National Earthquake Hazards Reduction Program

... a research and implementation partnership

Recent Program Developments

Opening Plenary Session
8 October 2010
National Earthquake Hazards Reduction Program

A Statutory Multi-Agency Partnership
Legislative Overview

- Overall purpose: “…to reduce the risks of life and property from future earthquakes in the United States…”

- NEHRP first authorized by U.S. Congress in 1978.

- NEHRP typically reauthorized on 2 – 5 year cycles.


- New reauthorization now in process: HR 3820 passed in March 2010 and referred to Senate.

- Agencies continue Program activities.

- Program not authorized to establish or enforce codes and regulations, or to conduct post-earthquake response and recovery operations.
2005-2011 NEHRP Agency Budgets

<table>
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<tr>
<th>FY</th>
<th>FEMA</th>
<th>NIST</th>
<th>NSF</th>
<th>USGS</th>
<th>NEHRP Total</th>
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</thead>
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<td>2005</td>
<td>14.7</td>
<td>0.9</td>
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<td>58.4</td>
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<td>2006</td>
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<td>0.9</td>
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<td>54.5</td>
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<td>2007</td>
<td>7.2</td>
<td>1.7</td>
<td>54.2</td>
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<td>2008</td>
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<td>1.7</td>
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<td>55.0</td>
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<td>4.1</td>
<td>55.3</td>
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</thead>
<tbody>
<tr>
<td>2011</td>
<td>9.0</td>
<td>4.1</td>
<td>53.8</td>
<td>62.3</td>
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Notes:
1. ARRA funds are not included.
2. Agencies currently operating under a Continuing Resolution through 12/3/10.
3. Agencies currently preparing FY 2012 budgets for inclusion in Administration's 2012 Budget Request.
NSF: NEHRP’s Primary Basic Research Arm

• Directorate for Geosciences (GEO)
  ➢ Incorporated Research Institutions for Seismology (IRIS)
  ➢ Southern California Earthquake Center (SCEC)
  ➢ Fundamental Research on Earthquakes (Unsolicited Proposals)
  ➢ EarthScope Facility (Related non-NEHRP activity)

• Directorate for Engineering (ENG)
  ➢ George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) Facility - Operations and Research
  ➢ Unsolicited Proposal Research Programs
    ✓ Hazard Mitigation and Structural Engineering
    ✓ Geotechnical Engineering
    ✓ Infrastructure Management and Extreme Events
    ✓ Natural Hazards Center

• Post-earthquake reconnaissance (GEO and ENG)
NEES for the Engineering Community

NEEShub Cyberinfrastructure
- Data repository
- Telepresence
- Simulation tools
- Hybrid simulation
- Collaborative tools
- Cybersecurity

NEES Headquarters at Purdue University (NEEScomm)
NIST: ATC “Roadmap” Philosophy

Combined in-house and extramural program has six primary focus areas, consistent with “Roadmap:”

- Technical support for building code development
- Performance-based seismic design development
- National design guidelines development
- Evaluated technology dissemination
- Development of improved evaluation and strengthening for existing buildings (potential increased future focus)
- Enhanced design productivity and interoperability development (future focus)

NIST goal: ~ 50/50 in-house/extramural split
Current NIST Research Emphases

• In-House
  ➢ Performance-Based Design Methodologies
  ➢ Improved Prescriptive Provisions for Building Codes.
  ➢ Nonlinear Seismic Analysis of Structures
  ➢ Performance of Buildings in Central/Eastern U.S.
Current NIST Research Emphases

- Extramural (NEHRP Consultants Joint Venture)
  - Techbriefs (Composite Diaphragms, Special Shear Walls)
  - Procedures for Selecting/Scaling Ground Motions for NRHA
  - Improved Characterization/Modeling of Soil-Structure Interaction
  - Improved Structural Response Modification Factors
  - Chile Earthquake – Related Studies
  - Mid-America Cost-Benefit Studies

Interested researchers may apply at “Opportunities for Consultants,” http://www.nehrp-consultants.org!
NIST Grant Activities

• ARRA Research Grants
  - PBSD Methods and Tools for Reinforced Masonry Shear Wall Structures (UCSD)
  - Development & Evaluation of PBEE-Compliant Structural Systems (VT)
  - Modeling Natural Disaster Risk Management (U DE)

