Fracture Critical Bridge Inspection Report

NBI Bridge No.: 04085

Local ID: -1

Route U.S. 281 over S. CANADIAN RIVER
County,

Prepared for:

Oklahoma Department of Transportation

Field Division 4

Inspection Date:

10/14/2018

Report Prepared By:

BURGESS & NIPLE, INC.

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Mr. Wes Kellogg, P.E.
Field Service Engineer
Oklahoma Department of Transportation
200 Northeast 21st Street
Oklahoma City, OK 73102-3204

Re: Fracture Critical Bridge Inspection Report
Structure No.: 0902 0000 X
NBI No.: 04085
U.S. 281 over South Canadian River
Canadian County, ODOT Field Division 4

November 8, 2018

Dear Mr. Kellogg:

Burgess & Niple (B&N) performed a fracture critical and routine inspection of the above referenced bridge on October 8 through 14, 2018. Route 281 is not a National Highway System (NHS) route. The bridge is a 40-span structure **(photos 1 and 2)** with spans numbered south to north and consisting of:

Spans 1 and 40:	36-foot long steel multi-beam approach spans
Spans 2-39:	100-foot long riveted pony truss spans

The limits of the inspection were from the south abutment to the north abutment. Inspection team members included Brendan Prendeville, PE (Team Leader), Kevin Hyland, PE, Shaun Fillmore, EI, Ryan Brown, EI, and Roger Aker.

The bridge had a 15-ton load restriction at the time of the inspection **(photos 3 and 4)**. The posting was lowered to 9 tons after cracks were discovered in the east U4 inboard gusset plates of spans 32 and 37 during the inspection. It was also discovered that the latest load rating report, dated March 25, 2014, used 8 rivets per gusset plate for the U1L0 and U4L3 panel points where only 6 exist. Note: numerous overweight vehicles were noted passing over the bridge during the inspection.

This report includes appendices containing:

- Significant Findings
- FC/Truss Rating Form
- Condition Photographs
- Oklahoma DOT Bridge Inspection Form/BrM element report
- Appendix A – Stringer Cope Cracks
- Appendix B – Stringer Connection Cracks
- Appendix C – Missing Stringer Rivets
- Appendix D – Stringer Loss
- Appendix E – Floor Beam Sweep
- Appendix F – Floor Beam Loss
- Appendix G – Floor Beam Cracks
- Appendix H – Gusset Plate Cracks

The current and previous NBI ratings for the bridge are:

NBI Item	Previous Rating (2018)	Current Rating (2017)
NBI Item 58 (Deck)	5 = Fair	5 = Fair
NBI Item 59 (Superstructure)	4 = Poor	4 = Poor
NBI Item 60 (Substructure)	5 = Fair	5 = Fair
NBI Item 61 (Channel)	5 = Bank Eroded	5 = Bank Eroded
Sufficiency Rating	21.1 (SD)	21.1 (SD)

The bridge is structurally deficient.

RECOMMENDED ACTIONS, in order of decreasing priority, are as follows:

Priority Code **CX** – *Bridge condition is bad enough that there is a possibility of failure of a major structural component if repairs are not completed within the next few days.*

- There are no CX repair items required at this time.

Priority Code **PX** – *Bridge condition is such that immediate repair is not necessary, but should be completed within the next several weeks or months.*

- Strengthen the stringer webs as recommended in Appendix D (spans 15, 16, 21, 24, 31, 36, and 38).
- Reinforce/replace the damaged concrete bridge railing in spans 1 and 40. Consider installing approach railing with transitions and terminations compliant with current standards in both approach roadways.
- Seal cracks in the asphalt in both the bridge and approach wearing surfaces. Consider removing the asphalt wearing surface on the bridge and the built-up elastomeric concrete header to remove dead load and prevent damage to structure from drainage trapped in the wearing surface.
- Remove loose elastomeric concrete and patch the joint headers as necessary to provide a smooth riding surface across the bridge.
- Reseal the poured seal expansion joints. Consider replacing the deteriorated joints and joint headers due to deteriorated concrete adjacent to the joint opening.
- Install elastomeric pads or steel shims at missing locations on the supplemental pier beams over piers 1 and 39.
- During future inspections, compare lengths of cracks in stringer and floor beam webs with Appendix A table values. Drill crack tips that grow significantly.
- Repair cracks in stringer connection angles noted in Appendix B by adding seat brackets below the stringer.
- Repair section loss in stringer and floor beam webs where corrosion holes and/or heavy section loss exists with welded plates and/or angles.
- Remove broken rivets for the stringer connections at the locations noted in Appendix C and replace with bolts.
- Replace sheared rivets in the vertical connection, upper chord, and end post with bolts at west U1 in spans 31 and 37.
- Remove pack rust and apply caulking and paint along the edges of the gusset plates at L0 and L5. Consider strengthening gusset plates where bowing is occurring.

- Clean and paint the stringer ends and floor beams adjacent to the joints above the piers and the lower chord panel points including the splice locations.
- Add rip rap around piers near the current channel to protect against scour.
- Repave the south approach near the bridge to provide a smooth transition.
- Install full depth pressure relief joints in both approaches to mitigate ongoing effects of pavement pressure.

Priority Code **FX** – *Bridge condition is such that repair should not be necessary any time soon, monitor during future inspections.*

- Monitor cracks in the inboard gusset plates at east U4, spans 32 and 37, and at west U1 span 37 for growth.
- Monitor the channel for further movement.
- Monitor the beam connections to the original pier beams at piers 1 and 39 for further cracking.
- Monitor notches and cuts in inboard flange and gusset plate at west U1L2, span 31 for cracks or signs of distress. Consider strengthening member if further distress is noted.
- Monitor collision damage to west U1L2 in span 6, west U1L0 in spans 7 and 37, and east U1L0 in spans 14 and 39 for distress.
- Monitor pack rust and section loss in truss web members and end posts at railing connections.
- Monitor spalls and corroding reinforcing steel in soffit for further deterioration.
- Monitor the lower chord gusset plates over the bearings for the development of horizontal cracks.
- Monitor cracks at floor beam copes for growth and further deterioration.
- Monitor the horizontal cracks in the web of the end floor beams at span 6 in floor beam 0, span 11 in floor beam 5, and span 20 in floor beam 0.
- Monitor fatigue prone stitch welds of angle strengthening at floor beam 0, span 2 for cracking.
- Monitor corrosion holes through the floor bracing system gusset plates for the development of cracks.
- Monitor the 1/4-inch bow in west U1U2 due to collision damage for further distress and development of cracks.
- Monitor bowed gusset plates near bearings for distress.
- Monitor section loss of the inboard lower chord at the floor system bracing connections, splices, and adjacent to stay/batten plates.
- Monitor bullet strike damage to east truss span 4 members/gusset plates for crack development.
- Monitor the cracking/spall of the east column capital, pier 3 for conditions which would undermine the bearing.
- Monitor the expansion bearing pins for signs of additional wear or distress.

In addition to these recommendations, it is recommended that this structure remains on a 12-month Routine/Fracture Critical Inspection Frequency and a 12-month Other Special Inspection Frequency.

We thank you for the opportunity to provide our engineering services. Please contact me if you have any questions or comments.

Sincerely,

BURGESS & NIPLE, INC.

Brendan J. Prendeville, PE
Team Leader
Attachments

SIGNIFICANT FINDINGS are as follows:

NBI Item 36 – Traffic Safety (5 = Fair condition)

- **PX** – Collision damage exists to the concrete railing in spans 1 and 40. One section of the east bottom rail has been severed in span 1 **(photo 5)**. The concrete post at the north abutment for the east rail is spalled and is severed from the base **(photo 6)**. The adjacent post has spalling with exposed reinforcing steel. Four of the concrete posts for the west rail in span 40 are leaning outward and the deck is cracked on the outside edge of the posts.
- Pack rust is typical between the metal bridge railing and the truss end posts and web members. No significant section loss was noted to the railing.
- Small cracks exist in the railing where the flange and web have been coped around the end post. Collision damage has caused minor bends in the steel railing at numerous locations. These conditions have not significantly affected the strength of the railing.
- None of the traffic safety items meet current standards for a non-National Highway System roadway.

NBI Item 58 – Deck (5 = Fair condition)

Driving Surface – (5 = Fair condition)

- **PX** – The asphalt wearing surface has unsealed longitudinal and transverse cracks throughout the spans **(photo 7)**. Raveling and patching of the asphalt pavement exists along the outside wheel lines at isolated locations **(photo 8)**. The aging wearing surface does not effectively shed drainage, allowing the drainage to infiltrate cracks in the deck.
- The deck appears to be growing from the center of each truss span as evidenced by the distress in the floor system at the end floor beams (cracking and web rotation of the floor beams, cracks in the stringer connection angles, and broken rivet heads at the stringer connection angles). These conditions were observed in nearly all of the truss spans.
- Evidence of significant approach pavement growth was noted at the deck/abutment backwall interface**.** The deck at the abutment seats has pushed towards the channel up to 3 inches.
- Deterioration of the curbs and edges of the deck are typical throughout the bridge **(photo 9)**. These conditions are promoted by deck drainage held against the concrete by the porous asphalt wearing surface. Spalls in the curb have been patched at isolated locations throughout the deck.

