COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KY 40622
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GOVERNOR

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Memo To: Joe Plunk
Chief District Engineer
District Three

From: Dora Alexander DGA
Load Rating Engineer
Division of Maintenance

Date: March 7, 2018

Subject: Bridge Closure
Warren County
Old Richardsville Road (CR 1350 at MP 0.261) over Barren River

After review of the condition and analysis or changes in the weight carrying capacity of the subject structure by the bridge preservation analysis staff, this office has determined that the posting level for the following bridge should be as follows:

114C00011N **Close the structure to all traffic due to the critical condition of the truss.**

Please notify the proper officials of this posting change. Should you have any questions, please advise.

DGA

c: Daryl Price, James Edmunds, Keith Humphrey, Nathan Rush, Matt Caudill
File

114C00011N -- Steel Truss Notes

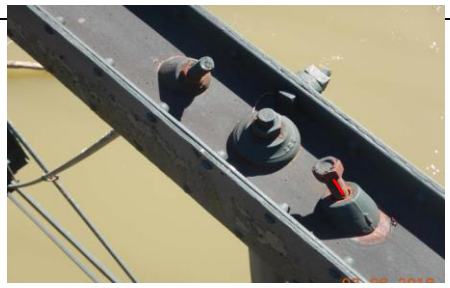
March 2018

Typical Defects Throughout Truss

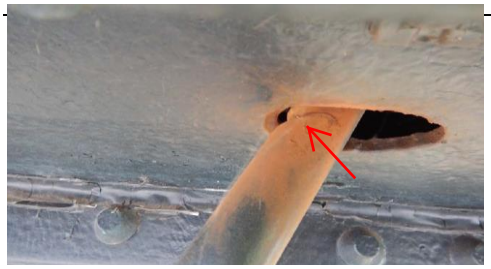
Typical Condition to all Splice Plates of Top Chord - Swelling Pack Rust between Interface of Splice Plate and Exterior Chord Plate has lead to distortion and failure of rivets.

The cast iron, crescent shaped bushings on some diagonal tension counters at the lower chord connections have badly deteriorated along with the nuts that hold the counters in place. Several locations are completely missing the bushings.
See **Media Tab** "***Tension Counter Nut Corrosion*** " for a catalogue of this defect.

Multiple diagonal tension counters are loose and do not come under tension during live load, resulting force distribution of live load is not evenly dispersed thoughout trusses.



Grooving of Tension Counter at protrusion of Lower Channel of Top Chord Build Up member is widespread throughout the structure



There are multiple instances of Tension Counter Failure. Failure of Tension Counter listed in this table is catagorized by failure at member connection Top or Bottom Chord. Typical mode of Failure at Top Chord locations is described as pull through of counter end washer and nut from Top Chord Channel Component. Typical Mode of Failure at Lower Chord locations is described by seperation of Tension Counter from Lower Chord Mounting Hardware. See **Media Tab** "***Tension Counter Failure Summary***".

Itemized Element Notes

Span #1

General Notes
Top Chord - Bolt that connects U2-L2, North Truss, Span #1 to the top chord has loosened and the member is easily moved without Live Loading to the bridge
Top Chord - The top bolt in the out rigger to top chord detail is not secure at out rigger #5, North truss, Span#1
Bottom Chord - L3 N.T S1: Vertical bracing contacts interior eye bar resulting in 0.25 in. section loss on vertical bracing.
Bottom Chord - Retrofit for full section crack consisting of bolted splice plate on the inside lower chord in panel #9, North Truss, Span #1.
Bottom Chord - There is a weld connecting the floor lateral to the lower chord in Panel #13, North Truss, Span #1.
Bottom Chord - Pin and Hanger L5, South Truss, Span #1 is loose.
Connection
The square washer on the end of the diagonal bracing bar at L1 N.T Span #1 is loose. The nut is still retaining the washer
The washer on the horizontal u bolt that captures the bottom of the vertical post at L4, NT S1 is loose.
Damage
Damage from previous construction/repairs. There are several 1 in. to 2 in. torch cut holes in the North truss in Span #1.

Span #2

General Notes

Top Chord - The top bolts in the out-rigger to top chord detail are loose at O.R #1, #2 and #5 on the North Truss and O.R #4 on the South Truss in Span #2.

Bottom Chord - Hairpin at L5, North Truss is loose in Span #2

Top Chord - Hairpin at L14, South Truss is loose in Span #2

Corrosion

Span #2 U10 North Truss (North Face) Expanding pack rust has distorted the plate. The rivets have deteriorated and no longer connect the splice plate.

span #2 north truss L8, L11 & L13 - lower vertical hangers have minor section loss where they clamp to the bottom chord in the threaded section between the I-bars of the lower

span #2 south truss L7 - lower vertical hangers have minor section loss where they clamp to the bottom chord in the threaded section between the I-bars of the lower

Cracking

Vertical post U2-L2, north truss, span #2, has a hairline, vertical crack, with minor seperation developing in the seam of the post from top to bottom. Check closely on each inspection for further propagation or splitting.

Vertical post U2-L2, South truss, Span #2, is split 3/8 in from top to bottom. Deterioration at the bottom of the post has resulted in a two separate 2.5 in horizontal cracks developing from the vertical split. There is also some crushing of the post and moderate L.O.S for 2.5 inches along the cracks at this location.

The Top Flange of Top Chord at multiple locations have a crack/groove emanating for the tension counter hole, notably at the following locations, (See 2017 Pics)
Downstream Truss Span #2 at U5
Downstream Truss Span #2 at U10
Downstream Truss Span #2 at U11

Connection

The 'hair-pin' anchorage of the retrofit steel at L10, Span #2, South Truss, has one bolt that is sheared off on the top plate.

