

Chapter 6

SELECTED ANNOTATED BIBLIOGRAPHY AND ADDITIONAL REFERENCES

The various "societal" (political, socioeconomic, administrative, and policy) problems inherent in the seismic rehabilitation of buildings and discussed in this publication are treated in literature that can be considered a subset of the literature on earthquake hazard mitigation which, in turn, is a subset of the literature on natural hazard mitigation. Thus, in discussing seismic rehabilitation or "hazardous structure abatement," there are three distinct but partially overlapping sets of reference literature that, taken together, are quite extensive.

The purpose of this publication has been to alert and orient the reader and potential user of the *Guidelines* documents with the array of societal problems often encountered in the seismic rehabilitation of buildings. A full treatment of each component of the array, however, simply is not feasible in a single document.

Once an individual begins to address seismic rehabilitation, he/she will face many of the problems and issues discussed earlier in this volume. The first section of this chapter presents a selected annotated bibliography designed to help those individuals identify appropriate additional reading, most of which also contain reference lists. It focuses on a core group of 10 books, 4 chapters from another book, 13 journal articles, and 4 reports. The second section of this chapter presents a list of other excellent works that may be of use to readers in specific situations.

CORE READINGS

A place to start exploring the policy and socioeconomic issues involved in the seismic rehabilitation of buildings is a January 1996 Earthquake Engineering Research Institute publication, *Public Policy and Building Safety*, an excellent and very readable report that succinctly surveys all of the major technical (i.e., nonengineering) issues and suggests practical strategies for understanding and dealing with many of

them. It includes a case study of the development of the Los Angeles ordinance requiring the inspection of steel-frame buildings; an overview of the typical policy-making process; and a reminder-style checklist of social, economic, and political factors to be considered in building safety.

An unusual and intentionally thought-provoking 1989 essay by Timothy Beatley, "Towards a Moral Philosophy of Natural Disaster Mitigation," appears in the *International Journal of Mass Emergencies and Disasters* (7 March 1989: 5-32). It is a clear and well written exploration of a rarely asked but fundamental question: What is the extent of government's moral obligation to protect people and property from natural disasters such as hurricanes and earthquakes? While many of the examples are drawn from the hurricane milieu (Beatley's specialty), mitigating the earthquake risk is addressed as well. Beatley argues that mitigation as public policy may be built on four ethical bases: utilitarian and market failure rationales (maximizing net social benefits); the concept of basic rights (providing primary physical security and subsistence); culpability and the prevention of harm (highlighting responsibility and costs); and paternalism (legitimizing government interventions).

A more conventional starting place is with a book by William J. Petak and Arthur A. Atkisson, *Natural Hazard Risk Assessment and Public Policy: Anticipating the Unexpected* (New York, New York: Springer-Verlag, 1982), which describes and explains mitigation policies and programs within the larger context of disasters and/or disaster management.

A "handbook" spelling out a four-step mitigation process (community analysis, emergency analysis, mitigation needs assessment, and mitigation strategy development) is, *Practical Mitigation: Strategies for Managing Disaster Prevention and Reduction* (Rockville, Maryland: Research Alternatives Inc.,

1982) by James W. Morentz, Hugh C. Russell, and Judith A. Kelly. The orientation of this work is much more practical than conceptual. Of special interest are 81 mitigation case histories from across the United States involving all types of natural and technological hazards.

A special kind of "cookbook" (meant in the best possible sense) cosponsored by FEMA and the International City Management Association is *Emergency Management: Principles and Practice for Local Government* (Washington, D.C.: International City Management Association, 1991) edited by Thomas E. Drabek and Gerald J. Hoetmer. This comprehensive textbook is intended for "front line" emergency managers and local government officials. The "Introduction" and Part I, "History and Foundations of Emergency Management," provide the reader with basic concepts and terminology setting the stage for the remaining parts. Two chapters are of specific relevance to mitigation -- Chapter 5, "Perspectives and Roles of the State and Federal Governments," which explains in detail the relationship between local emergency management and other levels of government, and emphasizes the intergovernmental process and system interdependence, and Chapter 6, "Disaster Mitigation and Hazard Management," which covers the evolution of federal mitigation policy, the relationship between mitigation and comprehensive emergency management, hazard identification and analysis, and mitigation strategies, tools and techniques.

In *Natural Hazards and Public Choice: The State and Local Politics of Hazard Mitigation* (New York, New York: Academic Press, 1982), Peter H. Rossi, James D. Wright, and Eleanor Weber-Burdim explore attitudes of "political influentials" toward hazard mitigation across 20 states using 100 community samples and 2,000 respondents. Their findings that community elites across the United States did not find hazards to be very important compared to other problems and that these elites preferred "quick fixes" to politically painful long-term measures were subsequently challenged by Elliott Mittler in *Natural Hazard Policy Setting: Identifying Supporters and Opponents of Nonstructural Hazard Mitigation* (Boulder, Colorado: University of Colorado Institute of Behavioral Science, 1989). Using the same data but a more sophisticated statistical treatment, Mittler

came to different, more positive conclusions about elite hazard perceptions and about who tends to be a supporter, nonsupporter, or neutral with respect to hazard policy.