Soffit – (5 = Fair condition)

- **FX** – Spalls exposing corroded reinforcing steel are common in the underside of the deck along the edge of the deck and floor beams **(photos 10 through 13)**. The spalls appear to be the result of deck drainage leaking through cracks in the deck.
- The deck is lifting from the exterior stringers and end floor beams due to pack rust on the top flange **(photos 13 and 14)**. A transverse crack is common in the underside of the deck between 4 and 6 feet from the expansion joints because of the lifting deck. This lifting of the deck is beginning to produce a ramping effect for traffic over each floor beam.

- The underside of the deck exhibits transverse cracks with light efflorescence and discolored concrete **(photo 15)**. Full depth patches exist adjacent to many of the joints and along the east curb at isolated locations. At a few locations, the timber formwork remains in place. A deck repair utilizing timber boards occurs on the south face of floor beam 3 between stringers 4 and 5 in span 34.

Joints – (4 = Poor condition)

- **PX** – Joint headers consisting of elastomeric concrete were installed to maintain a joint opening with the asphalt wearing surface. These headers are only as deep as the asphalt wearing surface and exhibit past patching using asphalt, concrete and elastomeric concrete. Spalling of the headers was observed along the joints at piers 1, 2, 13, 27, 33, 35, and 39 **(photos 16 and 17)**. Several of these spalls have occurred since the 2016 inspection when the joint headers were patched with asphalt concrete.
- **PX** – The poured seal joints typically are deteriorated or missing and show evidence of leaking **(photos 16 through 19)**. The poured seal was never installed at many of the repaired header locations, leaving only the form board to fill the joint. Spalling of the underside of the deck at the expansion joints is common and a direct result of the leaking joints.
- The joints are typically closed near the ends of the bridge as a result of approach pavement growth **(photo 20)**. The joints above the expansion bearings further from the ends of the bridge are not closed, though many of the truss expansion bearings are at or near their limits of movement. Joints over the fixed bearings typically are closed.
- The void between floor beam 5, span 20, and floor beam 0, span 21, over pier 20 has been filled with asphalt from the top of the floor beam bottom flanges to the underside of the deck **(photo 21)**. The asphalt retains moisture which accelerates corrosion and section loss on the floor beams.
- Joint armor and supports at pier 1 are heavily twisted. This is caused by pavement pressure and pack rust.
- Several of the fixed joints have been paved over with a transverse crack observed over the joint.

NBI Item 59 – Superstructure (4 = Poor condition)

Fracture Critical Member Rating Summary	
Floor Beams	4 = Poor condition
Pier Beams	4 = Poor condition
Truss Lower Chord	5 = Fair condition
Truss Web Members	5 = Fair condition

Steel Beams – (5 = Fair condition)

- **FX** – The connection angles for the beams to pier beam 39 are deformed due to the apparent approach pavement growth and pier beam rotation and sweep. The beams are still supported by the original pier beams at piers 1 and 39; however, the added pier beam will support the beams should the connection angles fail.
- The elastomeric bearing pads between the beams and the additional pier beam are missing beneath beams 1 through 4 at pier 1 and beams 1 through 3 at pier 39 **(photo 22)**. The bearing pad beneath beam 5 at the pier beam at pier 39 has moved but is still supporting the beam**.**
- Surface corrosion exists along the top flanges of exterior beams and on the end 1-3 feet of the beams.

Stringers – (4 = Poor condition)

- **PX** – Significant section loss, including corrosion holes, exists through the exterior stringer webs at the end floor beams at 59 locations with 3 locations added and 5 with noted change (see **Appendix D** for locations and sizes) **(photos 23 through 29)**. Multiple corrosion holes exist through the web adjacent to the connection angle. Section loss was noted at stringers 1 and 5 with a higher concentration (82%) noted at the end floor beams due to deck drainage passing through the joints. Stringer 5 has the majority of the loss locations (68%) compared to stringer 1 (32%). Numerous through holes also have cracks extending from the holes due to very thin remaining web thickness adjacent to the holes. Exceptionally severe section loss was observed in the following locations in which strengthening the stringer webs is recommended:
  - Web of stringer 5 at the south face of floor beam 5 in span 15 **(photo 23)**
  - Web of stringer 5 at the north face of floor beam 0 in span 16 **(photo 24)**
  - Web of stringer 5 at the south face of floor beam 5 in span 21 **(photo 25)**
  - Web of stringer 5 at the north face of floor beam 0 of span 24 **(photo 26)**
  - Web of stringer 5 at the south face of floor beam 5 of span 31 **(photo 27)**
  - Web of stringer 5 at the north face of floor beam 0 in span 36 **(photo 28)**
  - Web of stringer 5 at the north face of floor beam 0 in span 38 **(photo 29)**
- **PX** – Cracks were observed in the web of numerous stringers at the top flange cope **(photos 30 through 34)**. There are a total of 98 locations (see **Appendix A**) and 36 locations where cracks extend from section loss (see **Appendix D**). Three new cracks and one crack with growth were noted during the 2018 inspection. The cracks range in length from 1/8 inch to 2 1/2 inches. The cracks are well distributed throughout the truss spans with only two spans (spans 22 and 24) having no cracks observed. All but two cracks exist in the exterior stringers (66 at stringer 1 and 31 at stringer 5). A definitive cause for the cracks could not be determined during the inspection; however, differential movements between the deck and floor beam during flexure of the floor beams is a likely cause. The end floor beams no longer exhibit visible deflection during passage of truck loads due to the presence of the stiff leg repairs.
- **PX** – Cracks were observed in 61 stringer connection angles (see **Appendix B** for locations and lengths) **(photos 35 through 38)**. One new crack was found, and 4 cracks with

growth were noted during the 2018 inspection. The connection angle cracks were at the end floor beams (33 at floor beam 0 and 28 at floor beam 5). Cracks range from 1 1/4 inches to 7 inches in length with an average length of 3 1/2 inches. The cracks occur at the odd numbered piers where the expansion bearings/joints exist. More cracked connection angles were observed in the north half of the bridge and all but 3 cracked connection angles exist at the interior stringers (stringers 2, 3 and 4). Floor beam 0 has the highest concentration of cracks in stringers 2 and 3 (78%) and floor beam 5 has the highest concentration of cracks in stringers 3 and 4 (85%), suggesting that the cracks are related to the direction of traffic approaching the floor beam. The vertical cracks start at the top of the connection angle, propagating down through the angle leg adjacent to the floor beam web at the fillet. These cracks typically have a horizontal offset as if the floor beam web is being pushed away from the stringer.

- **PX** – A total of 121 broken rivets at 92 stringer connections (see **Appendix C** for locations and number of rivets) **(photos 36, 39 and 40)**. A total of 41 rivets were no longer considered to be in the shear plane between the floor beam web and the connection angle. One location is new for 2018. 32 connections were noted to have 2 rivet heads missing (A total of 8 rivets in single shear exist between the connection angles and floor beam web). The broken rivets are between the connection angle and the floor beam web and at the top rivet of the connection angle. The number of broken rivets are highest at the end floor beams and become less progressive for each floor beam further away from the end of each span (only two rivets broken at floor beam 3 for the entire bridge). The number of broken rivets are greatest at stringers 2 and 3 for floor beams 0, 1 and 2 (all but one head broken on the north face) and stringers 3 and 4 for floor beams 4 and 5 (all heads broken on the north face). These conditions appear to be the result of live load induced stringer end rotation causing the rivet shank to fatigue at the head.

[FCM] Floor Beams – (4 = Poor condition)

- **PX** – Active section loss is common in the end floor beams and the floor beams at the east truss connection. Corrosion holes were observed through the web of the floor beams at 57 locations (see **Appendix F** for locations and dimensions) **(photos 41 through 43)**. Several areas have cracks that extend from the corrosion holes in the copes due to very thin remaining section.
- **FX** – Cracks were observed in the web of the end floor beams between the top flange and the truss connection angle (see **Appendix G** for locations and lengths) **(photos 44 and 45)**. Horizontal cracks ranging from 5/8 inch to 9 3/16 inches in length were noted at 71 locations. The cracks are nearly evenly distributed between east and west truss locations and between floor beams 0 and 5. The cracks in floor beam 0 were 42% larger than those in floor beam 5 and the cracks at the east truss were 73% larger than those at the west truss. Several of these cracks have a horizontal offset between the faces of the crack with the top flange being pushed towards the joint. The cracks exist in every span except span 28 and most commonly occur over the odd number piers where the expansion bearings exist. New growth in existing cracks was noted at four locations ranging from 1/16-inch to 1/8-inch growth. One new crack measuring 1 1/8-inch in

length was found in floor beam 1, span 9 during this inspection. This new crack has self-arrested into a corrosion hole.

