



Seismic Safety: Will California’s Hospitals Be Ready for the Next Big Quake?

Introduction

For 33 years, California has explored policy options to mitigate the seismic vulnerability of its hospital buildings. The San Fernando Valley earthquake in 1971, which destroyed a number of hospitals, prompted the California Legislature to pass the [Alfred E. Alquist Hospital Facilities Seismic Safety Act](#) in 1973,¹ mandating that all new hospital construction meet stringent seismic safety requirements. In 1994, after the Northridge earthquake earlier that year severely damaged a number of hospitals, the legislature passed Senate Bill 1953, which expanded the scope of the Alquist Act and put hospitals on a firm schedule for meeting seismic safety goals (see Table 1). These laws seek to ensure that hospitals will continue operating after a large earthquake.

This issue brief looks at the progress California hospitals have made toward complying with SB 1953; the significant challenges they face in achieving compliance, including the dramatic rise in construction costs, the potential impact

of such costs on hospitals, as well as the related planning, design, and engineering hurdles; and the difficult policy choices that must be weighed to reach California’s seismic safety goals. The issue brief is based on the 2007 California HealthCare Foundation-funded RAND report, titled *SB 1953 and the Challenge of Hospital Seismic Safety in California*. That report updated a similar analysis by RAND in 2002, titled *Estimating the Compliance Costs for California SB 1953*. Both are available at www.chcf.org. Importantly, the report focuses on Structural Performance Category-1 (SPC-1) buildings, or collapse-hazard structures. Furthermore, it does not consider the impact that SB 1953 compliance actions, such as the closure of facilities, continued seismic vulnerability, and/or higher operational costs, could have on patients.

Background

Compared to other building codes in California that have historically focused on life safety, SB 1953’s goals for remaining operational after a large earthquake are far more demanding and are

Table 1. SB 1953 Compliance Deadlines

January 1, 2008*	After this date, any general acute care hospital building that has not been mitigated and poses a potential risk of collapse or significant loss of life shall only be used for nonacute care purposes.
January 1, 2013	Five-year extension of 2008 deadline for some hospital buildings. Hospitals must request extension. Qualified buildings must have received a building permit before 1973 and services provided in them must meet certain restrictions. [†]
January 1, 2030	After this date, all hospital structures not in compliance must be demolished, replaced, or changed to nonacute care use. All SPC-1 and SPC-2 [‡] buildings must be completely replaced with new structures, even if they were seismically retrofitted to meet the 2008/2013 deadlines.

*There have been two important revisions to the 2008 deadline since SB 1953 became law. In 2000, SB 1801 provided an opportunity for a five-year extension—hence, the 2013 deadline—that would be accessible to most California hospitals. In 2006, SB 1661 provided an opportunity for another two-year extension, to 2015, for hospitals that had made substantial progress on large construction projects in efforts to comply with SB 1953. These hospitals must submit detailed schedules describing their construction plans.

[†]For example, services must move to a seismically conformant or newly built conformant structure, or they can remain in the old building if it has been retrofitted.

[‡]SPC-2 buildings do not significantly jeopardize life, but may not be repairable or functional after strong ground motion.

ISSUE BRIEF

The Impact of HAZUS

In May 2006, the state's Hospital Building Safety Board authorized the Office of State Health Planning and Development (OSHPD) to re-evaluate the seismic risk of SPC-1 buildings using up-to-date engineering and scientific analysis based on HAZUS, a type of seismic risk analysis software.

If the new analysis shows that a SPC-1 building faces a 10 percent or less chance of complete damage, it will be reclassified as a SPC-2 building and will not have to meet the 2008/2013 deadlines. (A SPC-2 building does not significantly jeopardize life, but it may not be repairable or functional after strong ground motion.) If the analysis shows a 10 percent to 15 percent probability for complete damage, the building will be placed in a new SPC-1E category and the 2008/2013 deadlines will be moved back to 2020. In all cases, the reclassified buildings still must meet the 2030 deadline or be removed from acute care services.

