

Carquinez Strait Toll Bridge

Seismic Evaluation

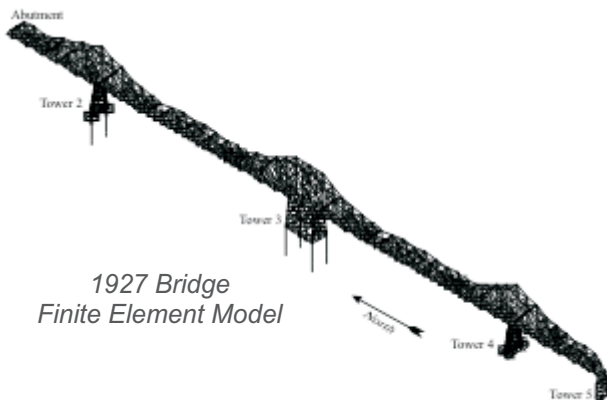
Location: Vallejo / Crockett, California

Owner: Caltrans

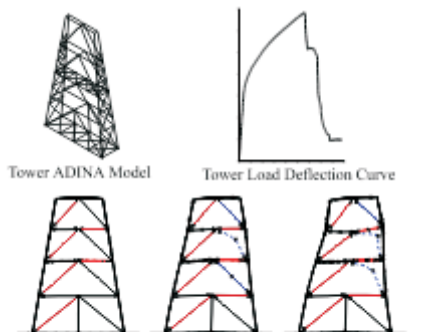
SC Solutions responsibilities included the creation of 3D finite element models of the 1927 (westbound) and the 1958 (eastbound) Carquinez Strait Toll Bridges. Analysis of the as-built and retrofitted strategy structures using the ADINA finite element program were conducted for static and seismic loads, including multi-support nonlinear time history analyses. Nonlinear effects simulated in these models included representation of viscous dampers, plastic hinging, buckling and post-buckling, pounding, and uplift through the use of dynamic contact surfaces. Nonlinear time history analyses with multiple support excitations was performed for several retrofit alternatives to determine the most cost effective, structurally sound retrofit configuration.



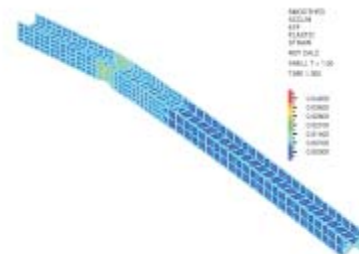
This project demonstrated that, through the use of nonlinear finite element analysis, problems related to large bridge structures subjected to strong ground motions could be mitigated efficiently and cost-effectively. The analytical team developed a thorough analysis methodology, which addressed critical issues in material and geometric nonlinear behavior for steel structures. Furthermore, the analysis team developed a rational set of criteria for evaluating levels of vulnerability and damage. Additionally, detailed finite element models were utilized to estimate response of various bridge components. Nonlinear pile-soil interaction analyses were performed to estimate the lateral displacement capacity.



1927 Bridge
Finite Element Model



Tower Pushover Collapse Sequence



H-Pile-Soil Lateral Load Analysis