FEMA Earthquake Program

July 2014

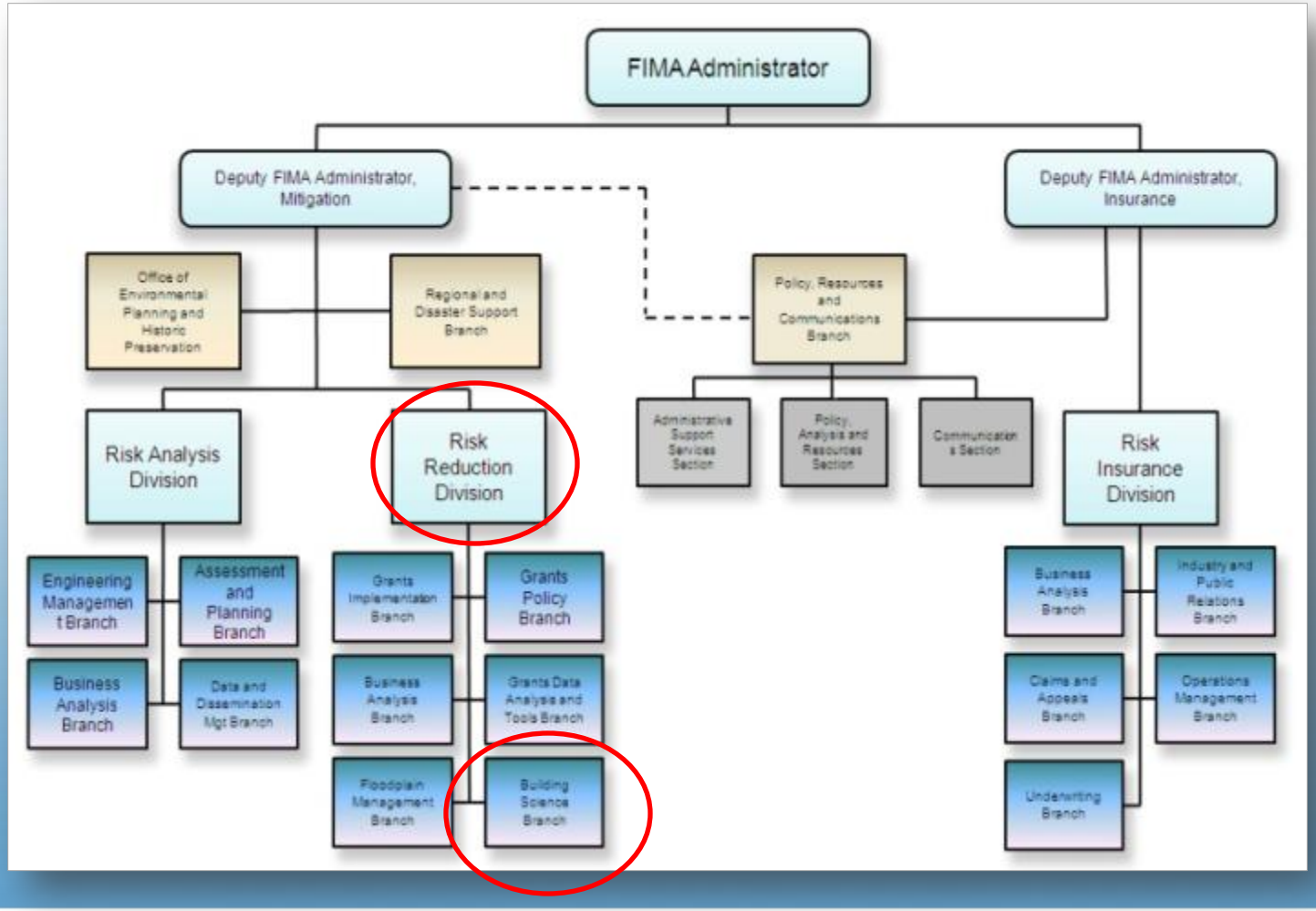
Edward M. Laatsch, P.E.
Chief, Building Science Branch

FEMA

What I'll Cover

- Where is Earthquake Program located & Who are We?
- FEMA NEHRP Priorities
- Budget Update
- What We Do/Accomplishments
- ACEHR Recommendations Responses

Federal Insurance & Mitigation Administration



FEMA NEHRP HQ

Edward Laatsch, P.E. – Branch Chief

Mike Mahoney – Codes/Special Projects (PBSD, R Factors, Tsunami, etc)