The hospital industry anticipates that the HAZUS analyses, which are expected to be completed in early 2007, could result in the reclassification of many SPC-1 buildings, thereby removing the requirements of the 2008/2013 deadlines.

largely untested in a regulatory environment. In drafting the law, policymakers anticipated that hospitals would meet the state's seismic safety goals in two phases: the most vulnerable buildings—those subject to collapse during an earthquake, and, therefore, posing a risk to life safety—would be mitigated first by means of retrofitting or reconstruction, and all noncompliant buildings would be reconstructed by 2030. To bring SPC-1 buildings into compliance, about 50 percent of current hospital floor space, or 52.4 million square feet, must be rebuilt.

Many Hospitals Will Not Meet Deadlines

Based on building permit data compiled by OSHPD, about half of SPC-1 buildings² will not meet the 2008/2013 deadlines and many may not meet the final 2030 deadline. Indeed, it could take more than 30 years for SB 1953 to be fully implemented, given that 40 million to 70 million square feet³ of infrastructure must be built.

Table 2. Retrofit/Reconstruction Overview

Total hospital buildings in California	2,507
SPC-1 buildings	975 (39% of total)*
Total SPC-1 floor space to be retrofitted/reconstructed	52.4 million ft (53.9% of total general acute care building area)
Total number of licensed beds affected	44,011 (47.2% of total)
Total number of operational hospital campuses affected	305 (67% of 456 acute care facilities)

*Source: OSHPD. *Summary of Hospital Seismic Performance Ratings*, April 2001.

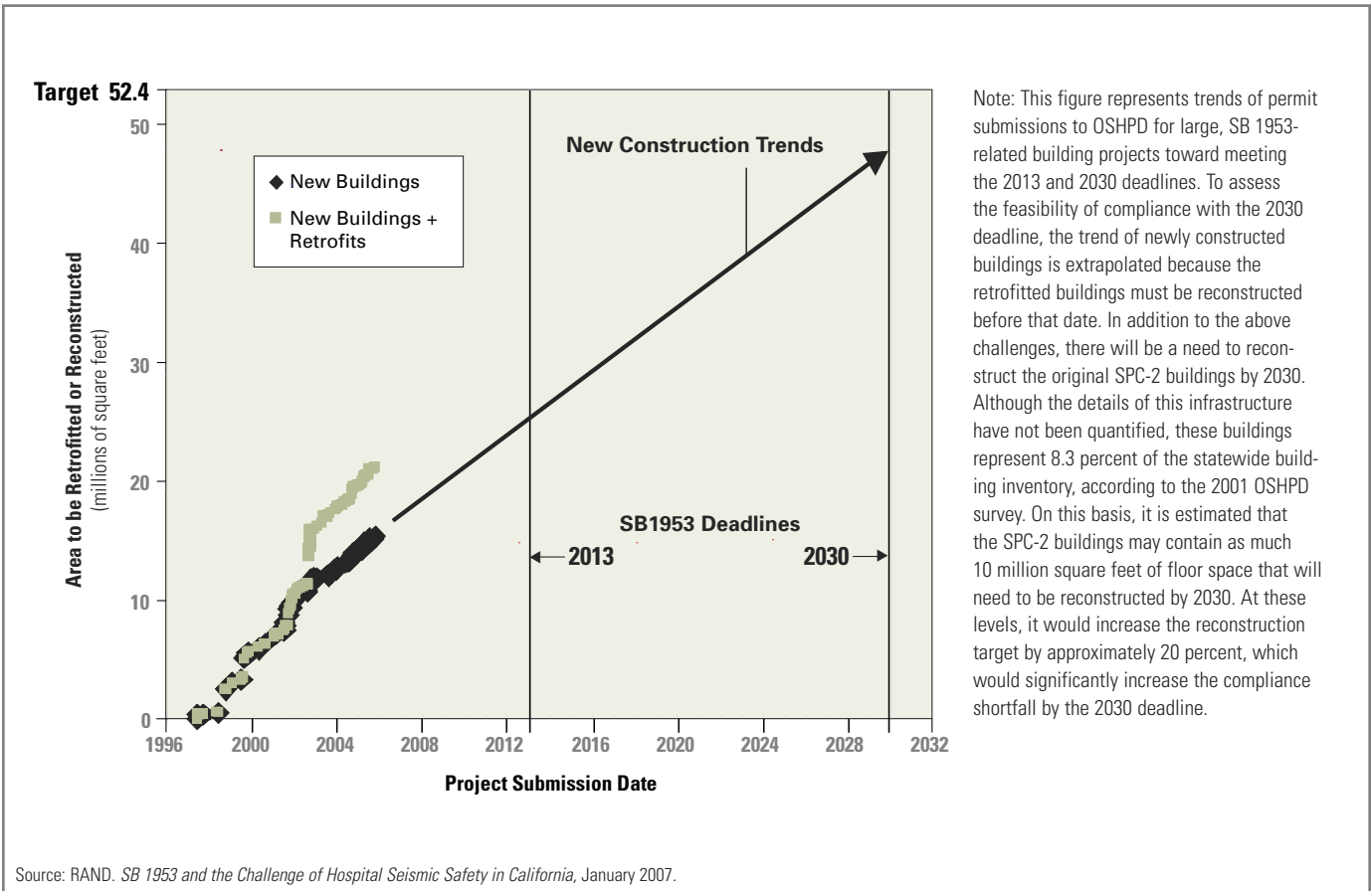
To date, the state has not officially assessed progress toward SB 1953 compliance, hospitals have not been required to report their progress (or lack thereof), and California does not maintain any databases for this purpose. The steps to SB 1953 compliance are largely unspecified, although it is generally accepted that, aside from closing a facility, retrofitting and reconstruction are the only compliance options. Meanwhile, hospital owners face extreme uncertainty as the time approaches for them to make compliance decisions.

