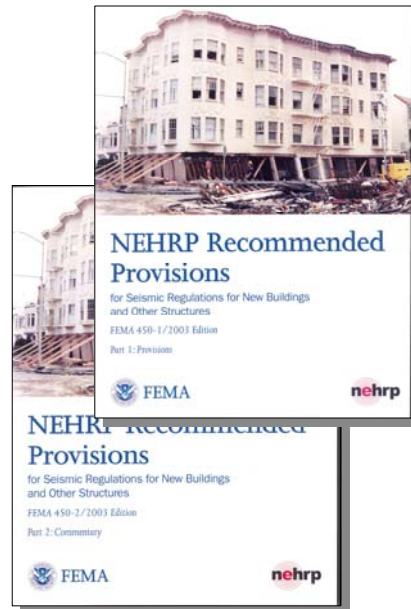


INTRODUCTION

Development of the *NEHRP Recommended Provisions*



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Introduction to NEHRP 8a - 1

This set of training aids is designed to increase competence among engineers and officials who make use of codes and standards based upon the *NEHRP Recommended Provisions*.

**NATIONAL
EARTHQUAKE
HAZARDS
REDUCTION
PROGRAM**



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Introduction to NEHRP 8a - 2

NEHRP: acronym for National Earthquake Hazards Reduction Program.

This federally-funded program created in 1977 by passage of Public Law 95-124 (the Earthquake Hazards Reduction Act). Primary objective: "to reduce the risks of life and property from future earthquakes in the United States."

NEHRP to include: development of earthquake resistant construction, earthquake prediction methods (by USGS), and model codes. NEHRP to support: greater understanding of seismic phenomena, dissemination of information, education, and research.

San Fernando, 1971

- Damage to Olive View Hospital
 - Stair tower separated from building
 - Near collapse in second story



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Introduction to NEHRP 8a - 3

Photo of severe structural damage caused by San Fernando earthquake (1971); illustrates inadequacies of then current design and construction practices. Although the 1964 Alaska earthquake was studied carefully by federal interests and captured the interest of the academic community, the 1971 earthquake was the one that really got the interest of the federal government. It was far from the most intense earthquake that could strike, and yet it caused great damage and disruption, building worry about what would happen in the realistic, but larger, earthquakes that could strike major urban areas.

Responses to San Fernando

- 1972 Workshop - Improve codes
- 1974 SEAOC - Quick Change
 - Higher forces
 - Soil factor
 - Importance factor
- 1974-76 ATC-3 Project
 - Fundamental changes
- 1977 Earthquake Hazard Reduction Act



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Introduction to NEHRP 8a - 4

1972 Workshop: Covered building practices for disaster mitigation (earthquake, wind, and other dynamic loads). Result: Building Science Series 46, *Building Practices for Disaster Mitigation*; recommended action on national level to implement existing knowledge and identified gaps where research was needed. "Model code provisions and commentary should be prepared on a top priority basis to bring the minimum level of practice into line with current state of knowledge and analytical techniques."

1974 SEAOC Quick Change: Immediately incorporated into UBC; required force levels increased, particularly for 5 to 10 story buildings, and the importance factor introduced.

ATC-3 Project: Continued response spectrum work of ATC-2. Joint project of ATC, NSF, and NBS (now NIST). (More detail on next slide.)

1977: The National Earthquake Hazards Reduction Program, as previously described, was created.

Creation of NEHRP

- Public Law 95-124: EHRA of 1977
 - “to reduce risks to life and property from future earthquakes in the United States.”
- Construction
- Model codes
- Plus response, recovery, and many other concerns



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Introduction to NEHRP 8a - 5

Congress catches up with federal agencies and sets forth objectives for government. National Earthquake Hazards Reduction Program created by executive branch in response to this act. Goals to be met by improving seismic resistance of constructed facilities. Implemented through model codes.

