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AN UPDATE OVERVIEW OF THE UNIVERSITY OF CALIFORNIA SEISMIC SAFETY PROGRAM

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SUMMARY

The September 1985 Mexico earthquakes and coincidental release of the report "A Campus at Risk," dated September 1985, prepared by the University of California at Los Angeles Earthquake Safety Committee, renewed The Regents' and State Officials' 1971 concerns about the seismic safety of University buildings. Long-held State funds were then released. Funding of earthquake safety programs almost always follows and does not precede major earthquakes. Unfortunately, the usual approach is to prepare a seismic safety program, seek its funding, keep it current and wait for funds to implement the program after the next damaging earthquake.

INTRODUCTION

Since 1887, the University of California has been active in research and instruction regarding all aspects of seismology, including recording of seismic events with regard to intensity and location and the probability of future occurrences. As a result, the University for many years has been concerned about the adequacy of its structures with regard to seismic resistance.

Following the 1971 San Fernando Valley earthquake, the University undertook a survey of existing buildings to identify those which warranted engineering analysis to assess their relative ability to withstand seismic forces. The engineering analyses conducted during the period 1971-1975 disclosed serious and extensive seismic resistance deficiencies in many University structures, both old and relatively new. About one-third of the existing University of California buildings were designed and constructed prior to 1955. Although they were designed to be in compliance with building codes when constructed, many are no longer considered to be adequate with regard to seismic safety.

In January of 1975, The Regents of the University of California adopted a policy regarding seismic safety in University structures with the expressed intent of providing an acceptable level of seismic safety for students, employees and the public who occupy and utilize University buildings and facilities. This University Policy on Seismic Safety was reaffirmed in a May 17, 1988, letter from the President of the University to the Chancellors and appropriate chief administrative officers and Directors of the Lawrence Berkeley Laboratory, Lawrence Livermore National Laboratory, and the Los Alamos Scientific Laboratory. The background and history of the development and implementation of the University Seismic Safety Policy is presented in a 1984 paper by the author entitled, "Development

and Implementation of the University of California Seismic Safety Policy" (Ref.1).

This current paper is an update overview of this Policy since 1984 to 1988. It is presented to provide a continuing documentation of the success of the University's program in seismic hazard abatement to aid others involved in the development and implementation of similar seismic programs.

BACKGROUND

In 1976, the State of California Legislative Analyst, after being alerted to the seismic problems of the University, recommended that the California Seismic Safety Commission (CSSC) undertake a study to determine the need for a State-wide seismic safety rehabilitation program and to report to the Legislature by January 1977. The recommended study concluded in 1979 with a report from the Commission to the Legislature (Ref.2). This CSSC report established a methodology for rating buildings with regard to seismic safety and was intended to serve as a budget tool for allocating funds on a "benefit-cost" priority basis among State buildings most urgently requiring correction of seismic deficiencies (Ref.3).

The University utilized the methodology developed in the CSSC Report (Ref.3) and the results of the University's building survey to establish a priority list of University facilities based on the life-saving potential of each project. In addition, the University engaged a consultant to investigate the possibility of a phased approach to the correction work so that the maximum value could be obtained for the construction dollars invested. In spite of the University's effort to develop a rational program, the State was reluctant to proceed with a program on a State-wide basis because of the magnitude of the problem and limited availability of funds.

In 1982, the State Public Works Board provided \$175,000 to the University to study the seven highest priority University buildings included in the CSSC priority report. The following information was developed for each of these buildings:

1. Detailed information on specific seismic resistance deficiencies which exist in the particular buildings.
2. Details of structural improvements required for increased seismic resistance capabilities to provide and improve seismic resistance ratings.
3. Construction costs for each individual building's structural improvements.
4. Investigation of the possibility of phased construction to provide for correction of the most serious deficiencies. This was intended to maximize the reduction of seismic risks through the implementation of limited rather than comprehensive correction. Development of the cost of each phase if phased construction is feasible.
5. The buildings for which detailed studies have been completed are: 1) Los Angeles Campus - Powell Library and Moore Hall, 2) Berkeley Campus - South Hall, Wheeler Hall and California Hall, 3) San Diego Campus - Undergraduate Science Building, and 4) Riverside Campus - Soils and Plant Nutrition Building.

In September 1982, the President recommended to The Regents in the 1983-86 Capital Improvement Program that 56 University buildings be carried as approved by the University for authorization of funding, pending availability of State funds.