Wendy Phillips – Consortia/Implementation & Outreach

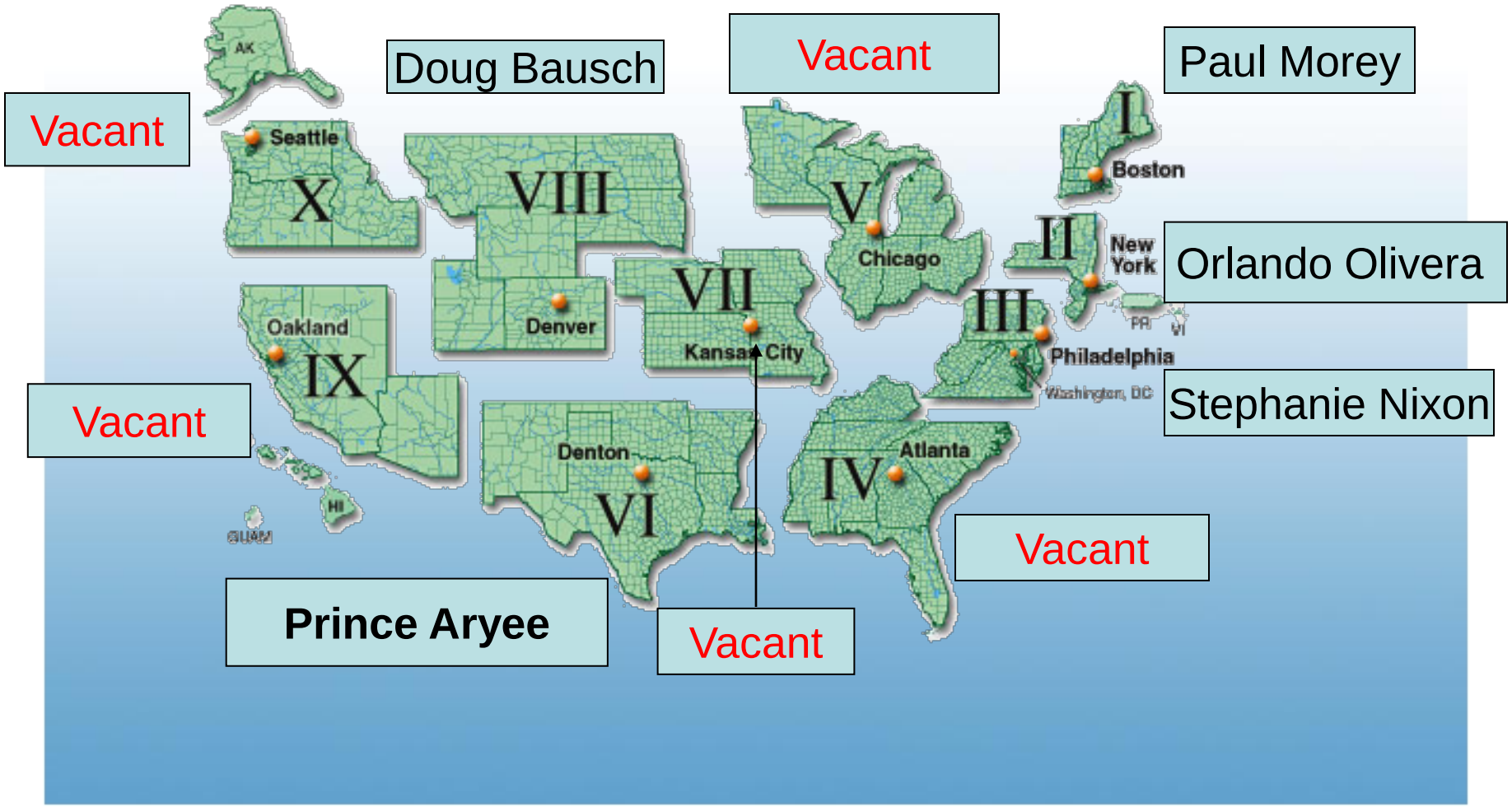
Vice Walsh – Vacant

Mai Tong – PhD. - EQ New Buildings Guidance/Building Science

Tammy Roy – Management Analyst – partial support

FEMA's National Earthquake Hazards Reduction Program

Regional EQ Program Managers



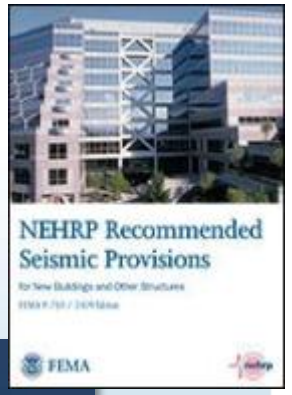
Building Science Branch

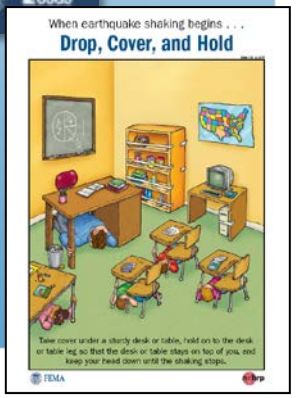
NHERP Goals

- Improve understanding of earthquake processes and impacts.
- Develop cost-effective measures to reduce earthquake impacts on individuals, the built environment, and society-at-large.
- Improve the earthquake resilience of communities nationwide.

FEMA NEHRP Priorities

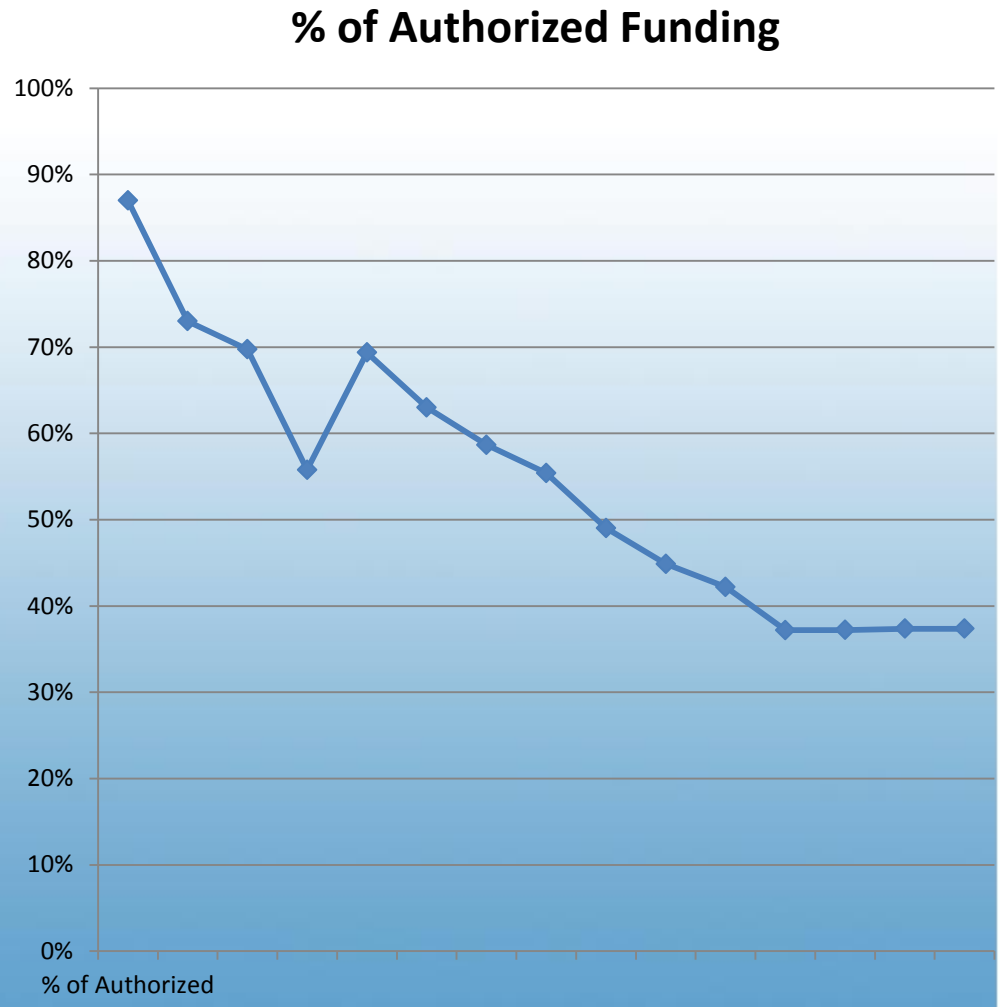
- Building Codes and Standards
- Guidance and Tools (books, software, training)
- Program Implementation and Outreach (awareness campaigns, media, articles, initiatives)
- Consortia Partnerships
- Support for Regional EQ Program Managers
- Disaster Support (SME, post-event studies)
- Critical Infrastructure (not doing this)





