

CAPSS Advisory Committee Meeting Notes

Room 2001, Department of Building Inspection

October 13, 2009

11:00 AM

Attendance

John Paxton, CAPSS Advisory Committee and Chair of the URM Workshop; Mary Lou Zoback, Advisory Committee Chair; Dick Morten, SPUR Emergency Response Committee; David Bonowitz, Structural Engineers Association of Northern California; Lisa Fricke, San Francisco Apartment Owners Association; Skip Soskin, Architect and BOMA; Tim Carrico, building owner; Lee Philips; Dave Massen, represents renters and the SPUR Disaster Task Force; Glen Altenburg; David Hoska, pest contractor; Armand Silva, civil engineer; Ephraim Hirsch, structural engineer; William Holmes and Brett Lizundia, Rutherford & Chekene; Stephen Tobriner, Professor Emeritus, UC Berkeley; Elean O'Neill, One Design; Chris Poland, Degenkolb Engineers; Robert Anderson and Fred Turner, Seismic Safety Commission Lisa Christensen, Department of Emergency Management; Heidi Sieuk, General Services Agency; Kurt Fuchs, Comptroller's Office; Laurence Kornfield, and Hanson Tom Department of Building Inspection.

Introduction

Attendees introduced themselves and described memories of the Loma Prieta earthquake.

ATC-SEI Conference

Mr. Tobin announced that public members of the Advisory Committee were invited to attend the ATC-Structural Engineering Institute of ASCE Conference on improving the seismic performance of existing buildings and other structures free of charge. The meeting will be at the Hyatt Regency Hotel from December 9 to December 11. He passed out copies of a flyer asking for use in making reservations. The conference website gives the conference program and schedule. Those who wish to attend the opening reception, luncheons or dinner gala event would have to pay for these events and can reserve a position and pay the fees on line. www.ATC-SEI.org.

Status Report

Work continues on tasks 2 (Complete and publish the 2005 report, *San Francisco's Earthquake Risk*) and 3 (Formulate post-earthquake repair and retrofit requirements). Extra care is being taken to review the task 2 results because estimates seem to over-estimate losses from single-family houses and underestimate other losses. This review will take additional time and the draft report will be delayed until about January 2010.

Soft Story Building Recommendations

Mr. Kornfield reported on Status of CAPSS recommendations relative to wood frame buildings having three or more stories and five or more residential units. The Mayor introduced legislation calling for a voluntary strengthening program incentivized by waiving permit fees and expediting the permit review process. He said that he had met with the Mayor's Office regarding the appointment of a task force to carry out the CAPSS recommendation. Concerns were expressed regarding the voluntary approach. Members generally agreed that there should be discussion regarding a mandatory or voluntary program.

Ms. Zoback reported for Debra Walker on an initiative to expand the use of previously approved bond funds for strengthening unreinforced masonry buildings to include retrofitting soft story buildings. The measure is likely to be on the November ballot. The expanded program would include loans at market rates to some, and below market for affordable housing. The Community Housing Organization, a not for profit that provides affordable housing, is interested in retrofitting the buildings it acquires along with improving energy efficiency. At present they have stimulus funds for energy efficiency.

Retrofit Standards

Mr. Kornfield reported that the Applied Technology Council received \$300,000 from FEMA to develop simplified guidance for seismic retrofit of soft story wood frame buildings. This effort, known as ATC 71-1, is in direct response to the CAPSS project calling for a new retrofit standard that takes deformation into account and allows retrofitting to a variety of performance standards. David Mar, the project director, will report on the project at the November Advisory Committee meeting.

Advisory Committee Role

Mr. Paxton said that the Advisory Committee responsibility is to advise DBI on the project and seismic safety. He and Ms. Zoback provided a document, "Possible Items to Include in CAPSS Project," that suggests a dozen topics for discussion. He asked members to consider the list and send comments to Dr. Zoback and him.

Unreinforced Masonry Buildings

Mr. Paxton introduced the panel and stated that he wanted CAPSS to consider how unreinforced masonry buildings, retrofitted and not retrofitted would perform in earthquakes. He said that the organizing committee identified the following key questions:

- What was the policy decision, as to acceptable standards of performance, when the unreinforced masonry ordinance was passed?
- How was the inventory of unreinforced masonry buildings determined? How accurate and comprehensive do we think it was?
- What does "Bolts+" really mean? What percent of the 1,532 complete buildings was retrofitted to the Bolts Plus standard?