A special edition (Volume 45, January 1985) of a leading scholarly journal, *Public Administration Review*, is entitled "Emergency Management: A Challenge for Public Administration," with William J. Petak serving as editor. This issue is an excellent overview/primer devoted to FEMA and to disaster response and recovery (including technological disasters). Of the 21 articles, all relatively short, those dealing at least in part with mitigation are: "Emergency Management: A Challenge for Public Administration" by William J. Petak; "Emergency Management and the Intergovernmental System" by Alvin H. Mushkatel and Louis F. Weschler; "Disaster Recovery and Hazard Mitigation: Bridging the Intergovernmental Gap" by Claire R. Rubin and Daniel G. Barbee; "Mitigation Strategies and Integrated Emergency Management" by David R. Godschalk and David J. Brower; and "Financing Disaster Mitigation, Preparedness, Response, and Recovery" by Allen K. Settle.

Continuing a focus on intergovernmental issues and problems is a thoughtful 1984 article by William J. Petak, "Natural Hazard Mitigation: Professionalization of the Policy Making Process," in *International Journal of Mass Emergencies and Disasters* (2, August: 285-302). In this article Petak examines the constraints/barriers to adopting and implementing hazard mitigation policies. Petak notes that while FEMA historically has pushed state and local governments to improve mitigation and enhance response and recovery capabilities in order to better handle hazards on their own, those very same state and local governments are constrained by geophysical, ecological, and sociopolitical factors. With this in mind, Petak addresses two important questions: How can current and projected natural hazard losses be reduced through improvements in building and land use practices in designated hazard areas? How can the adoption and use of specific hazard mitigation approaches by state and local governments be accomplished?

Also treating the intergovernmental problems generated by disaster is *Disaster Policy Implementation:*

Managing Programs Under Shared Governance (New York, New York: Plenum Press, 1986) by Peter J. May and Walter Williams. Adopting a "two worlds of disaster politics" approach (the world of normal politics/low saliency and the world of active policy making in the aftermath of a disaster), this study was driven by two fundamental questions: How are good ideas turned (or not) into concrete actions? How might FEMA stimulate greater mitigation and preparedness efforts? Taking an "implementation perspective," May and Williams explore the "politically less visible aspects of disaster policy" under situations of "shared governance" (local, state, and federal).

Perhaps the core book of the 1980s is Thomas E. Drabek's *Human System Responses to Disaster: An Inventory of Sociological Findings* (New York, New York: Springer-Verlag, 1986). This work is a self-conscious attempt to survey the disaster literature extant at the time and create an "encyclopedia" of findings. It remains a fundamental resource in the field, and significant attention is focused on to mitigation.

Next is a book edited by Louise K. Comfort, *Managing Disaster: Strategies and Policy Perspectives* (Durham, North Carolina: Duke University Press, 1988). This collection of original essays by 21 scholars in the field of public policy is organized around two basic questions: What are the primary issues confronting public managers in a disaster? What actions/measures can they take to save lives and protect property? Case studies are woven into the articles, and significant attention is paid to mitigation.

W. Henry Lambright began a research project in the early 1980s on the rapidly evolving role of states (including California) in disaster management, and he subsequently published *The Role of States in Earthquake and Natural Hazard Innovation at the Local Level: A Decision-Making Study* (Syracuse, New York: Syracuse Research Corporation, 1984, also available from the U. S. Department of Commerce, National Technical Information Service). Lambright's logic of comparison is actually based on three different "policy settings": Emergent (South Carolina and Nevada); intermediate (California); and advanced (Japan). The core of the study is the application of a six-stage process of innovation model em-

phasizing "entrepreneurs," "triggers," "the search for options," "adoption," "implementation," and "incorporation."

Focusing solely on one California policy innovation, Lambright followed his larger study with a 1985 journal article, "The Southern California Earthquake Preparedness Project: Evolution of an 'Earthquake Entrepreneur'" in the *International Journal of Mass Emergencies and Disasters* (3, November: 75-94). Lambright depicts the Southern California Earthquake Preparedness Project as a novel mechanism created to accelerate the pace and intensity of preparedness.

Kathleen J. Tierney reviews much of the mitigation literature through 1989 in "Improving Theory and Research on Hazard Mitigation: Political Economy and Organizational Perspectives" in the *International Journal of Mass Emergencies and Disasters* (7, November 1989: 367-396). In this article, Tierney notes that mitigation is the least studied and therefore the least understood of the four key disaster phases. The literature on mitigation, according to Tierney, can be divided into three major areas: studies on public perceptions of mitigation measures; research on agenda setting, adoption, and the implementation of hazard mitigation measures; and studies assessing the impact of hazard mitigation measures. Moreover, three themes pervade the literature on disaster mitigation: the only slightly coupled relationship between perceived risk and level of mitigation; the difficulty in promoting mitigation programs because the problems they attempt to address are complex and highly technical; and the positive role played by critical events in the adoption and implementation of hazard mitigation programs.

