ATC-71

Summary of NEHRP Workshop Proceedings

NEHRP Advisory Committee Meeting
November 19, 2012
Gaithersburg, Maryland

Jon A. Heintz
ATC Director of Projects

Workshop Overview

- NEHRP Workshop on Meeting the Challenges of Existing Buildings, September 19-20, 2007, San Francisco, CA
- Initiated by FEMA for their Existing Buildings Program
- FEMA, NIST, NSF, EERI, and ATC funded
- ATC-71 Project – FEMA funded
- ATC-73 Project – NSF funded

Workshop Overview

- Technical Impediments
  - ✓ technical problems with currently available resource documents
- Practical Impediments
  - ✓ problems in the application of currently available resource documents
- Regulatory/Public Policy Issues
  - ✓ problems in implementation in the code/permit approval process or in setting public policy
- Research Needs

Workshop Overview

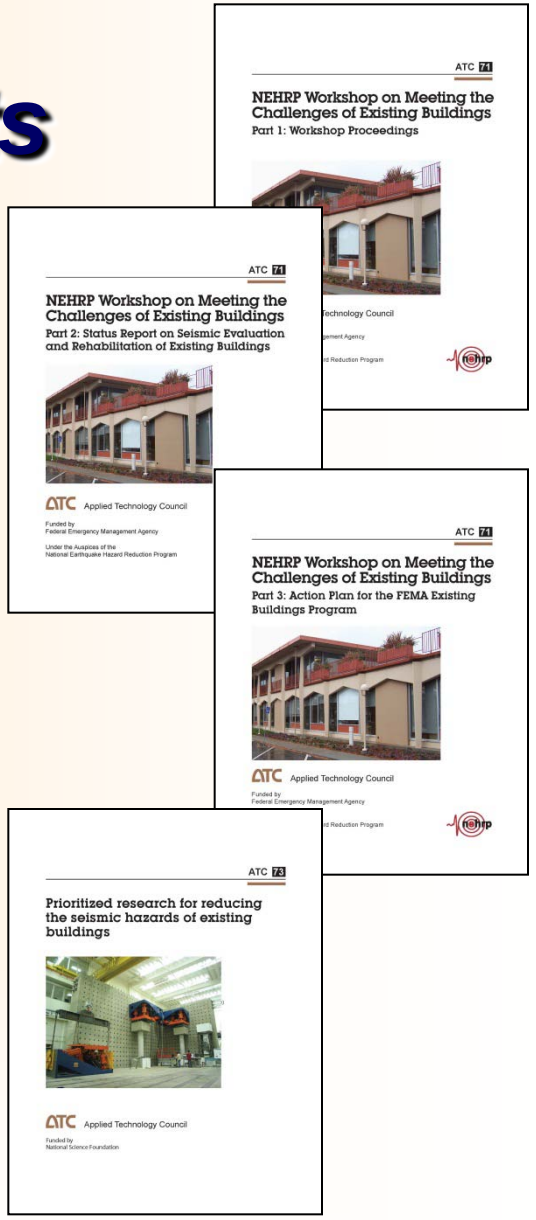
- Breakout groups were supposed to:
  - ✓ Discuss and clarify issue statements
  - ✓ Prioritize the issues
  - ✓ Discuss potential solutions
- Each fulfilled these objectives in similar, but different ways
  - ✓ Some grouped individual issues for discussion
  - ✓ Some consolidated issues into combined issues
  - ✓ Some ranked all as high or low
  - ✓ Some ranked the top 10 issues
  - ✓ Some ranked consolidated issues

Workshop Reports

- Breakout discussion reports were used to:
  - ✓ Understand what each group did
  - ✓ Understand the meaning behind what each group reported
  - ✓ Emphasize similarities between group results
  - ✓ Identify trends and commonalities
- The point was to:
  - ✓ Understand priorities
  - ✓ Understand the State-of-the-Art
  - ✓ Develop FEMA Existing Buildings Action Plan

Workshop Reports

- ATC-71 Part 1: Workshop Proceedings
- ATC-71 Part 2: Status Report
- ATC-71 Part 3: Action Plan for the FEMA Existing Building Program
- ATC-73 Prioritized Research for Reducing the Seismic Hazards of Existing Buildings