Principal NEHRP Agencies

- Federal Emergency Management Agency
- National Institute of Standards and Technology (new lead agency)
- United States Geological Survey
- National Science Foundation



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Introduction to NEHRP 8a - 6

Principal agencies that support NEHRP:

FEMA (lead agency) - not formed when NEHRP was created but subsequently named as the administrative organization;

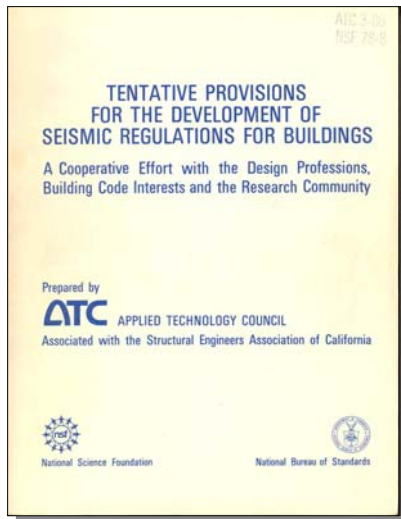
NIST (previously NBS) – named lead agency in 2005 and coordinates ICSSC (Interagency Committee on Seismic Safety in Construction), which represents all government bodies involved in construction (HUD, GSA, the armed forces, Veterans' Administration, etc.);

USGS - seismology and related topics;

NSF - funds basic and applied research on earthquake engineering and policy.

USGS and NSF have the largest budgets for NEHRP. FEMA's mitigation program has supported the development of improved standards for design and construction of new buildings as well as evaluation and rehabilitation of seismic hazards in existing buildings.

ATC-3 Report



- 1978 Publication of ATC / NSF / NBS
- New approaches:
 - Nationwide
 - Probabilistic
 - Inelastic behavior
 - Strength level
 - Nonstructural
 - Existing Buildings



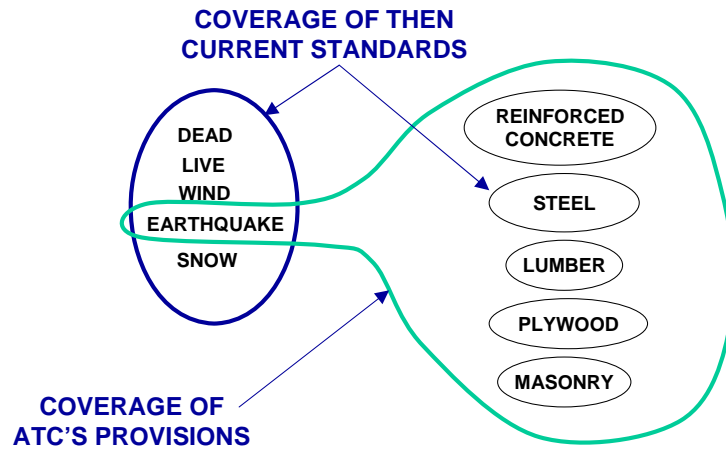
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Introduction to NEHRP 8a - 7

ATC 3-06 innovations included: applicable nationwide, realistic ground motions, inelastic behavior, varying levels of analysis, yield level design, nonstructural aspects, and existing buildings. Each is a departure from past practice and each continues in the *NEHRP Recommended Provisions*, except: existing buildings no longer covered. Existing buildings covered by *NEHRP Handbook for the Seismic Evaluation of Existing Buildings* and *NEHRP Handbook for Seismic Rehabilitation of Existing Buildings*, and the new (draft) *Guidelines and Commentary for Seismic Rehabilitation*. Existing buildings beyond the scope of this course.

Standards for Structural Design vs. ATC's Provisions



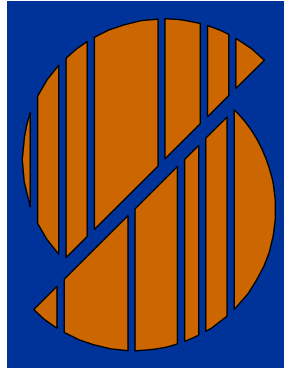
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Introduction to NEHRP 8a - 8

This compares scope of then existing standards (all types of loads in one standard, separate standards for design of materials individually) to ATC 3-06 (and *NEHRP Recommended Provisions*) coverage (earthquake loads only, applied to all materials). Thus, many organizations are directly affected by these seismic provisions. ATC document represented new approach to model codes.

