

Devil's Slide Tunnel

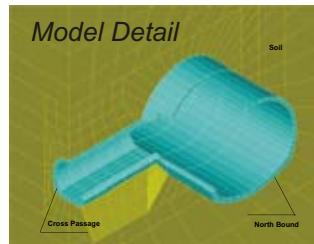
Seismic and Construction Sequence Analysis

Location: Montara, California

Owner: Caltrans

Devil's Slide Tunnel is a twin tunnel, to be constructed along US Route 1 in California for an estimated cost of \$190M. It is approximately 4,000 ft long portal-to-portal. The area is underlain by a faulted rock stratum, including the crystalline igneous rock of the Montara Granodiorite and sedimentary rocks of Cretaceous and Paleocene age. SC Solutions performed seismic analysis of the Devil's Slide Tunnel section to evaluate vulnerabilities of the concrete structure during the design seismic event. Additionally, excavation analysis was carried out to validate the design construction sequence process. Seismic evaluation was conducted using nonlinear time history analysis with multiple support excitations. Nonlinear effects simulated in these models included representation of the construction sequence, global geometric effects, and liner / soil interaction.

Specifically, effects of the seismic wave passage on the structural integrity of the tunnel were thoroughly examined.



The main tunnel liner, cross-passage, and the surrounding soil continuum were modeled using solid elements. These high-order elements characterized the bending behavior with a single element layer through the thickness. Connection between the liner and the soil mass was characterized by a series of tangential and longitudinal nonlinear springs with appropriate stiffness. The seismic loading was applied as displacement time history records at the boundaries of soil continuum model. Wave passage effects were considered. Results were computed and evaluated at each tunnel segment, as well as the tunnel to cross-passage connection.

