Item VIII

State of California
Seismic Safety Commission

Memo

To: Seismic Safety Commission

From: Fred Turner, Staff Structural Engineer
California Seismic Safety Commission
1755 Creekside Oaks Drive, Suite 100
Sacramento, CA 95833
Phone: (916) 263-0582 Fax: (916)263-0594 Email: Turner@StateSeismic.com

Date: November 5, 2013

Subject: **Proposed Guidebook to Identify & Manage the Risks of Collapse-Prone Buildings**

The Commission has a 38 year history of addressing seismic risk and much of that time has been devoted to the management of collapse risk posed by buildings. From the 1970's to the 1990's the Commission sponsored legislation to facilitate and encourage local governments in this respect. In 1987, the Commission published a *Guidebook to Identify and Mitigation Seismic Hazards in Buildings* (SSC 87-03) that focused on unreinforced masonry (URM) buildings. In light of recent attention by several local governments to address the collapse risk posed by other building types, the staff proposes that the Commission update its guidebook, broaden the scope beyond URM buildings, and modernize the guidance to local governments in light of our past experiences and what we know today.

This appears to be a straightforward effort that might take several months to complete, however, several aspects including retrofit costs, benefit-cost studies and actual data about building inventories will not be available for at least the next several years. To minimize printing and dissemination costs and to enable periodic updates as additional information becomes available, an updated guidebook is proposed to be published online.

Staff Recommendation

The staff recommends that the Commission consider whether or not it is appropriate for the Commission to update its advice to local governments about collapse prone buildings, and, if so, review and comment on the attached proposed outline, scope, and draft first two chapters of a proposed updated guidebook. If the Commission chooses to pursue this effort, the staff also recommends that it appoint an Ad Hoc Subcommittee of the Commission to assist in developing the rest of the draft for the Commission's consideration and possible action at a future hearing.

Proposed Outline for a Guidebook to Identify & Manage the Risks of Collapse-Prone Buildings

Preface

Recent media and policymaker focus on non-ductile concrete buildings has perpetuated several myths: 1) That no governments have inventoried and systematically retrofitted or replaced such buildings; and 2) That governments are restricted from inventorying such buildings because building owners will threaten lawsuits when they experience financial losses by such activities.

In actual fact, several federal, state, and local government agencies can provide detailed examples of successful inventories and risk management programs for collapse-prone buildings. And in California, government agencies have broad statutory immunity from liability when unde rtaking such activities.

The outline below draws from the Commission's past experience advising hundreds of local governments and several state agencies on how to effectively manage seismic risks posed by collapse-prone buildings including concrete, tilt-up, soft-story and unreinforced masonry.

In 1987, the Commission published a *Guidebook to Identify and Mitigate Seismic Hazards in Buildings* (SSC 87-03). This Guidebook was well received by hundreds of local governments and widely used in the late 1980's and early 1990's. The outline below draws heavily from this earlier publication and takes advantage of additional resources that were not available back in 1987.

The first three sections are intended for non-technical audiences including policymakers, building owners and other stakeholders. Section 4's reference material is intended to be more technical to help government staff charged with exploring and implementing alternatives.

Most aspects listed in the outline are readily adaptable and can, in the short term, provide stakeholders guidance, dispel myths, and facilitate effective management. Other aspects such as comprehensive building retrofit and replacement costs, and current benefit-cost analyses are not available. They would, in the best of circumstances, take several years to generate. So, for the time being, the Commission staff proposes that the Commission develop a web portal whereby readily-available information with broad consensus can be easily disseminated to stakeholders. Publishing a work in progress online will also help clarify and list other resources that are not yet available or are in progress and by whom. By maintaining this Guidebook as an online resource, the Commission can readily refine and update it at low cost.

*Items in the outline with asterisks are not currently available, are not based on recent costs or lack a broad consensus. Some asterisk items have been proposed or are under development by the CA Office of Emergency Services, the Pacific Earthquake Engineering Research Center, the Concrete Coalition, the Earthquake Engineering Research Institute, the American Society of Civil Engineers, the Federal Emergency Management Agency, and/or the Applied Technology Council.

