PHYSICAL CONDITION REPORT
FOR THE 2020 SPECIAL TOWER HEAD INSPECTION

SR 93 OVER THE OHIO RIVER
BR#: LAW-93-0.00
SFN: 4401263

OHIO DEPARTMENT OF TRANSPORTATION
DISTRICT 9
PID #102917

Inspected: October 19 – 21, 2020
Report: January 2021

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2020 SPECIAL TOWER HEAD INSPECTION PHYSICAL CONDITION REPORT

of

SR 93 OVER THE OHIO RIVER
BRIDGE NO. LAW-93-0.00
SFN: 4401263

LAWRENCE COUNTY, OHIO

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Inspected on:

October 19-21, 2020

Inspected by:
Steven Hammerschmidt, PE
Carolyn Guion, PE
Patrick Omar, PE
Victoria Feudo, EI
Michael Pugsley, EI

Prepared for:

OHIO DEPARTMENT OF TRANSPORTATION
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PID No. 102917

Report Submitted January, 2020

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BRIDGE DESCRIPTION

The LAW-93-0.00 Bridge (Oakley C. Collins Memorial Bridge) carries one lane of State Route 93 northbound and one lane of State Route 93 southbound over the Ohio River, local streets, and Norfolk Southern Railroad tracks between Ironton, Ohio and Russell, Kentucky.

Location Map

The bridge was built in 2016 and is composed of 9 spans with an overall length of approximately 2,616'-7". Spans 1 and 2 are approach spans on the Kentucky side, Spans 3 to 5 are a cable stayed main unit, and Spans 6 to 9 are approach spans on the Ohio side. The cable stayed unit is 1,640'-0" long with back spans of 370'-0" and a center span of 900'-0" **(see** Error! Reference source not found.**)**. It is supported by two 316'-0" tall cast-in-place reinforced concrete delta shaped towers founded on drilled shafts and 120 total stay cables which support the concrete edge girders and floorbeams and a concrete deck. Tower 3 is also known as the KY Tower and Tower 4 is also known as the OH Tower. The cables are identified based on if they are in a backspan (B) or the main span (M), geographic location, and numbered consecutively (1 to 30) from shortest to longest starting at the KY Tower and continuing at the OH Tower **(see** Error! Reference source not found.**)**. For example, Cable B15E is the farthest east cable from the KY Tower at deck level on the south face and Cable M16W is the closest west cable from the OH Tower at deck level on the south face. The plans divide the tower into 18 total segments (between construction joints), starting with Segment 1 at the bottom and ending with Segment 18 at the top **(see Figure 1)**.

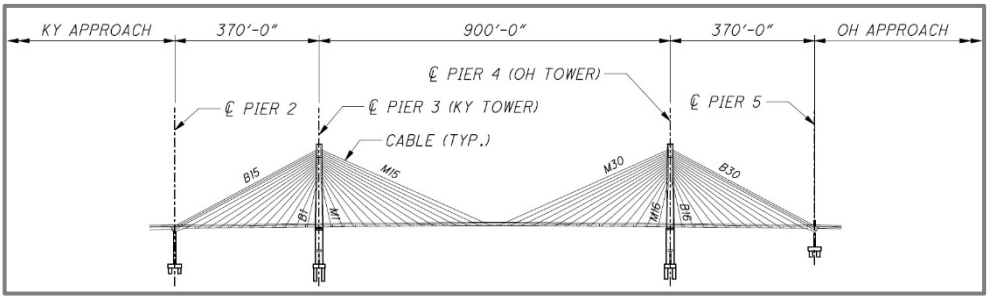

Figure 2 - LAW-93-0.00 Bridge West Elevation (taken from the 2010 design drawings)

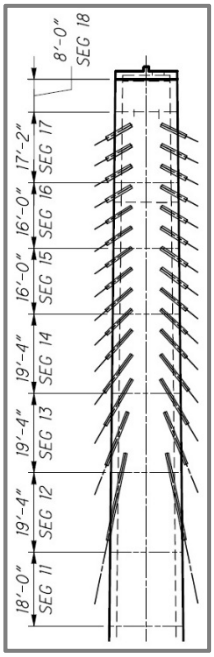

Figure 1 – Tower side partial elevation (taken from the 2010 design drawings)

INSPECTION SCOPE AND PROCEDURE

Personnel from TranSystems Corporation performed a special tower head inspection of the bridge on the dates of October 19 - 21, 2020. Access to the structure was gained through use of industrial rope access techniques and the fixed ladders inside the towers. Traffic control was necessary and the inspection was performed simultaneously with the ODOT routine inspection which consisted of a complete bridge closure.