FEMA NHERP Budget

- FY 15 –
  - Agency proposed $7.5M
  - Draft DHS Approp. Statutory Earmark - $8.5M
- FY 14 - $8.8M
- Negative Historical Trend



FEMA NHERP Budget

Historical Funding levels for FEMA NEHRP (July 2014)					
Fiscal Year	**Allocation**	**Authorization**	**S&B**	**% of Authorized**	**Comments**
2000	$15,063,000	$21,500,000	$3,640,000	87%	Includes State Grant funding
2001	$10,270,000	$19,861,000	$4,230,000	73%	
2002	$10,250,000	$20,705,000	$4,190,000	70%	
2003	$7,410,000	$21,585,000	$4,630,000	56%	
2004	$8,904,000	$21,585,000	$6,070,000	69%	
2005	$8,251,000	$21,000,000	$4,980,000	63%	
2006	$7,710,000	$21,630,000	$4,980,000	59%	$9,461,000 allocated but $7,710,000 used for NEHRP - remaining funds re-allocated
2007	$7,343,000	$22,280,000	$5,000,000	55%	
2008	$6,253,000	$22,950,000	$5,000,000	49%	
2009	$9,110,000	$23,640,000	$1,500,000	45%	Received Overguidance Request for $3M
2010	$8,977,000	$23,640,000	$1,000,000	42%	
2011	$7,792,000	$23,640,000	$1,000,000	37%	
2012	$7,792,000	$23,640,000	$1,006,000	37%	Amount set by Appropriations Report to FY 2011 level
2013	$7,792,000	$23,640,000	$1,041,000	37%	Amount set by Appropriations Report to FY 2011 level
2014	$7,792,000	$23,640,000	$1,041,000	37%	Amount set by Appropriations Report to FY 2011 level

What We Do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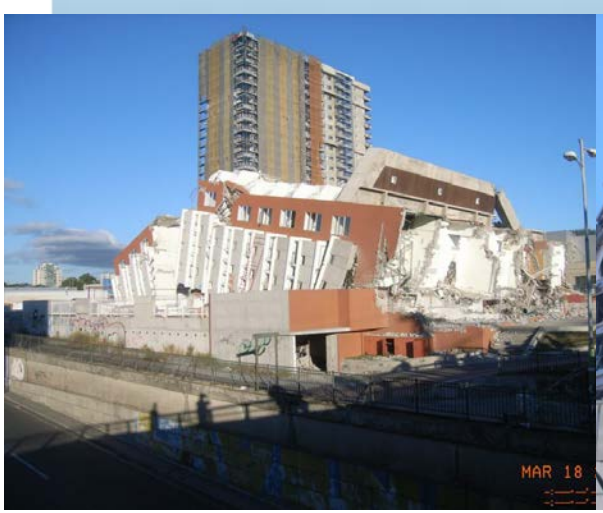
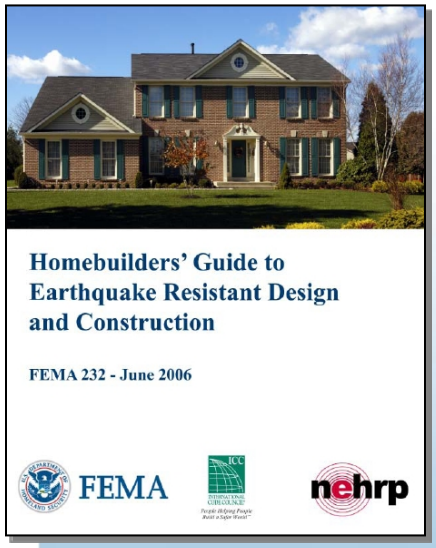
for Disaster-Resilient Communities
FEMA
Research/
New Knowledge
Lessons Learned
Research to Practice
Guidance and
Tools Development
Building Codes and Standards
Disaster Resistance
Outreach and Implementation
Technology Transfer
Reduced Disaster
Losses
MAT
Mitigation
Works

Lessons Learned From Earthquakes

- FEMA and NEHRP are capturing Lessons Learned from recent earthquakes in Chile, New Zealand and Japan.
- All three countries have building codes similar to US and experienced damage in buildings similar to US.
- Lessons will ultimately be incorporated into our codes.
- Stay tuned.



Residential Buildings Guidance



- Homebuilders Guide to Earthquake Resistant Design and Construction (FEMA 232)
  - Co-sponsored by the International Code Council.
  - Includes "Above Code Recommendations"
  - New training course just completed.
  - New Spanish translation just completed
  - All three products on a new FEMA 232CD.

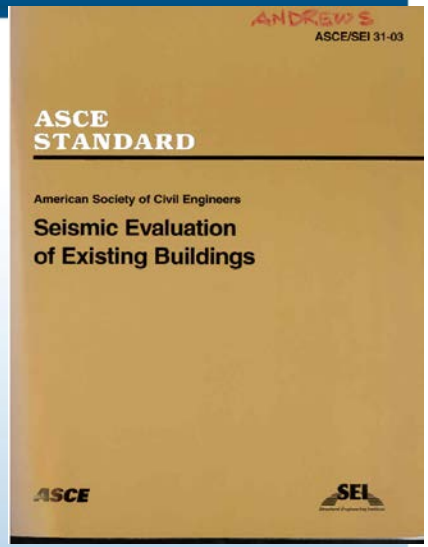
- Seismic Rehabilitation Training for One and Two Family Dwellings (FEMA P-593)
  - Training for retrofitting existing homes.
  - A new California CEA version being developed.