- **FX** – Cracks were observed in the web cope at the truss connection of the intermediate floor beams at 39 locations and range in size from 1/8 inch to 1 1/2 inches long with an average length of 7/16 inch (see **Appendix G** for locations and lengths) **(photo 46)**. The cracks have slightly higher occurrence at floor beams 1 and 4 than floor beams 2 and 3. Section loss at the cope appears to contribute to the cracking.
- **FX** – Longitudinal cracks were noted in the floor beam web above the stiff leg repairs at:
  - Span 6, floor beam 0 – 7 1/4-inch long crack **(photo 47)**
  - Span 11, floor beam 5 – 29 1/2-inch long crack including a 6-inch by 1 1/2-inch corrosion hole **(photo 48)**
  - Span 20, floor beam 0 – 14 1/2-inch long crack exists near the stiff leg repair **(photo 49)**
- **FX** – Floor beam 0 of span 2 has been strengthened using an angle stitch welded to the web and bottom flange. This condition creates a category E fatigue prone detail at the termination of the welds at the end of the member. No signs of cracking or distress were observed at these locations.
- **Member Alignment** – The end floor beams for the truss spans exhibit a sweep of the bottom flange away from the joint at the majority of the piers (see **Appendix E** for locations and dimensions). Stiff leg repairs have been installed at all end floor beams to mitigate the sweep. The bottom flange sweep ranges from 1/4 inch to 7/8 inch. The floor beam top flange is bent towards the joint causing the bottom flange to have a sweep in the opposite direction. It could not be determined if the floor beam distortion is caused by the deck expanding against the top flanges of the floor beam or pack rust developing between the deck and the joint armor pushing down and eccentrically on the floor beam top flange.
- The stiff leg shim plate under floor beam 5, span 26 at pier 26 is rotating out from under the floor beam bottom flange. Floor beam 0, span 8 at pier 7 impacts the stiff leg under truck loads. The stiff leg repairs are intended to catch the floor beam should it fail and do not need to be in contact with the floor beam.
- Pack rust exists between the floor beam bottom flange and the lower lateral bracing gusset plates causing section loss to the floor beam. This loss occurs at a location of low stress and does not significantly affect the load carrying capacity of the member.

[FCM] Pier Beams – (4 = Poor condition)

- **PX** – **Member Alignment** – The pier beams at piers 1 and 39 have been retrofitted with a supplemental pier beam due to severe sweep and rotation as a result of approach pavement growth **(photo 50)**. Longitudinal forces act through the deck to distort the pier beam. Most of the elastomeric pads between the supplemental pier beam and the beam bottom flange are missing, allowing the original pier beam to still carry the beam reactions. The supplemental pier beam currently acts as a catcher beam to support the beams should the original pier beam fail. No signs of distress from vehicular live loads were observed in either the original pier beam or the supplemental pier beam.

- The lower portion of the supplemental pier beam at pier 1 is rolled approximately 3 degrees to the south, and upper section is rolled approximately 1 degree south. Pier beam 39 is rolled approximately 1 degree over the lower portion of the web. This is likely an as-built condition and does not significantly affect the load carrying capacity of the supplemental pier beam.
- The bottom flange of the original pier beam at pier 1 is in contact with the stiff leg at pier 1. During higher temperatures they are in contact with each other, resulting in 1/16-inch wear on the north face of the original pier beam **(photo 51).**

Floor System Bracing – (5 = Fair condition)

- **FX** – Corrosion holes were observed at numerous lower lateral bracing gusset plates **(photo 52)**. The corrosion holes typically are less than 4 inches in diameter and occur adjacent to the interface with the floor beam bottom flange, though some of the holes are up to 14 inches long adjacent to the inboard flange of the lower chord. The corrosion holes do not significantly affect the functionality of the bracing. Up to 1/2-inch thick pack rust with adjacent pitting is also common at the floor system bracing gusset plates.
- Many hanger rods which support the floor system bracing near their mid-lengths are broken due to repetitive loading/vibration. The missing rods allow the lower lateral bracing to oscillate under live loads.

Truss Upper Chord – (5 = Fair condition)

- **PX/FX** – **Member Alignment** – Vehicular collision damage was observed at numerous locations in the upper chord:
  - **PX** – Impact damage resulting in multiple sheared rivets for the bottom lacing bars exists at east U3U4, span 9 and west U1U2, span 31 **(photos 53 and 54)**. No signs of local buckling were observed at this location.
  - **FX** – West U1U2 in span 37 is bowed globally to the east 1/4 inch. This damage does not significantly affect the load carrying capacity of the member and appears to be the result of vehicular collision. Multiple rivet heads are also sheared away on the stay plate and lacing bars along the inboard bottom flange.
  - Five failed lacing bars exist on the underside of east U3U4, span 9.
  - Impact damage exists on the inboard flanges of the upper chord at several additional locations. The damage does not significantly affect the load carrying capacity of the members.
- Outboard gusset plate at east U3, span 13 is bowed locally approximately 1/8 inch between the upper chord and the diagonal**.**

[FCM] Truss Lower Chord – (5 = Fair condition)

- **PX** – Corrosion of the lower chord is common at the floor beam/floor system bracing gusset plate connection. The corrosion has caused section loss of less than 1/4-inch to the inboard channel top flange. Corrosion also occurs around the inboard splice plates at L2 and L3 under the floor beams. The corrosion and resulting section loss is due to deck drainage passing through the deck joints above the interior floor beams and expansion

joints. Several areas of the lower chord have corrosion holes through the inboard bottom flange of the channels **(photo 55).** Corrosion is typically heavier at the east truss.

- **PX** – Corrosion is common around the inboard splice plates at L2 and L3 and appears to be the result of deck drainage splashing over the edge of the deck **(photo 56)**. Pack rust is developing at the bottom flange splice; however, no significant distress was observed in the web splice plates. Pack rust and corrosion are significantly less on the west truss.
- **FX** – Horizontal cracks were observed in the inboard truss gusset plate between the bearing pin and the end floor beam (see **Appendix H** for locations and sizes of cracks). All ten locations have been strengthened with the addition of a welded steel angle on the inboard face **(photo 57).** The distortion and cracks are a result of section loss and pack rust occurring between the gusset plate and the top edge of the lower chord channel. The crack is within the horizontal shear plane between the end post and the lower chord. Numerous locations exist where the gusset plate exhibits paint cracks indicating eminent development of cracks **(photo 58)**.
- **FX** – Lower chord gusset plates are typically bowed at L0 and L5 due to pack rust **(photo 59)**. The inboard gusset plate is bowed up to 1 inch between the end post and the lower chord with the outboard gusset plates typically bowed less than the inboard. The end of the end post is in contact or near contact with the top of the lower chord making the likelihood of a buckling failure remote. Section loss of the gusset plate is up to 50% of the plate thickness (gusset plate is 3/8 inch thick) and occurs at multiple locations. This loss affects the horizontal shear capacity of the gusset plate.
- Section loss up to 3/8 inch deep is common on the channel webs at the bearings**.** The channels are developed into the truss gusset plates at the location of the loss and the loss does not significantly affect the load carrying capacity of the truss.
- Pack rust exists between the channels of the lower chord and the stay and batten plates. The corrosion has produced 1/8-inch deep section loss of the channel web for the lower chord beneath the stay and batten plates. The localized loss does not significantly affect the load carrying capacity of the member.
- Wear is evident in the truss pins and/or pin plates at panel points L0 and L5. Up to 3/16-inch gaps were noted between the bottom of the pin and the pin hole at many end panel points **(photo 60)**. This is normal wear due to the repeated rotations that the end bearings experience due to live load deflection.

[FCM] Truss Web Members – (5 = Fair condition)

- **PX/FX** – **Member Alignment** – Vehicular collision damage was observed at numerous locations on the above deck truss members. The following are the most significant:
  - **PX** – Span 37, west U1L1 – U1L1 carries the floor beam reaction only. Two sheared rivet heads exist at the inboard gusset plate at U1 **(photo 61)**. The shank still exists through the rivet hole of the gusset plate and there is no sign of movement or distress from loading.
  - **FX** – Span 6, west U1L2 – Inboard flange bent inward 2 1/8 inch near U1.
  - **FX** – Span 31, west U1L2 – Inboard flange has a tear near U1 resulting in an approximate 50% loss of the flange **(photo 54)**. The adjacent gusset plate has two tears measuring 1 7/8 inches deep at the upper chord and 1-inch deep at

connection to U1L2. The 1 7/8-inch deep tear occurs in the shear plane between the diagonals and upper chord and will affect the shear strength of the gusset plate. The 1-inch deep tear occurs near the corner of the gusset plate and does not significantly affect the capacity of the gusset plate. The gusset plate is also bowed approximately 2 inches to the west due to the collision damage. This has not changed since the previous inspection.

- **FX** – Span 37, west U1 gusset plate – A 5/16-inch long crack exists in the bottom edge of the inboard gusset plate between U1L1 and U1L2 near U1L2 **(photo 61)**.
- **FX** – Span 37, west U1L2 – Inboard bottom flange is bent 1-inch near U1.

- **FX** – Pack rust developing under the corner of the upper chord gusset plates has caused cracks to develop in the edge of the gusset plate at east U4 in spans 32 and 37 **(photos 62 and 63)**. The cracks exist near the first row of rivets, reducing the capacity of the gusset plate for U4L3.
- **FX** –Bullet strike damage exists at the outboard gusset plate between east U2L3 and L2U3 in span 4. This condition does not significantly affect the connection's capacity.
- Slight bows of 1/8-inch are typical in the horizontal edges of the U1, L2 and L3 gusset plates. This appears to be an as-built condition as the verticals are approximately 9 7/8 inches deep and the diagonals are 10 inches deep with no fill plates utilized at the panel point connections.
- Pack rust 1/4-inch thick is common between the diagonals and the mid gusset plates with minimal section loss. Isolated locations exhibited pack rust up to 1 inch thick with 1/8-inch deep section loss. Similar conditions exist at the bridge railing connections to the truss web members.