Workshop Report – Observations, Findings and Conclusions

- Individual issues in three or more discussion tracks

Table 7-1 Issues Identified as High Priority in Multiple Discussion Tracks

Issue No.	Issue	Discussion Track
Three or more discussion tracks		
G066	Development of a Uniformly Acceptable Standard Building Performance Rating System	Technical Practical Regulatory/Public Policy Research Needs
G015, G034, G067, G068	Development of Simplified and/or Prescriptive Procedures, and/or Procedures for Non-Engineered Buildings	Technical Practical Regulatory/Public Policy

Workshop Report – Observations, Findings and Conclusions

- Individual issues in at least two discussion tracks

At least two discussion tracks		
G008	Education of Building Officials	Practical Regulatory/Public Policy
G021, G040	FEMA 356 / ASCE 41 – Further Development of Nonstructural Component Requirements	Practical Research Needs
G024	Conservative Bias of ASCE 41	Technical Research Needs
G026	Development of Nonlinear Analysis Modeling Guidelines	Technical Research Needs
G039	Education of Building Owners and Users on Seismic Risk	Practical Regulatory/Public Policy
G041	Improved Global Damage Prediction	Technical Practical
G047	ASCE 31 and ASCE 41 Standardization Conundrum	Practical Regulatory/Public Policy
G050	Improvement in Consistency of Code Enforcement	Practical Regulatory/Public Policy
G063	Seismic Rehabilitation Materials for College/University Instruction	Practical Regulatory/Public Policy
G074	Evaluation and Rating Process for New Technical Information	Technical Research Needs
G075	Improvement of Advanced Structural Analysis Procedures	Technical Research Needs
G078	"Over-Conservatism" of ASCE 31 and ASCE 41	Technical Research Needs

Workshop Report – Observations, Findings and Conclusions

- Common themes in three or more discussion tracks

Table 7-7 Common Themes Identified in Multiple Discussion Tracks

Theme	Discussion Track
Three or more discussion tracks	
Communication Between Stakeholder Groups – communication between engineers and owners, plan reviewers, and the public on seismic risk, business continuity planning, and cost/benefit decisions	Technical Practical Regulatory/Public Policy Research Needs
Advancement of Guidelines and Standards for Existing Buildings – for both structural and nonstructural components, includes transition of research into practice, improvement of acceptance criteria with new data, and calibration of procedures with engineering judgment or actual loss data	Technical Practical Research Needs

Workshop Report – Observations, Findings and Conclusions

- Common themes in at least two discussion tracks

Table 7-7 Common Themes Identified in Multiple Discussion Tracks

Theme	Discussion Track
At least two discussion tracks	
Education and Training in Seismic Rehabilitation – education of engineers and plan reviewers on the technical aspects of seismic rehabilitation; education of owners and the public on seismic risk and mitigation of risk; education of legislators on implementation of effective seismic policy	Practical Regulatory/Public Policy
Development of Simplified Procedures – further simplification of currently available simplified procedures; development of prescriptive provisions for selected systems; and guidance on how to address non-engineered structures	Practical Regulatory/Public Policy
Consistency in Enforcement – consistency in application of mandated seismic requirements; consistency in how requirements are are enforced on individual projects; and development of guidance on peer review	Practical Regulatory/Public Policy

Workshop Report – Observations, Findings and Conclusions

- Public policy and regulatory issues are critical to the implementation of seismic rehabilitation.
- Increased political will to support mitigation measures was identified as the most valuable contribution.
- The biggest impediment to seismic rehabilitation is the lack of market forces aligned to support such activities.

Workshop Report – Observations, Findings and Conclusions

- The language used by practitioners does not adequately convey seismic risk to owners and the public.
- Risk of potential loss in business revenue was identified as a persuasive justification.
- Currently available seismic evaluation and rehabilitation tools need to be technically improved.
- The cost of seismic rehabilitation and associated work can impede rehabilitation activities