Questioning the role of critical events is Elliott Mittler in *The Public Policy Response To Hurricane Hugo In South Carolina* (Boulder, Colorado: University of Colorado Institute of Behavioral Science, Natural Hazards Research and Applications Information Center, Working Paper 84, April 1993). This study contradicts the popular assumption that in the honeymoon period following a major disaster, political windows open easily for mitigation improvements. He maintains that those windows do not always open and, even if they do open, they slam shut very quickly.

Another antidote (but from earthquakes and from California no less) to the facile assumption that disasters lead easily to mitigation improvements is *Standing Rubble: The 1975-1976 Oroville, California Experience with Earthquake-Damaged Buildings* (Sacramento, California: Robert Olson Associates, Inc., 1988) by Robert A. Olson and Richard Stuart Olson. An article-length version appeared as "The Rubble's Standing Up in Oroville, California: The Politics of Building Safety" by Richard Stuart Olson and Robert A. Olson in the *International Journal of Mass Emergencies and Disasters* (11, August 1993: 163-188).

Another book high on any "must read" list for earthquake mitigation is *Earthquake Mitigation Policy: The Experience of Two States* (Boulder, Colorado: University of Colorado Institute of Behavioral Science, 1983) by Thomas E. Drabek, Alvin H. Mushkatel, and Thomas J. Kilijanek. This book is important not only because it pays explicit attention to definitions and policy issues, but also because its selection of state cases does not include California. In fact, hitting head-on the tendency to think of earthquake mitigation and California as synonyms, the authors subtitled their Missouri chapter, "This Isn't California," and their Washington chapter, "North from California." Rich in detail, the authors discuss three case histories of conflicts over earthquake mitigation policy that reveals the perceptual barriers and resource constraints typical at the state and local levels. Of particular interest is Chapter V, "Resistance from Below: St. Louis vs. HUD," which chronicles an intergovernmental political battle over lateral force requirements for building rehabilitations.

Almost a decade later, Philip R. Berke and Timothy Beatley published *Planning for Earthquakes: Risk, Politics, and Policy* (Baltimore, Maryland: Johns Hopkins University Press, 1992). Combining micro and macro approaches, Berke and Beatley present three earthquake mitigation case studies (Salt Lake County, Utah; Palo Alto, California; and Charleston, South Carolina) with statistical analysis of the responses to a questionnaire on mitigation practices from 202 communities in 20 states.

Arnold J. Meltsner's, "The Communication of Scientific Information to the Wider Public: The Case of Seismology in California," in *Minerva* (3, Autumn

1979: 331-354) follows the early 20th century history of seismology studies in California and the tremendous political obstacles faced by earth scientists and engineers who attempted to convince California's leaders to publicly recognize and come effectively to grips with the earthquake threat. The article chronicles the truly heroic efforts to establish that most basic of earthquake mitigation policies -- a seismic building code -- and is an excellent antidote to the myth that California's road to seismic safety prominence was easy.

The issue of what to do about "bad buildings" constitutes a small but important literature of its own. Still the only book-length study of the policy dilemmas inherent in trying to reduce the life-safety threat posed by unreinforced masonry buildings is *The Politics and Economics of Earthquake Hazard Mitigation: Unreinforced Masonry Buildings in Southern California* (Boulder, Colorado: University of Colorado Institute of Behavioral Sciences, Monograph 43, 1986) by Daniel J. Alesch and William J. Petak. In this book, Alesch and Petak analyze three California cases: Long Beach, Los Angeles, and Santa Ana. The emphasis is on the interplay between technical solutions, the economics and financing of building rehabilitation, and the political maneuvering (especially the role and importance of the "window opening" San Fernando earthquake of 1971) that yielded different ordinance outcomes in each of the cities.

To be read as a companion piece to Alesch and Petak's book is Richard Stuart Olson's, "The Political Economy of Life Safety: The City of Los Angeles and 'Hazardous Structure Abatement,' 1973-1981" in *Policy Studies Review* (4, May 1985: 670-679). Taking a more explicitly political viewpoint than Alesch and Petak, Olson profiles the "pro" and "con" sides on the famous Los Angeles seismic rehabilitation ordinance and emphasizes the importance of a credible scenario for a future earthquake to the passage of the Los Angeles ordinance.

The last item in the core list is the February 1994 "theme issue" of *Earthquake Spectra*. Edited by Mary C. Comerio, this journal issue reflects the outcome of a U.S.-Italy workshop held in October 1992 and focuses on "Design in Retrofit and Repair." The contributions revolve around 10 problems that both U.S. and Italian experts had to confront: achieving a

balance between life safety and cost, achieving a balance between life safety and building conservation, developing strategies "to preserve existing buildings (not just monuments)," finding support for pre-design investigations by an entire design team in preparation for formatting rehabilitation designs, developing performance criteria for building systems and for historic preservation as complements to structural design criteria, insufficient understanding of materials performance, insufficient understanding of the performance of composite structures resulting from multiple retrofits, resolving incongruities between finite elements analysis and building failure typologies, insufficient understanding of building performance over multiple earthquakes and how better information on that issue should be incorporated into reconstruction codes, and determining whether the building will be lost in another earthquake or by the engineer's design?