Truss End Posts – (5 = Fair condition)

- **PX** – Pack rust is common at the end post connection to the inboard gusset plate at the lower chord connection **(photo 64)**. Deck drainage which splashes over the curb travels down the end post promoting corrosion.
- **FX** – Pack rust is forming at many of the bridge railing to inboard end post channel connections. Up to 3/4-inch section loss was noted along the full height of the inboard channel webs.
- **FX** – Vehicular collision damage exists at numerous locations. The following are the most significant:
  - Span 7, west U1L0 – Bent inboard channel bottom flange and edge damage to top cover plate at U1**.**
  - Span 14, east U1L0 – Top inboard flange is bent down approximately 4 inches, and 5 rivet heads are sheared off **(photo 65)**.
  - Span 37, west U1L0 – Three lacing bars are detached on the bottom face and the member is also bowed globally 1/4-inch to the west. The inboard bottom flange is bowed west 5/8 inch and up 2 3/4 inch, and is torn 1 3/8 inches wide over 4 1/4 inches in length at top railing.
  - Span 39, east U1L0 – Inboard flange bent down approximately 2 inches near U1.

  This damage does not significantly affect the load carrying capacity of the end posts.

Paint/Coating System – (4 = Poor condition)

- **PX** – Corrosion and significant section loss are occurring at many locations on the lower chord, floor beams and stringers due to deck drainage passing through joints. Widespread section loss and corrosion holes exist in the exterior stringers and end floor beams **(photos 34 through 40)**.
- Minor to moderate pack rust and minor section loss at the gusset plate seams are common on the above deck truss members with weathered and chalking paint throughout.

Load Deflection – (6 = Satisfactory condition)

- Slight deflections of the end floor beams were observed during passage of truck loads.
- The global live load response is adequate.

NBI Item 60 – Substructure (5 = Fair condition)

Abutments – (6 = Satisfactory condition)

- No significant deficiencies were noted in the abutments, except for moderate debris on the bearing seats of both abutments and map cracking exposing a few reinforcing bars at the ends of the south abutment.

Piers – (5 = Fair condition)

- **FX** – A 7/8-inch wide crack exists in the capital of the east column of pier 3 which is emanating from the span 2 bearing anchor bolt **(photo 66)**. The crack has led to a large portion of the column capital shifting to the south approximately 1 inch. The truss bearing appears to be adequately supported and brackets have been added to stabilize the capital. A definitive cause of the crack could not be determined during the inspection.
- Map cracking with efflorescence and delaminations are common throughout many of the piers. It could not be determined if the cracks in the pier columns are the result of Alkali-Silica Reactivity.
- Vertical and horizontal cracks which mirror the reinforcing steel exist in the web walls at several locations. Spalls exposing reinforcing steel exist in the face and corners of the web walls due to inadequate cover. The cracks and spalls are most prevalent on the south face of the piers and do not affect the load carrying capacity.
- Shallow spalls due to gunshot damage are typical on the columns and web walls of piers 1 through 8.
- The top one to five feet of the pier column foundation are exposed at many piers, generally in the floodplain north of the river and on some piers in the south floodplain. This may be indicative of general scour of the sandy soils and/or may be an as-built condition.

Bearings – (5 = Fair condition)

- **PX** – Elastomeric pads are missing at the supplemental pier beams under beams 1 through 4 at pier 1 and at beams 2 and 3 at pier 39 with heavy pack rust forming at beam 5, pier 1 **(photo 22)**. The bearings appear to be walking from beneath the beams at pier 39 under beams 4 and 5. This condition limits the supplemental pier beams to act only as a catcher beam, available to carry the beams should the original pier beam fail.
- **FX** – Wear causing grooving in the expansion bearing pins and enlarging of the pin hole in the connecting gusset plates are common throughout the spans **(photo 60)**. The wear is a result of bearing rotation under live loads. This condition is most severe at L0 span 38 over pier 37, which has 3/16-inch total wear to the pin and gusset plate.
- Heavy pack rust with minor associated pitting is widespread on and between the bearing components, more so at the expansion bearings. Much of this deterioration is caused by debris accumulating on and around the bearing seats.
- Expansion bearings are rotated up to 3/4-inch towards the joint with pack rust filling the gap between the masonry plate and sole plate. The expansion bearings are generally centered on the masonry plate with no signs of recent movement observed, though many are in or near full expansion. The bronze sliding plate has slid slightly towards the center of the truss span and is fractured into pieces at a few locations **(photo 67)**. One bronze sliding plate has slid to the north 3 inches under the west truss at pier 5 in span 6. It is speculated that the bearings became frozen, and then rotated in expansion during warm weather, allowing pack rust to incrementally fill the gap between the plates.
- Exterior beams at both abutments have sheared anchor bolts at the bearings (the interior beam anchor bolts do not extend into the abutment seat concrete) **(photo 68)**. This most likely is a result of pavement pressure from the approach roadway pushing the bridge deck; up to 2 inches of movement to the north was noted at the south abutment. The beam bearings at the north abutment are pushed to the south up to 4 inches, also due to pavement pressure.
- Approximately 25-percent of the anchor bolts are broken or have corroded through within the slotted holes of the truss expansion bearing assemblies **(photo 69)**. This condition is more common at the expansion bearings. The remaining anchor bolts should be capable of resisting lateral forces on the truss spans. The anchor bolts are failing due to a combination of shear, pack rust-induced tension, and corrosion.

NBI Item 61 – Channel and Channel Protection (5 = Bank Eroded condition)

Flowline Stability – (5 = Fair condition)

- **PX** – The channel has moved north and is now flowing under span 11 **(photo 70)**. The channel was flowing under span 10 during the May 2018 inspection. Flowline measurements could not be taken due to high flow during the inspection. The flowline measurement taken during the 2016 fracture critical inspection was 29.7 feet taken at west L4, span 10. This measurement had noted a 2.4-foot degradation from the 2015 fracture critical inspection.

Channel Bank Damage – (5 = Fair condition)

- **FX** – The channel is moving north causing slumping of the north bank **(photo 71)**.

Debris – (6 = Satisfactory condition)

- Drift consisting of large trees exists on the west flood plain under and around spans 5 through 10. This does not significantly affect the high water flow characteristics under the bridge.

Vegetation – (6 = Satisfactory condition)

- The banks are well vegetated north of pier 11 with large trees and vegetation in the floodplain. The floodplain south of pier 10 contains sparse vegetation.

NBI Item 72 – Approach (5 = Fair condition)

Approach Roadway Condition – (5 = Fair condition)

- **PX** – A patch area and pothole exists in the northbound lane approximately 50 feet south of the bridge **(photo 72)**. These conditions create a rough riding surface for traffic approaching the bridge.
- **FX** – The concrete approach roadway is overlaid with asphalt which has unsealed joints and cracks. Obvious signs of pavement growth were observed at both abutments. This has caused longitudinal movement of the approach spans resulting in the severe sweep and rotation in the pier beams at piers 1 and 39.

Approach Roadway Settlement – (6 = Satisfactory condition)

- No significant settlement was observed.

NBI Item 113 – Scour Rating (7 = Countermeasures Installed) No change to scour rating is recommended.

- Local scour was observed around piers 5 through 10, and pier 23. Column footings were exposed up to 4 1/2 feet.
- Riprap has been installed around the north abutment and a drift fence consisting of tripods fabricated from railroad rails and cable exists northwest of pier 38.

Truss/FC Bridge Rating Form

Division	4	County	Canadian
NBI #	04085	Structure #	092 0000 X
Route	U.S. 281	Feature	South Canadian River

NBI Item #	2018	2017
36 - Traffic Safety	5	5
58 - Deck	5	5
a. Driving Surface	5	5
b. Soffit	5	5
c. Joints	4	4
59 - Superstructure*	4	4
a. Beams	5	5
b. Stringers**	4	4
c. Floor Beams **(FCM)**	4	4
d. Pier Beams **(FCM)**	4	4
e. Floor Bracing System	5	5
f. Truss Upper Chord***	5	5
g. Truss Lower Chord*** **(FCM)**	5	5
h. Truss Web Members **(FCM)**	5	5
i. Truss End Posts	5	5
j. Truss Bracing	N/A	N/A
k. Paint/Coating	4	4
l. Load Deflection	6	6
60 - Substructure****	5	5
a. Abutments	6	6
b. Piers	5	5
c. Bearings	5	5
61 - Channel/Channel Protection	5	5
a. Flowline Stability (formerly Channel Scou	5	5
b. Channel Bank Damage (new element)	5	5
c. Debris	6	6
d. Vegetation	6	6
Approach Roadway	5	5
a. Approach Roadway Condition	5	5
b. Approach Roadway Settlement	6	6
113 - Scour	7	7

Rating	Description (For 36, 58, 59, 60, 72)
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - no problems noted.
7	GOOD CONDITION - some minor problems.
6	SATISFACTORY CONDITION - structural elements show some minor deterioration
5 (FX,PX)	FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
4 (PX)	POOR CONDITION - advanced section loss, deterioration, spalling or scour.
3 (PX,CX)	SERIOUS CONDITION - loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2 (CX)	CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1 (CX)	IMMINENT FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	FAILED CONDITION - out of service - beyond corrective action.

