

- **Owner:**  
PennDOT District 12-0
- **Client:**  
Energy Client
- **Services:**
  - Bridge Strengthening
  - Inspection
- **Materials:**  
Fiber Reinforced Polymer
- **Year Completed:**  
Design: 2016  
Construction: 2016



# SR 3016 Bridge Strengthening



## Energy Client, Greene County, PA

Using advanced materials, Stahl Sheaffer strengthened PennDOT's bridge on SR 3016 in Greene County while keeping the trucks running for our client. Fiber Reinforced Polymer (FRP) technology installed at the bridge's beam ends strengthened the existing concrete by adding shear capacity for the client's special load conditions.

In early 2016, Stahl Sheaffer was asked to assess construction routes for planned or developing well sites in Aleppo Township. One route involved a concrete T-beam bridge over the South Fork of Wheeling Creek. Initial ratings of the existing bridge showed it could support legal truck traffic but was not capable of carrying the shear loading from the client's heaviest special hauling vehicles, with the interior beams found to be below capacity. Several alternatives were originally considered, including the construction of corbels to extend the beam seats, strengthening from above using a strong-back beam system, individual beam strengthening using a polymer/fiber wrap, and superstructure replacement. Each option was assessed for drawbacks such as constricting the hydraulic opening, creating roadside obstacles, or excessive cost. Once fully evaluated, the Fiber Reinforced Polymer (FRP) retrofit was determined to be the most advantageous, especially considering it was significantly less expensive than the lowest replacement estimate, coming in at \$107,500 including design, permits, traffic control, and the complete cost of installation (which is approximately 60% less than a new concrete beam superstructure).

To advance the FRP method, Stahl Sheaffer expanded collaboration on the project by bringing on a design-builder out of Carnegie, PA on the team. Stahl Sheaffer was able to develop a set of design plans that met PennDOT's approval. Design calculations followed AASHTO's 2012 Guide Specifications for Design of Bonded FRP Systems for Repair. U-wrap

FRP strengthening was designed to increase the shear capacity of the existing girders by 35 kips using V-wrap C200 unidirectional carbon sheets and V-wrap 700 epoxy adhesive. At the intersection between girders and diaphragms, strengthening was achieved by using an L-wrap configuration.

The design-builder supplied all material, safety, installation, and quality documentation leading up to the construction phase in October 2016. Their crew worked for six days, completing the installation in under a week. Access was gained by temporary scaffolding bolted to the abutment walls. Following AASHTO and the design-builder's quality plan, pull-off tests were performed in the field to ensure adhesion, and witness panels were tested in the lab to

ensure resin saturation had taken place and environmental conditions were conducive to proper curing. Stahl Sheaffer and PennDOT supplied full-time inspection on the job.

