UNIVERSITY TRANSPORTATION CENTER
RESEARCH BRIEF

Assessment of Washington State Bridges for Post-Earthquake Mobility and Recover Planning

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Background

Many bridges in the western United States, including those built during the Interstate Highway Program in the 1950s and 1960s, are seismically vulnerable to strong ground motions. The seismic performance of many of these bridges is essential to post-earthquake mobility of nearly all transportation modes, as bridges are relied upon as critical lifelines into and out of urban centers after natural disasters. Damage to bridges near critical facilities, such as airports and ports, can also delay the post-event emergency response and mobility of people, freight, and supplies. Accordingly, local, state, and federal agencies are interested in estimating post-earthquake bridge functionality to plan for disaster mitigation, post-event response, and long-term recovery.

Current estimates for the post-earthquake bridge functionality in Washington following a Magnitude 9 (M9) Cascadia Subduction Zone (CSZ) earthquake are inadequate due to overly simplistic predictions of bridge response. The current estimate from the Department of Homeland Security (DHS) is that 80% of the bridges in western WA would be non-functional following an M9 earthquake, which is not believed to be accurate. The lack of utility provided by current post-earthquake evaluations stems, in large part, from the lack of available data about the characteristics of the Washington bridge inventory. Models that are developed from more accurate data about the characteristics of the bridge inventory would enable more reliable estimates of post-earthquake bridge functionality and would provide authorities with better data from which to make policy and planning decisions.

Research Project

Because the DHS (2019) study predicts such widespread and high levels of bridge damage, the response and recovery plan is heavily reliant on-air transportation to provide resources to the affected populations. However, surface transportation modes, if available, are better suited for moving large volumes of resources and serving as critical lifelines for impacted regions of the state. The goal of this study, along with another PacTrans collaborative proposal and two WSDOT research proposals, is to create an improved map of predicted non-functional, partially functional, and functional bridges that will assist in post-earthquake emergency planning.

This research will focus on modeling and determining the functionality of bridges along the routes that connect the support bases and staging areas to the main WSDOT critical lifeline corridor of I5/405. Much of WSDOT's research activities focus on the I5/405 lifeline but does not directly access the functionality of the routes connecting into it. Without these secondary routes, the post-earthquake mobility of the state will be drastically reduced, emergency management plans will be difficult to enact, and long-term recovery will be impaired. The focus of this particular study is on Washington, but it is envisioned that the proposed methodology will provide a framework for future implementation in Oregon, Alaska, and British Columbia.

ABOUT THE AUTHORS

The research team consisted of Adam Phillips and Chris Motter of Washington State University.

ABOUT THE FUNDERS

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EXPECTED DATE OF COMPLETION

August 2022

FOR MORE INFORMATION

http://depts.washington.edu/pactrans/research/projects/assessment-of-washington-state-bridges-for-post-earthquake-mobility-and-recover-planning/