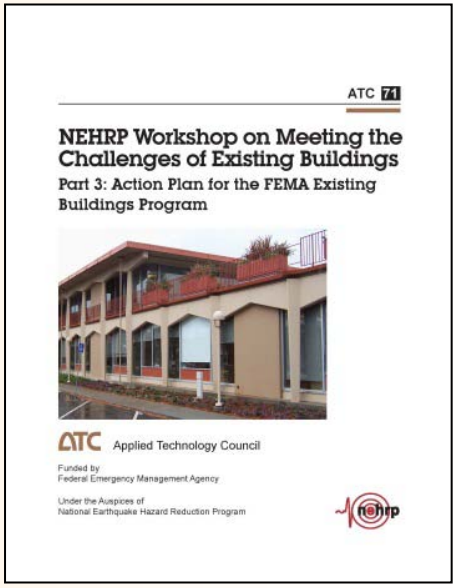
Workshop Report – Observations, Findings and Conclusions

- There was strong consensus for the development of prescriptive and/or simplified procedures for selected model building types.
- There was strong indication of the need for additional education and training materials.

ATC-71 Action Plan

ATC-71 Action Plan

- Twenty-Eight (28) Activities
- Five (5) Thematic Areas
- Three (3) Time Frames
  - ✓ Near-term (1 – 3 years)
  - ✓ Mid-term (4 – 6 years)
  - ✓ Long-term (7 – 10 years)

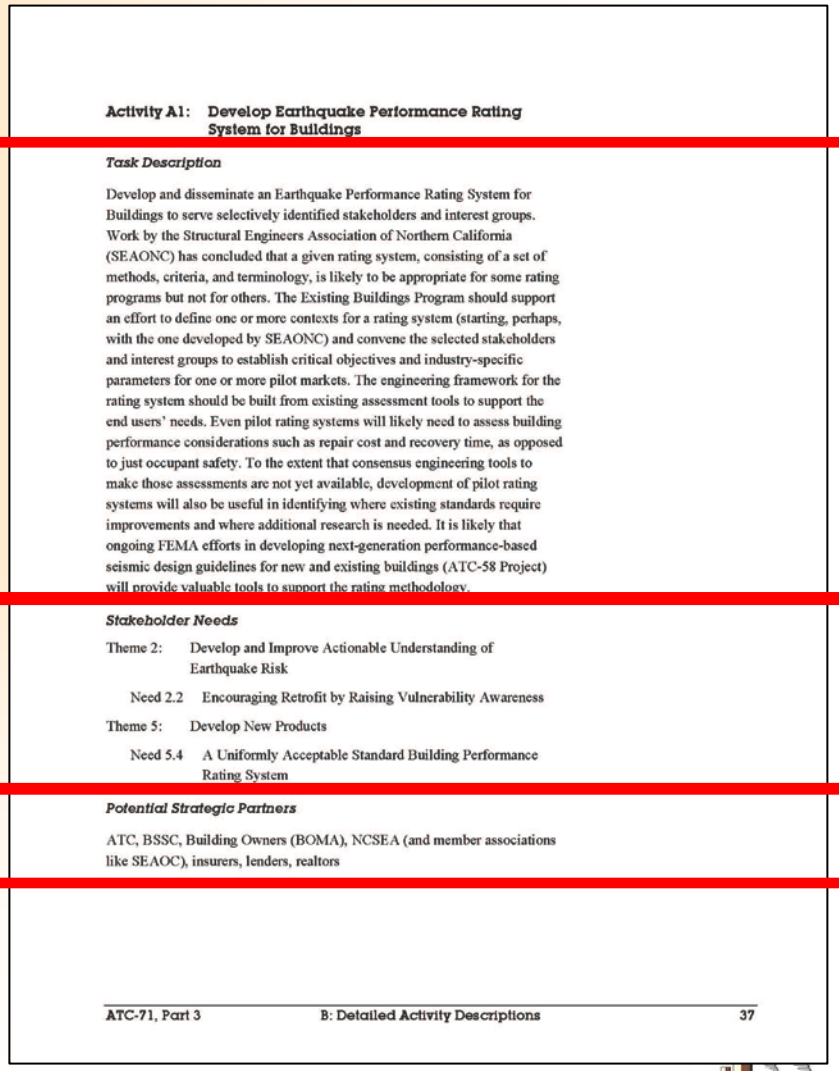


ATC-71 Action Plan

- Five (5) Thematic Areas:
  1. Facilitate Framework to Update Existing Building Standards
  2. Develop and Improve Actionable Understanding of Earthquake Risk
  3. Develop Simplified Evaluation and Rehabilitation Procedures
  4. Improve Education and Training of Engineering Professionals
  5. Develop New Products

