THE SOUTHERN CALIFORNIA STORY; NO LONGER JUST WAITING

M. Barnard¹

ABSTRACT

The pattern has repeated too many times. An earthquake occurs, there is damage and death, and then the laws are passed leveraging the temporary public support for enhanced requirements and enforcement. Breaking this pattern has historically proven challenging. The public quickly forgets about seismic safety. The more frequent and visible shocks and stressors that impact their daily lives grab peoples’ attention. However, recent tragic failures of community resilience throughout the world and within the United States on display through modern media has Southern California asking about our resilience. Action to address one of our biggest risks is happening for once without waiting until after a tragic earthquake. From the educational efforts by local media to efforts by the Structural Engineers Association of Southern California to the Building Forward LA initiative by the Office of the Mayor City of Los Angeles, there is momentum for meaningful improvements to the seismic safety of the built environment of Southern California.

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Introduction

Questions are being asked about what can be expected of our buildings in part through the efforts of the media, government leaders, and the Structural Engineers Association of Southern California (SEAOSC) and the Safer Cities program. The inspiration to ask these questions fortunately has not been a reaction to a tragic local earthquake. The questions have triggered actions. Starting with the City of Los Angeles and now taken even further by others, ordinances are being passed to address known high-risk existing structures such as buildings with soft stories and concrete structures with non-ductile detailing.

Historical Trends

Earthquakes and the network of faults crossing the area have shaped Southern California. How and what we have designed, permitted, and built can be directly related to previous large earthquakes. Our typical reaction to a large earthquake is to only then implement significant code improvements, create new agencies, and enforce new regulations that address the lessons so painfully learned.

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We have rarely been proactive. There are plenty of examples of beneficial but reactive responses to tragic earthquakes. The Division of State Architect (DSA) was created through the 1933 Field Act and subsequent legislation following the 1933 Long Beach Earthquake and the tragic collapses of some school buildings. Enhanced requirements and enforcement of the building code followed for buildings like K-12 schools and community colleges. The Office of Statewide Health Planning and Development (OSHPD) created through the 1973 Alfred E. Alquist Hospital Facilities Seismic Safety Act and subsequent legislation following the 1971 Sylmar Earthquake and the failure of some hospital buildings. The enhanced requirements and enforcement of the building code has significantly increased the expected performance of acute care healthcare facilities. The 1983 Coalinga Earthquake resulting deaths associated with unreinforced masonry (URM) construction inspired the 1986 passing of the URM Law that at least resulted in public disclosure of these potentially dangerous structures.

**Expected Building Performance**

It has been nearly 24 years and counting since the Northridge Earthquake hit the Los Angeles metropolitan area. While there have been earthquakes since then that have caused death, injury, and property and economic loss, our community is at risk of becoming too complacent once again. Much of the public has not experienced a large earthquake and seen firsthand how buildings will actually perform. Instead, as flushed out during the author’s breakout session during a Building Forward LA event in 2017, many believe a retrofitted building is the same as a new building. It was observed that a surprising number believe the myth that new buildings are “earthquake proof” or every new building is on “rollers”. The concept that building codes typically strive for life-safety and not resilience or a higher performance level surprises people.

During the same Building Forward LA event attended by the public and members of the design and construction community of all different backgrounds, attendees were asked to share what they want from a building. Fig. 1 shares these wants using the actual words of the attendees. While it was expressed that buildings need to “be safe”, a desire for more was also expressed. People want buildings to “exceed”, to “shelter”, and to “be resilient”. It is clear people expect more from the buildings they use, not less.

![Figure 1](image)

**Figure 1.** Graphic published by Building Forward LA documenting the responses to the question “In the future, I want buildings to _____”. 
Safer Cities

The existence of a difference between the public expectation of how a building will perform during a large seismic event and what may actually occur is not new information. To help address this difference and spur action, SEAOSC embarked on an ambitious effort in 2011 with the first Buildings at Risk Summit. This annual event has evolved into the Strengthening Our Cities Summit and is a cornerstone to SEAOSC’s Safer Cities effort.

Strengthening Our Cities Summit

The Strengthening Our Cities Summit hosted by SEAOSC is an annual conference attended by local print and broadcast media, the public, government officials, and members of the design and construction industry. While content relevant to structural engineers is included, the conference is more an opportunity for meaningful dialogue with various stakeholders about the seismic risk facing our buildings and what needs to be done to improve our built environment, reduce injuries and damage, and better align expectations. In 2017, the focus was engaging key stakeholders such as the insurance and finance industries. For additional information, visit www.seaosc.org/summit.

