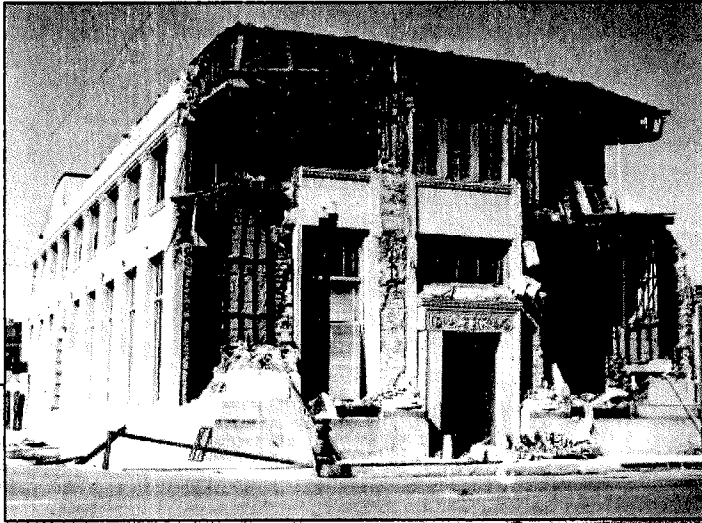


Status of the
**Unreinforced
Masonry
Building Law**



2003 Report to the Legislature



**Seismic Safety Commission
SSC 2003-03**



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STATUS OF CALIFORNIA'S UNREINFORCED MASONRY BUILDING LAW

PREFACE

In 1986, California enacted a law that required local governments in Seismic Zone 4 to inventory unreinforced masonry (URM) buildings, to establish a URM loss reduction program and report progress to the state by 1990. Each local government was allowed to tailor their program to their own specifications.

On the surface, the level of compliance with this law has been quite high with about 98 percent of the 25,500 URM buildings now in loss reduction programs. But so far, only about two thirds of the owners have reduced losses by retrofitting in accordance with a widely recognized building code or by other means. Significant progress has occurred, yet many URM programs are ineffective in reducing future earthquake losses.

What lessons can be drawn from California's experience with URM buildings and how can they be applied to future loss reduction efforts? This report summarizes the status of local government and building owner efforts to comply with this law. The Seismic Safety Commission adopted this report to the State Legislature with its recommendations on improving this law.

INTRODUCTION: URM BUILDINGS

Most unreinforced masonry (URM) buildings possess features that can threaten lives during earthquakes. These include unbraced parapets, walls and roofs that are not well attached to each other. When earthquakes occur, inadequate connections in these buildings can allow masonry to fall. Floors and roofs will collapse leaving occupants and passers-by in harm's way. These risks to life can be significantly reduced with seismic retrofits.

The URM Law

California's main effort to reduce these earthquake losses is the URM Law. Passed in 1986, this state law requires 366 local governments in the highest Seismic Zone 4 (ICBO, 1985) to do three things:

- Inventory URM buildings within each jurisdiction.
- Establish loss reduction programs for URM buildings by 1990.
- Report progress to the California Seismic Safety Commission.

In addition, the law recommends that local governments:

- Adopt mandatory strengthening programs by ordinance.
- Establish seismic retrofit standards.
- Enact measures to reduce the number of occupants in URM buildings.

This law can be found in Section 8875 *et seq.* of California's Government Code (CA, 1986). It allows each local government to choose its own type of loss reduction program. This leeway is, in part, intended to allow for each jurisdiction to take political, economic, and social priorities into account. The evidence suggests that individual communities pursued earthquake loss reduction programs best suited to their own local priorities reflecting the local balance of safety versus economy (CSSC, 1995-05).

California's Seismic Safety Commission monitors local government efforts to comply with this law and reports to the state's Legislature. This report updates the Commission's prior Year 2000 status report (SSC, 2000-02).

