It's All About Making The Right Connections

By Kurt Heidenreich, P.E., S.E.

Engineering Resources, Inc. was an Award winner for The Ron Venderly Family Bridge project in the 2010 NCSEA Annual Excellence in Structural Engineering awards program (Category – New Bridge and Transportation Structures)

Courtesy of James Whitcraft (IPFW).

Indiana University – Purdue University at Fort Wayne (IPFW) is a growing regional campus. For many years they were faced with the problem of access to an underutilized property on the west side. The St. Joseph River, separating the main campus from this area, was a challenging barrier. IPFW wanted a low-maintenance, but attractive, structure to connect the two properties. A cable-stayed option was selected, not only for aesthetics and maintenance benefits, but also for constructability.

The location of the pylons, abutment anchors and cable-stays were arranged to facilitate sequential, cantilevered construction from each side of the river. This allowed all of the substructure elements to be constructed on the river banks. The bridge provides a clear span over the main river channel, with approximately 8 feet of freeboard at center span during a 100 year flood event. This allows emergency river travel and continued pedestrian access during flooding. With the clear span, any debris that collects on the substructure can be removed from the stream bank after the water recedes.

To accommodate the physical plant's maintenance vehicles crossing the structure while it is in use by pedestrians and bicyclists, a 10-foot clear walkway width was provided. The bridge has a main span of 385 feet with two 40-foot end spans, for a total span length of 465 feet. With the end anchors, the total bridge length is over 555 feet. The 115-foot pylons were constructed of induction curved, 36-inch diameter pipe, with a ¾-inch wall thickness. During fabrication, all of the components were match-mated in the shop to ensure an exact fit for the field connections.

Due to the cable arrangement, the main span is torsionally flexible. This created the potential for the bridge to be unstable in certain wind conditions. The solution involved installing bent plates, also known as wind fairings, along the exterior face of the longitudinal girders. The fairings serve to increase the width/depth ratio of the cross section and provide a streamlined edge. RWDI, of Ontario, was consulted to complete a sectional wind tunnel test to verify the performance of the proposed solution. The structure performance was verified for catastrophic events as well as user comfort. In addition to solving the wind dynamic issue, the wind fairings serve as covers to enclose the electrical and telecommunications systems running along the bridge. Stainless steel was used for the wind fairings and cable socket covers to provide a maintenance-free and aesthetic material. All of the cable-stay strands and the hand railing were hot-dip galvanized for corrosion protection. In addition, the bridge was designed to facilitate removal of any single strand, for replacement, without requiring structure shoring.

The contractor worked with the steel fabricator, located about 8 miles from the site, to fabricate and assemble each 70-foot framing segment in the shop. Each assembly was shop painted, transported and installed as a single piece. Each segment was field bolted to the previous cantilevered segment using end plate connections. This greatly improved the erection process and allowed for a shop controlled three coat paint system with only field touch up. The center segment was designed one inch shorter than required, so it could be shimmed in place, to allow for construction tolerances. Since the project was constructed in multiple cantilevered phases, the anticipated structure deflections for each phase were provided on the plans. Construction engineers used the information to set pre-pour elevations and pylon tilt. During construction, the design team worked closely with the contractor to monitor the structure's response to ensure proper performance. A special hydraulic jacking system was developed to allow adjustment at each cable stay. The hydraulic system had the ability to uniformly adjust adjacent strands or operate independently at a single strand location. A similar system can also be used in the future when individual strand replacement is required.

The bridge was named in honor of Ron Venderly, a local entrepreneur, for his financial donation. The donor's decision to contribute was largely based on the aesthetic appearance of the bridge. The Ron Venderly Family Bridge is also a key link to the Fort Wayne river greenway system. This link is critical to connecting the downtown trails to the northeast park system. Shortly after the bridge opened, IPFW created an annual celebration, "Riverfest," for area residents, with the bridge serving as the focal point. The summer event was created to reconnect the public with the local rivers, which are the reason for the City's location. The bridge connects the campus to the community in many ways, and creates a much needed link for campus grounds. While it provides numerous functional benefits, it has also become a new landmark for the City of Fort Wayne.▪

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