Kansas Department of Transportation

TECHNICAL SUMMARY

Improving Infrastructure Sustainability 2: Repairing Existing Fatigue Cracks in Steel Bridges Using Carbon Fiber Reinforced Polymer Materials

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Introduction

Distortion-induced fatigue affects a large number of bridges within the US highway system. This type of damage is commonly observed at connections between cross frames and steel girders. The differential displacement induced by bridge traffic induces forces in the cross frames that cause out-of-plane distortion of the web, inducing highly localized stresses at the welds that tie the connection plate used to attach the cross frame to the girder.

Girder Subassembly Being Tested at the Fatigue and Fracture Laboratory

Project Description

This report describes the results of an experimental program to evaluate the use of composite materials to prevent and repair distortion-induced fatigue damage in web-gap regions of steel girders. In this method of repair, a composite block is cast in place in the area surrounding the cross frame-to-girder connection to provide an alternate load path and reduce the stress demands in the welds of the connection.

Two full-depth bridge girders were subjected to dynamic loading under a constant force range and allowed to develop fatigue cracks. The girders were subsequently repaired using composite blocks and subjected to several million fatigue cycles.

Project Results

Test results showed that the repair method was effective in halting the propagation of fatigue cracks in the bridge girders, and that it was particularly effective when anchor bolts were attached to the girder flange.

Project Information

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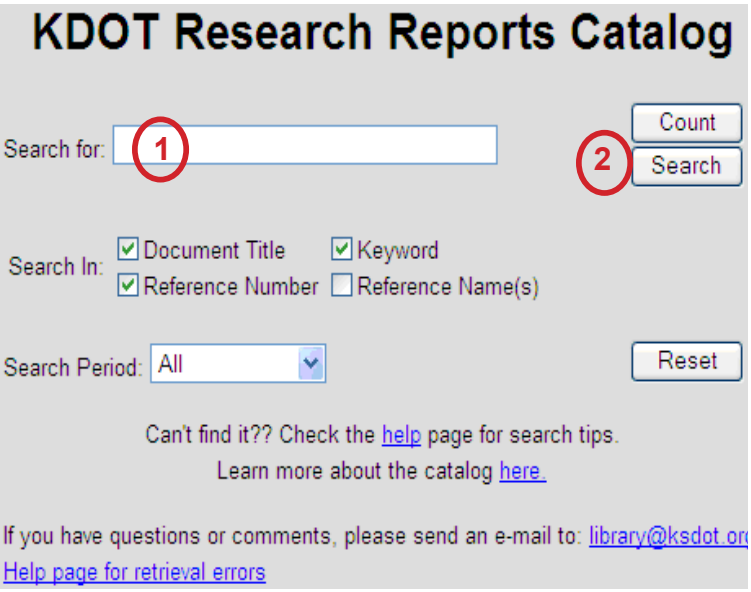

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