- What are the performance expectations of owners/occupants of retrofitted unreinforced masonry buildings?
- What performance do professionals expect from retrofitted and exempt unreinforced masonry buildings in future earthquakes, specifically a M7.2 event on the Peninsula segment of the San Andreas fault? Will these buildings satisfy our resiliency objectives?
- Does the presence of 1,532 retrofitted buildings, 153 exempt buildings, and 152 unreinforced masonry infill buildings, pose a significant threat to the resiliency of City?

Panel Participants

- Mr. John Paxton, CAPSS Advisory Committee, Panel Organizer and Chair
- Mr. Laurence Kornfield, Deputy Director, Department of Building Inspection
- Professor Stephen Tobriner, Department of Architecture, UC Berkeley
- Mr. Brett Lizundia, Rutherford & Chekene

Professor Stephen Tobriner

Professor Tobriner explained that the use of brick was a hazard mitigation measure against fire. There had been six widespread fires before 1906. He said that major earthquake in 1865 and 1868 damaged San Francisco and led to a primitive version of bolts plus and other seismic resisting features including government ties and anchors. The State of California enacted legislation in 1933 calling for a statewide earthquake building code that did not allow the use of unreinforced masonry. This provision came after the 1925 Santa Barbara and 1933 Long Beach earthquakes caused extensive damage to unreinforced masonry buildings.

Laurence Kornfield

Mr. Kornfield said that the City had completed a parapet ordinance just before the 1989 earthquake, and that this measure undoubtedly saved lives. He said the City adopted an ordinance requiring the retrofit of unreinforced masonry buildings in 1992. The objectives were to reduce the risk of death or injury. They were minimum standards to reduce life loss and injury, not to prevent casualties or damage. The ordinance was not to protect the buildings or allow their use following earthquakes. He said that Section 1605B.7 of the City ordinance expressed the intent of the Board of Supervisors that those who retrofitted their buildings would not be required in the future to upgrade their buildings again unless there was a “compelling public safety necessity.” It was explained that the state law requiring cities and counties to establish unreinforced masonry retrofit programs exempted retrofitted buildings from additional requirements for a period of 15 years.

Mr. Hanson Tom explained that in 1991 DBI first identified about 2,400 URM buildings in San Francisco. These buildings are located primarily downtown, south of Market, in the Tenderloin and in Chinatown. Most buildings include residential uses with commercial uses on the ground floor. Mr. Lizundia said that about 2/3 of the buildings had at least partial commercial occupancy.

Mr. Kornfield distributed a Summary Report of structures subject to the Unreinforced Masonry Building Ordinance. He said the current number of unreinforced buildings is 1,700. The original list included buildings outside of the City's jurisdiction such as those owned by the Port of San Francisco, public schools (Field Act buildings) and hospital buildings. Other buildings were removed from the list as additional information was collected. By 1990 the number of buildings within the Department of Building Inspection's jurisdiction was reduced to 2,007. The most recent summary report lists 1,700 buildings. Of these 1,532 have a Certificate of Final Completion or have been demolished. He said 97 buildings were demolished and 1,435 were retrofitted. About 168 buildings are not completed. He said the work on some of these building might be complete, but the owners have not completed the paper work needed to receive their CFC. Work is underway on about 50 buildings. He said 110 buildings have been referred to the City Attorney for enforcement action.

There are several categories of unreinforced masonry buildings that are not addressed by the ordinance. These are summarized as follows:

- Exempt 1 buildings were retrofitted between May 21, 1973 and February 15, 1993 following the provisions of Section 104(f); there are about 94 of these buildings.
- Exempt 2 buildings are residential only buildings with four or fewer residential units. There are about 59 of these buildings;
- Frame buildings with unreinforced masonry. There were 152 identified, but a comprehensive survey has not been done.
- Public school buildings that are regulated by the Division of the State Architect pursuant to the Field Act. There is a list with 15 school buildings of this type.
- Buildings owned by the City.
- Buildings owned by the Port of San Francisco.

Mr. Fred Turner commented that as of July 1977 all pre Field Act public school buildings were closed or retrofitted. However, some were retrofitted as early as 1935 so there is some concern over their safety. Some school districts sold pre Field Act schools to private schools. He said that the design and construction of new private schools is required to meet enhanced standards and quality control procedures, but these were not nearly as effective as are the requirements of the Field Act.

