

ABSTRACT

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Title: A Review of FRP Repair and Strengthening Methods for Application to Indiana Bridges

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According to the most recent ASCE Infrastructure Report Card, many of the bridges in the United States are approaching the end of their design lives. For these bridges, reparative action needs to be taken to ensure the structural performance is adequate for the demand imposed. If repair or rehabilitation is not feasible, then replacement of a component or structure is necessary. To avoid the costly process of component or system replacement, methods of rehabilitation have been established using conventional materials and procedures. Although these industry-proven methods are useful, many of the procedures have issues with long-term performance and constructability. An alternative method of bridge repair and strengthening using fiber reinforced polymers (FRP) has become a popular option. The use of FRP can effectively rehabilitate a structurally deficient bridge for many scenarios of damage and degradation.

Recognizing the potential benefits of the wide-spread use of FRP, a research project was initiated to determine the applicability of FRP application in Indiana. Using the current body of knowledge of FRP applications from Departments of Transportation across the United States, damage scenarios were determined along with the methods of application of FRP systems for proper repair and/or strengthening. Aspects such as flexural strengthening, shear strengthening, and column confinement were explored for superstructure and substructure repairs. Durability, anchorage, quality assurance-quality control, and design and application were other topics that were investigated for bridge elements in need of repair or strengthening. Following the literature review, a series of case studies was initiated to investigate the bridges in Indiana that have already received FRP repairs. The purpose of these case studies was to develop a timeline of structural issues each bridge had experienced prior to the repair, ascertain how and why the repairs were employed for each structure, and determine common issues found with each of the repairs. The information gathered from the case studies were used to generate recommendations for INDOT to improve FRP repairs in the future. Finally, industry surveys were distributed to neighboring Midwestern DOTs and engineers within Indiana to gauge the current level of

knowledge and usage of FRP. These surveys helped the research team target gaps in knowledge and accurately determine how designers can more effectively use FRP in Indiana.