The Scope of the URM Law

Seismic Hazard Zone 4 is a region defined in the California Building Code nearest historically active faults. In 1986, it included the major metropolitan areas of Los Angeles and San Francisco, roughly 28 million people, or three fourths of the state's population. When the law was passed, the city of San Diego was not considered to be in Zone 4 (ICBO, 1985). Since then, San Diego has been added to Zone 4 and has now voluntarily adopted a URM loss reduction program (ICBO, 1997).

Approximately 25,400 URM buildings with an average size of 10,000 square feet have been inventoried in Zone 4's 366 jurisdictions. This is a relatively small percentage of California's

total building stock of 12 million or so buildings, but this law impacts many cultural icons and historical resources in older parts of the state.

In the 1980's, it was estimated that the URM Law would result in roughly \$4 billion in retrofit expenditures with activity well into the new century. This cost, although large, pales in comparison with several hundred billion dollars in anticipated damage from one major urban earthquake in California. Average expected losses from earthquakes in California are approximately \$4 billion per year. Future earthquake losses can be greatly reduced by carrying out effective URM programs.

For more information about the pioneering efforts before the passage of the URM Law, early progress, social and economic issues, refer to a earlier status report (CSSC, 1995-05).

MEASURES OF IMPLEMENTATION

Types of Programs

There are four basic types of URM programs that cities and counties have adopted. They are explained below in Table 1. Later in this report, their popularity and relative effectiveness is further described.

Few jurisdictions rely on demolition to eliminate their relatively few hazardous buildings. Most local governments regard demolition as a last resort, and far more URM buildings statewide are being retrofitted rather than torn down.

Standards for Retrofitting

California requires all jurisdictions to enforce the 1997 Uniform Code for Building Conservation Appendix Chapter 1 (UCBC) as a model building code although local governments may adopt amendments under certain circumstances (ICBO, 2001). For historical buildings, the California Historical Building Code also refers to the UCBC (ICBO, 2001). The UCBC contains only technical standards and has no administrative triggers for retrofitting other than the issuance of permits. Each local government usually defines triggers for compliance. A fair amount of retrofitting has been performed in accordance with standards preceding the UCBC and may only partially comply with the latest UCBC.

Since the International Conference of Building Officials (ICBO) merged with other model code organizations to form the International Code Council (ICC), the UCBC is no longer being maintained and updated. ICC has since published the first edition of the International Existing Building Code (IEBC), which contains an updated chapter of retrofit requirements for unreinforced masonry buildings. The State is in the process of selecting new model building codes and may be considering the adoption of the applicable portions of the 2003 IEBC later this year.

Table 1. Types of URM Loss Reduction Programs Ranked by General Effectiveness from Most to Least (CSSC, 1995).

Program Type	Summary
Mandatory Strengthening	These programs require owners to strengthen or otherwise reduce risks in their buildings within times prescribed by each local government. Time schedules vary and generally depend on the number of occupants. Programs are based upon the City of Los Angeles' Division 88 ordinance (LA, 1981) which is also the historic basis for the Uniform Code For Building Conservation Appendix Chapter 1 (ICBO, 2001) and the Seismic Safety Commission's Recommended Model Ordinance (CSSC, 1995). Triggers for the Model Ordinance were developed in 1991 in cooperation with the California Building Officials. This is the most effective program type.
Voluntary Strengthening	These programs establish seismic retrofit standards and require owners to evaluate the seismic risks in their buildings. Owners then write publicly available letters to their local governments indicating when they intend to retrofit (CSSC, 1990). This type of program is somewhat more effective than Notification Only.
Notification Only	Local governments write letters to owners stating that their building type has been known to perform poorly in earthquakes. This is typically the least effective type of program. Most jurisdictions have adopted more comprehensive measures than this.
Other	Variations of the above with unique requirements and effectiveness. Some cities, for example, require owners to post placards on URM buildings that warn occupants and passersby of earthquake risks. In general, placarding has not proven to be an effective motivation for owners to retrofit. (CSSC, 1995)

Current Status of Implementing the URM Law

The California Seismic Safety Commission contacts local governments affected by the URM Law and asks them to summarize their efforts to date. In the late fall of 2002 and early 2003, the Commission contacted the 286 jurisdictions in Seismic Zone 4 with URM buildings. As of February 2003, 185 jurisdictions responded to the survey. This corresponds to a response rate of 65 percent, which is two percent higher than the response rate in 2000.

