I-280 Veterans' Glass City Skyway

A Proud Display of a Community's Vision

By Daniel Meyer, P.E. and Denney Pate, P.E.

Figg Bridge Engineering, Inc. was awarded an Outstanding Project Award in the 2008 NCSEA Annual Excellence in Structural Engineering program (*Category – Bridges and Transportation Structures*).

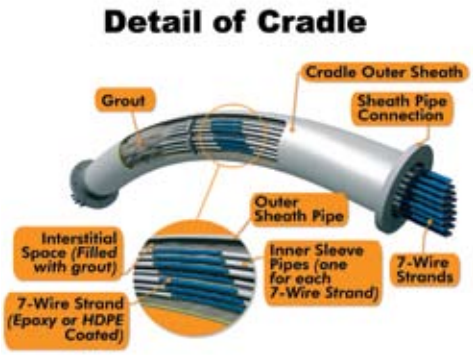
Toledo, Ohio's I-280 Veterans' Glass City Skyway opened to traffic on June 24, 2007, realizing the community's vision and hope for over 20 years. The Ohio Department of Transportation's (ODOT) new high-level signature cable-stay bridge carries interstate traffic previously routed across the Craig Memorial Bridge, one of the last remaining movable bridges in the interstate system, to ease congestion through the city while maintaining the shipping corridor to the Port of Toledo.

The entire $237 Million project encompasses 2.75 miles of ramps, roadway and cable-stayed bridge for a total of 1.2 million square feet of bridge deck. The 440-foot tall pylon is the focal point, with the top 196 feet featuring four sides of custom designed glass to honor the community's historical glass industry.

The Glass City

Collaboration between the Toledo Arts Council, the Maumee River Crossing Task Force, ODOT, the Design Consultant Team and the community developed into the bridge design based on a theme of "Glass," paying homage to the city's heritage as a glass-manufacturing leader. Sculpted pier and pylon shapes, a fanned stay arrangement with stainless steel sheathing, and other stainless steel elements were chosen. Prismatic pier and pylon shapes and a consistent concrete color create harmony throughout the length of the project.

The outcome of the public voting also resulted in the use of specialty glass on all four sides of the top 196 feet of the pylon. The glass reflects the sky during the day, and transmits the specialty light designs at night created by 384 LED fixtures behind the glass. Light shows change with the seasons, holidays and special events to provide dynamic nightly displays and capture the community's preference for distinctive feature lighting.



The Cradle System (Patent No. US 6,880,193) allows strands to act independently so they can be removed, inspected, and replaced at any time while traffic keeps moving.

An Inventive Solution

To achieve the desired pylon shape and ODOT's desire for a sustainable, easy to maintain design, a revolutionary new cable-stayed cradle system was developed that allows for complete replaceability of individual cable stays and a sleek, elegant pylon size. The cable stay strands are carried continuously from the bridge deck through the cradle in the pylon and back to the opposite side of the bridge deck. Each cable-stay strand is housed in its own pipe inside the curved cradle. The pipes are grouted into place, but the strands can be replaced individually and act independently. Extensive testing of the cradle system proved that interaction among the stays is eliminated in the curved portion and allowed for an increase in stay size of more than 70% to 156 strands, the largest in the world. In addition, removing the stay anchorages from the pylon allowed for a more slender pylon shape.

The cradle system streamlined construction and simplified maintenance over the 100+ year service life of the structure. Individual strands of any of the 20 stays can be removed, inspected and replaced at any time while traffic remains in operation. The easily replaceable strands will also allow for the use of new strand materials in the future.

Urban Aesthetics

Weaving through the heart of Toledo, this urban structure was established to be in context with the site and in harmony with the surrounding environment. Precast concrete segmental technology allowed casting of the bridge superstructure off-site, so that construction could be accomplished within the limited right-of-way. High-performance concrete for all structural members resulted in streamlined shapes while achieving the best strength and durability.

Approach spans carry three lanes of traffic in each direction, with safety shoulders. The 9-foot deep segmental box girders were cast with 6,000 psi concrete and set into place using span-by-span construction. An integral wearing surface with bi-directional post-tensioning increases the durability of the riding surface.

The main span features a single 440-foot tall pylon centered between 612½-foot spans to provide 120-feet of vertical clearance over the Maumee River. The single plane of stays is accomplished through the use of precast delta frames, another FIGG innovation for cable-stay bridges. High-performance, 10,000 psi concrete was used for the pylon. Temporary piers and span-by-span construction built spans up to the pylon, and cantilever construction completed the main span, extending out from the pylon.

A Vision Becomes Reality

Today, Toledo's vision is an integral part of the skyline, carrying interstate traffic across the Maumee River into downtown. The stainless steel cable-stay sheathing shimmers in the sunlight, complementing the reflections in the pylon's custom glass. The Skyway proudly displays the community's vision for honoring their glass heritage and shines brightly as a symbol for their future.▪

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