LOUISVILLE WATERFRONT PARK PHASE III BIG FOUR PEDESTRIAN RAMP

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BIOGRAPHY

Craig Finley is the founder and Managing Principal of Finley Engineering Group, Inc., based in Tallahassee, Florida. With over two decades of experience and numerous high-profile projects in his portfolio, Craig is among the acknowledged leaders in the bridge engineering and construction industry.

During his 32 years as a consulting engineer, Craig has been involved in the design, management, construction engineering and inspection of a wide range of complex steel, prestressed concrete, cable-stayed, suspension and moveable bridges with spans from 40 feet to over 5,000 feet. He has had extensive experience in directing the preparation of the design, construction engineering and management of over eighty segmental bridges designed and/or constructed in the United States and around the world.

Prior to founding Finley Engineering Group, Craig was Senior Vice President in charge of the Bridge and Tunnel Division of Parsons Corp., one of the world's largest engineering and construction firms. He joined Parsons after it acquired Finley McNary Engineers, the bridge engineering and consulting firm Craig co-founded in 1989. Craig is a registered professional engineer in 40 states.

SUMMARY

When the City of Louisville, Kentucky was given the abandoned Big Four Railroad Bridge over the Ohio River, they saw this as an opportunity for a new pedestrian bridge that would provide a centerpiece for the third phase of the Louisville Waterfront Park. They seized this opportunity in the spring of 2008, and began development of a project for the approach ramp, landing platform/overlook and the connection to the existing railroad bridge.

Their original scheme contained unusual elements which complicated the behavior of the new ramp. The details for the steel columns and steel superstructure were complex and expensive; and erection was costly.

FINLEY, along with Tampa Steel Erecting Company, proposed a value engineering proposal to the Contractor that changed the design of the columns and superstructure, leading to an accelerated construction time and a reduction in costs.

The presentation will focus on how FINLEY approached its value engineering design changes, including the construction and fabrication details that made this project a win-win for the City of Louisville.

LOUISVILLE WATERFRONT PARK PHASE III – BIG FOUR PEDESTRIAN RAMP

Figure 1 - Rendering of Original Concept for the Pedestrian Ramp

When the City of Louisville, Kentucky was given the abandoned Big Four Railroad Bridge over the Ohio River, they saw this as an opportunity for a new pedestrian bridge over the Ohio River that would provide a centerpiece to the third phase of the Louisville Waterfront Park. They seized this opportunity in the Spring of 2008, and began development of a project for the approach ramp, landing platform/overlook and the connection to the existing railroad bridge.

Original Scheme

The following is a summary of the details presented in original bid Contract Documents:

1. A single, "horseshoe" shaped unit of curved twin steel, box girders (radii varying from 92' to 425' and span lengths of 72' to 155').
2. Seven (7) piers and a single abutment, with HP 14 x 73 piles and reinforced concrete footings and columns.
3. The landing platform was very complex and required a combination of variable length steel box beams and plate girders and braced stringers to obtain the circular shape.
4. The deck for both the ramp and the landing platform were reinforced concrete, with expansion joints at the abutment and landing platform.
5. There were several architectural details that were considered critical for the project. The piers were all 8' in diameter and had a weathering steel cladding applied after the columns were erected. In addition, the underside of the landing platform also had an extensive soffit of weathering steel to give the underside a smooth and uniform surface from below.
6. The erection method for assembling the structural steel was complicated and required shoring towers and adjustments for stability and fit up of the many pieces.

Value Engineering Proposal

Overall, these details led to concerns that the project could not be erected within the available budget of $6.5million. The possibility of a Value Engineering Cost Proposal was agreed upon, with the requirement that the overall project purpose and characteristics must be maintained and the Value Engineering options that would be entertained would be limited to constructability features.

Figure 2 - Ramp Girder Cross-Section during Assembly

At the time the VECP was initiated, all the pilings had been driven and the footing caps cast. The VECP design incorporated the existing reinforcing details and in some cases removed reinforcement to relieve congestion in the pier-column dowel reinforcement. The new three unit configuration significantly reduced the foundation demand to a level well within the capacity of the existing foundation system.

Figure 3 - Lifting of Ramp Girder Pairs

Figure 4 - Steel Pier Shell/Form

Figure 5 - Lifting of   Assembled Platform

The Finley Engineering Group, Inc. (FINLEY) was engaged by the construction manager, Construction Solutions, LLC, to develop a value engineering alternate, along with Tampa Steel Erecting Company for the structural steel fabrication and Tensor Engineering for the structural steel detailing.

FINLEY proposed the following Value Engineering modifications:

1. Split the ramp into three, two-span units, with a fixed center pier in each unit. (All piers remained in the same location as the original design).

2. Eight foot diameter weathering steel pipe (1/2" wall thickness) was utilized for the cladding and the formwork pier column.

3. For the ramp superstructure, constant depth, twin, steel trapezoidal box girders with stay-in-place deck forms were utilized. At the fixed piers, an integral/composite steel box girder pier cap was utilized that allowed the column reinforcement to develop into the deck. One again the structural steel was used as the forming system and the concrete infill was placed following erection. At the expansion piers, the deck was supported on single neoprene bearings under a transverse plate girder diaphragm. The end of the trapezoidal steel box girder was "dapped" at the landing platform to provide a consistent bottom line into the landing platform.

4. To simplify the landing platform detailing and construction, FINLEY developed a single, circular structural steel ring girder (Radius=35ft), that was framed into the existing railroad pier and supported on two additional columns. In order to brace the ring girder and provide support to the platform deck, a combination of rolled I-beams and plate girders were used to square up the core of the circle. The deck was reinforced concrete supported by SIP deck forms, with brick pavers for the walkways. A soffit of 1/4" weathering steel plate then was suspended beneath the girder flanges of the framing system.

Figure 6 - Platform Assembled and Placed

5. The erection of the girders for the ramps was now able to be performed in a conventional manner and the pedestrian platform steel was assembled on the ground and lifted into place in one piece.

Summary of VECP Benefits	
Modification	**Benefit**
Three, 2-span units	Significant reduction in substructure loading and simplified girder erection
Weathering steel column shells	Achieved aesthetic intent and eliminated pier-column formwork
Integral Pier caps	Eliminated pier cap formwork and provided efficient torsional support for these highly curved spans
Platform "Ring" box girders	Utilized the torsional rigidity of the ring box girders to simplify the platform deck framing system and allowed erection in a single lift

This was truly a WIN-WIN solution.

Advantages / Results

This value engineering proposal provided an actual savings of $3million by reducing the costs relating to the materials, fabrication and construction; met all of the Owner's aesthetic requirements and shortened the construction schedule by several months.

Figure 7 - Completed Pedestrian Ramp