* - Members with fatigue cracks in compression zones (top flange stringer copes, clip angles, etc.) are to be coded as a 5 unless the crack turns toward a tension zone, then code 3.

* - Members with fatigue cracks in tension zones (cover plate ends, etc.) are to be coded as a 3.

** - Includes connection angles.

*** - Includes gusset plates. Missing rivets in connections are coded as a 3.

**** - Elements with superficial cracking are coded as 6, spalls with exposed rebar 5, spalls with exposed rebar with section loss 4.

Rating	Description (For 61)
N	NOT APPLICABLE
9	There are no noticeable or noteworthy deficiencies which affect thecondition of the channel.
8	Banks are protected or well vegetated. River control devices such as spur dikes and embankment protection are not required or are in a stable condition.
7	Bank protection is in need of minor repairs. River control devices and embankment protection have a little minor damage. Banks and/or channel have minor amounts of drift.
6	Bank is beginning to slump. River control devices and embankment protection have widespread minor damage. There is minor stream bed movement evident. Debris is restricting the channel slightly.
5	Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	Bank and embankment protection is severely undermined. River control devices have severe damage. Large deposits of debris are in the channel.
3	Bank protection has failed. River control devices have been destroyed. Stream bed aggradation, degradation or lateral movement has changed the channel to now threaten the bridge and/or approach roadway.
2	The channel has changed to the extent the bridge is near a state ofcollapse.
1	Bridge closed because of channel failure. Corrective action may putback in light service.
0	Bridge closed because of channel failure. Replacement necessary.

Rating	Description (For 113)
N	Bridge not over waterway
U	Unknown foundation that has not been evaluated for scour.
9	Foundations (including piles) on dry land well above floor water elevations.
8	Foundations determined to be stable for assessed or calculated scour conditions; Calculated scour above top of footing.
7	Countermeasures installed to correct previous scour problems.
6	Scour calculations not made
5	Foundations determined to be stable for calculated scour conditions; Calculated scour within limits of footing/piles.
4	Foundations determined to be stable for calculated scour conditions; Field review notes action is required.
3	Foundations determined to be unstable for calculated scour conditions; Scour within/below limits of footing/piles.
2	Field review indiates scour has occurred at foundations; Immediate action is required.
1	Field review indicates failure of foundations is imminent; Bridge closed to traffic.
0	Bridge has failed and is closed to traffic.

Scour Critical

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 1 - Looking south at the bridge end view.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
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Photograph 2 - Looking northwest at the bridge elevation.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 3 - Looking north at the 15-ton load posting sign in the south approach.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 4 - Looking south at the 15-ton load posting sign in the north approach.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 5 - Looking northeast at the east bridge rail in span 1. Note: bottom concrete rail is missing and top concrete rail is fractured in the first panel.

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04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 6 - Looking south at the east bridge rail in span 40. Note: concrete rail post at the north abutment is severed at the base.

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04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 7 - Looking north at the deck from span 36. Note: longitudinal and transverse cracks, spalls along centerline, and scaling in outside wheel line.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 8 - Looking south at the deck in span 38. Note: patches and raveling of the asphalt along the outside wheel line.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 9 - Looking northeast at the edge of the deck near west L5, span 18. Note: cracking and scaling of the concrete near the top of the deck.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 10 - Looking north along the east soffit overhang in span 8, between floor beams 1 and 2. Note: spalling of the deck underside. Pack rust on the stringer 5 top flange is lifting the deck.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 11 - Looking north at the underside of the deck from floor beam 1, span 26, between stringers 4 and 5. Note: spall with exposed reinforcing steel and corrosion on the exterior stringer.

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04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 12 - Looking up the underside of the deck adjacent to floor beam 2 and stringer 5, span 30. Note: spall with exposed reinforcing steel. Galloping bars are used in the deck.

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04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 13 - Looking east at the underside of the deck adjacent to floor beam 2 and stringer 5 in span 37. Note: spall with exposed corroding reinforcing steel. Pack rust is lifting the deck from the floor system.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 14 - Looking west at stringer 5 near the north face of floor beam 3, span 3. Note: 1/2-inch wide gap between the stringer top flange and deck due to pack rust on the floor beam top flange.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
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Photograph 15 - Looking north at the underside of the deck in span 2, between floor beams 1 and 2 and stringers 1 and 3. Note: transverse cracks with light efflorescence and discolored concrete.

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Photograph 16 - Looking west along the expansion joint over pier 13. Note: spall and patches in joint header. Seal is missing/torn for the full length of the joint.

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04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 17 - Looking east along the expansion joint over pier 27. Note: spall and patches in joint header. Seal is missing/torn for the full length of the joint.

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04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 18 - Looking east along the expansion joint over pier 19. Note: seal is missing/torn for the full length of the joint.

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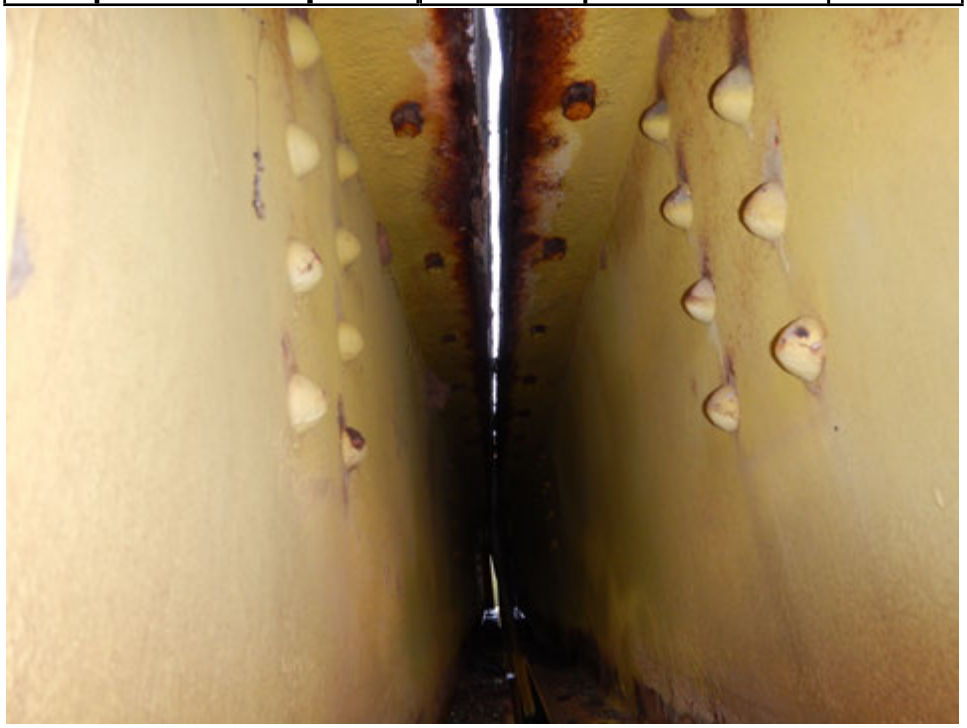
Photograph 19 - Looking west along the expansion joint over pier 7. Note: seal was not installed after patching.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018



Photograph 20 - Looking east at the underside of the expansion joint at pier 35. Note: joint is closed and seal is missing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 21 - Looking west at the underside of the floor beams above pier 20. Note: space between floor beams filled with asphalt. Fixed joint exists at this location.

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Photograph 22 - Looking northeast at beam 4, span 1 at pier 1. Note: elastomeric bearing pad between beam and supplemental pier beam is missing.

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04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 23 - Looking east at the stringer 5 connection to the south face of floor beam 5, span 15. Note: 1 1/4-inch diameter corrosion hole at the cope with adjacent 3/8-inch long crack below the hole. Corrosion hole measuring 2 inches vertical by 5 inches horizontal below connection angle.

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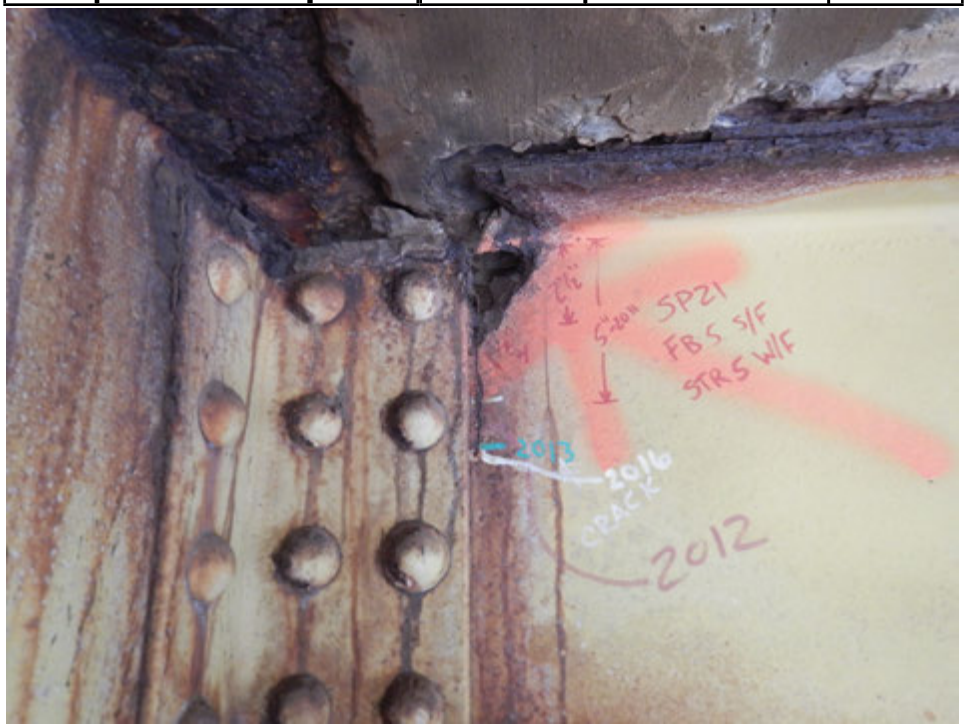
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 24 - Looking east at the stringer 5 connection to the north face of floor beam 0, span 16. Note: 5-inch vertical by 1 1/2-inch horizontal corrosion hole with adjacent 3/4-inch long crack below hole. Corrosion hole measuring 5 inches horizontal by 1 inch vertical along the bottom flange.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018