Mr. Turner explained that state legislation required all cities and counties in the higher-earthquake hazard areas of the state to do three things by January 1, 1990:

- Prepare a list of all unreinforced masonry buildings in their jurisdiction except for residential buildings with four or fewer units;
- Notify owners that their building is of a type especially vulnerable in earthquakes;
- Adopt a mitigation program.

He said that the legislation was not limited to unreinforced masonry bearing wall buildings and that some jurisdictions, Long Beach and Oakland, have addressed frame buildings with unreinforced masonry infill walls.

Mr. Bret Lizundia

Mr. Lizundia said the City of San Francisco required an Environmental Impact Report, which included an engineering study that evaluated various levels of retrofitting, before adopting its retrofit standards. He reviewed the standards as follows:

1. Bolts Plus—must meet criteria to use, anchors roof floors and walls plus braces on the wall to prevent out of plane buckling. Only a few buildings qualify for this standard. For example, buildings with a soft story had to meet a higher standard.
2. Uniform Code for Building Conservation
 - a. Special Procedure
 - b. General Procedure

Mr. Lizundia said the City should expect a wide distribution of damage in these buildings after an earthquake regardless of the retrofit standard used. In all categories some buildings would perform poorly, some very well. Retrofitting improves the median performance (50-percent better and 50-percent worse) of the category and improves the reliability with which the expected performance would be achieved. Those not retrofitted would perform worse than those retrofitted to the Bolts Plus standard, and those retrofitted to the Bolts Plus standard would do a little worse than those retrofitted following the Special Procedures. Those done according to the General Procedure would do a little better than those done using the Special Procedures. He said that for each standard there would be a distribution of damage from extensive to slight.

The number of buildings retrofitted to each standard could be counted from DBI's records. Of 1,532 unreinforced masonry buildings completed, about 20-percent were done to the Bolts Plus standard.

Mr. Turner said that the bolts plus standard is considerably lower than standards enforced in other jurisdictions. Others commented that structural engineers in San Francisco were uncomfortable with the Bolts Plus standard, and were asked to prepare a more rigorous standard called "Bolts Plus Plus" that addressed building irregularities.

Participants commented on the quality of engineering and construction observed in retrofitting projects. There are concerns regarding quality, but all are based on anecdotal evidence. Because the work was of a routine nature, specialty contractors and engineers formed design build teams to do the work at lower cost than regular engineers and separate contractor. The design build process creates conflict between the quality of design and construction with the design build team's profit motive. The work could have been more rigorous, standard details were applied in a blanket way without a more expensive and comprehensive approach. Some of these

engineer-contractor teams were from out of the area. The City of Los Angeles experienced similar problems, but to a greater and more serious degree. The Los Angeles district attorney had to bring criminal charges for fraudulent activities against some engineers and contractors. Mr. Hanson reminded the Committee that the Department of Building Inspection reviewed all designs, and a specialist inspector inspected all work.

Mr. Lizundia explained the expected performance from the standards under consideration was evaluated by estimating losses from a Magnitude 7 earthquake on the Hayward fault. He said that if nothing were done to retrofit the buildings there would be about \$840 million in property damage. The number of casualties would depend on the time of day. About 60 would die if the earthquake occurred at night. If it occurred during the day about 450 would die. He explained that many people would die when unattached walls fall outward onto the sidewalks. If the buildings were all retrofitted to the Bolts Plus standard, the damage would be reduced to about \$600 million, and the number of deaths reduced in half.

He said that if all of the buildings were retrofitted to the standards in the Uniform Code for Building Conservation, the damage would be reduced to about \$400 million and the number of deaths would be reduced to less than 10 at night and about 40 during the afternoon.

Mr. Paxton asked if retrofit practices changed over time? Mr. Holmes said practices have improved. He explained that many unreinforced masonry building in the early years were braced with thin-wall tubes that could buckle and fracture during strong shaking. He said that there are many braces with exceptionally weak connections (weaker than brace), and that many have very steep brace angles. He said that most of the braced retrofits were done pursuant to 104(f) requirements beginning in 1974, not the bolts plus requirements.

Many participants commented that the unreinforced masonry building retrofit program could be seen as preventing building collapse, might work well in moderate earthquakes, but not so well in the larger expected earthquakes. The structural engineering analysis and report focused on economic issues, owner burden issues, not resilience issues.