ADDITIONAL READINGS

Natural Hazards

Unique in the field and almost falling in the core list (except that it is 660 pages) is James Huffman's *Government Liability and Disaster Mitigation: A Comparative Study* (Lanham, Maryland: University Press of America, 1986). Undertaken by a professor of law, this is a fascinating study of liability laws and how they affect assignment of costs and, therefore, mitigation policy in six countries -- New Zealand, the United States, Peru, Japan, China, and what was then the Soviet Union.

In 1985, Peter J. May published *Recovering From Catastrophes: Federal Disaster Relief Policies and Politics* (Westport, Connecticut: Greenwood Press, 1985). In this work May asks who wins and who loses when it comes to bearing the costs and risks of disaster relief. Tracing the political evolution of disaster relief policy, May examines three histories -- legislative, organizational, and, most interesting, "what really happened." The legislative history focuses on policy changes, congressional politics, and the driving question of the federal government's appropriate role in disaster relief.

Another general treatment of the disaster problem in the United States is Raymond J. Burby's, *Sharing*

Environmental Risks: How to Control Governments' Losses in Natural Disasters (Boulder, Colorado: Westview Press, 1991). Summarizing the results of an extensive study of the losses from over 130 natural disasters occurring in the 1980s, Burby analyzes the complex relationship between federal, state, and local policies. While the work is comprehensive, Part II, "How to Control Losses," is dedicated to mitigation and focuses on the problem of how "to ease the perennial hardships states and localities suffer." A short chapter, "The Special Case of Earthquakes," argues that earthquakes create consequences and problems different from those caused by floods, hurricanes, and landslides. The author then addresses how earthquake-prone local governments can be persuaded to insure their property at risk.

Earthquake Hazard Mitigation

Also almost falling in the core list is a recent book by Robert A. Stallings, *Promoting Risk: Constructing the Earthquake Threat* (New York, New York: Aldine de Gruyter, 1995). Starting from a different base than the other authors, Stallings explores why earthquake risk has not achieved the status of a fully developed "social problem" given the likely national consequences of a catastrophic earthquake. For Stallings, the answer is that "promoters" of the earthquake threat have followed essentially an "insider" strategy and not a "grass-roots" strategy and have therefore failed to generate widespread public support.

Another study notable for its non-California intent is Arthur A. Atkisson and William J. Petak's "The Politics of Community Seismic Safety" in *Proceedings of Conference XV: Preparing for and Responding to a Damaging Earthquake in the Eastern United States* (Reston, Virginia: U.S. Geological Survey, Open-File Report 82-220, 1982).

Other specific but non-California studies include those by Peter J. May and others in, *Earthquake Risk Reduction Profiles: Local Policies and Practices in the Puget Sound and Portland Areas* (Seattle, Washington: University of Washington, Institute for Public Policy and Management, November 1989) and *Anticipating Earthquakes: Risk Reduction Policies and Practices in the Puget Sound and Portland Areas* (Seattle, Washington: University of Washington,

Institute for Public Policy and Management, November 1989).

Also worth reading is a short article by Peter J. May and Patricia Bolton, "Reassessing Earthquake Reduction Measures," in the *Journal of the American Planning Association* (52 Autumn 1986: 443-451), and May's "Addressing Public Risks: Federal Earthquake Policy Design" in the *Journal of Policy Analysis and Management* (10, Spring 1991: 263-285).

A basic resource document on federal efforts to promote seismic safety, that contains much original information is, *To Save Lives And Protect Property: A Policy Assessment of Federal Earthquake Activities, 1964-1987* (Washington, D.C.: Federal Emergency Management Agency, 1988) by Robert A. Olson, Constance Holland, H. Crane Miller, W. Henry Lambright, Henry J. Lagorio, and Carl R. Treseder.

Two U. S. Geological Survey studies that emphasize knowledge transfer and applications are *Applications of Knowledge Produced in the National Earthquake Hazards Reduction Program: 1977-1987* (Reston, Virginia: U.S. Geological Survey Open File Report 88-13-B, 1988) edited by Walter W. Hays and *Applications of Research from the U.S. Geological Survey Program, Assessment of Regional Earthquake Hazards and Risk Along the Wasatch Front, Utah* (Reston, Virginia: U.S. Geological Survey Professional Paper 1519, 1993) edited by Paula Gori. For further reading on the surprisingly partisan politics of seismic safety in Utah, see Richard Stuart Olson and Robert A. Olson's,

"Trapped in Politics: The Life, Death, and Afterlife of the Utah Seismic Safety Advisory Council" in the *International Journal of Mass Emergencies* (12, March 1994: 77-94).

A significant comparative work is *Earthquake Mitigation Programs in California, Utah, and Washington* prepared by C. E. Orians and Patricia A. Bolton for the Workshop on Issues and Options for Earthquake Loss Reduction (Seattle, Washington: Battelle Human Affairs Research Center, BHARC-800/92/041, September 1992).

In the same vein is a study by Joanne M. Nigg and others, *Evaluation of the Dissemination and Utilization of the NEHRP Recommended Provisions* (Wash-

ington, D.C.: Federal Emergency Management Agency, May 1992).

