



The remote Lokern Road Bridge

LOKERN ROAD BRIDGE REHABILITATION

Installed December 2001

Project Location: Lokern Road Bridge
– Intersection of Hwy 58 & Hwy 33,
Kern County, CA

Project Owner: State of California,
Department of Water Resources

Project Number: CN C51250

Engineer: State of California, Division
of Engineering. Leslie F. Harder, Jr. Chief
Engineer; Jim Peddy, Field Engineer

Contractor: Whitaker Contractors, Inc.

Producer: Southwest Ready Mix –
Buttonwillow, CA

CRACK-FREE BRIDGE DECK

Following is a brief history of the Lokern Road Bridge Rehabilitation project where Komponent® shrinkage-compensating cement additive (formerly known as Chem Comp) was used to minimize or eliminate drying shrinkage cracking.

Lokern Road is a county road that serves as a “shortcut” between State Highways 33 and 58 in Kern County, CA. The bridge, which crosses the California Aqueduct, is owned by the California Department of Water Resources (DWR). It had to be closed to through traffic in 2001 when a large hole (approximately 4 ft. x 5 ft.) was found in the deck. It is believed that the hole was caused by allegedly overloaded trucks carrying low-level hazardous waste to a landfill crossing the bridge at high speeds.

Inspection of the deck curing at a pre-bid meeting at the jobsite revealed a myriad of drying shrinkage cracks which appeared to follow the rebar in the deck.

In order to repair and strengthen the deck, DWR designed a 3-1/2” thick concrete overlay (4000 psi at 28 days) reinforced with No.4 rebar at 8” o.c. each way. To eliminate drying shrinkage cracking, the use of shrinkage-compensating concrete was specified.

The successful bidder, Whitaker Contractors, Inc., requested CTS Cement to develop a concrete mix design, based on a three-point curve, as well as to perform QC/QA at the batch plant and jobsite during the pour.

Trial batches were performed at a materials testing laboratory, Twining Laboratories of Southern California, in order to develop the three point curve, using Komponent expansive cement additive in conjunction with the local portland cement and aggregates proposed for this project.

PROJECT PROFILE

A mix was chosen based on a mix design that achieved 4000 psi at 14 days. (The project timeline did not allow for 28-day results to be obtained.) A restrained expansion of at least 0.05% at 7 days was required when tested in accordance with ASTM C878.

Because the total yardage was estimated to be only 64 cubic yards, and only one silo was available at the batch plant, Komponent was added manually from a tower platform at the batch plant. Bags were emptied directly into the mixer.

The mix design used 600 lbs. of portland cement, 110 lbs. of Komponent, sand, 3/8" and 3/4" rock, 42.5 gallons of water ($w/cm = 0.50$) and a superplasticizer. A w/cm of 0.50 and the use of a superplasticizer ensured sufficient water molecules were available for complete hydration of the Komponent cement additive and maximized workability of the concrete. (The principal compound in Komponent is a calcium sulfoaluminate, which requires 32 molecules of water for each molecule of calcium sulfoaluminate. Adequate water content is required to ensure complete hydration of Komponent and that the designed expansion is achieved.)

Prior to placement of the overlay rebar, the contractor shotblasted the existing deck, removing about 1/2" of concrete to effectively achieve a 4" thick overlay.

Concrete was placed by boom pump, one at each end of the deck. Placement started at 8am December 8, 2001. It was foggy and ambient temperatures were in the low 40s and rising — perfect weather for placing concrete!

Five truckloads were placed at the east end of the bridge, and four truckloads plus a cleanup load at the west end of the bridge, for a total of about 74 cubic yards. A DWR concrete technician performed a slump test on each truck. The first load had a 7-1/2" slump; succeeding loads ranged from a 4-1/2" to a 6" slump. The concrete from each truck experienced some slump loss during unloading but did not produce problems pumping, placing, vibrating, bullfloating or finishing. The technician also made test cylinders that were transported to Sacramento for testing.

A vibrating screed was used to consolidate and screed the concrete, along with a stinger vibrator to ensure encapsulation of the rebar. The concrete was bullfloated and given a light broom finish. Job specifications required a 14-day moist cure covered with burlene. Curing was completed as specified. The Contractor opted to leave the wet burlap in place for an additional two weeks due to scheduling of another project. (No additional water was added during this time.)

At the inspection eight weeks after installation, no cracks were found. During the inspection, a waste hauler crossed the bridge traveling at an estimated speed of 50 mph. The entire bridge shook and vibrated without a single crack being induced. At another inspection 20 months after installation and service, the deck was again found to be crack-free.



Lokern Road Bridge

For information on how Komponent can be used to provide a high-performance shrinkage-compensating concreting or grouting solution on your next project, contact a member of the CTS Cement Engineering Team at (800) 929-3030 or info@CTScement.com.