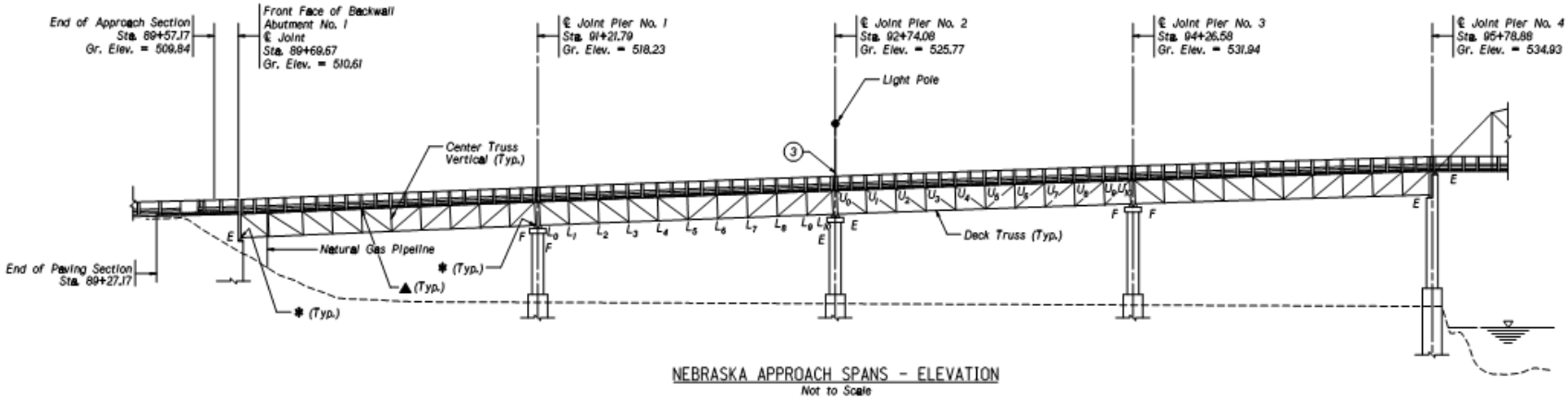
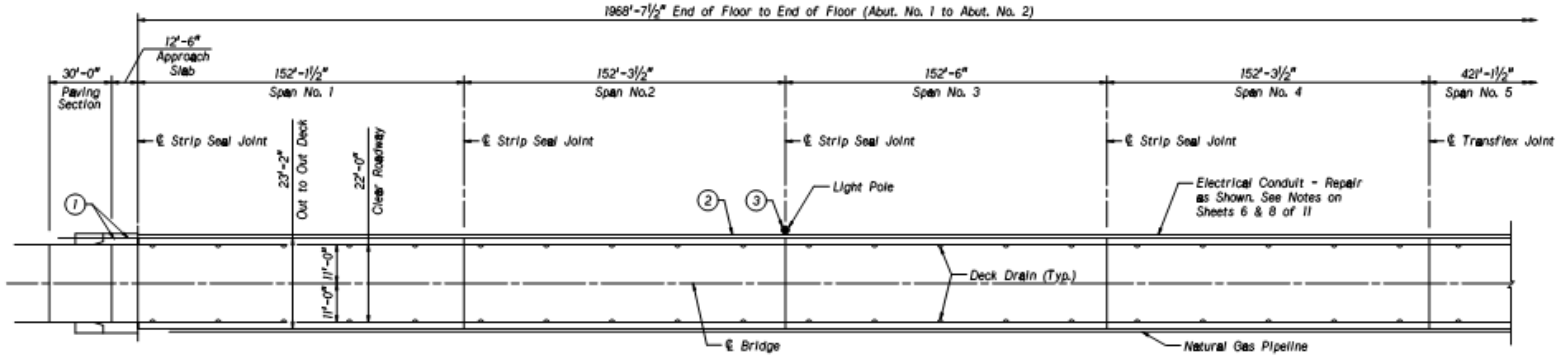
APPENDIX E. STRUCTURAL DOCUMENTS

- Bellevue Bridge Plan and Elevation
- Bellevue Bridge Inspection Report (InfraStructure, LLC 2017)
- Bellevue Bridge Underwater Inspection Report (Ayres Associates, 2017)
- Bellevue Bridge Load Rating Summary



NEBRASKA APPROACH SPANS - ELEVATION
Not to Scale

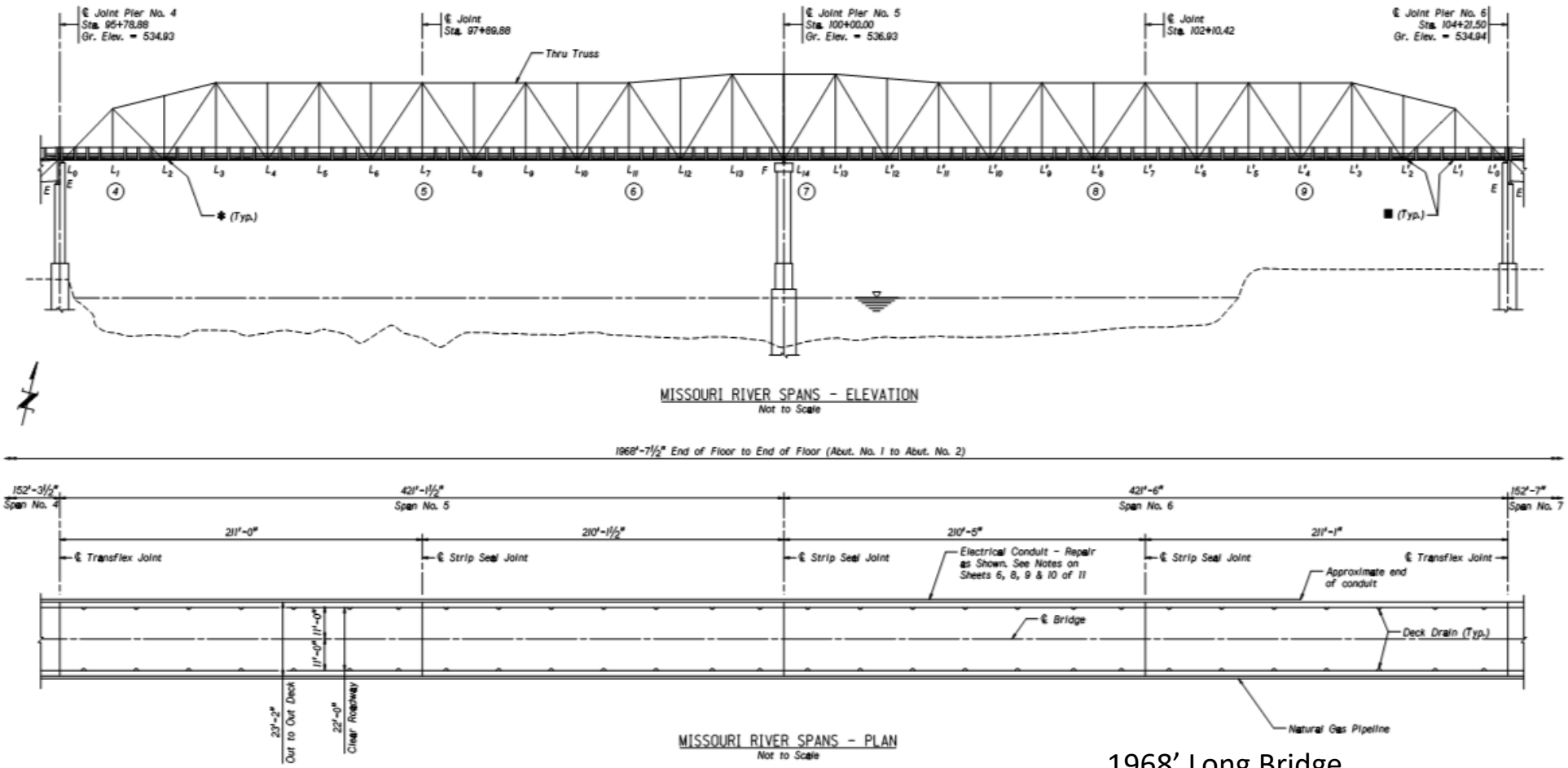


NEBRASKA APPROACH SPANS - PLAN
Not to Scale

Bellevue Bridge

1968’ Long Bridge

- 4 - 152’ Deck Truss Spans (West End)
- 2 - 421’ Through Truss Spans (Center)
- 2 - 152’ Deck Truss Spans (East End)
- 3 - 70’ Girder Spans (East End)



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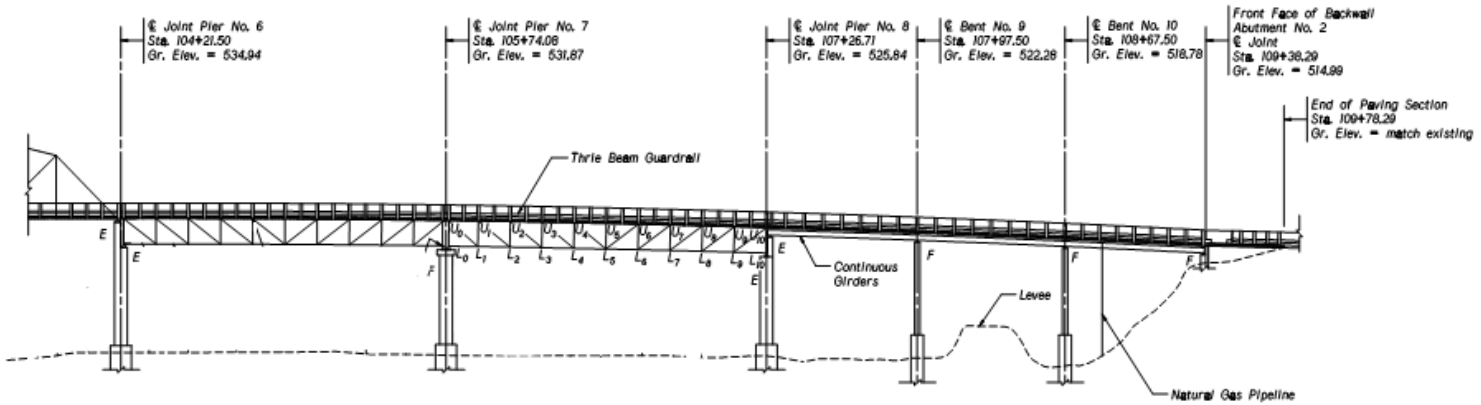
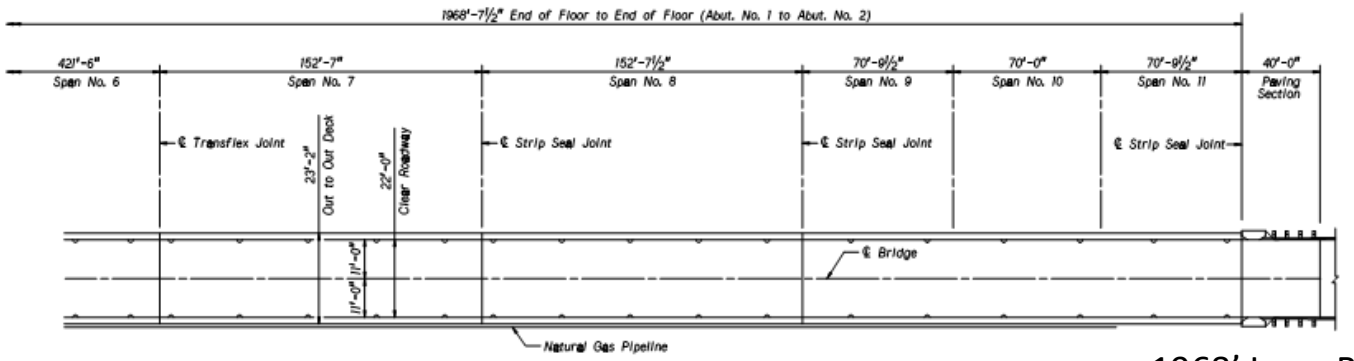
Bellevue Bridge



IOWA APPROACH SPANS - ELEVATION
Not to Scale



IOWA APPROACH SPANS - PLAN
Not to Scale

Bellevue Bridge

1968’ Long Bridge

- 4 - 152’ Deck Truss Spans (West End)
- 2 - 421’ Through Truss Spans (Center)
- 2 - 152’ Deck Truss Spans (East End)
- 3 - 70’ Girder Spans (East End)

Bellevue Toll Bridge
East Mission Avenue over the Missouri River
Bellevue, Nebraska

Structure No. S370 01918
Fracture Critical and Routine NBIS Bridge Inspection
April 2017

Prepared for:

Bellevue Bridge Commission

Prepared by:

InfraStructure, LLC
ENGINEERING CONSULTING GROUP

Submitted July 14, 2017

PROFESSIONAL CIVIL ENGINEER
TYLER D. CRAMER
E-15457
STATE OF NEBRASKA

7/14/17

TABLE OF CONTENTS

REPORT INFORMATION

This report was prepared by InfraStructure team leader Tyler Cramer, P.E. (TC6324).

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QC Signature	7/12/17
	Date QC Completed

EXECUTIVE SUMMARY

The work covered by this report is for the 2017 Routine, Fracture Critical, and Element Inspection of the above water/ground portions of the Bellevue Toll Bridge.

The Nebraska Bridge Inspection Program (NBIP) expands on the National Bridge Inspection Standards (NBIS) which requires an assignment of a condition rating for key components to the bridge. The structural condition ratings used in this report are based off of the NBIP descriptions. For further information of the program please refer to the *Nebraska Bridge Inspection Program Manual.* Based on the findings from our inspection, the condition rating for the following key components compared to the 2015 inspection are as follows:

Deck	Condition Rating remains at 7 (Satisfactory)
Joints	Condition Rating Changed to a 5 (Fair) from a 7 (Good)
Superstructure	Condition Rating remains at 5 (Fair)
Bearings	Condition Rating Changed to a 5 (Fair) from a 6 (Satisfactory)
Substructure	Condition Rating remains at 5 (Fair)
Abutments	Condition Rating remains at 5 (Fair)
Piers	Condition Rating remains at 5 (Fair)
Piling	Condition Rating remains at an "N" (No Piling Visible)
Channel	Condition Rating remains at 7 (Minor Damage)

A copy of the 2017 Nebraska Structure Inventory and Appraisal (SIA) Form is included in Appendix F. Items that have changed from the previous inspection are highlighted on the 2017 SIA.

Various cracking is present throughout the deck but has not changed since the last inspection. Each strip seal joint has evidence of water leakage below. There are typically two small holes in each end of each of these joints.

The areas of primary deterioration of the superstructure are below the deck with deterioration continuing in a similar fashion as noted at previous inspections. The deterioration is typically worst below the leaking bridge joints where heavier rust and packrust is present. Span 1 L0L1 Lt. has one hole at the middle batten plate in the top exterior angle and Span 1 L1L2 Lt. has holes in three of the four angles at the middle batten plate; deterioration was noted at the previous inspection but the holes were not present at the time. Due to the accelerated deterioration of these members it is recommended to inspect these members on a yearly basis until repairs can be made.

Several of the deck truss bearings are over rotated as noted at the previous inspection. This, along with debris build up in the anchor bolt slots, is causing the anchor bolts to bend and shifting some bearings. Several anchor bolts of the girder span bearings at Pier 8 are missing as noted at the previous inspection.

The substructures are typically in the same condition as the previous inspection with spalls, cracking, and delamination that has minimal effect on the capacity of the bridge. The concrete in front of the bearings at Abutment 1 has gotten worse since the previous inspection; it has spalled at the north bearing and is delaminating at the south bearing.

Inspection photos addressing the main inspection findings are included in Appendix A. Additional photos taken during the inspection are included in Appendix G but typically are general photos or photos of similar issues as shown in Appendix A. To maintain standards consistent with NDOR policies: the bridge is inventoried west to east, West Abutment is Abutment 1, East Abutment is Abutment 2, North Truss is Lt. Truss, and South Truss is Rt. Truss.

The last underwater inspection for this structure was in July 2012. The next scheduled underwater inspection is in July 2017.

The load rating from the 2009 report recommended the following load posting for legal vehicles:

Type 3	No Load Posting Required
Type 3S2	No Load Posting Required
Type 3 -3	No Load Posting Required

At the time of the inspection the bridge was not posted. FHWA and NDOR have recently come out with new load rating vehicles which don't appear to have been included in the most recent load rating. It is recommended a meeting should be scheduled with NDOR to discuss if this bridge requires a rating for the new vehicles. In either case a full load rating, or at a minimum a capacity analysis, should be done to determine low capacity areas needing repairs prior to any coating installation.

Recommendations for maintenance and repair are provided on Page 30. It has been recommended in the last several bridge inspections, as well as the coatings inspection completed in June 2016 by KTA, to re-coat the bridge – both steel and concrete elements. When comparing the deterioration at this inspection to past inspections, we have concluded the same as deterioration is progressing. Completing the recommended repairs, installing a coating, and completing routine maintenance activities should prolong the life of the bridge.

The more significant repairs recommended are:

- Repair the holes in deck truss lower chord member Span 1 L0L1 Lt.
- Repair the holes in deck truss lower chord member Span 1 L1L2 Lt.
- Replace the deck joints with holes and water leakage.
- Replace the over rotated deck truss rocker bearings and the bent anchor bolts.
- Replace the girder span end bearings and anchor bolts at Pier 8 and Abutment 2.
- Repair the deteriorated concrete at Abutment 1.

These repairs will require design by a licensed engineer and most should be completed by a qualified contractor.

INSPECTION INFORMATION

General Information

An NBIS routine, fracture critical, and element level field inspection for the Bellevue toll Bridge over the Missouri River was authorized by an engineering services agreement between the Bellevue Bridge Commission (BBC) and InfraStructure, LLC. The structure is located at the East edge of Bellevue, Nebraska, at river mile 601.4 based on the U.S. Army Corps of Engineers navigation charts. The field effort included inspection of substructure elements above the ground line/water line and an arm's reach examination of the superstructure, with particular emphasis on fatigue-prone details and fracture critical bridge members. This report includes a summary of the condition findings, photographs from the inspection, recommendations, and an updated Structure Inventory and Appraisal sheet.

Inspection Team, Procedure, and Conditions

The field inspection of the bridge superstructure and substructure elements above the ground line and water line were performed in 2017 from April 11 thru 14, 18, 20 thru 22, and 24. The weather conditions varied by day of inspection; a printout of the weather for these days can be found in Appendix B. The inspection was completed by a crew lead by InfraStructure with climbing support from Ayres Associates (Ayres).

InfraStructure members included:

- Tyler Cramer, P.E. – Inspector I.D. TC6324 – Team Leader
- Jon Harrison – Future Inspector I.D. JH8816 – Assistant Inspector / Equipment Operator

Ayres members included:

- Brian Schroeder, P.E. – Inspector I.D. BS4306 – Team Leader / Climbing
- Josh Makela, P.E. – Inspector I.D. JM5182 – Team Leader / Climbing
- Craig Jenkins, E.I. – Future Inspector I.D. CJ4964 – Assistant Inspector / Climbing
- Sally Shumaker, E.I. – Future Inspector I.D. SS0092 – Assistant Inspector / Climbing

A total of 220 inspector hours were required to complete the inspection. The following is a breakdown of the inspection schedule:

- April 11 thru 14
  - Ayres completed climbing/inspection of all elements of the thru truss spans and the inspection of the entire top of deck. 35 hours x 4 members = 140 hours
- April 18
  - InfraStructure completed inspection of all substructure elements, excluding the pier in the river, from the ground. 5 hours x 2 members = 10 hours
- April 20 thru 22
  - InfraStructure completed inspection of the superstructure and bottom of deck of Spans 1 thru 4. 25 hours x 2 members = 50 hours
- April 24
  - InfraStructure completed inspection of the superstructure and bottom of deck of Spans 7 thru 11. 10 hours x 2 members = 20 hours

Prior to starting the inspection, InfraStructure/Ayres held a meeting to establish roles and responsibilities and to answer any inspection and structure related issues. Safety protocol was reviewed by the staff every morning prior to the start of inspection. Any other issues were addressed as they came up in the field.

Equipment and Access

A visual and non-destructive inspection of the elements required by the contract was completed. As part of the contract, Non-Destructive Testing (NDT) methods such as dye penetrate testing and ultrasonic testing were available but were not required at this inspection. There are no recommendations to perform any other types of non-destructive evaluations as a result of this inspection.

General safety equipment on hand for the inspection included the following:

- hardhat
- eye protection
- steel toed boots
- harness
- first aid kit
- cell phone
- climbing gear
- appropriate weather wear

General inspection equipment on hand for the inspection included:

- chain drag
- camera
- mirror
- D-meter
- tape measure, caliper, and other measuring tools
- wire brush, hammer, and other cleaning tools
- digital level
- flashlight if daylight was not strong enough

The following is a breakdown of the methods of inspection access and equipment used:

- Deck and Rail: Both lanes of the deck were walked. A chain drag was used to check for and note any possible delamination in the deck. Due to the corrugated steel forms used for deck construction, the bottom of the deck was not visible for inspection.
- Superstructure, thru truss spans: Ayres utilized climbing techniques to inspect all the members of these spans above and below deck. Access for climbing was from the deck.
- Superstructure, deck truss and girder spans: Access was made possible from the ground through the use of a JLG 600AJ Boom Lift – a 60' articulating manlift. The lift was in use for 35 hours during the inspection. The ground below Spans 1 thru 4 was extremely soft at the inspection causing the lift to sink. Six sheets of 3/4" plywood were used to prevent the lift from sinking as the lift moved along the ground. One sheet was required per tire while moving two sheets at a time. There were minimal soft spots below Spans 7 thru 11 that required the plywood. The lift was rented from Titan Rentals of Omaha (Kevin Bewley, 402-733-3700).
- Substructure: The abutments were accessible from the ground with minimal climbing at Abutment 1. Climbing techniques were used to access the top of Piers 4 thru 6. The manlift was used to access the tops of the other piers. The lower portions of all piers but Pier 5 could be accessed from the ground. The lower portion of Pier 5 will be re-inspected during the underwater inspection this July; access will be by boat.

There were no potential dangers or protected wildlife considerations at this inspection. No other special considerations from those already listed were required at this inspection. The levee gate at the south side of the Iowa approach is locked and required opening to allow equipment access. The gate key is kept at the toll booth – if the key is not there the inspector shall contact the BBC.

Traffic Control

Due to the access methods no significant traffic control methods were utilized and both lanes of the bridge remained open throughout the inspection. Advanced warning signs were used when inspectors were on the deck and traffic cones were placed around the workers on the deck and moved as required.

BRIDGE DESCRIPTION

The Bellevue Toll Bridge was built in 1952 and consists of 11-spans with a total length of 1,965'-0". The bridge is owned and operated by the BBC and carries Nebraska's East Mission Avenue (previously Highway 370) and Iowa's County Highway H10 over the Missouri River. A map showing the location of the bridge is provided in *Figure 1* below and is followed by *Figure 2* which shows a satellite view of the typical river boundaries (an underwater inspection will be completed July 2017 and will give more detailed information on the channel). *Figures 3, 4, and 5* on the following pages show basic plan and elevation views of the bridge. Photos 1 through 4 show the basic elevation views of the bridge.

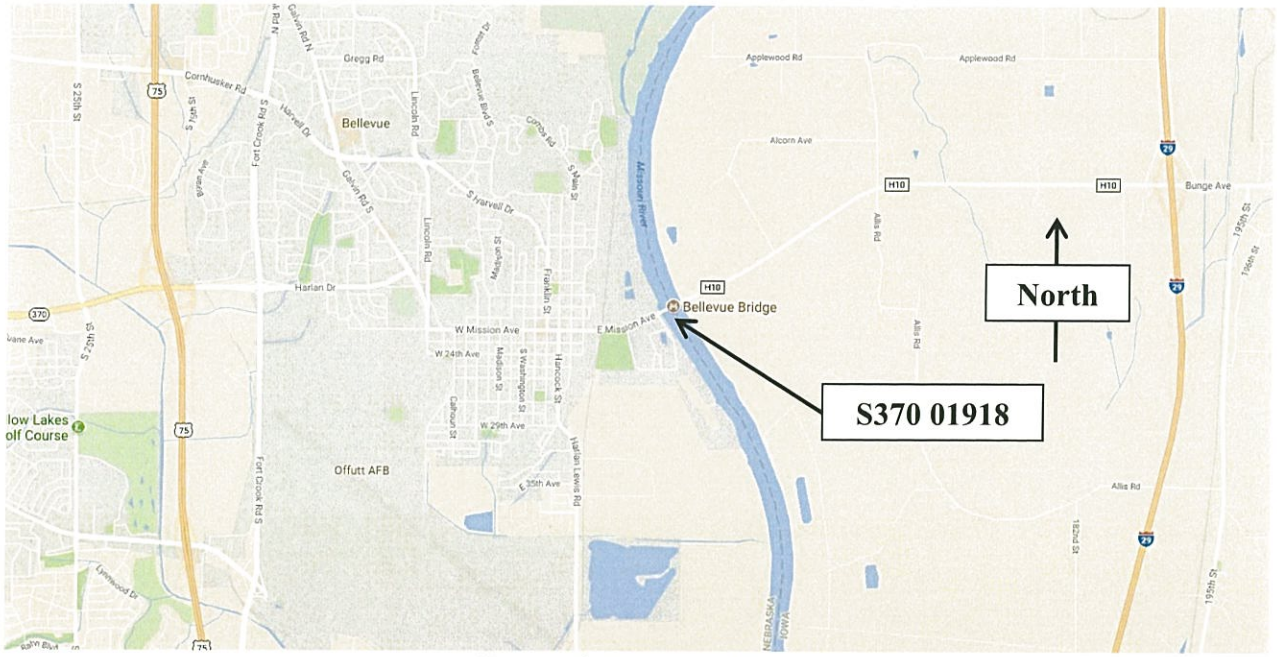


Figure 1: Location Map

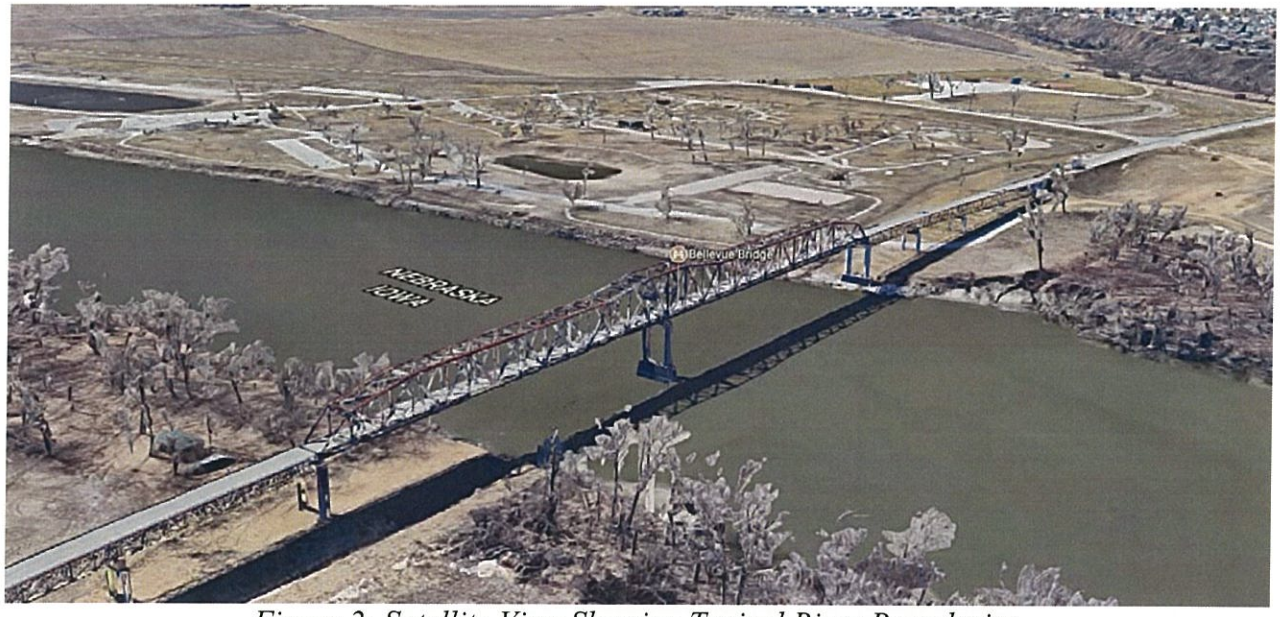


Figure 2: Satellite View Showing Typical River Boundaries

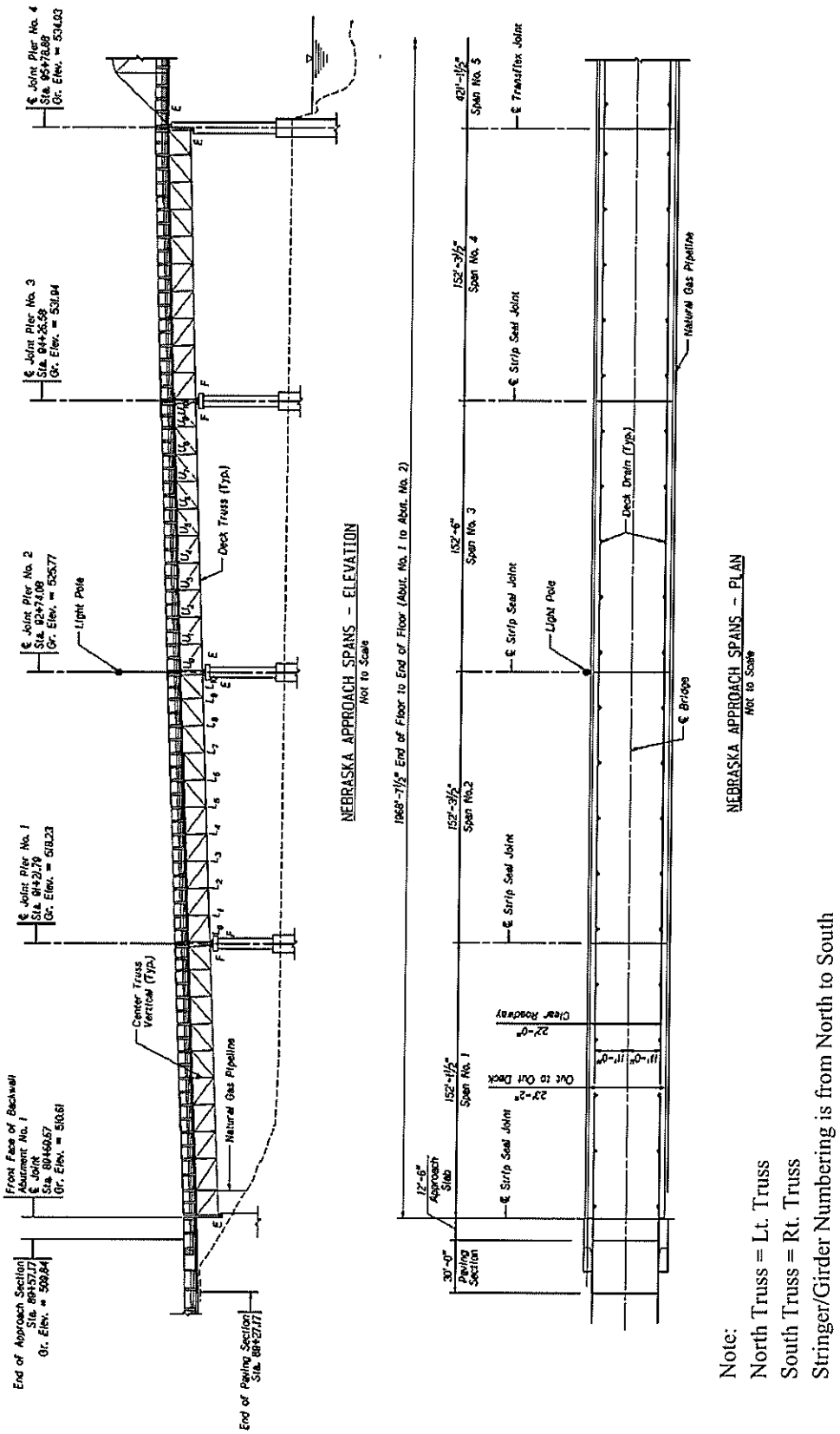
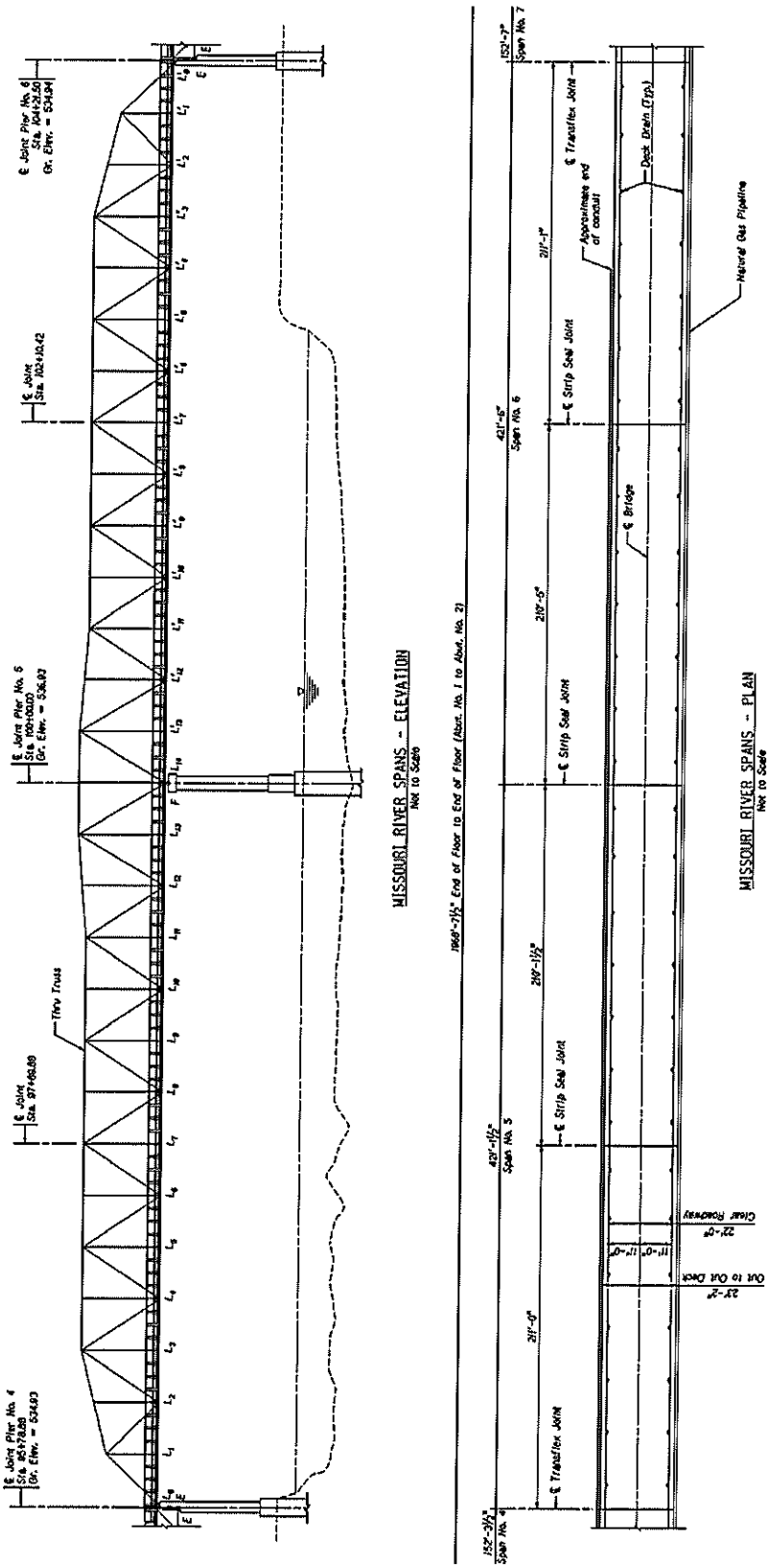


Figure 3: Nebraska Approach Spans Elevation and Plan



Note:
North Truss = Lt. Truss
South Truss = Rt. Truss
Stringer/Girder Numbering is from North to South

Figure 4: River Spans Elevation and Plan

Note:
North Truss = Lt. Truss
South Truss = Rt. Truss
Stringer/Girder Numbering is from North to South

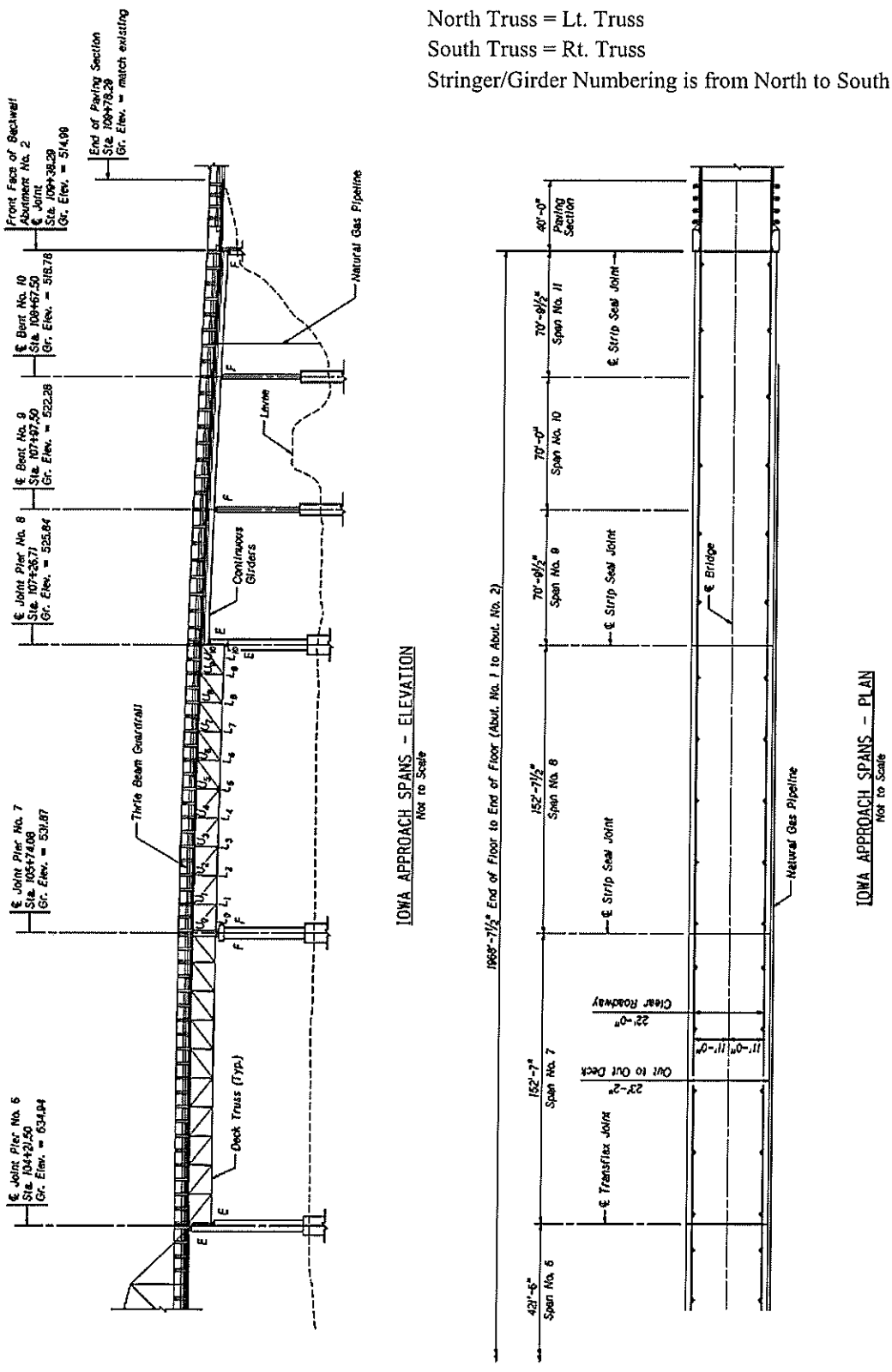


Figure 5: Iowa Approach Spans Elevation and Plan

2012 Average Daily Traffic count indicated 2645 vehicles use the bridge per day with an estimated 5% truck traffic. Currently there are two alternate routes for this bridge in case of closure. The first is the Highway 275 South Omaha Bridge 6 miles up-river. The second is the Highway 34 Plattsmouth Bridge 10 miles down-river. Both detours are approximately 20 miles. The access road for the levee on the Iowa side runs under Span 10.

The bridge was closed for rehabilitation in 2004 which included:

- Replacement of the deck, rails, and joints*.
- Addition of shear studs to all truss stringers and to girders of Spans 9 thru 11.
- Replacement of the bearings at Abutment 1.
- Repair of concrete at all supports**.
- Replacement of the approach slabs at both ends of the bridge.
- Repair of thru truss gusset plate at U13 Lt.

Other repairs include:

- Thru Truss floorbeams L2' and L1' were repaired in 2007, L8 and L3' in 2009, and L7' in 2012.
- The Pier 6 deck joint was repaired in 2011.
- In 2012 concrete repairs were completed at Piers 7 and 8 – the Span 9 Girder 2 bearing seat was repaired as part of this.

At some point stiffener angles were installed at various locations of the deck truss floorbeam ends to repair/strengthen the section due to the deterioration and holes in the web. With the exception of the asterisked items, all repairs and rehabilitations noted above are in good condition and appear to be effective. No other repairs were noted at this inspection; if there have been any, the repairs are effective.

* The deck joints appear to have been cut or torn at the ends allowing water to leak.

** The repaired concrete is deteriorating.

Deck

The deck is a cast-in-place concrete deck with corrugated steel stay-in-place forms with a clear roadway of 22'-0" and there are no sidewalks. The barrier rails consist of concrete curbs with steel thrie-beam guardrails on top. W-beam approach rails extend along the road at all four corners. Bridge deck lighting is present throughout the bridge. The conduit and wiring for the bridge deck lighting run through the rails. A natural gas pipeline sits on the south rail post and is connected with bracket attachments along the whole bridge with connections at each end of the bridge.

Superstructure

Progressing eastward from the west abutment:

- Spans 1 through 4 each consist of a simple span deck truss. Each span is approx. 152'.
- Spans 5 and 6 consist of a continuous thru truss. Each span is approx. 421'.
- Spans 7 and 8 each consist of a simple span deck truss. Each span is approx. 152'.
- Spans 9 through 11 consist of continuous steel multi-beams. Each span is approx. 70'.

All steel truss members consist of riveted and/or bolted, rolled, and built-up members with few welds, typically tack welds for construction, throughout. Truss members are connected with gusset plates using bolts and/or rivets. All stringers and floorbeams are rolled steel members.

Some floorbeams have been repaired with angles welded at the ends to act as stiffeners and a few have bolted repairs for strengthening purposes. The stringers are simply supported at the floorbeams. The stringers of both the thru and deck trusses are connected to the floorbeam webs with connection angles and bolts and/or rivets; the floorbeams can be considered braced by the stringers. The stringers are composite with the deck due to the presence of the shear studs. No butt welds are present on any truss component. Truss bearings consist of pins – rocker or fixed as required – all bearings are anchored to the concrete substructures using anchor bolts.

All girders are rolled steel members. Bolted and/or riveted splices were used for continuity. The girders are composite with the deck due to the presence of the shear studs. Channel separators attached to full height stiffeners are present throughout; stiffeners are bolted and/or riveted to the girder webs with some tack welds present. No butt welds are present on any girders. Girder bearings consist of pins – rocker or fixed as required. Pier 8 bearings are rocker bearings anchored to the concrete cap. All other girder bearings are fixed pins anchored to the concrete or steel caps with anchor bolts.

Substructure
The abutments consist of concrete walls supported on concrete columns and footings; Abutment 1 piling are steel and Abutment 2 piling are timber. Piers 1 thru 8 consist of concrete caps and columns supported on concrete walls; Piers 1 thru 3 and 6 thru 8 are supported on footings with steel piles, Piers 4 and 5 are on concrete caissons. Piers 9 and 10 consist of a concrete base wall supported on a concrete footing with steel pile; two steel columns, a steel cap, and steel bracing support the superstructure.

Signs
The toll booth operates on the Nebraska side. Roadway and navigation lighting is present throughout the structure. Signs include:

- No posting signs are in place; none are required per the current load rating.
- Delineators are present at all four corners of the bridge.
- Advanced warning signs are in place on both sides of the bridge indicating a toll bridge.
- Snow plow lift blade / expansion joint signs at both ends of the thru truss.
- 35 MPH speed limit signs ahead of and on the bridge; this includes radar speed signs on the bridge.

Load Rating
The Load Rating Summary Sheet (LRSS) was completed by HNTB and was stamped on 8/27/2009. Per the LRSS, the flexural capacity of the thru truss floorbeams controlled the load rating. The legal posting summary is 26.7 Tons, 38.1 Tons, and 48.5 Tons for the Type 3, Type 3S2, and Type 3-3 Trucks, respectively. The recommended posting is N/A, N/A, and N/A for the Type 3, Type 3S2, and Type 3-3 trucks, respectively, indicating no posting of the structure is required. The BBC has chosen to not post the bridge for any loads.

The structure was rated using the Load Factor Rating (LFR) method. Original plans, reconstruction plans, and field measurements were utilized. No overlay was modeled in the rating. Yield stress of 45 ksi was used for silicon steel and 33 ksi for carbon steel. Additional comments from the LRSS include:

- Deck truss losses: 5% on the floorbeam webs, 10% on the floorbeam flanges, 5% on the stringers, 5% on the lower chords, and no loss on the verticals or diagonals. The top chord loss was ignored because the deck is composite with the stringers.
- Thru truss losses: 10% on the floorbeam webs, 19% on the floorbeam flanges, 10% on the stringers, 10% on the lower chords, 10% on the top chord cover plates, and no loss on the verticals or diagonals.
- No loss on the continuous girder spans.
- A chain of Type 3 trucks was spaced at 30 ft. for spans longer than 200 ft. to represent an actual live load situation.
- Materials for the thru truss members consist of silicon steel and carbon steel.
- Permit loads assumed one truck travelling through the bridge.
- Gusset plates were analyzed and do not control the rating.
- Future inspections should look for progression of corrosion.
- There are no recommendations for improving the rating.

After the inspection was completed, the inspection notes were compared to past inspection notes. The structure is continuing to deteriorate with some sections having loss beyond what was originally rated. In addition the structure is not currently rated for the new vehicles required by FHWA and NDOR. As a result, it is recommended to complete a new load rating for the new vehicles and account for any additional loss at that time.

Problematic Details

Tack welds, intermittent welds, field welds, rivets and low tensile bolt connections, cover plates, open holes, section loss due to corrosion or collision, and distortion are among the problematic details on this bridge.