Agency reports to the U S. Congress often are given short shrift as resources, but some are of high quality. Such is the case of a 1993 FEMA report, *Improving Earthquake Mitigation, A Report to Congress* (Washington, D.C.: FEMA, Office of Earthquake and Natural Hazards, January 1993). Noteworthy within that report are "Social Science Research: Relevance for Policy and Practice" by Russell Dyness, "Local Public Capacity to Deal with a Catastrophic Earthquake" by Claire Rubin and "Education, Awareness and Information Transfer Issues" by Paula Schultz.

Of historic interest are two federal reports from the 1970s. Stimulated by unexpectedly high losses in the 1971 San Fernando earthquake, the federal government began to pay more systematic attention to the earthquake problem in the United States. *Earthquake Prediction and Public Policy* (Washington, D.C.: National Academy of Sciences, 1975) was prepared by National Research Council, Panel of the Public Policy Implications of Earthquake Prediction of the Advisory Committee on Emergency Planning and *Earthquake Hazards Reduction: Issues for an Implementation Plan* (Washington, DC: 1978) was prepared in response to the *National Earthquake Hazards Reduction Act of 1977* (PL 94-125) by the Executive Office of the President, Office of Science and Technology Policy, Working Group on Earthquake Hazards Reduction.

California Studies

Thirty-one years before the Loma Prieta earthquake captured the world's attention, Karl V. Steinbrugge published *Earthquake Hazard in the San Francisco Bay Area: A Continuing Problem in Public Policy* (Berkeley, California: Institute of Governmental Studies, University of California, 1968).

An interesting California mitigation (land use) case study is presented by Martha L. Blair and William E. Spangle in *Seismic Safety and Land-Use Planning, Selected Examples From California* (Reston, Virginia: U.S. Geological Survey Professional Paper 941-B, 1979).

In 1980, as a result of the devastation wrought by Mount St. Helens earlier that year, President Carter turned even more federal attention to the earthquake threat in California. As a result, FEMA produced a slim but important document, *An Assessment of the Consequences and Preparations for a Catastrophic California Earthquake: Findings and Actions Taken* (Washington, D.C.: FEMA, November 1980). The essence of this report is a set of earthquake scenarios with associated probabilities and with estimated casualty (dead and injured) figures.

In 1983, the small central California town of Coalinga was virtually destroyed by an earthquake. The response was unusually draconian -- level it and start over. Kathleen J. Tierney chronicles the impacts and aftermath in *Report on the Coalinga Earthquake of May 2, 1983* (Sacramento, California: California Seismic Safety Commission, 1985).

Multiple jurisdiction/intrastate studies of response to risk are rare, but two were authored in the mid-1980s: "Earthquakes and Public Policy Implementation in California," by Alan J. Wyner in the *International Journal of Mass Emergencies and Disasters* (2 August 1984: 267-284) and *Preparing for California's Earthquakes: Local Government and Seismic Safety* (Berkeley, California: University of California Institute of Governmental Studies, 1986) by Alan J. Wyner and Dean E. Mann.

Although most of the world will forever associate the 1989 earthquake in northern California with the baseball World Series, coincidentally between San Francisco and Oakland, that event is technically called the Loma Prieta earthquake. In the aftermath, Patricia A. Bolton and C. E. Orians undertook a study of that disaster's mitigation lessons: *Earthquake Mitigation in the Bay Area: Lessons from the Loma Prieta Earthquake* (Seattle, Washington: Battelle Human Affairs Research Center, Summary Report BHARC-800/92/015, March 1992).

On the same disaster but with a narrower focus on housing, Mary C. Comerio published "Hazards Mitigation and Housing Recovery: Watsonville and San Francisco One Year Later," in *Disasters and the Small Dwelling* (London: James and James Science Publishers, 1992) edited by Yasemin Aysan and Ian Davis.

As Executive Director of the California Seismic Safety Commission at the time, L. Thomas Tobin also reflected on the lessons of the 1989 disaster in "Legacy of the Loma Prieta Earthquake: Challenges to Other Communities," *Symposium on Practical Lessons from the Loma Prieta Earthquake* (Oakland, California: Earthquake Engineering Research Institute, March 1993).

Also stimulated by the Loma Prieta event and ensuing lessons was *Use of Earthquake Hazards Information: Assessment of Practice in the San Francisco Bay Region* (Portola Valley, California: Spangle Associates, July 1993) by Spangle Associates.

The relationship between earthquake disasters and mitigation opportunities inherent in reconstruction is the theme of two other reports by Spangle Associates: *PEPPER: Pre-Earthquake Planning for Post-Earthquake Rebuilding* (Sacramento, California: California Office of Emergency Services, for the Southern California Earthquake Preparedness Project, 1987) and *Rebuilding after Earthquakes, Lessons from Planners* (Portola Valley, California: Spangle Associates, 1991).

