



Research Project Summary

Prioritizing Regional Needs for Recovery Bridges through Post-earthquake Corridor Identification and System Fragility Assessment of the SF Region

PEER-Bridge 2024

Principal Investigator

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Research Team

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Start-End Dates:

6/1/2022-2/1/2025

Abstract

Recently adopted Seismic Design Criteria (SDC) 2.0 creates an optional seismic performance target that exceeds what is applied to Ordinary Standard Bridges (OSB), deemed a “Recovery Bridge (RB)”. Bridges designed to the more stringent criteria can be expected to remain undamaged in a modest earthquake (Functional Evaluation Earthquake, FEE) and incur only moderate damage in a severe design level event (Safety Evaluation Earthquake, SEE). This study will design a simple model that can be used to determine whether a bridge should be designed to an RB performance standard or an OSB performance standard from the perspective of the vulnerability of each bridge and their importance in the traffic network. The objective function of the proposed model is to evaluate the locations of the corridors that are used while the constraints ensure people in any place in the SF region can get access to critical facilities, such as hospitals, police stations, within the maximum allowable time. After obtaining the required corridors and considering the vulnerability of each bridge, these bridges are ranked, and the top-ranking bridges could be considered to be designed as RBs.

Deliverables



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We will deliver a spreadsheet containing the ranking of Caltrans corridors and bridges. Once the vulnerability of bridges is updated, Caltrans can use the spreadsheet to update the rankings of corridors and bridges. We will also deliver a PEER report and several conference and journal papers describing the research accomplishments made in this project.

Research Impact

The loss of accessibility due to damages/closures of the transportation network can greatly affect the rescue and recovery of a community after an earthquake. Transport asset managers need to know the route availability, traffic distribution, reduction in speed and reconstruction resources required under disaster scenarios, to evaluate the impacts and plan for relief measures. The aims of this project are to develop a framework to determine whether a bridge should be designed to an RB performance standard or an OSB performance standard and to deliver it to be used by Caltrans. Once the proposed framework for the SF Bay area is trialed in practice, it is possible to extend the work to other parts of California. The outcomes will also provide city-scale resilience planning for infrastructure planners.

Project Image

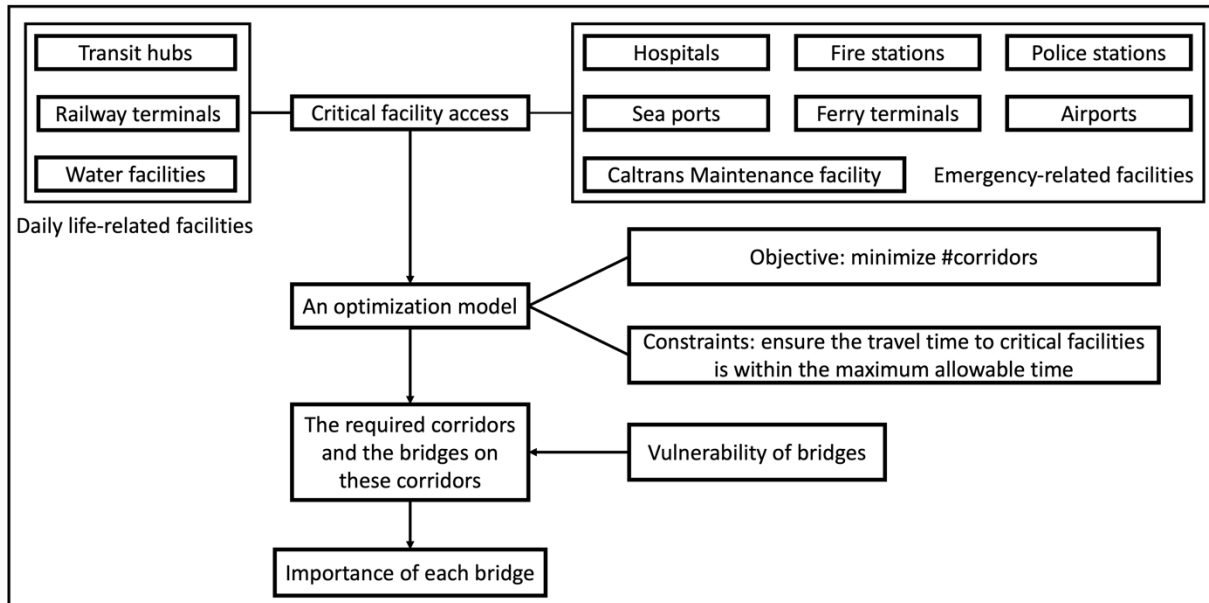


Figure: the framework of how to determine the importance of each bridge.