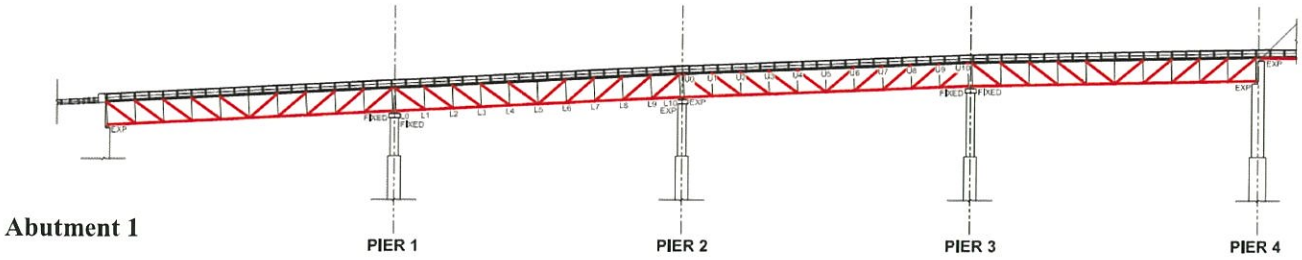
Fatigue Categories

Fracture Critical Member	AASHTO Fatigue Category
Truss Tension Member	D
Gusset Plate Connecting Truss Tension Member	D
Floorbeam	D
Pin Connecting Truss Tension Member	N/A
Pier 9 and 10 Steel I-Beam Cap	D

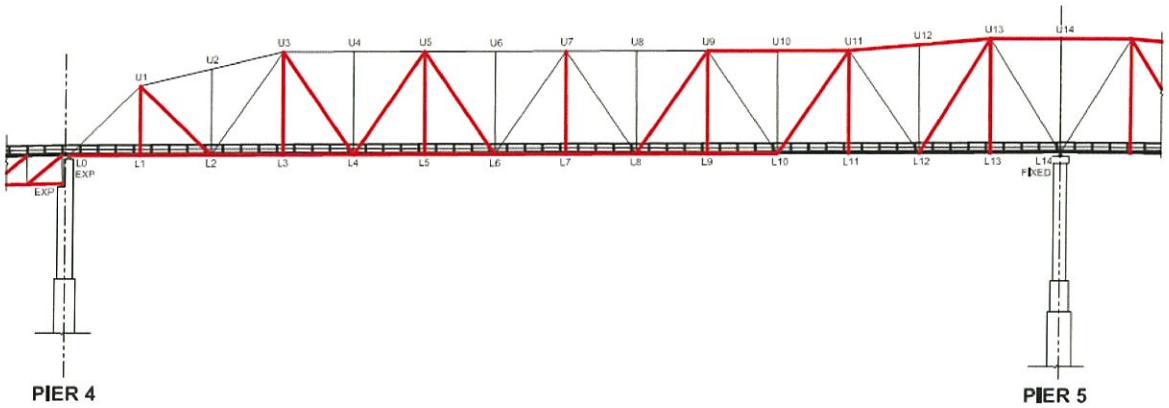
Table 1: Fracture Critical Member Legend

Table 1 notes:

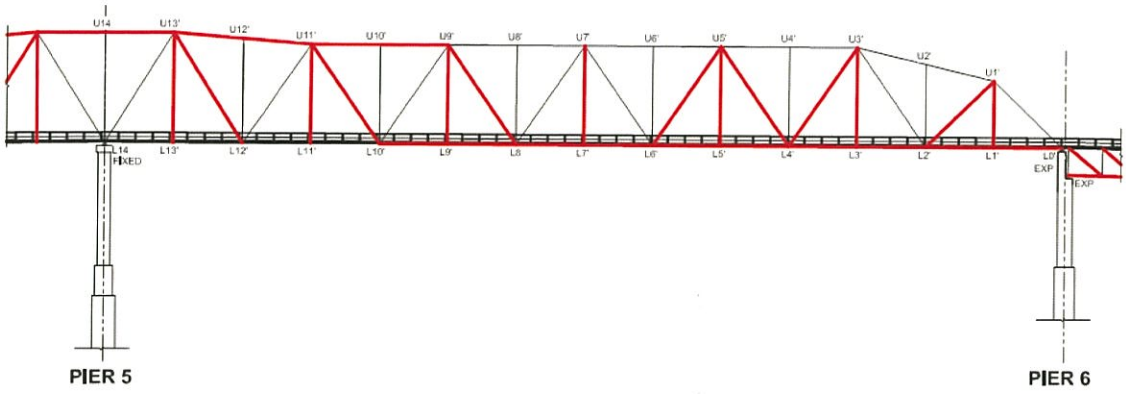
- See the diagrams in *Figure 6* on the next page for the location of the tension members.
- The worst case AASHTO Fatigue Category is shown.
- Most truss members and gusset plates are connected by bolts and/or rivets. Any rivet or open hole warrants a category "D". No determination could be made if the bolts are high strength, designated slip critical, or holes reamed out properly to warrant a Category "B"; therefore all bolted connections were treated as riveted.
- Floorbeams spaced greater than 14' supporting simple span stringers are fracture critical. See the note above about bolts and rivets for category selection.
- Pins connect truss members at bearings. There is no AASHTO Fatigue Category for pins.
- Pier 9 and 10 caps are steel I-beams supported with a support at each end, similar to a floorbeam. The caps should be considered fracture critical because of this.



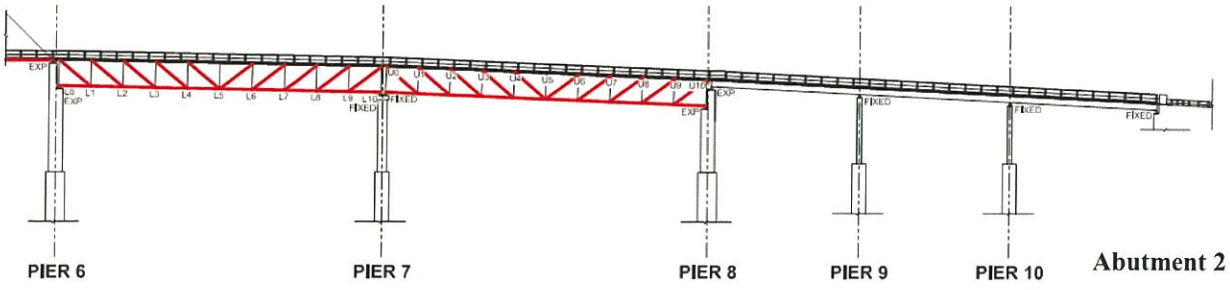
SPANS 1 THROUGH 4 - ELEVATION



SPAN 5 - ELEVATION



SPAN 6 - ELEVATION



SPANS 7 THROUGH 11 - ELEVATION

Figure 6: Location of Tension Members (Members highlighted Red)

STRUCTURE CONDITION

The following are a summary of the inspection findings for the specific areas noted. See Appendix A for referenced photographs. Note any other photos not incorporated into Appendix A can be found in Appendix G.

A. General

The bridge remains in fair condition with few changes noted since the previous inspection. The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. There is heavy rust and pitting with some section loss noted in both thru and deck-truss spans at several of the members below the deck – the worst is at locations below the existing joints and in the Lt. lower chords of Span 1. Packrust was noted throughout both trusses at several lower connections and in built-up members with up to 1" of packrust at some connections.

B. Deck

The condition rating of the deck remains coded at a 7, Good Condition. No significant changes have been noted since the previous inspection. A chain drag was used for sounding and no delamination was noted.

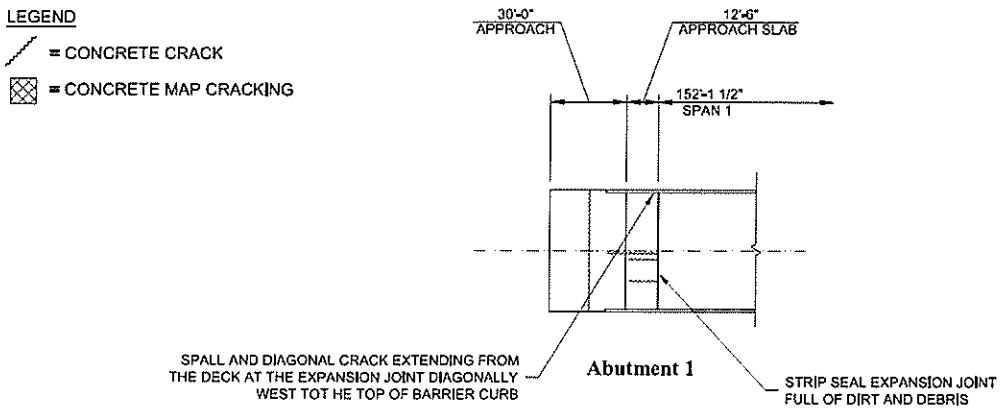
The area within 2' of each curb is showing light scaling, 1/16" to 1/8". There are several small aggregate popouts, 1/4" to 1", (Photo 5) and other snow plow markings (Photo 6) scattered throughout the deck surface. Where the deck is continuous over a floorbeam there is transverse cracking (Photo 7). Other areas of heavier map cracking, higher concentration of transverse cracking over the floorbeams, and areas of wear are identified in deck deficiency drawings in Figures 7 through 10 on the following pages – note there are no changes in the drawing from the last inspection.

Poor consolidation of the concrete during construction has left exposed rebar at the bottom of the deck overhang at both corners of the East Abutment (Photo 8). Most of the epoxy coating remains on the exposed bars with some rust showing where there is no epoxy remaining. Transverse cracking with efflorescence are present randomly throughout the overhangs of Spans 9 through 11 (Photo 9). A few seam locations of the stay-in-place decking in Spans 9 through 11 are showing rust (Photo 10). The deck forms blew out during construction at Span 2 U5 Rt.

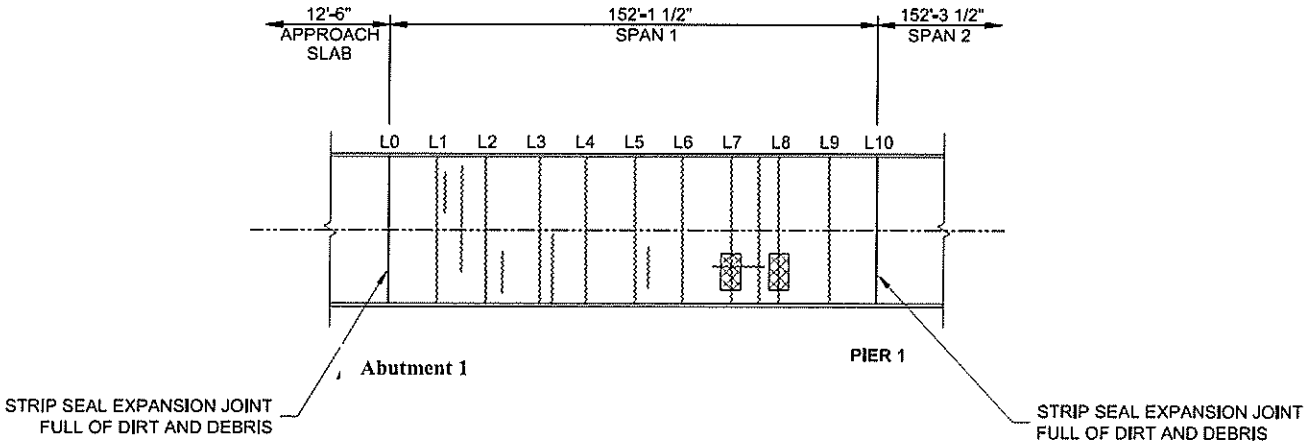
Deck drains are located along both side of the bridge and are open and working properly. All four deck drains in Span 11 and the two east deck drains in Span 10 have previously been filled with concrete to protect levee and abutment slopes from erosion.

The curbs have hairline vertical cracking with spacing of 2' to 4' throughout their entire length (Photo 11). The north curb at the Abutment 1 has a spall and diagonal crack that extends from the deck at the expansion joint diagonally west to the top of barrier curb. The north curb at Pier 5 has a diagonal crack.

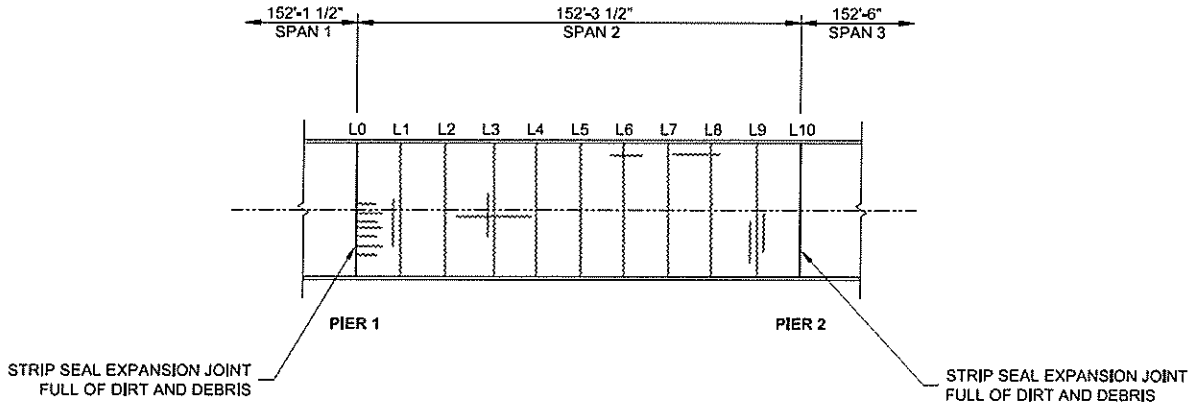
Both concrete approach slabs have transverse cracks and hairline longitudinal cracks; some of the cracks have previously been sealed. The east approach slab is undermined adjacent to the north barrier wall in two spots. At the abutment the penetration is approximately 6" tall by 4' wide x 3' below the slab (Photo 12). At the end of the slab where the ditch is eroding the penetration is approximately 6" tall by 2' wide by 2' below the slab (Photo 13). There is minor undermining along the south edge of the slab at the abutment. The undermining is causing some distress on the surrounding slab evident by diagonal cracking.



WEST APPROACH SPAN - PLAN

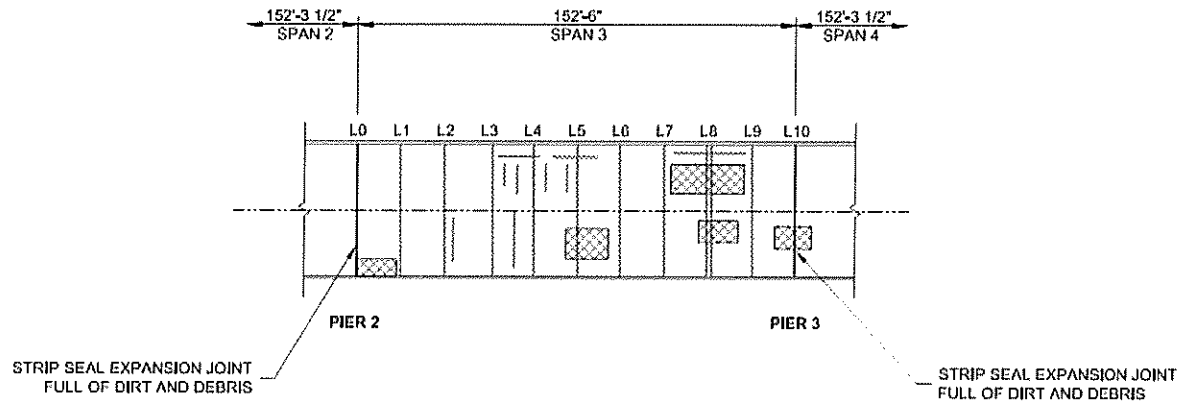


SPAN 1 - PLAN

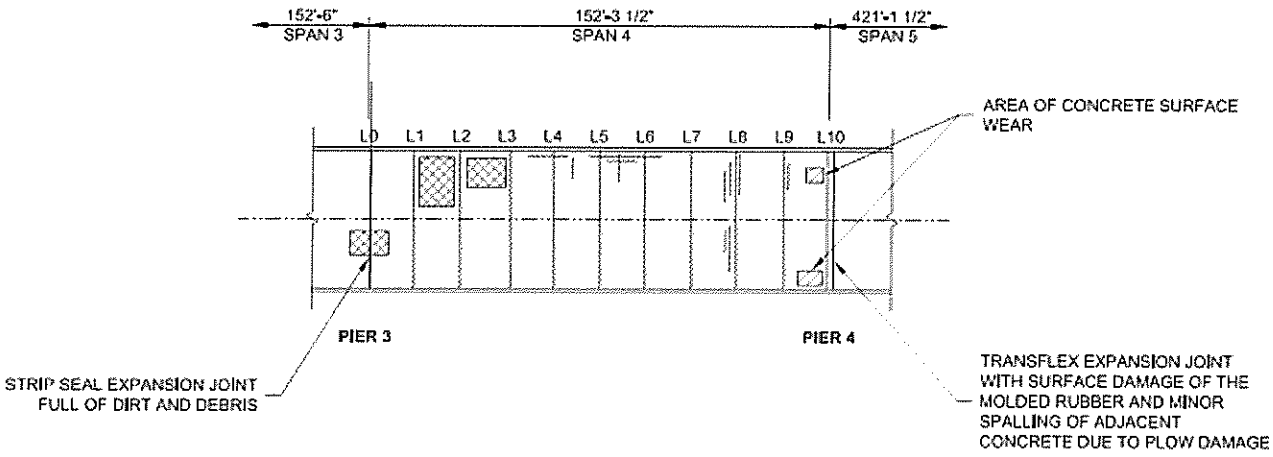


SPAN 2 - PLAN

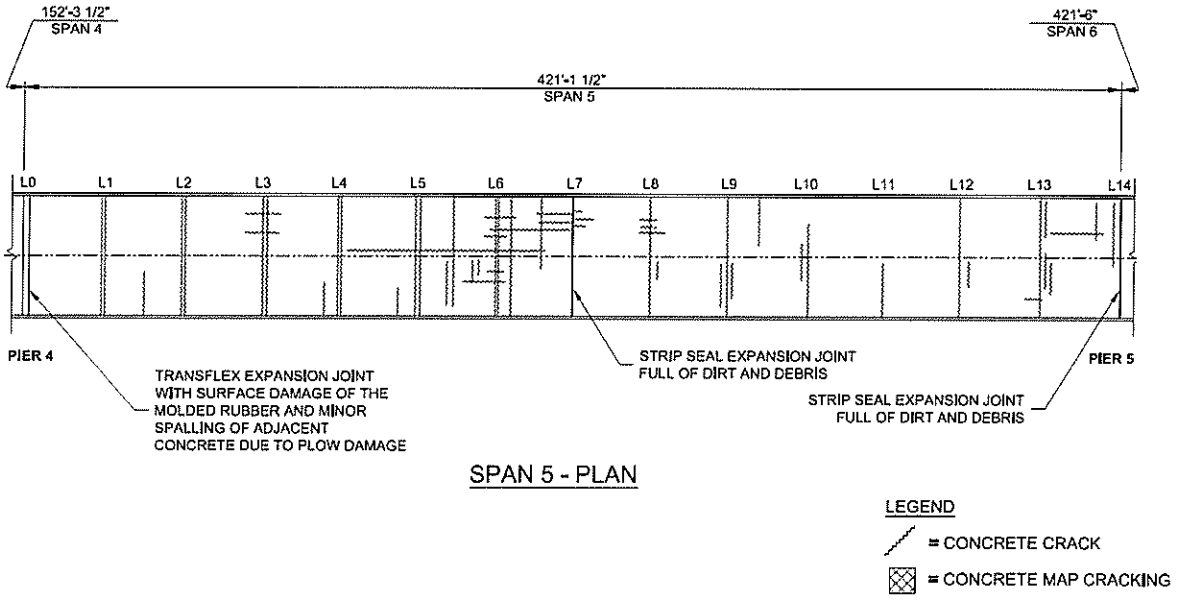
Figure 7: Plan of Deck Defects – West Approach to Span 2



SPAN 3 - PLAN



SPAN 4 - PLAN



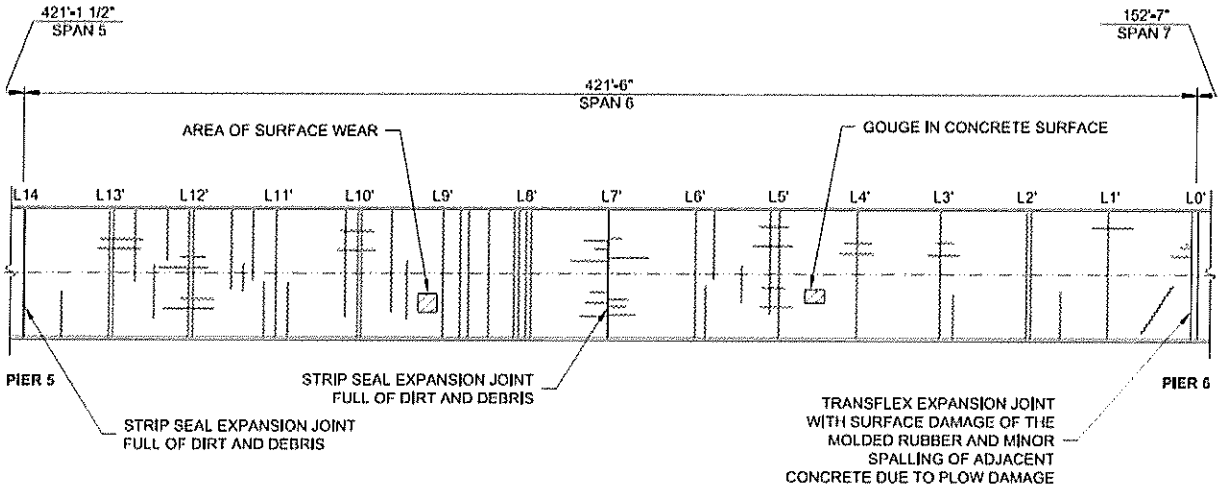
SPAN 5 - PLAN

LEGEND

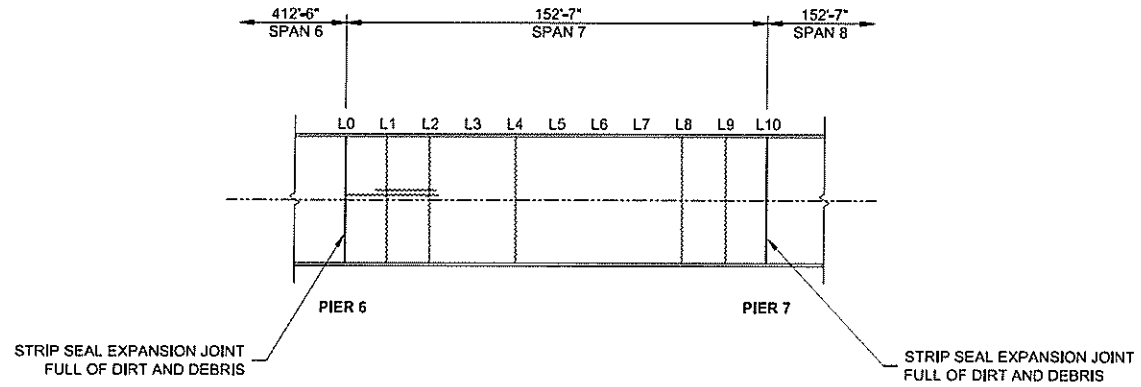
= CONCRETE CRACK

= CONCRETE MAP CRACKING

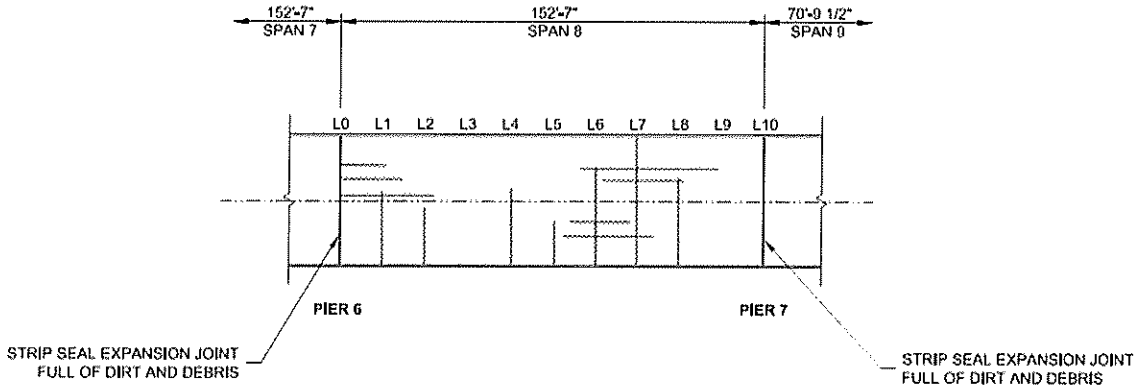
Figure 8: Plan of Deck Defects – Span 3 to Span 5



SPAN 6 - PLAN



SPAN 7 - PLAN



SPAN 8 - PLAN

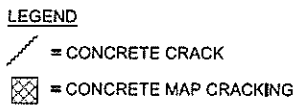


Figure 9: Plan of Deck Defects – Span 6 to Span 8

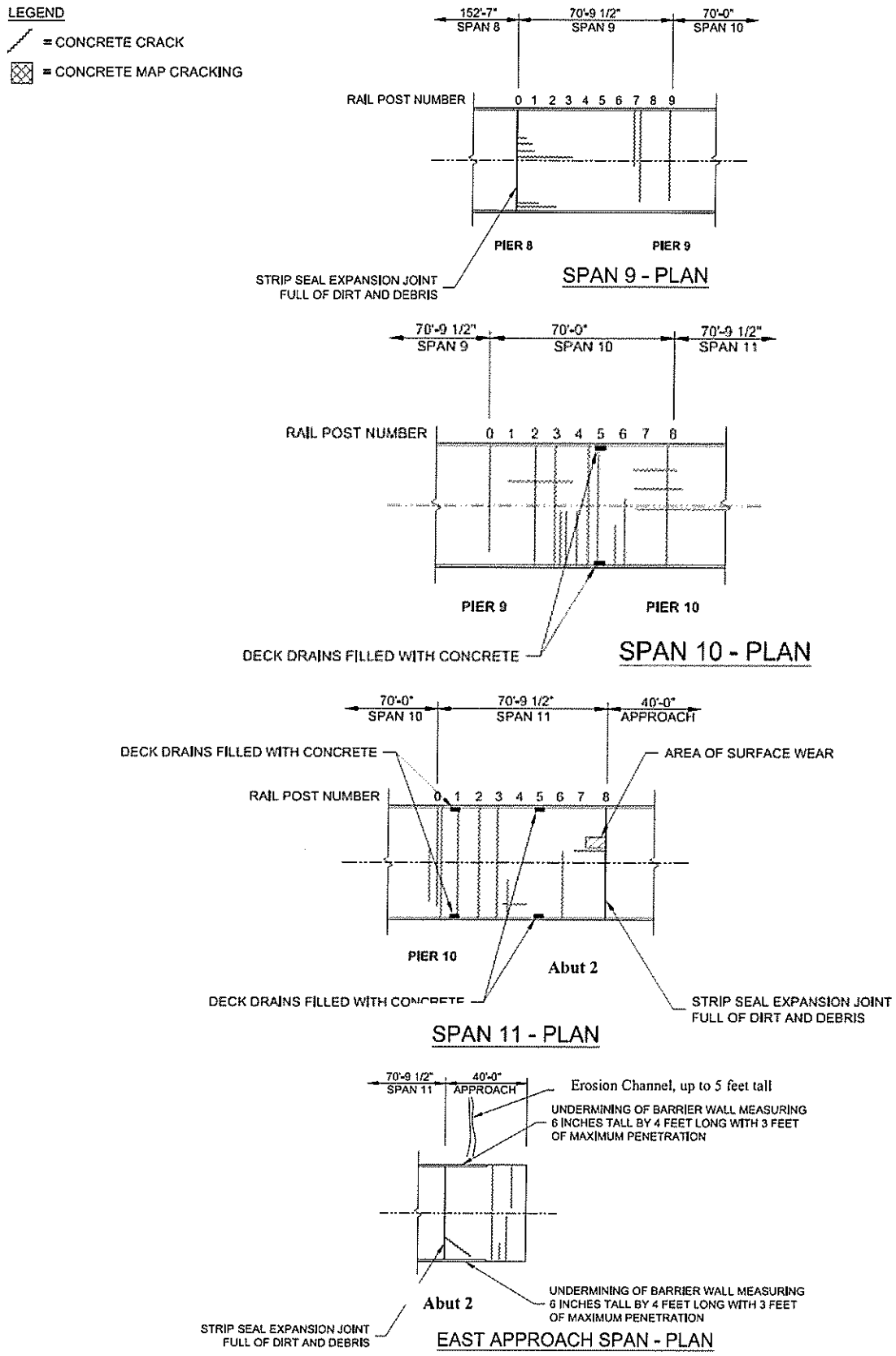


Figure 10: Plan of Deck Defects – Span 9 to East Approach

C. Deck Joints

The condition rating of the deck joints has changed from a 7, Good Condition, to a 5, Fair Condition. No significant changes, other than the joint leaks noted below, have been noted since the previous inspection.

Strip seal joints are present at the abutments, Piers 1 through 3, Pier 5, and Piers 7 through 10, and also L7 and L7' of the thru truss spans. All of these joints are full of debris but appear to be functioning properly (Photo 14). The steel armoring on several of these joints have evidence of plow damage. Each of these joints has evidence of water leakage below. At the inspection it was noted water was dripping from one of the joint ends. Further investigation indicated there are typically two small holes in each joint end, at all strip seal joints (Photo 15). The consistency of the hole size, shape, and location indicates this may have occurred during installation.

Transflex joints are present at Piers 4 and 6. Both of these joints have plow damage consisting of surface damage of the molded rubber and minor spalling of the adjacent concrete (Photo 16). Water lines are present on the deck truss span faces of the pier concrete.

The opening widths at the joint locations were measured and documented in *Table 2* below, along with the ambient temperature at the time of measurement. Measurements for the last three inspections are also shown for comparison. Note that due to the narrow deck width only the south edge measurement was taken; all measurements are taken 1' from the face of the rail with "W" indicated in *Figure 11* on the next page. The joints movements are behaving as anticipated for the corresponding temperature; however, future inspections should take measurements at significantly different temperatures than those shown to verify the bearings are allowing for thermal expansion and contraction.

TABLE 3: JOINT OPENING MEASUREMENTS

Inspection Year	Abutment 1		Pier 1		Pier 2		Pier 3	
	Temp (F)	W (inches)	Temp (F)	W (inches)	Temp (F)	W (inches)	Temp (F)	W (inches)
2011	40	2-1/2	40	2-1/2	40	2-7/8	40	2-3/4
2013	40	2-1/2	40	2-1/2	40	2-7/8	40	2-3/4
2015	60	2	60	2-1/4	60	2-1/8	60	2-1/4
2017	60	2 1/4	60	2 1/2	60	2 1/4	60	2 1/2

Inspection Year	Pier 4		Through Truss Joint L7		Through Truss Joint L14		Through Truss Joint L7'	
	Temp (F)	W (inches)	Temp (F)	W (inches)	Temp (F)	W (inches)	Temp (F)	W (inches)
2011	40	29	40	1-7/8	40	2-1/4	40	2
2013	40	28-3/4	40	1-3/4	40	2-1/4	40	2
2015	60	28	60	1-3/4	60	2-1/8	60	2
2017	60	28-1/2	60	2	60	2-1/8	60	2-1/8

Inspection Year	Pier 6		Pier 7		Pier 8		Abutment 2	
	Temp (F)	W (inches)	Temp (F)	W (inches)	Temp (F)	W (inches)	Temp (F)	W (inches)
2011	40	29	40	2-1/2	40	2-7/8	40	2-1/4
2013	40	29	40	2-1/2	40	3	40	2-1/8
2015	60	28	60	2-3/8	60	2-1/4	60	2-1/4
2017	60	28.5	60	2 5/8	60	2 5/8	60	2 1/4

Strip Seal Joint Measurmurement *Transflex Joint Measurement*

Figure 11: Deck Joint Measurment Width, "W"

D. Rails

The condition rating of the rails remains coded at a 6, Satisfactory Condition. No significant changes have been noted since the previous inspection.

Minor impact damage, most likely from plows, is present along both rails with several jagged tears (Photo 11). The impact damage is identified along the entire length of the north rail in Spans 2 and 7 and along the west end of the north rail in Span 3. All rail expansion joints appear to be functioning properly. The bottom connection weld of the northeast rail at Abutment 2 is cracked at the beam (Photo 17); the rails are bolted into the deck and connected to the beam with bolts and angles.

The northeast approach rail center (Photo 18) and end terminal has minor impact damage (Photo 19). There are locations of improper rail splice lapping in both east approach rails (Photo 20).

E. Superstructure

The overall condition rating of the superstructure remains coded at a 5, Fair Condition. The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. The condition of the paint and levels of rust throughout the superstructure can be seen in Photos 21 to 103.

a. Deck Truss Spans

The condition rating of the thru truss spans over the river, Spans 1 through 4, 7, and 8, remain coded at a 5, Fair Condition. No significant changes other than noted below have been noted since the previous inspection. Unless otherwise noted below, all bolts/rivets are present and in fair condition and all welds are in fair condition.

Truss Members

The truss members are in fair condition with minor surface rust throughout; heavier rust typically at the gusset plates, the ends of the span, and the batten plates of the lower chords. The corrosion along the upper chord can be attributed to water and salt infiltration through the deteriorated deck prior to its replacement in 2004. With the new deck in place, no sign of water or salt penetration was observed other than the areas at the ends of the spans where the deck joints are leaking.

The section loss at the batten plates of the lower chords is typically on the inside of the lower chord angle above and below the batten plate. Most of these areas have some form of section loss in the angles. Typically this loss is minimal and does range to approximately 1/8" depth for 1" to 2" above and below the batten plate (Photos 21 and 22). This loss does also go into some batten plates with holes having formed in the middle batten plates of Span 1 L0L1 Lt. (Photo 23) and Span 1 L1L2 Lt. (Photo 24) and the west batten plate in Span 2 L0L1 Lt. (Photo 25).

The worst case of lower chord loss is at the middle batten plate of Span 1 L1L2 Lt. There is complete section loss in both bottom angles for approximately 5" in length and 1" in depth (Photos 26 and 27). There is also a small 1/4" diameter hole in the horizontal leg of the top exterior angle just east of the middle batten plate rivets (Photo 24). This deterioration was not noted as being fully through the angle leg at the 2015 inspection but was noted as being fully through at the 2016 Coatings Inspection indicating possible accelerated section loss. A 1/2" diameter hole in the horizontal leg of the top exterior angle just west of the middle batten plate rivets in Span 1 L0L1 Lt. was also noted at this inspection that wasn't previously noted (Photo 23). Minor amounts of concrete are sitting on the lower chords at some locations; the worst is below the deck blowout.

Section loss has occurred in several of the horizontal gusset plates from water previously sitting on the plates (Photo 28). The worst is typically at the horizontal gusset plates above the truss bearings with rivet heads deteriorated at some locations. The horizontal plates between the lower chord members at these locations have similar deterioration with rivet head deterioration.

Packrust is typical throughout all gusset plates and members originally built with no gaps between two steel sections. Minor packrust up to 1/4" is typical at the following locations:

- Members coming into the lower connection gusset plates, both on the interior and exterior (Photos 29, 30, and 31), excluding the span's end connections.
- Lower chord splices (Photo 32).
- Cover plate of the upper chords which produces a ripple distortion along the rivets (Photo 33).
- Batten plates of the diagonals consisting of two angles (Photo 34).
- Continuous plates of the diagonals consisting of four angles; this produces similar ripple distortion along the rivets as seen in the upper chords (Photo 35).
- The upper connections below the deck joints (Photos 36 and 37).

Heavier packrust up to 1" is typical at the following locations:

- Gusset plates and plate connections to the bearings at ends of the spans (Photo 38).
- Upper chord cover plates below the floorbeam where only two rivets are present instead of four rivets (Photo 39).

The vertical angles of the lower chords from L0 to L2 and L8 to L10 were typically bowed outward approximately 2" from other lower chord measurements (Photos 40 and 41), 11" versus 9", with the interior leg of Span 7 L0L1 Rt. distorting in a wave pattern (Photo 42). The lower chord gusset plates at the bearing are typically bowed inward at the top and bottom (Photos 43, 44, and 45).

Small dents are present at some locations throughout the truss members: largest are at Span 1 L0L1 Lt. (Photo 46), Span1 U7U8 Rt. (Photo 47), Span 3 L9L10 Rt. (Photo 48), Span 7 U8L8 Lt., and Span 8 L0L1 Rt. (Photo 49). The Span 4 L7 Lt. exterior gusset plate has a minor tear (Photo 50). The exterior face of Span 3 U4L4 Rt. has a small rolling defect above L4 (Photo 51). These issues were most likely created during construction.

Most of the riveted splice connections in the lower chords have tack welds that were placed during construction. Cracks were found through the welds at some locations (Photo 52). There are no signs of any crack propagating into the base metal.

Floorbeams

The floorbeams are in fair condition with minor surface rust throughout; heavier rust typically at the floorbeam ends overhanging the truss and at locations below deck joints (Photo 53). There are areas of delamination in the floorbeam faces below the deck joints from previous and continued joint leakage (Photos 54 through 57). The worst is at the ends. The steel cantilever brackets in these areas also have similar issues with holes forming; however, these were made redundant when the deck was replaced. Minor packrust has developed between the web and exterior stringer connection angle at some locations throughout (Photo 58); minimal section loss was noted.

Several of the floorbeam ends have full penetration section loss varying in size (Photo 59). Most of these locations have been retrofitted with steel angles to strengthen the weakened web in these areas (Photo 60); the angles were typically welded on with the weld at Span 8 Floorbeam 4 Lt. cracked. The ends continue to deteriorate due to the exposure to rainfall but the deck replacement in 2004 was designed to cantilever outside of the exterior stringers making the floorbeams in the deteriorated area redundant.

No significant dents or distortion was noted throughout the floorbeams; however, there are larger dimple dents in the floorbeam web near the exterior stringers in a few locations (Photo 61). These were most likely due to construction.

Stringers

The stringers are in satisfactory condition with minor surface rust throughout. Heavier rust is present at some stringer ends and in the connection angles (Photo 58). The connection angles with packrust between the angle and floorbeam typically have minor packrust between the stringer web and connection angle as well (Photo 58). No significant dents or distortion was noted throughout the stringers; however, there are a few locations with minor bent flanges (Photo 62). Span 8 Stringer 4 has a gouge in the top cope at U3; the gouge is small and hasn't extended since the last time it was noted. The dents and gouge are likely from construction.

Lateral Bracing

All lateral bracing – lower, upper, and in the vertical plane – are in satisfactory condition with minor surface rust throughout and packrust developing at the center of the bracing (Photo 63). Seven lower lateral bracing angles and one upper lateral bracing angle were bent and/or dented at the following locations:

Span 1 Bay 3 lower (Photo 64)	Span 3 Bay 9 lower (Photo 67)
Span 1 Bay 4 lower (Photo 64)	Span 7 Bay 3 upper (Photo 68)
Span 2 Bay 5 lower (Photo 65)	Span 8 Bay 1 lower (Photo 69)
Span 3 Bay 4 lower (Photo 66)	Span 8 Bay 5 lower (Photo 70)

b. Thru Truss Spans

The condition rating of the thru truss spans over the river, Spans 5 and 6, remain coded at a 5, Fair Condition. No significant changes have been noted since the previous inspection. Unless otherwise noted below, all bolts/rivets are present and in fair condition and all welds are in fair condition.

Upper Chords

The upper chords are in fair condition with minor surface corrosion along the top of all members. The surface corrosion is uniform and does not have any signification pitting or section loss. Minor, isolated areas of packrust are present along the upper chord (Photo 71).

Several connection plates have tack welds placed during the original assembly of the trusses. One tack weld was found with a crack through the weld with no sign of propagation into the base metal. The cracked tack weld is located at the north splice plate of U13' Rt. (Photo 72). One rivet head is missing on the exterior face at U1 Rt. (Photo 73).

Lower Chords

The lower chords are in fair condition. Packrust is present at most built-up members and gusset plate connections (Photos 74 and 75). The box type member shape used for the lower chord in the compression zones near Pier 5 has more packrust inside the members between the bottom plate and the web compared to the tension zones where an open type of member shape with smaller batten plates are used. The packrust has broken rivets in several locations identified below (Photo 76), quantities are approximate:

Lt. Truss	Rt. Truss
L12 to L13: 1 broken rivet	L1 to L2: 1 broken rivet
L6' to L7': 8 broken rivets	L6 to L7: 7 broken rivets
	L7 to L8: 20 broken rivets
	L6' to L7': 5 broken rivets

A few of the baton plates on the lower chord are slightly bent (Photo 77). L3' Rt. has flaking corrosion of the exterior bottom angle (Photo 78); when removed pitting is up to 1/8" deep in the vertical leg of the angle.

Verticals and Diagonals

The vertical and diagonal members are in fair condition with minor areas or corrosion similar to the rest of the thru truss. A few of the lattice bars of the diagonal members are slightly bent. U13L12 Rt. has 2 broken rivets (Photo 79).

Upper Lateral Bracing

The upper lateral bracing are in fair condition with minor areas of corrosion throughout. A few of the lattice bars of are slightly bent at random areas throughout (Photo 80). There is a crack with a previously installed arrest hole located in the sway bracing gusset plate at U13 Lt. (Photo 81); the crack has not propagated beyond the hole.

Lower Lateral Bracing

The lower lateral bracing are in fair condition. Some of the hanger bolts used to minimize vibrations of the bottom lateral bracing are bent, sheared off (Photo 82), or have missing nuts. New hanger rods have previously been installed at some of these locations near Pier 5 and appear to be functioning as intended (Photo 83).

Lower lateral bracing from L2 Lt. to L3 Rt. is bent (Photo 84).

There is heavy packrust buildup between the angles of the lower lateral bracing (Photo 85). Areas of heavy corrosion and packrust are located at ends of the bracing angles near the gusset plate connections (Photo 86). The lower lateral bracing gusset plates themselves have corrosion and packrust forming; the plates at L1' and L2' have signification section loss with holes forming (Photo 87).

Floorbeams

The floorbeams are in fair condition. Floorbeams L1' and L2' were strengthened in 2007, L8 and L3' in 2009, and L7' in 2012. The strengthening consisted of a 1/2" steel plate bolted to the bottom flanges (Photo 88) and, at L1', L2', and L7', a bolted and welded 1/2" steel plate on both sides of the web between the exterior stringer and lower truss chord connection (Photo 89). The strengthening was completed due to section loss from corrosion.

Many of the remaining, un-strengthened, floorbeams have significant section loss of the flanges, webs, and rivets. Section loss at an isolated area of the underside of the bottom flanges at the beam ends to gusset plate connection (Photo 90) is generally greater than along the remaining length. Web corrosion and section loss is generally located in the lower half of the web between the exterior stringer and lower truss chord connection, although several floorbeams have corrosion and packrust along the top flanges and top half of the web at this same location. This corrosion and section loss also affects the gusset plates and riveted connections. At some stringer connections there is corrosion with minor flaking on the floorbeam web. See photos 91 thru 95 for floorbeam corrosion.

TABLE 3: FLOORBEAM MEASUREMENTS – RT. END

Year	2015				2017			
Floorbeam	Flange Thickness (inches)	Flange Location (inches)	Web Thickness (inches)	Web Location (inches)	Flange Thickness (inches)	Flange Location (inches)	Web Thickness (inches)	Web Location (inches)
L0	0.946	48	0.670	12	0.980	48	0.672	12
L1	0.701	72	0.577	12	0.747	12	0.566	12
L2	0.787	18	0.566	12	0.771	18	0.561	12
L3	0.732	16	0.564	16	0.705	16	0.578	16
L4	0.648	16	0.583	16	0.616	16	0.583	16
L5	0.592	18	0.575	18	0.566	18	0.576	18
L6	0.760	16	0.461	18	0.686	16	0.460	18
L7	0.755	17	0.409	30	0.777	17	0.400	30
L8	0.748	20	0.342	21	0.792	20	0.594	21
L9	0.814	18	0.571	17	0.781	18	0.609	17
L10	0.593	33	0.482	26	0.580	33	0.495	26
L11	0.775	18	0.571	18	0.799	18	0.598	30
L12	0.386	38	0.388	26	0.380	38	0.380	26
L13	0.793	30	0.566	21	0.819	30	0.566	21
L14	0.953	57	0.654	30	0.875	57	0.649	30
L13'	0.781	31	0.576	24	0.772	31	0.591	24
L12'	0.771	28	0.367	28	0.770	28	0.370	28
L11'	0.756	16	0.580	30	0.782	16	0.608	30
L10'	0.729	24	0.570	24	0.745	24	0.594	24
L9'	0.782	18	0.497	34	0.780	18	0.500	34
L8'	0.677	16	0.474	29	0.641	16	0.473	29
L7'	0.737	24	0.543	24	0.743	24	0.582	24
L6'	0.750	31	0.437	34	0.740	31	0.300	22
L5'	0.713	16	0.573	26	0.722	16	0.600	26
L4'	0.227	17	0.000	28	0.212	17	0.000	23
L3'	0.680	25	0.000	30	0.719	25	0.000	30
L2'	0.325	24	0.216	26	0.330	24	0.208	26
L1'	0.458	23	0.398	25	0.700	23	0.588	25
L0'	0.895	42	0.514	21	0.900	42	0.678	21

Two locations, Floorbeams L4' and L3', have 1/4" diameter holes in the web near the top flange (Photo 96).

The corrosion can be attributed to water and salt penetration through the deteriorated bridge deck prior to its replacement in 2004; however, the corrosion and section loss continues to advance as shown in *Tables 3 and 4* (previous page and below, respectively) which measured the floorbeam thickness at the noted locations from the end of the beams. No signs of water and salt penetration through the deck were observed during this inspection except at L7, L14, and L7' as indicated in the Deck Joint notes.

TABLE 4: FLOORBEAM MEASUREMENTS – LT. END

Year	2015				2017			
Floorbeam	Flange Thickness (inches)	Flange Location (inches)	Web Thickness (inches)	Web Location (inches)	Flange Thickness (inches)	Flange Location (inches)	Web Thickness (inches)	Web Location (inches)
L0	0.939	48	0.685	12	0.934	48	0.674	12
L1	0.762	72	0.580	12	0.774	72	0.608	12
L2	0.606	16	0.571	12	0.623	16	0.573	12
L3	0.700	16	0.566	20	0.757	16	0.566	20
L4	0.537	16	0.582	16	0.753	16	0.576	16
L5	0.655	16	0.577	15	0.698	16	0.570	15
L6	0.787	17	0.582	18	0.762	17	0.582	18
L7	0.735	16	0.468	18	0.762	16	0.576	30
L8	0.800	18	0.499	15	0.763	18	0.578	15
L9	0.819	16	0.464	21	0.785	16	0.600	21
L10	0.669	20	0.420	9	0.677	20	0.550	9
L11	0.778	20	0.571	21	0.800	20	0.594	21
L12	0.750	27	0.556	26	0.796	27	0.599	26
L13	0.808	24	0.467	31	0.773	24	0.470	31
L14	0.899	30	0.419	30	0.850	30	0.703	30
L13'	0.788	25	0.572	20	0.777	25	0.595	20
L12'	0.688	32	0.492	29	0.693	32	0.501	29
L11'	0.622	16	0.570	30	0.619	16	0.589	30
L10'	0.750	30	0.562	28	0.734	30	0.577	28
L9'	0.773	17	0.553	21	0.767	17	0.567	21
L8'	0.772	19	0.553	26	0.750	19	0.581	26
L7'	0.758	22	0.540	22	0.712	22	0.585	22
L6'	0.638	18	0.576	20	0.687	18	0.584	20
L5'	0.697	17	0.496	30	0.720	17	0.583	30
L4'	0.501	18	0.432	18	0.628	18	0.537	18
L3'	0.757	20	0.381	6	0.755	20	0.370	6
L2'	0.743	20	0.345	5	0.767	20	0.296	5
L1'	0.770	21	0.460	8	0.798	21	0.370	6
L0'	0.632	21	0.372	21	0.950	42	0.400	42

Stringers

The stringers are in fair condition with corrosion typically occurring at their end support connections to floorbeams (Photo 97); no measurable section loss was noted. The corrosion can be attributed to water and salt penetration through the deteriorated bridge deck prior to its replacement in 2004. No signs of water and salt penetration through the deck were observed during this inspection.

c. Continuous Steel Girder Spans

The condition rating of the 4 girders of the continuous steel girder spans, Spans 9 thru 11, remain coded at a 6, Satisfactory Condition. No significant changes have been noted since the previous inspection. Unless otherwise noted below, all bolts/rivets are present and in fair condition.

The leaking joints at above the ends of the girders have caused heavy rust with some section loss in the girder webs (Photos 98 through 103); the worst is at Pier 9 with areas of initial loss along portions of the stiffeners. No cracks or distress were observed at the saw cuts in the top flanges from the deck removal in 2004.

F. Bearings

The condition rating of the deck joints has changed from a 6, Satisfactory Condition, to a 5, Fair Condition. No significant changes, other than noted below, have been noted since the previous inspection. The temperature observed at the time of inspection was generally 60 degrees. All the expansion bearings have wearing marks indicating movement through the temperature range (Photo 104). The condition of the paint and levels of rust throughout the bearings can be seen in Photos 104 to 114.

a. Deck Truss Spans

The Abutment 1 bearings have previously been replaced and are in good condition. The pins and pin nuts do not appear to have been replaced and has heavy rust on them. The back interior bearing plate bolts were not installed. The bearings do not appear over rotated.

The Pier 1 bearings have minor rust.

The Pier 2 bearings have moderate rust. The Span 2 bearings appear to be over rotated. The Span 3 bearings are no longer centered on the bearing plate and have slide in towards the span approximately 3/4" (Photo 105). The anchor bolts have delamination in the threads between the nut and the bearing plate; the slots are filled with debris causing some of the bolts to bend (Photo 106). Packrust is developing below the rocker creating minor debris. The pins at the Rt. Bearings are worn on the interior.

The Pier 3 bearings have minor rust.

The Pier 4 bearings have moderate to heavy rust with delamination on parts of the plates. The bearings appear to be over rotated (Photo 107). The anchor bolts have delamination in the threads between the nut and the bearing plate; the slots are filled with debris causing some of the bolts to bend. Packrust is developing below the rocker creating minor debris (Photo 108).

The Pier 6 bearings have heavy rust with delamination on parts of the plates and plate anchor nuts. The bearings do not appear to be overrated but appear to have shifted slightly towards the river. The anchor bolts have delamination in the threads between the nut and the bearing plate (Photo 109); the slots are filled with debris causing some of the bolts to bend. Packrust is developing below the rocker creating minor debris.

The Pier 7 bearings have minor rust with moderate rust in spots.

