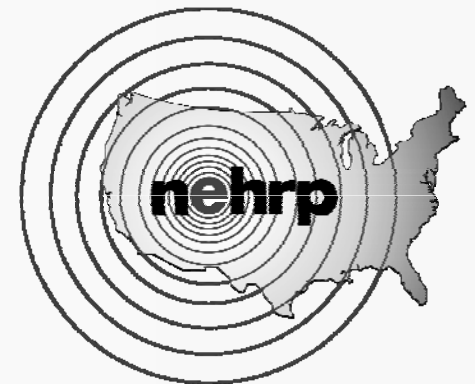


Status of FEMA Earthquake Program Building Science Guidance Products

Michael Mahoney
2005 Earthquake Program Managers Meeting



FEMA

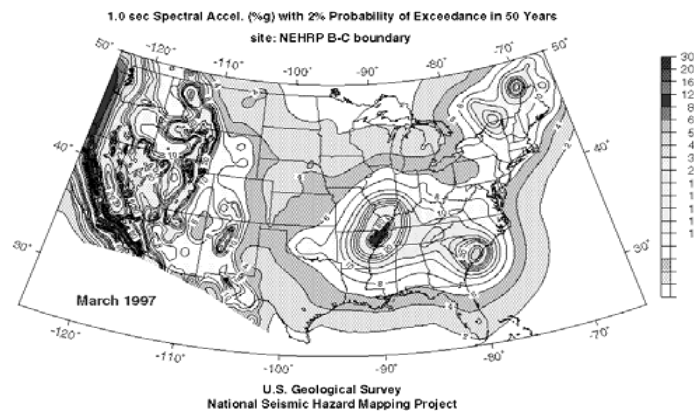


Earthquake Program Goals

- Reduce losses from earthquakes through...
 - Hazard Identification,
 - Risk Assessment,
 - Design Guidance for New and Existing Buildings,
 - Adequate Building Codes and Standards,
 - Training / Information Dissemination activities,
 - Implementation of policies and practices.

Hazard Identification

- USGS Hazard Maps become FEMA Design Maps
 - USGS Map CD basis for 2003 NEHRP Provisions CD and model building codes- no more paper maps.
 - USGS plans to perform an update of the maps by 2007 for inclusion in the 2008 FEMA NEHRP Provisions.



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Risk Assessment - HAZUS

- HAZUS - FEMA's nationally applicable GIS-based earthquake loss estimation software.
- Widely used for local/regional planning for mitigation and post-event assessment.
- Latest version is MR-1 of HAZUS MH.
- HAZUS earthquake module is the most mature.
- HAZUS training continues to be available.
- More information on HAZUS website.
 - www.fema.gov/hazus

Existing Buildings Guidance

- Progression of using guidance documents:
 - Rapid Visual Screening (FEMA 154)
 - Standard for Seismic Evaluation (ASCE 31)
 - Pre-Standard for Seismic Rehabilitation (FEMA 356 > ASCE 41)
 - Rehabilitation Techniques (FEMA 172)
 - Incremental Seismic Rehabilitation series
 - Typical Costs of Seismic Rehabilitation (FEMA 156)

Rapid Visual Screening (FEMA-154/155)

- Sidewalk survey to initially identify potentially hazardous buildings.
- Update of document done by ATC in 2002 and is available under same FEMA number.
- Improvements in fragility curves (HAZUS-based), use of new maps, and lessons learned from recent earthquakes.
- Supporting documentation (FEMA-155) updated to reflect changes to FEMA-154.

Standard for Seismic Evaluation (ASCE 31)

- ASCE Standard for engineers to perform detailed evaluation of existing buildings.
- Provides multiple performance objectives.
- Replaces FEMA-310 Pre-Standard.
- FEMA-310 no longer available from FEMA.
- It is available from ATC as an historic document and material still resides on Degenkolb website.

Pre-Standard for Seismic Rehabilitation (FEMA 356)

- FEMA/ASCE pre-standard for upgrade of existing seismically hazardous buildings.
- Replaces FEMA-273 Guidelines; FEMA-274 Commentary still valid.
- FEMA-357 provides a description of the differences between the two documents.
- Pre-standard is at an ASCE Standards Committee; resolving first ballot, at least one year away.
- Product to be published as ASCE 41 Standard.