ATC-71 Activity Description

- Tasks described
- Stakeholder needs addressed
- Strategic partners identified



Activity A1: Develop Earthquake Performance Rating System for Buildings

Task Description

Develop and disseminate an Earthquake Performance Rating System for Buildings to serve selectively identified stakeholders and interest groups. Work by the Structural Engineers Association of Northern California (SEAONC) has concluded that a given rating system, consisting of a set of methods, criteria, and terminology, is likely to be appropriate for some rating programs but not for others. The Existing Buildings Program should support an effort to define one or more contexts for a rating system (starting, perhaps, with the one developed by SEAONC) and convene the selected stakeholders and interest groups to establish critical objectives and industry-specific parameters for one or more pilot markets. The engineering framework for the rating system should be built from existing assessment tools to support the end users' needs. Even pilot rating systems will likely need to assess building performance considerations such as repair cost and recovery time, as opposed to just occupant safety. To the extent that consensus engineering tools to make those assessments are not yet available, development of pilot rating systems will also be useful in identifying where existing standards require improvements and where additional research is needed. It is likely that ongoing FEMA efforts in developing next-generation performance-based seismic design guidelines for new and existing buildings (ATC-58 Project) will provide valuable tools to support the rating methodology.

Stakeholder Needs

Theme 2: Develop and Improve Actionable Understanding of Earthquake Risk

Need 2.2 Encouraging Retrofit by Raising Vulnerability Awareness

Theme 5: Develop New Products

Need 5.4 A Uniformly Acceptable Standard Building Performance Rating System

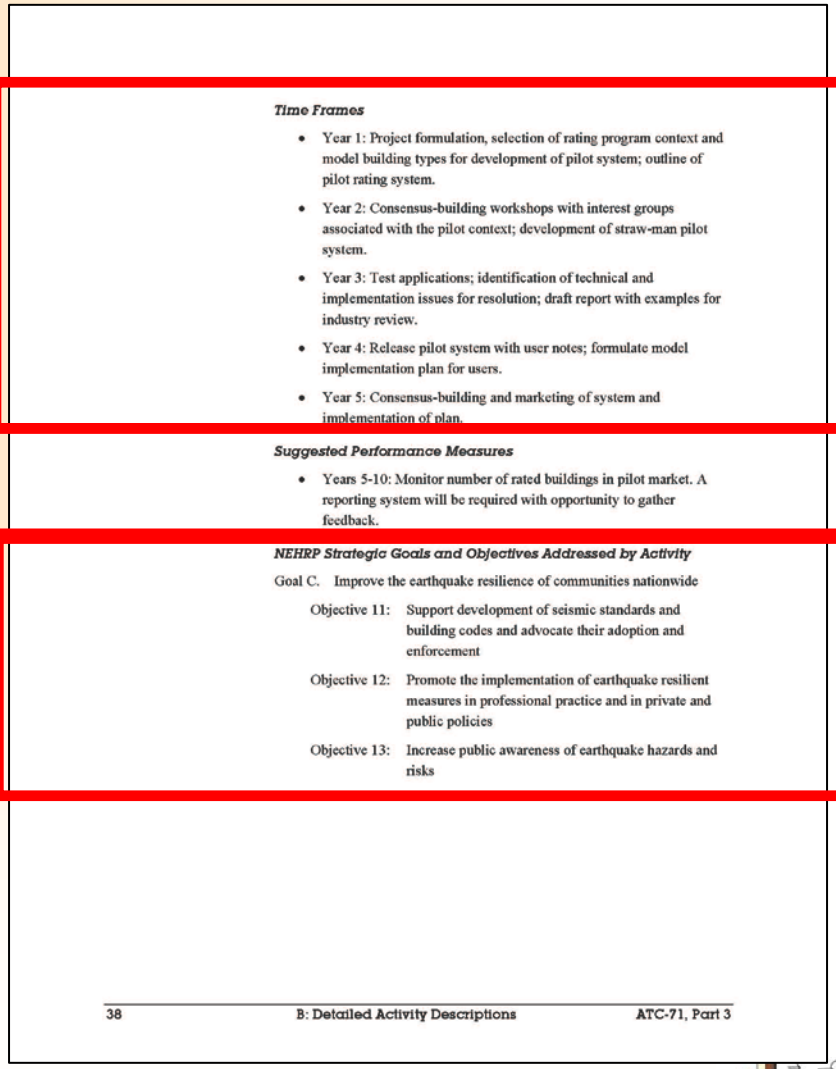
Potential Strategic Partners

ATC, BSSC, Building Owners (BOMA), NCSEA (and member associations like SEAOC), insurers, lenders, realtors