The Pier 8 bearings have moderate to heavy rust. The bearings appear to be over rotated.

b. Thru Truss Spans

There is minor surface rust on all bearings. The expansion bearings have wearing marks indicated movement through the temperature ranges. The angle of the bearings was measured at 5 degrees.

c. Continuous Steel Girder Spans

The Pier 8 bearings have heavy rust. Both anchor bolts at Girder 1 are sheared at the top of the slot (Photos 98 and 110). The south anchor bolt at Girder 2 is missing, the north has no nut (Photo 111). Both anchor bolts at Girder 3 are sheared at the top of the slot (Photo 112). The south anchor bolt nut of Girder 4 is approximately 1.5" above the plate. The slots of the sheared anchor bolts are typically filled with debris. The rotation of the bearings appears to not be the same at each girder and the bearings appear over rotated for the temperature observed at the time of inspection, 75 degrees. The concrete bearing seat repair at Girder 2 is in good condition.

The Pier 9 and 10 bearings are in good condition with minor rust.

The Abutment 2 bearings have heavy rust with heavy delamination and pitting throughout. The southeast anchor bolt at Girder 4 is deteriorated to the point no threads are distinguishable and the nut is almost completely gone (Photo 113); the north bolts at Girder 4 (Photo 114) and all four bolts at Girders 1 and 2 are starting to deteriorate in the same manner.

G. Substructure

The overall condition rating of the substructure, abutment, and piers all remain coded at a 5, Fair Condition. No significant changes, other than noted below at Abutment 1, have been noted since the previous inspection. Note no piling or caissons are visible.

The Abutment 1 bearing concrete is deteriorating. The front edge under the north bearing is spalled approximately 6" by 6" for nearly 3' – back edge of spall is at front edge of the bearing (Photo 115). A single rebar is exposed with initial deterioration of the bar. The concrete in the spalled area is soft and the fines are easily removed when struck with a hammer. The front edge under the south bearing is delaminating from the south corner to the bearing (Photo 116). The top of the concrete around the bearings sounds delaminated but appears to be the very top layer of concrete deteriorating or a protective coating coming loose from the concrete surface. The north vertical face of the cap is spalled 2" deep for approximately 2' by 2' (Photo 117); rebar is exposed with initial deterioration. Minor cracking throughout the backwall and wings. Vines are growing at the south wing.

Pier 1 has map cracking throughout with typically wider cracks; most cracks remain sealed with the concrete paint/sealant. There is a minor spall at the bottom edge of the wall at the southeast corner. Spalling with heavy rust staining on the vertical face of the cap at the north and south ends (Photo 118). There is heavier cracking on the bottom of the cap at locations of poor consolidation. The top of the cap has minor sealant coat deterioration with plain sand underneath it near the center; similar at the south end with cracks forming (Photo 119). There is a longitudinal crack in the top of the cap along the west end.

Pier 2 has map cracking throughout with typically wider cracks; most cracks remain sealed with the concrete paint/sealant. Minor spalling at the bottom of the wall at the southeast column. The top of the cap has sealant coat deterioration, approximately 1' by 1' with approximately 1" of sand and aggregate underneath it near both ends of the cap, two locations on the south (Photo 120) and one on the north (Photo 121) – one location at each end is next to a bearing.

Pier 3 has map cracking throughout with typically wider cracks; most cracks remain sealed with the concrete paint/sealant. There is heavier cracking on the bottom of the cap; there is also poor consolidation of concrete throughout the bottom. The top of the cap has minor sealant coat deterioration with plain sand and aggregate underneath it at the south end (Photo 122).

Pier 4 has map cracking throughout with typically wider cracks; most cracks remain sealed with the concrete paint/sealant. The top of the west face of the bottom wall has a side crack with spalling in some locations. The bottom of the deck truss cap has 1/8" longitudinal cracking within 6" of both edges of the cap. The faces of the top cap have heavier longitudinal cracking (Photo 123).

Pier 5 has map cracking throughout; no paint/sealant is present. The delamination/spall at the upstream nose on the west side near the waterline will be further investigated at the underwater inspection in July 2017. The timber debris has been removed since the last inspection.

Pier 6 has map cracking throughout with typically wider cracks; most of the wider cracks remain sealed with crack sealant, no paint is present. The top of the west face of the bottom wall has a side crack with spalling in some locations. There is delamination of the cap behind the Span 7 south bearing (Photo 124). Minor spalling around the cracks around the Span 6 south bearing. Minor efflorescence on the Span 7 cap (Photo 125).

Pier 7 has map cracking throughout with typically wider cracks; most of the wider cracks remain sealed with crack sealant, no paint is present. There is more frequent map cracking on the bottom of the cap; there is also poor consolidation in some locations. Efflorescence is present at the bottom corners of the cap (Photo 126), the top ends of the cap, and the east face of the bottom wall. The patched concrete around the Span 8 south bearing is delaminating (Photo 127).

Pier 8 has map cracking throughout with typically wider cracks; most of the wider cracks remain sealed with crack sealant, no paint is present. The top of the bottom wall is scaling which is creating spalls around some of the cracks; larger spalls are present at the southwest corner and east faces of the wall (Photos 128 and 129). Efflorescence is present at the west face of the bottom wall (Photo 130). There are areas of poor consolidation on the bottom of the deck truss cap, the interior face of the south column near the top cap, and the west face of the south column near the top. Erosion around the ends of the pier has created spots for water to pool along the concrete. Heavier cracking with some efflorescence around the patching in the interior faces of both columns above the deck truss bearings. The top of the top cap is scaling at both ends. The concrete patch around the north girder bearing is breaking up (Photo 110). The concrete patch and south end of cap by the south girder bearing is delaminating (Photo 131).

The Pier 9 concrete has heavier cracking throughout with typically wider cracks; most of the wider cracks remain sealed with crack sealant, no paint is present. The paint system is in poor condition throughout the steel, with large areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. There is surface rust throughout the steel. Heavy packrust has developed between the steel column anchor bolts and their stiffeners; there is section loss on some bolts (Photo 132). Water pools along the east face of the pier.

The Pier 10 concrete has heavier cracking throughout with typically wider cracks; most of the wider cracks remain sealed with crack sealant, no paint is present. The paint system is in poor condition throughout the steel, with large areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. There is surface rust throughout the steel. Heavy packrust has developed between the steel column anchor bolts and their stiffeners; there is section loss on some bolts (Photo 133). Small trees and vines are growing along the concrete and into the bottom steel strut.

Abutment 2 has minor cracking throughout. The top backwall patching is in good condition.

H. Channel, Embankment, and Slopes

The overall condition rating of the channel remains coded at a 7, Minor Damage. The embankment and slopes around Abutment 1 are well vegetated and no issues were noted. The slope in front of Abutment 2 has both vegetation in the plane to the sides of the abutment and aggregate in the plane in front of the abutment; no issues noted in either.

The undermining at the northeast corner of the east approach has previously created a 2' deep embankment erosion channel. The channel is now between 4' and 5' deep (Photo 134). The erosion at the northeast rail end previously noted appears to have been repaired or now blends in with the surrounding natural ground. There is erosion of the grass and soil below the deck drains of Spans 1 through 4 (Photo 135).

Riprap is sparse along the east face of Pier 4 (Photograph 136). At the time of inspection the waterline extended to the base of Pier 4, no scour or erosion was observed relating to the sparse riprap.

There are areas of erosion immediately up- and downstream of the bridge along the west embankment. There are steep embankments, up to approximately 10 feet tall, along the east embankment at the bridge site and up- and downstream. The river training spurs up- and downstream of the bridge appear to be functioning properly. The condition of the channel will be further investigated at the underwater inspection in July 2017.

I. Utilities and Signs

The overall condition rating of the utilities and signs remains coded at a 6, Satisfactory Condition.

No posting signs are present, none are required. Delineators are present at all four corners of the bridge approaches; one of the northeast delineators has minor misalignment and deformation (Photo 18).

All navigation lights appear to be functioning properly and are not damaged. All but one roadway light appears to be functioning properly and is not damaged; the southernmost light in the easternmost thru truss portal was not functioning properly.

There is a missing conduit junction box cover on top of the Pier 4 cap at the north end and in Span 5 along the inside of U8U9 Lt. (Photo 137); both have exposed wires. The conduit in Span 5 is unsupported along the inside U7U8 Lt. (Photo 138).

RECOMMENDATIONS

After reviewing the inspection findings, InfraStructure has the following recommendations:

A. Nondestructive Evaluation

There are no recommendations to perform nondestructive evaluations as a result of this inspection.

B. Load Rating Analysis

FHWA and NDOR have recently come out with new load rating vehicles which don't appear to have been included in the most recent load rating. It is recommended a meeting should be scheduled with NDOR to discuss if this bridge requires a rating for the new vehicles.

Our understanding is that one of the intentions of this inspection is to determine what repairs are needed to keep the bridge unposted prior to installing a new coating. If the bridge does require rerating then the load rating should include the noted defects in the rating and the rating should be used to locate the areas needing repairs. If a new load rating is not required then other analysis means and methods should be used to locate the areas needing repairs.

C. Inspection Frequency Cycle

This structure is on a 24 month NBI Routine, Fracture Critical, and Element Inspection Frequency Cycle currently in April of odd numbered years. There are no recommendations to modify this inspection frequency cycle.

This structure is on a 60 month Underwater Inspection Frequency Cycle. There are no recommendations to modify this inspection frequency cycle. The last Underwater Inspection was performed in July 2012; the next scheduled Underwater Inspection is in July 2017 and will be completed by Ayres.

This structure is not currently scheduled for any Special Inspections. Due to the holes that have developed in Span 1 L0L1 Lt. and Span 1 L1L2 Lt., it is recommended these members should require a special inspection to alternate years with the routine inspection cycle – April of even numbered years. The condition of the members should be monitored for additional issues until the members are repaired or an analysis is done to determine if the member's capacity is adequate as is. A Special Inspection Form (NDOR Form DR7) has been initiated and can be found in Appendix C.

D. Maintenance

Issues were identified during the inspection that should be corrected, for which immediate action is not required. A Structure Maintenance Checklist (NDOR Form DR27) has been completed to note these items and can be found in Appendix D. These items are as follows:

- Prepare and coat the steel superstructure and substructure elements as recommended in the June 2016 coatings inspection report prepared by KTA; packrust should be mitigated at this time as recommended by KTA's report.
- Prepare and coat/seal the concrete deck and substructure elements as recommended in the June 2016 coatings inspection report prepared by KTA.
- Until the steel coating is installed the steel members should be cleaned in accordance with recent NDOR specifications at least every two years. After the coating is installed these members should be cleaned in accordance with specifications and schedule determined when preparing the coating plans. Cleaning will extend the life of the coating and steel by removing potential contaminants.
- Until the sealant is installed the concrete members should be cleaned in accordance with recent NDOR specifications at least once a year. After the sealant is installed these members should be cleaned in accordance with specifications and schedule determined when preparing the coating plans. Cleaning will extend the life of the concrete by removing potential contaminants.
- The deck joints should be cleaned at least twice a year, typically once in the late fall before winter months and once in the early spring after the winter months. This will remove any debris and allow them to function as intended. This inspection did note holes and water leakage so the joints will need to be replaced. The joints should continue to be cleaned regardless of the current condition.
- Replace the broken/missing rivets with high strength structural bolts of similar diameter.
- Reset the northeast delineator to the proper position.
- Remove the vines growing at south wing of Abutment 1 before they grow over the top.
- Remove the small trees and vines growing at the base of Pier 10 before they grow further into the structure. Note that trees should be removed during winter months to avoid migratory bird nesting.
- Repair the southernmost light in the easternmost thru truss portal.
- Replace the missing conduit junction box cover on top of the Pier 4 cap at the north end and in Span 5 along the inside of the U8U9 Lt. to prevent environmental damage to the electrical wiring.
- Provide support to the conduit in Span 5 along the inside of U7U8 Lt. to prevent damage to the utilities.
- Fill in the erosion around Piers 8 and 10 to prevent water from pooling around the base.
- Install energy dissipation pads in the ground below the deck drains to prevent local erosion.
- Fill in the undermining and erosion at the northeast approach slab to prevent further issues to the slab itself.
- Correct the splice lap issue in the east approach rails. The lap splice should be with the direction of traffic to provide proper collision protection.
- Install an equipment path along both edges of the bridge below Spans 1 through 4 to allow for easier equipment access during inspection and other maintenance activities.

E. Repair

Issues were identified during the inspection that should be corrected, for which engineered plans may be required (note other recommended repairs may be noted later during any load capacity review). A Structure Repair Report (NDOR Form DR321) has been completed to note these items and can be found in Appendix E. These items are as follows:

- Repair the holes in deck truss lower chord member Span 1 L0L1 Lt. to prevent future issues with the member.
- Repair the holes in deck truss lower chord member Span 1 L1L2 Lt. to prevent future issues with the member.
- Replace the deck joints with holes and water leakage to extend the life of the members below the joint.
- Replace the over rotated deck truss rocker bearings and the bent anchor bolts to allow for proper expansion and contraction of the bridge. Improper rotation can lead to additional stresses in bridge members that were not accounted for in design.
- Replace the girder span end bearings and anchor bolts at Pier 8 and Abutment 2. The lack of anchor bolt capacity from loss of bolt or loss of bolt section may allow for uplift of the girders in the future. The current bearing conditions and positioning can lead to additional stresses in bridge members that were not accounted for in design.
- Repair the spall in the north curb at Abutment 1.
- Repair the deteriorated concrete at Abutment 1.
- Repair the spalled and delaminated concrete sections throughout the piers.
- Repair the northeast rail end to provide proper collision protection.

F. Closure

There are no closure recommendations as a result of this inspection.

Appendices

Photo 1: Looking east at the bridge from the west approach.

Photo 2: Looking west at the bridge from the east approach.

Photo 3: Looking north at the bridge from the park on the Nebraska side.

Photo 4: Looking south at the bridge from the levy on the Iowa side.

Photo 5: There are several small aggregate popouts, ¼" to 1", scattered throughout the deck surface.

Photo 6: There are several snow plow markings scattered throughout the deck surface.

Photo 7: Where the deck is continuous over a floorbeam there is transverse cracking.

Photo 8: Poor consolidation of the concrete during construction has left exposed rebar at the bottom of the deck overhang at both corners of the East Abutment. South corner shown.

Photo 9: Transverse cracking with efflorescence is present randomly throughout the overhangs of Spans 9 through 11. South overhang of Span 9 shown.

Photo 10: A few seam locations of the stay-in-place decking in Spans 9 through 11 are showing rust. Span 9 shown.

Photo 11: The curbs have hairline vertical cracking with spacing of 2' to 4' throughout their entire length. Minor impact damage is present along both rails with several jagged tears.

Photo 12: The east approach slab is undermined adjacent to the north barrier wall in two spots. Shown is at the abutment the penetration is approximately 6" tall by 4' wide x 3' below the slab.

Photo 13: The east approach slab is undermined adjacent to the north barrier wall in two spots. Shown is at the end of the slab where the ditch is eroding is the penetration is approximately 6" tall by 2' wide by 2' below the slab.

Photo 14: All of the strip seal joints are full of debris.

Photo 15: There are typically two small holes in each end of the joint, at all strip seal joints. The north end of the joint above Pier 2 is shown and water is visibly coming out of the hole.

Photo 16: Both of the transflex joints have plow damage consisting of surface damage of the molded rubber and minor spalling of the adjacent concrete.

Photo 17: The bottom connection weld of the northeast rail at Abutment 2 is cracked at the beam; the rails are bolted into the deck and connected to the beam with bolts and angles.

Photo 18: The northeast approach rail center has minor impact damage. One of the northeast delineators has minor misalignment and deformation.

Photo 19: The northeast approach end terminal has minor impact damage.

Photo 20: There are locations of improper rail splice lapping in both east approach rails.

Photo 21: The section loss at the batten plates of the deck truss lower chords is typically on the inside of the lower chord angle above and below the batten plate. Span 7 L0L10 Lt. shown.

Photo 22: The section loss at the batten plates of the deck truss lower chords is typically on the inside of the lower chord angle above and below the batten plate. Span 1 L0L1 Lt. shown.

Photo 23: The loss shown in Photos 21 and 22 does also go into some batten plates with holes having formed in the middle batten plates of Span 1 L0L1 Lt.

Photo 24: Similar loss in Span 1 L1L2 Lt. middle batten plate as shown in Photo 23. There is also a small ¼" diameter hole in the horizontal leg of the top exterior angle of this member.

Photo 25: Similar loss in Span 2 L0L1 Lt. west batten plate as shown in Photos 22 and 23.

Photo 26: The worst case of the deck truss lower chord loss is at the middle batten plate of Span 1 L1L2 Lt. Complete section loss in the exterior angle for approx. 5" in length and 1" in depth.

Photo 27: The worst case of the deck truss lower chord loss is at the middle batten plate of Span 1 L1L2 Lt. Complete section loss in the interior angle for approx. 5" in length and 1" in depth.

Photo 28: Section loss has occurred in several of the deck truss horizontal gusset plates from water previously sitting on the plates. Span 3 L0 Lt. shown.

Photo 29: Minor packrust up to 1/4" is typical at the members coming into the deck truss lower connection gusset plates, excluding end connections. Span 8 L9 Rt. exterior shown.

Photo 30: Minor packrust up to 1/4" is typical at the members coming into the deck truss lower connection gusset plates, excluding the end connections. Span 8 L9 Rt. interior shown.

Photo 31: Minor packrust up to 1/4" is typical at the members coming into the deck truss lower connection gusset plates, excluding the end connections. Span 3 L8 Rt. west inside shown.

Photo 32: Minor packrust up to 1/4" is typical at the deck truss lower chord splices. Span 2 L8L9 Lt. shown – note this splice has more packrust than typical.

Photo 33: Minor packrust up to 1/4" is typical at the cover plate of the deck truss upper chords which produces a ripple distortion along the rivets. Span 8 U8U9 Lt. shown.

Photo 34: Minor packrust up to 1/4" is typical at the batten plates of the deck truss diagonals consisting of two angles. Span 2 U3L4 Lt. shown.

Photo 35: Minor packrust up to 1/4" is typical at the continuous plates of the deck truss diagonals consisting of four angles. Span 1 U6L5 Lt. shown.

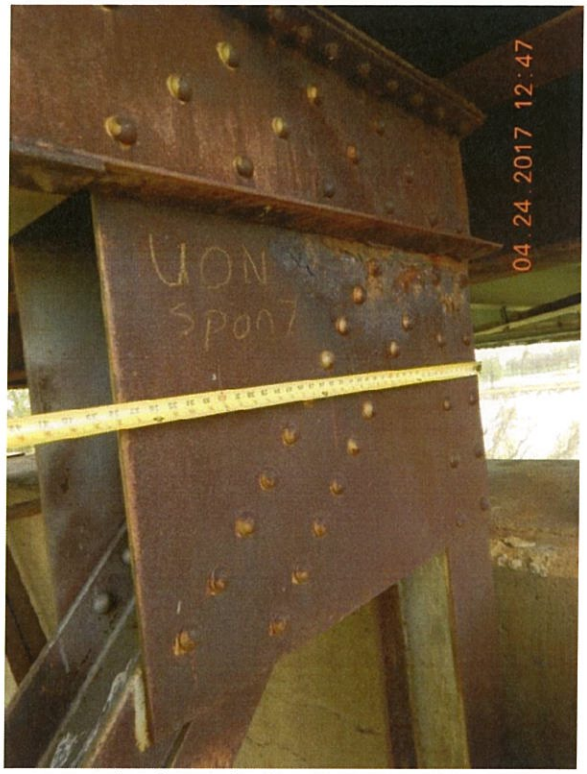


Photo 36: Minor packrust up to 1/4" is typical at the deck truss upper connections below the deck joints. Span 7 U0 Lt. exterior shown.

Photo 37: Minor packrust up to 1/4" is typical at the deck truss upper connections below the deck joints. Span 7 U0 Lt. end shown.

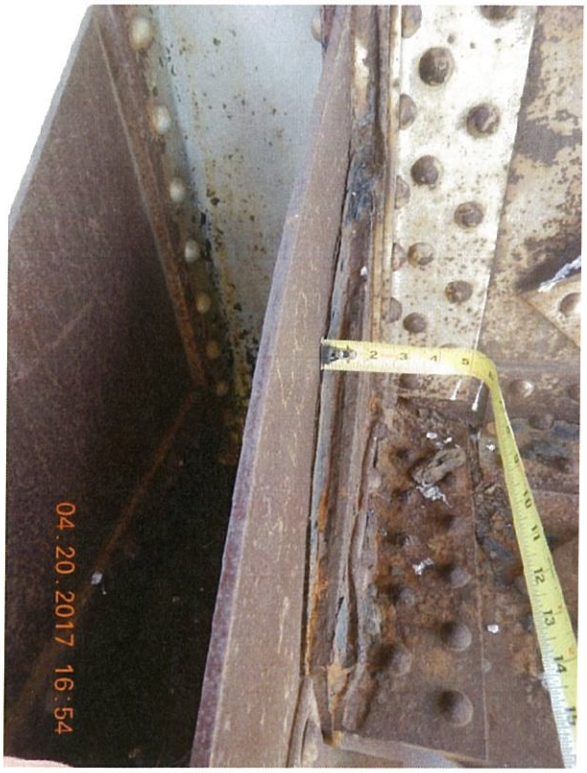


Photo 38: Heavier packrust up to 1" is typical at the deck truss gusset plates and plate connections to the bearings at the ends of the spans. Span 3 L0 Rt. interior top edge shown.

Photo 39: Heavier packrust up to 1" is typical at the deck truss upper chord cover plates below the floorbeam where only two rivets are present instead of four. Span 3 U3 Rt. shown.

Photo 40: The vertical angles of the deck truss lower chords from L0 to L2 and L8 to L10 were typically bowed outward. Span 2 L0L1 Lt. shown.

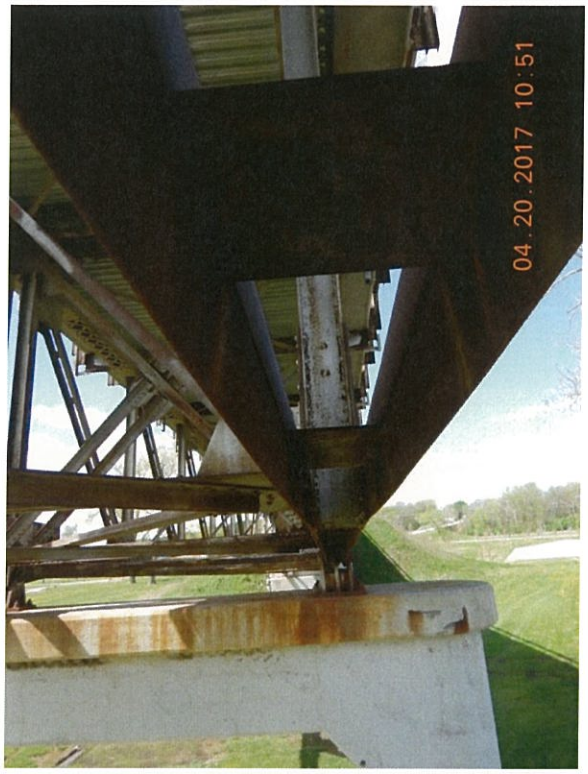


Photo 41: The vertical angles of the deck truss lower chords from L0 to L2 and L8 to L10 were typically bowed outward. Span 2 L0L1 Lt. shown.

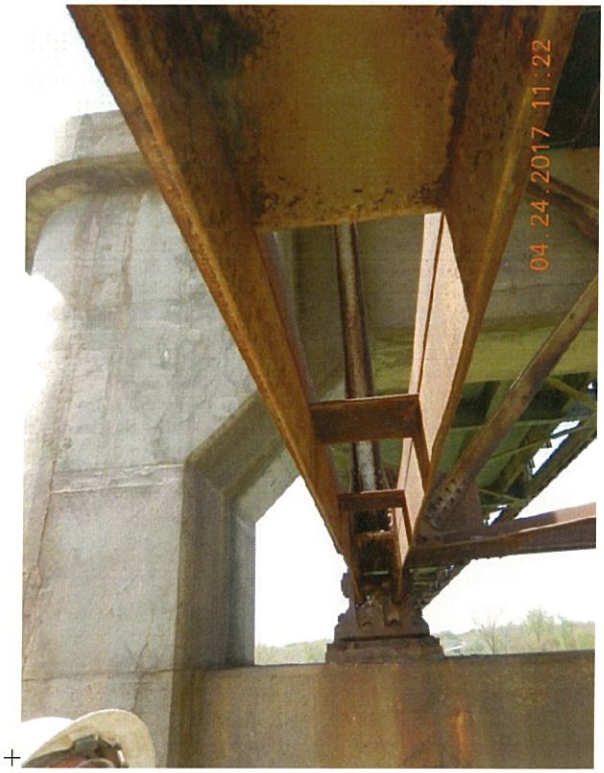


Photo 42: The vertical angles of the deck truss lower chords from L0 to L2 and L8 to L10 were typically bowed outward with the interior leg of Span 7 L0L1 Rt. distorting in a wave pattern.

Photo 43: The lower chord gusset plates at the deck truss bearings are typically bowed inward at the top. Span 2 L0 Lt. shown.

Photo 44: The lower chord gusset plates at the deck truss bearings are typically bowed inward at the bottom. Span 2 L0 Lt. shown.

Photo 45: The lower chord gusset plates at the deck truss bearings are typically bowed inward at the bottom. Span 8 L0 Lt. shown, also has a dent on the exterior.

Photo 46: Small dents are present at some locations throughout the deck truss. These dents were most likely created during construction. Span 1 L0L1 Lt. exterior near L0 shown.

Photo 47: Small dents are present at some locations throughout the deck truss. These dents were most likely created during construction. Span 1 U7U8 Rt. lacing near L7 shown.

Photo 48: Small dents are present at some locations throughout the deck truss. These dents were most likely created during construction. Span 3 L9L10 Rt. exterior at L10 shown.

Photo 49: Small dents are present at some locations throughout the deck truss. These dents were most likely created during construction. Span 8 L0L1 Rt. exterior at L0 shown.

Photo 50: The Span 4 L7 Lt. exterior gusset plate has a minor tear.

Photo 51: The exterior face of Span 3 U4L4 Rt. has a small rolling defect above L4.

Photo 52: The riveted splice connections in the deck truss lower chords have tack welds placed during construction. Cracks found through welds at some locations. Span 2 L3L4 Rt. shown.

Photo 53: The deck truss floorbeams have minor surface rust throughout; heavier rust typically at the floorbeam ends overhanging the truss. Span 1 Floorbeam 2 Rt. shown.

Photo 54: There are areas of delamination in the deck truss floorbeam faces below the deck joints. Span 4 Floorbeam 10 shown.

Photo 55: There are areas of delamination in the deck truss floorbeam faces below the deck joints. Span 7 Floorbeam 10 Rt. end shown.

Photo 56: There are areas of delamination in the deck truss floorbeam faces below the deck joints. Span 8 Floorbeam 0 Rt. end shown.

Photo 57: There are areas of delamination in the deck truss floorbeam faces below the deck joints. Span 8 Floorbeam 0 Rt. end shown.

Photo 58: Minor packrust has developed between the deck truss floorbeam web and exterior stringer connection angle at some locations throughout. Span 2 Stringer 4 at Floorbeam 8 shown.

Photo 59: Several of the deck truss floorbeam ends have full penetration section loss varying in size. Span 3 Floorbeam 2 Rt. shown.

Photo 60: Most of the locations shown in Photo 59 have been retrofitted with steel angles to strengthen the weakened web. Span 3 Floorbeam 4 Rt. shown. This location has the worst section loss with extended growth towards the stringer clip angle since last being marked.

Photo 61: There are larger dimple dents in the deck truss floorbeam webs near the exterior stringers in a few locations. Span 4 Floorbeam 5 Lt. shown.

Photo 62: There are a few locations with minor bent flanges in the deck truss stringers. Span 7 Stringer 1 dent east of U3.

Photo 63: Packrust is developing at the center of the deck truss bracing; the worst is typically in the vertical plane bracing at the ends of the spans. Span 3 L0 end shown.

Photo 64: Deck truss lower lateral bracing is bent at Span 1 Bay 3 and 4; note Bay 3 is the closest bay shown in the photo.

Photo 65: Deck truss lower lateral bracing is bent at Span 2 Bay 5.

Photo 66: Deck truss lower lateral bracing is bent at Span 3 Bay 4.

Photo 67: Deck truss lower lateral bracing is bent at Span 3 Bay 9.

Photo 68: Deck truss upper lateral bracing is bent at Span 7 Bay 3.

Photo 69: Deck truss lower lateral bracing is bent at Span 8 Bay 1.

Photo 70: Deck truss lower lateral bracing is bent at Span 8 Bay 5.

Photo 71: Minor, isolated areas of pack rust are present along the upper chord of the thru truss spans.

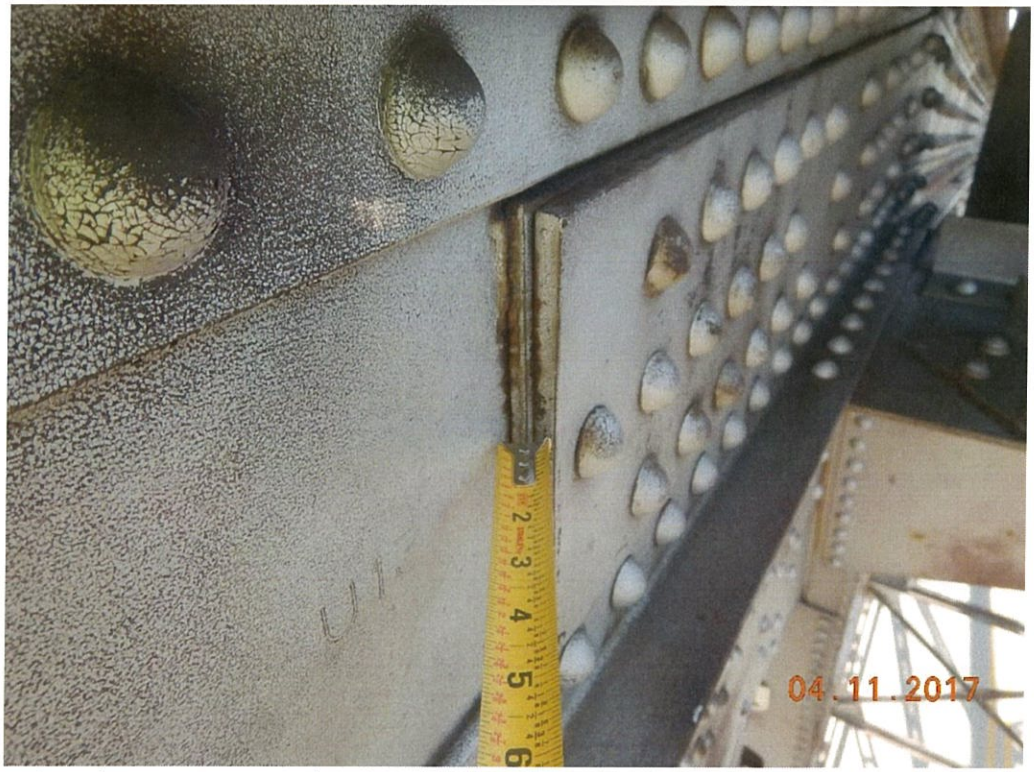


Photo 72: One thru truss upper chord tack weld was found with a crack through the weld with no sign of propagation into the base metal. The cracked tack weld is located at the north splice plate of Span 6 U13' Rt.

Photo 73: One rivet head is missing on the exterior face at Span 5 U1 Rt.

Photo 74: Packrust is present at most lower gusset plate connections of the thru truss spans.

Photo 75: Packrust is present at most lower chords of the thru truss spans.

Photo 76: The packrust has broken rivets in several locations of the thru truss lower chords. Span 6 L6'L7' Lt. at L6' shown.

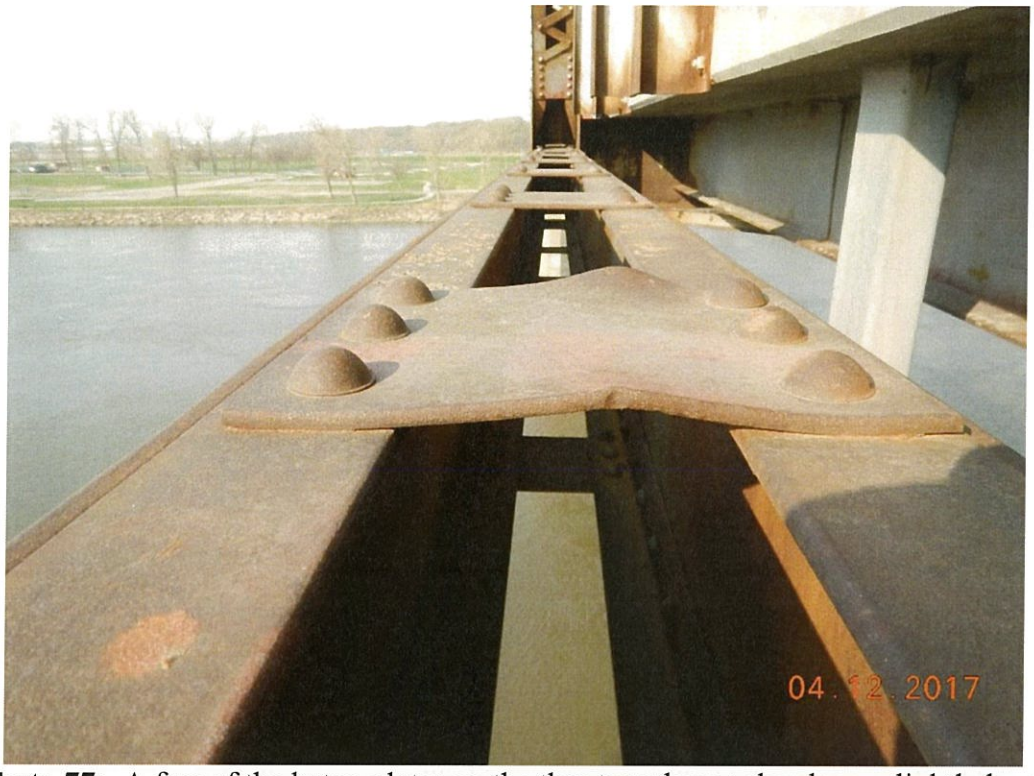


Photo 77: A few of the baton plates on the thru truss lower chords are slightly bent.

Photo 78: Span 6 L3' Rt. has flaking corrosion of the exterior bottom angle; when removed pitting is up to 1/8" deep in the vertical leg of the angle.

Photo 79: Span 6 U13L12 Rt. has 2 broken rivets on the interior face, only one shown.

Photo 80: A few of the thru truss upper lateral bracing lattice bars of are slightly bent at random areas throughout.

Photo 81: There is a crack with a previously installed arrest hole located in the sway bracing gusset plate at Span 5 U13 Lt.; the crack has not propagated beyond the hole.

Photo 82: Some of the thru truss lower lateral bracing hanger bolts used to minimize vibrations of the bracing are sheared off.

Photo 83: New thru truss lower lateral bracing hanger rods have previously been installed at some locations near Pier 5 and appear to be functioning as intended.

Photo 84: Span 5 lower lateral bracing from L2 Lt. to L3 Rt. is bent.

Photo 85: There is heavy packrust buildup between the angles of the thru truss lower lateral bracing.

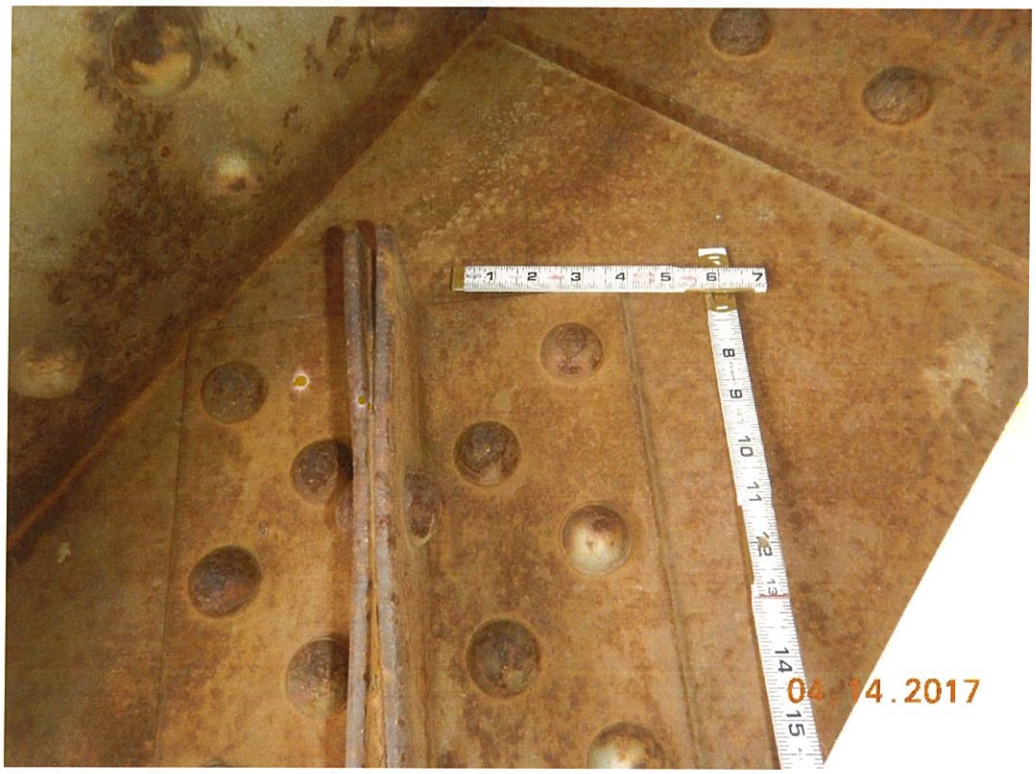


Photo 86: Areas of heavy corrosion and packrust are located at ends of the thru truss lower lateral bracing angles near the gusset plate connections.

Photo 87: The thru truss lower lateral bracing gusset plates have corrosion and packrust; the L1' and L2' have signification section loss with holes forming. Span 6 L1' Lt. shown.

Photo 88: Typical thru truss floorbeam bottom flange repair.

Photo 89: Typical thru truss floorbeam web repair.

Photo 90: Many of the remaining, un-strengthened, floorbeams have significant section loss of the flanges, webs, and rivets. Section loss at an isolated area of the underside of the bottom flanges at the beam ends to gusset plate connection.

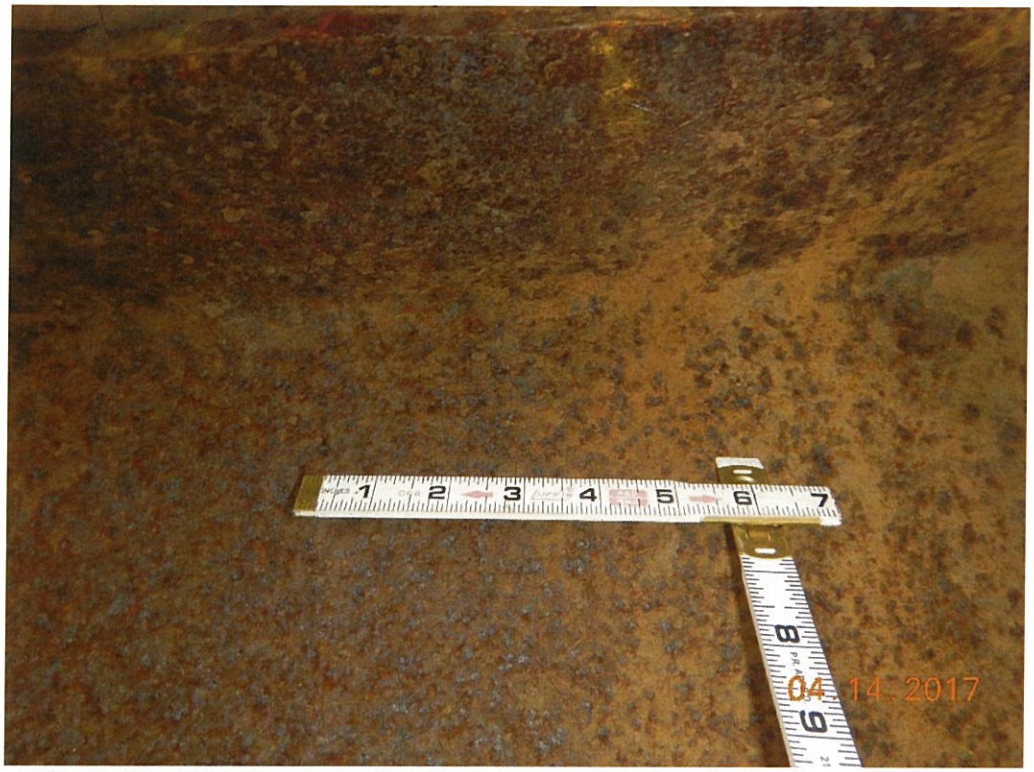


Photo 91: The thru truss floorbeam corrosion showing web to top flange.

Photo 92: Typical thru truss floorbeam corrosion with packrust at stringers.

Photo 93: Thru truss floorbeam corrosion shown in Span 5 at Floorbeam 0 below the joint.

Photo 94: Thru truss floorbeam corrosion shown at Span 5 Floorbeam 2 Lt., web to bottom flange.

Photo 95: Thru truss floorbeam corrosion show at Span 6 Floorbeam L0' with section loss, below the joint.

Photo 96: Two locations, Floorbeams L4' and L3', have 1/4" diameter holes in the web near the top flange. Floorbeam L4' shown.

Photo 97: The thru truss stringers are in fair condition with corrosion typically occurring at their end support connections to floorbeams.

Photo 98: The leaking joints at above the ends of the girders have caused heavy rust with some section loss in the girder webs. Girder 1 exterior face at Pier 8 shown – exterior anchor bolt is sheared off).

Photo 99: The leaking joints at above the ends of the girders have caused heavy rust with some section loss in the girder webs. Girder 2 interior face at Pier 8 shown.

Photo 100: The leaking joints at above the ends of the girders have caused heavy rust with some section loss in the girder webs. Girder 4 interior face at Pier 8 shown.

Photo 101: The leaking joints at above the ends of the girders have caused heavy rust with some section loss in the girder webs. Girder 4 exterior face at Pier 8 shown.

Photo 102: The leaking joints at above the ends of the girders have caused heavy rust with some section loss in the girder webs. Girder 1 exterior face at Abutment 2 shown.

Photo 103: The leaking joints at above the ends of the girders have caused heavy rust with some section loss in the girder webs. Girder 4 exterior face at Abutment 2 shown.

Photo 104: All the expansion bearings have wearing marks indicating movement through the temperature range. Span 3 L0 Rt. shown.

Photo 105: The Span 3 bearings at Pier 2 are no longer centered on the bearing plate and have slide in towards the span approximately ¾". L0 Rt. shown.

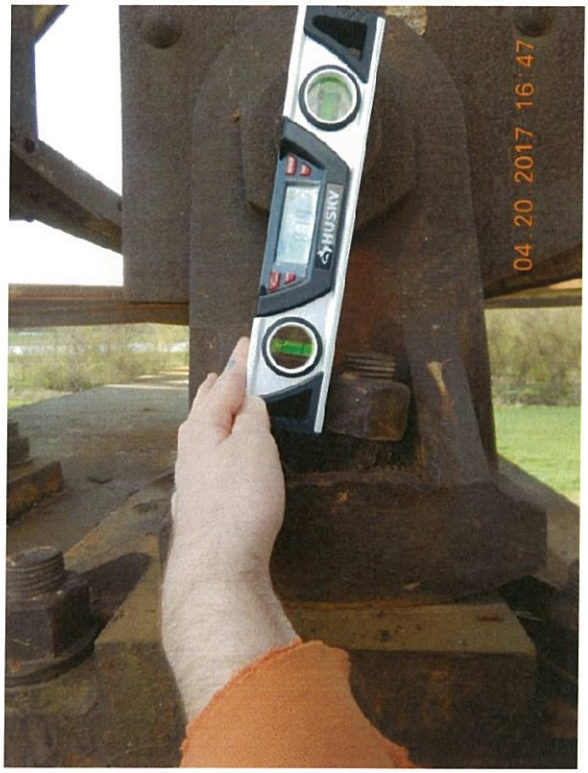


Photo 106: The deck truss anchor bolts at expansion bearings have delamination in the threads between the nut and the bearing plate; the slots are filled with debris causing some of the bolts to bend. Span 3 L0 Rt. exterior bolt shown.

Photo 107: All of the deck truss expansion bearings appear to be over rotated. Span 4 L10 Lt. shown.

Photo 108: Packrust is developing below the deck truss expansion bearing rockers creating minor debris. Span 4 L10 Lt. shown.

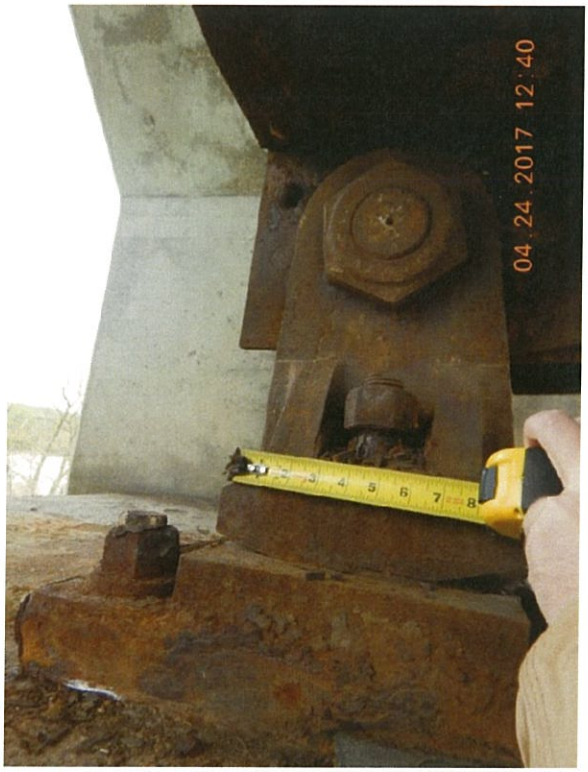


Photo 109: The deck truss expansion bearing anchor bolts have delamination in the threads between the nut and the bearing; the debris from this is filling up the slots. Span 7 L0 Lt. interior shown.

Photo 110: Both anchor bolts of Span 9 Girder 1 are sheared at the top of the slot at the Pier 8 bearing.

Photo 111: The south anchor bolt at Span 9 Girder 2 is missing at the Pier 8 bearing and the north has no nut.

Photo 112: Both anchor bolts at Span 9 Girder 3 are sheared at the top of the slot at the Pier 8 bearing.

Photo 113: The southeast anchor bolt at Abutment 2 for Span 11 Girder 4 is deteriorated to the point no threads are distinguishable and the nut is almost completely gone.

Photo 114: The north bolts at Abutment 2 for Span 11 Girder 4 are starting to deteriorated in a similar manner as shown in Photo 113. This is typical at all four bolts of Girders 1 and 2.

Photo 115: The front edge of Abutment 1 under the north bearing is spalled approximately 6" by 6" for nearly 3' – back edge of spall is at front edge of the bearing.

Photo 116: The front edge of Abutment 1 under the south bearing is delaminating from the south corner to the bearing 2.

Photo 117: The north vertical face of the Abutment 1 cap is spalled 2" deep for approximately 2' by 2'.

Photo 118: Spalling with heavy rust staining on the vertical face of the Pier 1 cap at the north and south ends. Northeast corner shown.

Photo 119: The top of the Pier 1 cap has minor sealant coat deterioration with plain sand underneath it near the center; similar at the south end with cracks forming - shown.

Photo 120: The top of the Pier 2 cap has sealant coat deterioration with sand and aggregate underneath it at two locations on the south.

Photo 121: The top of the Pier 2 cap has sealant coat deterioration with sand and aggregate underneath it at one location on the north.

Photo 122: The top of the Pier 3 cap has minor sealant coat deterioration with plain sand and aggregate underneath it at the south end.

Photo 123: The faces of the top cap of Pier 4 have heavier longitudinal cracking. The west face is shown. This is similar to Piers 6 and 8 where superstructure type changes.

Photo 124: There is delamination of the Pier 6 cap behind the Span 7 south bearing.

Photo 125: Minor efflorescence on the Pier 6, Span 7 cap.

Photo 126: Efflorescence is present at the bottom corners of the Pier 7 cap. It is also present at the top ends of the cap and the east face of the bottom wall.

Photo 127: The patched concrete in Pier 7 around the Span 8 south bearing is delaminating.

Photo 128: The top of the Pier 8 bottom wall is scaling which is creating spalls around some of the cracks; larger spalls are present at the southwest corner and east faces of the wall. East face shown.

Photo 129: The top of the Pier 8 bottom wall is scaling which is creating spalls around some of the cracks; larger spalls are present at the southwest corner and east faces of the wall. Close up of largest spall on east face shown.

Photo 130: Efflorescence is present at the west face of the Pier 8 bottom wall.

Photo 131: The concrete patch and south end of the Pier 8 cap by the south girder bearing is delaminating.

Photo 132: Heavy packrust has developed between the Pier 9 steel column anchor bolts and their stiffeners; there is section loss on some bolts. West bolts at the south column shown.

Photo 133: Heavy packrust has developed between the steel column anchor bolts and their stiffeners; there is section loss on some bolts. East bolts at the north column shown.