In September 1983, The Regents approved an authorization for the President to include projects in the "Program for Correction of Seismic Deficiencies" and to request appropriate State funding, should the State indicate a willingness to provide funds for seismic safety projects.

In September 1984, the Regents' 1985-1986 Budget for Capital Improvements requested State funds for the planning and design of seismic corrections of Wheeler Hall and South Hall and for additional studies of the Doe and Moffitt Libraries, all on the Berkeley campus. Funds totalling \$721,000 were appropriated for the preparation of the design drawings and specifications for the South Hall project and for the studies (only) of the Berkeley Libraries.

In September 1985, prior to the September 19, 1985 Mexico earthquake, The Regents' 1986-87 Budget for Capital Improvements requested State funds for construction of the South Hall seismic structural corrections project at Berkeley, planning and design of the Wheeler Hall seismic structural correction project at Berkeley, and study funds to determine the solution for correction of seismic structural problems of the Powell Library at Los Angeles.

Concurrently, there were continuing seismic investigation studies being conducted at the Berkeley campus and the Los Angeles campus. The events described in the following section of this paper were important in getting funds totalling \$3.7 million appropriated, in late 1985, for the above two Berkeley projects, and \$693,000 in design funds appropriated for a project at the San Diego Medical Center that includes seismic structural correction of the main hospital building. The University provided study funds for Powell Library.

"A CAMPUS AT RISK"

The UCLA Ad-Hoc Joint Senate-Administration Earthquake Safety Committee was appointed on June 15, 1983, by the Administrative Vice-Chancellor and the Chair, Academic Senate, Los Angeles Campus. This Committee was asked to specifically undertake the following: 1) review the current information about the seismic safety at UCLA; 2) consider and make recommendations for up-dating the current priority and safety ratings for seismic rehabilitation; 3) review and, as necessary, make recommendations for the amplification and updating of the Campus Emergency Plan; 4) monitor and make recommendations for improving measures to reduce the impact of the physical damage and personal injury resulting from earthquakes and other catastrophes; 5) devise methods for the improvement of communications about the existence of the Emergency Plan for the entire campus; and 6) report at least annually to the Chancellor and the Chair of the Academic Senate on the above matters and such others as the Committee believes should be brought to their attention.

The Committee held fifteen meetings, and on June 7, 1984, made an initial presentation to Chancellor Young and his senior staff. It was the strong and unanimous opinion of this Committee that UCLA was "a campus at risk," and faced a potentially devastating catastrophe as a result of the next great earthquake in Southern California (Ref.4).

The Committee was completing its written Report, dated September 1985, when the September 19, 1985 Mexico earthquake occurred. Their Report, "A Campus at Risk," was "leaked" and the October 19, 1985, Los Angeles Times quoted from the

Report that "When the next great earthquake rumbles through Southern California, UCLA will be left in a shambles.....The number of deaths on campus could approach 2,000 and serious injuries could exceed 4,000" (Ref.5).

The tenured professors on the Committee had nothing to lose by "calling a spade a spade" and included the number of deaths and injuries projected at UCLA in their Report. The large number of casualties in Mexico City added credibility to the Report because many of the buildings on the UCLA campus, which had been rated "Very Poor", were similar to buildings that had collapsed in Mexico City.

Two investigative reporters from the Los Angeles Times who were looking into the seismic safety of University buildings picked up on "A Campus at Risk" Report and kept it alive for several weeks (Ref.5). They reported in the Sunday, December 8, 1985, Los Angeles Times an excellent summary of the University Seismic Program and its problems in getting funding from the State of California (Ref.6).

Despite the longstanding concern about the seismic hazards on the University campuses, the 1985-1986 fiscal year was the first in which the Legislature has appropriated large sums of money to strengthen the University buildings. The September 19, 1985 Mexico earthquake got The Regents and the State Legislature thinking again about seismic safety.

It is the author's considered opinion that the coincidence of the release of "A Campus at Risk" Report (Ref.4) immediately following the September 19, 1985 Mexico earthquake and the follow-up articles in the Los Angeles Times renewed concerns by The Regents and underscored their wisdom in adopting a 1975 University Seismic Safety Policy and their annual request for State funds to carry out this Policy.