Building Seismic Safety Council



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Introduction to NEHRP 8a - 9

The BSSC, established in 1979, assisted in (and later took over) task of reviewing the new provisions. The BSSC members are organizations (such as ACI and SEAOC), not individuals. Its aim: to improve seismic provisions for buildings. To a great extent, the demand for BSSC was created by recognition that improved mitigation of seismic risk in building design and construction demanded coordinated effort across many organizations with a stake in the model codes and the standards of practice.

BSSC

- Private, voluntary
- A council of NIBS
- National forum for issues:
 - Technical
 - Social
 - Economic
- 60+ organizational members
- Consensus process



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Introduction to NEHRP 8a - 10

Review nature of BSSC as noted on slide. NIBS is the National Institute of Building Sciences, a Congressional established private nonprofit institution. Nearly all the funds for BSSC activities come by way of contracts with FEMA.

BSSC Members

Building Community Organizations

Examples:

ACI	AF&PA	AIA	AISC
AISI	AITC	APA	ASCE
ASME	BIA	EERI	ICC
NCMA	NCSEA	NFPA	PCA
SEAOC	TMS		

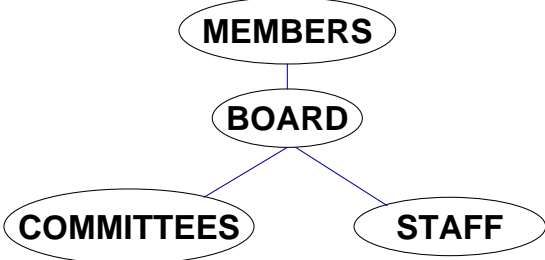


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Again note that BSSC members are organizations (not individuals). Some examples noted on slide. Thus, nearly all in audience are usually represented in BSSC.

BSSC Organization



Review BSSC organization. The staff is small, approximately 4 people.

History of *NEHRP Recommended Provisions* for New Buildings

- 1974-78 ATC 3 Tentative Provisions
- 1979-80 Review Committees
- 1981-84 Trial Designs
- 1985 Edition (first edition to be “Recommended”)
- New editions in 1988, 1991, 1994, 1997, 2000, and 2003



Point out large effort and necessary deliberate pace.

Context and Use of the *NEHRP Recommended Provisions*

- Building codes and standards
- Organizations generating standards and model codes
- Role of BSSC

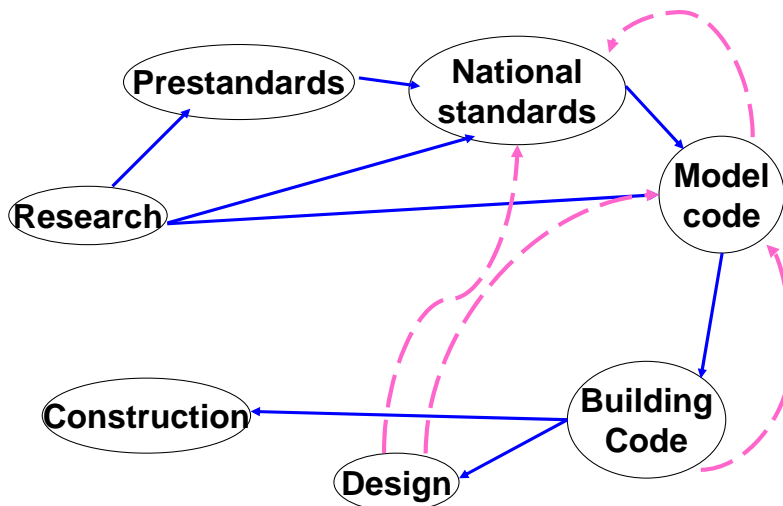


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Introduction to NEHRP 8a - 14

Building codes and standards generated by a number of different organizations (described in subsequent slides). Local, regional, and national jurisdictions adopt and modify codes to suit their needs. BSSC develops improved seismic provisions and coordinates comments on proposed changes to model building codes.