As part of its own planning efforts, the California Seismic Safety Commission published and made widely available its *California at Risk, Reducing Earthquake Hazards 1992 to 1996* (Sacramento, California: California Seismic Safety Commission, Report SSC 91-091, 1992). From the same source and interesting from an historical viewpoint is *Earthquake Hazards Management: An Action Plan for California* (Sacramento, California: California Seismic Safety Commission, September 1982). Probably of the greatest historical import, however, is the California Legislature Joint Committee on Seismic Safety's *Meeting The Earthquake Challenge* (Sacramento, California: Legislature, State of California, January 1974). This study, commissioned as a result of the 1971 San Fernando earthquake, was really the blueprint for seismic safety improvements in California for more than a decade.

No list of literature on California would be complete or credible if it did not include *Waiting for Disaster: Earthquake Watch in California* (Berkeley, California: University of California Press, 1986) by Ralph H. Turner, Joanne M. Nigg, and Denise Heller Paz. This book addresses the issue of seismic prepared-

ness in the high risk zone of Palmdale, California. Due to the alternating uplifting and subsiding of the earth's crust in the region (the so-called Palmdale Bulge), it was widely believed that Palmdale was a harbinger of earthquakes. Hypothesizing that this "near prediction" heightened the saliency of the region's earthquake threat, the authors examine the attitudes and actions of people and organizations in response to the threat.

Hazardous Buildings Studies

For more general reading on the conflict potential inherent in public policy attempts to deal with existing earthquake-vulnerable buildings, see Richard Stuart Olson and Douglas C. Nilson's "California's Hazardous Structure Problem: A Political Perspective," in *California Geology* (April 1983: 89-91), and subsequently reprinted in *Building Standards* (52, July-August 1983: 15-17).

How the federal government approached and handled the problem of its own earthquake-vulnerable buildings is the subject of Diana Todd and Ugo Morelli in "Adoption of Seismic Standards for Federal Buildings: Issues and Implications" in *Proceedings, Fifth U.S. National Conference on Earthquake Engineering, 1994* (Oakland, California: Earthquake Engineering Research Institute, 1994, pp. 995-1003). In the same *Proceedings* (pp. 1005-1012) is another paper with a non-California focus -- David O. Knutunen's, "New Code Provisions for Existing Buildings in Massachusetts."

Dealing with the problem of seismic rehabilitation of hospitals in an even more non-California (i.e., a non-United States) setting is Allan Lavell's, "Opening a Policy Window: The Costa Rican Hospital Retrofit and Seismic Insurance Program 1986-1992" in *The International Journal of Mass Emergencies and Disasters* (12, March 1994: 95-115). This article is especially interesting for its treatment of Costa Rica's ability to "learn" not only from its own earthquakes, but also from the Mexico City disaster of 1985.

Reflecting on housing lessons from the Los Angeles hazardous structure abatement ordinance is Mary C. Comerio in "Impacts of the Los Angeles Retrofit Ordinance on Residential Buildings" in *Earthquake Spectra* (8, February 1992: 79-94). In the February

1994 *Earthquake Spectra* theme issue discussed above in the core list, Comerio followed upon this earlier work with "Design Lessons in Residential Rehabilitation (pp. 43-64), which focuses on mitigation policy and housing in the aftermath of the 1989 Loma Prieta earthquake.

Example Rehabilitation Ordinances and Initiatives

To illustrate the array of subjects discussed in this publication, numerous enacted or proposed laws and ordinances and accompanying materials, bond issue descriptions, public finance materials, environmental impact reports, special studies, and federal documents and reports have been examined. While too voluminous to actually reprint in this *Societal Issues* volume, each is summarized below to make it as easy as possible for readers to understand the contents of these materials and to obtain any that might be of help.

City of Los Angeles, *Los Angeles Building Code, Chapter 88: Earthquake Hazard Reduction in Existing Buildings*, is available from the Department of Building and Safety, Building Bureau, 200 N. Spring St., Los Angeles, California 90012, (310) 485-2304. This well-known ordinance, enacted in 1981 (10 years after San Fernando earthquake), established a comprehensive program to require the seismic rehabilitation or demolition of unreinforced masonry bearing wall buildings built before 1934 (or for which a building permit was issued prior to October 6, 1933). The intent is clear: Where the analysis determines deficiencies, this chapter of the building code requires the building to be strengthened or demolished. The ordinance sets minimum standards, provides procedures and standards for identifying and classifying subject buildings according to their current use, provides analysis methods and allowable values, specifies information to be included on plans, defines priorities and time periods for compliance, and specifies penalties for noncompliance.

City of Los Angeles, *Los Angeles Building Code, Division 91: Earthquake Hazard Reduction in Existing Tilt-Up Concrete Wall Buildings* available for the Department of Building and Safety, Building Bureau, 200 N. Spring St., Los Angeles, CA 90012, (310)

485-2304. Similar in concept to Chapter 88, this ordinance focuses on another proven earthquake vulnerable building -- the tilt-up concrete wall buildings "designed under building codes in effect prior to January 1, 1976." The intent to require strengthening or demolition is the same. Like Chapter 88, Division 91 sets minimum standards for identifying and classifying subject buildings according to current use, provides analysis methods and allowable values, specifies notification procedures, prescribes information to be included on plans, defines priorities and times for compliance, and specifies penalties for noncompliance.