Immediately upon the release of "A Campus at Risk" Report, the UCLA Chancellor authorized a detailed seismic study of thirty-seven structures including buildings for teaching and research, libraries, residence halls, parking structures, and student and sports facilities. A 1987 report, "The Seismic Correction Program at UCLA" (Ref.7), outlined a conceptual master plan for seismic corrections projecting total costs for the above thirty-seven structures falling between \$110 and \$150 millions. Approximately \$75 to \$100 million would be needed from State funds, while the remainder would have to come from the residence halls, student union, and parking revenues or non-State funds. Among the top seven State building priorities set forth by the CSSC Report (Ref.3), was Powell Library, built in 1929 before any seismic building codes were in place. Seismic improvements in other State-funded buildings, such as Moore, Royce and Kinsey Halls, are further down the priority list. Other non-State-funded buildings include Ackerman Union, Kerckhoff Hall, student residence halls - Hedrick, Rieber, Sproul, and Dykstra.

It is important to note that the UCLA Ad-Hoc Joint Senate-Administration Earthquake Safety Committee (ESC), whose report "A Campus At Risk" led to the extensive structural analysis of the UCLA buildings in 1986, has also helped to shape the comprehensive earthquake preparedness program at UCLA (Ref.7).

CONCLUSIONS

In the 1985-88 University Capital Improvement Program, it is estimated that \$319.8 million will be needed from the State Legislature to strengthen the top priority 56 State-owned buildings and \$35.0 million from other sources to upgrade 36 top priority campus housing, sports and recreation facilities and other non-State-funded buildings (Ref.2).

The Los Angeles, Berkeley, Davis, Riverside, San Diego and Santa Barbara campuses have immediate 1987 funding needs of \$150.0 million, \$90.0 million, \$30.0 million, \$1.6 million, \$6.0 million and \$21.0 million, respectively. At least \$500.0 million would be needed to mitigate all of the University seismic hazards in 1987 dollars, based on an Engineering News Record 20 Cities ENR Cost Index of 4440 (Ref.2).

In November 1986, an \$800 million State capital improvement bond issue provided the first major funding of the University Seismic Program. It includes the funding of the first phase of the Berkeley campus and Mt. Lick Observatory reconstruction programs which includes 1873 South Hall (\$2.5 million), 1905 California Hall (\$1.7 million) and 1915 Wheeler Hall (\$1.6 million) and the 1888 Mt. Lick Observatory (\$1.5 million). This first phase is to be completed by 1991 - twenty years after the 1971 San Fernando earthquake that initiated the University Seismic Safety Program.

On October 1, 1987, an earthquake of 6.1 on the Richter scale occurred in the Whittier area of the Los Angeles basin. No serious damage occurred to University of California facilities. One student fatality and severe architectural and structural damage were experienced at the California State University at Los Angeles, which is part of the California State University System, not the University of California System.

Although progress made to date on seismic correction work has been limited because of lack of funding, there is a November 1988 State bond issue bill being considered in the California State Legislature. This \$500 million bond issue program would provide the funding for a start on the seismic correction work with \$150 million to be used for seismic retrofitting of local government buildings and facilities, and \$350 million for seismic strengthening of buildings owned by the State, University of California and the California State University systems. This legislation, "State Earthquake Bond Act of 1988", if passed by the Legislature and approved by the Governor, would provide for the submission of the above Bond Act at the November 1988 General Election and would become operative upon adoption by the voters at this election. Unfortunately, as of late July 1988, this bond issue is being held in a powerful Legislative Assembly Committee on Ways and Means. If this important legislation is not passed by the Legislature, the California Seismic Safety Commission will sponsor this bill again next year.

Approval of the above bond issue would provide the necessary funding for substantial progress on the seismic correction program for University facilities. The University has continued to work on seismic correction problems in its non-State-funded facilities over the years and has taken it upon itself the responsibility to correct non-structural seismic problems, such as falling hazards, with its facilities utilizing the ongoing operational budget provided for departments and for maintenance and operation of plants (Ref.8).

The logical assumption is made that there is an urgent need for earlier completion of the stated goal called for in the "Earthquake Hazards Reduction Act", enacted by the State Legislature in 1986. The stated goal is to significantly reduce seismic life safety hazards by the end of the century. Furthermore, the University of California, owner of approximately one-half of the high occupancy State facilities identified as potentially unsafe, must be a leading force in the efforts to secure funding, to develop appropriate and reasonable seismic rehabilitation programs, and to ensure, to the extent possible, that the lives and safety of the persons using University buildings are protected.

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