

# CALIFORNIA

## Role on California's earthquake retrofit task force continues

With new research following the Loma Prieta earthquake near San Francisco, California began a multi-billion dollar program in 1994 to "quake proof" approximately 2,200 bridges.

CH2M HILL, a member of the state's "Design Task Force," has designed seismic retrofits throughout California, including three San Francisco Bay Area bridges: I-880 Cypress Viaduct, I-280 China Basin Viaduct, and I-80 Carquinez Bridge. We've also been involved with managing construction.

Retrofit construction is now under way on the Carquinez Bridge, a half-hour's drive northeast of San Francisco above the East Bay.

Caltrans' goal was to strengthen the bridge to withstand an earthquake of magnitude 6.5 on the Franklin Fault with "no catastrophic failure or loss of life."

"We tested the very limits of the worst case scenario," said Chris Serroels, a member of the design team. "The number of variables was the most our structural analyst had ever evaluated."

More than 100,000 vehicles cross the bridge each day. The design could not lead to construction that would interfere with traffic, meaning the joints that secure the bridge's framework could not be rebuilt.

Instead, CH2M HILL came up with massive reinforcement joints or "lock-up devices" that support existing connections.

"The devices are the largest of their kind in the world," Serroels said. "They can withstand forces equivalent to thrust of the space shuttle. In other words, it could hold down the shuttle on take off."

The design team, led by John Hinman, traveled to Italy to have the lock-up joints constructed. "A lot of the technology we did on the Carquinez Bridge is just brand new. Partly because it's a retrofit and partly because it's so big, we wrote our own rules," Hinman said.