City of Los Angeles, Los Angeles Building Code, Proposed (June 16, 1994) *Chapter 92: Prescriptive Provisions for Seismic Strengthening of Light, Wood-Frame, Residential Buildings* available from the Department of Building and Safety, Building Bureau, 200 N. Spring St., Los Angeles, California 90012 (310) 485-2304. This ordinance, proposed following the Northridge earthquake, was adopted August 27, 1996, as a voluntary ordinance. It focuses on particularly vulnerable older light wood frame buildings that have the following structural weaknesses: "(a) sill plates or floor framing which are supported directly on the ground without an approved foundation system. (b) a perimeter foundation system which is constructed of wood posts supported on isolated pad footings. (c) perimeter foundation systems that are not continuous." Damage often is serious to structures with any of these characteristics, and the displaced occupants will result in a major demand for emergency shelter. This is a voluntary program, but like the city's other ordinances, this one also specifies analytical procedures and similar matters. Being prescriptive in nature the ordinance specifies how the corrective work should be done. Even though not officially adopted, it has been used as a handout and as a reference during plan checking.

City of Palo Alto, California *Ordinance Number 3666 adding Chapter 16.42 to the Palo Alto Municipal Code Setting Forth a Seismic Hazards Identification Program*, is available from the Building Inspection Division, 250 Hamilton, Palo Alto, California 94303, (415) 329-2550. While not able to enact a mandatory seismic rehabilitation program, Palo Alto succeeded in requiring that engineering reports be done and publicly filed by owners of the following

three types of buildings: all URM buildings, all pre-1935 buildings with 300 occupants or more other than URM buildings with 100 occupants or more, and all buildings constructed between January 1, 1935, and August 1976. The 1986 ordinance, anchored in the intent of the safety element of the city's comprehensive plan, defines responsibilities, scope, building categories, reporting requirements, review processes, and other matters.

City of Oakland, California *Ordinance Number 11274, Adopting Interim Standards for the Voluntary Seismic Upgrade of Existing Structures*, is available from the City Clerk, One City Hall Plaza, Oakland, California 94612(510) 238-3611. Ordinance 11274 was enacted in 1990 after the 1989 Loma Prieta earthquake. It was part of a series of policy efforts to deal with damaged buildings and to initiate a comprehensive program to abate the hazards posed by URM structures. This ordinance provides standards and force levels for upgrading, defines historic buildings to be exempted, establishes a design review and appeals process, and contains an exemption from future seismic upgrades for 15 years. It was seen as an interim measure until a permanent program could be established. One of the ordinance's goals was to "promote public health, safety and welfare," but this was to be done "within the constraint of reasonable economic effects."

City of Oakland, California Ordinance 11613, Adding Article 6 to Chapter 18 of the Oakland *Municipal Code Adopting a Seismic Hazards Mitigation Program for Unreinforced Masonry Structures* available from the City Clerk, One City Hall Plaza, Oakland, California 94612 (510) 238-3611. Ordinance 11613 is the city's URM building ordinance. It applies to all such buildings built before November 26, 1948 (the date of the city's first code containing seismic provisions), interestingly addresses both voluntary (limited scope) and mandatory (broader scope) rehabilitation standards, assigns interpretive responsibility to the building official, specifies right of entry, establishes notification and reporting requirements, establishes a public list of subject buildings and criteria for deletion of the building, establishes procedures for reviewing historic buildings, and provides for a variety of appeals and other processes.

State of California, *Health and Safety Code, Chapter 12.2 - Building Earthquake Safety* ("The URM

Law"), in available from legal research services or the California Seismic Safety Commission, 1900 K Street, Suite 100, Sacramento, California 95814, (916) 322-4917. Added to California's statutes in 1986, this law requires the building departments in all cities and counties located wholly or partially in the *Uniform Building Code Seismic Zone 4* to "(a) identify all potentially hazardous buildings within their respective jurisdiction on or before January 1, 1990, (b) establish a mitigation program for potentially hazardous buildings to include notification to the legal owner, . . . and (c) by January 1, 1990, all information regarding potentially hazardous buildings and all hazardous building mitigation programs shall be reported to the appropriate legislative body of a city or county and filed with the Seismic Safety Commission." It requires the commission to monitor the program by annually publishing a report and was amended in 1993 to require that, upon transfer of ownership of any URM built before January 1, 1975, the purchaser must be given a copy of the *Commercial Property Owner's Guide to Earthquake Safety*. The law also refers to the following one, which excuses locals from associated liabilities.

State of California, *Health and Safety Code, Article 4 (Sections 19160 through 19168) - Earthquake Hazardous Building Reconstruction*, is available from legal research services or the Seismic Safety Commission, 1900 K Street, Suite 100, Sacramento, California 95814, (916) 322-4917. This law was passed in 1979 and was one of the earliest attempts to remove barriers to seismic rehabilitation. It was permissive in that the statute authorizes (not mandates) local jurisdictions to assess their hazards, allows for adoption of rehabilitation standards less than those required for new buildings, and among other subjects provides immunity from liability for local jurisdictions arising from damages to rehabilitated buildings or casualties caused by earthquakes. While well intended, the law also became an excuse for many local jurisdictions to do nothing until stronger legislation was passed in 1986.