Table 2. Status of Compliance with the URM Law in 2003

Cities & Counties	Number	Percent	Population	Percent	URM's	Percent
• with inventories not complete	9	2%	1,413,398	5%	114	<1%
• with inventories complete, but no URM programs	24	7%	705,782	3%	499	2%
• with no URM's	82	22%	2,909,296	10%	0	0
• with URM programs	251	69%	23,494,105	82%	24,902	97%
Totals	366	100%	28,522,581	100%	25,515	100%

The URM Law continues to gain effectiveness in 2003. There weren't dramatic changes from the 2000 data, but most of the changes still depict the continued efforts of local governments and owners to carry out the URM Law.

In the past three years:

- Cities and counties with inventories completed, but with loss reduction programs not established (as required by law) decreased from 27 to 24.

- The number of cities and counties with URM buildings in compliance with the law increased from 250 to 251.
- The number of URM buildings that are in communities that don't have earthquake loss reduction programs increased slightly from 568 to 613 (2.4 percent of those inventoried).
- The number of cities and counties without URM buildings increased from 79 to 82.
- 1,129 URM buildings have been retrofitted since 2000 to bring the total to 13,303 or 52 percent of those inventoried.
- 64 URM buildings have been demolished since 2000 to bring the total to 3,458 or 13 percent of those inventoried.

The size and numbers of each type of loss reduction program are summarized in Table 3. Most local governments chose to adopt more effective mandatory strengthening programs even though the state didn't require them. The remaining jurisdictions either do not have URM buildings or have yet to comply with the law.

Table 3. Number and Scope of URM Loss Reduction Programs in California's Zone 4 as of June 2003

Type of Loss Reduction Programs	Entities	Percent	Population	Percent	URM's	Percent
Mandatory	130	52%	15,868,879	64%	19,112	77%
Voluntary	39	16%	2,664,065	11%	1,371	5%
Notification	45	18%	2,617,823	10%	1,599	6%
Other	37	14%	3,640,083	15%	2,878	12%
TOTALS	251	100%	24,790,850	100%	24,960	100%

Since 2000, there has not been a significant change in the type of loss reduction programs. The number of jurisdictions with mandatory programs and other programs each increased by one. The number of jurisdictions with voluntary programs remained the same, while the number of jurisdictions with notification programs decreased by one. Overall, this fluctuation corresponds to a shift in the total number of jurisdictions with loss reduction programs from 250 to 251.

Loss Reduction Program Effectiveness

Several simplifying assumptions were made to monitor the relative effectiveness of different types of mitigation programs. Tables 4 and 5 below are predicated on the assumption that most loss reduction programs have had sufficient time to cause substantial retrofit activity. Most programs were initiated around 1990 and have had more than 13 years of seismic evaluation and retrofit activity. However, there are major exceptions to this assumption. Some programs are still just getting started and others were completed years ago. So the data may be subject to other interpretations, particularly since some programs are still in progress.

In many ways, each building owner's situation is unique as well as conditions in each jurisdiction. The Commission has attempted to generalize with simplistic interpretations and statewide averages of the data below. Appendix A summarizes the significant variations in progress among jurisdictions.

Readers should note that many strengthening programs have unique time schedules for compliance and that local economies vary widely from those with high property and rental rates to others facing high vacancy rates, low rents and property values. These variations are not captured by the information below.