An in-depth hands-on inspection of the tower roofs, top two feet of the perimeter of the tower roofs, and north and south faces were performed. The scope was limited to hammer sounding the tower roofs and areas around the cable interfaces on the exterior of the towers. Any delaminations and spalled areas were noted. At these locations, all loose concrete was removed with a hammer, the surface was brushed to remove fine particles, and the bare concrete was sealed with Duraguard 310CRU Federal Color Standard No. 17778 – Light Neutral.

The inspection findings were recorded on bridge specific field inspection forms, and field sketches were created to document specific conditions. Inspection equipment utilized during the inspection included but was not limited to: chipping hammers, wire brushes, measuring tapes, 6 foot carpenter rules, and flashlights. Color digital photographs were taken of typical findings and areas of delamination and/or spalling.

INSPECTION TEAM

The TranSystems inspection team members are as follows:

- Steven Hammerschmidt, PE, SPRAT III
- Carolyn Guion, PE, SPRAT II
- Patrick Omar, PE, SPRAT II
- Victoria Feudo, EI, SPRAT I
- Michael Pugsley, EI

SPECIAL TOWER HEAD INSPECTION FINDINGS

TYPICAL FINDINGS

Overall the exterior faces of the towers are in good condition. Vertical and diagonal hairline cracking on the exterior faces of the towers at the cable anchorages is typical **(see Photo 1)**. Cracking with rust staining from the guide tube on the exterior faces around the full circumference of the lowest anchorages in Segment 12 of the towers is also typical **(see Photo 1)**. Poor construction/consolidation has resulted in minor to moderate voids up to 1" in diameter and up to 1/2" deep throughout the tower exterior vertical faces and roof with many of these voids not having the sealant penetrated inside **(see Photo 3)**. Isolated areas with very minor rust staining were noted on the exterior faces **(see Photo 2)**.

Photo 1 - Typical hairline crack above the anchor and cracking with rust staining around the guide tube (looking north at the south face of Tower 3 at Cable M16E in Segment 12).

Photo 3 - Typical voids in the exterior faces of the towers (looking north at the south face of Tower 3 at the top).

Photo 2 – Typical isolated area of minor rust staining (looking north at the south face of Tower 3 above Cable M19W).

TOWER 3 (KY TOWER)

Besides the typical findings, there are uneven areas of forming most notably on the west face at the top of the tower in Segment 18 **(see Photo 4)**, but no areas of delaminated, spalled or loose concrete were found. The rubber gaskets are extruded slightly from the steel guide tubes at the tops of Cables B14E and B13E on the south face of the tower (**see Photo 5)**. Although the weather was calm at the time of inspection, it was noted that the top three cables had minor to moderate vibration.

Photo 4 – Uneven forming of the west face of Tower 3 at the top, but no loose concrete was found (looking south at the northwest corner).

Photo 5 – Rubber gasket slightly extruded from steel guide tube (looking north at Cable B13E on the south face of Tower 3).

TOWER 4 (OH TOWER)

A spall at the top of the tower at the northwest corner was first documented by ODOT in a 2019 inspection. During this inspection, the spall was measured to be a maximum of 28" wide along the north face by 20" long along the west face by 8" high at the very corner and it was cleaned and sealed **(see Photo 6**Photo 5**)**.

Photo 6 – Tower 4 northwest corner with existing spall (looking west) and after area was sealed (looking southwest).

A 6" high by 3" wide area of failing sealant just east of the Cable B16E anchorage in Segment 12 on the north face of the tower was cleaned and sealed **(see Photo 7)**. At this same cable, a 6" high by up to 8" deep void was found along the west side of the steel guide tube near the bottom due to poor consolidation around the bottom of the guide tube **(see Photo 7)**.