The Slow Pace of SB 1953 Compliance

Determining how much progress hospitals have made in retrofitting or replacing SPC-1 structures is difficult, for two reasons. One, OSHPD has only limited data about the scale and purpose of hospital construction projects. And two, there is no guarantee that planned projects under OSHPD review will ever be completed. It is possible that building plans may not be approved, or, if a building permit is granted, that a hospital may not start construction, perhaps because funds are not available.

Based on a conservative assumption that all projects for which there are currently building permits will eventually be finished, large construction projects submitted to or under review by OSHPD as of December 2006 had addressed at most 28 percent of the SPC-1 floor space, or about 40 percent if large seismic retrofits are included (see Figure 1).

Figure 1. Estimate of Compliance Trend for SB 1953 Deadlines



Retrofits Often Not Practical

The two-phase approach in SB 1953 assumed that retrofits could be done quickly and cheaply compared to rebuilding.

However, as recent experience in California demonstrates, this assumption turns out to be largely incorrect. Earthquake engineers, state officials, and hospital owners report that the costs of retrofits often are comparable to those of new construction projects and they greatly disrupt hospital operations. Furthermore, when the retrofits are completed, they do not change the capabilities of individual buildings. Consequently, relatively few hospitals are retrofitting to meet the 2008/2013 deadlines.

Seismic Safety Challenges for Hospitals

Many hospitals face a number of obstacles that make it difficult for them to comply with an aggressive disaster mitigation policy like SB 1953.

New Buildings Are Very Costly. Hospital buildings are among the most expensive infrastructure projects and require large, up-front expenditures. The finished cost of a fully furnished and equipped new building is about \$1,000 per square foot, and for an unfurnished, unequipped building, about \$560 per square foot. Hospital construction costs have nearly doubled in California since 2001, rising at a rate of 14 percent per year above the Consumer Price Index.

Compared to construction costs, the average profitability of the current California hospital infrastructure is about \$40 per square foot, although there is a substantial range

of profitability—from more than \$300 to less than \$200 per square foot. The difference between the costs of new construction and the average profitability of current buildings means many hospitals will have difficulty financing new structures strictly with revenues from health care operations.

The current average cost per adjusted patient day among all general acute care hospitals in California is about \$1,980.⁴ The additional cost per adjusted patient day as a result of new construction expenditures, based on a finished cost of \$1,000 per square foot, could be between \$200 and \$950. It is unclear how hospitals would offset this expense.

Recent design trends suggest that California hospitals are building new structures that, for a given level of medical functionality, are considerably larger than old facilities. But as the size of replacement projects increases, so do the time and cost to complete them. An important factor in this cost is the construction cost inflation rate. Depending on project size, length of construction, and future inflation trends, total construction costs in California could range from \$45 billion to \$110 billion in 2006 dollars. This estimate excludes financing costs, which could increase the total by as much as a factor of two. This estimate of construction costs also does not include the cost of reconstructing the SPC-2 buildings by 2030, which, as mentioned previously, would probably raise the overall cost estimate by an additional 20 percent.

