



TOLL BRIDGE PROGRAM OVERSIGHT COMMITTEE

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION

Just the Facts: Skyway Post Tensioning

In 2006, Caltrans was midway through installation of post-tensioning strands in the Skyway section of the new East Span. Post tensioning involves the installation of high strength steel tendons inside of concrete to provide concrete with additional strength. The strands are installed inside of ducts that are embedded in the concrete. Once installed, the strands are placed under tension to exert force on concrete box girders, and then the ducts are filled with grout to protect the strands from corrosion.

“Normal” practice requires tendons to be grouted shortly after tensioning. On the Skyway, which was dense with post-tensioning, and had tendons that ran through a large number of deck segments, grouting had to be delayed to allow for installation of a number of deck segments and tendons. The delay was required as grouting of one individual tendon could cross over to an adjacent empty duct. The only way to avoid this issue, known as “cross duct grouting” was to get all tendons installed and grouted in one large area at the same time, which meant some tendons remained ungrouted while all adjacent tendons were installed.

A special powder was applied to tendons, and entry points to ducts were sealed to provide protection after installation while waiting grouting. However, during a routine site inspection, rust stains were observed near post tensioning ducts, indicating that the protection was not performing as required, and an investigation was initiated to determine the status of steel tendons in the Skyway.

Caltrans utilized a bore scope at 4,328 access points to inspect 1,635 strands of the nearly 2,000 ungrouted strands. Tendon samples were also tested in a laboratory.

25 strands had developed moderate corrosion and retained more than 90% of their designed tensile strength. The remaining 1,610 strands had slight or no corrosion at all and retained all tensile strength. No strands were

severely corroded. Overall, given the extreme redundancy present in this element (and in the bridge as a whole) there remains more than sufficient capacity in the tendons to address both the life of the bridge as well as the next major earthquake.

Caltrans also tested the water in the ducts for compounds and factors that may facilitate corrosion. The chemistry of the water did not create an environment likely to drive aggressive corrosion.

Multiple public reports have been published on the issue—which arose and was resolved six years ago.

The Federal Highway Administration participated in the investigation along with other engineering experts.

Further Reading

Three reports chronicled the investigation, and are available to the public at <http://baybridgeinfo.org/quality-assurance>