Photo 134: The undermining at the northeast corner of the east approach has previously created a 2' deep embankment erosion channel. The channel is now between 4' and 5' deep.

Photo 135: There is erosion of the grass and soil below the deck drains of Spans 1 through 4.

Photo 136: Riprap is sparse along the east face of Pier 4.

Photo 137: There is a missing conduit junction box cover on top of the Pier 4 cap at the north end and in Span 5 along the inside of U8U9 Lt. – shown.

Photo 138: The conduit in Span 5 is unsupported along the inside U7U8 Lt.

Omaha Offutt, NE

Offutt Air Force Base

5:24 PM CDT on June 28, 2017 (GMT -0500)

Today Forecast

Weather History for KOFF - April, 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Actual: 46° | 37° 0.02 in Average: 54° | 34° 0.08 in
2 Actual: 54° | 43° 0.06 in Average: 55° | 35° 0.08 in	**3** Actual: 56° | 49° 0.01 in Average: 55° | 35° 0.08 in	**4** Actual: 59° | 47° 0.00 in Average: 55° | 35° 0.08 in	**5** Actual: 59° | 45° 0.00 in Average: 56° | 36° 0.08 in	**6** Actual: 57° | 32° 0.00 in Average: 56° | 36° 0.09 in	**7** Actual: 64° | 26° 0.00 in Average: 57° | 37° 0.09 in	**8** Actual: 77° | 50° 0.00 in Average: 57° | 37° 0.09 in
9 Actual: 81° | 55° 0.00 in Average: 58° | 38° 0.09 in	**10** Actual: 56° | 37° 0.00 in Average: 58° | 38° 0.09 in	**11** Actual: 63° | 30° 0.00 in Average: 59° | 39° 0.09 in	**12** Actual: 72° | 38° 0.02 in Average: 59° | 39° 0.09 in	**13** Actual: 78° | 45° 0.04 in Average: 60° | 40° 0.09 in	**14** Actual: 70° | 56° 0.60 in Average: 60° | 40° 0.09 in	**15** Actual: 76° | 58° 0.05 in Average: 60° | 41° 0.09 in
16 Actual: 70° | 44° 0.00 in Average: 60° | 41° 0.09 in	**17** Actual: 72° | 38° 0.00 in Average: 61° | 41° 0.09 in	**18** Actual: 70° | 56° 0.20 in Average: 61° | 42° 0.09 in	**19** Actual: 81° | 50° 0.51 in Average: 61° | 42° 0.09 in	**20** Actual: 61° | 46° 0.00 in Average: 62° | 42° 0.10 in	**21** Actual: 57° | 39° 0.00 in Average: 62° | 43° 0.10 in	**22** Actual: 67° | 42° 0.00 in Average: 62° | 43° 0.10 in
23 Actual: 72° | 30° 0.00 in Average: 63° | 43° 0.10 in	**24** Actual: 75° | 47° 0.00 in Average: 63° | 44° 0.11 in	**25** Actual: 57° | 42° 0.01 in Average: 63° | 44° 0.11 in	**26** Actual: 43° | 36° 0.00 in Average: 64° | 44° 0.11 in	**27** Actual: 58° | 35° 0.00 in Average: 64° | 45° 0.11 in	**28** Actual: 47° | 37° 0.52 in Average: 65° | 45° 0.11 in	**29** Actual: 45° | 40° 0.10 in Average: 65° | 46° 0.11 in
30 Actual: 44° | 39° 0.76 in Average: 66° | 46° 0.11 in						

Calendar Legend

Sunny Clear · Mostly Cloudy · Partly Cloudy · Cloudy · Rain · Snow

Hail Flurries · Thunderstorms · Hazy Fog · Sleet · '?' denotes 'chance of' · Unknown

Weather information during the inspection duration (dates highlighted red).
From https://www.wunderground.com/

Nebraska Department of Roads

Scheduled Special Inspection – Bridge Report

Structure No.:	Special Inspection Requested By: *(Print Name)*	Date Report Submitted:	Date of Last Inspection:
S370 01918	Tyler Cramer, TC6324, InfraStructure	7/14/17	4/24/17

General Location of Defect: ☐ Deck ☒ Superstructure ☐ Substructure ☐ Piles ☐ Other _____

Specific Location of Defect or Condition:

Superstructure - Span 1, L0L1 Lt. and L1L2 Lt.

Description of the condition or defect to be inspected and the purpose of the inspection: *(Attach photos)*

The worst case of deck truss lower chord loss is at the middle batten plate of Span 1 L1L2 Lt. There is complete section loss in both bottom angles for approximately 5" in length and 1" in depth. There is also a small ¼" diameter hole in the horizontal leg of the top exterior angle just east of the middle batten plate rivets. This deterioration was not noted as being fully through the angle leg at the 2015 inspection but was noted as being fully through at the 2016 Coatings Inspection indicating possible accelerated section loss. A ½" diameter hole in the horizontal leg of the top exterior angle just west of the middle batten plate rivets in Span 1 L0L1 Lt. was also noted at this inspection that wasn't previously noted. Due to the accelearted deterioration the members should be monitored for additional issues until the member is repaired or capacity anslysis is done.

Requested Next Special Inspection *(Month/Year)*: 4/18/17	Special Inspection Form shall be addressed at full inspections as well.
	Special Inspection Term: *(Months)* ☐ 3 ☐ 6 ☐ 12 ☒ 24 ☐ Other _____

Date of Inspection	Inspector ID	Inspection Comments *(Describe any changes observed in the condition or defect and attach photos.)*
4/24/17	TC6324	Special inspection intiated. See details above.

Reason for Termination of Special Inspections:

Termination of Special Inspections Approved By: *(Print Name)*	Date of Termination:
	Special Instructions:

DR Form 7, July 2012 Page ____ of ____

Span 1 L0L1 Lt exterior top angle hole at middle batten plate

SPan 1 L1L2 Lt bottom exterior angle hole below middle batten plate

Span 1 L1L2 Lt bottom interior angle hole below middle batten plate

Span 1 L1L2 Lt top exterior angle hole by middle batten plate

Structure Maintenance Checklist

Structure No.:	S370 01918	District:	2
Inspected By:	Tyler Cramer, TC6324, InfraStructure	Date of Inspection:	4/24/2017
Structure Location:	1E Bellevue (over the Missouri River)	County:	Sarpy

Item No.	Item	Maint. Needed
1.	Repair damaged guardrail.	X
2.	Repair/replace signs.	X
3.	Clean debris from expansion device.	X
4.	Sweep the deck/open plugged floor drains.	X
5.	Remove debris from girder, caps, and bearings.	X
6.	Remove debris from channel.	
7.	Cut and remove trees from channel.	X
8.	Fill in washout under approach slab.	X

Item No.	Item	Maint. Needed
9.	Fill in erosion on sideslopes and banks.	X
10.	Fill in erosion at culvert ends.	
11.	Remove silt from barrels.	
12.	Remove excess silt between culvert wings.	
13.	Patch bridge deck.	
14.	Seal cracks.	
15.	Pressure wash deck, rails, joints, and drains.	X
16.	Other: Coat, replace rivets, light, utilities, path	X

Remarks:

Item 16: Prepare and coat/seal the steel and concrete elements of the bridge.
Item 5: The steel members should be cleaned at least every two years.
Item 4/15: The concrete members should be cleaned at least once a year.
Item 15: The deck joints should be cleaned at least twice a year.
Item 16: Replace the broken/missing rivets with high strength structural bolts of similar diameter.
Item 2: Reset the northeast delineator to the proper position.
Item 7: Remove the vines growing at south wing of Abutment 1.
Item 7: Remove the small trees and vines growing at the base of Pier 10.
Item 16: Repair the southernmost light in the easternmost thru truss portal.
Item 16: Replace the missing conduit junction box cover on top of the Pier 4 cap at the north end and in Span 5 along the inside of the U8U9 Lt. to prevent environmental damage to the electrical wiring.
Item 16: Provide support to the conduit in Span 5 along the inside of U7U8 Lt. to prevent damage to the utilities.
Item 9: Fill in the erosion around Piers 8 and 10.
Item 9: Install energy dissipation pads in the ground below the deck drains.
Item 8: Fill in the undermining and erosion at the northeast approach slab to prevent further issues to the slab itself.
Item 1: Correct the splice lap issue in the east approach rails.
Item 16: Install an equipment path along both edges of the bridge below Spans 1 through 4.

DR Form 27, July 2012

Structure Repair Report

Structure No.:	S370 01918	District:	2
Inspected By:	Tyler Cramer, TC6324	Date of Inspection:	April 24, 2017
Structure Location:	1E Bellevue (over Missouri River)	County:	Sarpy

Condition Ratings:

Deck: 7	Superstructure: 5	Substructure: 5	Abutments: 5
Piers: 5	Piling: N	Joints: 5	Bearings: 5
Culvert: N	Culvert Barrel: N	Culvert Ends: N	

See Appendix A and G of full 2017 Inspection Report for all photos

PHOTO

See Appendix A and G of full 2017 Inspection Report for all photos

PHOTO

Description of Damage:

Holes in deck truss lower chord members Span 1 L0L1 and L1L2 Lt.

Strip seal deck joints have holes at each end.

Deck truss rocker bearings are over rotated with bent anchor bolts.

Girder span end bearings at Pier 8 and the East Abutment are deteriorated; several anchor botls are missing at Pier 8.

The West Abutment concrete is spalling or delaminating in front of the bearings.

The north curb is spalled at the West Abutment deck joint.

There are spalled and delaminated concrete sections throughout the piers.

Collision damage to the northeast approach rail end.

DR Form 321, July 2011

See notes on last page regarding highlighted information.

Structure SI&A
S370 01918
1E BELLEVUE

Form Number

Inspection Date **April 24, 2017**

Location:

Feature Intersected (006A) **MISSOURI RIVER**
Facility Carried (007) **N370**
Location (009) **1E BELLEVUE**
County (003) **Sarpy**
District (002) **District 2**

Ownership:

Owner (022) **26 Private(nonRailroad)**
Maint. Resp. (021) **26 Private(nonRailroad)**

Year Built (027) **1952**
Year Reconstruct (106) **2004**

Geolocation:

Latitude (016) **41° 08' 18.74"**
Longitude (017) **095° 52' 45.91"**

Condition:

Deck (058)		**7 Good**
Superstructure (059)		**5 Fair**
Substructure (060)		**5 Fair**
Culvert (062)		**N N/A (NBI)**
Depth of Cover on Deck (306)		**0 in**

Posting Values:

	Capacity	Posting Value	Posted Sign Value	
Type 3	**26 ton**	**0 ton**		-
Type 3S2	**38 ton**	**0 ton**		-
Type 3-3	**48 ton**	**0 ton**		-

Element Condition:

Element/Description	Env Scale Factor	Total	Quantity State 1	State 2	State 3	State 4
Main Span #1 Steel Thru Truss						
12-Re Concrete Deck Element record added 2014-06-16.	Sev. 1	19,523 sq.ft	17,570	1,953	0	0
113-Steel Stringer Element record added 2014-06-16.	Sev. 1	3,360 ft	3,024	168	168	0
120-Steel Truss Element record added 2014-06-16.	Sev. 1	1,680 ft	722	924	34	0
152-Steel Floor Beam Element record added 2014-06-16.	Sev. 1	754 ft	452	226	76	0
162-Stl Gus Plate Element record added 2014-06-16.	Sev. 1	86 each	86	0	0	0
205-Re Conc Column Element record added 2017-07-05.	Sev. 1	6 each	4	2	0	0
210-Re Conc Pier Wall Element record added 2017-07-05.	Sev. 1	100 ft	40	60	0	0
234-Re Conc Pier Cap Element record added 2014-06-16.	Sev. 1	108 ft	52	54	2	0
300-Strip Seal Exp Joint Element record added 2014-06-16.	Sev. 1	46 ft	38	8	0	0
330-Metal Bridge Railing Element record added 2014-06-16.	Sev. 1	1,685 ft	1,667	18	0	0
9152-X-Frame Element record added 2014-06-16.	Sev. 1	450 ft	450	0	0	0
9220-Sub R/C Footing/Cap Element record added 2014-06-16.	Sev. 1	50 (EA)	50	0	0	0
9303-Fix Pinned Bearing Element record added 2014-06-16.	Sev. 1	2 (EA)	0	2	0	0
9311-Rocker W/Pin Bearing Element record added 2014-06-16.	Sev. 1	4 (EA)	0	4	0	0
Appr Span #2 Steel Deck Truss						
12-Re Concrete Deck Element record added 2014-06-16.	Sev. 1	21,217 sq.ft	19,096	2,121	0	0
113-Steel Stringer Element record added 2014-06-16.	Sev. 1	3,658 ft	3,290	184	184	0
120-Steel Truss Element record added 2014-06-16.	Sev. 1	1,829 ft	695	1,097	37	0

152-Steel Floor Beam	Sev.	1,584 ft		897		515		172		0
Element record added 2014-06-16	1									
162-Stl Gus Plate	Sev.	264 each		260		0		4		0
Element record added 2014-06-16	1									
205-Re Conc Column	Sev.	10 each		6		4		0		0
Element record added 2014-06-16	1									
210-Re Conc Pier Wall	Sev.	140 ft		60		80		0		0
Element record added 2014-06-16	1									
215-Re Conc Abutment	Sev.	26 ft		20		0		6		0
Element record added 2014-06-16	1									
234-Re Conc Pier Cap	Sev.	182 ft		102		80		0		0
Element record added 2014-06-16	1									
300-Strip Seal Exp Joint	Sev.	139 ft		57		70		12		0
Element record added 2014-06-16	1									
330-Metal Bridge Railing	Sev.	1,829 ft		1,629		200		0		0
Element record added 2014-06-16	1									
9303-Fix Pinned Bearing	Sev.	12 (EA)		0		12		0		0
Element record added 2014-06-16	1									
9311-Rocker W/Pin Bearing	Sev.	12 (EA)		0		12		0		0
Element record added 2014-06-16	1									
Pav Span #3 Paving Approach										
301-Pourable Joint Seal	Sev.	22 ft		11		11		0		0
Element record added 2014-06-16	1									
321-Re Conc Approach Slab	Sev.	1,940 sq.ft		1,649		291		0		0
Element record added 2014-06-16	1									
9333-Mtl Appr Rail	Sev.	133 ft		0		120		13		0
Element record added 2014-06-16	1									
9334-R/C Closed Appr Rail	Sev.	32 ft		0		26		6		0
Element record added 2014-06-16	1									
Appr Span #3 Steel Girders										
12-Re Concrete Deck	Sev.	4,872 sq.ft		4,375		487		10		0
Element record added 2017-07-05	1									
107-Steel Opn Girder/Beam	Sev.	840 ft		800		24		16		0
Element record added 2017-07-05	1									
202-Steel Column	Sev.	4 each		0		4		0		0
Element record added 2017-07-05	1									
210-Re Conc Pier Wall	Sev.	44 ft		24		20		0		0
Element record added 2017-07-05	1									
215-Re Conc Abutment	Sev.	36 ft		36		0		0		0
Element record added 2017-07-05	1									
231-Steel Pier Cap	Sev.	36 ft		36		0		0		0
Element record added 2017-07-05	1									
234-Re Conc Pier Cap	Sev.	28 ft		18		10		0		0
Element record added 2017-07-05	1									
300-Strip Seal Exp Joint	Sev.	23 ft		10		11		2		0
Element record added 2017-07-05	1									
330-Metal Bridge Railing	Sev.	423 ft		373		50		0		0
Element record added 2017-07-05	1									
9303-Fix Pinned Bearing	Sev.	12 (EA)		0		10		2		0
Element record added 2017-07-05	1									
9311-Rocker W/Pin Bearing	Sev.	4 (EA)		0		0		4		0
Element record added 2017-07-05	1									

Structural Appraisal:

Approach Alignment (072)		8 Equal Desirable Crit	Structural Evaluation (067)	Computed Values	4 Minimum Tolerable
Bridge Railings (036A)		1 Meets Standards	Deck Geometry (068)		2 Intolerable - Replace
Transitions (036B)		0 Substandard	Underclearances (069)		N Not applicable (NBI)
Approach Guardrail (036C)		1 Meets Standards			
Approach Guardrail Ends (036D)		1 Meets Standards	SD/FO Status		Func Obsolete (2)
Pier Protection (111)		1 Not Required	Sufficiency Rating (SRB)		39.7

Minimum Vertical Clearances:

Over Structure (053)		99.99 ft	Reference Feature (055A)		N Feature not hwy or RR
Under (Reference) (054A)		N Feature not hwy or RR	Right Side (055B)		0 ft
Under Clearance (054B)		0 ft	Left Side (056)		0 ft

Minimum Lateral Clearances:

Navigation Data:

Navigation Control Exists (038)		Permit Required	Navigation Horizontal Clearances (040)		11 ft
Navigation Vertical Clearances (039)		2 ft	Minimum Vertical Lift Clearances (116)		0 ft

Waterway Adequacy:

Waterway (071)		8 Equal Desirable	Is There a Scour Problem (358)		N No Scour Problem
Channel (061)		7 Minor Damage	Scour Plan of Action Effective Date (358C)		01/01/1900
Crossing a Canal (345)		N No Canal	Scour Critical (113)		5 Stable w/in footing
Stream Bed Degradation (346)		N No Degradation	Alignment With Flow (355)		8 - 5 degrees°
Noticeable Contraction of Stream (347)		N No Bridge Constriction	Potential Debris Upstream (353)		Y Debris Upstream
Stream Shifted from Center (350)		N Channel Centered			

Bridge Waterway Adequacy Evaluation:

Drop from Upstream Deck to Flowline (357)		87 ft	Drop from Upstream Deck to Ground Abutment 1 (357A)		28 ft
			Drop from Upstream Deck to Ground Abutment 2 (357B)		4 ft

Inventory - Structure Identification, Location and Administrative Designations:

NBI Structure No (008)	S370 01918	Type of Service on (042A)	1 Highway
Name	BELLEVUE	Under (042B)	5 Waterway
FIPS State (001A)	31 Nebraska	Lanes Under (028B)	N/A
FHWA Region (001B)	Region 7-Kansas City	Agency Admin Area	901 - Unknown
Nebraska County ID (003B)	77 Sarpy	On/Off Agency System	Off System
City/Town/Placecode (004)	Bellevue city	Bridge Group	No Bridge Group
Nebraska City Code (004B)	0230 BELLEVUE	NBIS Bridge Length (112)	Long Enough
Historic Significance (037)	5 Not eligible for NRHP	Parallel Structure (101)	No || bridge exists
		Temporary Structure (103)	Not Applicable (P)

Border Bridge Designations:

Border State (098AA)	19 Iowa	Border FHWA Region (098AB)	Region 7-Kansas City
Share(%) (098B)	50 -1	Border Struct No (099)	000000000036100
First County Border Bridge (200A)	N N/A	Second County Border Bridge (200C)	N N/A
First County Border Bridge Percent (200B)	N/A	Second County Border Bridge Percent (200D)	N/A
First City Border Bridge (200E)	0000 N/A	Second City Border Bridge (200G)	0000 N/A
First City Border Bridge Percent (200F)	N/A	Second City Border Bridge Percent (200H)	N/A

Inventory - Design:

Deck:

Deck Structure Type (107)		1 Concrete-Cast-in-Place	Number of Main Spans (045)	2
Deck Surface Type (108A)		1 Monolithic Concrete	Main Spans Material (043A)	3 Steel
Deck Membrane Type (108B)		0 None	Main Spans Design (043B)	10 Truss-Thru
Deck Protection (108C)		1 Epoxy Coated Reinforci	Number of Approach Spans (046)	9
Curb Sidewalk width/Left (050A)	0.6	6.6 ft	Approach Span Material (044A)	3 Steel
Curb Sidewalk width/Right (050B)	0.6	0 ft	Approach Span Design (044B)	09 Truss-Deck
Deck Width (out-to-out) (052)		23.2 ft	Skew (034)	0°
Bridge Median (033)		0 No median	Structure Flared (035)	0 No flare
Deck Area		45680.8 (SF)	Pier Column Geometry	2 Two Columns

Spans Data:

Structure Status:

Bridge Status	3 Active
Bridge Sequence Number	0 Orig Brdg In the Field

Structure Length:

Maximum Span Length (048)	420.00 ft
Structure Length (049)	1,969.00 ft

Inventory - Roadway:

1 Route On Structure

Identification:

Road/Route name	EAST MISSION AVE	Kilometer/Mile Point (011)	2.99 mi		
Kind Hwy(Rt prefix) (005B)	3 State Hwy	National Base Net (012)	On Base Network		
Desig. level service (005C)	1 Mainline	LRS Inventory Rte (013A)	0000000370	Sub# (013B)	00
Rte# (005D)	05002	Toll Facility (020)	3 On free road	1 Toll Bridge	
Suffix (005E)	0 N/A (NBI)	Functional Class (026)	14 Urban Other Princ		
Critical Facility (006B)	Not Applicable	Traffic Direction (102)	2 2-way traffic		

Highway Networks & Service Classifications:

Traffic:

Lanes (028A)	2
Medians	0
Speed	
ADT Class	ADT Class 3
Recent ADT (029)	2645
Year (030)	2012
Truck % (109)	5
Future ADT (114)	3968
Fut. Year (115)	2033

Alternate Classifications:

Defense Highway (100)	0 Not a STRAHNET hwy
Nat. Hwy System (104)	1 On the NHS
Fed. Lands Hwy (105)	0 N/A (NBI)
Nat. Truck Network (110)	1 Part of natl network
School Bus Route	0 Not On School Bus Rte
Transit Route	0 Not On Transit Rte
Emergency Route	0 Not On Emergency Rte
NBI Route	1 On NBI Rte
Federal Aid Route Number (206)	0370
Highway Route Number (207)	370
State Classification of Inventory Route (208)	4 Major Art/Intermediate
Priority Commercial System Bridges (211)	Y On Priority Comm Sys

Clearances:

Vertical (010)	17 ft
Horizontal (047)	22 ft

Detours:

Length (019)	12 mi 20 mi
Speed	

Widths:

Approach Road (032)	22 ft	Count	
Roadway crb-crb (051)	22 ft	Rate	

Accidents:

Load Rating:

Load Rating Date **10/21/2008**

Load Rating Program **15 LARS**

Load Rating Review Recommended **Unknown**

Posting Status:

Open/Posted/Closed (041)	A Open, no restriction
Posting (070)	5 At/Above Legal Loads
Design Load (031)	2 M 13.5 (H 15)

Design Load:

Operating Type (063)	1 LF Load Factor
Operating Rating (064)	28 ton
Inventory Type (065)	1 LF Load Factor
Inventory Rating (066)	17 ton

Fatigue Truck:

	N/A	Fatigue Load Truck	N/A
	N/A	Capacity	N/A

Legal Loads & Posting:

	Inventory	Operating	Posting Value	Posted Sign Value
NDOR Truck Type 3	0 rf	26 ton	0 ton	-
NDOR Truck Type 3S2	0 rf	38 ton	0 ton	-
NDOR Truck Type 3-3	0 rf	48 ton	0 ton	-

Special Haul Vehicle & Posting:

Special Haul Vehicle 4 Axle	0 rf	0 ton	0 ton	-
Special Haul Vehicle 5 Axle	0 rf	0 ton	0 ton	-
Special Haul Vehicle 6 Axle	0 rf	0 ton	0 ton	-
Special Haul Vehicle 7 Axle	0 rf	0 ton	0 ton	-

Inspection Summary:

Inspection Date **04/24/2017**

Primary Type **Fracture Critical**

Inspector **Tyler Cramer (TC6324EL)**

Under Bridge Inspection Equipment Type **C Climbing**

Schedule:	Insp Req	Insp Performed	Previous Inspection Date	Frequency (Months)	Next Inspection Date	Inspection Cycle & Type
NBI (090)	✓	✓	04/29/2015	(091) 24	04/24/2019	Nov Odd April Odd
Element Condition		✓	04/29/2015	24	04/24/2019	
Fracture Critical (092AA)	✓	✓	(093A) 04/29/2015	(092AB) 24	04/24/2019	12112
Underwater (092BA)	✓		(093B) 07/24/2012	(092BB) 60	07/24/2017	U Update Update
Other Special (092CA)	✓		(093C)	(092BC) 24	04/24/2018	U Unknown April Even

Inspection Resources:

Crew Hours		220.00	Assistant Inspector 1		BS4306
Helper Hours		0.00	Assistant Inspector 2		JM5182
Flagger Hours		0.00	Assistant Inspector 3		CJ4964
Under Bridge Inspection Equipment Hours		0.00	Assistant Inspector 4		JH8816
Special Equipment Crew Hours		0.00			
Special Equipment Hours		35.00			

DFCF

General Bridge Notes:

The Bellevue Toll Bridge was built in 1952 and consists of 11-spans with a total length of 1965'. The bridge is owned by the BBC and carries Nebraska's East Mission Avenue (previously Highway 370) and Iowa's County Highway H10 over the Missouri River.

The deck is a CIP concrete deck with SIP forms with a clear roadway of 22' and no sidewalks. The rails consist of concrete curbs with steel thrie-beam guardrails.

The superstructure, from east to west:
-Spans 1 to 4 are simple span deck truss, span approx 152'.
-Spans 5 and 6 are continuous thru truss, span approx 421'.
-Spans 7 and 8 are simple span deck truss, span approx 152'.
-Spans 9 to 11 are continuous steel multi-beams, span approx 70'.
All steel truss members consist of riveted and/or bolted, rolled, and built-up members with few welds, typically tack welds. Truss members are connected with gusset plates using bolts and/or rivets. All stringers and floorbeams are rolled steel. Stringers are simply supported at the floorbeams. The stringers of both the thru and deck trusses are connected to the floorbeam webs with connection angles and bolts and/or rivets. The stringers are composite with the deck. No butt welds present. Truss bearings consist of pins.

All girders are rolled steel. Bolted and/or riveted splices were used for continuity. The girders are composite with the deck. Channel separators attached to full height stiffeners. No butt welds present. Girder bearings consist of pins.

The abutments consist of concrete walls supported on concrete columns and footings; A1 piling are steel and A2 are timber. Piers 1 thru 8 consist of concrete caps and columns supported on concrete walls; Piers 1 thru 3 and 6 thru 8 are supported on footings with steel piles, Piers 4 and 5 are on concrete caissons. Piers 9 and 10 consist of a concrete base wall supported on a concrete footing with steel pile; two steel columns, a steel cap, and steel bracing support the superstructure.

General Inspection Notes:

04/24/2017

See detailed inspection report dated 4/24/17.

Deck remains at 7. Joints changed to a 5 from a 7.
Various cracking is present throughout. Typically two small holes in each end of each of the strip seal joints allowing water to leak.

Superstructure remains at 5.
The areas of primary deterioration are below the deck with deterioration continuing. The deterioration is typically worst below the leaking bridge joints where heavier rust and packrust is present. Span 1 L0L1 Lt. has one hole at the middle batten plate in the top exterior angle and Span 1 L1L2 Lt. has holes in three of the four angles at the middle batten plate; deterioration was noted at the previous inspection but the holes were not present at the time. Due to the accelerated deterioration of these members it is recommended to inspect these members on a yearly basis and a special inspection form has been initiated.

Bearings changed to a 5 from a 6.
Several of the deck truss bearings are over rotated. This, along with debris build up in the anchor bolt slots, is causing the anchor bolts to bend and shifting some bearings. Several anchor bolts of the girder span bearings at Pier 8 are missing.

Substructure, abutments, and piers remain at 5. No piling visible.
Spalls, cracking, and delamination typical throughout. The concrete in front of the bearings at Abutment 1 has spalled at the north bearing and is delaminating at the south bearing.

Channel remains at 7.

The more significant repair/maintenance recommended are:
-Recoat the steel and concrete elements as recommended in the June 2016 coatings inspection report by KTA.
-Repair the holes in deck truss lower chord members Span 1 L0L1 and L1L2 Lt.
-Replace the deck joints with holes and water leakage.
-Replace the over rotated deck truss rocker bearings and the bent anchor bolts.
-Replace the girder span end bearings and anchor bolts at Pier 8 and Abutment 2.
-Repair the deteriorated concrete at Abutment 1.

04/29/2015	RE5380 4/19/2016 Revised the Fracture Critical type from None to 12112. This bridge has two types. for estimate reasons only 12112 was selected. RE5380 3/15/2016 Last underwater inspection of 7/24/2012 was not transferred from Pontus to BrM. UW inspection dates were updated. See detailed inspection report dated 4-29-15. 1. If not previously completed, load rate the gusset plate connections. 2. Replace the broken rivets with structural bolts. 3. Clean and paint superstructure and Piers 9 and 10 to prolong the life of the structure. 4. Seal the concrete deck on a semi-annual basis to prevent water and salt infiltration. This will effectively protect the deck without further repair of the minor popouts. 5. Remove the dirt and debris from the strip seals joints on an annual basis to maintain functionality of the expansion joints. After cleaning, if there are holes visible in the gland then they should be replaced. 6. Provide additional support for the unsupported conduit in Span 5 along the north top chord to prevent damage to utilities. 7. Replace missing conduit junction box covers at Pier 4 and in Span 5 along the north top chord to protect the wiring inside from the environment. 8. Repair the undermining of the east approach concrete barriers and approach slab and the adjacent erosion channel to the north. 9. Complete concrete repairs of the west abutment bearing area, the spall in Pier 1 cap and the north curb at the west abutment. 10. Remove the accumulation of timber debris from the upstream nose of Pier 5.
11/25/2013	See detailed inspection report dated 2013. 1. East abutment foreslope has scour holes below bridge deck drains. 2. West Abutment bearing seat and curbs need concrete repairs. 3. Concrete deck needs minor patching of pop-outs. 4. Replace deck joint strip seal rubber glands @ thru truss nodes L7, L14 & L7'. 5. Clean and paint thru truss floor beams and associated connections at L0, L14 & L0'. 5. Wash bridge at end of snow season. 6. Remove timber debris lodged against Pier 5
11/22/2013	See detailed inspection report dated 2013. 1. East abutment foreslope has scour holes below bridge deck drains. 2. West Abutment bearing seat and curbs need concrete repairs. 3. Concrete deck needs minor patching of pop-outs. 4. Replace deck joint strip seal rubber glands @ thru truss nodes L7, L14 & L7'. 5. Clean and paint thru truss floor beams and associated connections at L0, L14 & L0'. 5. Wash bridge at end of snow season. 6. Remove timber debris lodged against Pier 5
11/15/2011	See detailed inspection report dated 2011 submitted to NDOR. 1. Repair impact damage to SE guardrail & secure spacer block at the NE guardrail. 2. Repair patching & spalled areas on Piers 7 & 8. Concrete under bearing at Girder 2 on Pier 8 more critical item. Repairs should be made to restore complete bearing area for girder as well as restore the structural integrity of the entire bearing beam. 3. Repair bottom flange of floor beam at L7'. Section loss of up to 43% was noted on this inspection. 4. East abutment foreslope has scour holes below bridge deck drains. Fill scour hole and plug deck drains with concrete. 5. Anchor cables at east approach guardrail terminal sections has missing anchor nuts that need to be replaced.
08/01/2009	See detailed inspection report dated Sept 2009

Element Condition Notes:

Main Span #1 Steel Thru Truss

12 Re Concrete Deck	**3 Mod.**
04/29/2015	Light scaling (1/16 inch to 1/8 inch) is located with approximately 2 feet along the curbs. There are several small (1/4 inch to 1 inch in diameter) aggregate popouts and other snow plow markings scattered throughout the deck surface. The deck has transverse cracking at each floor beam location where the slab is continuous over the floor beam. Other areas of heavier map cracking, higher concentration of transverse cracking over the floor beams, and areas of wear are identified in deck deficiency drawings.
11/25/2013	Quantity as per plans
12 Re Concrete Deck	**4 Sev.**
04/24/2017	
113 Steel Stringer	**3 Mod.**
04/29/2015	
11/25/2013	Quantity as per plans
113 Steel Stringer	**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to the ineffective coating the subelement was removed and will be reevaluated if new coating is installed.
120 Steel Truss	**3 Mod.**
04/29/2015	
11/25/2013	Quantity as per plans
120 Steel Truss	**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016

	coatings inspection performed by KTA. Due to the ineffective coating the subelement was removed and will be reevaluated if new coating is installed.	
152 Steel Floor Beam		**3 Mod.**
04/29/2015	Floor beams L1' and L2' have been strengthened since 2007, floor beams L8 and L3' in 2009, and L7' in 2012. The strengthening consisted of a ½ inch steel plate bolted to the bottom flanges and at floor beams L1', L2', and L7', a bolted and welded ½ inch steel plate on both sides of the web between the exterior stringer and lower truss chord connection. The strengthening was completed due to section loss from corrosion. Many of the remaining, un-strengthened, floor beams have significant section loss of the flanges, webs, and rivets. Section loss at an isolated area of the underside of the bottom flanges at the beam ends to gusset plate connection is generally greater than along the remaining length. Web corrosion and section loss is generally located in the lower half of the web between the exterior stringer and lower truss chord connection although several floor beams have corrosion and pack rust along the top flanges and top half of the web at this same location. This corrosion and section loss also affects the gusset plates and riveted connections. Two locations, floor beams L4' and L3', have an area of full penetration section loss in the web near the top flange. In both instances the area of full penetration is approximately ¼ inch in diameter.	
11/25/2013	Quantity as per plans	
152 Steel Floor Beam		**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to the ineffective coating the subelement was removed and will be reevaluated if new coating is installed.	
162 Stl Gus Plate		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
162 Stl Gus Plate		**4 Sev.**
04/24/2017		
205 Re Conc Column		**4 Sev.**
04/24/2017		
210 Re Conc Pier Wall		**4 Sev.**
04/24/2017		
220 Re Conc Pile Cap/Ftg		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans AASHTO needs to correct description, Element 220 in not submerged	
234 Re Conc Pier Cap		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
234 Re Conc Pier Cap		**4 Sev.**
04/24/2017		
300 Strip Seal Exp Joint		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
300 Strip Seal Exp Joint		**4 Sev.**
04/24/2017		
330 Metal Bridge Railing		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
330 Metal Bridge Railing		**4 Sev.**
04/24/2017		
9152 X-Frame		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
9152 X-Frame		**4 Sev.**
04/24/2017		
9220 Sub R/C Footing/Cap		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans Unit for this Element is FT not EA	
9220 Sub R/C Footing/Cap		**4 Sev.**

04/24/2017		
9303 Fix Pinned Bearing		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
9303 Fix Pinned Bearing		**4 Sev.**
04/24/2017		
9311 Rocker W/Pin Bearing		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
9311 Rocker W/Pin Bearing		**4 Sev.**
04/24/2017		
9540 Stl Paint Prot Coat		**3 Mod.**
04/29/2015		
04/29/2015		
04/29/2015		
04/29/2015		
11/25/2013	Quantity as per plans	
11/25/2013	Quantity as per plans	
11/25/2013	Quantity as per plans	
11/25/2013	Quantity as per plans	
	Appr Span #2 Steel Deck Truss	
12 Re Concrete Deck		**3 Mod.**
04/29/2015	Light scaling (1/16 inch to 1/8 inch) is located with approximately 2 feet along the curbs. There are several small (1/4 inch to 1 inch in diameter) aggregate popouts and other snow plow markings scattered throughout the deck surface. The deck has transverse cracking at each floor beam location where the slab is continuous over the floor beam. Other areas of heavier map cracking, higher concentration of transverse cracking over the floor beams, and areas of wear are identified in deck deficiency drawings.	
11/25/2013	Quantity as per plans	
12 Re Concrete Deck		**4 Sev.**
04/24/2017		
113 Steel Stringer		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
113 Steel Stringer		**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to the ineffective coating the subelement was removed and will be reevaluated if new coating is installed.	
120 Steel Truss		**3 Mod.**
04/29/2015	Corrosion and pack rust on the deck trusses was mostly found on the floor beams, stringers, upper chords and gusset plates along the upper chord and some of the gusset plate connections and batten plates along the lower chord. The corrosion along the upper chord can be attributed to water and salt infiltration through the deteriorated deck prior to its replacement in 2004.	
11/25/2013	–	
120 Steel Truss		**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to the ineffective coating the subelement was removed and will be reevaluated if new coating is installed.	
152 Steel Floor Beam		**3 Mod.**
04/29/2015	Many of the floor beams overhanging the deck truss in the approach spans (Spans 1 through 4 and Spans 7 and 8) have full penetration section loss in the top corners. Most of these locations have been retrofit with steel angles to strengthen the weakened web in this area. These areas continue to corrode due to the floor beams having direct exposure to moisture.	
11/25/2013	Quantity as per plans	
152 Steel Floor Beam		**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to the ineffective coating the subelement was removed and will be reevaluated if new coating is installed.	
162 Stl Gus Plate		**3 Mod.**

04/29/2015	Among the gusset plate connections along the lower chord the most severe corrosion in the horizontal gusset plates at the south bearings at Pier 2. Corrosion at these two bearing locations have resulted in section loss of the gusset plates and rivet heads.	
11/25/2013	Quantity as per plans	
162 Stl Gus Plate		4 Sev.
04/24/2017		
205 Re Conc Column		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans	
205 Re Conc Column		4 Sev.
04/24/2017		
210 Re Conc Pier Wall		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans	
210 Re Conc Pier Wall		4 Sev.
04/24/2017		
215 Re Conc Abutment		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans	
215 Re Conc Abutment		4 Sev.
04/24/2017		
220 Re Conc Pile Cap/Ftg		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans ASSHTO needs to correct the description, Element 220 is not submerged	
234 Re Conc Pier Cap		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans	
234 Re Conc Pier Cap		4 Sev.
04/24/2017		
300 Strip Seal Exp Joint		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans	
300 Strip Seal Exp Joint		4 Sev.
04/24/2017		
330 Metal Bridge Railing		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans	
330 Metal Bridge Railing		4 Sev.
04/24/2017		
9303 Fix Pinned Bearing		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans	
9303 Fix Pinned Bearing		4 Sev.
04/24/2017		
9311 Rocker W/Pin Bearing		3 Mod.
04/29/2015		
11/25/2013	Quantity as per plans	
9311 Rocker W/Pin Bearing		4 Sev.
04/24/2017		
9540 Stl Paint Prot Coat		3 Mod.
04/29/2015		
04/29/2015		
04/29/2015		
11/25/2013	Quantity as per plans	
11/25/2013		
11/25/2013	Quantity as per plans	
	Pay Span #3 Paving Approach	
301 Pourable Joint Seal		3 Mod.

04/29/2015		
11/25/2013	Quantity as per plans	
301 Pourable Joint Seal		**4 Sev.**
04/24/2017		
321 Re Conc Approach Slab		**3 Mod.**
04/29/2015	Light scaling (1/16 inch to 1/8 inch) is located with approximately 2 feet along the curbs. There are several small (1/4 inch to 1 inch in diameter) aggregate popouts and other snow plow markings scattered throughout the deck surface.	
11/25/2013	Quantity as per plans	
321 Re Conc Approach Slab		**4 Sev.**
04/24/2017		
9333 Mtl Appr Rail		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
9333 Mtl Appr Rail		**4 Sev.**
04/24/2017		
9334 R/C Closed Appr Rail		**3 Mod.**
04/29/2015		
11/25/2013	Quantity as per plans	
9334 R/C Closed Appr Rail		**4 Sev.**
04/24/2017		
	Appr Span #3 Steel Girders	
12 Re Concrete Deck		**4 Sev.**
04/24/2017	_	
107 Steel Opn Girder/Beam		**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to the ineffective coating the subelement was not included and will be reevaluated if new coating is installed.	
202 Steel Column		**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to the ineffective coating the subelement was not included and will be reevaluated if new coating is installed.	
210 Re Conc Pier Wall		**4 Sev.**
04/24/2017	_	
215 Re Conc Abutment		**4 Sev.**
04/24/2017	_	
231 Steel Pier Cap		**4 Sev.**
04/24/2017	The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to the ineffective coating the subelement was not included and will be reevaluated if new coating is installed.	
234 Re Conc Pier Cap		**4 Sev.**
04/24/2017	_	
300 Strip Seal Exp Joint		**4 Sev.**
04/24/2017	_	
330 Metal Bridge Railing		**4 Sev.**
04/24/2017	_	
9303 Fix Pinned Bearing		**4 Sev.**
04/24/2017	_	
9311 Rocker W/Pin Bearing		**4 Sev.**
04/24/2017	_	

FORM NOTES:

Yellow Highlights - Condition information that has changed since the 2015 inspection.

Magenta Highlights - Items that need to be changed but must be done by NDOR. The changes to the items shown in red text next to the highlight have been requested but not completed at this time.

Cyan Highlights - Bridge is no longer carrying a highway and does not require element inspection per NDOR. Last inspections have still included the elements but not the condition defects. This inspection has continued this but has reviewed and updated the elements and quantities as required - split out the girder span information and updated substructure quantities as needed, hidden elements not included. Environmental Factor is 4 for all elements and they were changed accordingly; it is unknown why the element notes on this page and the last few pages have not printed correctly. The paint system is in poor condition throughout, with areas of complete paint failure, as noted at the June 2016 coatings inspection performed by KTA. Due to ineffective coating the subelement was not included and will be reevaluated if new coating is installed.

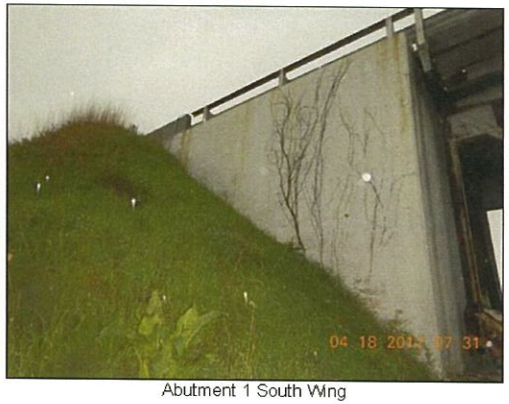
Bearings Pier 2 North

Abutment 2

Abutment 1 North Wing

Bearings Pier 2 South

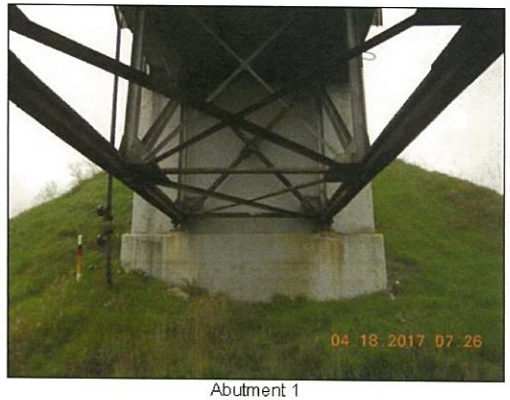
Bearings Abutment 2 Girders 1 and 2



Abutment 1 South Wing

Bearings Pier 3 North

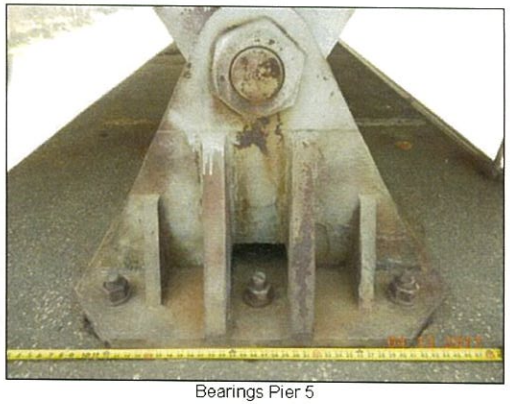
Bearings Abutment 2 Girders 3 and 4

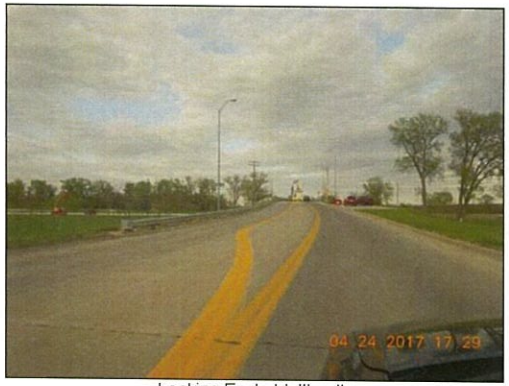


Abutment 1

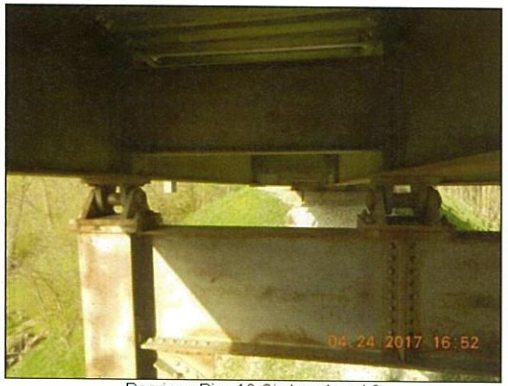

Bearings Thru Truss ends

Bearings Pier 9 Girders 3 and 4

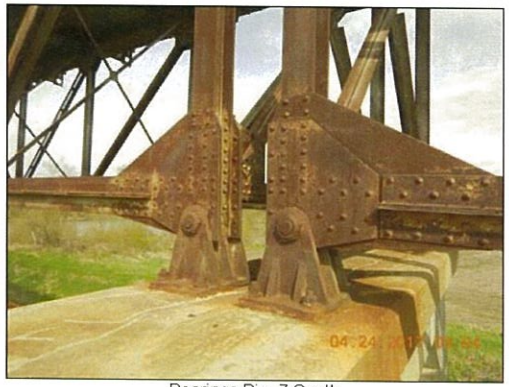

Bearings Pier 5

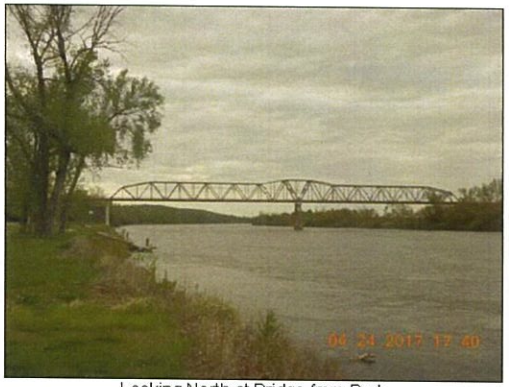


Looking East at tollbooth

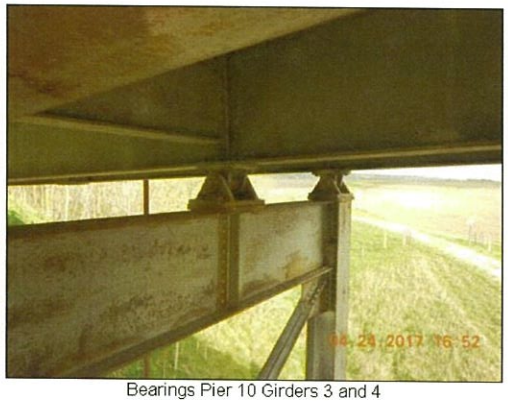


Bearings Pier 10 Girders 1 and 2

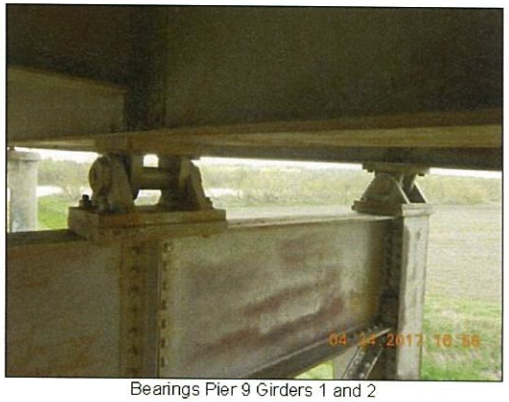

Bearings Pier 7 South



Looking North at Bridge from Park

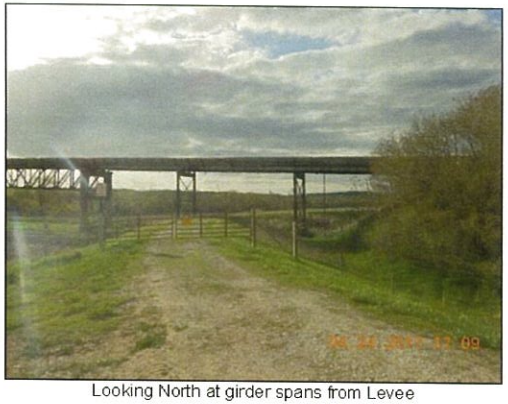


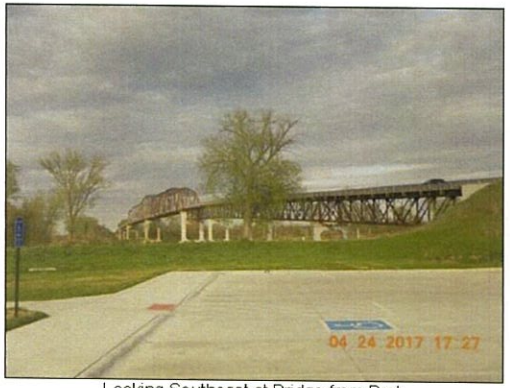
Bearings Pier 10 Girders 3 and 4


Bearings Pier 9 Girders 1 and 2

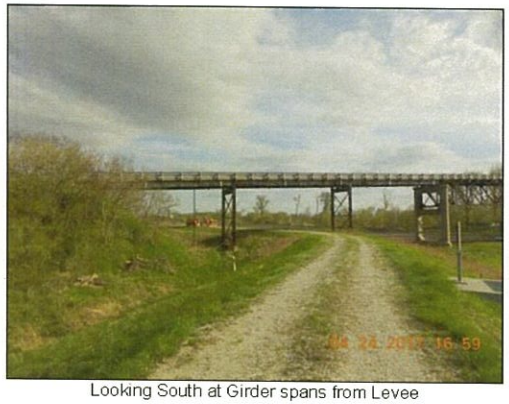
Looking South from Pier 7

Looking South at bridge from levee

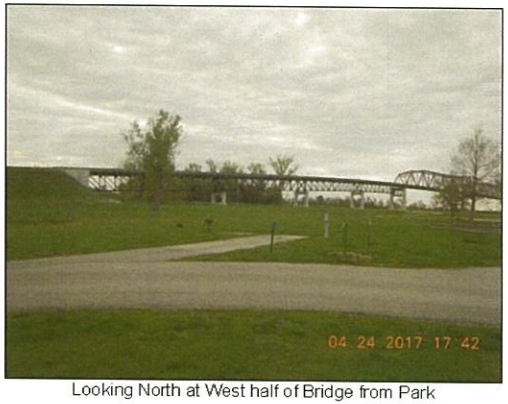

Looking North at girder spans from Levee



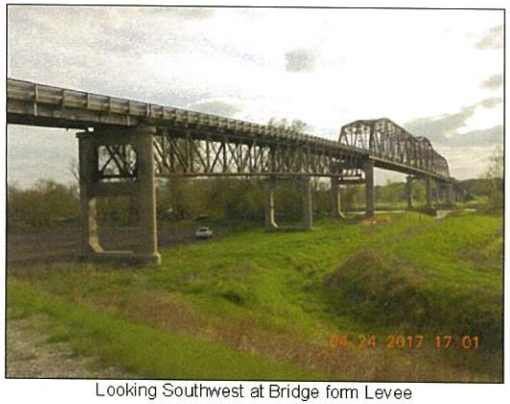
Looking Southeast at Bridge from Park



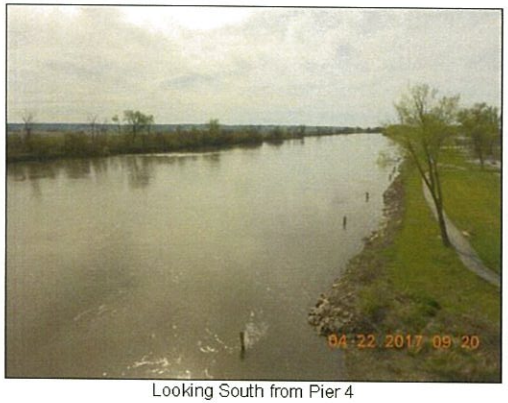
Looking South at Girder spans from Levee



