

# CARBON FIBER BRIDGE STRENGTHENING

JASPER, INDIANA



## A permanent repair solution

For over a decade LAN Construction has been utilizing carbon fiber on a vast array of projects from residential foundation repair to civil infrastructure.

Looking for opportunities to utilize these materials to assist his county with the maintenance and preservation of their structures, owner Luke Nordoff, turned to the Dubois County Engineer to start the conversation regarding the uses and benefits of carbon fiber.

The engineer had been monitoring cracking on the pier caps of the County maintained bridge that spans the Patoka River in Jasper Indiana. The discussion regarding the utilization of CFRP as a solution to repair the piers began two years prior to LAN Construction being selected as the low bidder on the publicly advertised project.

## Carbon Fiber is bridging the gap on America's aging infrastructure.

## A pressing concern for many local governments across the US.

According to the American Road and Transportation Builders Association, there is an estimated 230,000 U.S bridges in need of repair, 46,000 of those deemed "Structurally Deficient" and in Poor Condition.

Dubois County was one of the many counties across North America to turn to carbon fiber as a permanent means to preserve its critical infrastructure.

The County enlisted the services of Bulter Fairman & Amp; Seufert Civil Engineers Engineering out of Indianapolis, IN to assist in the design of the repairs on this project. After a full investigation of the pier caps it was determined that the lap lengths of the horizontal steel in the cap were not sufficient to withstand the loading on the cantilever sections of the pier caps.



# CARBON FIBER STRENGTHENING SYSTEMS

The project not only consisted of the full encapsulation of the pier caps but as many projects of this type, required a full Indiana PE stamped design and required approvals of the contractor installing the material as well as the material supplier. Witness panels had to be made on each of the days that the material was installed as a method to verify that the required system strengths were met. These panels were broken at a third-party laboratory in order to verify the specified design strength.



Epoxy injection was utilized to fill the vertical cracks using the SRS-1000 Structural Epoxy Resin in conjunction with the SRS-2000 Structural Epoxy Paste to seal the cracks and set the injection ports.

Carbon Fiber fabric is easily tailored to fit any geometry and once the epoxy bonding component is cured, becomes an integral part of the structural element, acting as an externally bonded reinforcing system.



While carbon fiber is resilient to almost all environmental conditions, the epoxy that saturates and bonds the fabric to the concrete substrate requires protection from long term exposure to the sun's ultra violet rays.

To overcome this, UV inhibitors formulated into the epoxy are used to decrease the rate of UV degradation to the system. However, additional protection is needed in conditions that present long term exposure to the sun's powerful rays. Once both pier caps were encapsulated in the composite strengthening system the entire installation was coated with an elastomeric stucco from Sherwin Williams.

Authorities across North America have recognized many aging structures as structurally deficient by today's standards. Due to the vast amount of aging structures, structural strengthening has become an essential requirement to maintain this infrastructure. Carbon Fiber Reinforced Polymer (CFRP) strengthening techniques have been established as a preferred strengthening method as they provide excellent structural results, quick installation times, and economical solutions when compared to the other techniques.



Structural Reinforcement Solutions supported LAN Construction throughout the entire project, providing the materials, engineering, and on-site assistance to help make this complete project a success.

Learn more at [Structuralrs.com](http://Structuralrs.com)

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