

An Analytical Study of FRP-Concrete Bridge Superstructures

Authors : Wael I. Alnahhal

Abstract : It is a major challenge to build a bridge superstructure that has long-term durability and low maintenance requirements. A solution to this challenge may be to use new materials or to implement new structural systems. Fiber reinforced polymer (FRP) composites have continued to play an important role in solving some of persistent problems in infrastructure applications because of its high specific strength, light weight, and durability. In this study, the concept of the hybrid FRP-concrete structural systems is applied to a bridge superstructure. The hybrid FRP-concrete bridge superstructure is intended to have durable, structurally sound, and cost effective hybrid system that will take full advantage of the inherent properties of both FRP materials and concrete. In this study, two hybrid FRP-concrete bridge systems were investigated. The first system consists of trapezoidal cell units forming a bridge superstructure. The second one is formed by arch cells. The two systems rely on using cellular components to form the core of the bridge superstructure, and an outer shell to wrap around those cells to form the integral unit of the bridge. Both systems were investigated analytically by using finite element (FE) analysis. From the rigorous FE studies, it was concluded that first system is more efficient than the second.

Keywords : bridge superstructure, hybrid system, fiber reinforced polymer, finite element analysis

Conference Title : ICCIUE 2015 : International Conference on Civil, Infrastructure and Urban Engineering

Conference Location : Vancouver, Canada

Conference Dates : August 06-07, 2015