Nevertheless, one way to gauge the effectiveness of different types of programs is by comparing average rates of retrofit and demolition. Table 4 shows percentages of buildings retrofitted in substantial compliance of Appendix Chapter 1 of the UCBC or demolished since their original inventories. These figures summarize only those jurisdictions responding in 2003:

Table 4. Average Rates of Retrofit in Substantial Compliance with the UCBC Appendix Chapter 1 and Average Rates of Demolition Based on Local Government Responses to the 2003 Survey.

Type of Program	Mandatory	Voluntary	Notification	Other
Retrofitted	41%	14%	5%	14%
Demolished	12%	5%	2%	6%
Total Percent	53%	19%	7%	19%
Total No. URM's	18,078	937	958	2716
Entities Responding as of June 2003	99	30	27	29

Table 5 is a more complete summary of progress based on the responses from the 2003 survey as well as those others responding in 2000, 1997, and 1995. Table 5 includes those URM buildings retrofitted to standards other than UCBC.

Table 5. Average Rates of Retrofit Average Rates of Demolition

Type of Program	Mandatory	Voluntary	Notification	Other	Number of Buildings
Retrofitted to UCBC	42%	14%	5%	14%	8,685
Retrofitted to other than UCBC	24%	N/A	N/A	N/A	4,618
Demolished	15%	5%	2%	7%	3,458
Percents & Total	81%	19%	7%	21%	16,761
Total No. URMs	19,112	1,371	1,599	2,878	24,960
Total Entities	130	39	45	37	

Although data is limited, it appears that economic incentives may have helped encourage voluntary retrofits by owners albeit at a considerably slower pace than mandatory strengthening programs. There is a 20% rate of UCBC retrofit for the nine cities with economic incentives and about a 12% rate for those thirty cities without incentives. So the presence of economic incentives coupled with URM programs seems to encourage owners in voluntary strengthening programs to retrofit.

These observations about the relative effectiveness of program types and financial incentives should all be tempered with the particular characteristics that the state's URM Law confronts - relatively high cost retrofits on generally pre-1933 buildings in a high seismic region. Other types of retrofitting and incentives in other regions and for other building types will likely produce different results.

CONCLUSIONS

Upon reviewing these results, the Seismic Safety Commission still recommends mandatory strengthening to local governments as the most effective URM loss reduction program.

Voluntary strengthening has not been as effective because current economic incentives are typically not sufficient to create a market-driven willingness to retrofit. The Commission has proposed additional retrofit incentives in its *California Earthquake Loss Reduction Plan* (CSSC, 2002). That plan recommends that state and local governments “encourage economic incentives, such as improved mortgage terms, reduced insurance rates, and positive tax benefits, for upgrading structural and non-structural elements in buildings.”

Still much remains to be done with respect to the URM Law. For example, California has 33 remaining jurisdictions with 613 URM buildings that are not in compliance with the law.

COMMISSION RECOMMENDATIONS IN 2003

The Legislature should hold a hearing to revisit the state’s Unreinforced Masonry (URM) Law and consider appropriate actions to address the inequities and the public’s continuing exposure to risk that have resulted from the failure of a significant number of local governments to comply with the intent of the law, such that approximately one third of the state’s URM buildings in Seismic Zone 4 remain unstrengthened or partially strengthened. Actions to be considered should include:

- Developing legislation or other policy options to encourage local governments that have little or no retrofit progress to provide incentives to encourage owners to retrofit.
- Adopting legislation to mandate the strengthening of all unreinforced masonry bearing buildings including state-owned buildings in accordance with the state’s model building code.
- The California Building Standards Commission should adopt the International Existing Building Code as the State’s model building code so that future alterations to existing buildings trigger seismic retrofits to the latest standards.
- Enacting legislation to establish retrofit standards and mitigation programs for other types of vulnerable buildings such as soft-story apartments, tiltups and older concrete frames.
- Since the development of new URM programs has stopped and retrofit progress has slowed, future surveys of local government can be undertaken less frequently.

ACKNOWLEDGMENTS

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