Photograph 25 - Looking east at stringer 5 connection to the south face of floor beam 5, span 21. Note: 2 1/2-inch vertical by 1 1/2-inch horizontal corrosion hole with adjacent 4 1/2-inch long crack below the hole.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
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Photograph 26 - Looking east at the stringer 5 connection to the north face of floor beam 0, span 24. Note: 1-inch and 3/4-inch diameter corrosion holes in the web adjacent to the conn. angle with 1/16 to 1/8-inch remaining thickness for the full height, 10 1/2-inch x 2-inch thru hole adjacent to bottom flange.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
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Photograph 27 - Looking east at the stringer 5 connection to the south face of floor beam 5, span 31. Note: Three corrosion holes with a 5-inch long crack and thinning of the web along the connection angle (approximately 75% web loss in stringer).

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 28 - Looking east at the stringer 5 connection to the north face of floor beam 0, span 36. Note: 2 1/2-inch vertical by 1 1/2-inch horizontal corrosion hole at the cope with adjacent 1 3/4-inch long crack and section loss along the connection angle (approximately 50% web loss in stringer).

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 29 - Looking west at the stringer 5 connection angle to the north face of floor beam 0, span 38. Note: 1-inch diameter corrosion hole with up to 1/4-inch deep section loss along the connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 30 - Looking east at the stringer 5 connection to the north face of floor beam 0, span 7. Note: 2 1/4-inch long crack in the stringer cope.

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Photograph 31 - Looking southwest at the stringer 5 connection to the north face of floor beam 4, span 8. Note: 7/8-inch long and 1 1/4-inch long cracks in the stringer cope.

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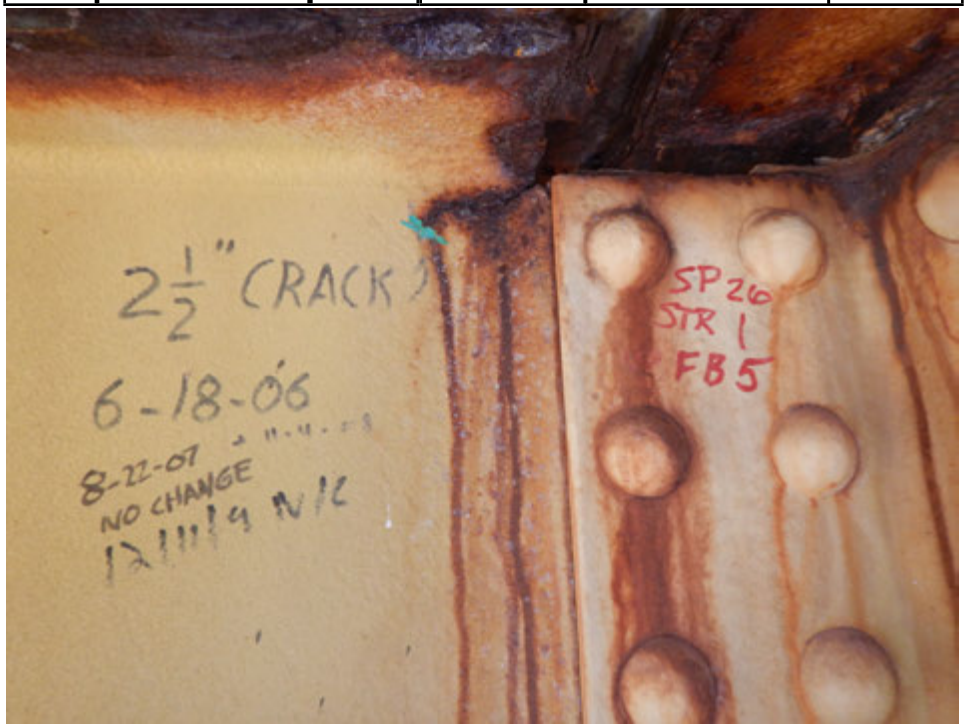
Photograph 32 - Looking northwest at the stringer 5 connection to the south face of floor beam 1, span 16. Note: 1 5/8-inch long crack in the stringer cope.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018



Photograph 33 - Looking west at the stringer 1 connection to the south face of floor beam 5, span 26.
Note: 2 1/2-inch long crack in the stringer cope.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
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Photograph 34 - Looking west at the stringer 1 connection to the north face of floor beam 2, span 32.
Note: 1/4-inch long crack in the stringer cope.

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Photograph 35 - Looking southeast at the stringer 2 connection to the north face of floor beam 0, span 2. Note: 3 1/4-inch long crack in the connection angle.

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Photograph 36 - Looking south at the stringer 2 connection to the north face of floor beam 0, span 12. Note: 3-inch long crack in the connection angle and missing rivet in the connection angle.

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Photograph 37 - Looking north at the stringer 4 connection to the south face of floor beam 5, span 17. Note: 4 1/2-inch long crack in the connection angle.

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Photograph 38 - Looking south at the stringer 3 connection to the north face of floor beam 0, span 30. Note: 4 5/8-inch long crack in the connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
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Photograph 39 - Looking south at stringer 4 east connection angle to the north face of floor beam 0, span 4. Note: 1 missing rivet head with the rivet shank no longer in the shear plane between the floor beam web and the connection angle.

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Photograph 40 - Looking south at stringer 3 east connection angle to the north face of floor beam 0, span 34. Note: 1 missing rivet head with the rivet shank no longer in the shear plane between the floor beam web and the connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
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Photograph 41 - Looking southeast at floor beam 0, between stringers 4 and 5, span 4. Note: Corrosion holes over a 14-inch horizontal by 1-inch vertical area of the floor beam web.

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Photograph 42 - Looking north at floor beam 4 at the east truss connection, span 16. Note: 3 1/2-inch vertical by 4 1/4-inch horizontal corrosion hole at the cope.

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Photograph 43 - Looking southwest at floor beam 0 between stringers 4 and 5, span 38. Note: four corrosion holes in web: 1 inch vertical by 5 inches horizontal, 1 inch vertical by 1 inch horizontal, 1 inch vertical by 1 1/2 inches horizontal, and 1 1/2 inches in diameter.

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Photograph 44 - Looking south at the floor beam 0 connection to the west truss, span 24. Note: 4 3/4-inch long horizontal crack in floor beam web between the top flange and the connection angle.

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Photograph 45 - Looking north at the floor beam 5 connection to the east truss, span 25. Note: 6 3/4-inch long horizontal crack in the floor beam web between the top flange and the connection angle.

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Photograph 46 - Looking south at the floor beam 1 connection to the east truss, span 14. Note: 7/16-inch long diagonal crack at the cope.

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Photograph 47 - Looking southeast at floor beam 0, span 6 above the stiff leg repair. Note: 7 1/4-inch long horizontal crack in the floor beam web near the bottom flange.

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Photograph 48 - Looking northeast at floor beam 5, span 11 above the stiff leg repair. Note: 29 1/2-inch long horizontal crack in the floor beam web near the bottom flange with a 6-inch by 1 1/2-inch corrosion hole. Slight offset exists in the web across the crack.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 49 - Looking southwest at floor beam 0, span 20 between stringers 3 and 4. Note: 14 1/2-inch long horizontal crack in the floor beam web near the bottom flange with multiple corrosion holes up to 1 inch high near the stiff leg repair.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 50 - Looking west at pier 1. Note: original pier beam is rotated north with a supplemental pier beam in place.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 51 - Looking east at the original pier beam above pier 1 at the stiff leg under floor beam 0 in span 2. Note: pier beam bottom flange has made contact with the stiff leg.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 52 - Looking west at the lower lateral bracing gusset plate adjacent to the south face of floor beam 3, span 5 and the east truss. Note: corrosion holes up to 2 1/2 inches in diameter through the lower lateral bracing gusset plate.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 53 - Looking southeast along east U3U4, span 9. Note: lacing bars on the underside of the upper chord are detached due to sheared rivets from collision damage.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 54 - Looking southwest at west U1, span 31. Note: sheared rivet heads for upper chord stay plate and lacing bars. Inboard flange of west U1L2 has a torn inboard flange near the U1 gusset plate.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 55 - Looking up at east L3, span 20. Note: corrosion hole through the inboard channel bottom flange of L2L3 adjacent to the splice plate.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 56 - Looking west at the lower chord splice at west L3, span 23. Note: heavy corrosion and loss to the lower chord and splice.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 57 - Looking west at the east L0 inboard gusset plate in span 2. Note: 17 5/8-inch long horizontal crack in the gusset plate.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 58 - Looking northwest at the east L0 inboard gusset plate in span 7. Note: horizontal paint crack in line with the top of the inboard channel for the lower chord.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 59 - Looking south at the inboard gusset plate for west L0, span 37. Note: gusset plate bowed inward 1/2 inch due to pack rust between the gusset plate and truss members.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 60 - Looking northeast at the inboard pin plate for the expansion bearing at west L0, span 38, panel point 0. Note: up to 1/8-inch deep wear to the pin and pin hole.