Span #1 North Truss near L7: The small bottom beam of the outrigger (sway bracing) that rests on the bottom chord is loose and can be moved by hand. The same condition exists in Span #2 of the North Truss near L3.

Top chord Splice plates: There are a few location that the splice plate rivets are missing - Notable North Truss Span #2 Top Chord Near U10 -- Repairs should be made at this locations in particular and other splice plate locations missing rivets should be replaced

Span #3

General Notes

There are two small bars welded to both lower chords in panels #4 & #5, north truss, span #3. Possible stress riser.

The horizontal pin and hanger that connects the vertical post to the floor beam, L3, South truss, is loose causing approx. 1/8” of movement at the bottom of the vertical post.

Pin and hanger at vertical post #1 is loose is span #3 North truss

The top clamp that connects the vertical post to the bottom chord appears to have shifted 1/8” at vertical post #3, Span #3 North Truss.

Pin and Hanger at Vertical #5 North Truss Span #3 is loose

Vertical #12 in span #3, North Truss is loose at the lower chord.

Corrosion

The section of the vertical posts that extend through the bottom C-Channel of the top chord is necking down due to rusting/wear at the following locations.
U4 (N.T. Span #3) - The east face of the vertical post has necked down 0.125 in.
U7 (N.T. Span #3) - The east face of the vertical post has necked down 0.25 in.

Span #3 south truss L14 - lower vertical hangers have minor section loss where they clamp to the bottom chord in the threaded section between the I-bars of the lower

Span #3 north truss L5, L7 and L8 - lower vertical hangers have minor section loss where they clamp to the bottom chord in the threaded section between the I-bars of the lower

Cracking

Vertical post U13-L13, south truss, span #3, is split ¼”(1/8” ON THIS 2-28-2013 INSPECTION) wide below wrap and tapers to hairline at bottom and top 29 inches total.. Repairs with wrapped & clamped cable were made in 1992 to stabilize the member and still appear adequate. The end of the split is marked with a cold-chisel mark.

Damage

Damage from previous construction/repairs. There is a hole in the web of the bottom channel of the upper chord, South Truss, Panel #5, Span #3. Possible damage from the 1967 retro fit

Tension Counter

Nut Corrosion Catalouge

		Downstream (South Truss)		Upstream (North Truss)	
Span #1		West Nut	East Nut	West Nut	East Nut
	L1	X	X	Moderate	Moderate
	L2	X	X	X	Severe
	L3	Moderate	Severe	Moderate	Moderate
	L4	Moderate	Moderate	X	Moderate
	L5	Moderate	Severe	Moderate	Moderate
	L6	Moderate	Severe	Severe	Severe
	L7	Moderate	Severe	Moderate	Moderate
	L8	X	X	Severe	Severe
	L9	Moderate	Severe	Severe	Moderate
	L10	X	Moderate	Severe	Moderate
	L11	Severe	Severe	Moderate	Moderate
	L12	Moderate	Moderate	Moderate	Moderate
	L13	Moderate	X	Severe	Moderate
	L14	Severe	X	Severe	X
Span #2					
	L1	X	Moderate	X	Moderate
	L2	X	Moderate	Severe	Moderate
	L3	Moderate	Severe	Moderate	Moderate
	L4	Severe	Moderate	Severe	Severe
	L5	Moderate	Moderate	Severe	Severe
	L6	Moderate	Moderate	Moderate	X
	L7	Moderate	Severe	Moderate	X
	L8	X	X	Severe	Severe
	L9	Severe	X	Severe	Severe
	L10	X	X	Severe	Moderate
	L11	X	Moderate	X	X
	L12	Moderate	Moderate	X	X
	L13	Moderate	X	Moderate	X
	L14	X	X	X	X
Span #3					
	L1	Moderate	X	Moderate	Moderate
	L2	Moderate	Severe	Severe	Severe
	L3	Severe	Moderate	Severe	Severe
	L4	Severe	Severe	Severe	Severe
	L5	Moderate	Moderate	Moderate	X
	L6	Moderate	Severe	Moderate	Moderate
	L7	X	X	Moderate	X
	L8	Severe	Severe	Severe	Severe
	L9	Severe	X	Severe	Moderate
	L10	Severe	Moderate	X	X
	L11	Moderate	Severe	Severe	Moderate
	L12	Moderate	Severe	Severe	Moderate
	L13	X	X	Severe	X
	L14	Moderate	Severe	Severe	X

X	*None to Minor*
Moderate	*20% to 50% LOS*
Severe	*More Than 50% LOS*

Failure of Tension Counters

Span #1

Downstream

U9-L8	Complete Failure of Tension Counter at Top Chord
U11-L12	Complete Failure of Tension Counter at Top Chord

Upstream

U9-L10	Complete Failure of Tension Counter at Top Chord
L5-U6	Complete Failure of Tension Counter at Lower Chord

Span #2

Downstream

U5-L6	Complete Failure of Tension Counter at Top Chord
U10-L11	Initialized Failure of Tension Counter at Top Chord
U11-L10	Initialized Failure of Tension Counter at Top Chord

Upstream

U9-L10	Complete Failure of Tension Counter at Top Chord

Span #3

Downstream

L5-U6	Complete Failure of Tension Counter at Lower Chord

Upstream

U7-L6	Complete Failure of Tension Counter at Top Chord
U6-L5	Complete Failure of Tension Counter at Top Chord
U5-L4	Complete Failure of Tension Counter at Top Chord
U9-L10	Initialized Failure of Tension Counter at Top Chord

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