• Construction Grant: Expansion of the Center for Civil Engineering Earthquake Research Facilities at UNR

Figure courtesy of UNR
USGS seismic hazard assessments: National, regional, urban

U.S. National Seismic Hazard Maps

Uniform California Earthquake Rupture Forecast

Seattle urban hazard map
USGS & FEMA: Translating USGS national hazard maps into model building codes

U.S. Geological Survey
National Seismic Hazard Map

Recommended Provisions, ASCE 7, and International Building Code based on the USGS national seismic hazard map
FEMA’s NEHRP Activities

- State and Local Coordination (NETAP, EMPG, State Assistance)
- Partnerships (consortia, EERI)
NEHRP Strategic Plan

A national vision for the future:

A nation that is earthquake-resilient in public safety, economic strength, and national security.
2003 EERI Report

- Developed 20-yr research & outreach plan for earthquake engineering, with broad discussion of national needs, listing of broad task/activity areas, & rough estimation of costs for tasks/activities

Post-2003

- Advances have occurred
- Pace of change may not have matched that envisioned in EERI report
- Costs have changed
- New NEHRP Strategic Plan is seen by earthquake professionals as addressing broad national needs

Study Purpose:

- Provide an independent technical roadmap to implement strategic goals, objectives, outcomes, and priorities identified in the NEHRP Strategic Plan, to be used by the NEHRP agencies as an informational reference document in program planning
Once Again Pushing the Envelope
The 2009 NEHRP Recommended Seismic Provisions for New Buildings and Other Structures

Since it was first published in 1988, the NEHRP Recommended Seismic Provisions for New Buildings and Other Structures (the Provisions) has always sought to push the envelope of earthquake safety by advancing the effectiveness and acceptance of seismic design standards. Early on, the envelope was empty and easily pushed, because seismic design provisions were largely absent from industry standards and from the model building codes adopted by states and localities.

Successive editions of the Provisions, published by the Federal Emergency Management Agency (FEMA), began to fill the envelope with codified design requirements. The envelope swelled further as industry groups such as the American Concrete Institute and the American Institute of Steel Construction incorporated seismic measures into their national design standards. By the early 2000s, the envelope bulged with the addition of the increasingly complete seismic requirements included in Minimum Design Loads for Buildings and Other Structures (ASCE/SEI 7), the preeminent U.S. structural design standard maintained by the American Society of Civil Engineers (ASCE).

FEMA found the envelope harder to push as Provisions updates became preoccupied with the congruence between the Provisions and ASCE/SEI 7. This led to a major change in the 2000 edition of the Provisions (FEMA P-750). By adopting the latest (2001) edition of ASCE/SEI 7 as the reference standard to be updated in the 2000 Provisions, instead of revising the previous (2000) edition of the Provisions, the developers of FEMA P-750 enabled the Provisions to again push the envelope and assume its role as the resource for introducing new knowledge, innovative concepts, and design methods to improve national seismic standards and codes.

A Collaborative and Voluntary Tour De Force
In 2006, FEMA contracted with the Building Seismic Safety Council (BSSC) through the council's parent organization, the National Institute of Building Sciences, to develop the 2009 Provisions. A unique national resource established in 1978, the BSSC is a voluntary council of representatives from more than 60 organizations interested in the seismic safety of the built environment. BSSC members include organizations representing the building materials industry, trade and professional groups, code and standards-developers, public agencies, researchers, and other interests.

By 2008, the BSSC had recruited more than 300 national experts to assist in updating the Provisions. These volunteers were organized into the 2009 Provisions Update Committee (PUC) and a dozen associated technical subcommittees and ad hoc issue teams. It was these volunteers, working with the BSSC's Board of Directors, member organizations, and staff, as well as personnel from FEMA and NEHRP, who developed the 2009 Provisions. "Americans unfortunate enough to experience the earthquakes that will inevitably occur in the future will owe much, perhaps even their lives, to the contributions and dedication of these individuals."

Consensus on the Provisions was achieved through ballots conducted at subcommittees, PUC, and BSSC-member levels.


Thank You!

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