Seismic Rehabilitation Techniques

- Original document published as FEMA 172.
- Provides example rehabilitation techniques for different building types.
- In need of update to take into account FEMA 356.
- Update being done by NIST (subcontractor R&C)
- Updated document will include a large number of techniques for most building types.
- Update due out next year.

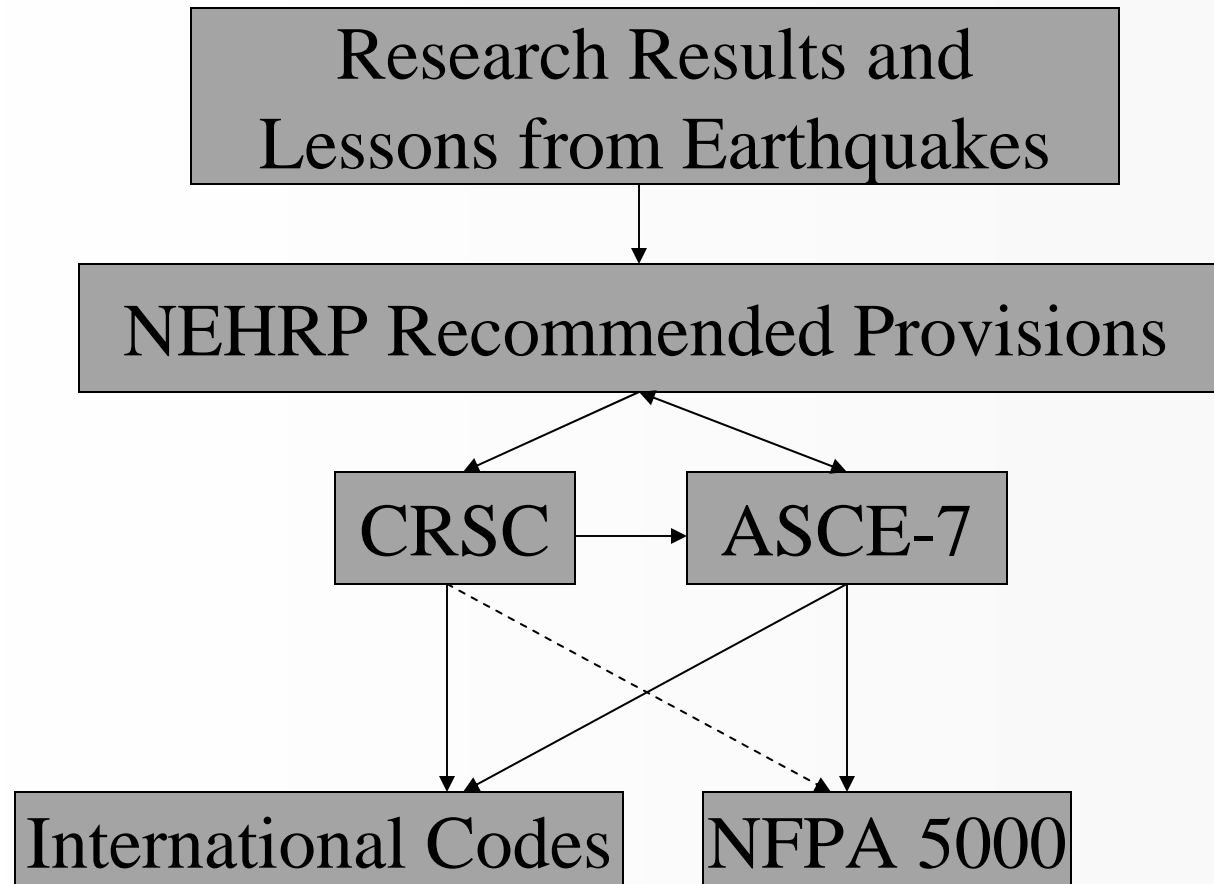
Incremental Seismic Rehabilitation

- Project producing occupancy-specific documents describing possible partial seismic upgrades.
- First manual on ISR of schools is already available as FEMA-395.
- Other manuals (hospitals, offices, retail, and public assembly) being prepared.
- A common manual for engineering considerations covering all occupancies, also to be published.