1. **Introduction**
    a. Background and Intended Audience for this Guidebook
    b. Types of Collapse-Prone Buildings
    c. Summary of the Guidebook's contents
2. **Why Should Governments Consider Getting Involved in this Issue?**
3. **Steps to Managing the Seismic Risk of Collapse-Prone Buildings**
    a. Step One: Developing a Process that Includes Effective Public Participation
    b. Step Two: Identifying Collapse-Prone Buildings in Inventories
    c. Step Three: Developing and Considering Options for Mitigating the Risk
        i. Option One: Rely on Current Triggers for Alterations in Building Code
        ii. Option Two: Develop an Inventory of Collapse-Prone Buildings
        iii. Option Three: Undertake Cursory Seismic Screenings or Evaluations
        iv. Option Four: Require Detailed Seismic Evaluations and/or Ratings
        v. Option Five: Encourage Voluntary Seismic Retrofits or Replacements
        vi. Option Six: Require Mandatory Seismic Retrofits or Replacements
        vii. Considering Model Ordinances*
        viii. Considering Approaches Including Those Adopted by Other Governments
            1. Range of Current Costs to Local Governments*
            2. Range of Current Costs for Building Owners and Occupants*
            3. Typical Current Benefit-Cost Comparisons*
            4. Social Implications of Risk Management Alternatives
        ix. Incentives
            1. Federal and State Financial Incentives
            2. Local Financial and Zoning Incentives, Removal of Disincentives
        x. Other Management Considerations
            1. Incorporating Seismic Risk Management into other initiatives to address multiple objectives such as economic development, urban revitalization, smart growth, green buildings, traffic, fire, and flood
            2. Historical Buildings
            3. Building Department Personnel Qualifications and Training
            4. Evaluation, Stabilization, and Repair of Damaged Buildings
    d. Step Four: Implementing Effective Risk Management Programs
        i. Adopting Long-term Perspectives and Commitments
        ii. Progress Monitoring, Maintaining Inventories, Sharing Progress with State
        iii. Periodically Reevaluating Progress Especially after Future Earthquakes
        iv. Plan for Future Adjustments to Risk Management Programs
4. **Reference Material**
    a. Applicable State Laws
    b. Liability Considerations for Owners and Local Governments
    c. Ordinances and progress summaries in agencies with existing programs
    d. Recommended Model Ordinance(s)
    e. Bibliography

Introduction - Draft

California is earthquake Country. Seismologists say the odds are over 90 percent that a major earthquake will strike California within the next 30 years. Moderate but damaging earthquakes will strike more frequently. Moderate earthquakes that impact smaller communities may only create localized, regional economic disruption, but major metropolitan earthquakes can cause long-term, statewide economic losses. All of California is at risk, but steps can be taken to reduce these risks.

The risk to life comes primarily from certain existing buildings that are vulnerable to earthquakes in regions with active faults. Portions of buildings can be damaged or collapse threatening lives and jeopardizing the economies of communities and the state, but these buildings can be identified and retrofitted or replaced. Among building types that have a history of poor performance in past earthquakes are:

- Unreinforced masonry (URM) buildings made with brick, block or stone constructed before the 1940's
- Concrete buildings constructed before the 1980's
- Buildings that have weak or "soft" first stories, irregular shapes or long spans
- Tilt-up concrete buildings constructed before the 1990's
- Steel buildings constructed before the mid 1990's
- Buildings that have not been properly constructed or maintained or have been weakened by modification
- Buildings located in geologically hazardous areas such as those subject to earthquake fault displacement, landslide or soil liquefaction

These and other building types considered vulnerable to earthquakes are described in further detail in the *Commercial Property Owners Guide to Earthquake Safety* and the *Homeowners Guide to Earthquake Safety* that are available for free download online.

This guidebook is intended to assist local government officials and building owners in managing the seismic risks posed by these buildings. The guidebook presents step-by-step approaches in Part 2 and background material in Part 3 that address considerations that often enter into risk management decisions. Step One is developing a decision-making process that includes effective public participation. Step Two is identifying collapse-prone buildings and the risks they pose. Step Three is developing and considering options for managing the risks. Step Four is implementing effective programs.

Why Should Governments Consider Getting Involved in this Issue? - Draft

This is a valid question, considering that our government's Common Law, in effect throughout the U.S. and England for centuries, states that building owners are principally responsible for ensuring and maintaining the safety of their buildings. This Common Law stems from cases in England that created legal precedents hundreds of years ago and to this day imposes duties on building owners:

> "Common law requires that an owner exercise the ordinary care that a reasonable person would use under the circumstances. In addition, building owners are required to have the premises in a reasonably safe condition for the customer, and to warn the customer of any unsafe condition which the owner knows about or should, using ordinary care, know about." (Compiled from various internet sources)

In 2010, the State's Second Appellate Court, Division Six, ruled to affirm this Common Law, upholding a lower court's decision by finding that building owners were negligent regardless of compliance dates adopted in the City of Paso Robles' mandatory retrofit ordinance for URM buildings.

