

2010 ACEHR Report-Trends and Developments Appendix

X. Building Codes, Standards and Compliance

X.1 General

One of the most effective ways to address earthquake safety is to ensure our buildings are constructed according to current national standards. A substantial majority of fatalities and injuries from earthquakes are due to the failure of buildings. A resistant building stock mitigates the initial damage, minimizes harm to people and property, speeds a community's recovery and conserves resources. In 1999 FEMA Director, James Lee Witt, stated "When disaster strikes, no matter where or how, building codes, and local code officials, are America's first line of defense against tragedy ...Communities that recognize the life-or-death consequences of building codes pick up the pieces and recover from disasters while communities that shirk those codes wallow in the damage for months and years."

Authority for building construction regulation is a responsibility that remains with the states; therefore it is regulated by state and local governments. There is no mandatory national building code, but there is an established mechanism to get strengthening provisions into buildings on a national basis. For almost a century the model building code system has been a convenient mechanism for state and local entities to remain current in addressing disaster specific hazards and transferring research into implementation.

X.2 Achievements

For the past four decades NEHRP along with the structural engineering community has been working within the model code system improving seismic performance criteria for new buildings.

In the spring of 2000 the International Building Code (IBC) and International Residential Code (IRC) were published by the International Code Council (ICC) as a collaborative effort by the three leading model building code organizations in the United States. NEHRP recommended provisions served as the basis for the seismic regulatory code language in the first editions of the IBC and IRC through participation by FEMA and USGS in the ICC code development process.

The substantial advantages of a consistent set of requirements is clear. A single set of comprehensive codes allows for the conservation of industry resources and a uniform approach to the education of architects, engineers, trades workers, and construction code and fire prevention officials. It eliminates trade and design barriers stemming from contradictory regulations and promotes better constructed buildings through consistent inspections and improved regulatory administrative processes. The hope

was that issues surrounding construction regulation would have a single forum for discussion, consideration, and resolution which would facilitate more effective public/private partnerships at all levels of government.

Since the publication of the IBC and IRC those codes have achieved dominance as the basis for construction regulation in the US. The three founding model code organizations have consolidated providing a strong advocacy base. NEHRP recommendations continue to be incorporated into the new editions of the I-Codes and the ASCE 7 structural reference standard. Furthermore, code training for all construction professionals has increased dramatically, and building inspector certifications are at an all time high.

X.3 Issues and Challenges

Adoption and Enforcement--- While the contemporary building code has been adopted in every state to some extent, state and local adoption is neither universal nor comprehensive. There is enormous diversity in the way codes are adopted in the US from full attainment, to limited adoption, to marginal enforcement, to areas that strip out disaster resisting provisions, to smaller communities that have no effective building code.

The best code in the world is of little use if it is not adopted and enforced by well qualified inspectors. The most successful way to ensure buildings are actually constructed according to the code and built per the engineered plan is through competent public officials with sufficient resource to do thorough and accurate inspections as well as peer plan reviews.

Creating earthquake resistant buildings is a long term proposition. It is a wasted opportunity if we do not insist that all new buildings are constructed in ways to limit future damage and conserve resources. Code compliant new buildings can be accomplished with minimal initial expense while providing considerable enduring benefit.

Even when the cost is extremely low, a major challenge facing earthquake resistant construction in some areas is the resistance of local developers to any added expense to strengthen new buildings due to the short duration of a developer's financial exposure. Understandably, a developer's goal is to turn a project as quickly as possible for the greatest financial gain. Unfortunately, there are those who will sacrifice the long term benefit for the short term profit. Obviously, local elected officials support development because of the contribution to a community's economic well being. Unfortunately, due to the lack of political will or understanding of the long term risk, many local governments fail to embrace disaster resisting regulations to protect against their future vulnerability.

Because building codes are a state and local issue, there needs to be powerful incentives for those who do not currently support a strong code and enforcement philosophy. FEMA currently ties part of the recovery money from a federally declared disaster to preparedness and mitigation. The possibility of including building code compliance as

criteria for reimbursement should be investigated. There are existing evaluation services available such as the Insurance Services Office (ISO) Building Code Effectiveness Grading Schedule (BCEGS) or the International Accreditation Service (IAS). Also, some insurance companies provide discounted rates to the private sector based on the ISO-BCEGS. The practice should be encouraged and expanded.

Consolidation of Basic Requirements-- A recent trend has been to move construction requirements from the text of the building codes to multiple reference standards. Regrettably, the effort has moved some indispensable elements out of the latest editions of the codes. The requirements are technically incorporated into the building code through reference standards that are used extensively by structural engineers for building design. However, certain details critical for seismic resistant construction do not usually appear on the engineered drawings or in the base code. Construction inspectors generally keep a building code with them for ready reference, but many important requirements will not be found in the book they keep in their truck. When building inspectors have to search numerous standards for basic requirements, the enforcement of these types of details becomes extremely cumbersome, less effective or even overlooked. In addition, certification testing for building inspectors is based only on the building code because it is impractical to test to all the various reference standards. Today it is possible to become a certified building inspector with no knowledge of basics like concrete reinforcement detailing or suspended ceiling bracing for areas of high seismic risk.

If the goal is to have buildings comply with seismic resistant regulations, the last line of defense is the local inspector who ensures the engineer's design and seismic resisting elements are correctly incorporated into the actual construction. It is extremely important that inspectors have ready access to basic requirements which do not appear in the latest editions of building codes. Gaps need to be identified and typical field inspection requirements must be returned to the building codes.

Existing Structures--Existing buildings present additional challenges. Every community will have some older buildings which are not constructed to modern codes. It may not be practical to retrofit all existing structures in disaster prone areas, but essential buildings and those that represent a substantial hazard must be analyzed and strengthened. There are a number of good standards available for voluntary strengthening of existing buildings. However, we must continue to search for ways to lower the cost and provide incentives if significant improvements are to be made.

Performance Based Codes/the Next Generation—The intent of the IBC is “to establish the minimum requirements to safeguard the public health, safety and general welfare...and safety to life”. While modern codes do a good job of saving lives and preserving certain essential facilities they are not intended to ensure most buildings are usable after an earthquake. Many code compliant buildings will save lives, but

will not remain operational during repair or will need to be demolished after a large event.

Valuable work is being done regarding performance based design, as discussed in another chapter of this appendix. One challenge is for the engineering community to agree on a consistent approach.

Summary--In order to secure better outcomes after natural or man-made disasters it is essential the federal government be adamant that states adopt contemporary building codes including provisions for vigorous enforcement, encourage consolidation of basic earthquake resistance construction requirements, provide targeted incentives, offer assistance to retrofit critical existing buildings, and create incentives for voluntary rehabilitation of other buildings at risk.