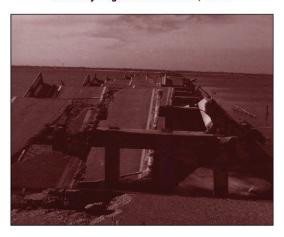
## PERFORMANCE OF TRANSPORTATION SYSTEMS

Edited by Reginald DesRoches, Ph.D.



Technical Council on Lifeline Earthquake Engineering
Monograph No. 29



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### HURRICANE KATRINA

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Kiremidjian, Ann, editor. Recent Lifeline Seismic Risk Studies. TCLEE Monograph No. 1, 1990.

Taylor, Craig, editor. Seismic Loss Estimates for a Hypothetical Water System. TCLEE Monograph No. 2, 1991.

Schiff, Anshel J., editor. Guide to Post Earthquake Investigations of Lifelines. TCLEE Monograph No. 3, 1991.

Cassaro, Michael, editor. Lifeline Earthquake Engineering. Proceedings of the Third U.S. Conference. TCLEE Monograph No. 4, August 1991.

Ballantyne, Donald, editor. Lifeline Earthquake Engineering in the Central and Eastern U.S. TCLEE Monograph No. 5, September 1992.

O'Rourke, Michael, editor. Lifeline Earthquake Engineering. Proceedings of the Fourth U.S. Conference. TCLEE Monograph No. 6, August 1995.

Schiff, Anshel J. and Buckle, Ian, editors. *Critical Issues and State of the Art on Lifeline Earthquake Engineering*. TCLEE Monograph No. 7, October 1995.

Schiff, Anshel J., editor. Northridge Earthquake: Lifeline Performance and Post-Earthquake Response. TCLEE Monograph No. 8, August 1995.

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Schiff, Anshel, editor. Guide to Post-Earthquake Investigation of Lifelines. TCLEE Monograph No. 11, July 1997.

Werner, Stuart D., editor. Seismic Guide to Ports. TCLEE Monograph No. 12, March 1998.

Taylor, C, Mittler, E., Lund, L., editors. Overcoming Barriers: Lifeline Seismic Improvement Programs. TCLEE Monograph No. 13, September 1998.

Schiff, A.J., editor. *Hyogoken-Nanbu (Kobe) Earthquake of January 17, 1995—Lifeline Performance*. TCLEE Monograph No. 14, September 1998.

Eidinger, John M., and Avila, Ernesto A., editors. Guidelines for the Seismic Upgrade of Water Transmission Facilities. TCLEE Monograph No. 15, January 1999.

Elliott, William M. and McDonough, Peter, editors. Optimizing Post Earthquake Lifeline System Reliability, Proceedings of the Fifth National Conference on Lifeline Earthquake Engineering. TCLEE Monograph No. 16, September 1999.

Tang, Alex K., editor. *Izmit (Kocaeli) Earthquake of August 17, 1999 Including Duzce Earthquake of November 12, 1999—Lifeline Performance.* TCLEE Monograph No. 17, March 2000.

Schiff, Anshel J., and Tang, Alex K., editors. *Chi-Chi Taiwan Earthquake of September 21, 1999—Lifeline Performance.* TCLEE Monograph No. 18, 2000.

Eidenger, John M., editor. Kujurat (Kutch) India M7.7Earthquake of January 26, 2001 and Napa M5.2 Earthquake of September 3, 2000. TCLEE Monograph No. 19, 2001.

McDonough Peter, editor. The Nisqually, Washington Earthquake of February 28, 2001—Lifeline Performance. TCLEE Monograph No. 20, 2002.

Taylor, Craig E. and Van Marcke, Erik H., editors. *Acceptable Risk Process – Lifelines and Natural Hazards*, TCLEE Monograph No. 21, 2002.

Heubach, William F., editor. Seismic Screening Checklists for Water and Wastewater Facilities, TCLEE Monograph No. 22, 2003.

Edwards, Curtis L., editor. Atico, Peru M<sub>w</sub> 8.4 Earthquake of June 23, 2001 – Lifeline Performance, TCLEE Monograph No. 23, 2003.

Lund, Le Val and Sepponen, Carl, editors. Lifeline Performance El Salvador Earthquakes of January 13 and February 13, 2001, TCLEE Monograph No. 24, 2003.

Beavers, James E., editor. Advancing Mitigation Technologies and Disaster Response for Lifeline Systems, TCLEE Monograph No. 25, 2003.

