I-84 Bridge Move

SOUTHINGTON, CONNECTICUT

ConnDOT's project goals were to replace the existing eastbound & westbound superstructures over Marion Avenue using rapid construction methods to minimize construction time, resulting in fewer road closures, and reduced disturbance to the traveling public on both the interstate and local roads. *"The Southington project was one of the best planned and most perfectly executed construction projects that this department has undertaken in years," said DOT spokesman Kevin Nursick - Harford Business Journal.* Steere Engineering was the Structural Engineer In-Charge of the Accelerated Bridge Construction (ABC) for the 2014, I-84 Bridge Replacement Project located in the town of Southington, Connecticut. The two new 100' long by 57' wide, 1,041 ton, concrete bridges were constructed in separate staging areas located at the northeast and northwest corners of the project site supported on temporary staging towers. The pre-stressed concrete beams and reinforced concrete decks were designed for the negative moments induced by the location of the lift points, 23.5' from the beam ends. The project utilized a series of two 12-line, 8 file PST Goldhofer, self-propelled modular transport units (SPMT's) to move the proposed I-84 EB & WB bridges from the adjacent staging areas into final position on the existing rehabilitated abutments. The SPMT approach was also used to transport the existing I-84 EB Bridge from the abutments back to the temporary staging area for demolition, at the same time that the I-84 WB Bridge was demolished in place. Transport of both the new and existing structures occurred over a ***single weekend shutdown period which finished 9 hours ahead of schedule*** *and had the interstate reopened to traffic well ahead of the deadline imposed by the contract.*

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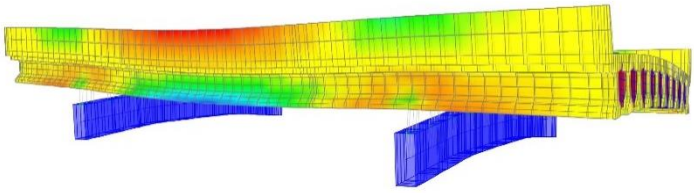

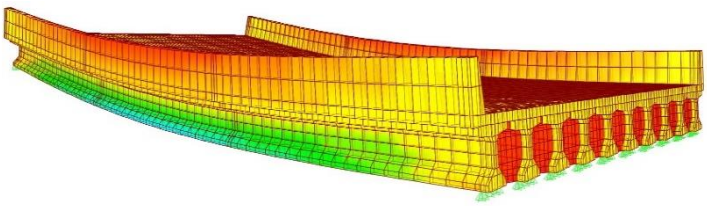

Steere Engineering, the bridge move engineer for Northern Construction Service, was responsible for the structural engineering and coordination associated with the accelerated bridge project. Specifically, Steere used SAP2000 to perform a detailed structural analysis of the bridge using 3D solid elements. The finite element analysis investigated various degrees of support movement of the transfer girders during the move, under multiple load cases, to identify resulting stresses in the prestressed beams and reinforced concrete bridge decks. The results of the analysis were used to develop a movement monitoring plan. This plan outlined the limits for allowable deflections, structural twist, and corresponding strains that the bridges could tolerate during transport. Steere used a combination of techniques to monitor these key limits in real time. The first utilized a series of strain gages cast into both the prestressed concrete beams and reinforced concrete bridge deck at high stress locations. The output readings from the strain gages were linked to a website which was monitored by Steere, continually over the 36 hour period to ensure strains and corresponding stresses remained within the allowable limits as identified in the movement monitoring plan. The second method consisted of a series of crossing, electrified, string lines placed just above the bridge deck set with a predetermined gap. Any corresponding movement of the four bridge corners would result in the closing of this gap. If the electrified strings touched, the allowable movement limit was being approached, triggering an alarm/notification light so corrective action could be taken.

Steere's other design responsibilities on this $8-million project included the development of the contingency planning, design of the temporary support staging towers and foundations, erection procedures, demolition procedures, and associated concrete formwork and pour procedures. In addition, Steere provided 3D modeling and animation of the proposed move sequences which included both the SPMT equipment and superstructures to ensure sufficient clearances, both horizontally and vertically, along the travel paths. The project was awarded the 2014 WTS Innovative Project Solutions Award and the 2015 ACEC/MA Engineering Bronze Excellence award.

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Design Completion: 2014
Construction Completion: 2014
Project Cost: $8M