ATC-71, Part 3 B: Detailed Activity Descriptions 37

ATC-71 Activity Description

- Time frame milestones laid out
- Performance measures suggested
- NEHRP Strategic Plan objectives identified



Time Frames

- Year 1: Project formulation, selection of rating program context and model building types for development of pilot system; outline of pilot rating system.
- Year 2: Consensus-building workshops with interest groups associated with the pilot context; development of straw-man pilot system.
- Year 3: Test applications; identification of technical and implementation issues for resolution; draft report with examples for industry review.
- Year 4: Release pilot system with user notes; formulate model implementation plan for users.
- Year 5: Consensus-building and marketing of system and implementation of plan.

Suggested Performance Measures

- Years 5-10: Monitor number of rated buildings in pilot market. A reporting system will be required with opportunity to gather feedback.

NEHRP Strategic Goals and Objectives Addressed by Activity

Goal C. Improve the earthquake resilience of communities nationwide

Objective 11: Support development of seismic standards and building codes and advocate their adoption and enforcement

Objective 12: Promote the implementation of earthquake resilient measures in professional practice and in private and public policies

Objective 13: Increase public awareness of earthquake hazards and risks

38 B: Detailed Activity Descriptions ATC-71, Part 3

ATC-71 Activities

1. Facilitate Framework to Update Existing Building Standards

1. Facilitate Framework to Update Existing Building Standards

- Activity A5: Support Development of Standards Update Framework (near-term)
- Activity A7: Develop Consensus Code Change Proposals to Align the Provisions of the IBC, IEBC, and IRC (near-term)
- Activity A11: Framework for Convening Issue Teams to Move Research into Practice (near-term)
- Activity A13: Develop Recommendations for Treatment of Earthquake Hazard Issues for Existing Buildings (mid-term)
- Activity A16: Define Test Beds and Case Studies (mid-term)
- Activity A18: NEHRP Existing Building Workshop Support (mid-term)
- Activity A19: Coordinate Recommendations for Evaluation & Rehabilitation of Nonstructural Components (mid-term)

ATC-71 Activities

2. Develop and Improve Actionable Understanding of Earthquake Risk

2. Develop & Improve Actionable Understanding of Earthquake Risk

- Activity A3: Monitor Use of ASCE 31 and ASCE 41 for Projects Triggered by Codes (near-term)
- Activity A4: Develop Community Building Inventories (near-term)
- Activity A6: Enhance LEED Ratings for Resilience (near-term)
- Activity A10: Develop & Promote Earthquake Risk Communication Tool (near-term)
- Activity A17: Develop and Disseminate Policies and Guidance for Various Mitigation Approaches (mid-term)
- Activity A21: Benchmark Model Building Expected Performance (long-term)
- Activity A25: Prepare White Paper on Seismic Rehabilitation and Social Vulnerability (long-term)
- Activity A26: Develop Methodology for Tracking the Progress of Earthquake Risk Reduction (long-term)

ATC-71 Activities

3. Develop Simplified Evaluation and Rehabilitation Procedures
4. Improve Education and Training of Engineering Professionals

3. Develop Simplified Evaluation and Rehabilitation Procedures

- Activity A8: Develop Simplified Evaluation and Rehabilitation Guidance (Regional Module) (near-term)
- Activity A24: Develop Simplified Rehabilitation Guidance (General Module) (long-term)

4. Improve the Education & Training of Engineering Professionals

- Activity A9: Develop Seismic Evaluation & Rehabilitation Example Applications (near-term)
- Activity A12: Promote Incremental Seismic Rehabilitation Guidance (mid-term)
- Activity A14: Develop Nonlinear Analysis Modeling Guidelines (mid-term)
- Activity A15: Promote Education and Training of Engineering Professionals (mid-term)

