



# THE SAN FRANCISCO-OAKLAND BAY BRIDGE SEISMIC SAFETY PROJECTS

CALTRANS

BAY AREA TOLL AUTHORITY

CALIFORNIA TRANSPORTATION COMMISSION

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## **PRESS RELEASE**

### **TOLL BRIDGE PROGRAM OVERSIGHT COMMITTEE APPROVES SUBSTITUTE FOR BROKEN RODS**

**Oakland, May 8, 2013** – The Toll Bridge Program Oversight Committee (TBPOC) today announced a plan to install large steel saddles over two seismic safety devices on the new East Span of the San Francisco-Oakland Bay Bridge after 32 high-strength anchor rods holding the devices in place broke. These devices, known as shear keys, are located beneath the eastern end of the Self-Anchored Suspension (SAS) portion of the new East Span. The fix will cost \$5 million to \$10 million. It is still being determined whether fabrication and installation of the saddles will affect the schedule to open the bridge by Labor Day weekend.

“Safety is not just job one on this project, it is the only job,” said Steve Heminger, Executive Director of the Bay Area Toll Authority and chair of the Toll Bridge Program Oversight Committee. “We share everyone’s frustration that after years of engineering innovation and difficult construction work, we face the possibility of further delay. But when this bridge opens to traffic, it will be safe.”

There are four shear keys beneath the road decks at the eastern end of the SAS and four other seismic devices known as bearings. The bearings allow the road decks to move slightly during an earthquake, while the shear keys prevent the decks from moving too much. The bearings and shear keys are bolted between the roadways above and a concrete cap beam below with high-strength steel anchor rods.

In March, when 96 rods were tightened to connect two shear keys, 32 broke. The 96 rods cannot be removed or replaced because they are directly under the decks and are embedded in concrete, so engineers explored solutions to bypass the rods altogether.

“The saddle will provide the equivalent clamping force as the original bolt design to hold down the shear keys,” said Andre Boutros, Executive Director of the California Transportation Commission. “We have selected the saddle as the retrofit strategy because while requiring more detailed fabrication, it will be less difficult to install and require less coring of the concrete cap beam.”

The saddle option was reviewed by the Toll Bridge Program’s Seismic Safety Peer Review Panel members Dr. Frieder Seible, Dean of the Jacobs School of Engineering at the University of California, San Diego and an expert in bridge design and strategies to mitigate earthquake damage in buildings and bridges; and Dr. John Fisher, professor emeritus of civil engineering at Lehigh University and director emeritus of the ATLSS Engineering Research Center, and an expert who has been investigating the effects of earthquakes on steel structures for the last four decades.

The TBPOC also released a letter sent by the committee to the Federal Highway Administration (FHWA), requesting the FHWA's assistance to conduct an independent review of the TBPOC's findings and recommendations related to high-strength bolts on the East Span.

"We welcome an independent review to make sure that the investigation was comprehensive and the solution is the best and safest possible decision," said Malcolm Dougherty, Director of the California Department of Transportation (Caltrans).

Caltrans and prime SAS contractor American Bridge/Fluor (Joint Venture) determined that the 96 failed anchor rods, fabricated in 2008, broke due to hydrogen embrittlement. Investigators found the 2008 rods were susceptible to hydrogen embrittlement due to a lack of uniformity - the outside of the rods was harder than the middle. The rods broke within days of being tightened, which is typical of hydrogen embrittlement. The TBPOC also released a detailed metallurgical testing and fracture analysis of the 2008 rods today.

An additional 192 anchor rods, fabricated in 2010, have been tightened since March and have shown no signs of failure. Although the rods remain sound, engineers are subjecting them to a battery of tests to confirm integrity. Preliminary test results indicate that these rods have more ductility and no evidence of internal hydrogen embrittlement. Additional testing will focus on surface hardness, microscopic examination and corrosion testing. Anchor bolts elsewhere on the bridge have been visually inspected and are performing as required. Anchor bolts at other locations are under significantly lower tension levels.

The TBPOC was created by the State Legislature in 2005 to provide project oversight and project control for the Toll Bridge Seismic Retrofit Program in California. The TBPOC is comprised of the Director of the Department of Transportation (Caltrans), the Executive Director of the Bay Area Toll Authority (BATA), and the Executive Director of the California Transportation Commission (CTC). The Committee's oversight and control activities include review and approval of contract bid documents, review and resolution of project issues, evaluation and approval of project change orders and claims, and the issuance of monthly and quarterly program progress reports.

For the latest information on Bay Bridge construction—including videos, fact sheets and public records regarding the ongoing investigation into the broken bolts—visit [BayBridgeInfo.org](http://BayBridgeInfo.org).

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