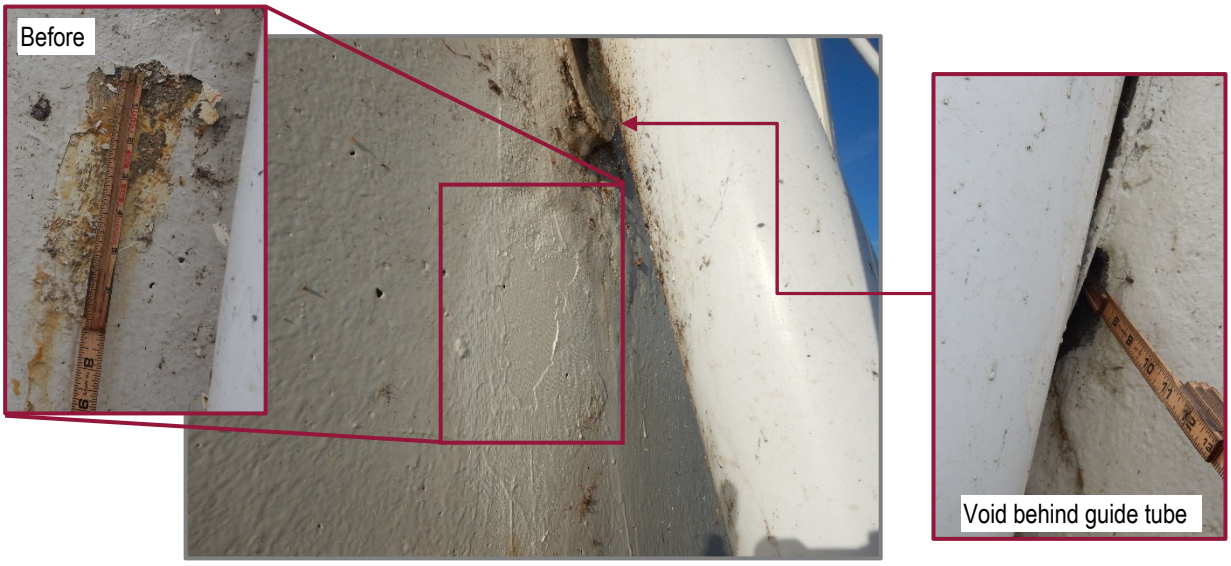

Photo 7 – East leg of Tower 4 north face in Segment 12 near Cable B16E with area that was sealed (looking southwest). Also note the void along the bottom west side of the steel guide tube.

An existing void/spall from construction, approximately 1" wide by 1 1/2" high by 1 1/2" deep with partially exposed reinforcing was cleaned and sealed on the north face of the east leg in Segment 12. Two small areas of sealant failure, about 1 1/2" in diameter each were sealed on the west face of the east leg in Segment 11 **(see Photo 8)**.

At the top of the south face above the east leg, an area up to 5" wide by 3" high was found to have a sealant that differed from the final coat so this area was cleaned and sealed **(see Photo 9)**.

On the south face in Segment 17 below and about 24" west of Cable M30E, a 5" diameter delamination was found. The loose concrete was removed which resulted in a 1/4" deep spall that was then cleaned and sealed **(see Photo 10)**.

The total area sealed on Tower 4 was approximately 4 square feet **(see Table 1)**.

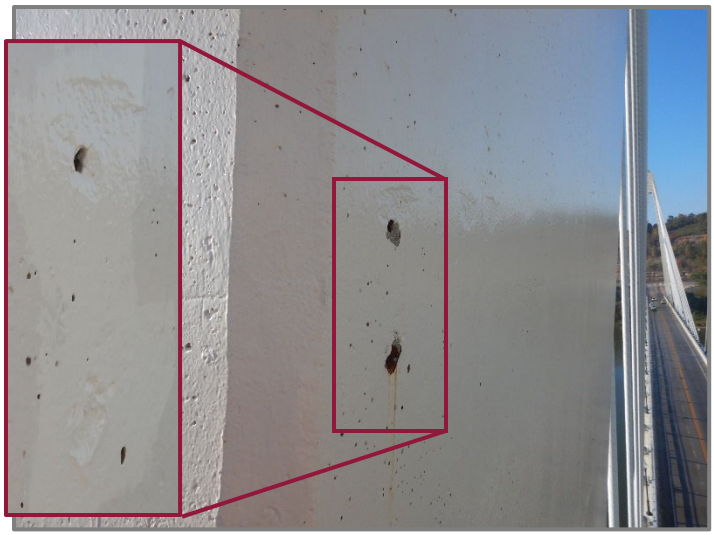

Photo 8 – Tower 4 west face with two small areas of sealant failure with the top one around a void (looking south) and after areas were sealed (inset).

