

SEISMIC RISK TO WATER AND SEWAGE LIFELINE SYSTEMS

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The seismic risk, or potential loss, associated with water and sewage lifeline systems differs in several fundamental ways from that associated with buildings and other structures:

- Whereas damage to buildings occurs primarily during an earthquake, the performance of water and sewage lifelines becomes most important after the earthquake.
- Damage depends not only on the size of the earthquake and the response of the system, but also on how the system is managed after the seismic event.
- Life safety is generally not an issue for the failure of individual lifeline components (except for case of reservoirs and tanks in populated areas); however, failure of the system as a whole can have a large impact on health and life safety.
- The wide areal extent and redundancy of water and sewage systems require a careful definition of "level of performance" and "failure."
- The wide areal extent commonly precludes site-specific evaluation of seismic risk for distribution pipelines, which make up a large portion of water and sewage lifeline systems. (In some areas, microzonation or site-specific analysis may still be warranted.)
- A systems model is required to evaluate earthquake performance.

This paper, which addresses a number of seismic risk issues, begins with an historical perspective on damage and risk, a description of the various components of risk, and a summary of seismic damage to water and sewage systems in selected U.S. earthquakes. Three principal issues for seismic safety include: operation of existing systems, retrofitting and strengthening of existing systems, and seismic design for new construction. Each of these issues is described with respect to current status and recommended actions, including rough cost estimates and a suggested breakdown of responsibilities for further work.