Replacing Single Buildings Is Difficult. The typical hospital campus has multiple, connected buildings, with the oldest one in the center. From an engineering and construction standpoint, it often is impossible to replace the oldest, most vulnerable structure without closing the entire campus. Thus, SB 1953 compliance may require larger construction programs that go beyond the replacement of one vulnerable facility.

Finding Funding to Pay for Projects Is a Challenge.

California hospitals have limited capability to pay for large projects. The difference between profitability and the cost of new construction may result in large increases in costs per adjusted patient day that hospitals could have difficulty absorbing as part of their ongoing business expenses.

Many Hospitals Lack Staff with the Skills Needed for Complex Construction Programs.

Special planning and organizational skills are necessary to build new facilities. Planning and executing a construction program that meets strategic and health care goals can take up to 10 years for each new building. Many hospitals may not have staff with the skills and capabilities they would need over such a long period.

Impact of Hospital Reconstruction on Health Care Is Uncertain.

A variety of public health policy goals influence hospital operations, and some, such as reducing health care costs, may conflict with disaster mitigation goals. Ultimately, those who pay for health care services—patients, employers, and taxpayers—will have to pay for new hospital buildings. If the high cost of disaster mitigation forces some hospitals to close, access to health care could be reduced.

Policymakers Face Difficult Choices

Fully implementing SB 1953 according to the original schedule may exceed the financial and organizational capabilities of government and the private sector. Doing so will require difficult choices among various policy options, including these:

- **Push ahead with SB 1953 implementation.** This could lead to substantial problems, as the state would be forced to close large numbers of noncompliant hospitals in 2008/2013 and 2030. While the threat of closure would provide a critical incentive to comply with SB 1953, it could also lead to large-scale negative impacts on the availability of health care in California.

- **Modify or eliminate SB 1953’s requirements so most facilities can comply.** While this approach would not impact health care availability, it would have two negative side effects. One, it would raise the question of policy fairness, given that a significant number of California hospitals already have made a large investment in projects to comply with the original law. And two, seismic vulnerability would remain mostly unaddressed, which, after the next big earthquake, could lead to questions about why the vulnerability had not been properly ameliorated.
- **Provide public funding for hospitals that are unable or unwilling to comply with SB 1953’s requirements.** Hospitals are critical public facilities and there is a history of state funding for seismic strengthening of public infrastructure. However, this approach also would raise fairness questions among hospitals that already have invested in SB 1953 compliance and could trigger public debate about the best use of taxpayer funds for health care purposes.

Conclusion

While there are considerable near-term challenges to implementing SB 1953, California hospitals over time will address the Alquist seismic safety goals by replacing old buildings through normal modernization efforts. In other words, the key question is not whether hospitals will meet the goals, but when.

Hospitals clearly favor extended use of old buildings rather than construction of new ones, given the current financial and business environment. But without the SB 1953 requirements, it could take longer than 50 years to achieve full seismic safety compliance—a period during which California is highly likely to experience a large and damaging earthquake.

Therefore, the SB 1953 policy debate should focus on realistic time scales for achieving California’s seismic safety goals, given that current deadlines will be difficult for hospitals to meet and that bringing all hospital

infrastructure into compliance with SB 1953 will take more than 20 years.

Understanding the interaction between SB 1953 compliance activities and other public policy issues in which hospitals play a central role, such as public health and the cost of health care, will be important, as will new ways to weigh the impact of compliance versus the benefits of compliance after a disastrous earthquake.

ENDNOTES

1. The law was updated in 1983. Among other things, it gave OSHPD all authority for seismic compliance and pre-empted all local building codes.
2. There are five structural performance categories, including SPC-1. For an explanation of these, see Appendix A in the 2007 RAND report *Estimating the Compliance Costs for California SB 1953*.
3. This range, compared to the state’s estimate of 52.4 million square feet, reflects the likelihood that not all SPC-1 space will be replaced and that some new buildings will be significantly larger than the original facilities to accommodate recent design trends, new patient care philosophies, and new technologies.
4. This estimate is based on 2004 OSHPD data.

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