# Composite Bridge Decking for Moveable Bridges

Highways for LIFE Partnerships 2010 Award $460,305

U.S. Department of Transportation
Federal Highway Administration
HIGHWAYS FOR LIFE
Accelerating Innovation for the American Driving Experience.

## Project Status

The project is in Phase I, which consists of an iterative process of analyzing, testing and evaluating various deck sub-components that will be used to optimize the design. A finite element model is being created and prototypes of the deck section have been made. A 40' long proof-of-concept installation will be done in the spring of 2012 in Bolivar, Allegany County, NY to demonstrate that connection detailing suits the needs of a typical bridge owner.

## Need for Innovation

Bridge owners use lightweight bridge decks to reduce the energy and mechanical system requirements needed to raise or swing a moveable bridge. For rehabilitations, a light deck is often needed because the bridge was not originally designed to carry the weight of a concrete deck and in some cases, reducing dead load can allow an increase in live load capacity. For a new bridge, a lightweight deck can help reduce the cost of the foundation, especially when soil conditions are poor. Currently available options such as steel grate decks have a short service life because they are prone to corrosion.

## Project Overview

Composite materials hold great promise because of their high strength to weight ratio and resistance to corrosion but the initial cost and some problems with the wearing surface have deterred widespread use. This project will refine the materials and fabrication methods used to produce a fiber reinforced polymer (FRP) composite bridge deck that was developed by the University at Buffalo for New York State Department of Transportation.

## Contact Information


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## Project Team

BridgeComposites, LLC; Allegany County, NY, Integrated Materials and Applied Computing, Inc., LeTourneau University, Penn State University, XC Associates, Inc.

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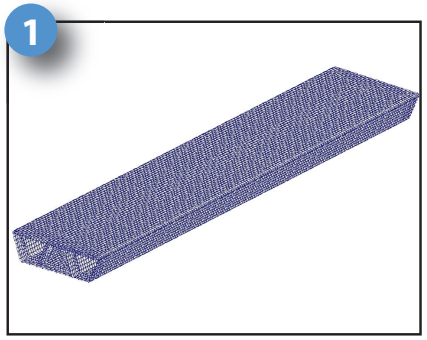

**Finite Element Analysis**
The deck design is being optimized by FEA using a model with 31,857 nodes and 38,892 elements..

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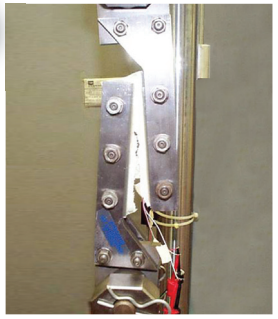

**Laminate Coupon Testing**
Various material specimens are being tested in tension, compression, and shear.

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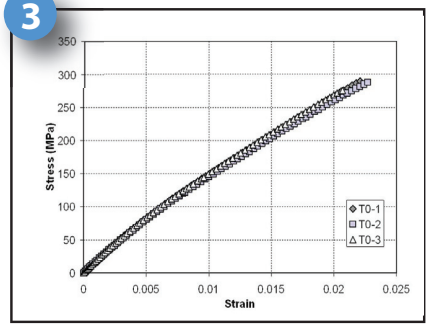


**Evaluation of Material Options**
Material alternatives will be evaluated to determine the best fiber architecture to use for the deck.

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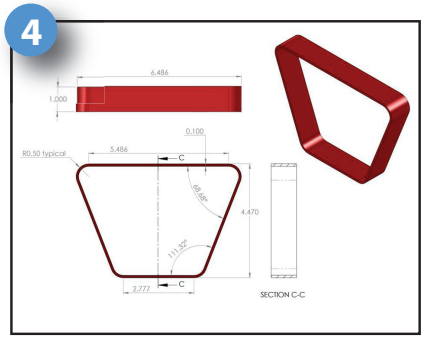


**Prototype**
Tube subcomponents were generated on a 3D printer from a Solid Works model.

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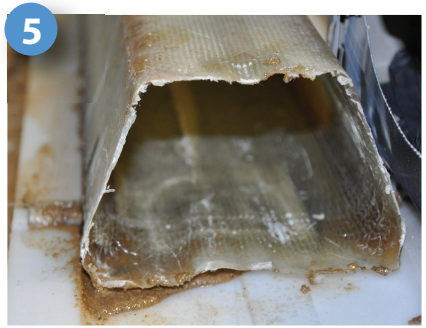

**Subcomponent Qualification**
Full scale tube subcomponents are being fabricated and tested to verify that the desired properties are obtainable during production.

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**Fabrication**
Tubes and deck panels will be made using a combination of fabrication processes to compare efficiency of production.

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**Panel Testing**
3'x10' test panels will be made using several different tube subcomponents, then tested in flexure, shear, and bearing.

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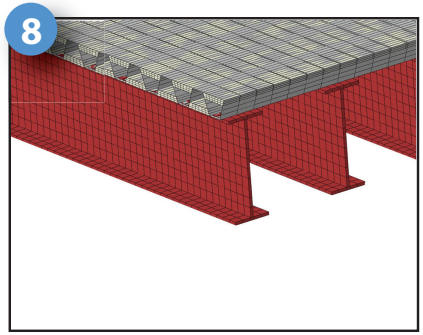

**3D Analysis**
The full system (deck installed on steel stringers) is being modeled and the global and local deflection will be checked prior to installation.