Kansas Department of Transportation

TECHNICAL SUMMARY

Long-Term Monitoring of a Pretensioned Concrete Bridge Near Winfield, Kansas

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Introduction

The following report is an expansion of previous work conducted at Kansas State University and published as FHWA-KS-07-1 in April 2007 (Larson, Peterman, & Esmaeily, 2007). It details the findings from the long-term monitoring of a five-span bridge that was constructed in 2005 on US Highway 160 in Cowley County just west of Winfield, KS. The bridge utilized Type K3 pretensioned concrete girders that were fabricated by Prestressed Concrete, Inc., in Newton, KS. The girders in three of the spans were manufactured with conventional concrete while the girders in the remaining two spans were manufactured with self-consolidating concrete.

Project Description

Seven of the girders used in the bridge were monitored to determine the time-dependent losses. This was done by using vibrating-wire strain gages that were embedded into the girders at the time of fabrication. Four of these instrumented girders contained conventional concrete, while three utilized self-consolidating concrete.

Mounted Solar Panel Powering the Data Logger

Project Results

The results show that, after 8 years of installation, the self-consolidating concrete girders had higher long-term prestress losses than the conventional concrete girders. However, the average long-term losses for each mixture were still less than the predicted amounts. A visual inspection revealed no obvious differences in the performance of these girders, such as possible cracking, crazing, increased camber or deflection, or discoloration. The monitoring system, which consisted of embedded vibrating-wire strain gages and a solar-powered data logger, proved to be an excellent option for determination of long-term losses in pretensioned concrete bridge girders.

A flexural analysis of a continuous line of girders along the bridge superstructure was then conducted to determine if it would be possible to detect any differences in the flexural response of the girders in spans containing self-consolidating concrete and those containing conventional concrete due to realistic truck loads that could be applied during a load test. This analysis found that the K3 girders and composite concrete deck used in this bridge have such a large stiffness (moment of inertia) that it would not be possible to produce meaningful strain differences in the vibrating-wire strain gages under foreseeable test loads. The load test was therefore deemed not to be warranted.

Project Information

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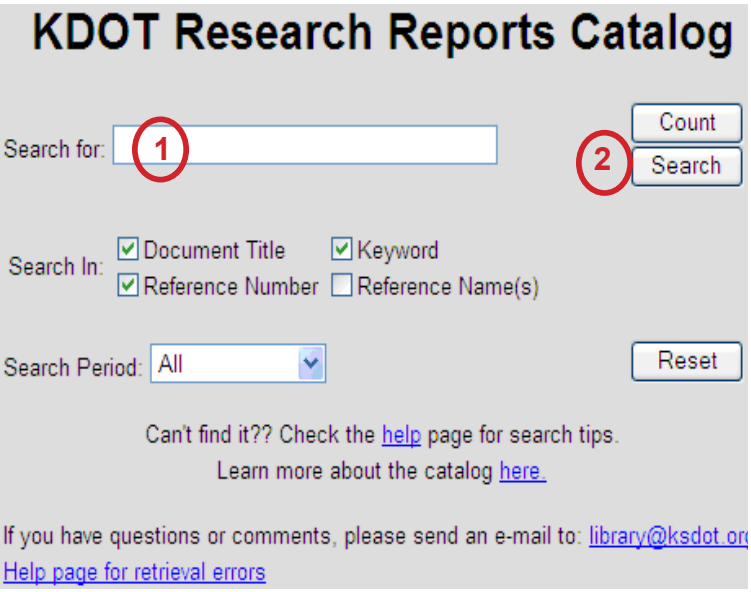

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