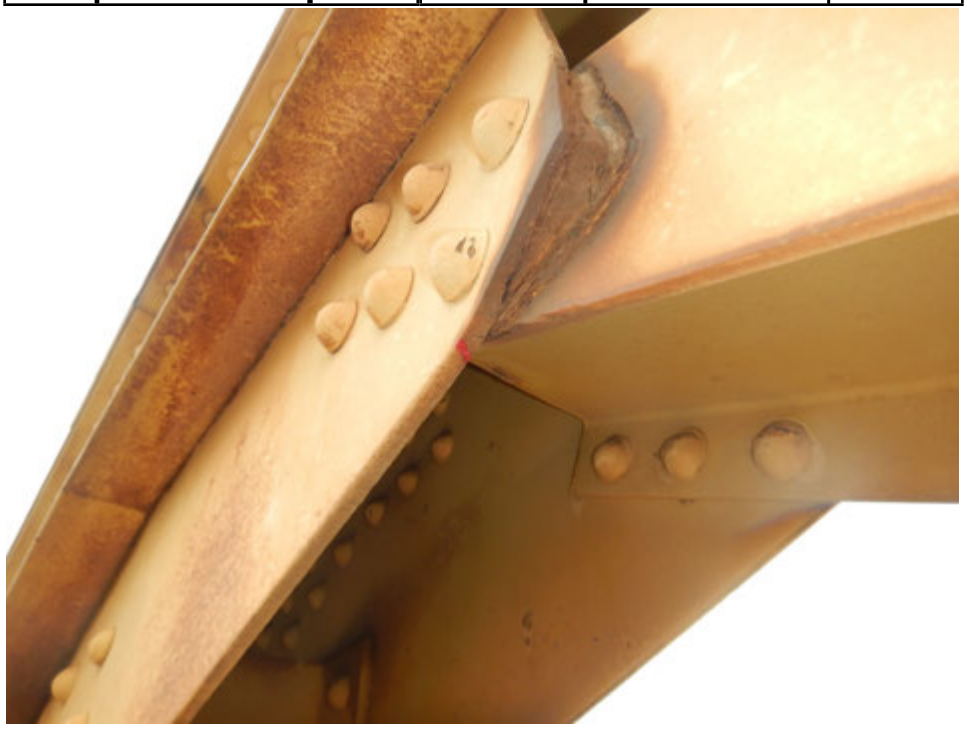
NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 61 - Looking southwest at the inboard gusset plate at west U1, span 37. Note: two sheared rivets at the connection for U1L1. A 5/16-inch long crack exists in the bottom edge of the gusset plate near the connection rivet for U1L2.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 62 - Looking northeast at the inboard gusset plate at east U4, span 32. Note: crack at the edge of the gusset plate near the connection rivet for U4L3. Pack rust exists between the gusset plate and U4L3.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018



Photograph 63 - Looking northeast at the inboard gusset plate for east U4, span 37. Note: crack at the edge of the gusset plate near the connection rivet for U4L3. Pack rust up to 1 inch thick exists between the gusset plate and U4L3.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 64 - Looking south along the outboard face of the lower chord at west L5, span 22. Note: pack rust up to 5/16 inch thick exists between the end post and the gusset plate.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 65 - Looking northeast at east U1L0, span 14. Note: collision damage to the end post has bent down the top inboard flange and top plate 4 inches and sheared 5 rivet heads.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 66 - Looking northwest at the capital of the east column of pier 3. Note: 7/8-inch wide crack emanating from the span 2 bearing anchor bolt. Steel angles have been added to stabilize the capital.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 67 - Looking east along the north edge of the west truss bearing for span 6 at pier 5. Note: the bronze sliding plate has slid north and is fractured.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 68 - Looking southwest at the beam 1 expansion bearing for span 1 at the south abutment. Note: sheared anchor bolts exist at the exterior bearings at the south abutment.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 69 - Looking west at the east truss expansion bearing for span 32 at pier 31. Note: bearing anchor bolt is missing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 70 - Looking east at the downstream channel from span 11. Note: channel cutting into the north bank. Power poles in photo were in channel near the north bank during the May 2018 inspection.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 71 - Looking west at the upstream channel from span 11. Note: channel cutting into the north bank.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X		U.S. 281	S. CANADIAN RIVER	10/14/2018

Photograph 72 - Looking northwest at the south approach roadway at approximately 50 feet south of the bridge. Note: failed asphalt patch exists in the northbound lane.

Oklahoma Dept. of Transportation - Bridge Inspection Report

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	
04085	0902 0000 X	-1	21.10	SD

IDENTIFICATION

Bridge Description:
38-100ft. PONY TRUSS & 2-36ft. I-BM. SPANS(BRIDGEPORT BR.)

1. State: Oklahoma
2. Division: Division 4
3. County: CANADIAN
4. City: Unknown
Admin Area: L/T Truss
5a. On/Under: Route On Structure
5b. Kind of Hwy: U.S. Hwy
5c. Lvl of Srvc: Mainline
5d. Route No.: 00281
5e. Dir. Sufx: N/A (NBI)
7. Facility Carried : U.S. 281
6. Feat. Intersect: S. CANADIAN RIVER
9. Location: CADDO CANADIAN CL
11. Mile Post: NA
13. LRS Inv. / Sub Rte: 0902 0000 / 01
16. Latitude: 35° 32' 25.00"
17. Longitude: 098° 19' 22.00"
98. Border Brdg: Unknown (P)
% Responsible: 0.00
99. Border Brdg #: Unknown

INSPECTION

Type	Insp. Req.	Insp. Done	Freq.	Insp. Date	Next Insp.
NBI:		1	12 months	10/14/2018	10/14/2019
FC:	Y	1	12 months	10/14/2018	10/14/2019
UW:	N	0		NA	NA
OS:	Y	0	12 months	4/11/2018	4/14/2019

CLASSIFICATION

12.Base Hwy Net.: On Base Network
20. Toll Facility: On free road
21. Custodian: State
22. Owner: State
26. Function Class: 06 Rural Minor Arteria
37. Historical Sig.: Br eligible for NRHP
100. Def. Hwy: Not a STRAHNET hwy
101. Parallel Str.: No || bridge exists
102. Traffic Dir.: 2-way traffic
103. Temp. Str.: Not Applicable (P)
104. Hwy System: Not on NHS
105. Fed Land Hwy: N/A (NBI)
110. Defense Hwy: Not a STRAHNET hwy
112. NBIS Length: Long Enough

STRUCTURE TYPE AND MATERIALS

43a/b. Main Span: Steel / Truss-Thru
44a/b. Appr. Span: Steel / Stringer/Girder
45. # of Main Spans: 38
46. # of Appr. Spans: 2
107. Deck Type: Concrete-Cast-in-Place
108a. Wearing Surface: Bituminous
108b. Membrane: Unknown
108c. Deck protection: Unknown

CONDITION

58.Deck: 5 Fair
59.Sup.: 4 Poor
60.Sub: 5 Fair
62.Culvert: N/A (NBI)
61.Chan./Chan. Prot.: 5 Bank Prot Eroded

Flowline Notes

OCT-2018: Flow too high to measure. Channel now in span 11.
OCT-2017: 29.7' TOC at L4, west truss, span 10

AGE AND SERVICE

19. Detour Length: 11.8 mi
27. Year Built: 1933
28a/b. Lanes on/und: 2 / 0
29. ADT: 1,100
30. Year of ADT: 2016
42a/b. Type of Svc on/und: Highway / Waterway
106. Year Reconst.:
109. Truck ADT: 16%

LOAD RATING AND POSTING

31. Design Load: M 13.5 (H 15)
41. Post. Status: P Posted for load
70. Posting: 2 20.0-29.9%below
Date Rated: 03/25/2014
63.Op / 65.Inv. Rating Meth.: 1 LF Load Factor / 1 LF Load Factor

	H	HS	3-3	EV3	SHV
64. Operating Rating (tons):	15.00	15.10	65.40	36.30	0.00
66. Inventory Rating (tons):	14.00	14.10	37.70	21.80	

