EFFECTS OF THE 1985 MICHOACAN EARTHQUAKE ON WATER SYSTEMS AND OTHER BURIED LIFELINES IN MEXICO

by

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PREFACE

The National Center for Earthquake Engineering Research (NCEER) is devoted to the expansion and dissemination of knowledge about earthquakes, the improvement of earthquake-resistant design, and the implementation of seismic hazard mitigation procedures to minimize loss of lives and property. The emphasis is on structures and lifelines that are found in zones of moderate to high seismicity throughout the United States.

NCEER's research is being carried out in an integrated and coordinated manner following a structured program. The current research program comprises four main areas:

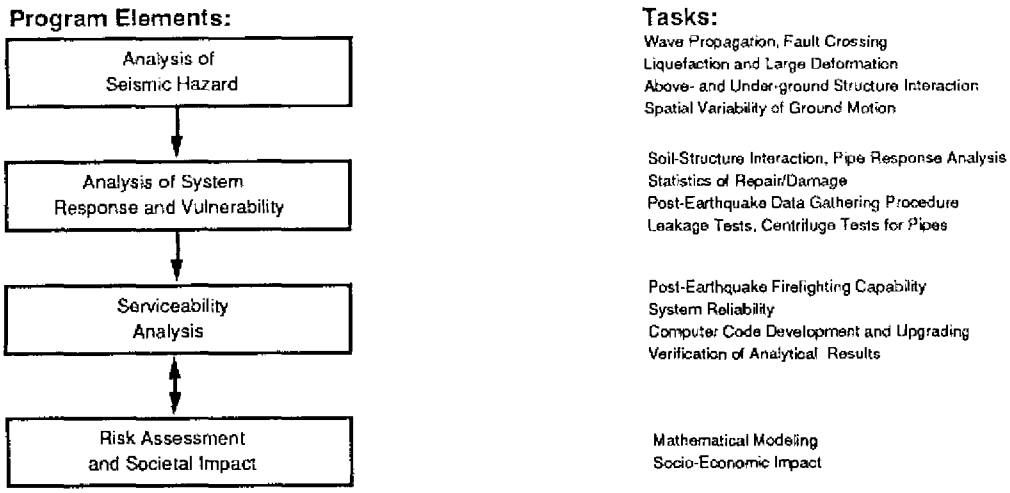
- Existing and New Structures
- Secondary and Protective Systems
- Lifeline Systems
- Disaster Research and Planning

This technical report pertains to Program 3, Lifeline Systems, and more specifically to water delivery systems.

The safe and serviceable operation of lifeline systems such as gas, electricity, oil, water, communication and transportation networks, immediately after a severe earthquake, is of crucial importance to the welfare of the general public, and to the mitigation of seismic hazards upon society at large. The long-term goals of the lifeline study are to evaluate the seismic performance of lifeline systems in general, and to recommend measures for mitigating the societal risk arising from their failures.

From this point of view, Center researchers are concentrating on the study of specific existing lifeline systmes, such as water delivery and crude oil transmission systems. The water delivery system consists of two parts. The first studies the seismic performance of water delivery systems on the west coast. While the second part addresses itself to the seismic performance of the water delivery system in Memphis, Tennessee. For both systems, post-earthquake fire fighting capabilities will be considered as a measure of seismic performance.

The components of the water delivery system study are shown in the accompanying figure.



This study investigates the effects of the 1985 Michoacan earthquake on water delivery systems in the metropolitan Mexico City area. Damage statistics for buried segmented pipes are correlated with soil conditions and earthquake characteristics. Seismic effects on welded steel pipes, sewer and underground metro lifelines are also discussed. A historical account of seismic damage to the Mexican water system due to past earthquakes is also provided. This report highlights the importance of such a historical perspective for an understanding of the seismic vulnerability of these types of systems.

ABSTRACT

In this report the effects of the 1985 Michoacan Earthquake on water systems in Mexico are investigated. Because the damage from the 1985 event was most severe in Mexico city, the report concentrates on the Metropolitan Mexico City Area. A historical perspective is provided by information about seismic damage to Mexican water systems due to past earthquakes. This historical perspective highlights the seismic vulnerability of these types of systems.

The effects of the earthquake on water supply as well as some aspects of the emergency response are discussed. Soil conditions in Mexico City and the characteristics of the earthquake are investigated and correlated with the observed damage. Damage statistics are presented for the buried segmented pipelines in the water system. Other sections are devoted to damage to a continuous (welded steel) pipeline and to seismic effects on the sewer and underground Metro lifelines.

Seismic damage to lifelines in the epicentral region was relatively light. A comparison of ground motion characteristics recorded in Mexico City and in the epicentral region is used to explain these differences. Finally, a general summary and recommendations to reduce the seismic vulnerability of the Mexico City water system as well as other water systems are given.

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