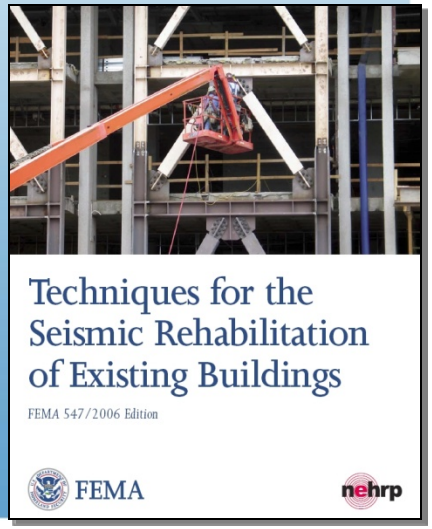
Seismic Rating of Residential Buildings

- *Simplified Seismic Assessment Procedures for Detached, Single-Family, Wood-Frame Dwellings* (ATC 50).
- Provides a list of conditions that, if seismically retrofitted, would allow the owner to improve their seismic rating score.
- The FEMA P-50 system assigns a rating score based on:
  - Foundation (type, slope, anchorage)
  - Framing and Configuration (irregularities, heavy roof or wall materials)
  - General Condition Assessment (evidence of deterioration)
  - Nonstructural Elements (chimney, water heater anchored, veneer)
  - Local Site Conditions (sloped lot, cut and fill pad, settlement)
  - Regional Seismic Score (S_{DS}, ground failure, liquefaction, faulting)

Existing Buildings Guidance

- ASCE Standard for Seismic Evaluation (FEMA 310 > ASCE-31)
- ASCE Standard for Seismic Rehabilitation (FEMA 356 > ASCE-41)
- ASCE 31 and 41 recently updated and combined together into a single consensus standard.
- The new standard is ASCE 41-13 and will be adopted by reference into the 2015 IEBC.
- FEMA 547 training on EERI website.





Existing Buildings Guidance

- Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories (FEMA P-807).
  - Developed in coordination with the San Francisco CAPPS Project.
  - Targets “Marina District” and Northridge style soft story multi-unit wood frame residential structures.
  - Retrofit limited to weak (soft) story only.
  - To be available on NEHRP, ATC and NEES websites.

Seismic Evaluation and Retrofit Of Multi-Unit Wood-Frame Buildings With Weak First Stories

FEMA P-807 / May 2012

FEMA

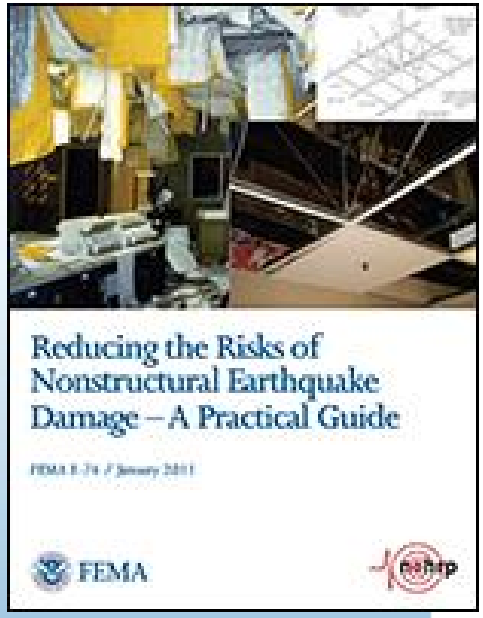
nehrp

Seismic Rehabilitation Cost Estimator

- Online program for calculating cost estimates for seismic retrofitting
- Based on statistical evaluation of cost data from approximately 2,000 seismic retrofitting projects using FEMA 156, Typical Costs for Seismic Rehabilitation.
- Recently used in Utah seismic retrofitting analysis.
- Downloadable version of SRCE is now located at:
  - www.fema.gov/media-library/assets/documents/30220?id=6820

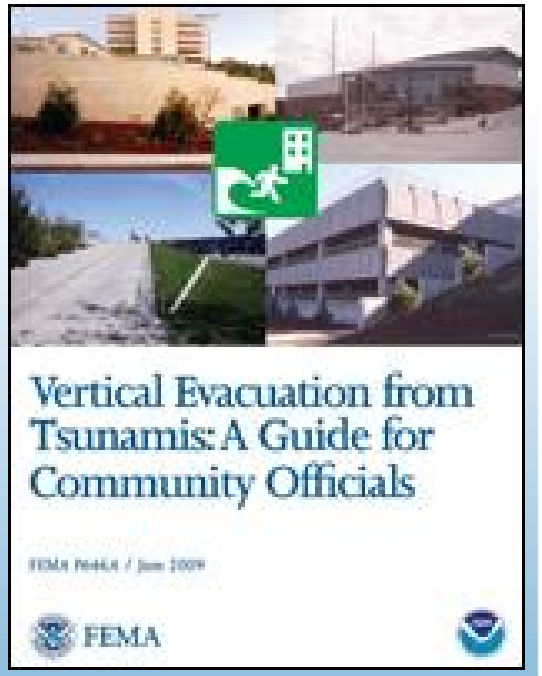
Nonstructural Mitigation Guide (FEMA E-74)

- Nonstructural Design Guide (FEMA E-74)
  - Web-based design guide.
  - Provides design guidance for over 70 different nonstructural components.
  - Provides examples of damage and plans or photos of the recommended mitigation technique for each component.
  - Includes technical specifications, risk rating forms and sample inventory checklists.
  - Short web-based and longer NETAP-based technical training materials now available.
    - http://www.fema.gov/plan/prevent/earthquake/fema74/index.shtm



Tsunami Vertical Evacuation Guidance

- Technical design guidance for special facilities for vertical evacuation.
- Refuge must be able to withstand loads from both earthquake ground shaking and from multiple tsunami waves and debris and still remain functional.
- A joint FEMA/NOAA publication distributed by FEMA as FEMA P-646.
- Encourages multiple use structures such as parking garages, community centers, hotels, etc.



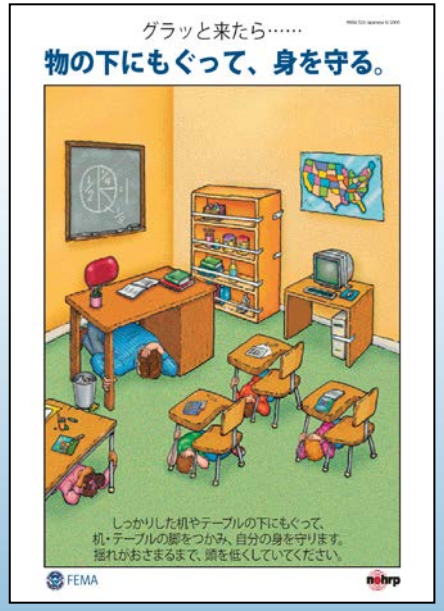
Tsunami Vertical Evacuation Guidance

- The new April 2012 edition includes the following improvements:
  - Adds documentation of 2011 M9.0 Tohoku earthquake and tsunami that struck Japan.
  - Documents lessons learned, including performance of vertical evacuation refuges.
  - Corrects errors to the debris loading formula.

Courtesy Gary Chock

Minamisanriku's emergency operations center had been manned for the tsunami, but it was inundated.