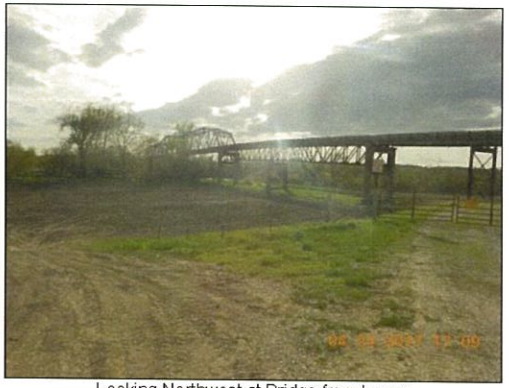
Looking North at West half of Bridge from Park



Looking Southwest at Bridge form Levee



Looking South from Pier 4


Looking Northwest at Bridge from Levee

Looking west at Span 8 from Pier 8

Looking West from Pier 4

Pier 1 looking East

Pier 1 Looking West

Pier 2 looking East

Pier 2 looking West

Pier 3 looking East

Pier 3 looking West

Pier 4 looking East

Pier 5 looking East

Pier 5 looking West

Pier 6 looking East

Pier 6 looking West

Pier 7 looking East

Pier 7 looking West

Pier 8 looking East

Pier 8 looking West

Pier 9 looking East

Pier 9 looking West

Pier 10 looking East

Pier 10 looking West

Span 1

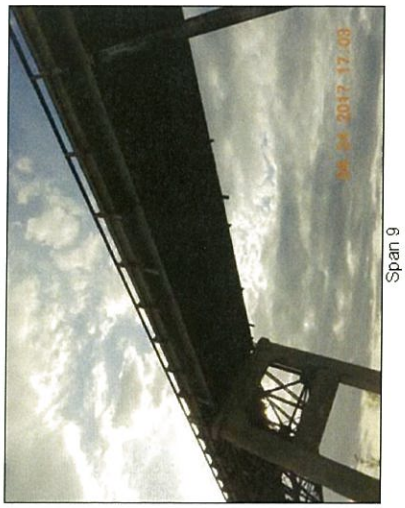
Span 2

Span 3

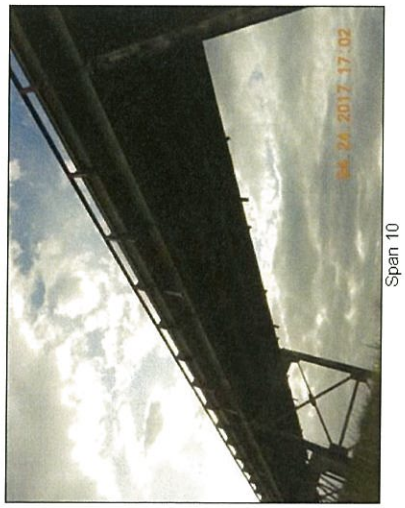
Span 4

Span 7

Span 8

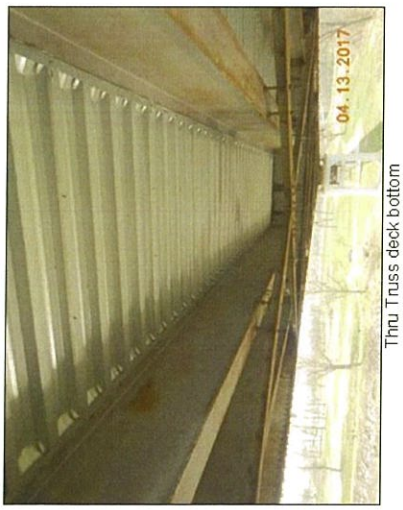


Span 9



Span 10

Span 11



Thru Truss deck bottom

Abutment 1 North deck joint tear

Abutment 1 South deck joint holes

Deck patch near transflex joint

Pier 1 deck joint

Pier 1 North deck joint torn

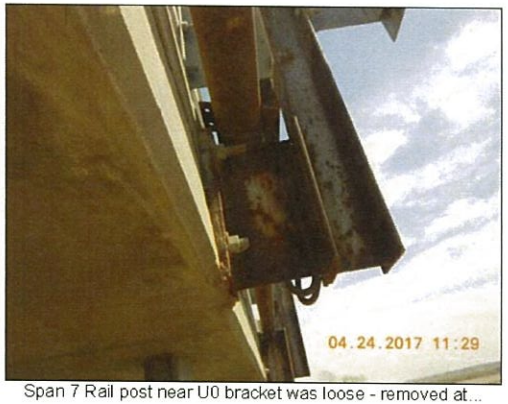
Pier 2 deck joint tear at south end

Pier 2 deck joint

Pier 3 Deck joint cuts on South

Pier 6 deck joint possible leaking on North

Span 11 Abutment 2 South deck corner poor consolidation with exposed rebar

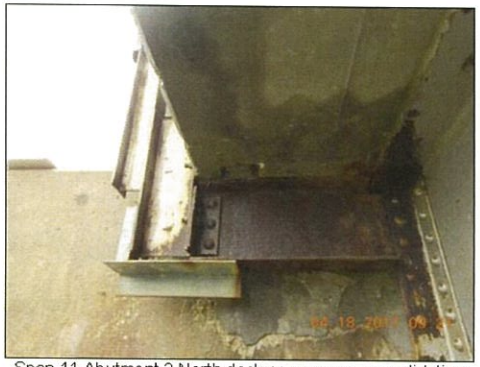


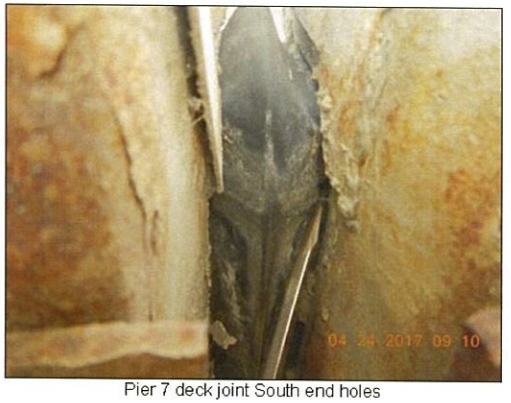
Span 7 Rail post near U0 bracket was loose - removed at...

Pier 6 deck joint South end possible leak

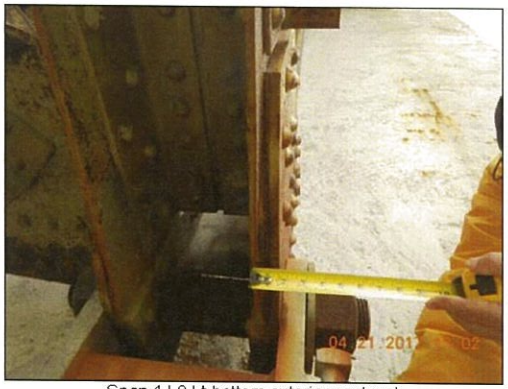
Span 11 Abutment 2 North deck corner poor consolidation with exposed rebar closeup


Pier 7 deck joint holes on north end


Span 11 Abutment 2 North deck corner poor consolidation with exposed rebar



Pier 7 deck joint South end holes

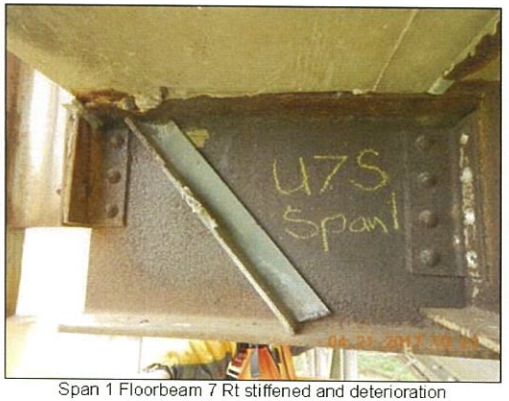


Span 1 L0 Lt bottom exterior packrust

Span 1 Floorbeam 5 Rt heavy deterioration

Span 1 Floorbeam 0 Lt deterioration

Span 1 L0 Lt bottom interior packrust



Span 1 Floorbeam 7 Rt stiffened and deterioration

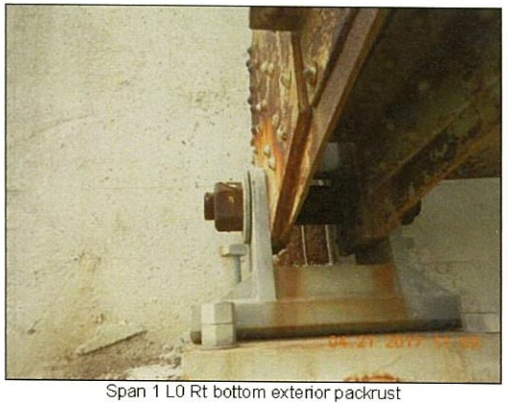
Span 1 Floorbeam 0 Rt end deterioration

Span 1 L0 Lt gusset plates bent inward

Span 1 Floorbeam 10 Lt end deterioration

Span 1 Floorbeam 1 Rt deterioration

Span 1 L0 Rt top exterior packrust



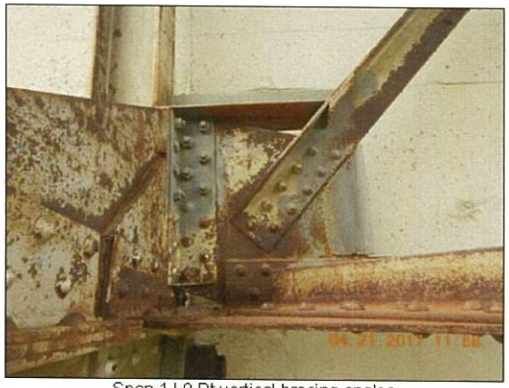
Span 1 L0 Rt bottom exterior packrust

Span 1 L0 Lt top exterior packrust

Span 1 L0 Rt top interior packrust

Span 1 L0 Rt bottom interior packrust

Span 1 L0 Lt top interior packrust

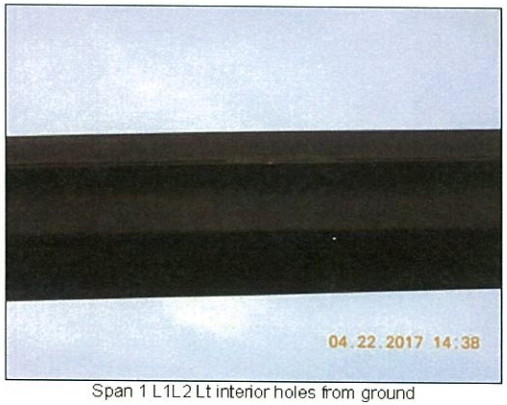


Span 1 L0 Rt vertical bracing angles

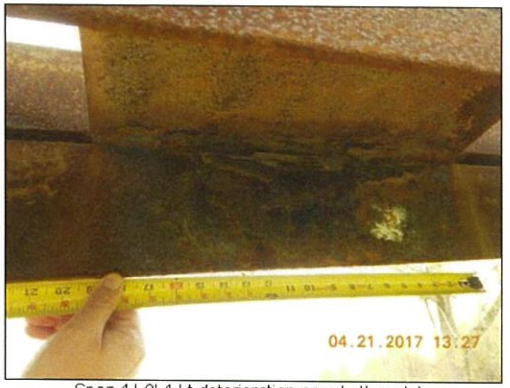
Span 1 L0 Rt gusset plates bent inward

Span 1 L0 Lt vertical bracing angles

Span 1 L3 Rt exterior packrust

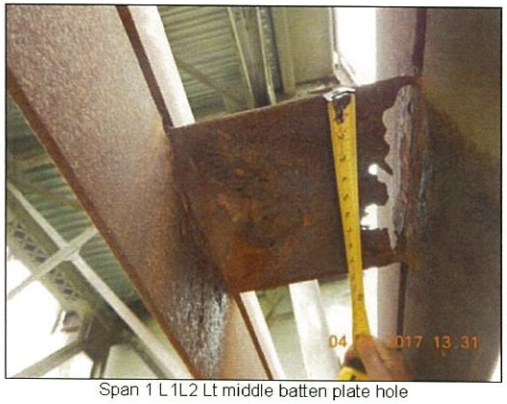


Span 1 L1L2 Lt interior holes from ground



Span 1 L0L1 Lt deterioration near batten plate

Span 1 L9 Lt interior packrust

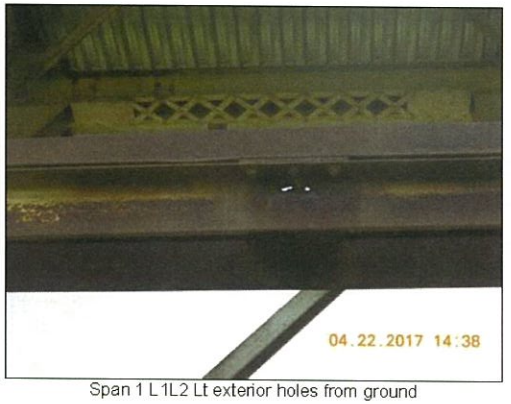


Span 1 L1L2 Lt middle batten plate hole

Span 1 L0L1 Lt middle batten plate hole

Span 1 L10 Lt bottom exterior packrust

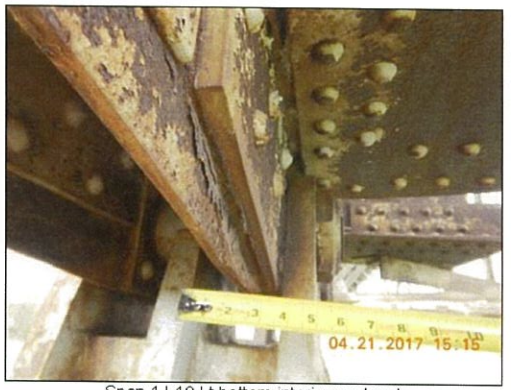
Span 1 L2 Lt exterior heavy deterioration



Span 1 L1L2 Lt exterior holes from ground


Span 1 L10 Rt gussets bent inward

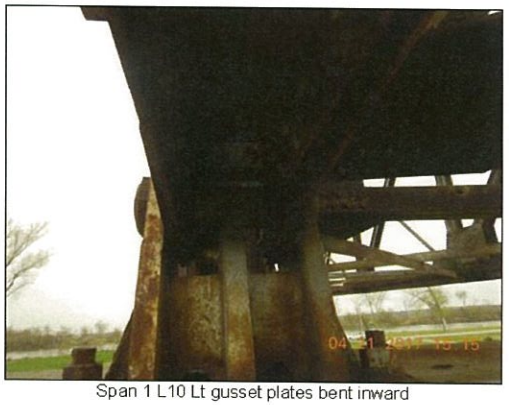
Span 1 L10 Lt top interior packrust

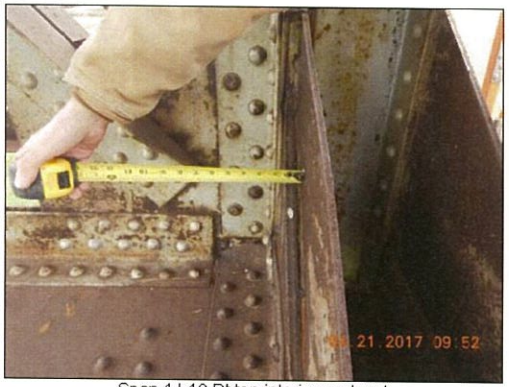


Span 1 L10 Lt bottom interior packrust


Span 1 L10 Rt top exterior packrust


Span 1 L10 Rt bottom exterior packrust

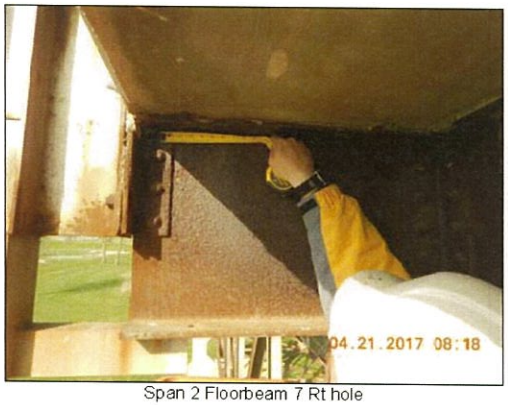

Span 1 L10 Lt gusset plates bent inward



Span 1 L10 Rt top interior packrust

Span 1 L10 Rt bottom interior packrust

Span 1 L10 Lt top exterior packrust

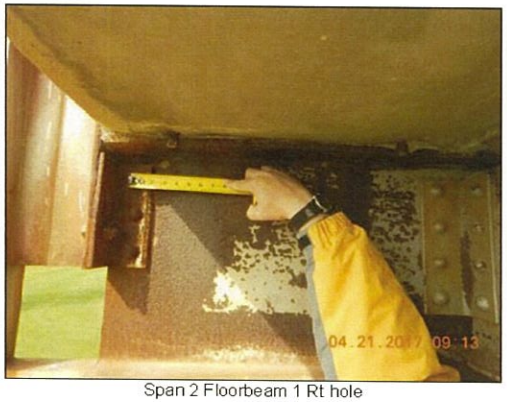


Span 2 Floorbeam 7 Rt hole


Span 2 Floorbeam 0 Lt end deterioration


Span 1 U1L2 Lt batten plate deterioration

Span 2 Floorbeam 8 Lt stiffened and deterioration


Span 2 Floorbeam 1 Rt hole

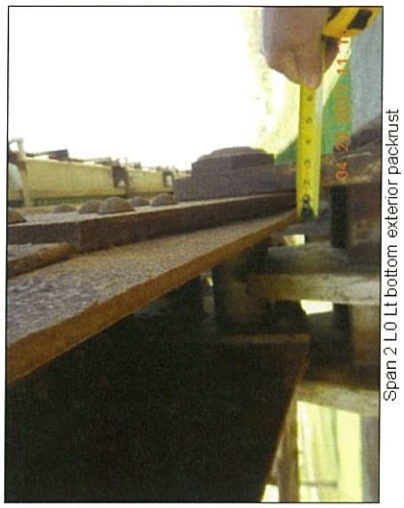

Span 2 bottom interior packrust


Span 2 Floorbeam 8 Rt stiffened and deterioration

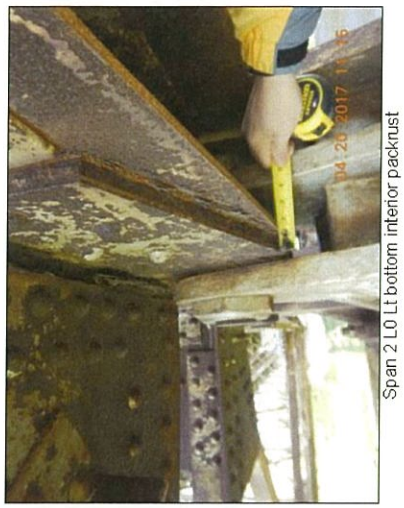

Span 2 Floorbeam 4 Lt deterioration and web hole


Span 2 Floorbeam 0 Lt deterioration

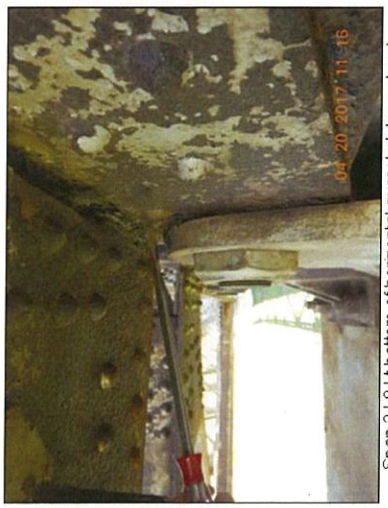
Span 2 Floorbeam 9 Rt hole



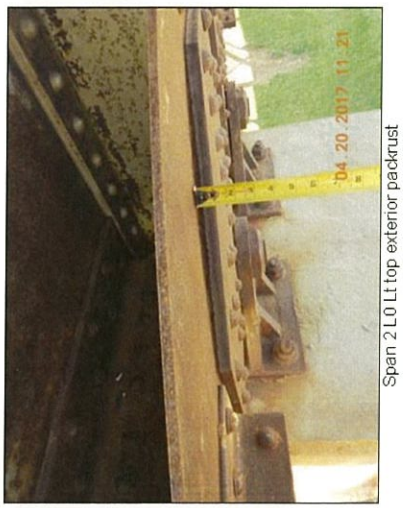
Span 2 L0 Lt bottom exterior packrust



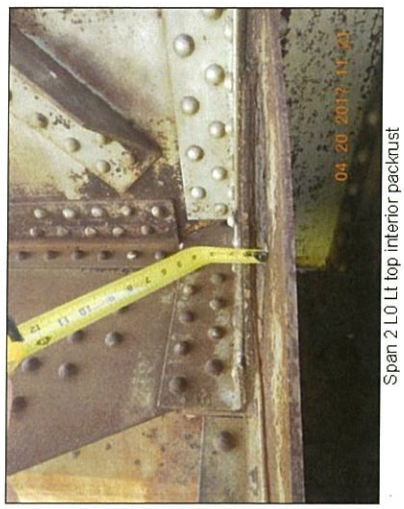
Span 2 L0 Lt bottom interior packrust



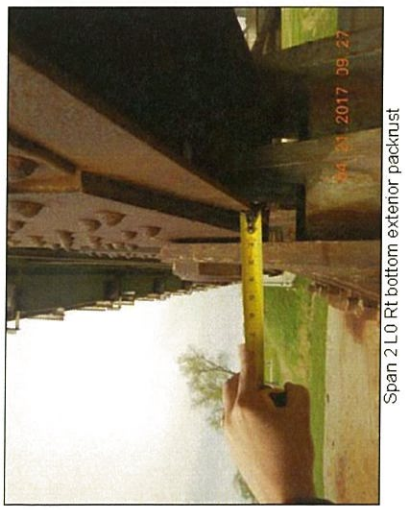
Span 2 L0 Lt bottom of horizontal gusset plate packrust



Span 2 L0 Lt top exterior packrust



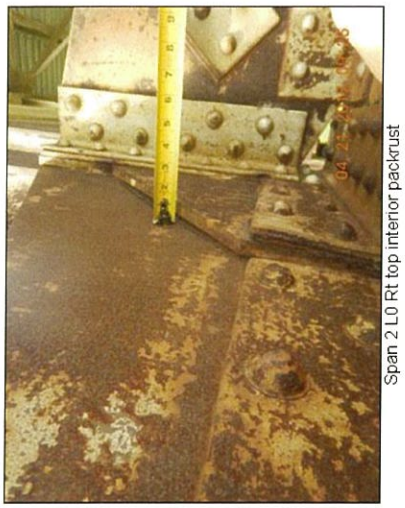
Span 2 L0 Lt top interior packrust



Span 2 L0 Rt bottom exterior packrust

Span 2 L0 Rt gusset plates bent inward

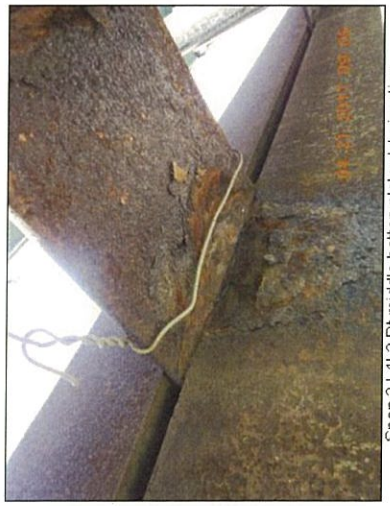
Span 2 L0 Rt top exterior packrust



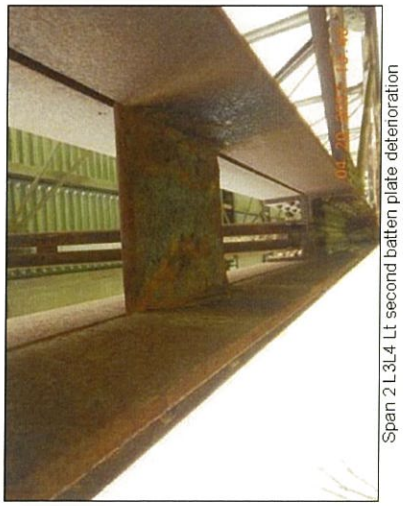
Span 2 L0 Rt top interior packrust

Span 2 L0L1 Lt batten plate deterioration from top

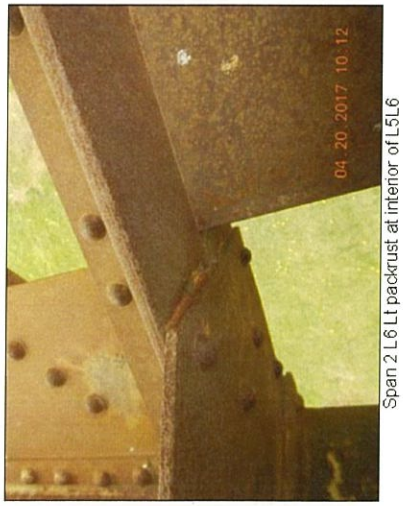
Span 2 L1L2 Lt batten plate deterioration at top



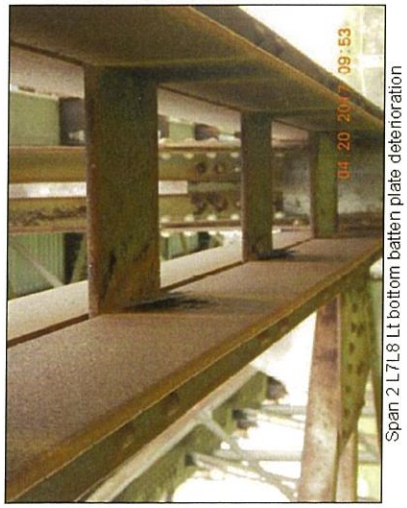
Span 2 L1L2 Rt middle batten plate deterioration



Span 2 L3L4 Lt second batten plate deterioration

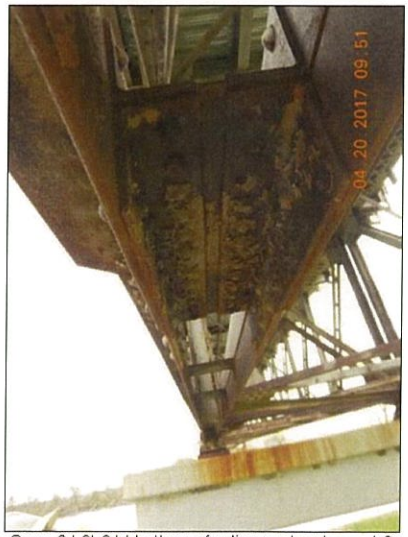


Span 2 L6 Lt packrust at interior of L5L6

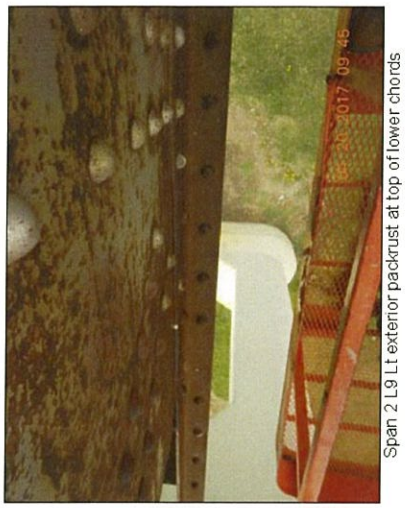


Span 2 L7L8 Lt bottom batten plate deterioration

Span 2 L8L Lt horizontal gusset plate deterioration



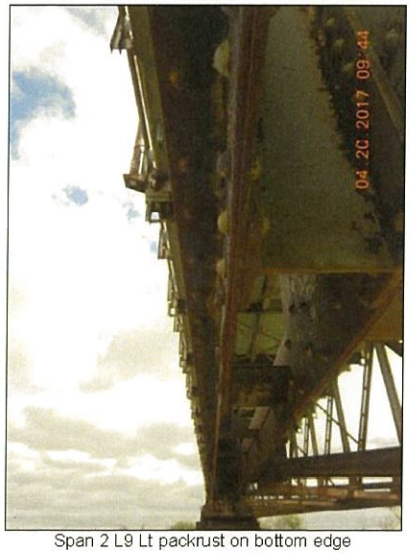
Span 2 L8L9 Lt bottom of splice packrust near L8



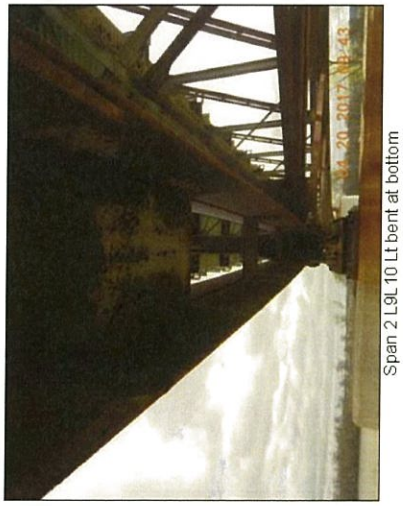
Span 2 L9 Lt exterior packrust at top of lower chords

Span 2 L9 Lt interior packrust at top of lower chords

Span 2 L9 Lt packrust at L9L10

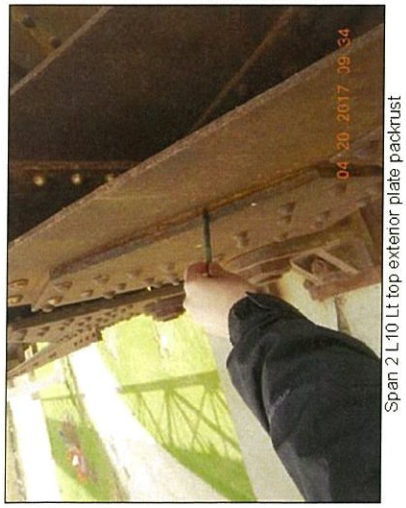


Span 2 L9 Lt packrust on bottom edge



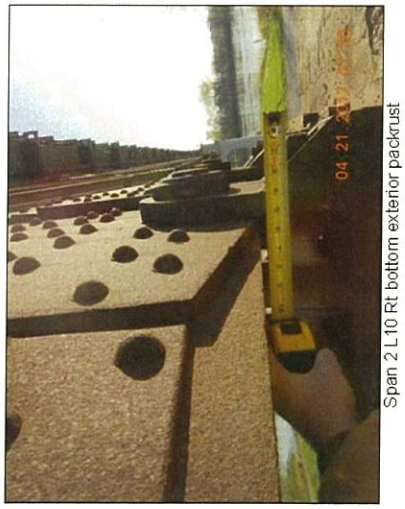
Span 2 L9L10 Lt bent at bottom

Span 2 L9L10 Lt first from L9 batten plate deterioration



Span 2 L10 Lt top exterior plate packrust

Span 2 L10 Lt top interior plate packrust and deterioration



Span 2 L10 Rt bottom exterior packrust

Span 3 Floorbeam 2 Lt web deterioration

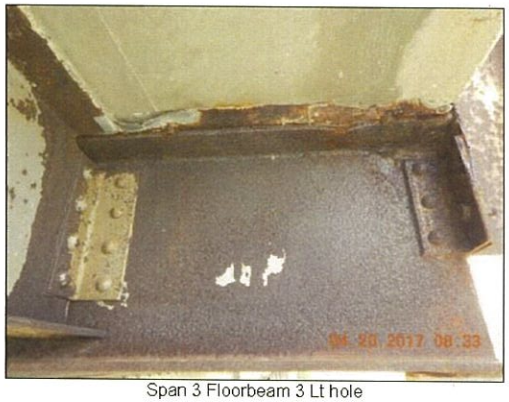
Span 2 U8 Lt exterior upper channels not lined up

Span 2 L10 Rt inside deterioration

Span 3 Floorbeam 2 Rt deterioration

Span 2 U10 Rt typ packrust at upper chord cover plates

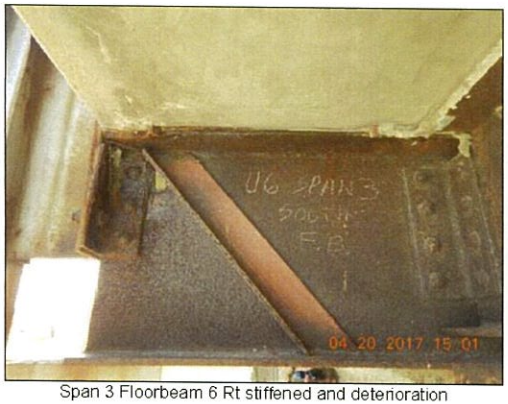
Span 2 U6L5 Lt packrust on top side



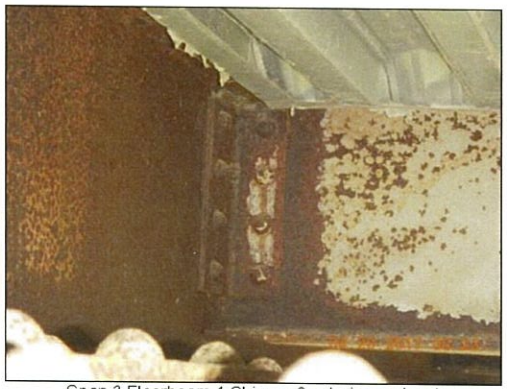
Span 3 Floorbeam 3 Lt hole


Span 3 Floorbeam 2 Lt deterioration

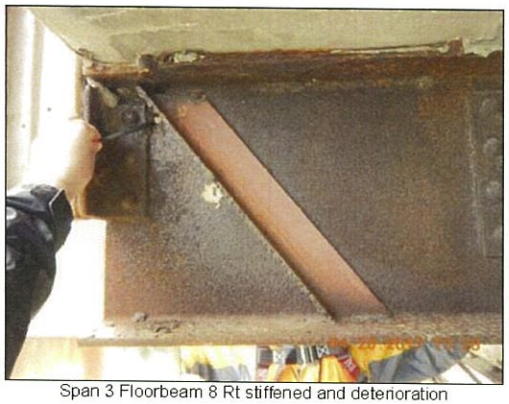
Span 2 U7 Lt packrust in top plate on East



Span 3 Floorbeam 6 Rt stiffened and deterioration


Span 3 Floorbeam 4 Stringer 2 exterior packrust

Span 3 Floorbeam 3 Rt deterioration


Span 3 Floorbeam 8 Rt stiffened and deterioration


Span 3 Floorbeam 4 Stringer 4 deterioration

Span 3 Floorbeam 4 Rt stiffened and web deterioration...

Span 3 L0 end vertical bracing packrust

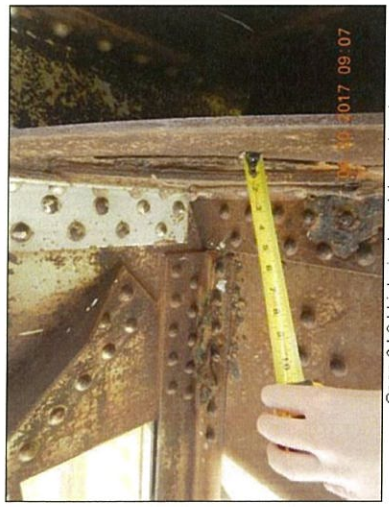
Span 3 Floorbeam 5 Rt web hole

Span 3 Floorbeam 4 Rt west face deterioration

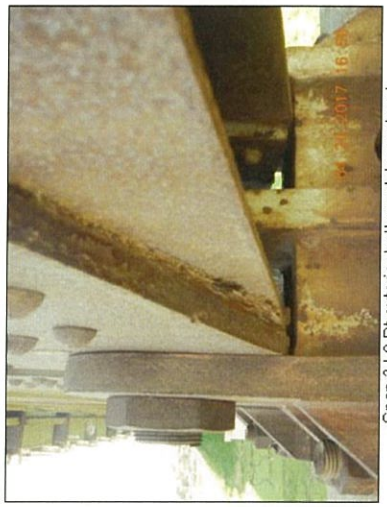
Span 3 L0 Lt end plate deterioration with rivets severely deteriorated on exterior side


Span 3 L0 Lt exterior bottom plate packrust


Span 3 L0 Lt interior bottom plate packrust

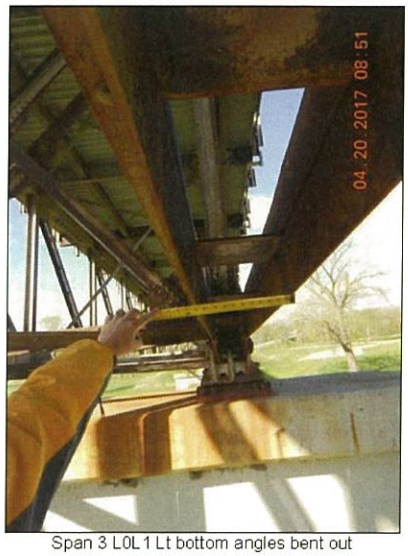

Span 3 L0 Lt interior top plate packrust


Span 3 L0 Rt bottom plates bowed inward


Span 3 L0 Rt exterior bottom plate packrust

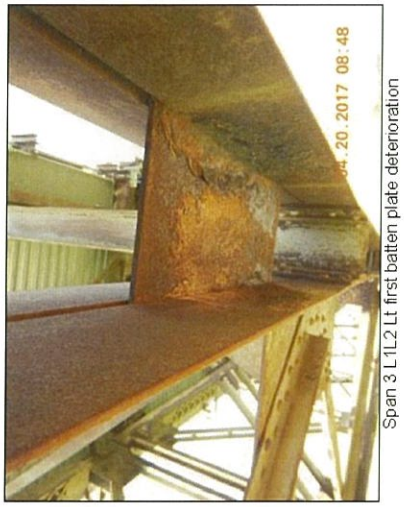

Span 3 L0 Rt horizontal gusset plate deterioration


Span 3 L0 Rt interior bottom plate packrust

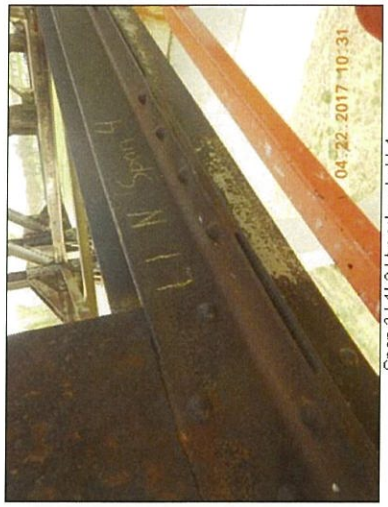


Span 3 L0L1 Lt bottom angles bent out

Span 3 L1L2 Lt 2nd batten plate deterioration



Span 3 L1L2 Lt first batten plate deterioration



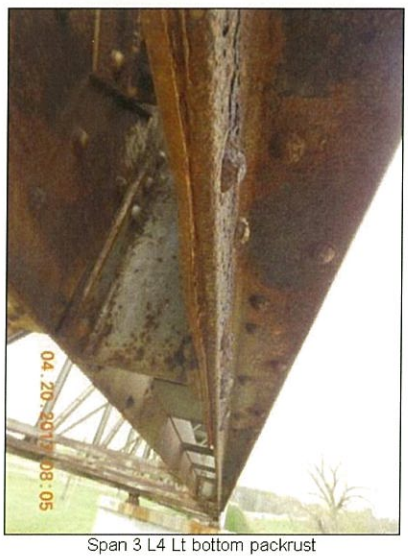
Span 3 L1L2 Lt packrust at L1

Span 3 L1L2 Rt splice tack weld crack

Span 3 L2 Lt horizontal gusset plate deterioration

Span 3 L2 Rt horizontal gusset plate packrust on bottom

Span 3 L3 Rt horizontal gusset plate deterioration



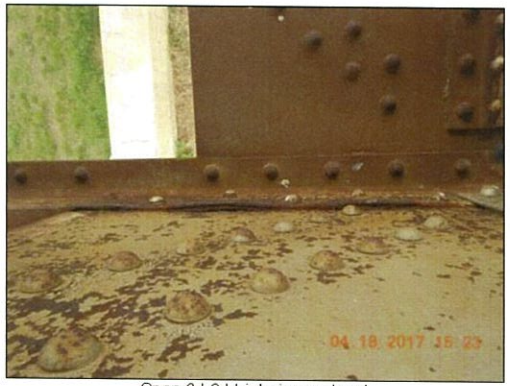
Span 3 L4 Lt bottom packrust

Span 3 L4 Lt exterior lower chord deterioration


Span 3 L7 Rt horizontal gusset plate deterioration

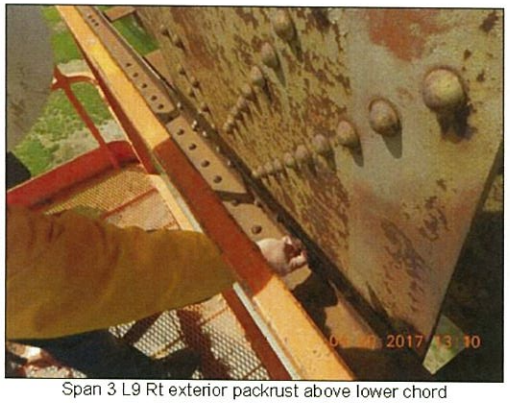

Span 3 L6L7 Lt at L7 packrust and loss


Span 3 L4 Lt horizontal gusset plate deterioration


Span 3 L9 Lt interior packrust


Span 3 L6L7 Lt plate deterioration at L7


Span 3 L4 Lt packrust


Span 3 L9 Rt exterior packrust above lower chord


Span 3 L7 Lt lower chord distortion at batten plates


Span 3 L4L5 Lt bottom of batten plate deterioration

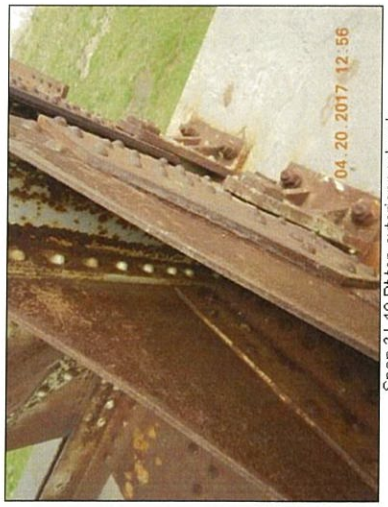
Span 3 L9L10 Lt batten and lower chord deterioration near L9

Span 3 L9L10 Lt batten plate deterioration on bottom

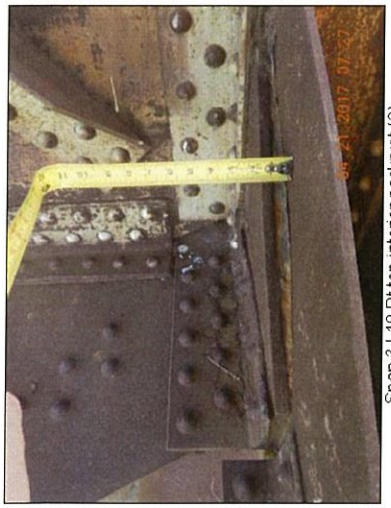
Span 3 L10 Lt interior packrust

Span 3 L10 Rt bottom horizontal gusset plate packrust

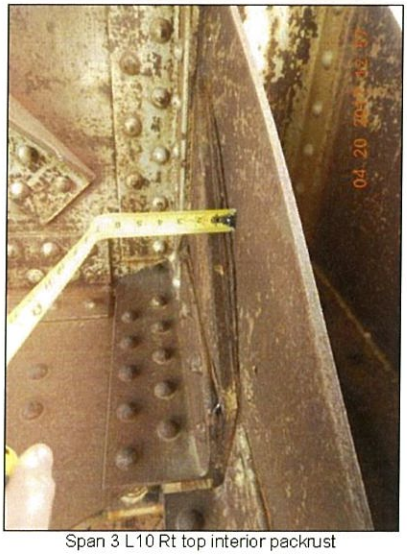
Span 3 L10 Rt top exterior packrust (2)



Span 3 L10 Rt top exterior packrust

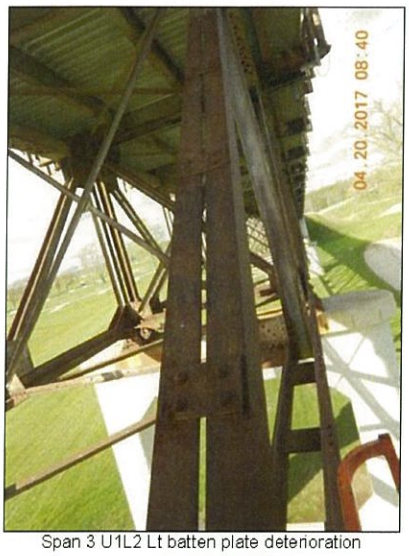


Span 3 L10 Rt top interior packrust (2)

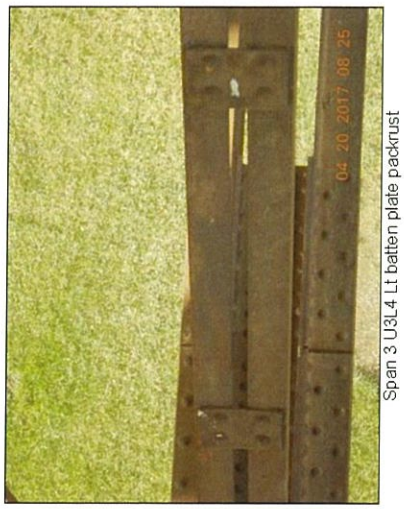


Span 3 L10 Rt top interior packrust

Span 3 U0 Lt end packrust

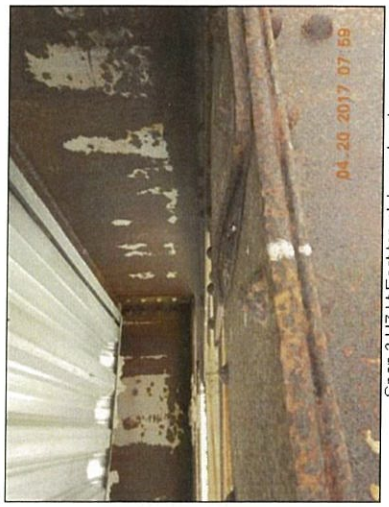


Span 3 U1L2 Lt batten plate deterioration



Span 3 U3L4 Lt batten plate packrust

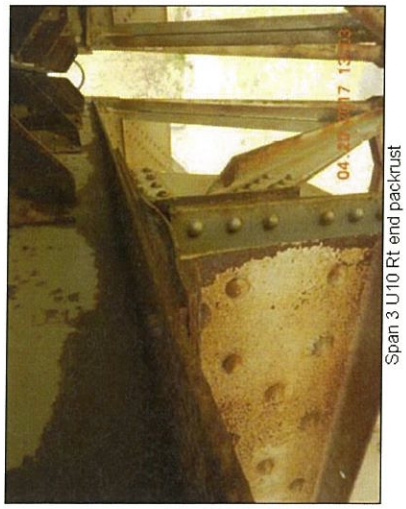
Span 3 U6 Lt stiffener and deterioration