ATC-71 Activities

5. Develop New Products

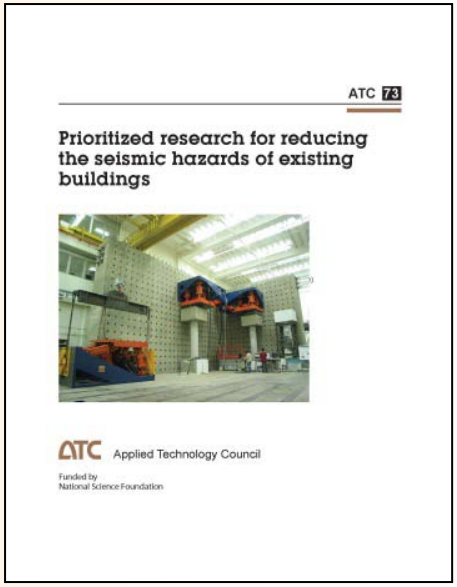
5. Develop New Products

- Activity A1: Develop Earthquake Performance Rating System for Buildings (near-term)
- Activity A2: Develop Rehabilitation Cost Guidance (Update FEMA 156 and FEMA 157) (near-term)
- Activity A20: Develop Business Continuity Earthquake Planning Guidelines (long-term)
- Activity A23: Develop Guidelines for Seismic Rehabilitation of Historic Structures (long-term)

ATC-73 Prioritized Research

ATC-73 Prioritized Research

- Fifty (50) Research Needs
- Seven (7) Goals
- One (1) Vision



"Substantial Reduction of Casualties and Other Losses from Existing Buildings in Earthquakes"

ATC-73 Prioritized Research

- Seven (7) Goals:
  1. Goal 1: Establishment of a Coordinated Research Program
  2. Goal 2: Mitigation of Building Collapse Risks
  3. Goal 3: Advancement of Guidelines and Standards for Existing Buildings
  4. Goal 4: Communication of Earthquake Risks
  5. Goal 5: Calibration of Engineering Tools with Realistic Data
  6. Goal 6: Development of New Materials and New Building Systems
  7. Goal 7: Development of Building Investigative Technologies

ATC-73 Top Twelve

Table 1 Highest Priority Research Needs

Overall Priority Ranking	Research Need	Goal
1	Fragility data for structural and nonstructural components and systems, and a consistent framework for developing and establishing such data	Goal 3: Advancement of Guidelines and Standards for Existing Buildings
2	Development of a nonproprietary building rating system	Goal 4: Communication of Earthquake Risks
3	Risk-based approaches to selection of ground motions for evaluation of buildings	Goal 3: Advancement of Guidelines and Standards for Existing Buildings
4	Full- or large-scale shake table testing of complete building systems	Goal 2: Mitigation of Building Collapse Risks Goal 5: Calibration of Engineering Tools with Realistic Data

ATC-73 Top Twelve

Table 1 Highest Priority Research Needs

Overall Priority Ranking	Research Need	Goal
5	In-situ testing of the behavior of existing buildings	Goal 2: Mitigation of Building Collapse Risks Goal 5: Calibration of Engineering Tools with Realistic Data
6	Uniform method for development of acceptance criteria in guidelines and standards	Goal 3: Advancement of Guidelines and Standards for Existing Buildings
7	Behavior and performance data on innovative structural materials and systems for use in seismic analysis and design	Goal 6: Development of New Materials and New Building Systems
8	Improved analytical platforms for next-generation nonlinear analysis and quantification of risk	Goal 3: Advancement of Guidelines and Standards for Existing Buildings

ATC-73 Top Twelve

Table 1 Highest Priority Research Needs

Overall Priority Ranking	Research Need	Goal
9	Information on soil-foundation-structure interaction effects on input ground motion	Goal 3: Advancement of Guidelines and Standards for Existing Buildings
10	New tools for non-destructive investigation of building components	Goal 7: Development of Building Investigative Technologies
11	Identification and inventory of buildings that are collapse risks, by type and region	Goal 2: Mitigation of Building Collapse Risks
12	Soil-foundation-structure interaction (deformations, capacity, and behavior under extreme loading)	Goal 3: Advancement of Guidelines and Standards for Existing Buildings

Thank you!