Non-Technical Guidance

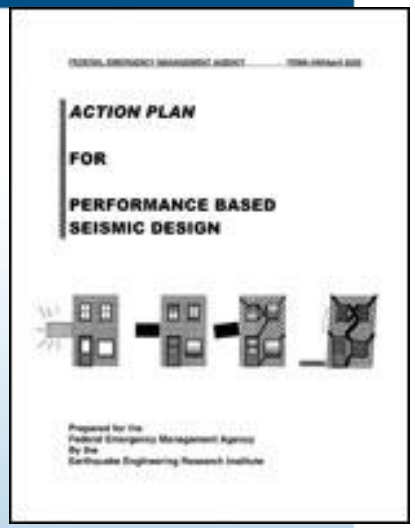


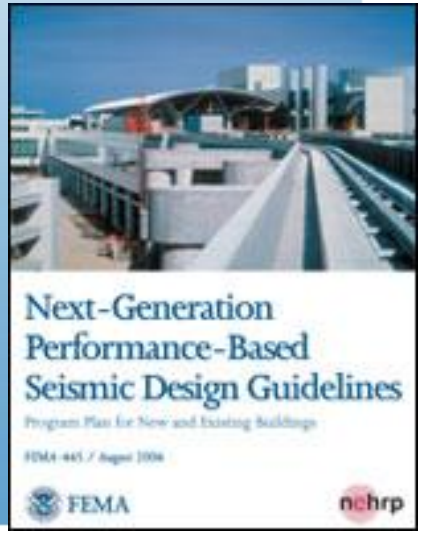
Over 125 documents in FEMA NEHRP library

Performance Based Seismic Design

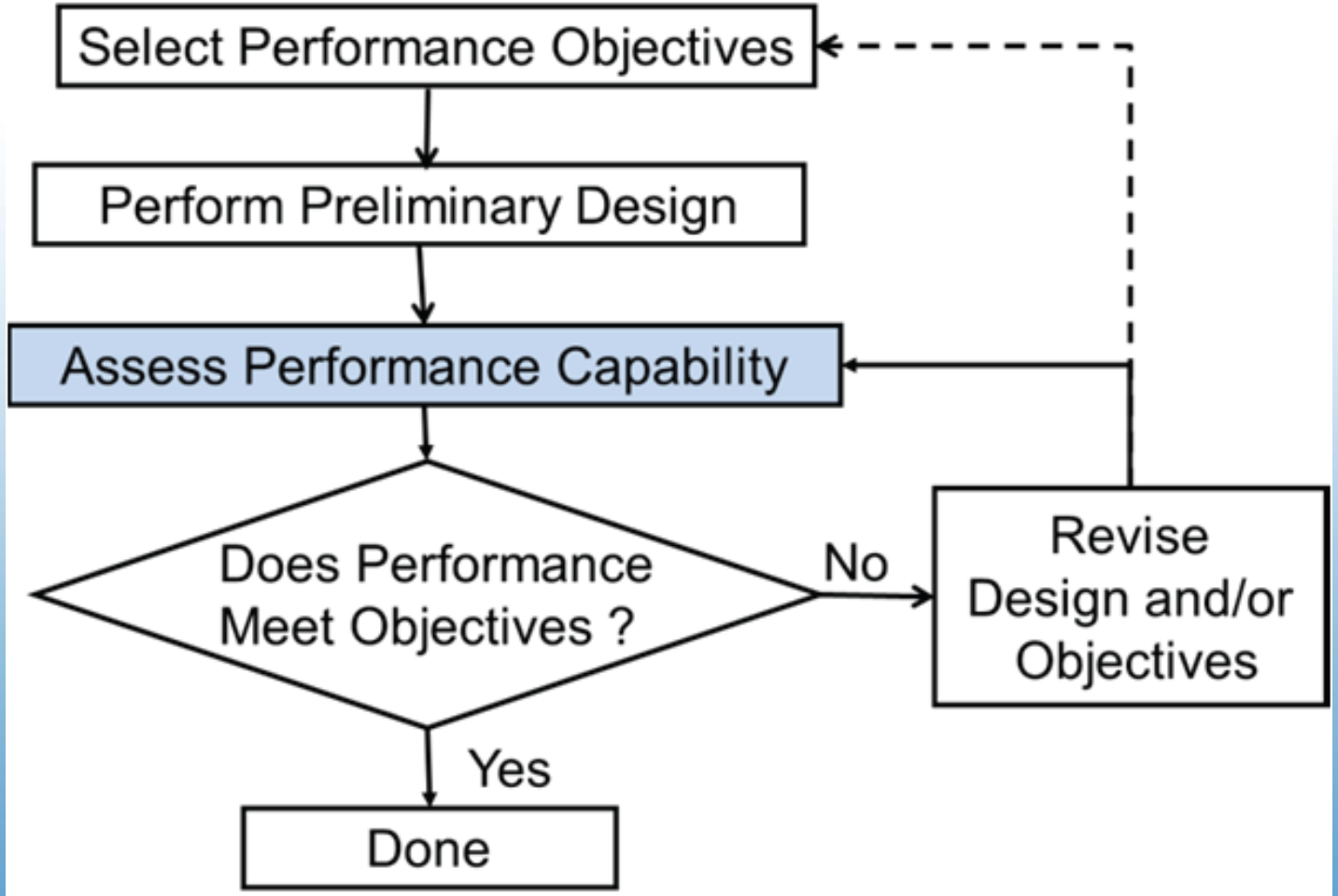
Current prescriptive building codes are designed to provide “life safety” level of protection. For earthquake, this means the building will probably not collapse, but will still suffer damage which can result in loss of use and may require demolition as only option. Code performance does not include any way of determining what will happen to the building, contents, and occupants. Performance based design provides design and construction criteria that allow an owner to determine performance of their building based on criteria they can understand:

