Kansas Department of Transportation Column Expert: Shear Capacity of Circular Bridge Piers Confined with Fiber-Reinforced Polymer (FRP) Wrapping

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Introduction

The importance of the analysis of circular columns to accurately predict their ultimate confined (steel and fiber-reinforced polymer [FRP]) capacity under shear-flexure-axial force interaction domain is recognized in light of the extreme load event imposed by the current *AASHTO LRFD Bridge Design Specifications*.

Project Description

In this study, various procedures for computing the shear strength are reviewed. A formulation conforming to AASHTO (2014) *LRFD Bridge Design Specifications*, based on the Simplified Modified Compression Field Theory, is developed to predict the axial force-shear-moment interaction diagrams of circular confined concrete bridge pier sections reinforced with FRP. Comparisons with a large database of experiments indicate the accuracy of the resulting diagrams.
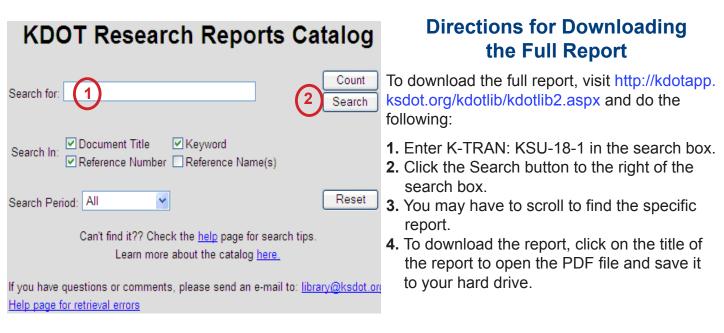
Project Results

Transverse steel area, spacing, cross section diameter, and applied axial force are the main keys to analyze and increase the shear capacity of the cross section. Treating the cracked concrete as a new different material proved to be a beneficial approach to predict the sections' capacities and behaviors.

Using transverse reinforcement of FRP shows a significant improvement for axial force-bending moment and shear force capacities. The reader is also directed to use KDOT Column Expert for more accurate prediction of the interaction diagrams.

Project Information

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