Typical Costs of Seismic Rehabilitation

- Current second edition of FEMA 156 still valid.
- In process of developing the third edition.
- Update project builds on statistical reexamination of the building data from the second edition, and involves use of new data mining technology to better use the original data.
- The third edition will include an electronic data base and the data mining program.
- Product will be ready by the end of the year.

New Buildings



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New Buildings Guidance

- NEHRP Recommended Provisions for New Buildings – resource document to translate research results to design guidance.
- Current 2003 edition – FEMA 450
- Replaces 2000 edition (FEMA 368/369), which is still valid and available only on CD.
- FEMA 450 available in both print and CD.
- 2008 update process is currently underway.

New Buildings Guidance

- 2008 Provisions to continue and complete the process of converting Provisions back to resource document instead of a code entry point (ASCE 7).
- Current ballot to use ASCE-7 as the base document underway, passed PUC currently BSSC.
- We have revised the committee structure to better address new issues and not copy ASCE-7 process.
- We have added four specific Issue Investigation Teams to better target problem issues.

Future Updates to New Buildings Guidance

- Updating User and Training Guide (FEMA 451)
 - Design Examples using NEHRP Provisions.
 - Replaces old Guide to Application (FEMA 140)
 - Training material of PowerPoint slides, instructor's notes, student handouts, usable as both individual training and a course instructors guide.
 - Currently being finalized - to be done later this year.
- Update of Non-Technical Guide (FEMA 99).
- Update of Communities at Risk (FEMA 83), which will be primarily a web-based product.

Building Code Activities

- Building code activities are monitored by FEMA/BSSC Code Resource Support Comm.
- 2000 IBC / IRC seismic code language based on 1997 NEHRP Provisions due to FEMA/CRSC.
- 2003 IBC / IRC seismic code language based on 2000 NEHRP Provisions.
- 2003 IBC now adopts portions of ASCE-7.
- ASCE and FEMA/CRSC cosponsored a code change to totally adopt ASCE 7-05 for 2006 IBC.

Building Code Activities

- NFPA 5000 uses ASCE 7-02 for seismic.
 - FEMA/CRSC on 2006 NFPA 5000 committees.
- FEMA/CRSC involvement in NFPA 225.
 - Installation of manufactured housing.
- ASCE 7-05 is NEHRP equivalent.
 - FEMA/CRSC assisted in reformatting ASCE 7-05
 - Next edition of ASCE 7 (2010) to be coordinated with 2008 Provisions to remain NEHRP equivalent.
- Guide for Local Code Officials (FEMA 313).

ICC CodeMaster

- FEMA partially funded development of ICC CodeMaster, a laminated six page foldout that walks through seismic design requirements of:
 - IBC
 - ASCE 7
 - NEHRP Recommended Provisions
- For sale by ICC at minimal cost.
- Limited supply available from FEMA today only, for a special low price (Free!).

Home Builders Guide

- Update of Home Builders Guide (FEMA 232), nearly done and due later this year.
- Completely rewritten to make it more useable.
- Incorporates the results of the FEMA-funded post-Northridge CUREE Wood Frame Project.
- Closely coordinates with the International Residential Code and AF&PA guidance.
- Include some upgrade material for existing homes.
- ICC training being done next month.

Reducing Nonstructural Earthquake Damage

- Nonstructural damage has become a larger threat than structural damage due to improved codes.
- Current Guide (FEMA 74) last revised after Northridge earthquake.
- Scheduled to be updated in 2006.
- Update will take into account recent findings from Performance Based Seismic Design project.

Electrical, Mechanical and Piping Install Manuals

- Guidance for new and existing buildings.
- New audience – site workers and inspectors.
- Manuals highly illustrated and designed for use on construction sites.
 - FEMA 412: Seismic restraints for mechanical equipment.
 - FEMA 413: Seismic restraints for electrical installation.
 - FEMA 414: Seismic restraints for duct and piping installation.

Seismic Guide for Storage Racks Accessible to Public

- FEMA approached by Washington State and WSSPC for guidance on storage racks in public retail facilities due to increase in “big box” stores:
 - Question raised after fatality from falling pallet;
 - Concern about eq performance after Nisqually;
 - Increased risk to life safety due to increase in stores.
- FEMA 460 addresses design, installation, retrofit, and use of pallet racks accessible to the public.
 - Protection of racks from collapse.
 - Protection against racks losing loads.