Scawthorn, Charles, Eidinger, John M., and Schiff, Anshel J., editors. *Fire Following Earthquake*, TCLEE Monograph No. 26, 2005.

Edwards, Curtis L., editor. Zemmouri, Algeria, Mw 6.8 Earthquake of May 31, 2003, TCLEE No. 27, 2004.

Mark Yashinsky, Mark, editor. San Simeon Earthquake of December 22, 2003 and Denali, Alaska, Earthquake of November 3, 2002, TCLEE Monograph No. 28, 2004.

DesRoches, Reginald, editor. *Hurricane Katrina: Performance of Transportation Systems*, TCLEE No. 29, 2006.

### **TCLEE Publications**

Duke, C. Martin, editor. The Current State of Knowledge of Lifeline Earthquake Engineering, 1977.

Dowd, Munson, editor. Annotated Bibliography on Lifeline Earthquake Engineering, 1980.

Smith, D. J. Jr., editor. Lifeline Earthquake Engineering: The Current State of Knowledge, 1981.

Hall, William, editor. Advisory Notes on Lifeline Earthquake Engineering, 1983.

Nyman, Douglas, editor. Guidelines for the Seismic Design of Oil and Gas Pipeline Systems, TCLEE Committee on Gas and Liquid Fuel Lifelines, 1984.

Coopers, James, editor. Lifeline Earthquake Engineering: Performance, Design and Construction, 1984.

Eguchi, Ron, and Crouse, C. B., editors. *Lifeline Seismic Risk Analysis—Case Studies*, 1986.

Cassaro, Michael and Martinez-Romero, E., editors. *The Mexico Earthquakes—1985 Factors Involved and Lessons Learned*, 1986.

Wang, Leon R. L. and Whitman, Robert, editors. Seismic Evaluation of Lifeline Systems—Case Studies, 1986.

Cassaro, Michael and Cooper, James, editors. Seismic Design and Construction of Complex Civil Engineering Systems, 1988.

Werner, Stuart D. and Dickenson, Stephen E., editors. *Hyogoken-Nanbu (Kobe) Earthquake of January 17, 1995: A Post-Earthquake Reconnaissance of Port Facilities,*TCLEE Committee on Ports and Harbors Lifelines, 1996.

Schiff, Anshel J., editor. Guide to Improved Earthquake Performance of Electric Power Systems, ASCE Manual 96, 1999.

## TCLEE Lifeline Earthquake Investigation Reports

ASCE Technical Council on Lifeline Engineering (TCLEE) Earthquake Investigation Committee (EIC) members have participated in a number of lifeline earthquake investigations. Reports have been prepared on the performance of lifeline and published in ASCE publications (other than TCLEE monographs), Earthquake Engineering Research Institute (EERI) and other publications listed as follows:

Coalinga Earthquake, May 2, 1983, M 6.5, Report by Luis Escalnate, TCLEE-EIC, EERI Newsletter.

Cluster County (Idaho) Earthquake, October 28, 1983, M 6.9, Report by Patrick Wong, TCLEE-EIC, ASCE News and EERI Newsletter.

Kaoiki (Hawaii) Earthquake, November 16, 1983, M 6.6, Report by Patrick Wong, TCLEE-EIC, ASCE News and EERI Newsletter.

Morgan Hill (California) Earthquake, April 24, 1984, M 6.1, Reports by Patrick Wong, TCLEE-EIC and Anshel Schiff, TCLEE-EIC, ASCE News.

Morgan Hill (California) Earthquake, April 24, 1984, EERI Earthquake Spectra, Vol. 1, No. 3, 1985.

Chile Earthquake, March 3, 1985, M 8.1, The Chile Earthquake of March 3, 1985, L. Escalante and A.J. Schiff, EERI Earthquake Spectra, Vol. 2, February 1986.

Mexico City Earthquake, September 19, 1985, M 8.1, Report by Luis Escalante, TCLEE, ASCE News, December 1985.

Mt. Lewis (Idaho) Earthquake, March 31, 1986, M 5.4, Report by Anshel Schiff, TCLEE-EIC, ASCE News, December 1986.

San Salvador Earthquake, October 10, 1986, M 5.4, Report by James Morgan, TCLEE-EIC, ASCE News, April-May 1986.

Ecuador Earthquakes, March 5, 1987, M 6.1 & 6.9, Report by Tom O'Rourke, ASCE News, June 1987.