Fact Sheet

COMPOSITE BRIDGE DECKS FOR HIGHWAYS

PROBLEM

According to the Federal Highway Administration (FHWA), approximately one-third of the nation's bridges are structurally deficient. Corrosion of steel components is a major distress generator. When steel reinforcement corrodes in concrete, it loses strength and expands. The corrosion expansion can crack and split reinforced concrete elements. If the problem is allowed to progress in highway bridge decks, it can pose a fatal safety risk.

In cold regions, the use of deicing salts accelerates corrosion. Repair of corrosion-damaged structures is expensive and disruptive. Every time a vehicle travels over a bridge, a cycle of load–unload occurs. Large numbers of load–unload cycles weaken bridge decks through a process called fatigue. At low temperatures, materials such as steel lose ductility. Instead of ductile failure, a corrosion-weakened bridge deck could fail suddenly without warning. The fatigue behavior of bridge deck systems needs to be defined to produce reliable structural designs.

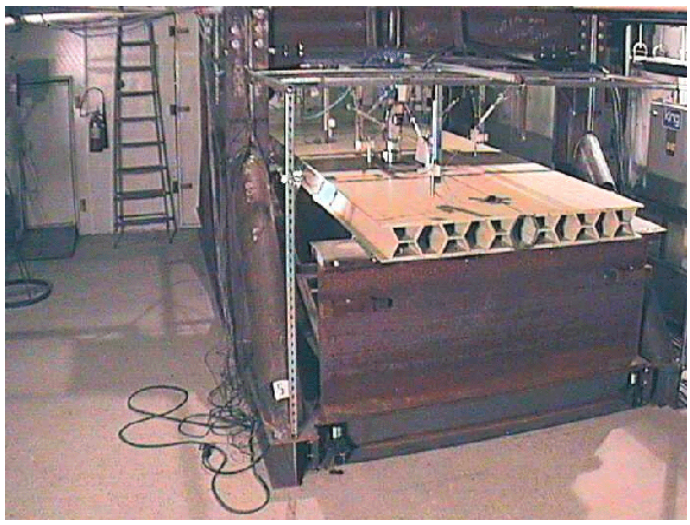
SOLUTION

Fiber-reinforced polymer (FRP) deck systems are a viable alternative to conventional steel-reinforced concrete bridge decks. FRP deck systems eliminate the corrosion problem because they do not contain steel. However, the fatigue characteristics of these new systems need to be defined for the range of climatic conditions where these decks will function.

FRP deck systems offer significant advantages over their conventional counterparts. They provide high strength, high stiffness-to-weight ratio, and high strength-to-weight ratio. Their light weight reduces transportation costs, and they are highly resistant to environmental effects. It is anticipated that these deck systems will result in lower capital and lower life-cycle costs.

RESULTS

The fatigue evaluation of several FRP deck systems is ongoing at the Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, New Hampshire. This work is being conducted in cooperation with the University of Maine, University of Cincinnati, Ohio University, University of Kentucky, and the Ohio Department of Transportation. The initial data indicate that these systems demonstrate good fatigue behavior across a wide range of temperatures. Final results will be published as soon as the experimental work is completed.



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