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March 19, 2009

To: Mr. Ron Beckort
Kentucky Transportation Cabinet
District 5 Bridge Engineer
8310 Westport Road
Louisville, KY 40242

RE: **Statewide Ohio River Bridge Inspection – Package 2**
**Agreement No. 200923**
**Milton Madison (US 421) Bridge over Ohio River**
**05-MP-112-0421-B00001**

On January 23, 2009, ENTRAN, PLC completed the Fracture Critical Inspection of the Milton Madison over the Ohio River in Trimble County, Kentucky. The inspection included the main through-truss spans, the multi-girder and two-girder spans on the Kentucky approach, and the deck truss spans on the Indiana approach.

Inspectors performed an arm's length inspection of all fracture critical members of the trusses (deck truss, simple span truss, and cantilever through truss), both faces of the fracture critical girders in the approach spans, all floorbeam connections, floorbeams located at expansion joints and the steel bents on the Kentucky approach spans. Any significant problems discovered during prior inspections were closely checked and observed for any condition changes.

Climbing techniques were used exclusively to access the above deck truss members of the main spans. Inspectors used lanyards, webbing, and harnesses to position themselves on and traverse the top chord members and all vertical or diagonal members with steel lattice. To inspect vertical and diagonal members consisting of built-up I-sections, the inspectors used rope access equipment and a pair of 110 ft ropes. The below deck through-truss members were accessed using lanyards, webbing and harnesses. An 80 ft manlift was used to access the approach spans from below. To eliminate traffic delays, no lane closures were used at any time during the inspection. A manned safety boat was on the river and nearby whenever the inspectors were working above water. The manlift, safety boat and operator were provided by Intech Contracting, LLC of Lexington, Kentucky.

The inspectors assigned to this project included the following:

Susan Rich, P.E. (Project Manager)
Michael Perry, PE. (Team Leader)
Michael Lawler, P.E. (Team Leader)
David Kaiser, EIT (Project Engineer)
Sam King, EIT (Project Engineer)
Taylor Perkins, EIT (Project Engineer)
Eric Trimble (Inspector)

## SUMMARY OF FINDINGS

The following is a summary of the significant findings resulting from the fracture critical inspection.

Above the deck, the main members of the through truss are in satisfactory condition. In some locations, there is minor pack rust at the joints between eyebar heads, gusset plates, and around pin caps. There is also minor pack rust between the flanges and webs of built-up members.

Below the deck, the main members of the through truss are in poor condition with a few areas in serious condition. On the upstream truss at panel point 32, the vertical gusset plates that connect the diagonal and vertical members to the lower chord have 90% to 100% section loss across a significant portion of the plates. On the downstream truss of span 4, pack rust is bowing and/or cracking the web splice plates of the lower chord. Some of the more typical conditions below deck include pack rust between gusset plates and section loss (up to 100%) of the lattice on the lower chord.

The floorbeams of the through truss are in poor condition. The top and bottom flanges have regions of significant section loss near the connection to the lower chord. However, the bottom flange is reinforced with a cover plate in most locations. Several of the floorbeams have 100% section loss in their webs where they connect to horizontal gusset plates for the lateral bracing.

The main members of the deck truss spans on the Indiana approach are generally in poor or serious condition. At the connection to the floorbeams, the inside flange on a number of the vertical members has cracks or perforations that typically extend across the majority of the flange. The portion of the deck truss level with the roadway surface also has substantial deterioration across the flanges of the members. The lower chord of the deck truss is peppered with perforations in its webs and flanges. The Indiana approach, along with the lower chord of the simple span through truss, has the most extensive deterioration of any portion of the bridge.

The two-girder span on the Kentucky approach is also in poor condition. The bottom flange has pack rust and section loss along the length of the girder. The webs of the girders also have section loss at the floorbeam connections. On the downstream girder, a perforation is visible in the web at panel point 99.

The lateral bracing is generally in fair condition, except where the ends of the bracing members connect to the lower chord, which is in poor condition. The horizontal gusset plates that form this connection are generally also in poor condition, due to severe pitting and some perforations.

The deck of the bridge, which was replaced in 1996, is in satisfactory condition. Minor transverse and longitudinal cracks are visible on the majority of the bridge. The transverse cracks typically extend through the concrete curb.

The bearings are generally in fair condition and appear to be functioning properly. Along the approach spans, a portion of the anchor bolts/nuts have substantial section.

The piers and abutments are in satisfactory condition with only minor cracking and a few small areas of spalled concrete.