KANSAS DEPARTMENT OF TRANSPORTATION

RESEARCH

POST RETROFIT ANALYSIS OF THE TUTTLE CREEK BRIDGE

Report Number: K-TRAN: KU-06-2

By: Benjamin Anderson, Stanley T. Rolfe, Ph.D., P.E., Adolfo B. Matamoros, Ph.D., Caroline Bennett, Ph.D., Santiago Benetti
The University of Kansas, Lawrence, Kansas

Introduction

The Tuttle Creek Bridge was built in 1962. Like many older welded steel bridges, it has developed fatigue cracks. The majority of cracks were forming in the upper web-gap region. In addition, fatigue cracking was occurring along gusset plates in the structure. A retrofit was performed in 1986 to prevent further fatigue cracking. Unfortunately, the cracks propagated after the retrofit. The purpose of this report is to present results of the post-retrofit test with data from the pre-retrofit test. Comparisons of stresses for each key area are included in the report. Details of the Tuttle Creek Bridge and testing procedure are provided.

Project Description

Finite Element Models (FEM) were created at the University of Kansas to investigate the continued fatigue cracking. The models supplied a more effective retrofit procedure that included attaching the connection stiffener to the upper flange of the girder.

Two tests were planned to determine the effectiveness of the retrofit. The first field test occurred before the repair was started. Its purpose was to provide stress values in key areas for comparison after the repair. In addition, the pre-retrofit test provided information for future finite element models. In 2005, the second retrofit was completed.

Project Results

Although stress concentrations were localized at the tip of the stiffener in both cases, the maximum stress decreased after the repair. the side of the girder web opposite to the stiffener, stress concentrations were found right at the tip of the stiffener. However, the area over which these stress concentrations were present was very small. The implementation of the proposed repair did reduce the size of the region affected by stress concentrations. The FEM indicate that stress gradients at the sides of the model, near the tip of the stiffener, were eliminated by the repair. After the repair, stresses propagated from the tip of the stiffener over a larger area along the stiffener. Also the stress distribution after the repair shows a much more gradual gradient.

Report Information

For technical information on this report, please contact: Stanley T. Rolfe, The University of Kansas, 1530 W. 15th Street, Lawrence, Kansas 66045-7609; Phone: 785-864-3767; fax: 785-864-5631; e-mail: srolfe@ku.edu, **or** Adolfo B. Matamoros, The University of Kansas, 1530 W. 15th Street, Lawrence, Kansas 66045-7609; Phone: 785-864-3761; fax: 785-864-5631; e-mail: amatamor@ku.edu.

For a copy of the full report, please contact: KDOT Library; 700 SW Harrison Street, Topeka, Kansas 66603-3754; Phone: 785-291-3854; Fax: 785-291-3717; e-mail: library@ksdot.org.