Bridge Factors Factual Report Attachment 41 – Email from Mr. John Engberg of Barnhart Crane and Rigging to Mr. Dan Walsh of NTSB dated August 20, 2018

Miami, FL

HWY18MH009

(3 pages)

The system utilized to transport the 950 Ton bridge consisted of two SPMTs that were positioned at locations that were specified by FIGG, in a memorandum from Dwight Dempsey dated July 25, 2017, based on their structural evaluation of the bridge for the temporary support condition during transport. Located symmetrically about the longitudinal and transverse centerlines of each SPMT were four shoring stands (eight total), each stand supported a hydraulic jack assembly. The hydraulic jack assemblies were positioned symmetrically about the longitudinal centerline of the bridge, resulting in four pairs of hydraulic jack assemblies located at discrete locations along the length of the bridge. Each pair of hydraulic jack assemblies supported a beam, positioned transversely to the bridge span. Two wedge shaped hardwood mats (the angle of the wedge matched the angle of the tapered bottom flange of the bridge) were installed on top of each beam, symmetrically about the longitudinal centerline of the bridge. Two truss assemblies were installed at both ends of the SPMTs to connect them together to assure the two SPMTs maintained the proper spacing throughout the travel path. Figure 1 shows the transport system during the movement of the bridge on March 10, 2018. Transportation of the bridge began at approximately 4:30 am on March 10, 2018. Final placement of the bridge on the permanent supports concluded eight hours later at approximately 12:30 pm.

Figure 2 - Main Span During Move

Jacking operations were performed utilizing two pumps and operators, one for each SPMT. Raising and lowering of the bridge was done by extending or retracting all eight hydraulic jack assemblies simultaneously. Loads to each jacking assembly were equalized through valves in the hydraulic control system.

Transportation operations were performed utilizing two operators. One operator controlled the steering and forward/reverse functions for the entire system, as well as leveling of the hydraulic suspension on the North SPMT. The second operator only controlled leveling of the hydraulic suspension for the South SPMT. Steel mats were placed in the gravel staging area, as well as adjacent to the curb and median where the SPMTs would travel over them. These mats were installed to provide a solid surface for the tires in the staging area to ensure adequate traction during transport, additionally they provided a means for the tires to smoothly transition over the curb and median along the travel path. Securement chains were installed, connecting the shoring system to the deck of the SPMTs, to resist forces due to motion associated with acceleration/deceleration of the system while it was moving.

Monitoring system criteria was specified by FIGG, in a memorandum from Dwight Dempsey dated January 5, 2018. The bridge was sensitive to forces due to torsion (i.e. twisting of the bridge about its longitudinal axis). Therefore, a system was developed to monitor transverse rotation at three cross-sections; center of the two lift points (i.e. SPMTs) and at midspan. Twist was computed as the difference in rotation angle between the two lift point cross-sections. This data was calculated and displayed in real-time by the monitoring system so that corrective actions could be taken if the specified twist tolerance was approached. Global deformation measurements in the form of span deflection and flexural rotation were performed at the time of the lift and for the final placement. All global deformations such as rotation, twist, and deflection indicated the condition of the span after the move was nearly identical to its initial state. Changes in strain during lifting and setting events were essentially equal and opposite, indicating all measured responses were linear-elastic.