Photo 9 – Tower 4 south face at the top with an area that had a different color (looking north) and after areas were sealed (inset).

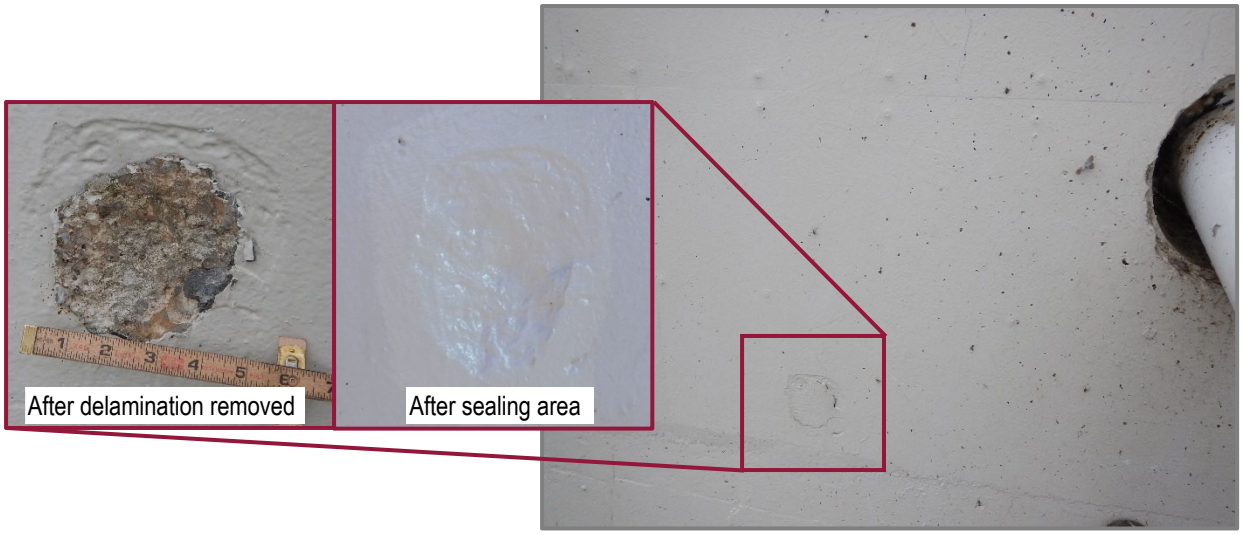

Photo 10 – Tower 4 south face in Segment 17 near Cable M30E with a delamination that was removed and sealed (looking north).

Segment	Face	Location	Area sealed	Photo
18	North/West/Roof	Northwest corner	3 SF	6
12	North	East leg near Cable B16	< 1 SF	7
12	North	East leg	< 1 SF	-
11	West	East leg	< 1 SF	8
18	South	Top above east leg	< 1 SF	9
17	South	Below and west of Cable M30E	< 1 SF	10

Table 1 – Areas sealed on Tower 4

While not related to the concrete inspection, it was also noted that fiberboard around the hatch on the exterior is decaying and becoming debonded **(Photo 11)**. However, it was not in danger of falling off at the time of inspection.

Photo 11 – Decayed boards around the exterior of the Tower 4 roof access hatch (looking east).

CONCLUSIONS AND RECOMMENDATIONS

The special tower heading inspection revealed no major areas of delamination on the exterior tower roofs or faces. A small delamination on the south face of Tower 4 was removed. Seven total areas on the exterior of Tower 4 were sealed including the existing spall on the northwest corner. No areas on Tower 3 required sealing. Recommendations include:

- Continue to monitor the exterior faces of the towers and perform sounding during in-depth inspections.
- Remove decaying boards around the tower roof access hatches.
- Although the existing anchors on the roof are adequate for rope access, future inspections may benefit from the installation of additional anchors.