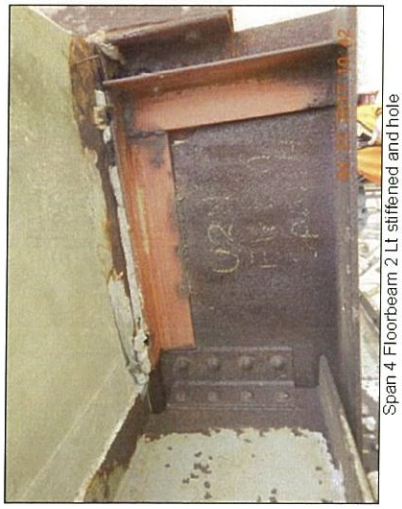


Span 3 U7 Lt East top plate packrust

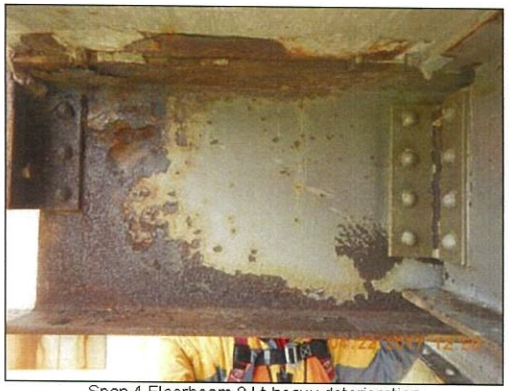
Span 3 U8 Rt exterior channels not lined up

Span 3 U10 Rt deterioration below deck joint

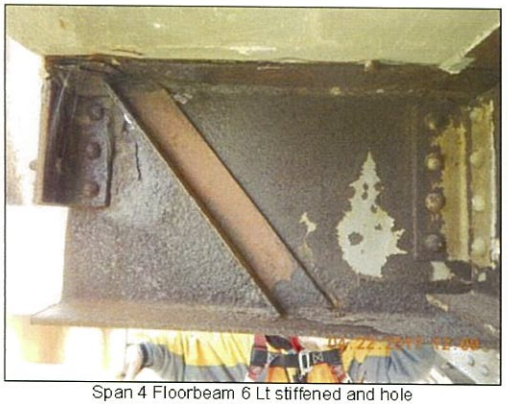

Span 3 U10 Rt end packrust


Span 4 Floorbeam 2 Lt stiffened and hole


Span 4 Floorbeam 2 Rt stiffened and hole



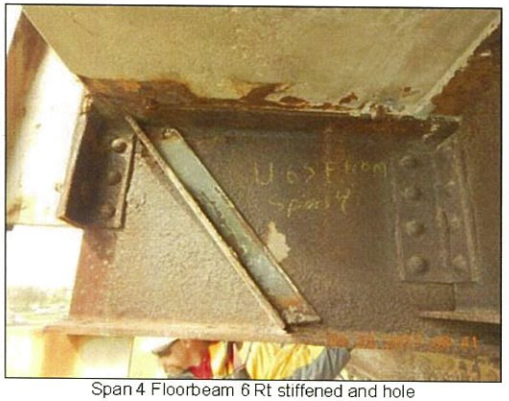
Span 4 Floorbeam 9 Lt heavy deterioration



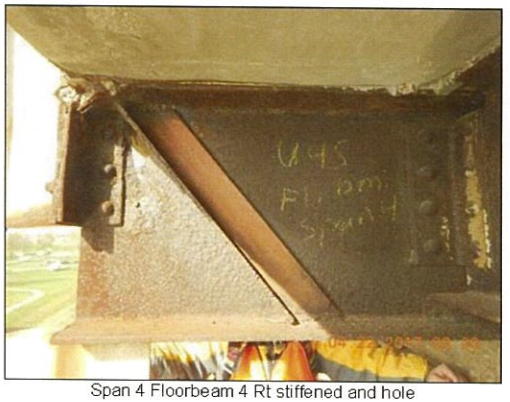
Span 4 Floorbeam 6 Lt stiffened and hole

Span 4 Floorbeam 3 Rt dent above upper connection

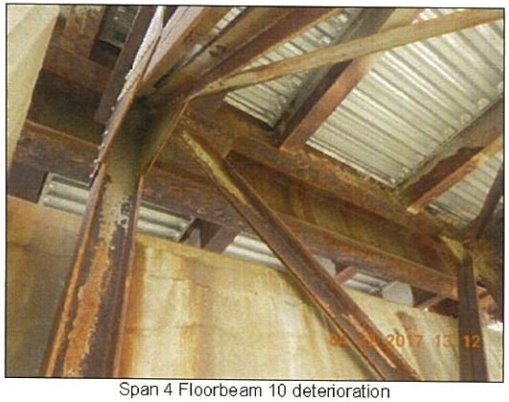
Span 4 Floorbeam 9 Rt hole



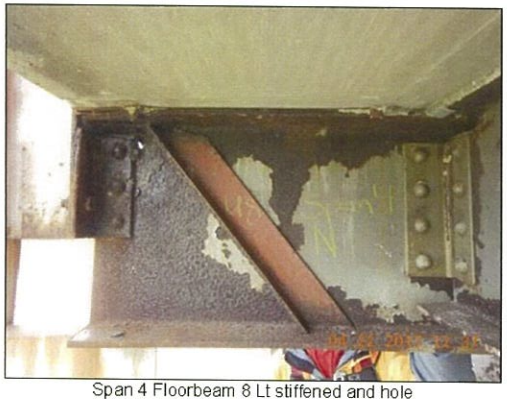
Span 4 Floorbeam 6 Rt stiffened and hole



Span 4 Floorbeam 4 Rt stiffened and hole

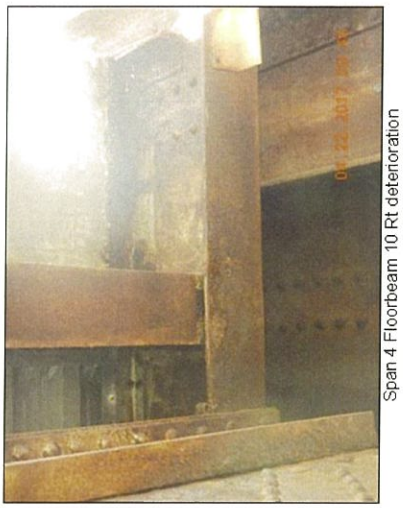


Span 4 Floorbeam 10 deterioration

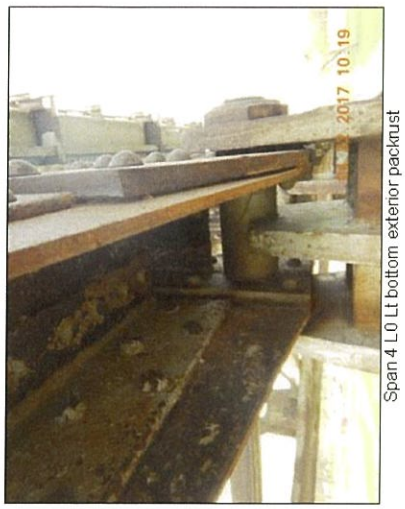


Span 4 Floorbeam 8 Lt stiffened and hole

Span 4 Floorbeam 4 Stringer 1 exterior clip bent out at corner

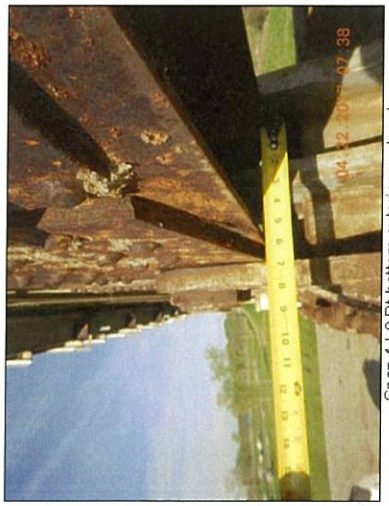


Span 4 Floorbeam 10 Rt deterioration

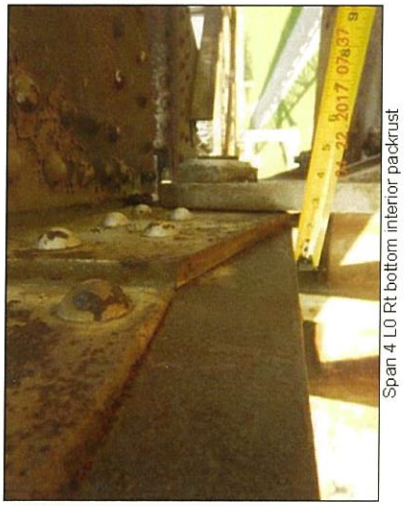


Span 4 L0 Lt bottom exterior packrust

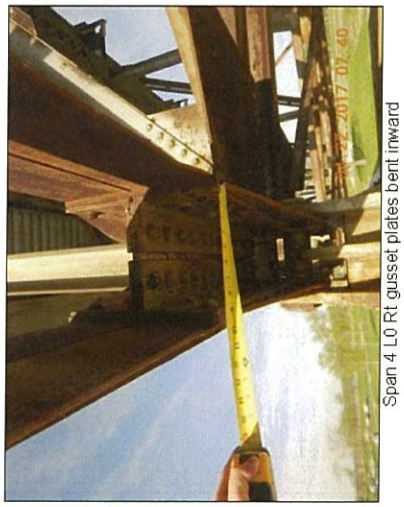
Span 4 L0 Lt bottom interior packrust



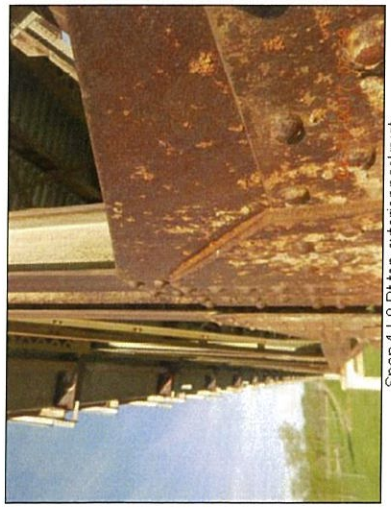
Span 4 L0 Rt bottom exterior packrust



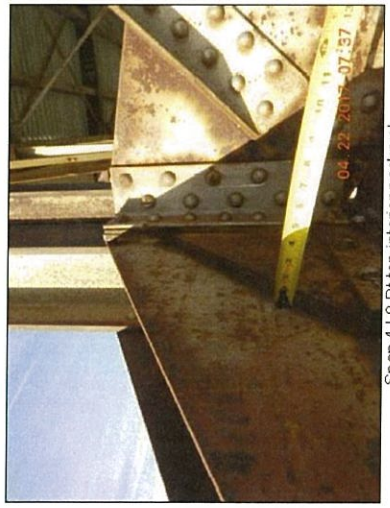
Span 4 L0 Rt bottom interior packrust



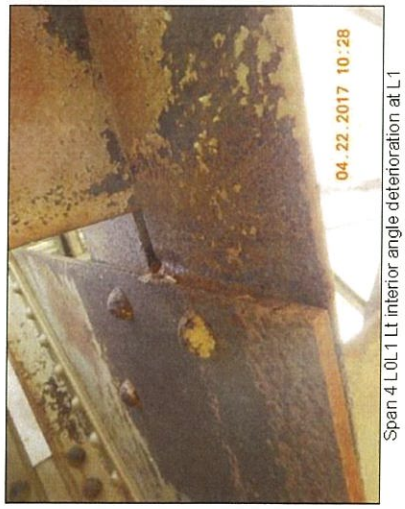
Span 4 L0 Rt gusset plates bent inward



Span 4 L0 Rt top exterior packrust

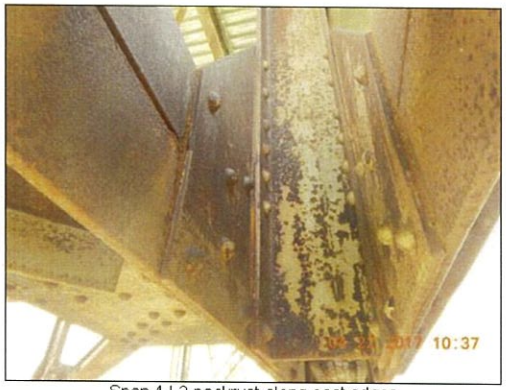


Span 4 L0 Rt top interior packrust



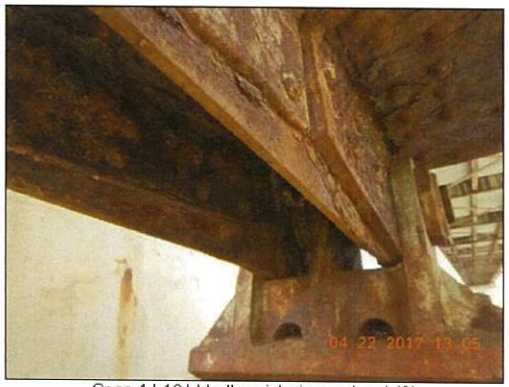
Span 4 L0L1 Lt interior angle deterioration at L1

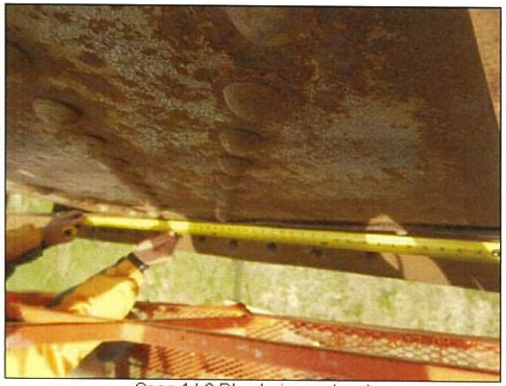
Span 4 L10 Lt bottom interior deterioration

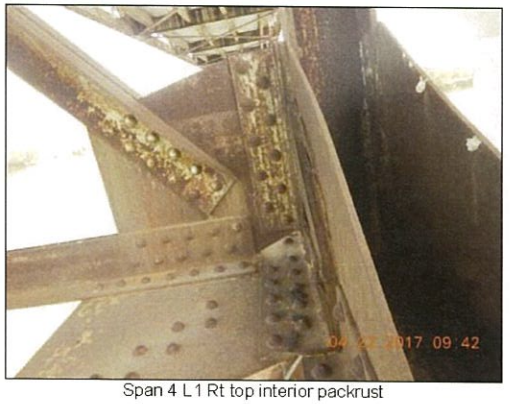


Span 4 L2 packrust along east edges


Span 4 L1 Lt exterior packrust


Span 4 L10 Lt bottom interior packrust (2)


Span 4 L9 Rt exterior packrust

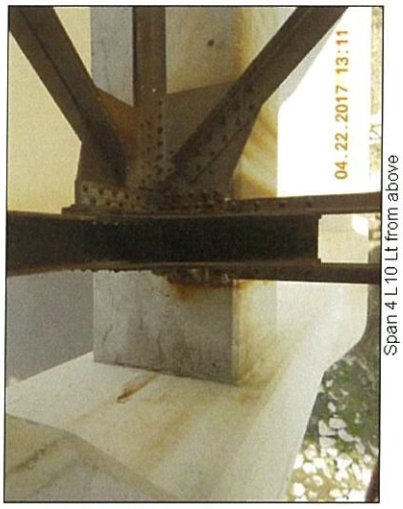


Span 4 L1 Rt top interior packrust

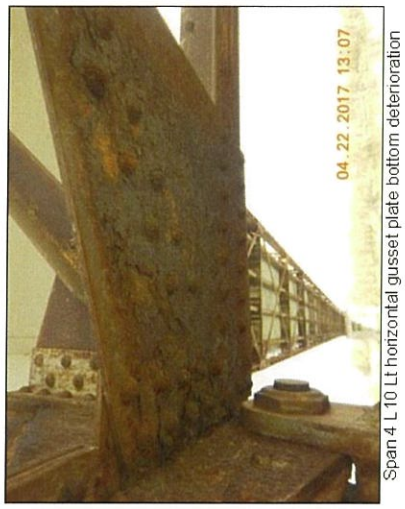

Span 4 L10 Lt bottom interior packrust

Span 4 L9 Rt interior packrust

Span 4 L1L2 Lt deterioration at batten plate near L1



Span 4 L 10 Lt from above



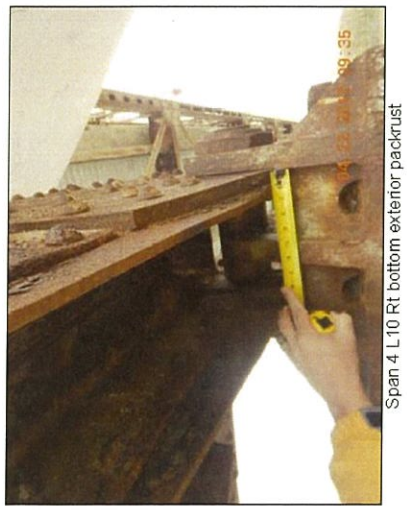
Span 4 L 10 Lt horizontal gusset plate bottom deterioration

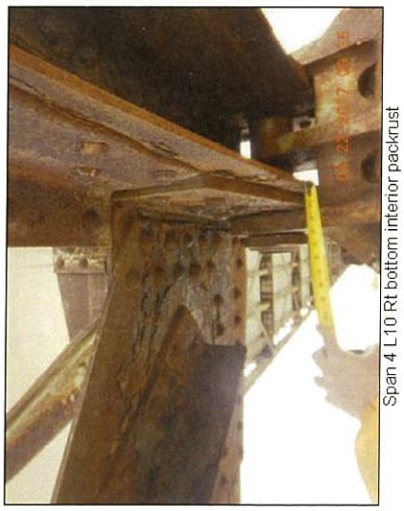
Span 4 L10 Lt top exterior packrust (2)


Span 4 L10 Lt top exterior packrust


Span 4 L10 Lt top interior packrust (2)


Span 4 L10 Lt top interior packrust


Span 4 L10 Rt bottom exterior packrust

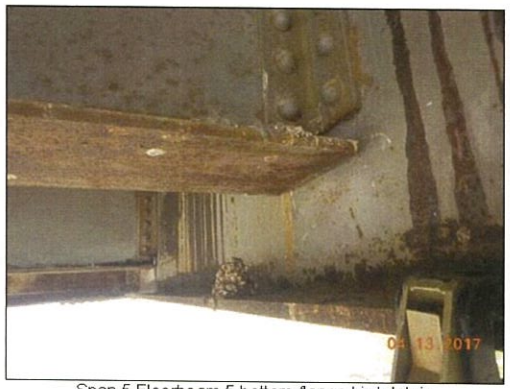

Span 4 L10 Rt bottom interior packrust

Span 4 L10 Rt gusset plates bent inward

Span 4 U10 Rt interior deterioration

Span 4 U10 Lt exterior deterioration

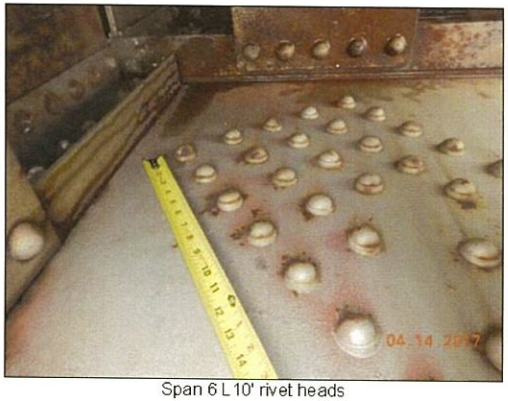
Span 4 L10 Rt horizontal gusset plate deterioration on bottom



Span 5 Floorbeam 5 bottom flange bird debris

Span 4 U10 Rt exterior deterioration

Span 4 L10 Rt top exterior packrust



Span 6 L10' rivet heads

Span 4 U10 Rt interior deterioration (2)

Span 4 U6 Rt exterior deterioration

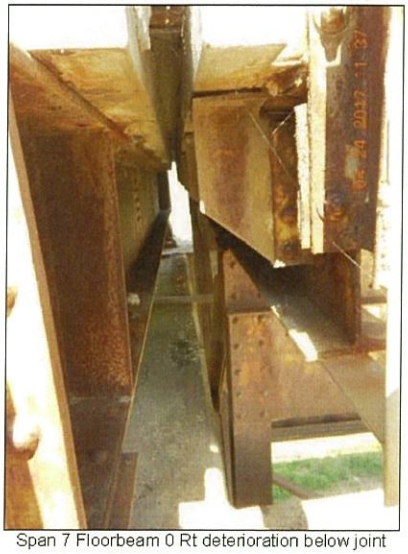
Span 7 bracket at Floorbeam 0

Span 7 Floorbeam 0 interior deterioration (2)

Span 7 Floorbeam 0 interior deterioration (3)

Span 7 Floorbeam 0 interior deterioration

Span 7 Floorbeam 0 Lt deterioration below deck joint



Span 7 Floorbeam 0 Rt deterioration below joint

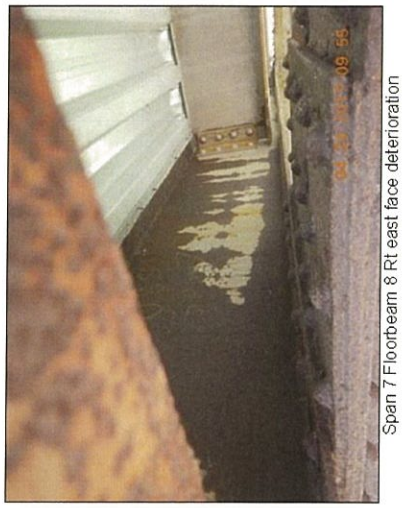
Span 7 Floorbeam 0 Rt interior deterioration

Span 7 Floorbeam 1 Lt stiffened and hole

Span 7 Floorbeam 2 Rt stiffened and hole

Span 7 Floorbeam 4 Lt hole

Span 7 Floorbeam 4 Rt stiffened and hole



Span 7 Floorbeam 8 Rt east face deterioration

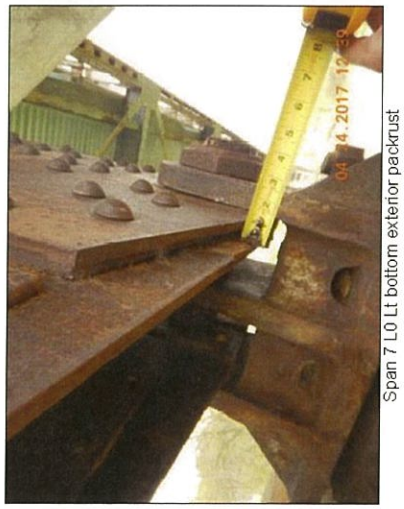
Span 7 Floorbeam 8 Rt stiffened and hole

Span 7 Floorbeam 8 Rt top flange loss

Span 7 Floorbeam 10 deterioration below deck joint

Span 7 Floorbeam 10 Rt deterioration below joint

Span 7 L0 Lt bottom deterioration



Span 7 L0 Lt bottom exterior packrust

Span 7 L0 Rt bottom exterior packrust

Span 7 L0 Lt top exterior packrust

Span 7 L0 Lt bottom interior deterioration

Span 7 L0 Rt bottom interior packrust

Span 7 L0 Lt top interior packrust

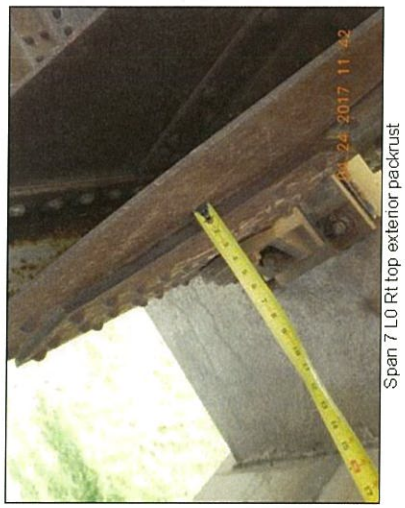
Span 7 L0 Lt bottom interior packrust

Span 7 L0 Rt horizontal gusset plate bottom deterioration

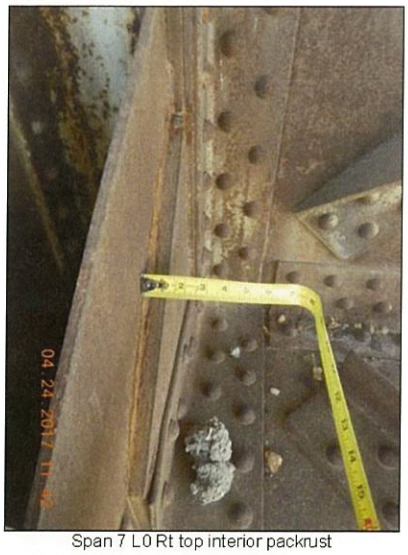
Span 7 L0 Rt bottom deterioration

Span 7 L0 Lt top deterioration

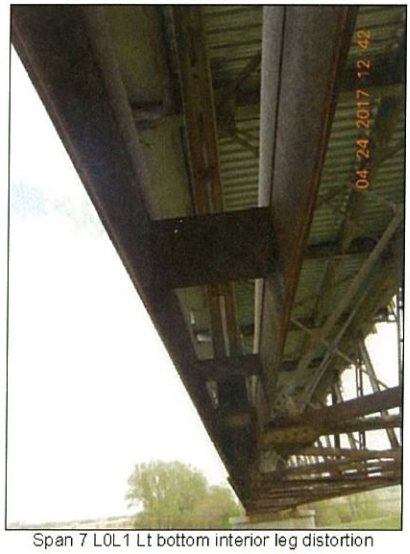
Span 7 L0 Rt top deterioration



Span 7 L0 Rt top exterior packrust



Span 7 L0 Rt top interior packrust



Span 7 L0L1 Lt bottom interior leg distortion

Span 7 L3 Lt exterior deterioration

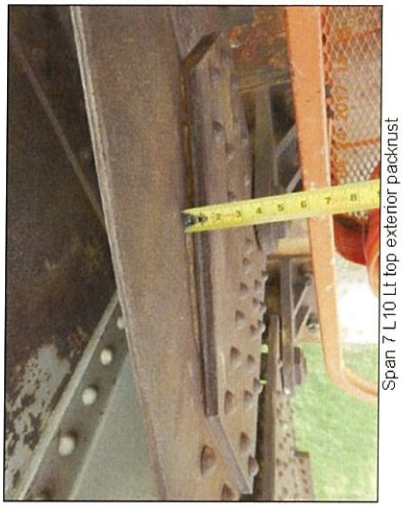
Span 7 L10 Lt bottom deterioration

Span 7 L10 Lt bottom exterior packrust

Span 7 L10 Lt bottom interior deterioration

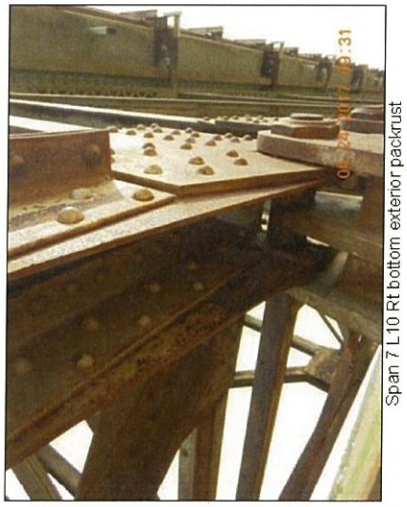
Span 7 L10 Lt bottom interior packrust

Span 7 L10 Lt top deterioration

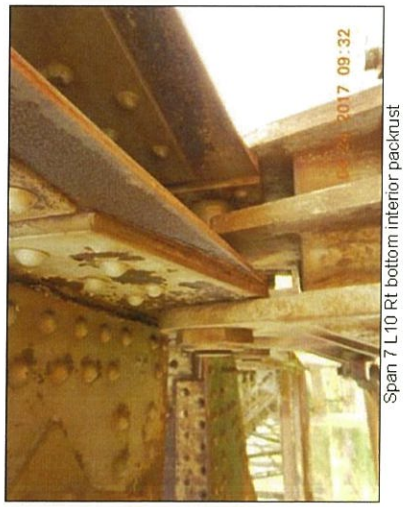


Span 7 L10 Lt top exterior packrust

Span 7 L10 Lt top interior packrust



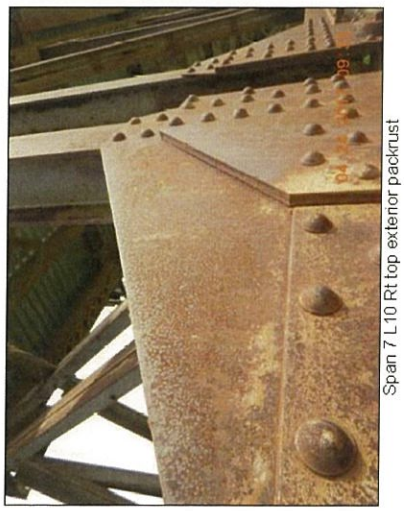
Span 7 L10 Rt bottom exterior packrust



Span 7 L10 Rt bottom interior packrust

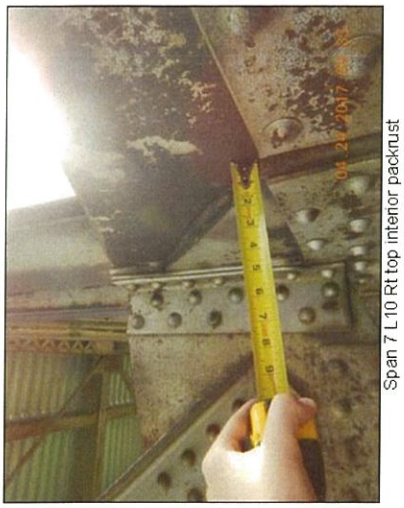
Span 7 L10 Rt horizontal gusset plate deterioration

Span 7 L10 Rt top deterioration

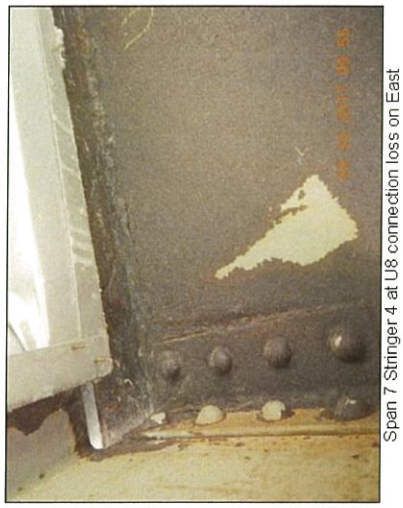


Span 7 L10 Rt top exterior packrust

Span 7 L10 Rt top interior deterioration



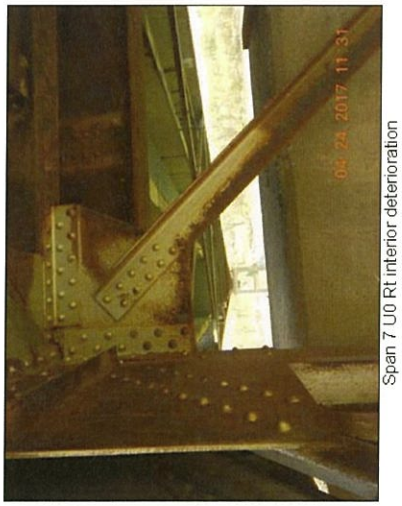
Span 7 L10 Rt top interior packrust



Span 7 Stringer 4 at U8 connection loss on East

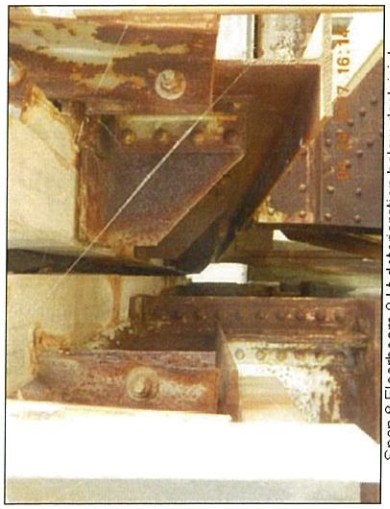
Span 7 U0 Lt interior deterioration

Span 7 U0 Rt exterior deterioration

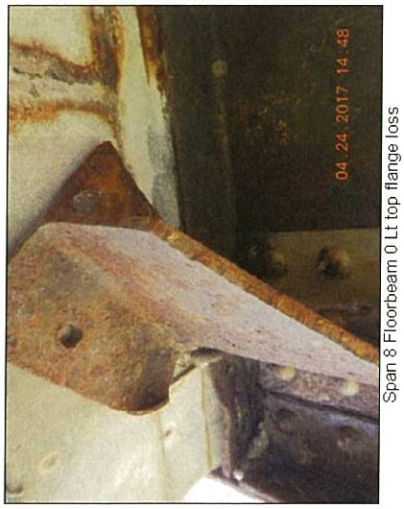


Span 7 U0 Rt interior deterioration

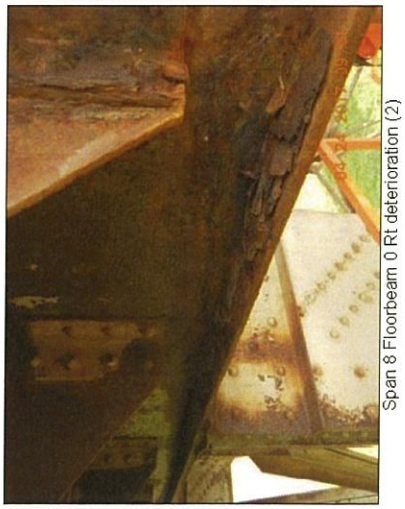
Span 7 U6L5 Lt packrust



Span 8 Floorbeam 0 Lt deterioration below deck joint

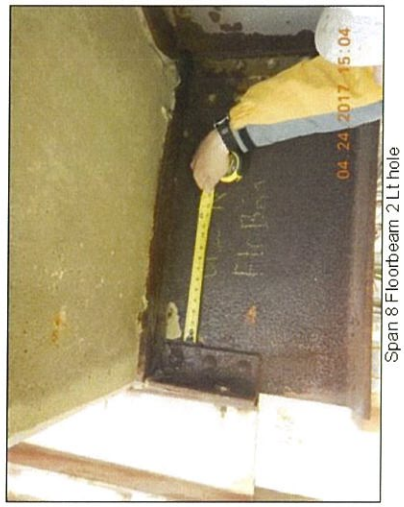


Span 8 Floorbeam 0 Lt top flange loss

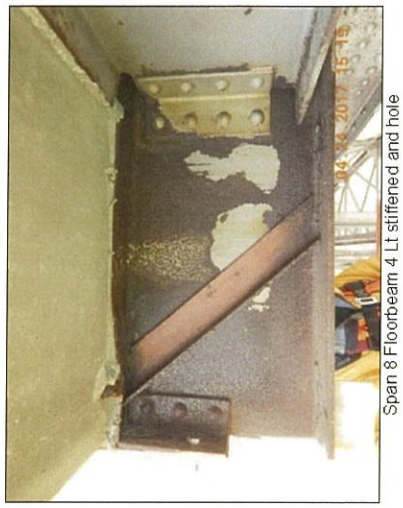


Span 8 Floorbeam 0 Rt deterioration (2)

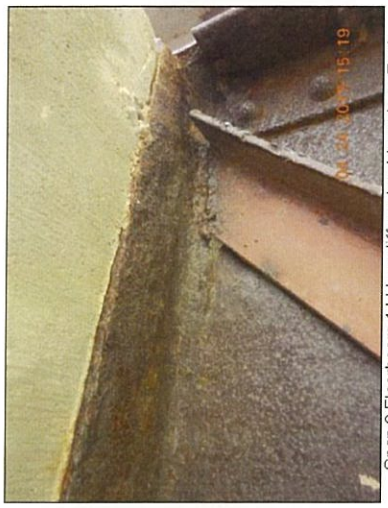
Span 8 Floorbeam 0 Rt deterioration



Span 8 Floorbeam 2 Lt hole



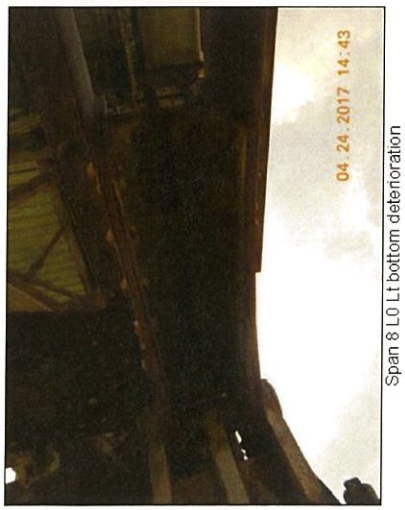
Span 8 Floorbeam 4 Lt stiffened and hole



Span 8 Floorbeam 4 Lt top stiffened weld crack on East

Span 8 Floorbeam 6 Rt stiffened and hole

Span 8 Floorbeam 8 Rt stiffened and hole

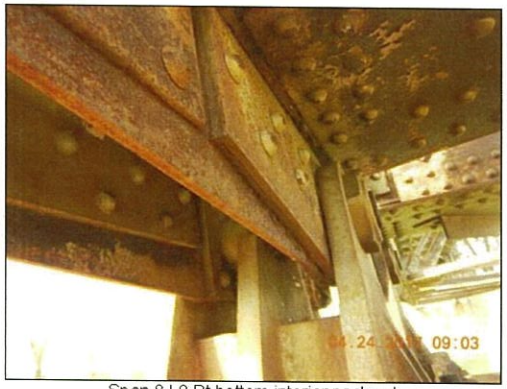


Span 8 L0 Lt bottom deterioration

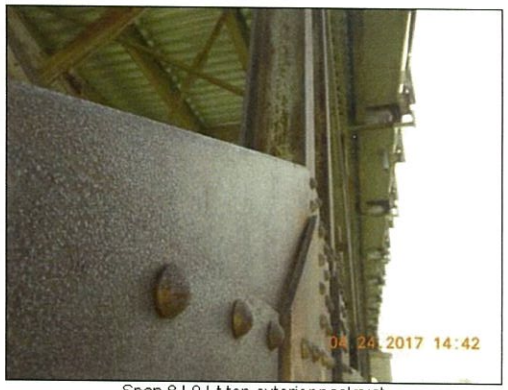

Span 8 L0 Lt bottom interior packrust

Span 8 L0 Lt top deterioration


Span 8 L0 Rt top exterior packrust



Span 8 L0 Rt bottom interior packrust



Span 8 L0 Lt top exterior packrust


Span 8 L0 Rt top interior packrust

Span 8 L0 Rt horizontal gusset plate deterioration

Span 8 L0 Lt top interior packrust

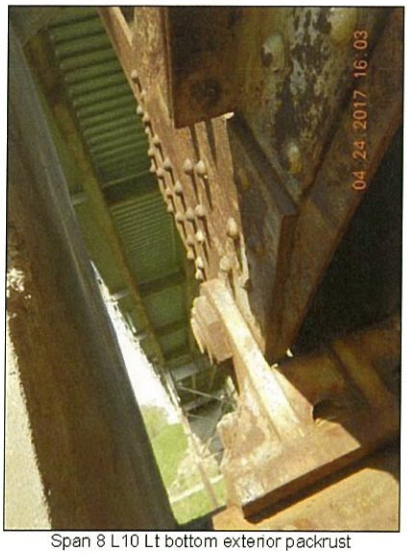

Span 8 L1 Rt exterior packrust


Span 8 L0 Rt top deterioration

Span 8 L0 Rt bottom exterior packrust

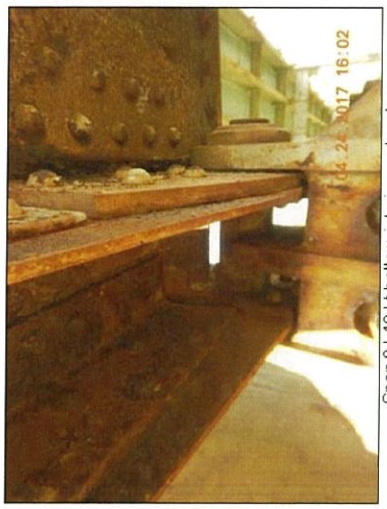
Span 8 L1 Rt interior packrust


Span 8 L10 Lt bottom deterioration



Span 8 L10 Lt bottom exterior packrust

Span 8 L10 Lt bottom interior deterioration

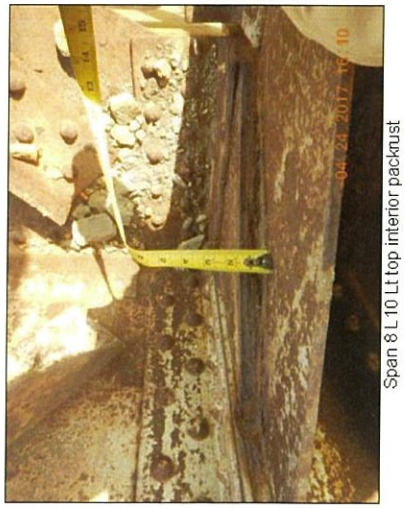


Span 8 L10 Lt bottom interior packrust

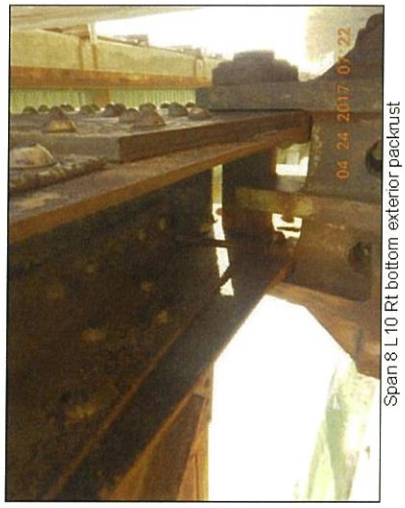

Span 8 L10 Lt horizontal gusset plate deterioration


Span 8 L10 Lt top deterioration

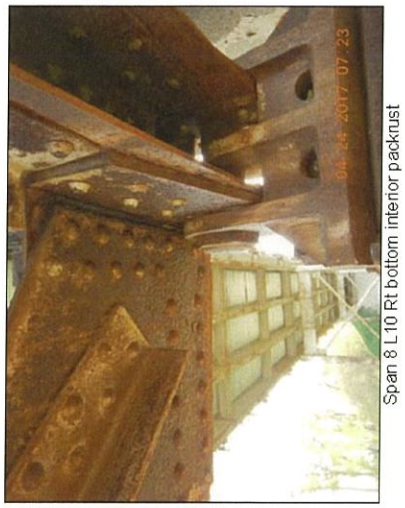

Span 8 L10 Lt top exterior packrust


Span 8 L10 Lt top interior packrust

Span 8 L10 Rt bottom deterioration

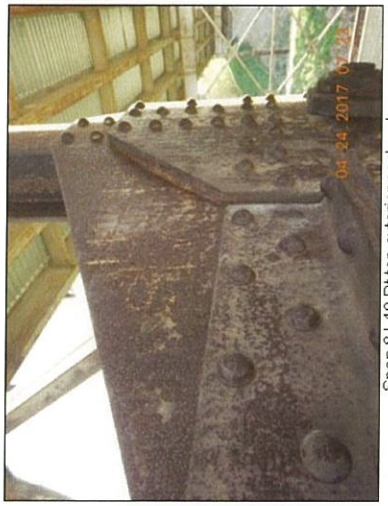


Span 8 L 10 Rt bottom exterior packrust



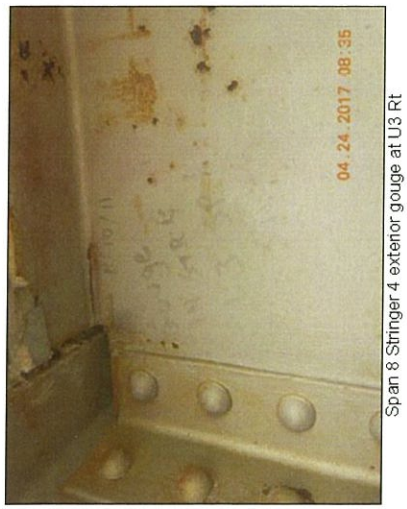
Span 8 L 10 Rt bottom interior packrust

Span 8 L 10 Rt top deterioration

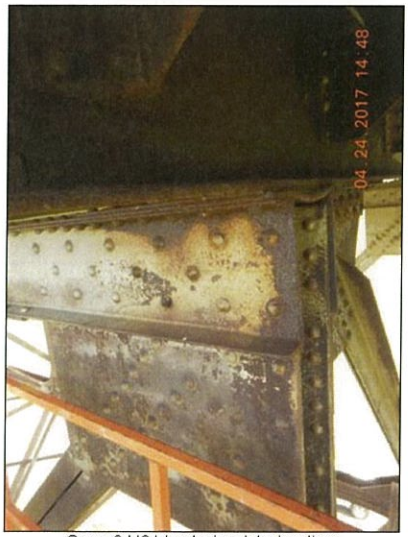


Span 8 L 10 Rt top exterior packrust

Span 8 L 10 Rt top interior packrust

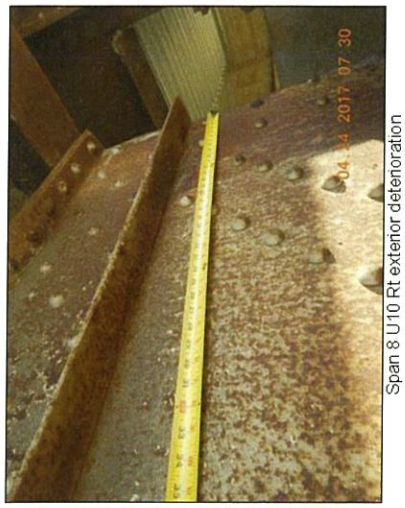


Span 8 Stringer 4 exterior gouge at U3 Rt

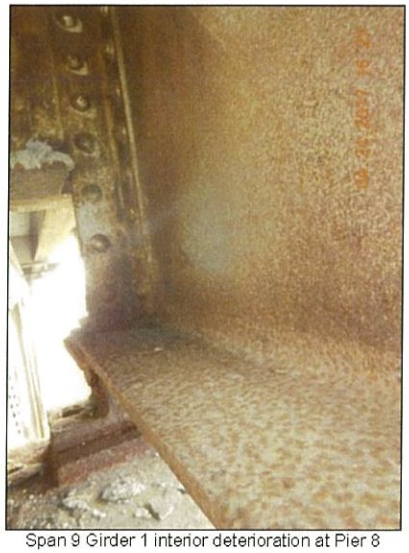


Span 8 U0 Lt exterior deterioration

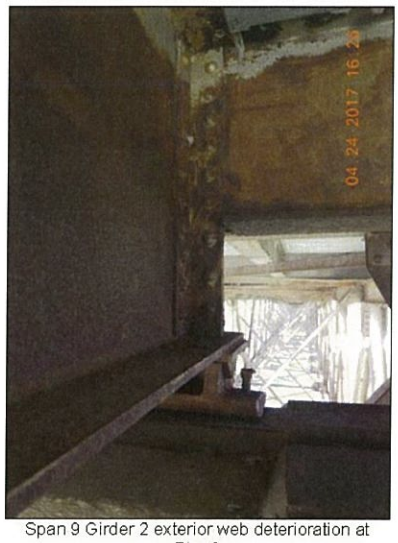
Span 8 U10 Lt exterior deterioration



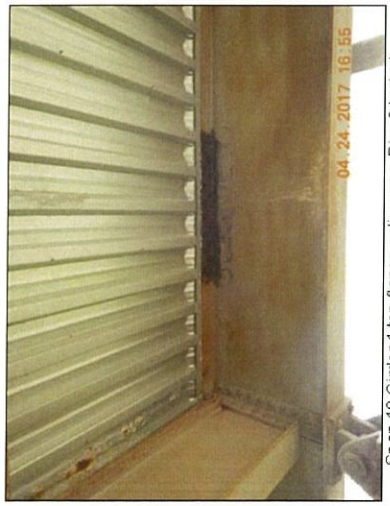
Span 8 U10 Rt exterior deterioration



Span 9 Girder 1 interior deterioration at Pier 8



Span 9 Girder 2 exterior web deterioration at Pier 8

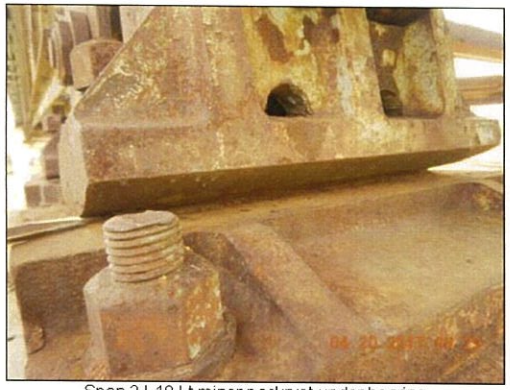


Span 10 Girder 1 top flange splice near Pier 9 typical...