- Dollars Casualties Downtime



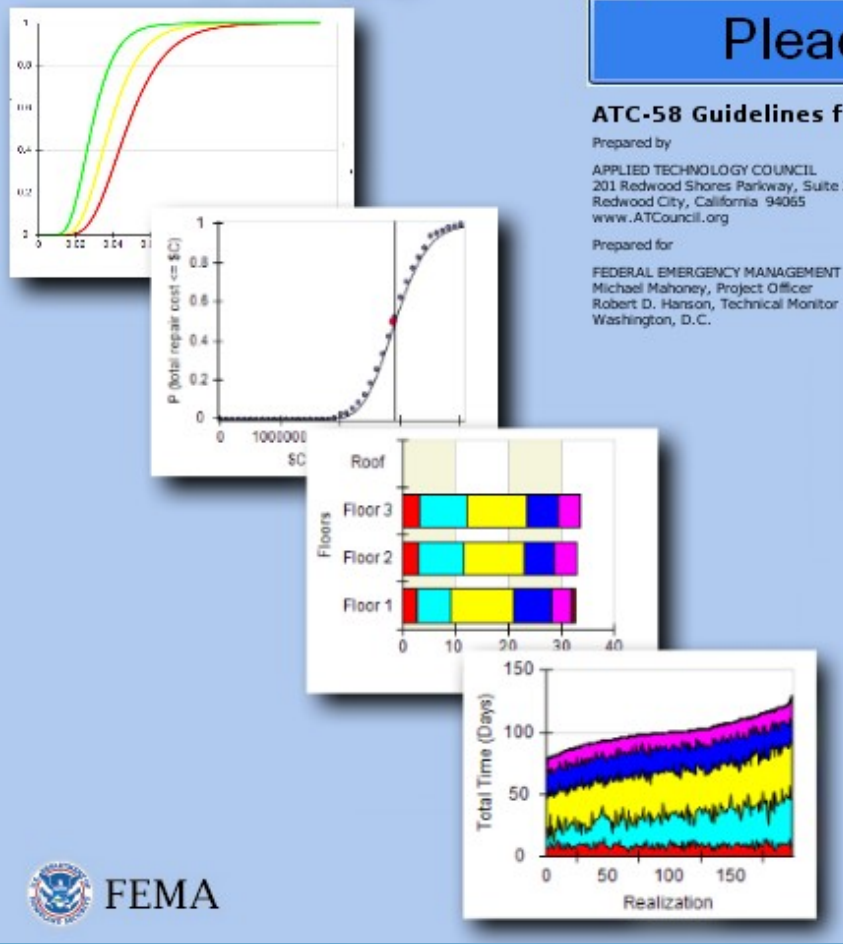


Performance Based Seismic Design



PACT Performance Assessment Calculation Tool

Version 2 Alpha



Please click to continue

ATC-58 Guidelines for Seismic Performance Assessment of Buildings

Prepared by

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Based on a prototype developed by:
PACIFIC EARTHQUAKE ENGINEERING RESEARCH CENTER
Jack P. Moehle
T.Y. Yang

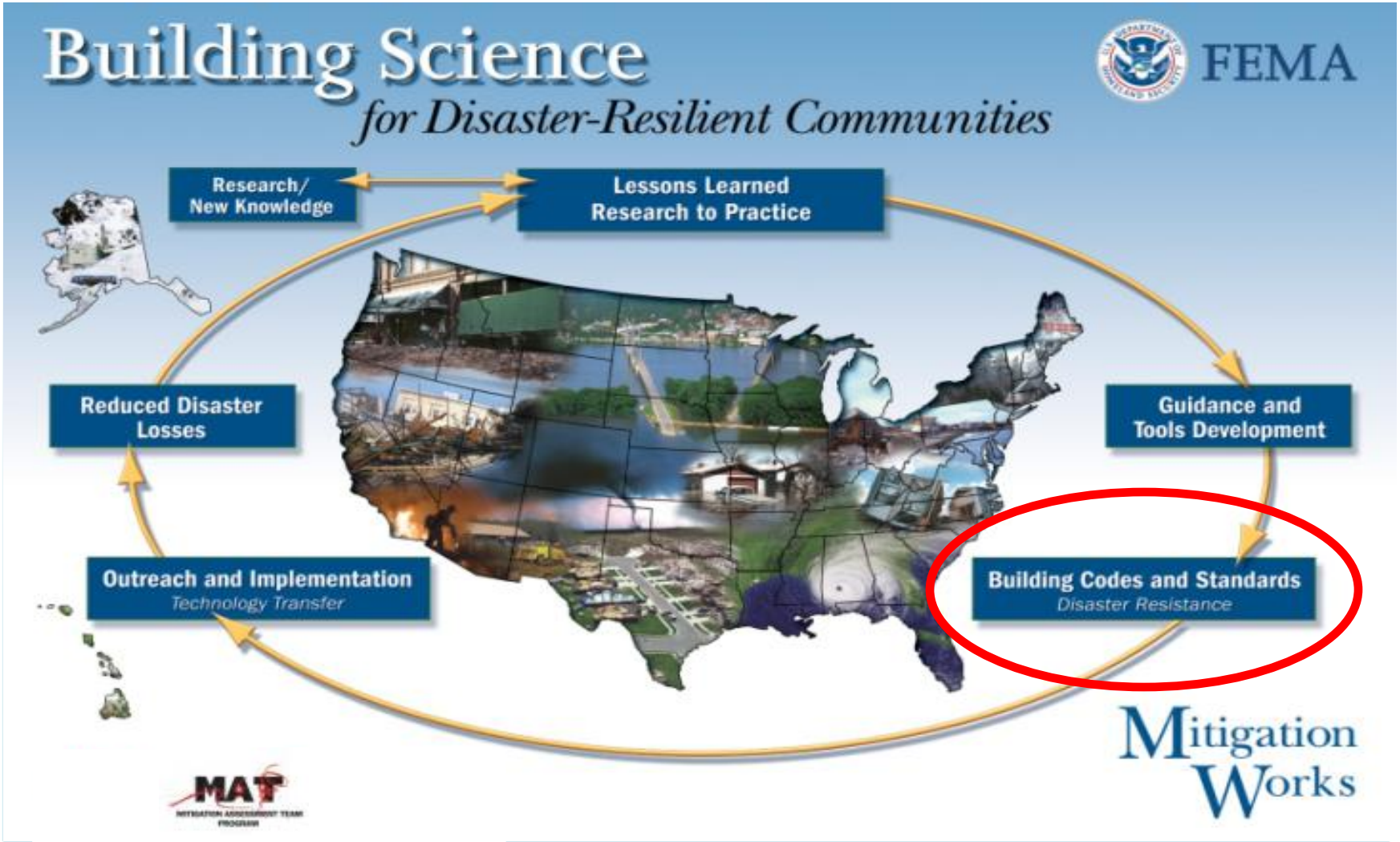
FEMA

ATC
Applied Technology Council

Possible Uses of PBSD and PACT

- Evaluation of design alternatives. How is building performance changed if:
  - Use of an alternate framing system
  - Add components to make the structure stronger/stiffer
  - Add damping or seismically isolate the building
  - Change the cladding
- Provide far more accurate Probable Maximum Loss (PML) computations for insurance and finance industries.
- Conduct comparisons with code-conforming buildings.