Safer Cities Survey

In 2016 at the Strengthening Our Cities Summit, the Safer Cities Survey was released to the public. This report compiled the results of an extensive survey of all 191 cities in Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties and their progress in addressing seismically vulnerable buildings. The seismically vulnerable buildings considered in this survey were URM buildings, wood framed buildings without sufficient cripple wall bracing and bolting of the structure to the foundation, concrete tilt-up buildings without sufficient out-of-plane wall anchorage, non-ductile reinforced concrete buildings, soft first-story buildings, and pre-1994 Northridge steel moment frame structures.

Each city within the six counties was asked if their city had mandatory ordinances or voluntary ordinances in effect, ordinances in the process of being developed or at least being discussed, or if no ordinance was being considered. A PDF copy of the survey is available via a free download at www.seaosc.org/Safer-Cities-Survey. While the number of cities with ordinances or at least considering developing ordinances was discovered to be small, it is important to note that the cities that have or are taking action are the ones with significant population at risk from these seismically vulnerable buildings (Table 1).

Safer Cities Advisory Program

In 2016, SEAOSC also introduced the Safer Cities Advisory Program. The Safer Cities Advisory Program provides an effective way for cities to engage the structural engineering community. This program offers cities an independent, qualified review of their draft ordinances and programs. It is intended to complement any internal resources available to the cities, the work by the various technical committees of SEAOSC, and any consultants retained by the cities. SEAOSC members care. For more information on the Safer Cities Advisory Program, visit the website www.seaosc.org/Safer-Cities-Advisory-Program.
City of Los Angeles

The City of Los Angeles has been on the forefront of past and now recent efforts to address the seismic risk facing the city. Two recent signature efforts are the Resilience by Design initiative and the even more recent Building Forward LA initiative.

Resilience by Design

When elected into office, Los Angeles Mayor Eric Garcetti directed his administration to focus the city government on their core responsibilities including addressing seismic safety. Starting with the engagement of Dr. Lucy Jones as his Science Advisor for Seismic Safety, a yearlong process developed achievable action steps to address seismic safety. The Resilience by Design report documents recommended action steps of which several have already been taken including the passing of ordinances requiring action on existing soft-story structures and on existing non-ductile concrete buildings. Retrofits of these dangerous buildings have already begun.

Other Cities have engaged in similar processes to identify their hazardous buildings. Ordinances have been passed requiring actions to be taken to address their hazardous buildings too. Some cities have even gone further than the City of Los Angeles in passing ordinances that go beyond soft-story structures and non-ductile concrete buildings.
Building Forward LA

Building Forward LA (www.lamayor.org/BuildingForwardLA) is an initiative by the Office of Los Angeles Mayor Eric Garcetti to identify new opportunities through the rules and policies of the City to further improve the City’s resilience in the face of earthquakes or other shocks and stressors such as drought, fire, pollution, and the affordable housing shortage. The effort has engaged the public and the design and construction industry. The impacted City Departments have been engaged by the Mayor’s Office.

The result is set of general recommendations and recommended implementation approaches that is expected to inspire ordinances and other actions. In October 2017, ten draft recommendations were released to the public with those recommendations and supporting implementation details being finalized by the end of 2017. Through these recommendations, a path forward towards the continued adopting of the needed programs and steps to increase the performance of existing and new buildings is being made both in addressing the seismic hazard and the other shocks and stressors that will challenge the resilience of the City of Los Angeles.

Table 1. Ten Draft Recommendations and corresponding guiding. The final recommendations and supporting details including implementation recommendations, next steps, and case studies are published via a final report issued by the Mayor’s Office.

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<thead>
<tr>
<th>Equity</th>
<th>Transparency</th>
<th>Collaborative</th>
<th>Forward Thinking</th>
<th>Reflexivity</th>
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<tr>
<td>Increase participation in performance based review and alternative design.</td>
<td>Establish teams to expedite review of projects that incorporate new/innovative technology.</td>
<td>Increase training opportunities for industry professionals on best practices and how to navigate the permit process for innovative projects.</td>
<td>Expand partnerships to facilitate evaluation and approval of emerging technologies</td>
<td>Increase training opportunities for city staff on best practices related to sustainability and resilience</td>
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<td>Establish opportunities for sustained engagement with the private sector to continue Building Forward LA</td>
<td>Increase training opportunities for industry professionals on best practices and how to navigate the permit process for innovative projects.</td>
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<td>Elevate usage of seismic and climate data in order to better inform project design and resilience.</td>
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<td>Develop a publically accessible database of projects that exemplify usage of new technologies.</td>
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<td>Encourage the City to lead by example through a Building Forward LA Pilot Project.</td>
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Conclusions

The recent progress in Southern California to address the seismic performance of the built environment is remarkable and is expected to inspire efforts by others. The work through has just begun. It is critical that the structural engineering community continues to advocate seismic safety by embracing such efforts as Building Forward LA. By assisting those asking the questions, we can help make sure that the answers to those questions include beneficial actions that will continue to improve seismic safety and performance of buildings.