Span 11 Abutment 2 Girder 1 girder end deterioration and stiffener packrust

Span 11 Abutment 2 Girder 4 exterior face deterioration

Span 11 Abutment 2 Girder 4 interior face deterioration

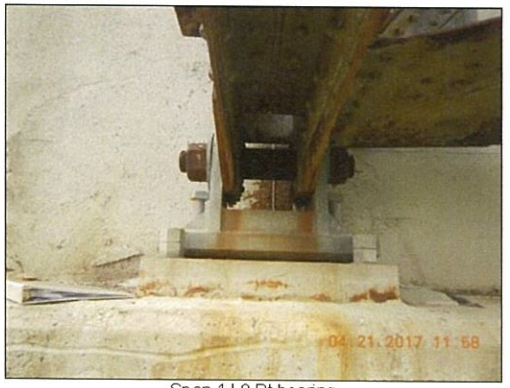

Span 2 L10 Lt minor packrust under bearing

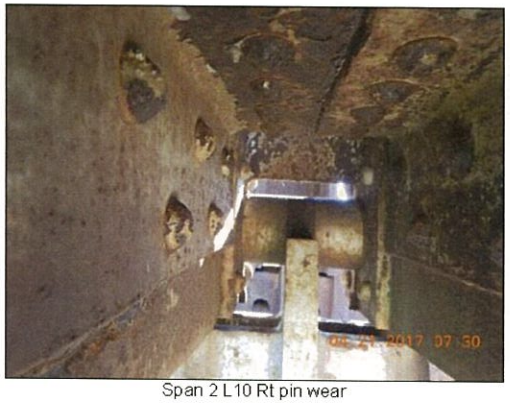

Span 2 L0 Lt interior pin packrust


Span 1 L0 Lt interior back bolt not installed - typ Rt

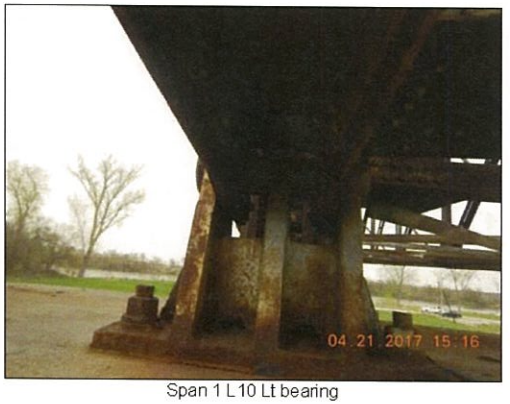

Span 2 L10 Rt bearing

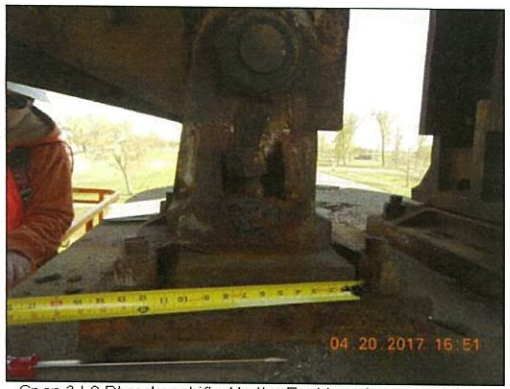

Span 2 L0 Rt interior pin packrust


Span 1 L0 Rt bearing


Span 2 L10 Rt pin wear

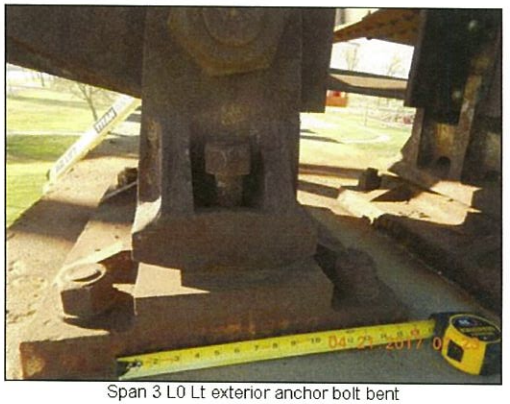

Span 2 L10 Lt exterior anchor bolt deterioration typical interior


Span 1 L10 Lt bearing



Span 3 L0 Rt rocker shifted to the East hanging over plate,...

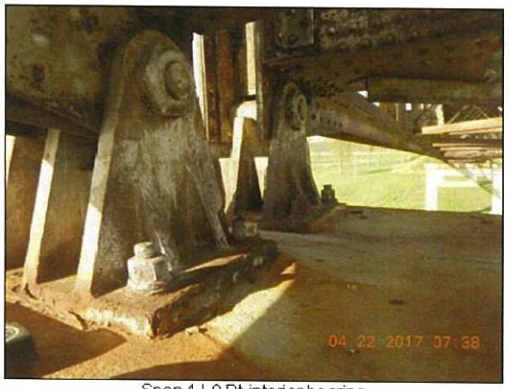

Span 3 L0 Rt bearing interior


Span 3 L0 Lt exterior anchor bolt bent


Span 4 L0 Lt bearing interior

Span 3 L0 Rt interior anchor bolt bent

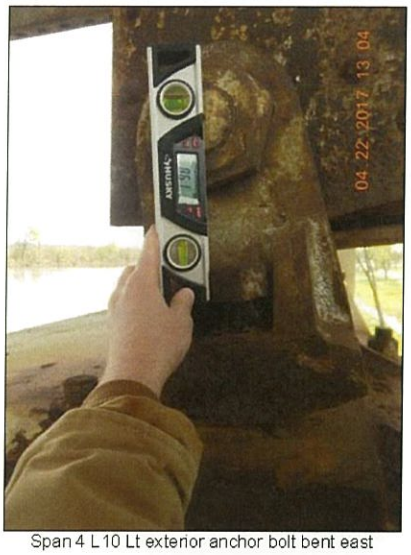

Span 3 L0 Lt interior anchor bolt bent



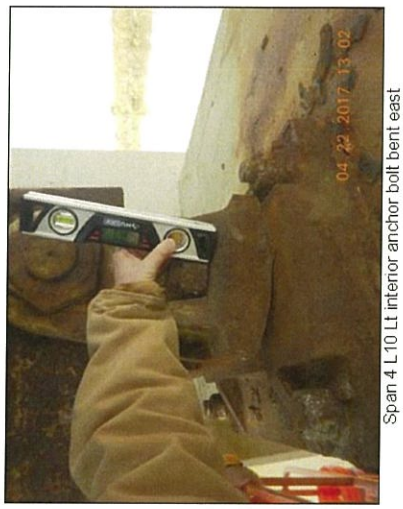
Span 4 L0 Rt interior bearing


Span 3 L0 Rt pin wear

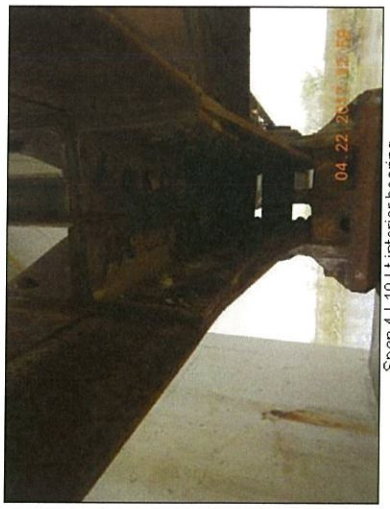
Span 3 L0 Lt interior anchor bolt deterioration



Span 4 L10 Lt exterior anchor bolt bent east

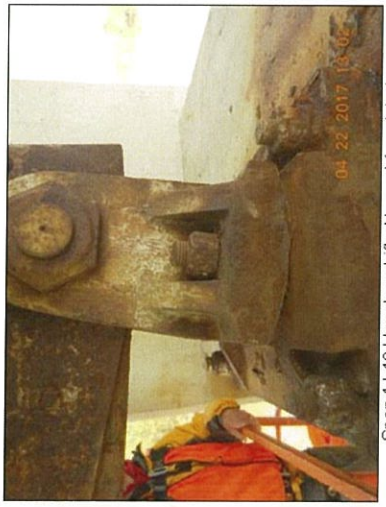


Span 4 L10 Lt interior anchor bolt bent east



Span 4 L10 Lt interior bearing

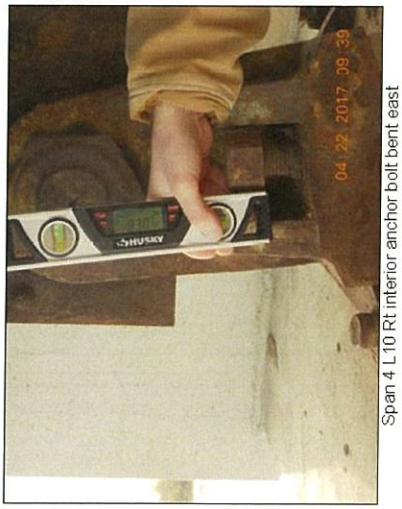
Span 4 L10 Lt rocker shifted east from exterior



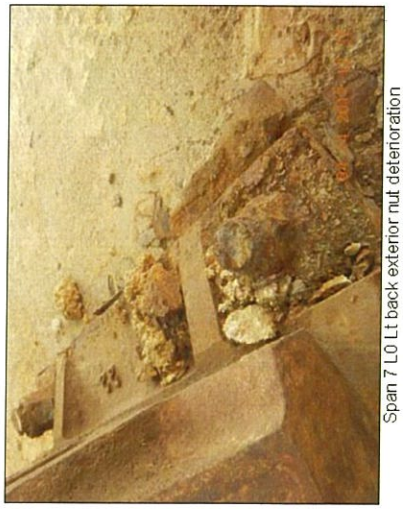
Span 4 L10 Lt rocker shifted to east from interior

Span 4 L10 Rt bearing packrust

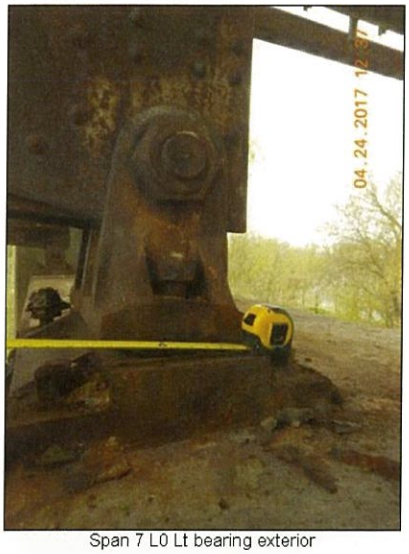
Span 4 L10 Rt exterior anchor bolt bent east



Span 4 L10 Rt interior anchor bolt bent east



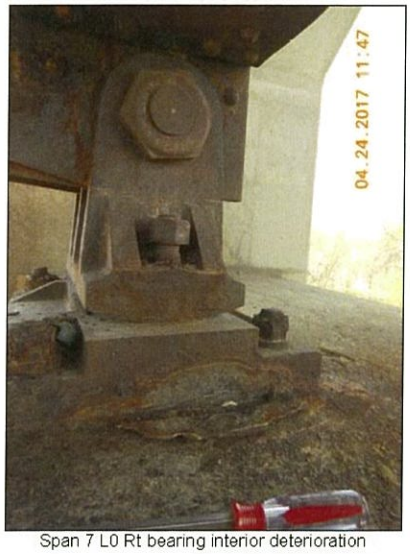
Span 7 L0 Lt back exterior nut deterioration



Span 7 L0 Lt bearing exterior

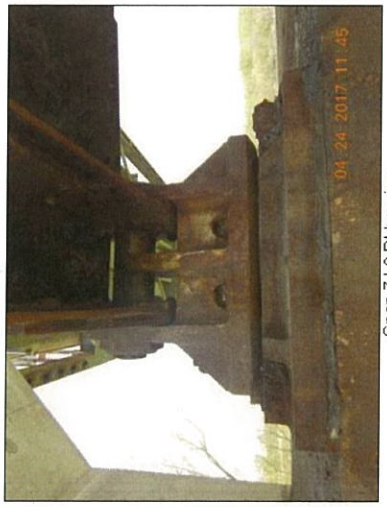

Span 7 L0 Lt front interior nut not down


Span 7 L0 Rt bearing exterior face



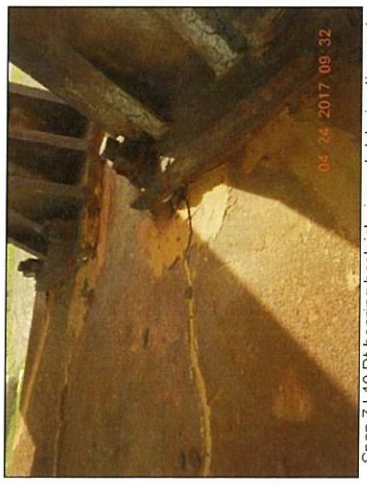
Span 7 L0 Rt bearing interior deterioration


Span 7 L0 Rt bearing nut deterioration



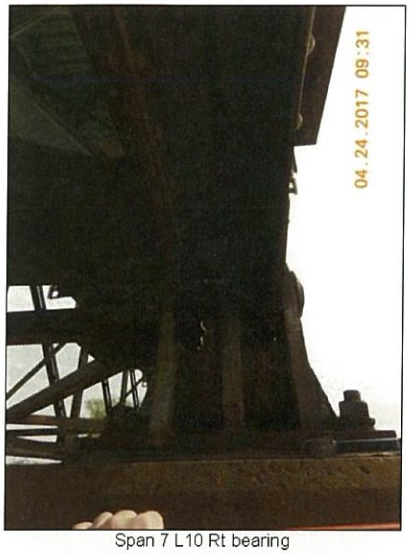
Span 7 L0 Rt bearing


Span 7 L0 Rt interior anchor bolt deterioration

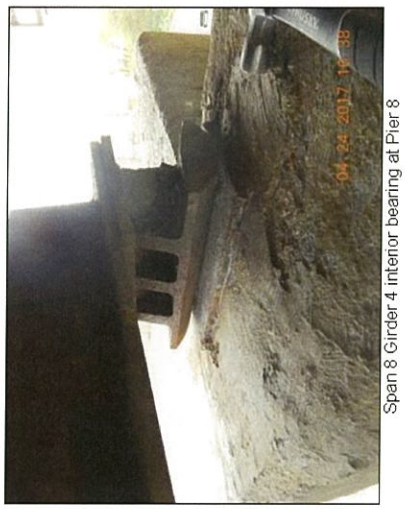


Span 7 L10 Rt bearing back interior nut deterioration and pier cap deterioration

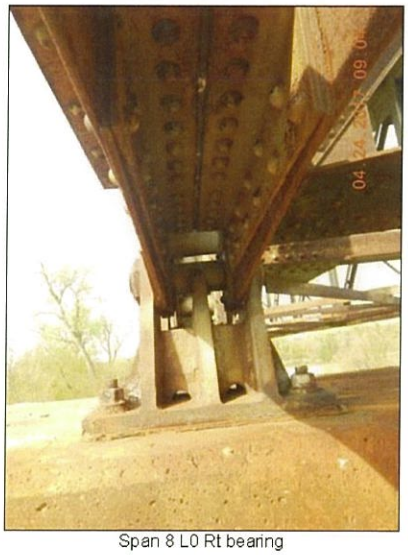
Span 7 L10 Rt bearing interior edge



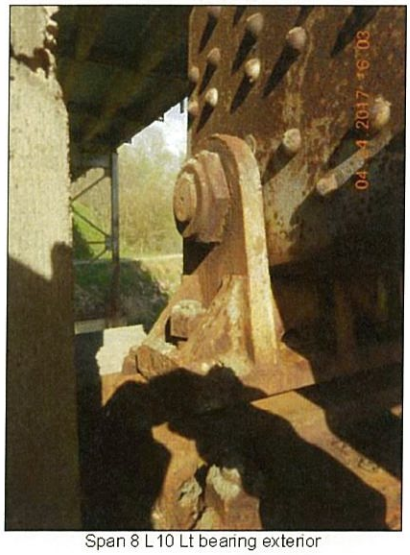
Span 7 L10 Rt bearing



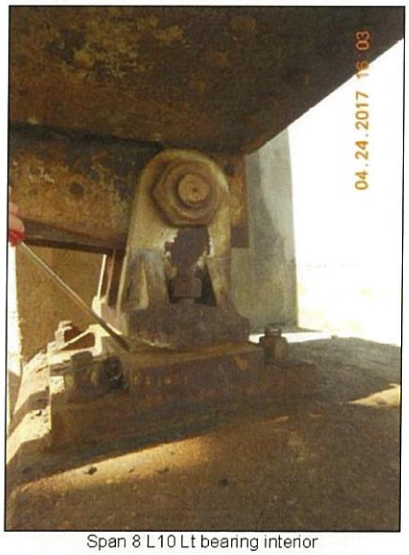
Span 8 Girder 4 interior bearing at Pier 8



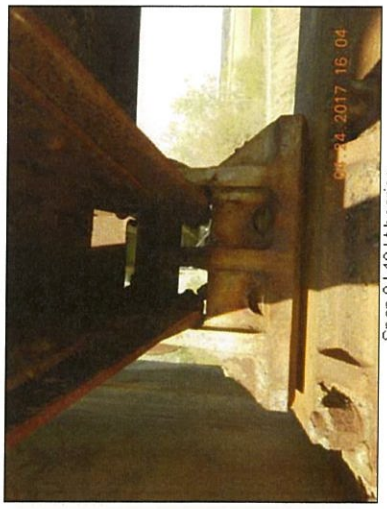
Span 8 L0 Rt bearing



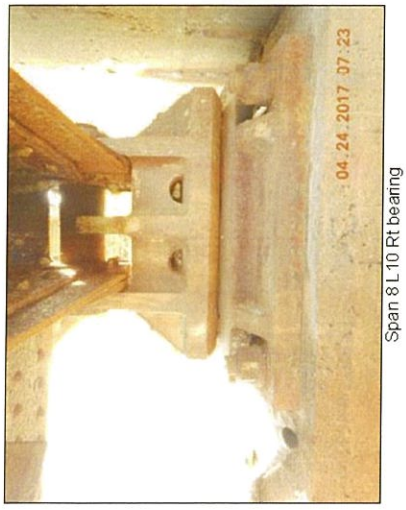
Span 8 L10 Lt bearing exterior



Span 8 L10 Lt bearing interior

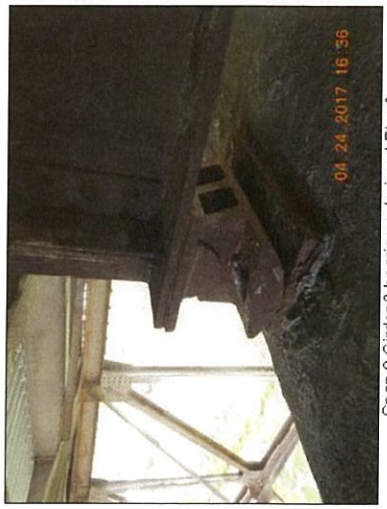


Span 8 L10 Lt bearing



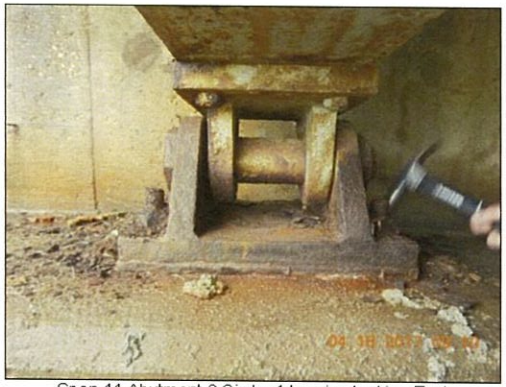
Span 8 L10 Rt bearing

Span 9 Girder 2 bearing at Pier 8

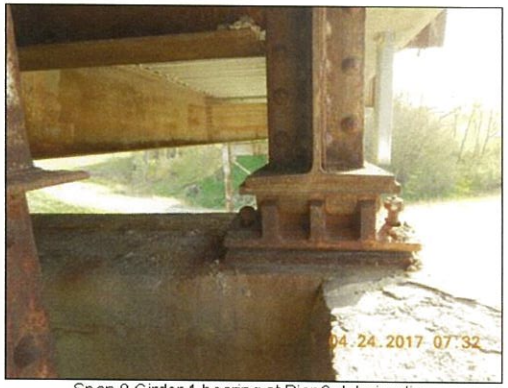


Span 9 Girder 3 bearing exterior at Pier 8

Span 11 Abutment 2 Girder 1 bearing



Span 11 Abutment 2 Girder 1 bearing looking East



Span 9 Girder 4 bearing at Pier 8 deterioration

Span 11 Abutment 2 Girder 2 bearing interior

Span 11 Abutment 2 Girder 1 bearing looking North -interior nuts and bolts deterioration

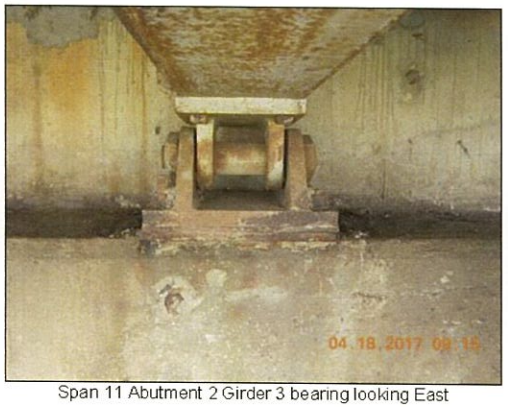
Span 9 Girder 4 bearing exterior at Pier 8

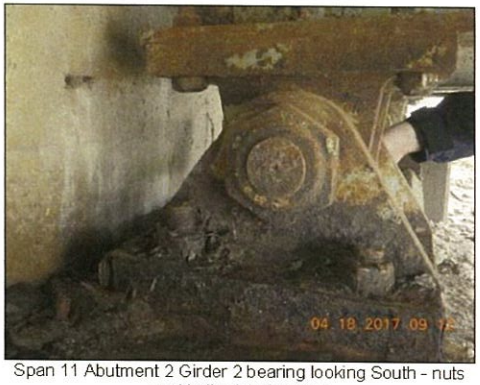
Span 11 Abutment 2 Girder 2 bearing looking North - nuts and bolts deterioration

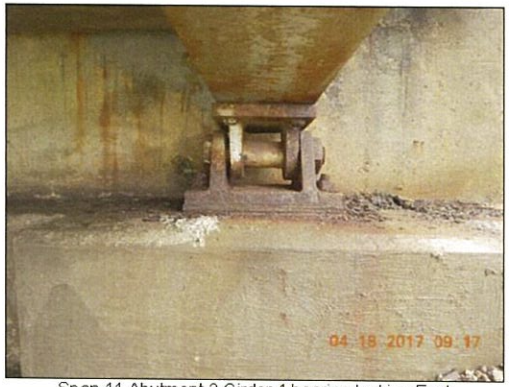
Span 11 Abutment 2 Girder 1 bearing looking South - exterior nuts and bolt deterioration

Span 11 Abutment 2 Girder 1 bearing looking East delamination

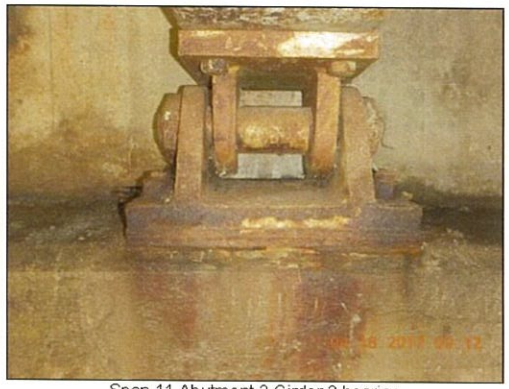

Span 11 Abutment 2 Girder 4 bearing interior


Span 11 Abutment 2 Girder 3 bearing looking East


Span 11 Abutment 2 Girder 2 bearing looking South - nuts and bolts deterioration

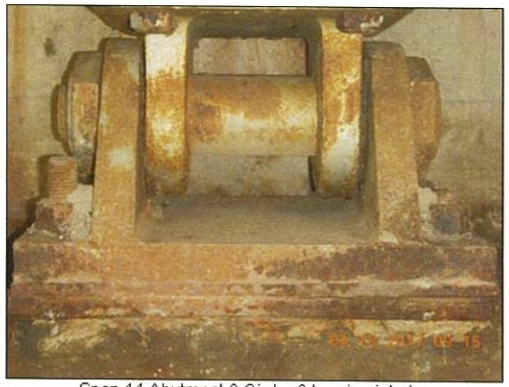

Span 11 Abutment 2 Girder 4 bearing looking East


Span 11 Abutment 2 Girder 3 bearing looking North

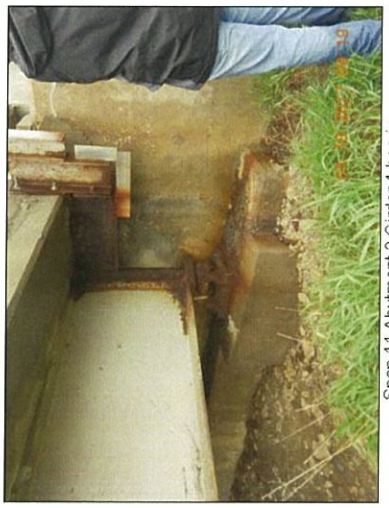

Span 11 Abutment 2 Girder 2 bearing


Span 11 Abutment 2 Girder 4 bearing looking North - nuts and bolt deterioration


Span 11 Abutment 2 Girder 3 bearing looking South - minor deterioration


Span 11 Abutment 2 Girder 3 bearing interior

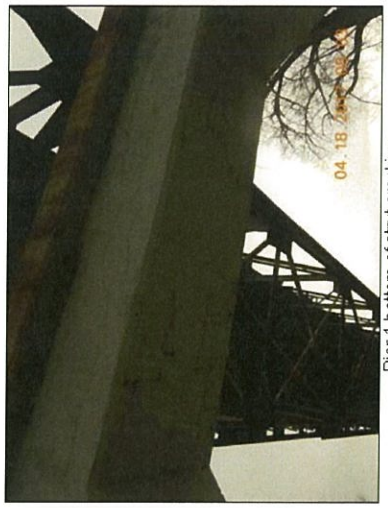
Span 11 Abutment 2 Girder 4 bearing looking South - nuts and bolt deterioration



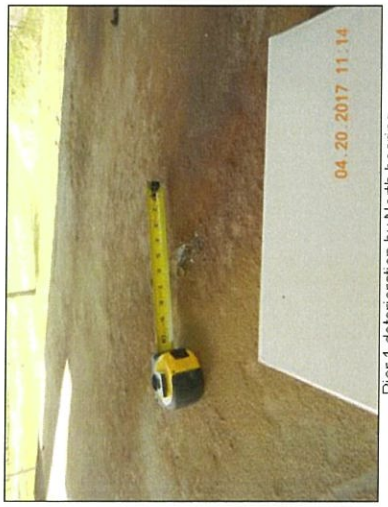
Span 11 Abutment 2 Girder 4 bearing

Abutment 1 South water marks from joint leakage


Pier 1 bottom of strut cracking closeup

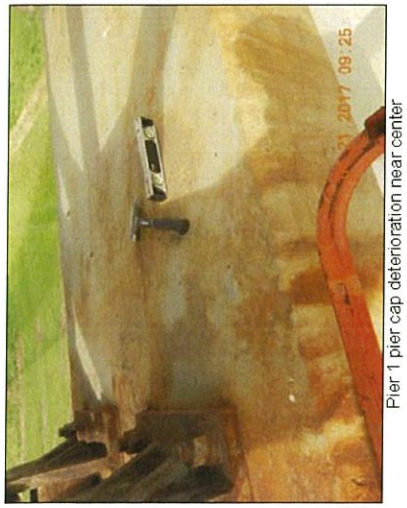

Pier 1 bottom of strut cracking


Pier 1 cap crack on West



Pier 1 deterioration by North bearing

Pier 1 North deterioration on East side


Pier 1 pier cap deterioration near center


Pier 1 south cap detenoration

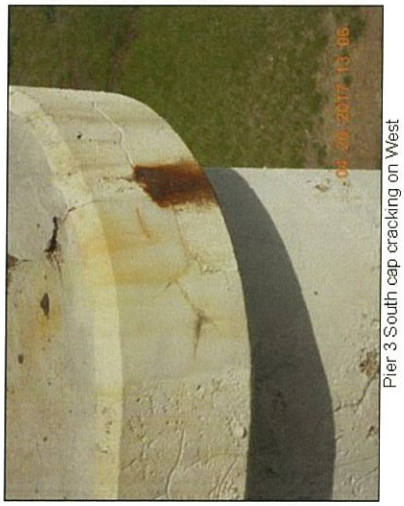

Pier 1 Southeast spall at bottom

Pier 2 South cap deterioration closeup

Pier 2 South cap deterioration

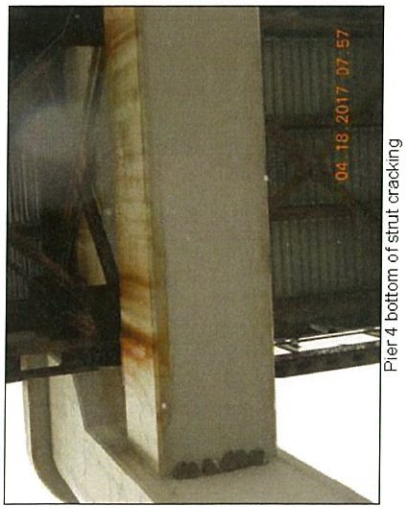
Pier 2 Southeast spall at bottom

Pier 3 cracking on bottom of strut

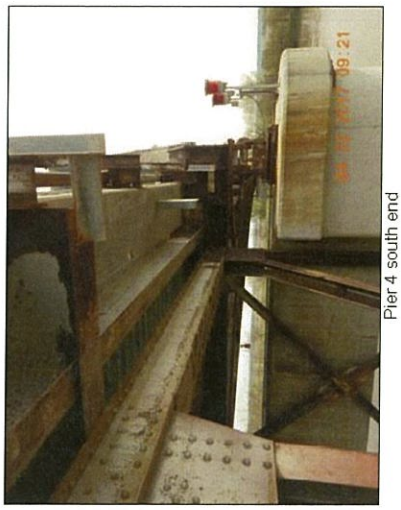


Pier 3 South cap cracking on West

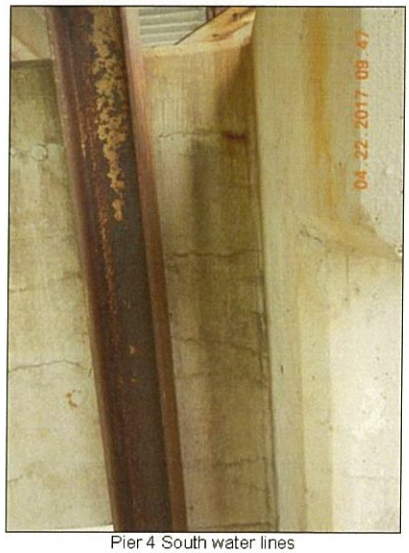
Pier 4 bottom cap cracking on west face



Pier 4 bottom of strut cracking



Pier 4 south end



Pier 4 South water lines

Pier 4 south west face cracking

Pier 4 West side crack at bottom

Pier 6 bottom cracking on East

Pier 6 cap deterioration below Span 7 L0 Lt

Pier 6 cap deterioration near Span 7 L0 Lt

Pier 6 cracking above Span 7 L0 Lt

Pier 6 North top deterioration

Pier 6 South end cap deterioration

Pier 6 South end top deterioration on west face

Pier 7 bottom of strut efflorescense at Southeast

Pier 6 top strut West face cracking

Pier 6 South end top deterioration

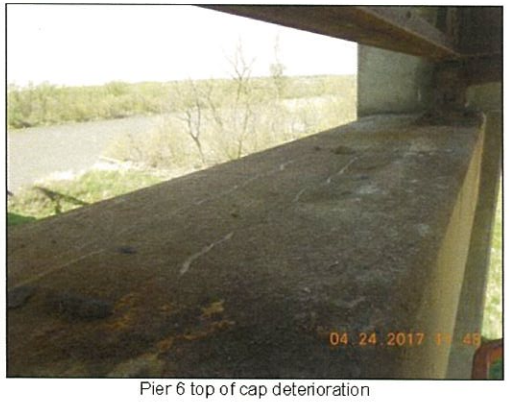

Pier 7 cracking below Span 7 L10 Lt


Pier 7 bottom efflorescence at Northeast

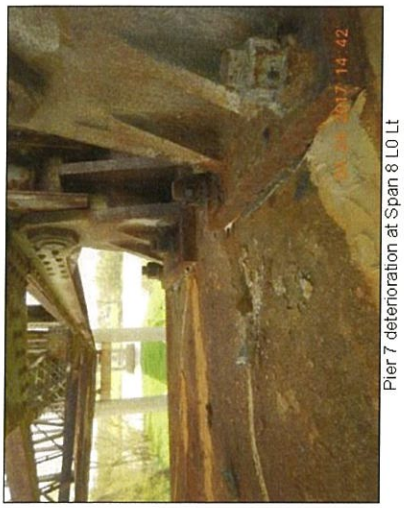

Pier 6 top cracking

Pier 7 cracking below Span 8 L0 Lt


Pier 7 bottom efflorescence at Southeast



Pier 6 top of cap deterioration



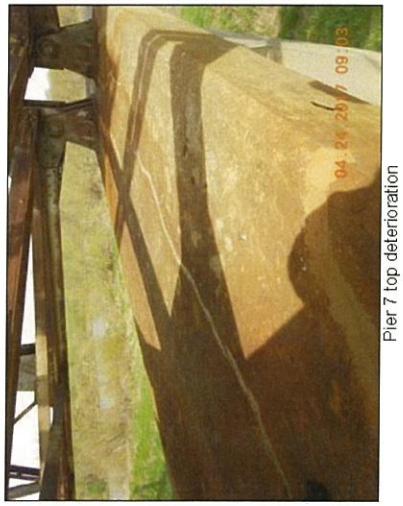
Pier 7 deterioration at Span 8 L0 Lt

Pier 7 South end cap deterioration

Pier 7 South end west face deterioration

Pier 7 South end West face of cap deterioration

Pier 7 South top deterioration



Pier 7 top deterioration

Pier 7 top north deterioration

Pier 8 bottom cracking and poor consolidation

Pier 8 cap deterioration

Pier 8 deterioration on East

Pier 8 deterioration on Northeast

Pier 8 deterioration on Northwest

Pier 8 east cap deterioration on west face

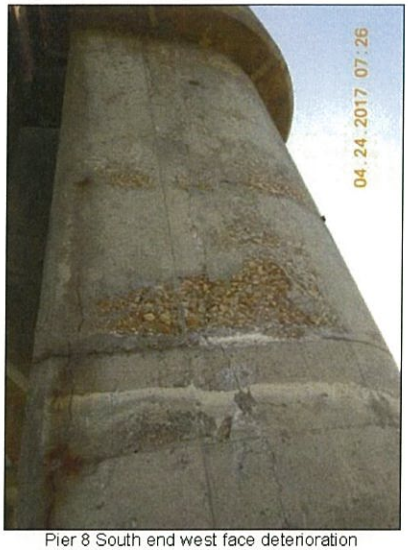
Pier 8 North end cap deterioration

Pier 8 North end top cap deterioration

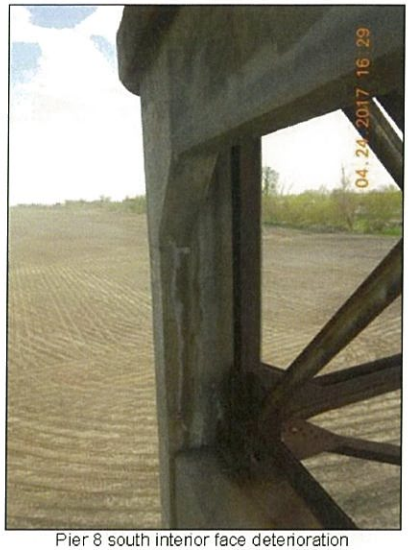
Pier 8 North end west face cracking

Pier 8 North interior face deterioration

Pier 8 South cracking and scaling

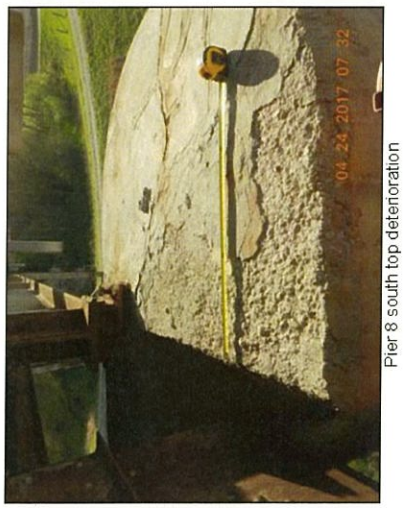


Pier 8 South end west face deterioration

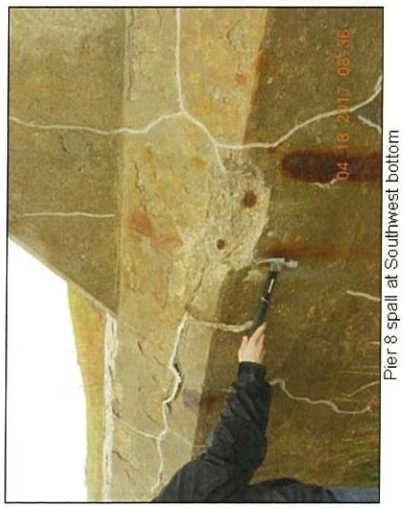


Pier 8 south interior face deterioration

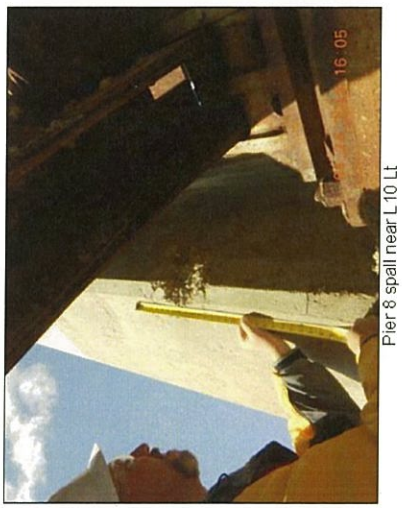

Pier 8 South side interior deterioration near U10 Rt



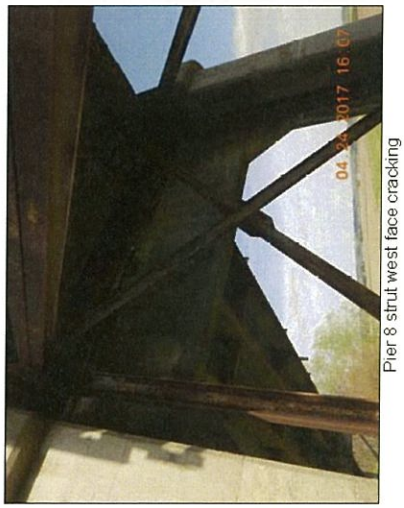
Pier 8 south top deterioration



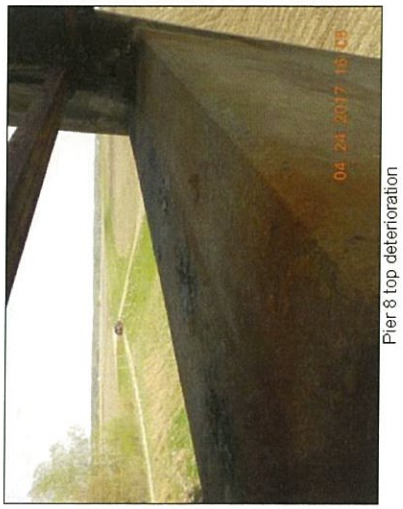
Pier 8 spall at Southwest bottom

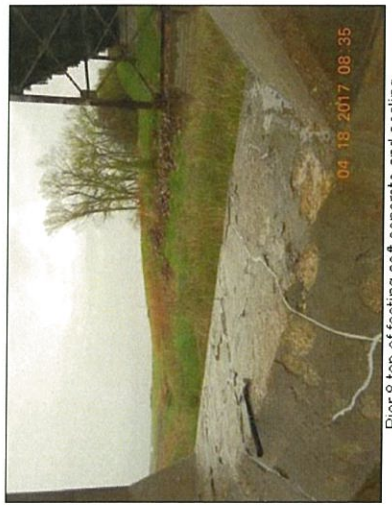

Pier 8 spall near L10 Lt


Pier 8 strut consolidation



Pier 8 strut west face cracking

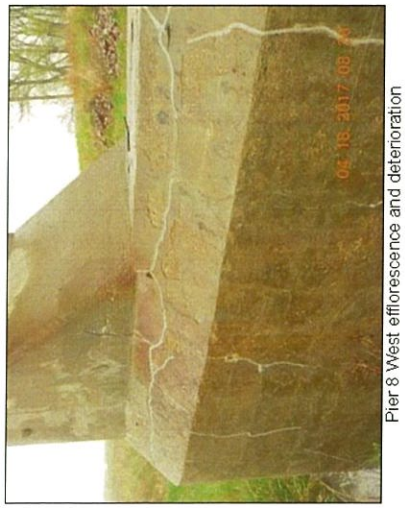

Pier 8 top deterioration



Pier 8 top of footing soft concrete and scaling


Pier 8 water buildup on South


Pier 8 water buildup


Pier 8 West efflorescence and deterioration


Pier 9 North - East bolts packrust


Pier 10 South - East bolts packrust, typ on west

East approach erosion ditch on North measurement

East approach erosion ditch on North

East Approach erosion on North end

Bellevue Bridge Commission
Underwater Bridge Inspection Report

S370-01918
East Mission Avenue Bridge

July 7, 2017

AYRES ASSOCIATES
3433 Oakwood Hills Parkway
Eau Claire, WI 54701
(715) 834-3161

NDOR
Nebraska
Department of Roads

Table of Content

Underwater Inspection

Underwater Inspection Safety

Structure Description:

East Mission Avenue Bridge (Bellevue Toll Bridge) over the Missouri River was inspected on July 7, 2017 by Ayres Associates. The bridge is located in Bellevue, Nebraska and can be seen in the location map below. The structure consists of 11 spans. Spans 5 and 6 are thru trusses. The substructure units in the water at the time of inspection was Piers 4 and 5. The piers are comprised of two reinforced concrete columns supported by a pier wall. Below the waterline, Pier 5 is supported by two independent caissons.

Location:

East Mission Avenue Bridge over the Missouri River is located in Bellevue, NE with the following coordinates.

Latitude	Longitude
N41.138605	W95.879165

Findings and Conclusions

Findings

As the result of this U/W inspection the following defects/concerns were discovered:

1) Scour at the upstream side of Pier 4 has been repaired with riprap and appears to be stable.
2) Minor local scour was observed at Pier 5 with no adverse effect to the pier.
3) The steel shells surrounding the caissons are in good condition with light surface corrosion.

As the result of this U/W inspection the following inspection notes were recorded but are not of concern:

1) No timber debris present on north end of caisson at Pier 5.
2) Minor collision damage at the upstream face of caisson at Pier 5.
3) No significant cracks, spalls or holes were found.
4) Previously noted, a 7 inch diameter hole on the east side of the upstream caisson on Pier 5 was not found.
5) All elevation changes were smooth and gradual with no drop offs.
6) Several spur dikes have been installed along the east bank as channel training measures.

Conclusions

The following condition ratings are determined for

1) Piling, Item 360: N
2) Bracing and Connections, Item 361: N
3) Column Wall, Item 362: 7
4) Footings, Item 363: N
5) Scour, Item 364: 8
6) Debris, Item 365: N
7) Abutments, Item 316: N/A
8) Pier(s), Item 317: 7
9) Substructure, Item 60: 7
10) Channel and Channel Protection: 8

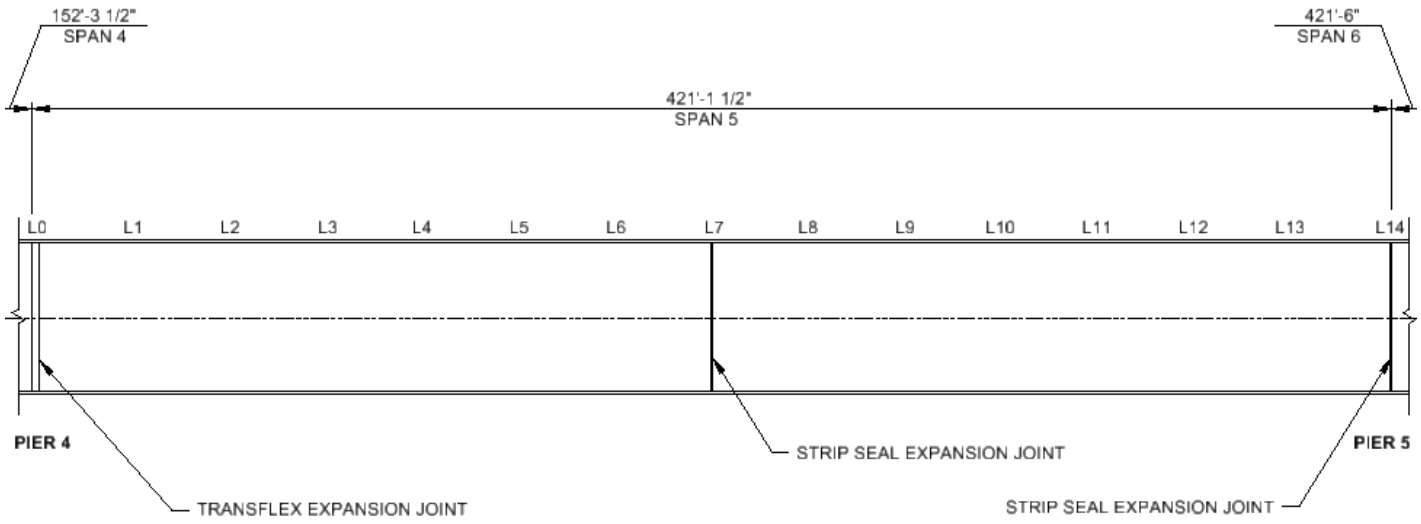
The following is the recommendation, if any, that may result in longer service life for this structure:
Continue underwater inspection at a 60 month interval.