Mr. Paxton asked the panel members to explain how they expect retrofitted buildings to perform?

Mr. Lizundia said that the Northridge earthquake provided insight into the expected performance. He referred to damage in areas with different levels of shaking intensity. There was very little damage in areas of MMI 7 intensity (moderate level of shaking), and some damage in areas with MMI 8. Because there were only three buildings in areas with MMI 9 intensity shaking, there was little to learn.

Mr. Lizundia said that he believes retrofitted buildings will do significantly better than those that are not retrofitted. Following major earthquakes on the Hayward and San Andreas faults, he said the majority would receive a "green tag" with about 10 to 25 percent losses. The number of deaths would be about 10-25 if the earthquake occurs at night, and about 40-200 if during day. He said that about 10 to

25 percent of the buildings would receive a “red tag” and could not be occupied. He said that the City could lose from five to ten percent of the buildings retrofitted to the Section 104(f) requirements. He said that 10-25 percent of the Exempt 1 buildings—solely residential buildings with four or fewer units—would not be available. This performance would not meet the SPUR resilience objectives, but the occupants would be relatively safe.

Mr. Bonowitz said objectives for housing, recovery and resiliency changes discussion. Individual retrofits clearly benefit to the City as a whole. If an ordinance were considered today, it is likely the standards would be higher.

Committee members asked if the Exempt 1 buildings (those previously retrofitted) and Exempt 2 buildings (residential only buildings with one to four units) should remain exempt? Mr. Lizundia estimated that there were about 50 or 60 buildings of this type. The cost to retrofit a small unreinforced masonry building would be relatively expensive on a unit basis. Some committee members said that all owners should have some obligation for the safety of their tenants. It was mentioned that these smaller buildings are less vulnerable by the nature of their size, but the occupants would not be able to occupy them following intense shaking.

Mr. Paxton asked about the expected performance of steel, concrete and wood frame buildings with unreinforced masonry walls. It was noted that unreinforced bearing wall buildings would perform worse, and that —steel frame buildings should perform better than concrete frame buildings. Some will perform well, others poorly.

Mr. Paxton asked panel members for their opinion on what the public expects to happen in these buildings. Professor Tobriner said that the public doesn’t know what to expect, but in general they expect their buildings are safe and can be occupied following earthquakes. Others added that the general perception is that the City would not allow them to occupy buildings that were not safe.

Advisory Committee Comments

Ms. Sieck said that the challenge was to decide whether to address the safety of people or the continued use of buildings and resiliency.

Mr. Allenberg suggested disclosing the performance of these buildings by placing placard describing what building would withstand. He also suggested that the City should offer retrofit clinics frequently to train owners and contractors and to link owners with contractors and lenders.

Mr. Paxton summarized the discussion.

- Unreinforced masonry buildings will perform poorly in future earthquakes. Those that have been retrofitted will perform better (fewer lives will be lost), but all will suffer greater damage than other building types.
- Owners and occupants of all buildings expect a high level of performance. The City needs to do a better job of informing owners and occupants of the risks associated with owning and occupying unreinforced masonry buildings.

- The exemption for Exempt category 1 and 2 buildings should be re-evaluated. Even though these buildings are few in number, and a small percentage of the City's building stock, they are expected to perform worse than buildings that were retrofitted under the unreinforced masonry building ordinance. They should not be ignored because they are likely to perform poorly in future earthquakes.
- Masonry infill wall buildings should be evaluated. The number of buildings in this category is not well documented. Most are higher than four stories and are expected to suffer damage that would prevent occupancy and threaten the safety of persons adjacent to the buildings on the ground.
- Enforcement actions on the 110 buildings referred to the City attorney's office seems to be languishing, with little action. Many members of the committee would like the City Attorney to take more aggressive action taken by the City Attorney.
- There is evidence that some private school buildings are built with unreinforced masonry buildings, but have not been addressed. If this were true, those children would be in serious danger in future earthquakes.
- Societal expectations have changed. The concept of recovery and resiliency calls for better performance from buildings than improving safety, the primary objective in 1992 when the unreinforced masonry building ordinance was passed.

Mr. Paxton said there needs to be a greater sense of urgency and that retrofit requirements need to go beyond saving lives and reducing injuries in future earthquakes, to include post earthquake habitability.

The meeting ended at 12:55 PM.