What We Do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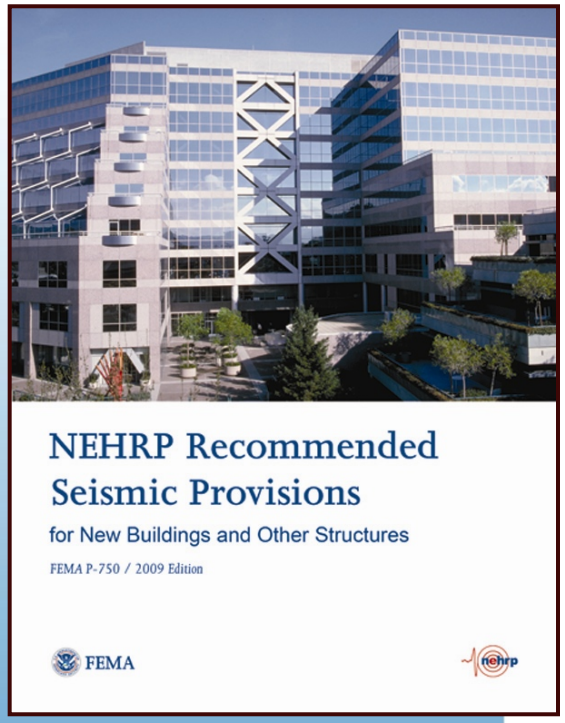
NEHRP Recommended Seismic Provisions

- NEHRP Recommended Seismic Provisions for New Buildings and Other Structures (FEMA P-749)
- Primary resource for ASCE/SEI 7-10 and the national model building codes IBC and IRC 2012.
- Recently completed two supporting publications:
  - FEMA P-751 Design Examples
  - FEMA P-752 Training Materials
- 2015 NEHRP Recommended Provisions to be complete early next year.



Building Codes and Standards

- Cornerstone of effective mitigation
- Building Science provides key input into model codes and standards
- FEMA has an MOU with the International Code Council
- Ongoing Adoption Tracking and efforts to measure losses avoided

Model Building Codes

- 2012 I-Codes are available for adoption and training.
- 2015 code change update cycle almost complete:
  - IBC, IRC and IEBC code change hearings are complete.
  - IBC: Limited changes, including new USGS maps for Guam (x2) and AS (x ½) and reinstating a requirement for continuous ties on lightweight diaphragms inadvertently dropped from ASCE 7-10.
  - IRC: Additional requirements for braced walls.

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Collaborating with Other Organizations

Cooperative Agreements

- Earthquake Consortia
  - Northeast States Emergency Consortium (NESEC)
  - Central U.S. Earthquake Consortium (CUSEC)
  - Cascadia Regional Earthquake Workgroup (CREW)
  - Western Seismic States Policy Consortium (WSSPC)
  - Southern California Earthquake Consortia (SCEC)
- Federal Alliance for Safe Homes (FLASH)
  - Grassroots outreach and partnership (Disney, ICC, etc.)
- Southern California Earthquake Consortia
  - Nationwide support for Shake Out and EQ Country Alliance

Training and Technical Assistance

- Earthquake Engineering Research Institute
  - Technical training and workshops
  - Academic Partnership
- National Earthquake Technical Assistance Program (NETAP)
  - Training development and delivery
    - Trains over 2,500 local officials annually in over 25 States and territories
  - Technical assistance
  - Special projects & Pilots

Earthquake State Assistance Changes

- Targeted assistance for State/Territorial earthquake hazard reduction programs began again in FY 2009 after many years gap (moved into EMPG in the ‘90’s)
- Starting in FY 2012, legal opinion ruled that 44CFR 361.4 applied to this assistance which required 50% ‘cash only’ match – hadn’t been the in FY 09 - 11
- State Assistance was evaluated in FY 12 and support was re-allocated thru consortia and partners

Earthquake State Assistance Evaluation

- In FY 12, 15 of the eligible 33 State/Territorial earthquake programs couldn't meet all or part of the 50 percent 'cash only' cost share being required which kept these states' from fully participating
- Highly earthquake-prone states/territories couldn't meet match including California, Hawaii, and the U.S. Virgin Islands
- Other problems meeting the 50% match
  - 4 States/Territories that could only partially match (KY, IL, AR, NC) 9 States/Territories who didn't meet match (CA, HI, NM, OK, MA, VT, AS, GM, VI)
  - 3 States/Territories did not participate (TX, GA - funds absorbed by EQ Consortia and partners; ID - funds to WA)

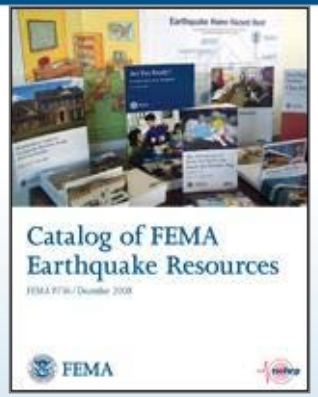
State Assistance Re-allocation

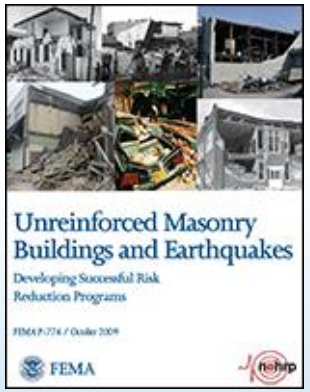
- Variety of support for our states will be provided including:
  - educational webinars and training for all states and territories
  - new publications in the form of CDs, pamphlets, videos, a media outreach plan
  - inventorying of critical structures
  - regional and local in-person seminars and meetings
  - travel to a national earthquake managers meeting for in-person education for all states and territories
  - ShakeOut support with the development/improvement of individualized state webpages
  - support for continuing projects in high risk states such as CA and their “Concrete Coalition Project”
  - earthquake scenario development,
  - nationwide education toolkit.