Team Leader's Signature & Seal Brian K Schwab **Date:** 8/14/2017

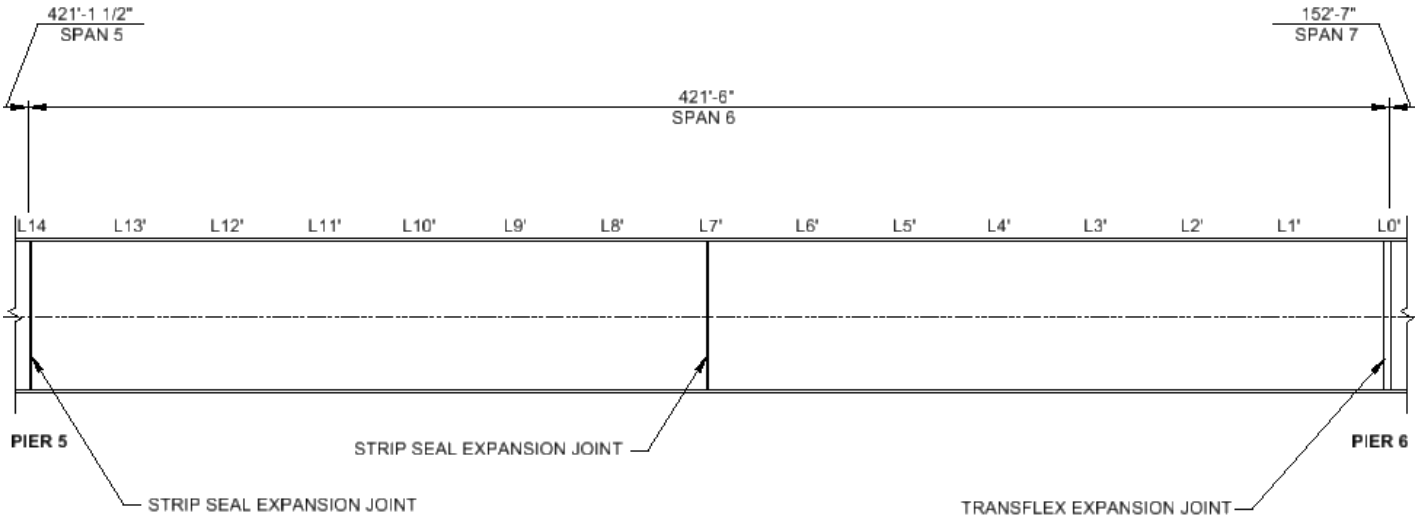
Underwater Inspection Report - Plan View

Structure No.: S370 01918 **Date of Inspection:** 07-07-2017 *Sheet 5 of 23*

STRUCTURE PLAN VIEW



SPAN 5 - PLAN



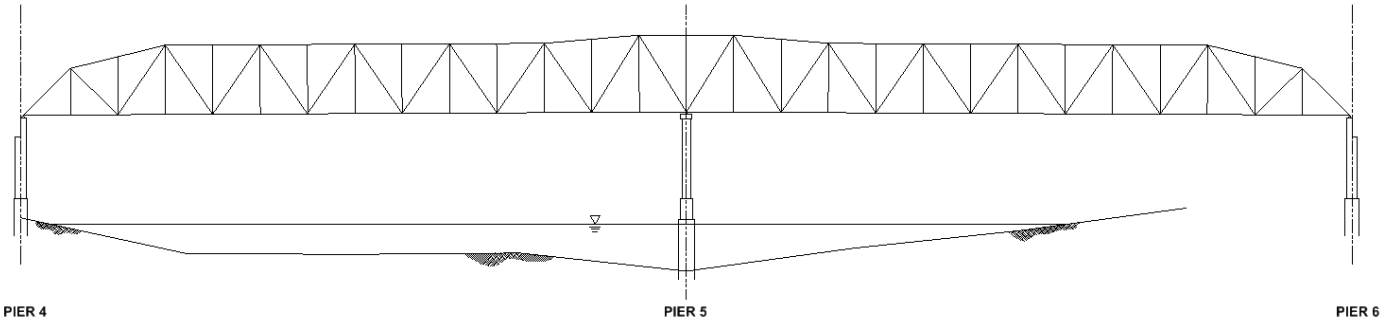
SPAN 6 - PLAN

Plan View: Span 5 and 6

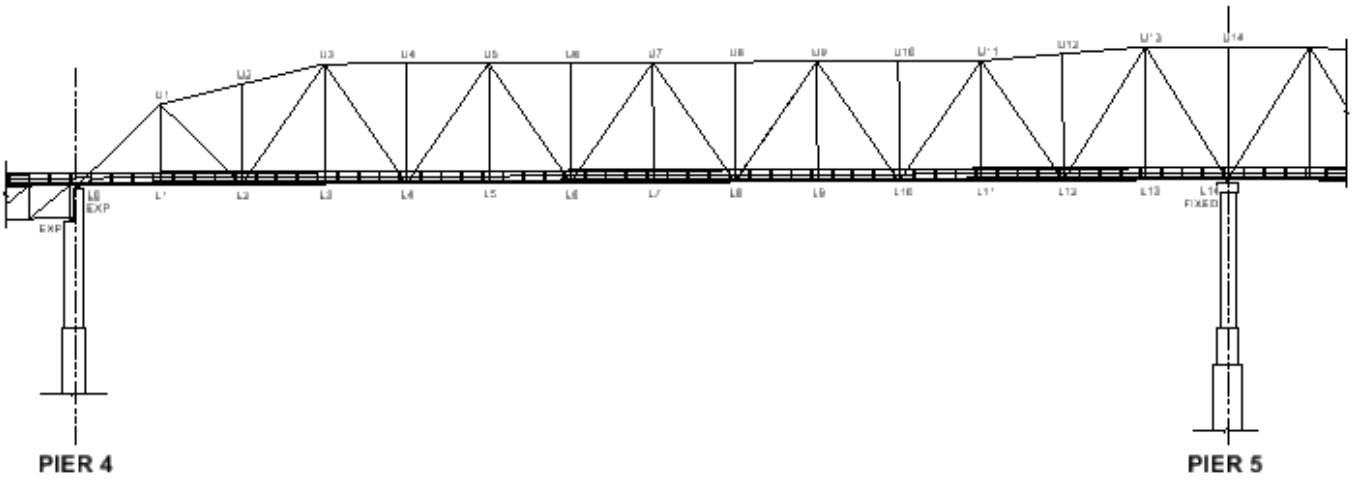
Underwater Inspection Report - Elevation View

Structure No.: S370 01918 **Date of Inspection:** 07-07-2017 *Sheet 6 of 23*

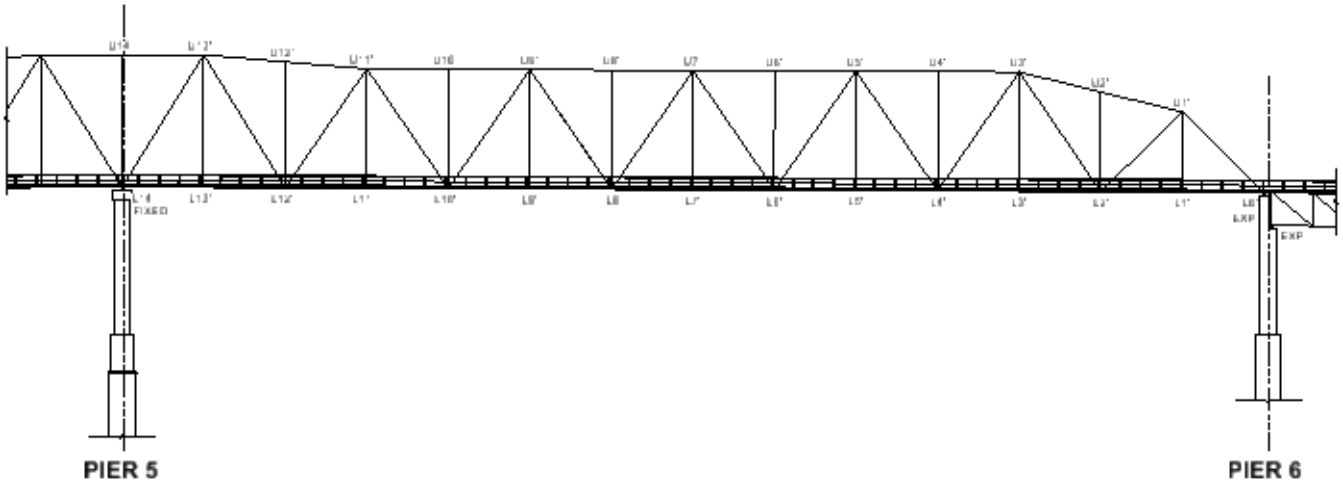
STRUCTURE ELEVATION VIEW



UPSTREAM PROFILE - LOOKING UPSTREAM



SPAN 5 - ELEVATION



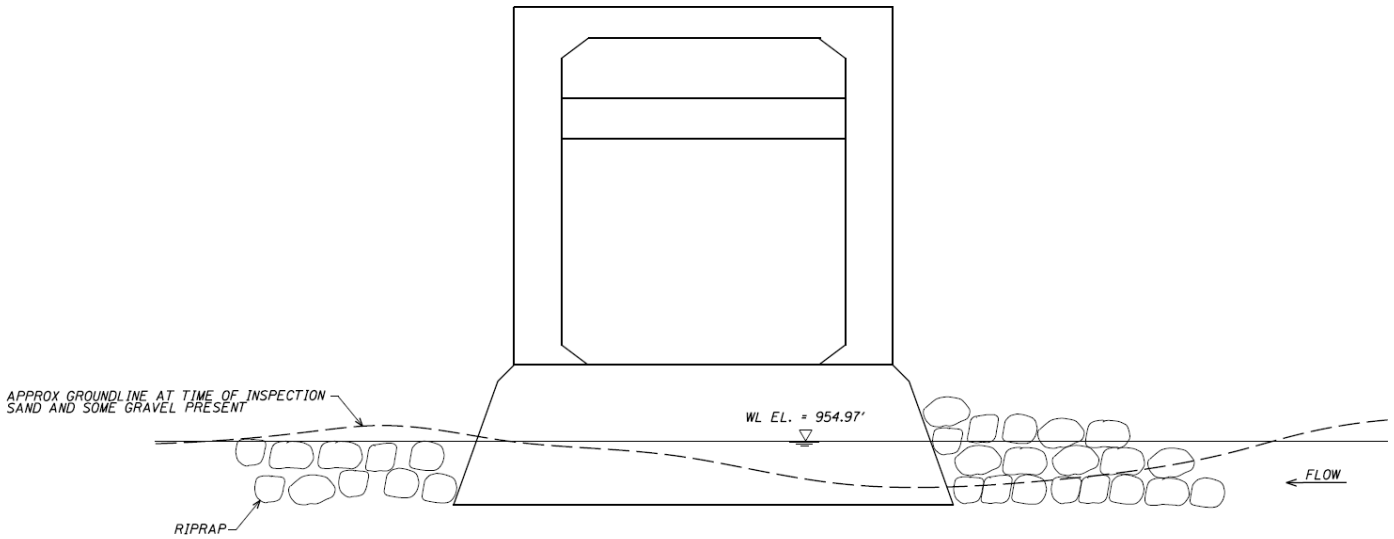
SPAN 6 - ELEVATION

Elevation View: Span 5 and 6

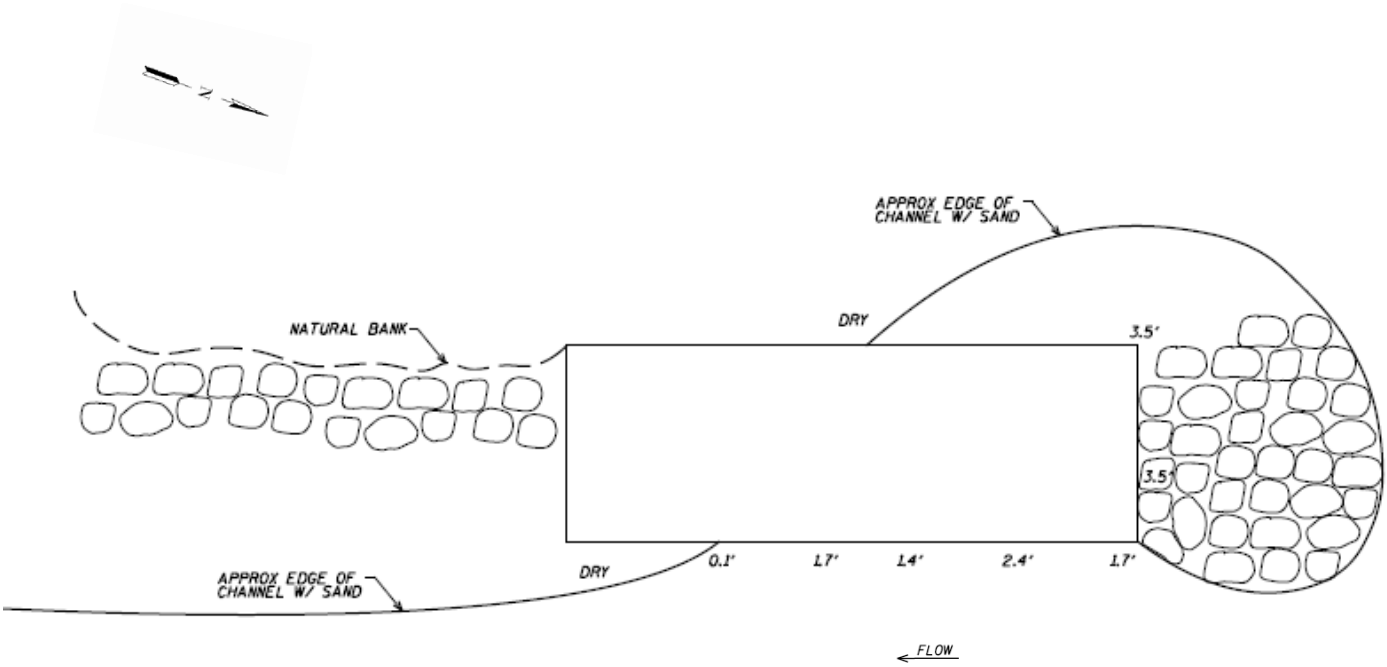
Underwater Inspection Report
Substructure Units

Structure No.: S370 01918 | **Date of Inspection: 07-07-2017** | *Sheet 7 of 23*

ELEVATION SKETCH FOR EACH SUBSTRUCTURE IN WATER

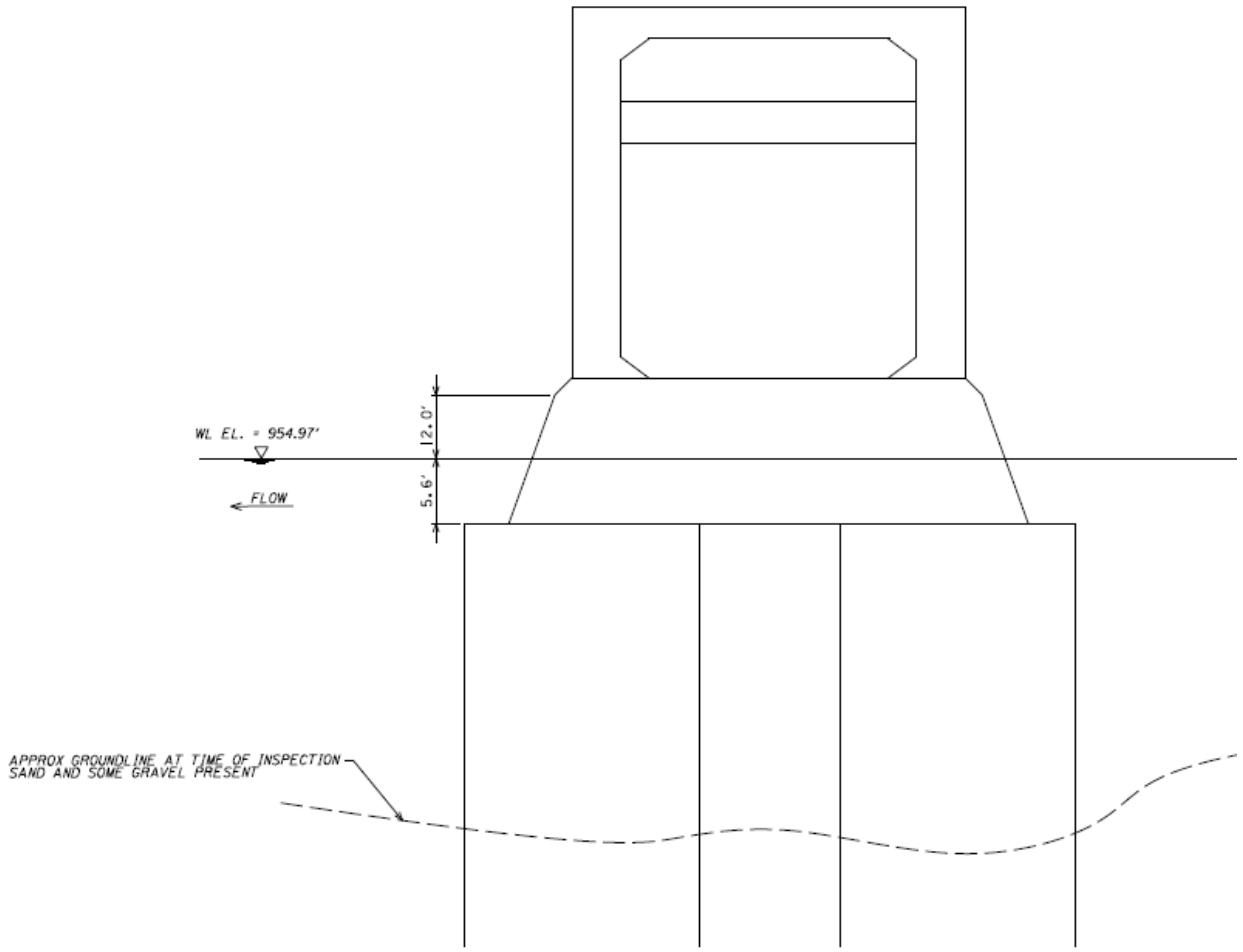


EAST ELEVATION OF PIER 4 ***(Not to Scale)***

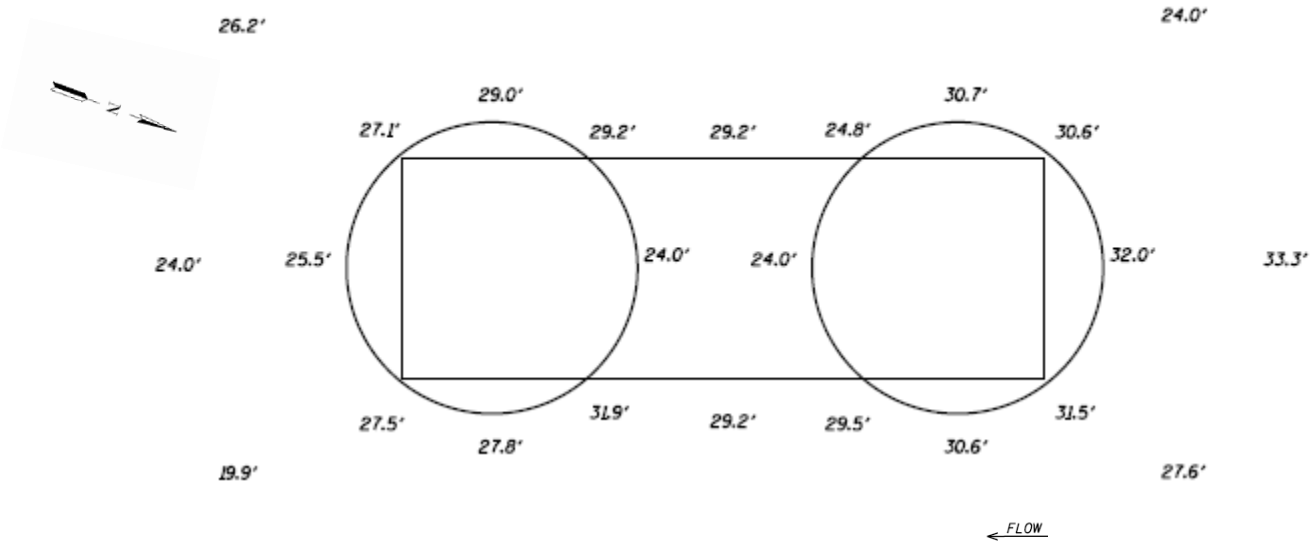


PLAN OF PIER 4 ***(Not to Scale)***

ELEVATION SKETCH FOR EACH SUBSTRUCTURE IN WATER



EAST ELEVATION OF PIER 5 ***(Not to Scale)***



PLAN OF PIER 5 ***(Not to Scale)***

Inventory Photos

Bridge Structure No.: S370 01918
County: Sarpy

Inspection Date: 07-07-2017
Project No.: 63-0551.00

South Profile (Downstream)

North Profile (Upstream)

West Bank – East Face Pier 4

West Face Pier 5

East Face Pier 5

East Bank

Upstream Channel

Downstream Channel

Deficiency Photos

Bridge Structure No.: S370 01918
County: Sarpy

Inspection Date: 07-07-2017
Project No.: 63-0551.00

Typical Condition at Waterline

Spur Dyke at East Bank

Pier 4 – Riprap Placed to Repair Scour

Pier 5 – No Debris at Upstream Nose

Structure No.: S0370 01918 **Date:** [5] 7/24/2012 **Circle Flow Condition:** a) normal flow, b) low flow, c) high flow, d) frozen/snow covered

Distance from Gutter to Top of Rail, Ft.: **Inspector's Name and ID No.:** Brian Schroeder, BS4306

Distance from Gutter to Low Superstructure, Ft.: **Height of Low Superstructure above Water Surface:** **Distance from Gutter to FL, Ft.:**

Maximum "X" Interval, Ft.: 50 **Bridge Length (EOF to EOF):** 420 (Span 5)

	Span # 1	Span # 2	Span # 3	Span # 4	Span # 5	Span # 6	Span # 7	Span # 8	Span # 9
Span Lengths, Ft.:					421.125	421.42			

Downstream X-Section, feet [1], [4]			DS X-Section, (continued), feet			DS X-Section, (continued), feet			US X-Section at substructures, feet			US X-Section at Substr. (continued), feet		
Point No.	X	Y [6]	Point No.	X	Y [6]	Point No.	X	Y [6]	Point No.	X	Y [6]	Point No.	X	Y [6]
1 [2]	0	0.0	21	771	0.00	41			Lt Abut, 1			P5, 1		
2 [3]	3	-0.5	22			42			Lt Abut, 2			P5, 2		
3	50	-8.2	23			43			Lt Abut, 3			P5, 3		
4	100	-16.3	24			44			Lt Abut, 4			P5, 4		
5	150	-15.8	25			45			P1, 1			P6, 1		
6	200	-15.3	26			46			P1, 2			P6, 2		
7	250	-15.3	27			47			P1, 3			P6, 3		
8	300	-15.4	28			48			P1, 4			P6, 4		
9	350	-17.0	29			49			P2, 1			P7, 1		
10	400	-18.7	30			50			P2, 2			P7, 2		
11	418	-19.3	31			51			P2, 3			P7, 3		
12	421	-19.4	32			52			P2, 4			P7, 4		
13	424	-19.1	33			53			P3, 1			P8, 1		
14	450	-16.6	34			54			P3, 2			P8, 2		
15	500	-11.8	35			55			P3, 3			P8, 3		
16	550	-7.7	36			56			P3, 4			P8, 4		
17	600	-3.7	37			57			P4, 1			Rt Abut, 1		
18	650	-1.9	38			58			P4, 2			Rt Abut, 2		
19	700	0.0	39			59			P4, 3			Rt Abut, 3		
20	750	0.0	40			60			P4, 4			Rt Abut, 4		

(1) Mark the DS side of the bridge from face of abutment to face of abutment at maximum X distances. Take a measurement of "X" and "Y" at every ground breaks and substructure face but never exceed the maximum interval shown above.

(2) The first and the last "X" distance is 20 feet from the face of abutment to verify scour at the abutment, if any.

(3) Zero "X" is at the face of the abutment on your left side when you are on the bridge facing the DS side.

(4) All "x" distances are measured to the nearest foot. All "Y" distances are measured to the nearest tenth of a foot.

(5) Inspection date MUST be entered.

(6) Measured from ground to 2012 waterline and values were adjusted to 2017 waterline.

Structure No.: S0370 01918 **Date:** [5] 7/7/2017 **Circle Flow Condition:** a) normal flow, b) low flow, c) high flow, d) frozen/snow covered

Distance from Gutter to Top of Rail, Ft.: **Inspector's Name and ID No.:** Brian Schroeder, BS4306

Distance from Gutter to Low Superstructure, Ft.: **Height of Low Superstructure above Water Surface:** **Distance from Gutter to FL, Ft.:**

Maximum "X" Interval, Ft.: 50 **Bridge Length (EOF to EOF):** 420 (Span 5)

	Span # 1	Span # 2	Span # 3	Span # 4	Span # 5	Span # 6	Span # 7	Span # 8	Span # 9
Span Lengths, Ft.:					421.125	421.42			

Downstream X-Section, feet [1], [4]			DS X-Section, (continued), feet			DS X-Section, (continued), feet			US X-Section at substructures, feet			US X-Section at Substr. (continued), feet		
Point No.	X	Y [6]	Point No.	X	Y [6]	Point No.	X	Y [6]	Point No.	X	Y [6]	Point No.	X	Y [6]
1 [2]	0	0.0	21	771	12.00	41			Lt Abut, 1			P5, 1		
2 [3]	3	-0.1	22			42			Lt Abut, 2			P5, 2		
3	50	-10.7	23			43			Lt Abut, 3			P5, 3		
4	100	-22.0	24			44			Lt Abut, 4			P5, 4		
5	150	-21.1	25			45			P1, 1			P6, 1		
6	200	-20.2	26			46			P1, 2			P6, 2		
7	250	-18.7	27			47			P1, 3			P6, 3		
8	300	-17.1	28			48			P1, 4			P6, 4		
9	350	-19.8	29			49			P2, 1			P7, 1		
10	400	-22.5	30			50			P2, 2			P7, 2		
11	418	-23.4	31			51			P2, 3			P7, 3		
12	421	-23.6	32			52			P2, 4			P7, 4		
13	424	-23.3	33			53			P3, 1			P8, 1		
14	450	-21.0	34			54			P3, 2			P8, 2		
15	500	-16.5	35			55			P3, 3			P8, 3		
16	550	-11.7	36			56			P3, 4			P8, 4		
17	600	-6.8	37			57			P4, 1			Rt Abut, 1		
18	650	11.4	38			58			P4, 2			Rt Abut, 2		
19	700	11.4	39			59			P4, 3			Rt Abut, 3		
20	750	11.8	40			60			P4, 4			Rt Abut, 4		

(1) Mark the DS side of the bridge from face of abutment to face of abutment at maximum X distances. Take a measurement of "X" and "Y" at every ground breaks and substructure face but never exceed the maximum interval shown above.

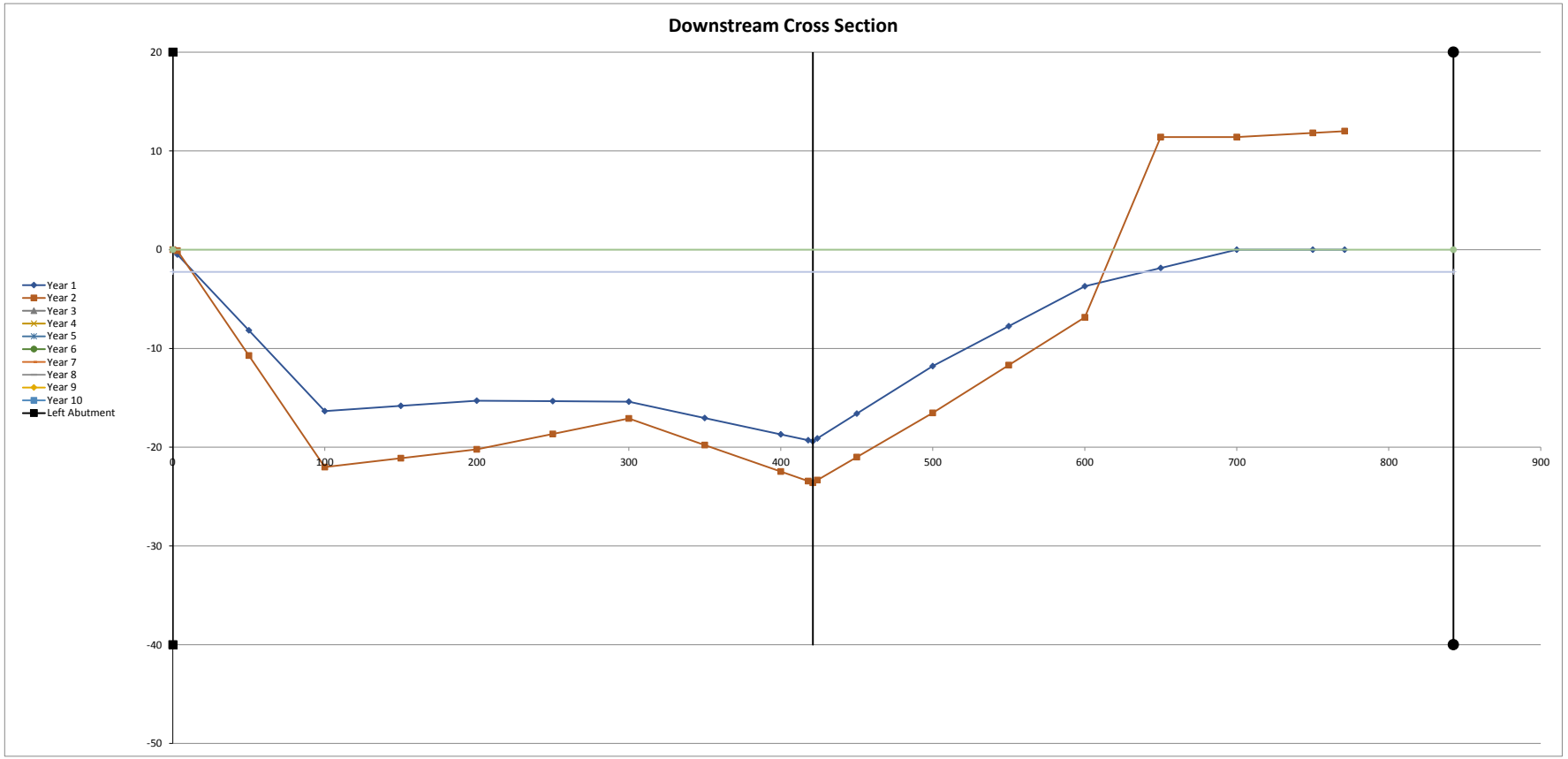
(2) The first and the last "X" distance is 20 feet from the face of abutment to verify scour at the abutment, if any.

(3) Zero "X" is at the face of the abutment on your left side when you are on the bridge facing the DS side.

(4) All "x" distances are measured to the nearest foot. All "Y" distances are measured to the nearest tenth of a foot.

(5) Inspection date MUST be entered.

(6) Measured from ground to 2012 waterline and values were adjusted to 2017 waterline.


Downstream Cross Section
20
10
0
-10
-20
-30
-40
-50
0
100
200
300
400
500
600
700
800
900
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Year 8
Year 9
Year 10
Left Abutment

General Inspection Procedure for Underwater Inspection of Nebraska Bridges

Perform a Level I Inspection of 100% of the submerged portion of the bridge to determine deterioration, deficiencies, and damages. Inspections should be conducted during predictable low flow and slow current conditions.

For river flow conditions in Missouri, Platte, and their tributaries, contact the Corps of Engineers at:

Larry Murphy, Team Leader, Reservoir Regulation, (402) 996-3870
Mike Swenson, Team Leader, Power Production, (402) 996-3860

Missouri River stage forecast can be checked at the following links:

http://www.nwd-mr.usace.army.mil/rcc/reports/forecast.html

http://www.crh.noaa.gov/mbrfc/?n=RFC_forecast

https://waterdata.usgs.gov/ne/nwis/rt

Typically, water levels at various irrigation canals are low from the middle of September to the beginning of April. Periodically, water may be drained empty for inspection or maintenance work of the canal, and the underwater inspection schedule should be adjusted for such events. See contact information in roster of canal owners available with NDOR. For an updated roster, contact the Department of Natural Resources, Mike Thompson, (402) 471-0587.

Contact information for the three major canal systems in Nebraska are:

CNPPID canals, Cory Steinke, (308) 995-8601
Loup Power District canals, Neal Suess, (402) 564-3171
NPPD canals, Frank Kwapnioski, (308) 535-5922

Any critical finding will be immediately reported by the Inspection Team Leader to the Engineer/Contact Administrator *(NDOR Bridge Inspection Program Manager)*. A determination if immediate corrective action, including bridge closure, is necessary will be made in consultation with NDOR. In case immediate closure is determined to be appropriate, inspection team shall remain onsite to divert traffic until the bridge owner *(NDOR/County/Municipality)* is engaged onsite.

If deterioration is found, a Level II inspection is required. This inspection consists of limited measurements of damaged or deteriorated areas. Any debris or marine growth present will be removed as required to facilitate the inspection. Determination of whether a Level III inspection, including NDT testing is required, will be made in consultation with the Engineer or Contract Administrator.

Due to near-zero visibility, inspection of the submerged portion of substructure will be mostly tactile.

For concrete elements, such as piers, pile caps, pile encasements, concrete piles, and drilled shafts, measure and document items such as, but not limited to, cracks, spalls, broken edges, loose concrete, and exposed reinforcing. Perform a complete tactile inspection of the concrete surface to detect such defects.

For steel elements, such as H or pipe piles and bracings, measure and document section loss due to corrosion. Section loss observed above current water line may require spot cleaning and thickness gauge readings *(caliper or d-meter)*. For portion of pile below water, perform a tactile inspection to detect any change in cross-section or defects.

For timber piles, measure and document section loss, cracks, and decay. Above water portion of piles will be sounded with a hammer and drilled, as necessary to measure internal decay. For portion of pile below water, perform a tactile inspection to detect any change in cross-section or defects.

For pile caps and concrete pile encasements, measure and document any exposed pile length below the concrete which may indicate evidence of scour. For portion of pile below water, perform a tactile inspection to detect any change in cross-section or defects.

For the above water portions of the substructure not accessible from land, make a visual inspection of any deterioration such as, but not limited to, cracks, spalls, section loss, impact damage, etc.

Check for local scour around bridge foundations by probing the base of the substructure element at the mud line. Look for void, scour holes, etc. This will be done along the entire perimeter of all foundations. Measure water depths at three or more locations along each face of each submerged substructure element. Document condition of riprap and slope protection measures near the bridge.

Measure and document stream cross-sections to determine general scour. For Missouri River bridges, stream cross-section measurement will be made at 10 ft., 100 ft., and 500 ft. U/S and D/A of bridge railing. For irrigation canals, stream, river crossings measure and document at U/S and D/S railing of the bridge.

If pile caps or footings are exposed above mud line, measure and document extents of exposed footing.

Determine and document the composition of the channel bed and bank material *(silty clay, firm clay, sand, gravel, stone, etc.)*. Also, determine and document condition of all pier and bank protection measures.

Measure distance from top of deck to water level at one substructure location and relate to datum as show in available bridge plans. For bridges where plans are not available, a datum of 100 ft. at the top of the rail will be assumed. For bridges with a slope or change in vertical profile, measure at each substructure unit or ground line points of change such as thalweg, top of bank, bottom of bank, etc.

Document direction of water flow. In streams with stagnant water, flow direction may not be apparent.

Location position and amount of debris constricting the waterway. Typically, debris will be lodged against piers, bents, and bracing. Exercise caution to avoid becoming entangled in debris or hit by moving debris. Recommend removal, if necessary, to inspect bridge elements and reschedule, as necessary.

Document inspection findings with notes and photos. Photos should include elevation view of bridge from both upstream and downstream *(US and DS)* sides, elevation view of substructure, view of channel US. And DS, channel banks, debris in channel, bank erosion if any, etc. Format of report will be on NDOR Bridge Division standard forms.

Specific Instructions for Underwater Inspection:

East Mission Avenue over Missouri River

1. Pier 4 and 5 located in the river require an underwater inspection.
2. A 20-foot jon boat, suitable for carrying the diver, dive supervisor, dive tender, surface supplied air gear, depth finder equipment, GPS, etc. is needed.
3. Dive boat US, DS of bridge and around pier to take required photographs and soundings.
4. Visually inspect above-water portions of Pier 4 and 5.
5. Look for floating or submerged debris in the water before diving. Exercise caution to avoid becoming entangled in debris or hit by moving debris.
6. Dive entry point is upstream or downstream nose. Dive exit point should be located at the DS side of the pier.
7. Execute dive. Historically dive takes approximately 60 minutes for pier 5.
8. Deterioration locations need to be documented on plan and profile sketches as wells as pier/bent sketches.

Nebraska Department of Roads
Bridge Division

Underwater Inspection Dive Log

Date of Inspection: **07-07-2017**

Emergency Information			
Hospital:	Bellevue Medical Centeer	Phone No.:	402-763-3000
Sheriff:	Sharpy Co. Sheriff Dept.	Phone No.:	911
Fire Department:	Bellevue Fire Department	Phone No.:	911
Air Refill:	AquaTrec	Phone No.:	402-420-6338

Location Information			
District:	2	Structure Type:	4

Site Information	
Dive Supervisor:	Josh Makela
Main Diver/Inspector:	Brian Schroeder
Safety Diver:	Josh Makela
Dive Tender:	Emerson Hegeman
Entry Location:	Southside of Pier
Exit Location:	Southside of Pier
Method of Entry:	Boat
Air Temp *(F^)*:	90
Weather:	Clear
Equipment Used:	Surface Supplied Air

Dive Information		
Water Temp. *(F^)*:	80	
Maximum Depth *(FT)*:	32’	
	Main Diver	**Safety Diver**
End Dive:	1030	Not Deployed
Begin Dive:	0945	N/A
Total Time:	45	N/A
Air In:	N/A	N/A
Air Out:	N/A	N/A
Total Air Used:	3000	N/A

Condition of Waterway	
Current *(1 Knot = 1.7 F.S.)*	4.0 fps
Bank Condition:	Vegetation, Stable
Bottom Condition:	Loose Sand/Gravel
Pollution:	N/A
Visibility:	< 1 ft
Hazards	Current

Rate Items 360 – 365 using NBIS Condition Rating	
360 – Piling:	N
361 – Bracing & Connections	N
362 – Column Wall:	7
363 – Footings:	N
364 – Scour:	8
365 – Debris:	N

Remarks

1. NBIS Level Inspection: 1
2. Flow Direction: South
3. Type of piles: Piers are founded on two independent caissons
4. Underwater substructure units inspected: Piers 4 and 5
5. Ice deflectors in place on nose of each pier? ☒ Yes ☐ No Nose condition: Satisfactory
6. Debris encountered: No
7. Visible abutment damage: N/A
8. Marine growth: None
9. Condition of concrete corners: Good Evidence of collison or ice damage: Minor
   Degree of concrete damage: Minor
10. Indication of local scour based on streambed profile measured: Minor local scour at Pier 5
11. Banks stabilized with: Vegetation and riprap
12. Recommendations for corrective action: None
13. Issues noted in previous inspection report:
    A. No heavy timber debris present on north end of caisson at pier 5.
    B. No significant cracks, spalls or holes were found.
    C. Previously noted 7 inch diameter hole on the east side of the upstream caisson on Pier 5 not found.

D. All elevation changes were smooth and gradual with no drop offs.

E. Several spur dikes have been installed along the east bank as channel training measures.

Previous inspection report dated: July 2012

14.Overall condition rating for underwater elements inspected is a: 7

Nebraska Department of Roads
Bridge Division
Underwater Inspection Team

Inspection Operations Plan/Risk Assessment

Structure No. S370 01918 **Date:** 07-07-2017

Dive Planning	**Risk Factors**		**2**
Inspection Type	**Preparatory Time**		
	Optimum	**Adequate**	**Minimal**
Baseline/Inventory	☐ 1	☐ 2	☐ 3
Routine	☒ 2	☐ 3	☐ 4
In-depth/Special or Damage/Post Event	☐ 3	☐ 4	☐ 5

Organization & Equipment	**Risk Factors**		**1**
Project Organization	**Equipment Available**		
	Own Equipment	**Rented Equipment**	**Other Company Equipment**
Normal Bridge Inspection	☒ 1	☐ 2	☐ 3
Bridge Inspection with Private Organization	☐ 2	☐ 2	☐ 4
Underwater Inspection with Other NDOR Division	☐ 3	☐ 2	☐ 3

Physical Requirement of Divers	**Risk Factors**		**3**
Environment	**Employee Preparation**		
	Optimum	**Adequate**	**Minimal**
Non-acclimated	☐ 3	☐ 4	☐ 5
Partially acclimated	☐ 2	☐ 3	☐ 4
Acclimated	☐ 1	☐ 2	☒ 3

Dive Team Members	**Risk Factors**		**2**
Inspection Type	**Preparatory Time**		
	Optimum	**Adequate**	**Minimal**
Complex	☐ 3	☐ 4	☐ 5
Routine	☒ 2	☐ 3	☐ 4
Simple	☐ 1	☐ 2	☐ 3

Weather	**Risk Factors**		**1**
Water Temperature	**Rain and Weather**		
	Clear	**Drizzle, Humid**	**Rain, Ice, Dust**
< 45 or 85 >	☐ 3	☐ 4	☐ 5
45 – 65	☐ 2	☐ 3	☐ 4
65 – 85	☒ 1	☐ 2	☐ 3

Waterway	**Risk Factors**		**5**
Visibility	**Preparatory Time**		
	No Current	**Moderate**	**Swift**
Zero Visibility	☐ 4	☐ 5	☐ 6
1’ to 3’	☐ 3	☐ 4	☒ 5
Above 3’	☐ 2	☐ 3	☐ 4

Inspection Duration	**Risk Factors**		**2**
Duration in Actual Inspection Days	**Team Experience Working Together**		
	Much	**Some**	**Little**
8	☐ 3	☐ 4	☐ 5
4	☐ 2	☐ 3	☐ 4
1	☐ 1	☒ 2	☐ 3

Total Risk Value: 16

Action to be Taken to Reduce Assigned Risk Values >15

RISK ASSESSMENT VALUES
Low Risk = 0 to 12
Moderate Risk = 13 to 25
High Risk = 26 to 35

High Risk operations assigned a value of 20-35 require the approval of the NDOR Bridge Engineer and a more detailed Dive Plan. When two or more areas are assigned a Risk Value of 5, the overall rating is to be considered a High Risk.

Actions

Note: Risk assessment is 16, dive plan was followed.

Dive Plan: The diving operation will be conducted with a boat. Equipment to be used will be surface supplied air to the diver from scuba tanks. The diver's umbilical will consist of an air hose, communication cable, pneumofathometer hose, and a strength member. The diver will wear a Superlite 17k Helmet to maintain hardwire communications throughout the dive. Wet or dry suits will be worn depending upon weather conditions. A bail-out bottle will be worn during all diving operations. A dressed-in standby diver is not required due to water depth but a complete safety diver rig will be on site, connected, tested and ready to dive immediately if needed. The exact entry/exit point will be determined during the pre-dive inspection. Also, the inspection route will be determined. A pre-dive briefing will be held prior to entry. All diving activities will be accomplished in accordance with FHWA and OSHA regulations.

Organization and Equipment: Superlite 17k helmet, dry suit, air tanks, wired electronic communication

Physical Requirements: Diving, Wading

Team Members: Josh Makela (Supervisor, Back up Diver)
Brian Schroeder (Team Leader, Diver)
Emerson Hegeman (Tender)

Weather: Clear, Air = 90 deg F, Water = 80 deg F

Waterway: Current = 4 fps, Visibility 0-1 ft

Inspection Duration: 0945 – 1030 (45 min)

Additional Hazard Analysis for High Risk Assessment

Underwater hazards may include, but not be limited to, possible brush, trees, fishing line that may collect in the structure, etc. In addition, caution must be exercised to ensure against possible entanglement of the diver's umbilical cord. The diver and tender must use caution when raising or lowering the diver to the bottom.

Team Leader: Brian Schroeder **Date:** 7/7/2017

Load Rating Summary

Structure ID: **S370 01918**
Location: **1E Bellevue**

Analyst: **JSire**
QC By: **SGogoi 3/16/2018**
Analysis Date: March 9, 2018

Structure Identification

Feature Intersected : **Missouri River**
Material Main Span: **4 Steel Continuous**
Design for Main Span: **10 Truss-Thru**
Year Built: **1950**

County: **Sarpy(153)**
National Highway System Indicator: **0 Not on NHS**
District: **District 2**
Administrative Area: **901 - Unknown**

Maintainer : **26 Private(nonRailroad)**
Owner : **26 Private(nonRailroad)**

Name: **Grand Army of the Republic Bridge**
Emergency Route : **Off**

Description

1965' 11-span bridge, west to east: Spans 1-4 are 152' simple span deck truss. Spans 5 & 6 are 421' continuous thru truss. Spans 7 & 8 are 152' simple span deck truss. Spans 9-11 are 70' continuous steel beams. Truss members consist of riveted and/or bolted, rolled, and built-up members. Truss members connected with gusset plates using bolts and/or rivets. Stringers, floorbeams and girders are rolled steel. Stringers simply supported at the floorbeams. Stringers are connected to the floorbeam webs with connection angles and bolts and/or rivets. The stringers and girders are composite with the deck.

Ratings and Loads

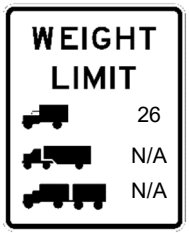
Deck (58): 7 Good | Superstructure (59) : 5 Fair | Substructure (60) : 5 Fair | Culvert (62) : N N/A

Design Load (031): **2 M 13.5 (H 15)**
Operating Type (063): **1 LF Load Factor**
Inventory Type (065): **1 LF Load Factor**

Type of Overlay : **None**
Overlay Thickness / Fill Height (in): 0

Truck	Inventory Rating		Operating Rating		Legal		Posting Value (tons)	Member	Control Location			Limit State
	Rating Factor	Tons	Rating Factor	Tons	Rating Factor	Tons			Span	Location (ft)	Percent of Span	
HS-20	0.490	17.64					N/A	FB	5	12.42	50.0	Design Flexure - Steel
HS-20			0.820	29.52			N/A	FB	5	12.42	50.0	Design Flexure - Steel
SU4					0.970	26.20	-	FB	5	12.42	50.0	Design Flexure - Steel
SU5					0.887	27.50	-	FB	5	12.42	50.0	Design Flexure - Steel
SU6					0.797	27.70	-	FB	5	12.42	50.0	Design Flexure - Steel
SU7					0.733	28.40	-	FB	5	12.42	50.0	Design Flexure - Steel
NE Type 3					1.104	27.60	26	FB	5	12.42	50.0	Design Flexure - Steel
NE Type 3S2					1.065	39.40	N/A	FB	5	12.42	50.0	Design Flexure - Steel
NE Type 3-3					1.165	50.10	N/A	FB	5	12.42	50.0	Design Flexure - Steel
EV2												
EV3												
							-					
							-					

Weight Limit Posting Requirements



EMERGENCY VEHICLE AXLE WEIGHT LIMIT	
SINGLE	t
TANDEM	t
GROSS	t

Documentation

Rating Information Provided: ☒ **Plans** ☐ **Field Measurements** ☐ **Testing** ☐ **No Information Exists**

BrR Computations Submitted : **No**
Analysis Engine Version : **LARS v.10.05.00.10**

Additional Comments

Please see following sheet for extended comments.

NE Professional Engineering Seal

The Rating and Posting values for this structure are based on a theoretical analysis of the structural elements involved and on a limited amount of information concerning the structural condition. These weight limits are intended only as a general guideline and may be varied accordingly by the officials responsible for this structure after an investigation of the structural condition, reaction to vehicular loads and any other items where judgment is required to establish a proper weight limit.

Load Rating Summary

Structure ID: **S370 01918**

Location: **1E Bellevue**

Analyst: **JSire**

QC By: **SGogoi 3/16/2018**

Analysis Date: March 9, 2018

Structure Identification

Feature Intersected: **Missouri River**

Material Main Span: **4 Steel Continuous**

Design for Main Span: **10 Truss-Thru**

Year Built: **1950**

County: **Sarpy(153)**

National Highway System Indicator: **0 Not on NHS**

District: **District 2**

Administrative Area: **901 - Unknown**

Additional Comments

1. This preliminary rating is based on findings of inspection report completed in April 2017 and design drawings.
2. Bridge is currently not posted. There are guardrails on the bridge. River banks are stable.
3. The following section losses were assumed for different members based on the inspection and observation: Deck Truss – 5% on floor beam webs; 10% on floor beam flanges; 5% on stringers; 5% on lower chord + additional 10% on lower chord from L0 – L2; No loss on verticals and diagonals. Top chord loss is ignored due to deck composite with stringers; Continuous Composite Steel Girders (partially new construction) – no loss assumed; Through Truss – 20% on floor beam webs; 20% on floor beam top flanges; 50% on outside 5 ft. of floor beam bottom flanges; 10% on floor beam bottom flange center portion; 10% on stringers; 10% on lower chord; No loss on verticals and diagonals, 10% on top chord cover plates.
4. To represent an actual live load situation for the 7 legal trucks, a chain of trucks were used at 30 ft. spacing for spans longer than 200 ft. One truck from adjacent lane was superimposed at the middle of the train for each legal truck type train to simulate loading requirements per AASHTO. Up to 30 axles are permitted in LARS and were modeled as such. For obtaining legal truck load limits from the train loads, the rating factor for each truck train were multiplied to the individual truck weights to obtain the tonnage of each truck.
5. Materials for through truss members consist of silicon steel (SS) and carbon steel (CS) Yield stress of 45 ksi and 33 ksi are used respectively for SS and CS.
6. In the through truss members U9-U13, U15-U19, L10-L12, L16-L18, and a mixture of diagonal and vertical members are CS and remaining are SS.
7. Per direction from Bentley, the deck truss in the approach spans were designated as through truss while modeling in LARS.
8. Two LARS models were created. S370 01918_AS.BMD for the approach spans. S370 01918_MS.BMD for the main spans.
9. Controlling members are the floor beams on the through truss on the main spans.
10. There are no recommendations for improving the rating. Future inspections should look for progression of corrosion.
11. Gusset plates have been rated for this MAR2018 rating to include the most recent inspection (April 2017) and the 4 new SHV legal trucks. Gusset plate load ratings do not control.
12. Bridge requires posting for the SU4, SU5, SU6 and SU7 trucks as shown on the previous sheet.

Bridge Condition – April, 2017 Inspection

Structure Component	Rating	Condition	Needs
Deck	7	Good	
Deck Joints	5	Fair	Monitor due to rapid degradation (good to fair in 10 years)
Rails	6	Satisfactory	
Deck Truss Members	5	Fair	
Deck Truss Floor Beams	5	Fair	Monitor gusset connections due to increased degradation
Deck Truss Stringers	6	Satisfactory	
Deck Truss Lateral Bracing	6	Satisfactory	
Through Truss Upper/Lower Chords	5	Fair	
Through Truss Verticals/Diagonals	5	Fair	
Through Truss Upper/Lower Laterals	5	Fair	Monitor gusset connections due to increased degradation
Through Truss Floor Beams	5	Fair	Monitor gusset connections due to increased degradation
Through Truss Stringers	5	Fair	
Substructure	5	Fair	Monitor bearing seats due to increased degradation

Good or Satisfactory (6 or higher) – 100% capacity
Fair (5) – 95% capacity
Poor (4 or lower) – 85% capacity