Seismic Considerations Series

- Seismic Considerations (FEMA 149-153) being updated - addresses seismic design needs of specific occupancies.
- Product will consist of:
 - An “Owners” document, which will be a short, graphic-oriented pamphlet to capture attention.
 - A “Design Community” document to help walk an owner through the design process.
- Project includes use of marketing firm.

Inelastic Seismic Analysis Procedures Project

- Project to evaluate and offer improvements to inelastic seismic analysis and design procedures.
- Evaluating and improving two procedures:
 - Coefficient method (*FEMA 356*)
 - Capacity spectrum method (ATC-40)
- FEMA 440 to provide guidance on improvements and how each procedure should be used. Report currently being printed.

Tsunami Vertical Evacuation Shelter Project

- Many coastal communities in PNW do not have sufficient time to evacuate to high ground prior to a Cascadia earthquake generated tsunami.
- Project to develop vertical evacuation shelter design to withstand tsunami for community use.
- Funded by FEMA (NEHRP) & NOAA (NTHMP).
- Structure must be capable of withstanding specific earthquake and then subsequent tsunami loads.
- Link to FEMA Coastal Construction Manual.

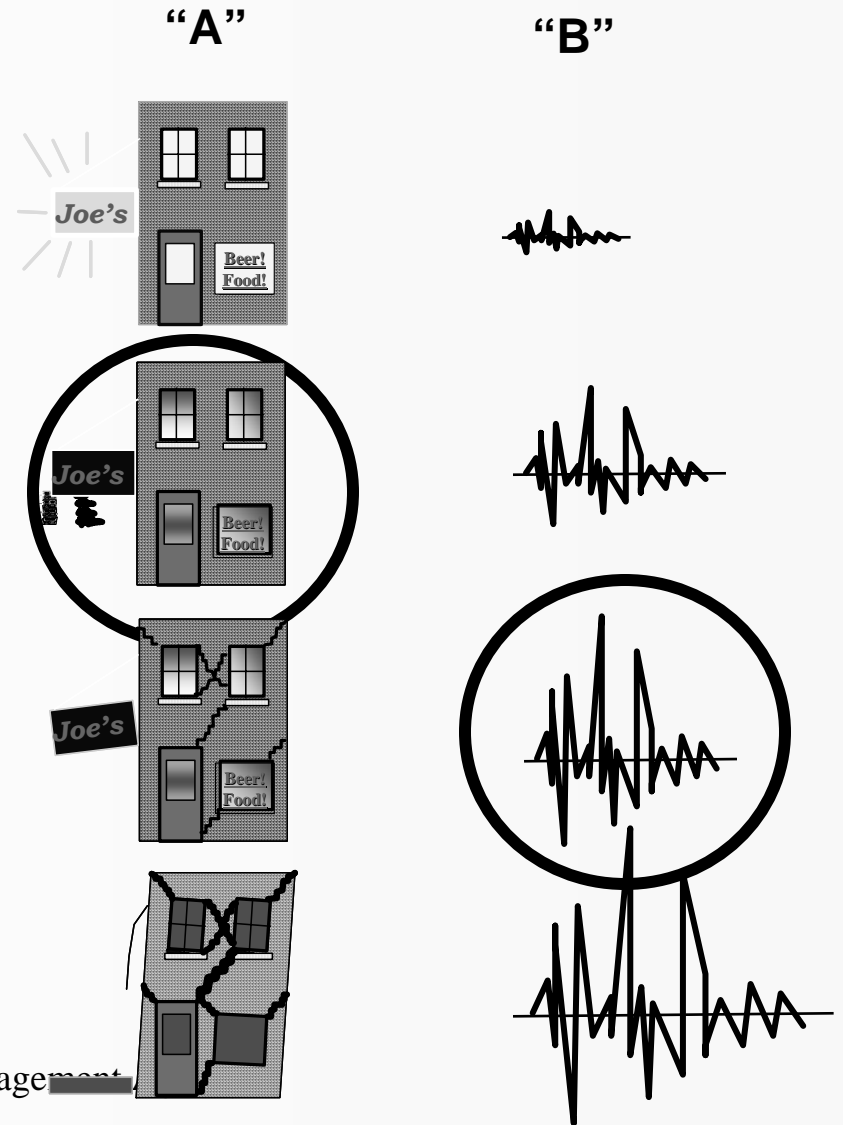
Performance Based Design

- Goal is to develop performance-based seismic design criteria to select and assess performance levels for new and existing buildings.
- Project results also to be used to better validate current prescriptive code level design.
- Based on EERI Action Plan (FEMA-349).
- Project to build on results from NSF EERC's.
- Project contractor is ATC (ATC-58).
- May include other hazards (fire and blast).

