

Fiberglass Bridge Design

Design Analysis

Location: Butler County, Ohio

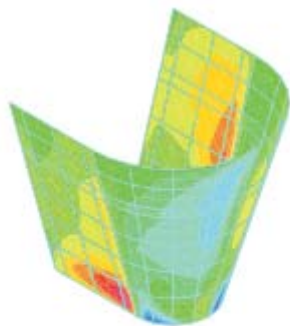
Owner: Ohio DOT

In conjunction with Martin Marietta Materials, SC Solutions engineers performed design analysis of a 100% fiberglass bridge which was installed in Butler County, OH. This 30 ft. span bridge was designed for two lane loading of HS20 trucks. The global analytical model consisted of orthotropic layered shells representing the support beams, and layered shells in a sandwich structure around an equivalent core representing the deck. Detailed models of the deck were used to evaluate local stresses. Analyses included stresses and deformations due to dead load, live load, thermal gradients, and guard rail loads (accident impact). Shear buckling of the support beams was also examined and stresses in all bond lines (factory and field joints) were also checked.

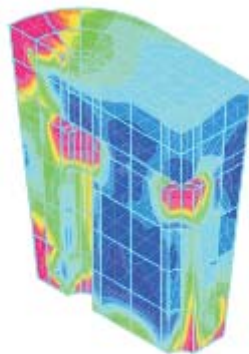
The entire bridge was fabricated in Hayward, CA, and transported to the site on a single truck. Installation was accomplished in a few hours. Extensive testing of the bridge was conducted after installation, using overloaded trucks and measuring deflections and strains in the material. All results were within a few percent of the analytical predictions.



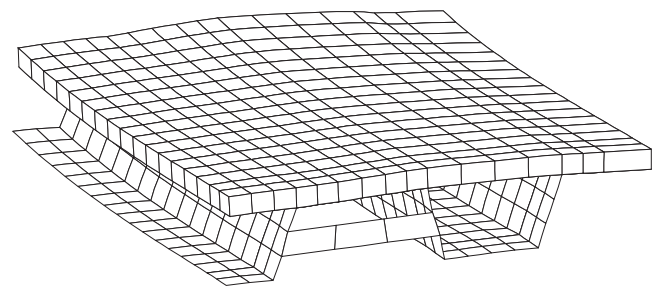
After successful completion of the new bridge, the concrete deck of another existing bridge was replaced with a new fiberglass deck, using the existing steel support beams, with standard studs providing the shear connection. The studs protruded from the beams through pre-drilled holes in the deck. SC Solutions was asked to determine if it would be necessary to reinforce the pre-drilled holes with fiberglass inserts and grout. Through analysis, SC Solutions was able to clearly show that the joint and the stud would fail without the fiberglass insert.



Insert Model



Stress in Grout Model



Deformed Symmetric Analytical Model Under Maximum Live Load