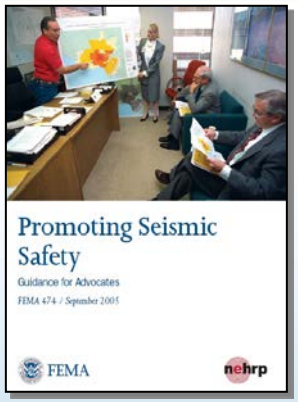
QuakeSmart, Shake Out & Partnerships

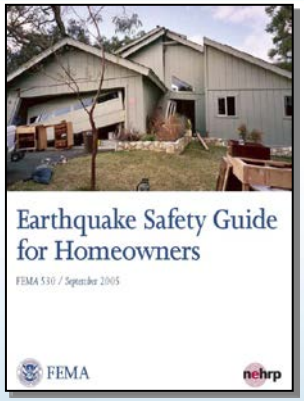
- Quake Smart - Earthquake Mitigation Campaign for Private Sector
  1. FEMA P-811 QuakeSmart Toolkit
  2. Earthquake Mitigation Train the Trainer for Homes and Businesses
  3. Ongoing partnership with FEMA Preparedness & FEMA EA Private Sector
- Shake Out – Over 20,000,000 participants in 20+ States in 2013
- West Coast - QuakeSmart Pilot: Antelope Valley, CA
  1. FLASH, ECA, CalEMA Partnership
  2. FEMA Non-Structural Mitigation Training & QuakeSmart Toolkit
  3. Revision of “Seven Steps for an Earthquake Resilience Business”
- Worked with TN and TX to improve and enhance EQ-resistant codes and enforcement.
- EQ School Hazard Hunt game

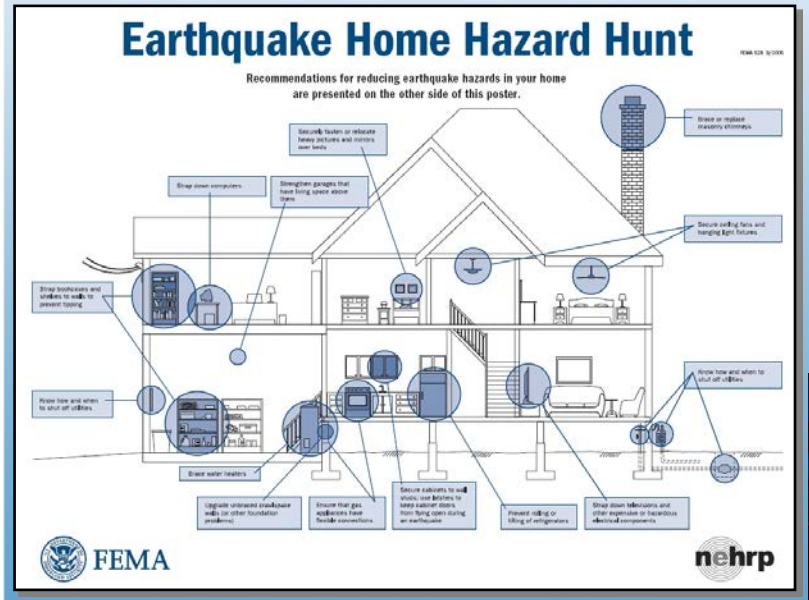
Examples of Outreach Products

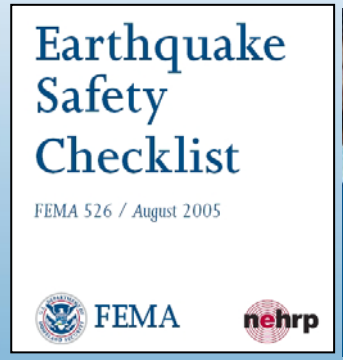


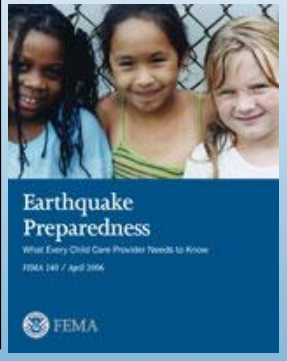


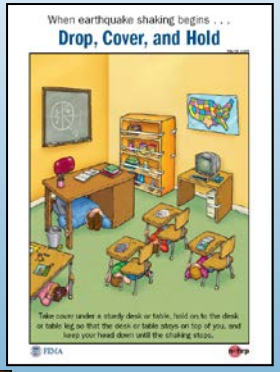


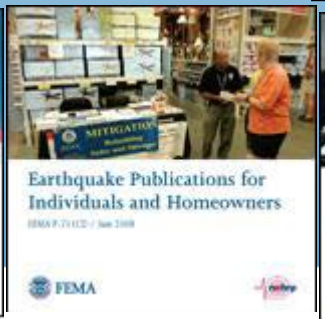












Accomplishments

Historical Accomplishments

1. NEHRP Recommended Provisions
2. Technical Subject Matter Experts/Technical Services Bureau (FIMA, FEMA, DHS, other Agencies)
3. Regional Consortia, Quake Smart and outreach partnerships
4. Over 100,000 EQ documents & other materials distributed annually
5. 6 guide books completed or revised and over 3,000 trained in FY 2014

State Assistance Re-allocation

- Variety of support for our states will be provided including:
  - educational webinars and training for all states and territories
  - new publications in the form of CDs, pamphlets, videos, a media outreach plan
  - inventorying of critical structures
  - regional and local in-person seminars and meetings
  - travel to a national earthquake managers meeting for in-person education for all states and territories
  - ShakeOut support with the development/improvement of individualized state webpages
  - support for continuing projects in high risk states such as CA and their “Concrete Coalition Project”
  - earthquake scenario development,
  - nationwide education toolkit.

Responses to ACEHR Recommendations

ACEHR RECOMMENDATION: REINVIGORATE THE IMPLEMENTATION COMPONENT OF NEHRP

The committee recommends that FEMA be given, and FEMA management allocate, increased funding to restore all mitigation activities, including state and local government mitigation and preparedness programs, to their historic levels.

Responses to ACEHR Recommendations

FEMA Response: This recommendation specifically targets the activities of the Federal Emergency Management Agency (FEMA) within NEHRP. FEMA continues to work diligently to meet its statutory NEHRP responsibilities to the greatest extent possible within the constraints of available resources. FEMA has allocated $7.8M in FY 2014 for FEMA's NEHRP activities and the President has requested $7.8M for FEMA's planned NEHRP activities in FY 2015.

Responses to ACEHR Recommendations

ACEHR RECOMMENDATION: DEVELOP A BUILDING PERFORMANCE RATING SYSTEM THAT CAN STIMULATE MITIGATION ACTIVITIES - *The committee recommends that a building performance rating system be developed and implemented, and that to accomplish this, NIST should make the development of required tools and standards a priority, and FEMA should make implementation of the system a priority.*

Responses to ACEHR Recommendations

FEMA/NIST Response: FEMA had begun examining the issue of developing building performance rating systems several years before the ACEHR made this recommendation, so it was appropriate to engage FEMA in the NEHRP response to the recommendation. FEMA has produced a substantial white paper, *NEHRP Response to 2013 ACEHR Recommendation Regarding Building Rating Systems*, on this topic that is included at the end of this document. The white paper includes brief discussion of related NIST activity.

FEMA

www.fema.gov