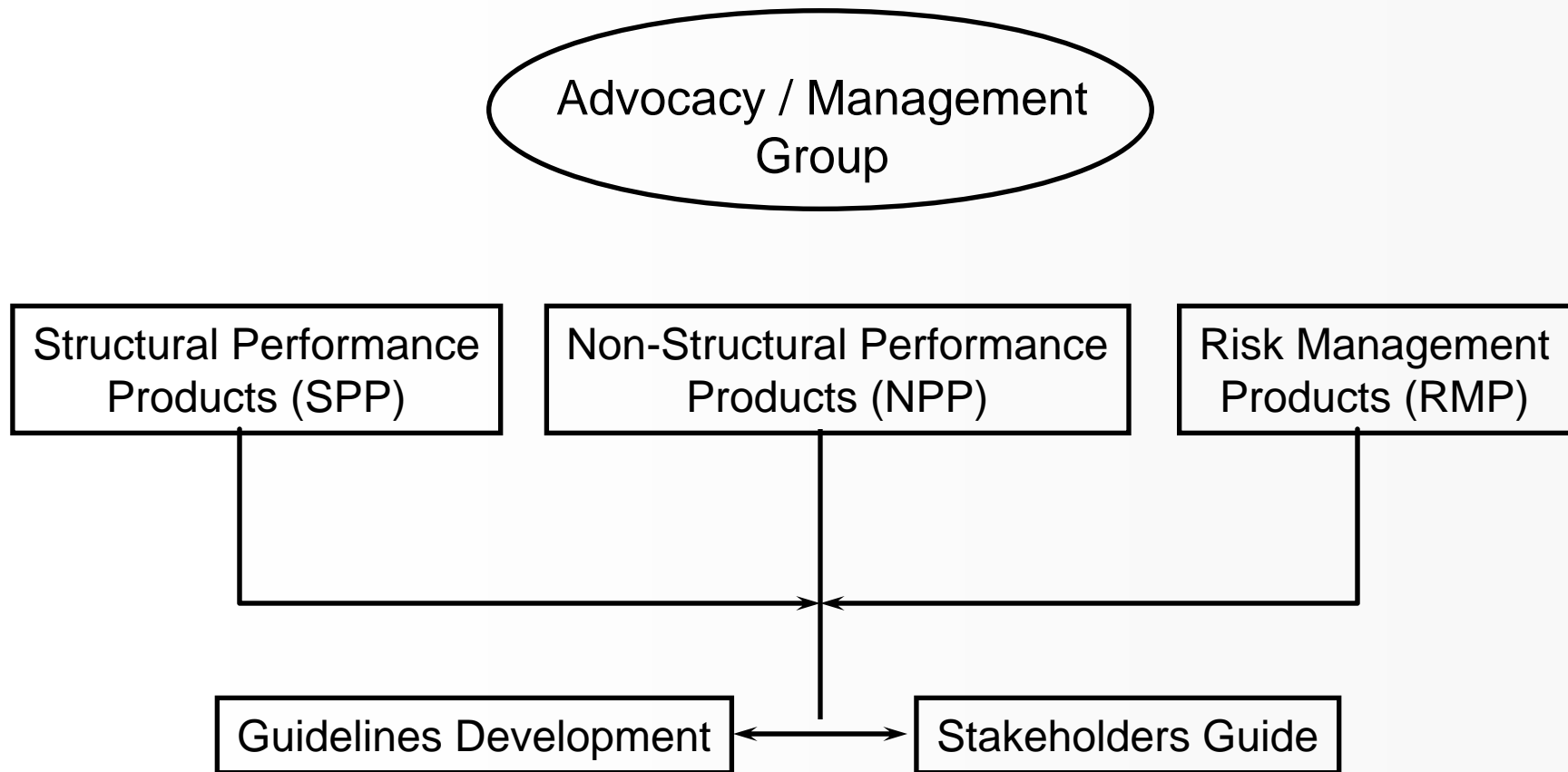
Performance-Based Design

- Commonly associated with a menu approach to selection of performance alternatives
- Can also be used with prescriptive code-based approaches
 - Rationalizing and optimizing the intended performance goals
 - Providing basis for provisions that more reliably and optimally achieve the desired performance

