

District 6 News

Beaufort, Berkeley, Charleston, Colleton, Dorchester and Jasper counties

District Engineer: **Tim Henderson** (843) 740-1665
FAX: (843) 740-1663

District 6 crews continue to evolve with bridge needs

By Kevin Turner

District 6 is adapting operations to rehabilitate existing structures to prevent, or remove, the resulting load postings.

Closing bridges, or reducing the load allowed, has a significant impact on daily commutes, commerce and emergency services. Essential public services such as school buses and trash collection can be disrupted by bridge weight restrictions.

That rehabilitation strategy, which involved replacing deck slabs with a more modern design, was specifically targeted at addressing an aging structure type that was constructed, largely by in-house maintenance crews, in the 1950's, 60's and 70's. This bridge type accounts for nearly one third of all bridges in District 6.

That strategy was also specifically intended to be more cost than complete replacement yet still address structures that had significant deterioration or damage.

Many bridges were suggested for load posting without the obvious cracks, spalls or other indications of capacity reductions. Many bridges were discovered to be in relatively good condition for their age. Despite the fact they remained functional for the level of service they experience on a day-to-day basis, analytical load ratings exposed that they were never intended to support the size and volume of modern day truck traffic.

Even though previous rehabilitation methods were fast, effective and cost considerably less than a full bridge replacement, District 6 engineers desired to further leverage the remaining service life by adding more "tools to the toolbox." The end result employs an external strengthening method using cutting edge carbon fiber products, which is a technology commonly used in airplanes, racecars and high-end athletic equipment.

The specific application used was a series of 4-inch wide strips measuring only a couple of millimeters thick. They are ultra-lightweight, durable and capable of adding significant strength to existing structural elements.



Carbon fiber strips applied underneath certain bridges can fix weight load restrictions.

We need to provide proof of concept prior to field operations before using this new product. We had to work in and around field obstructions with materials that only remain workable for 15 minutes. We had plan an execution that was manageable or all efforts would be wasted.

SCDOT worked with manufacturer representatives to erect a test slab to simulate actual field conditions in the yard requiring us to work overhead on actual bridge elements that would represent a "worst case" level of structural deterioration. If we could be successful in a mock, worst case scenario on our first attempt we would feel confident we could be successful on an in-service bridge.

The manufacturer's representative approved our work and certified the Specialized Bridge Crew as official installers of their product. The slab was shipped to Clemson University to be fatigue tested to better define our expected strength gains.

The first field application was a high-volume, two-lane secondary highway in Berkeley County. Recent weight restrictions made a local fire station detour several miles to reach hundreds of homes that would otherwise be less than one mile away. Every second counts during emergency response and fire response times can impact home own-

er's insurance rates.

To strengthen the bridge, the concrete surface was first prepared by grinding and removing surface irregularities and widespread contaminants and applying cleaning solvents. Carbon fiber strips were then cut to size and cleaned with similar solvents. A two-part epoxy, specifically designed for structural strengthen, was then applied to the concrete

Meet Tyler Ward



Tyler Ward, left, poses with his family. From left: Tyler Ward, Isla, Aly and Everett.

Got news?

Contact Debra Jerideau :
 843-834-9034 or
 by emailing her at
 JerideauDJ@scdot.org



Debra Jerideau

surface and to the carbon fiber with a custom built die box. Finally the strips were adhered to the concrete surface and protected from vibrations or other external forces until initial set had been achieved. Since the procedure utilizes ultra-light materials, conventional equipment, and has relatively few procedural steps, it has proven to be efficient and relatively non-disruptive to the public. A crew of five to seven employees can strengthen a bridge span in one to two days.

The finished project was again rated by structural engineers who determined the structure no longer required posting and the adjacent 78,000 lb. fire truck could safely traverse the structure. The numerical analysis was substantiated by field load testing which was performed before and after the strengthening work.

Not only was the in-house work successful it was capable of being performed under routine lane closures which greatly minimized the impact to commuters.

District 6 intends to strengthen many more bridges in this manner, including those on primary routes, in order to remove weight restrictions.

Tyler Ward is the Assistant Resident Maintenance Engineer at Colleton Maintenance.

He was born and raised in Galax, VA, where he started his career with a Virginia Department of Transportation maintenance contract. In spring 2018, he became a crew leader at SCDOT at Beaufort Maintenance. He was promoted to his new position at Colleton Maintenance earlier this year.

Ward earned a Master of Science in Civil Engineering from NJIT in May 2021.

In his spare time, he likes spending time with family exploring all that the Lowcountry, lakes and the mountains in the upstate have to offer.