that the Executive Summary will discuss earthquakes that have occurred since the

last report and resilience. The section will discuss lessons learned from the earthquakes in Chile and Haiti and whether the West Coast is prepared for an 8.8 magnitude earthquake.

Poland thanked the members for their contributions to the draft report. Within the next week, authors will complete their draft sections and a first draft will be e-mailed to members for review. Members will provide final feedback on the annual report during a conference call meeting on April 28, 2010.

VII. Public Comments

There were no public comments.

VIII. Adjournment

Chris Poland thanked the members for an excellent two days of meetings. He adjourned the meeting at 5:30 p.m. on March 16, 2010.