Federal Emergency Management



PBSD Action Plan Components



Federal Emergency Management Agency

Performance Based Design Project

- Two Workshops held in 2002 to frame project.
- Stakeholder Workshop provided insight in how owners and their reps. define risk and how we will need to present performance (3 C's).
- Provider Workshop provided information that is being used to update the FEMA-349 Action Plan and to prioritize the tasks.
- First task defined/quantified performance in a manner useable to the end customer.

Performance Based Design Project Products

- Performance Based Seismic Design Program Plan (FEMA 445), updates FEMA 349 goals and tasks.
- Defining Risk from Extreme Events (FEMA 446), will describe performance based criteria on risk in language of our customer.
- Building Component Testing Protocols for PBSD (FEMA 461), being developed with the three NSF EERC's, to propose testing criteria to meet PBSD.
- Reports quantifying performance on ATC website.

Performance Based Design: Future Phases

- Performance Assessment Methodology
 - Each of the three teams have already been identified and have begun work on tasks.
 - Assessment method is needed in order to evaluate building or design performance.
- Development Performance-Based Design Guidance.
 - Guide on how to design a building or upgrade to meet performance assessment.

Earthquake Training Products

- FEMA products often include training materials.
 - Steel Buildings materials now used by AISC.
- Use of FEMA training materials will be expanded
 - Existing buildings using a new ATC contract.
 - New Buildings using BSSC contract.
- Working with other organizations to increase use.
 - ICC training session on Home Builders Guide.
- EMI focus moving to distant learning – (EQ 101)

Survey and Evaluation of NEHRP Publications

- Project conducted a survey on the effectiveness of distribution and use of FEMA's design guidance publications.
- Project selected targeted peers, who were contacted by e-mail for survey.
- Survey approved by OMB.
- Results will now serve as basis for planning and marketing of future publications.

NEHRP Website

- A new NEHRP website has been developed and is now up on FEMA site.
- Website continuing to be updated and improved – let us know your comments.
- The new website will contain most of our guidance publications plus links and latest news.
- To be used to perform future publications surveys.

New Earthquake Products

- Earthquake Safety Checklist (FEMA 526)
 - Brochure with family safety information.
- EQ Home Hazard Hunt Poster (FEMA 528)
- Homeowners Guide to EQ Safety (FEMA 530)
 - Reformatted (stolen) from California.
- Promoting Seismic Safety: Guidance for Advocates (FEMA 474)

New Earthquake Products

- Adventures of Terry the Turtle and Gracie the Wonder Dog (FEMA 531) – stolen from WA
- Drop, Cover and Hold Poster (FEMA 529)
 - School poster
- Earthquake Safety Activities (FEMA 527)
 - Elementary school activities (old FEMA 88A)
- Seismic Sleuths CD (FEMA 253CD)
 - Middle and high school curriculum

Program Mechanisms for State and Local Assistance

- HMTAP: Hazard Mitigation Technical Assistance Program uses disaster funding to fund work on specific mitigation assistance issues.
 - A very effective vehicle for funding specific post disaster mitigation assistance.
- NETAP: National Earthquake Technical Assistance Program uses NEHRP funds to provide mitigation assistance.
 - New ATC contract just underway.
 - Primary focus is on funding training opportunities.

Program Mechanisms for State and Local Assistance

- PDM: Pre-disaster Mitigation is a competitive grant program to fund specific mitigation projects prior to a disaster.
 - FY 05 projects recently selected and being announced.
 - FY 06 competition recently announced.
- HMGP: Hazard Mitigation Grant Program funds post disaster mitigation projects using 7.5% of the disaster amount.
 - Still a very effective mitigation vehicle after a disaster.

NEHRP Implementation

- Program not regulatory, no incentives.
- Emphasis includes developing tools for dissemination, such as through model codes to State and local codes.
- Need to better leverage available Local and State programs and resources through pre- and post-disaster mitigation programs.
- Key goal of the NEHRP Strategic Plan is to increase resources for implementation.