U.S. Government, Office of the President, Executive Order 12941, *Seismic Safety of Existing Federally Owned or Leased Buildings*, is available from the Mitigation Directorate, Federal Emergency Management Agency, 500 C Street, S.W., Washington, D.C. 20472, (202) 642-3231. Based on earlier legislation,

this Presidential Executive Order is an example of the exercise of authority that could be provided to any chief executive, administrative officer, city manager, or other appropriate official. Executive Order 12941 sets minimum standards for use by federal departments and agencies "in assessing the seismic safety of their owned or leased buildings and mitigating unacceptable risks. . . ." In addition, the order assigns implementation responsibilities, provides for periodically revising the standards, and requires the preparation of cost estimates consistent with the standards.

State of California, *Health and Safety Code, amending Section 18938 and adding Articles 8 and 9 to Chapter 1 of Division 12.5 Relating to the Rehabilitation, Changed Use, or Closure of Acute Care General Hospitals by January 1, 2030*, is available from legislative reference services or the Office of Statewide Health Planning and Development, 1600 Ninth Street, Sacramento, California 95814, (916) 654-3362. Following the 1971 San Fernando earthquake, state legislation was passed effective January 1, 1973, requiring new hospitals to be designed, reviewed, and constructed to higher standards. Later known as the "Alfred E. Alquist Hospital Seismic Safety Act," these amendments were passed in 1994 following the Northridge earthquake. By far, the most significant feature is the law's retroactivity: ". . . after January 1, 2008, general acute care hospital buildings that are determined to pose certain risks shall only be used for nonacute care hospital purposes" and ". . . no later than January 1, 2030, owners of all acute care inpatient hospitals shall demolish, replace, or change to nonhospital use, all hospital buildings that are not in substantial compliance, or seismically retrofit them so that they are in compliance with the [Office's] standards."

State of California, State Government Code, Sections 8878.50-8878.107, *Earthquake Safety and Public Buildings Bond Act of 1990 (Proposition 122)*, is available from the California Seismic Safety Commission, 1900 K Street, Suite 100, Sacramento, California 95814, (916) 322-4917. Added to California's statutes directly by its voters, this \$250 million bond issue's purposes were to: "fund retrofitting, reconstruction, repair, replacement, or relocation of state-owned buildings or facilities which have earthquake or other safety deficiencies" and "provide financial

assistance to local governments for earthquake safety improvements in structures housing those agencies critical to the delivery of essential government functions in the event of emergencies or disasters." The statute also funds related research and specifies how priorities, eligibility, fund distribution, and accountability will be maintained.

School District of Clayton, Missouri *Bond Issue Proposals*, available from the District's Community Relations Department, 75 Maryland Ave., St. Louis, Missouri 63105, (314) 726-5210. Of potential use to jurisdictions interested in seismic rehabilitation, but in lower seismic zones, this \$18,365,000 bond issue "built in" earthquake resistance improvements to schools as part of a broader agenda. The agenda encompassed the need to accommodate increasing enrollment, to comply with the Americans with Disabilities Act (ADA), to preserve and properly maintain existing schools, to provide student access to modern computer technology, and "the obligation to protect lives of students in the event of an earthquake by strengthening portions of existing schools which do not conform to current building codes."

City and County of San Francisco, Department of City Planning, *Earthquake Hazard Reduction in Unreinforced Masonry Buildings: Program Alternatives*, Final Environmental Impact Report 89.112E, available from the City Planning Department, 1660 Mission St., San Francisco, California 94103, (415) 558-6287. This extremely valuable assessment of the community impacts of a proposed ordinance to require at least partial seismic rehabilitation of URM buildings contains a wealth of information on the issues discussed generally in this publication. One section, "Existing Financing Sources for the Retrofit of San Francisco's Unreinforced Masonry Buildings," was very helpful.

City of Oakland, California, Office of Public Works, *Preliminary List of Financial Resources to Consider in Developing a Local URM Seismic Safety Program*, available from the Office of Public Works, One City Hall Plaza, Oakland, California 94612, (510) 238-3961. Similar to the section of San Francisco's EIR, this list of potential funding alternatives and sources was prepared for the city by the staff of the California Seismic Safety Commission. It contains many of the same references as San Francisco's but also has additional information and some discus-

sion of the purposes and advantages and disadvantages of various financing mechanisms.

Federal Emergency Management Agency, *A Benefit-Cost Model for the Seismic Rehabilitation of Buildings, Volume 1, A User's Manual and Volume 2, Supporting Documentation* (FEMA 227 and 228), is available from the Publication Distribution Facility, 500 C St. S.W., Washington, D.C. 20472, (800) 480-2520. Increasing use is being made of methods to evaluate the benefits and costs of investing public funds, in this case for the seismic rehabilitation of private buildings. Later publications (FEMA 255 and 256) expand the use benefit-cost methods to federally owned buildings. These volumes provide background information and procedures and software for calculating the benefits and costs of seismic rehabilitation. The second volume in each set provides additional supporting data and technical papers.

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In addition to the key items in the preceding annotated bibliography, there exists a myriad of other valuable materials used in preparing this publication. These included the following:

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