Information Flow Through Building Codes



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Introduction to NEHRP 8a - 15

Diagram shows evolution of building codes and forces that influence code development. Change initiated through research or field observation. Primary path for new knowledge is through national standards and model codes, then eventually into local codes. Practical application of codes in the field strongly influences development and refinement of standards and model codes. Changes in building codes affect design and construction practices. *NEHRP Recommended Provisions* are a “prestandard.”

Model Code Organizations

- International Conference of Building Officials
 - Uniform Building Code
- Building Officials and Code Administrators
 - National Building Code
- Southern Building Code Congress **Previous**

 - Standard Building Code **Current**
- International Code Council
 - International Building Code
- National Fire Protection Association
 - NFPA 5000

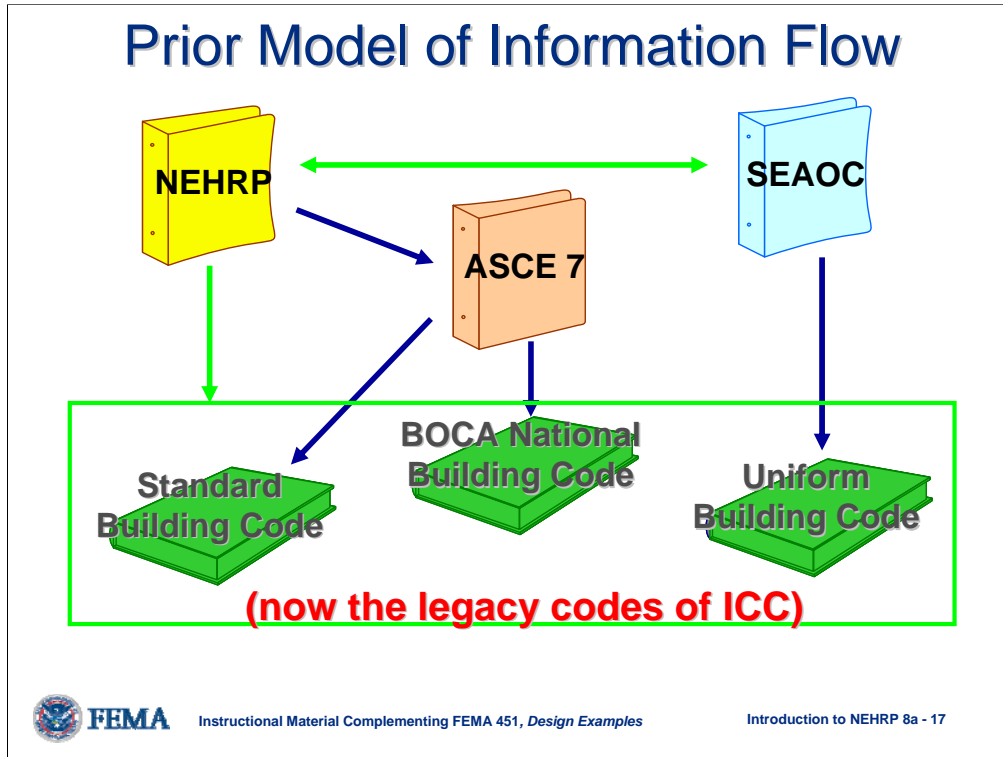


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Model code organizations and the codes they write. Members of each organization are predominantly building officials. Codes have **no legal power** until adopted by a government. (NBC was previously the Basic Building Code). ICC is a new creation of the three model code organizations. IBC: first edition was in 2000, and UBC, NBC, and SBC are no longer published, although the 1997 UBC is still in use in California. NFPA has long history of publishing many standards relevant to building construction; it entered the model building code field shortly after creation of ICC.



SEAOC is the “Blue Book” published by the Structural Engineers Association of California. Conscientious attempts were made to have the *NEHRP Recommended Provisions* and the Blue Book be comparable, but there were significant differences. By the 1997 UBC the differences were minimal. Under the IBC practice will be relatively uniform across the nation. The many standards influenced by the *NEHRP Recommended Provisions* are described in the next lesson.