ATC-25

SEISMIC VULNERABILITY AND IMPACT OF DISRUPTION OF LIFELINES IN THE CONTERMINOUS UNITED STATES

by

APPLIED TECHNOLOGY COUNCIL
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Funded by

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1991

Preface

In September 1988 Applied Technology Council (ATC) was awarded a contract by the Federal Emergency Management Agency to assess the seismic vulnerability and impact of disruption of lifeline systems nationwide. The purpose of the project is to develop a better understanding of the impact of disruption of lifelines from earthquakes and to assist in the identification and prioritization of hazard mitigation measures and policies. In addition, FEMA plans to utilize results from the project to promote national awareness of the importance of protecting lifeline systems from earthquakes, and assuring reliability and continued serviceability of lifelines.

The project is being conducted in several phases. Phase I, reported on herein, provides a national overview of lifeline seismic vulnerability and impact of disruption. Lifelines considered include electric systems, water systems, transportation systems, gas and liquid fuel supply systems, and emergency service facilities (hospitals, fire and police stations). The vulnerability estimates and impacts developed are presented in terms of estimated direct damage losses and indirect economic losses. These losses are considered to *represent a first approximation* because of the assumptions and methodology utilized, because several lifelines are not included (e.g., telecommunication systems), and because, in some cases, the available lifeline inventory data lack critical capacity information.

Phase II, to be reported on in the ATC-25-1 Report, provides a practical model methodology for the *detailed* assessment of seismic vulnerability and impact of disruption of water transmission and distribution systems. Subsequent phases to develop model methodologies for the seismic assessment of other lifeline systems are also planned.

EQE Inc., a structural and earthquake engineering firm with experience in the seismic evaluation of lifeline systems, served as the project subcontractor and prepared this report. The research and engineering work was performed by Charles Scawthorn, Principal-in-Charge, Mahmoud Khater, Principal Research Engineer, and other EQE staff. Marvin Feldman of Resource Decisions served as consultant on the indirect economic loss methodology and data.

The ATC-25 Expert Technical Advisory Group (ETAG), comprised primarily of individuals drawn from the technical committees of the American Society of Civil Engineers (ASCE) Technical Council for Lifeline Earthquake Engineering (TCLEE), provided overall review and guidance for the project. Members were: Lloyd Cluff, James D. Cooper, Holly Cornell, John W. Foss, James H. Gates, Neal Hardman, Jeremy Isenberg, Anne S. Kiremidjian, Le Val Lund, Peter McDonough, Dennis K. Ostrom, Gerard Pardoen (ATC Board Representative), Michael Reichle, Anshel J. Schiff, J. Carl Stepp, and Domenic Zigant. The affiliations and addresses of these individuals are provided in Appendix A.

Applied Technology Council gratefully acknowledges the valuable assistance, support and cooperation provided by Kenneth Sullivan, FEMA Project Officer, and Arthur J. Zeizel and Kupussammy Thirumalai, prior Project Officers.

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Executive Director

FEMA NOTICE

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