So arguably, governments can – and often do - leave the issue of managing the collapse risk of buildings to the discretion of building owners since they are principally responsible for their own buildings' safety. Option1 described in Step 3 below summarizes how that is done and how mitigation progress can be monitored when relying on this approach.

If buildings were to collapse onto their own properties, harm no one, and not adversely impact adjacent properties or impede commerce, then perhaps owners should be granted full discretion to manage their buildings' risk. However, many common circumstances associated with existing buildings raise questions about the appropriate role of local governments in ensuring the public's safety and welfare:

- Collapsing buildings often fall onto sidewalks, streets, and adjacent lower buildings placing those at harm directly within the public right of way.
- Owners don't necessarily know if their buildings are vulnerable to collapse or don't typically warn the public about unsafe conditions.
- Owners often don't evaluate seismic risk, nor periodically maintain and upgrade their buildings.
- The public is largely unaware of which buildings are at risk of collapse but has a right to know so that individuals can make their own informed decisions about earthquake risk, for example, about whether or not to continue to use vulnerable buildings or to relocate instead.
- Owners, regulators and policy-makers will confront questions as to what constitutes clearly unsafe conditions compared to more rarely-occurring, potentially unsafe conditions and what conditions constitute acceptable levels of risk.
- Local jurisdictions have the authority to regulate the safety of new construction, as well as alternations, additions, and repairs to existing buildings, and, as a result, the public typically assumes that such regulation ensures safe buildings.
- A tall building that is severely damaged in an earthquake can force the closure of multiple city blocks around its perimeter until it is stabilized.

- Impacts of collapse or even the possibility of smaller amounts of debris falling from buildings can cause severe, direct impacts to neighborhoods as well as indirect impacts to the overall well-being of a community, its economy and social viability.
- Cumulative local government decisions regarding neighborhood revitalization, redevelopment, historic preservation, and intensification of building usage can increase the public's exposure to seismic risk.

State and federal constitutions tend to be silent on the State and Federal roles in ensuring building safety, so for the most part, with a few exceptions for public schools and essential services buildings, local governments are primarily responsible for regulating building safety.

Circumstances surrounding existing buildings tend to accumulate and, in the absence of proactive intervention, can fester over decades, with gradual increases in risk influenced by individual, at times uninformed, decisions of owners, local and state regulators, planners, and policy-makers.

On the positive side, this situation doesn't create a Hobson's Choice where the public has only one option and is forced to take it or leave it. On the other hand, there are no easy answers and most choices for aggressively managing this earthquake risk tend to be quite costly, even onerous. They are not often cost-effective when only the owners' direct costs and benefits are considered. But if the interests of owners and other stakeholders are also considered including the potential for saving lives, reducing the cost of injuries, business interruption, the time value of funds invested in improving buildings, who pays, who benefits, and other direct and indirect social and economic impacts, then decision-makers can more appropriately compare the many options. Buildings that collapse are also onerous.

California's population is another major consideration affecting seismic risk since population has increased dramatically over the past several hundred years. So California's building stock is relatively young and much more earthquake-resistant compared to other parts of the world. Approximately 90 percent of the state's growth has occurred since local governments began to require earthquake resistance in building construction, so the percentage of vulnerable buildings is comparatively low and getting smaller with each year of growth. So a strategy of adopting a passive approach to earthquake risk management and allowing market forces to gradually reduce seismic risk should take into account the effects of population growth. Local governments should try to determine the rates of investment devoted to managing or reducing seismic risk that will result in manageable losses after future earthquakes. Knowing the current rates of investment, or more specifically the percentage of vulnerable buildings replaced or retrofitted annually will give communities a tool to gage the adequacy of seismic risk policies and whether or not adopting other approaches will increase or decrease those rates.

In the end, communities in regions of high seismicity should explore two classes of difficult choices: A) Passive, market-driven risk management approaches with potentially large numbers of casualties, larger social and economic disruption, slower recovery after future earthquakes, and higher future costs; or B) More assertive risk management approaches with significantly reduced casualties, less social and economic disruption, and faster recovery after future earthquakes, as a result of higher up-front investments.

The choice is best left to each local government, to consider their unique circumstances, including the economics, social conditions, investment priorities, and exposures to risk that they face. The following steps have proven to be useful approaches and are based in large part on past experiences of hundreds of local governments compiled over the years by the Seismic Safety Commission.

Steps to Managing the Seismic Risk of Collapse-Prone Buildings – To be Continued