GEOMETRIC DATA

10. Vert. Clearance: 99.99 ft
32. Appr Rwy Width: 30.00 ft
33. Median: No median
34. Skew: 0.00°
35. Struct. Flared: No flare
47Horizontal Clr: 24.00 ft
48. Length Max Span: 100.07 ft
49. Struct. Length: 3,937.01 ft
50a. Curb/Sdwlk Width L: 1.00 ft
50b. Curb/Sdwlk Width R: 1.00 ft
51. Width Curb to Curb: 24.00 ft
52. Width Out to Out: 26.00 ft
Deck Area: 102,364.79 sq. ft
53. Min.Vert.Cl.Ovr Brg: 99.99 ft
54a.Min.Vt.Undclr.Ref.: N Feature not hwy c
54b. Min. Vert. Undclr.: 0.00 ft
55a. Min.Lat.Undclr.Ref: N Feature not hwy
55. Min.Lat.Underclr. R: 99.90 ft
56. Min.Lat.Underclr. L: 99.90 ft

APPRAISAL

36a. Brdg Rail: 0 Substandard
36b. Transition: 0 Substandard
36c. Appr. Rail: 0 Substandard
36d. Appr.Rail Ends: 0 Substandard
67. Str Evaluation: 4 Minimum Tolerab
68. Deck Geom.: 4 Tolerable
69. Vert./Horiz. Undclr: Not applicable (NB
71. Waterway Adeq: 5 Above Tolerable
72. Appr. Alignment: 6 Equal Min Criteria
113. Scour Critical: 7 Countermeasures

PROPOSED IMPROVEMENTS

94. Bridge Cost: $6,781,689
95. Roadway Cost: $4,500,000
96. Total Cost: $11,920,275
97. Yr.of Cost Est.: 2015
75. Type of Work: 31 Repl-Load Capacity
76. Lngth of Improvement: 3,937.0 ft
114. Future ADT: 1,760
115. Yr.of Future ADT: 2036

NAVIGATION DATA

38. Nav. Control: Permit Not Required
39. Vert. Clearance: 0.0 ft
40. Horiz. Clearance: 0.0 ft
111. Pier Protect.: 1 Not Required
116. Lift Bridge Vert. Clr.: 0.0 ft

OKLAHOMA ITEMS

200c. Temperature: 50
200d. Weather: Rain/Snow
201. Struc.Stl. ASTM Desig.: -1 / -1
202. Waterprf.Membrane: -1
Date Installed: 01/01/1901
203. Type Exp. Device: Sliding Plate
Open Joint-No Device _
204. Type of Railing: Metal Railing (other)
205. Material Quantity: 10.00
208a. Type of Abutment: Pedestal
b. Type of Found.: Bears on Natural Found.
209. Type of Pier/Found.: 2 / Yes
No Piling/Drilled Shaft
210. Foundation Elev.: -1.00 -1.00 -1.00 -1.00 -1.00
211. Wear.Surf.Prot.Sys: None
Date Installed: 01/01/1901
213. Utilities Attached: Communication

214a. Posted Weight Limit: 090909
b. Posted Speed Limit:
c. Narrow/1way Brdg Sign:
d. Vertical Clr. Sign: No
Adv. Warning Sign: No
e. Navigation Lights?: No
Working/Not Working: No
215. Overpass: U.S. HIGHWAY
221. Substr.Cond.(U/W):
222. Fill Over RCB:
223. Appr.Slab/Rwy Cond.: 3
225. Paint Type/Ovrct: Red Lead 3 Coat System
N/A
226. Date Painted: 1933
227. Paint Color: Silver
233. Deck Forming: Conventional Forming
238. School Bus Rte.: Current & Desired route
240. Appr. Rwy Type.: Concrete
243. Grdr Spacing/No.: /

244. Span Lengths:
245. Girder Depth: 48.00
246a. Type of Ovelay: AC Overlay
b. Overlay Thickness: 3.00
c. Overlay Date: 12/04/2003
d. Ovly Depth Changed >1": _
247. Protective Systems: _ _ _ _ _
248. # Field Splices w/ Corrosion:
249. Scour Crit. POA Exists?: _
250. Headwall:
254. Thru Truss Type:
257a. OkiePROS Truck Routing: Yes
258. Plans w/Found.in ODOT File:
259. Scour Eval. in ODOT File:
263. Interchange at Intersection: No
264. Interstate Milepoint: -1.00

Oklahoma Dept. of Transportation - Bridge Inspection Report

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	
04085	0902 0000 X	-1	21.10	SD

Inspection Date: 10/14/18 Brendan Prendeville

Invoice No.: 845637 Inspected With: -1

Brendan J. Prendeville

Digitally signed by Brendan J. Prendeville
DN: cn=Brendan J. Prendeville, o=B&N, ou=Burgess & Niple, Inc., email=brendan.prendeville@burgessniple.com, c=US
Date: 2018.12.04 13:12:46 -05'00'

BRIDGE NOTES:

(38) 100-foot long riveted pony trusses with (2) 36-foot long steel beam approach spans. The bridge had a 15-ton load restriction at the time of the inspection. The posting was lowered to 9 tons after cracks were discovered in the east U4 inboard gusset plates of spans 32 and 37 during the inspection. It was also discovered that the latest load rating report, dated March 25, 2014, used 8 rivets per gusset plate for the U1L0 and U4L3 panel points where only 6 exist.
OS Inspection Items: See Appendix tables in 2018-10-14 FC report for list of the following: Inspect cracks in stringer web copes, stringer connection angles, floor beams web copes, lower chord gusset plates above bearings for growth, stringer connections at end floor beams for additional loss or broken rivets; pier beams and supplemental pier beams at piers 1 and 39 for distress; misalignment of W U1U2 sp 37; floor beam section loss; gusset plate cracks at east U4 spans 32 and 37; scour from stream in spans 10 and 11; areas of collision damage on deck to steel trusses; east bearing at pier 3 for any undermining.

INSPECTION NOTES: 10/14/18

PX – Strengthen the stringer webs as recommended in Appendix D (spans 15, 16, 21, 24, 31, 36, and 38); Reinforce/replace the damaged concrete bridge railing in spans 1 and 40; Seal cracks in the asphalt in both the bridge and approach wearing surfaces; Remove loose elastomeric concrete and patch the joint headers as necessary to provide a smooth riding surface across the bridge; Reseal the poured seal expansion joints; Install elastomeric pads or steel shims at missing locations on the supplemental pier beams over piers 1 and 39; Compare lengths of cracks in stringer and floor beam webs with Appendix A values. Drill stringer crack tips noted in Appendix A that grow significantly; Repair cracks in stringer connection angles noted in Appendix B by adding seat brackets below the stringer; Repair section loss in stringer and floor beam webs where corrosion holes and/or heavy section loss exists with welded plates and/or angles; Remove broken rivets for the stringer connections at the locations noted in Appendix C and replace with bolts; Replace sheared rivets in the vertical connection, upper chord, and end post with bolts at west U1 in spans 31 and 37; Remove pack rust and apply caulking and paint along the edges of the gusset plates at L0 and L5; Clean and paint the stringer ends and floor beams adjacent to the joints above the piers and the lower chord panel points including the splice locations; Add rip rap around piers near the current channel to protect against scour; Repave the south approach near the bridge to provide a smooth transition; Install full depth pressure relief joints in both approaches to mitigate ongoing effects of pavement pressure.
FX – Monitor: Cracks in the inboard gusset plates at east U4, spans 32 and 37, and at west U1 span 37 for growth; Channel for further movement; Beam connections to the original pier beams at piers 1 and 39 for further cracking; Notches and cuts in inboard flange and gusset plate at west U1L2, span 31 for cracks or signs of distress; Collision damage to W U1L2 span 6, W U1L0 in spans 7 and 37, and E U1L0 in spans 14 and 39 for distress; Pack rust and section loss in truss web members and end posts at railing connections; Spalls and corroding reinforcing steel in soffit for further deterioration; Lower chord gusset plates over the bearings for the development of horizontal cracks; Cracks at floor beam copes for growth and further deterioration; Horizontal cracks in the web of the end floor beams at span 6 in floor beam 0, span 11 in floor beam 5, and span 20 in floor beam 0; Fatigue prone stitch welds of angle strengthening at floor beam 0, span 2 for cracking; Corrosion holes through the floor bracing system gusset plates for the development of cracks; 1/4-inch bow in W U1U2 due to collision damage for further distress and development of cracks; Bowed gusset plates near bearings for distress; Lower chord section loss at floor system bracing connections, splices, and adjacent to stay/batten plates; Bullet strike damage to east truss span 4 members/gusset plates for crack development; Cracking/spall of the east column capital, pier 3 for conditions which would undermine the bearing; Expansion bearing pins for signs of additional wear or distress.

ELEMENT CONDITION STATE DATA

Elem. / Env	Description	Unit	Total Qty	% 1	Qty. 1	% 2	Qty. 2	% 3	Qty. 3	% 4	Qty. 4
12 / 1	Re Concrete Deck	sq.ft	94,488.00	0%	0.00	0%	0.00	100%	94,488.00	0%	0.00
	Many portions of the curbs exhibit spalls and/or cracking with corroding reinforcing steel especially over the ends of the intermediate floor beams. Some spalls have been patched in isolated areas throughout the deck. Deck appears to be growing from center of each span causing cracking of floor beam webs at connection angles and distress/cracking of stringer connection angles at end floor beams.										
510 / 1	Wearing Surfaces	sq.ft	94,488.00	80%	75,488.00	10%	9,500.00	10%	9,500.00	0%	0.00
	PX – The asphalt wearing surface has unsealed longitudinal and transverse cracks throughout the spans. Raveling and patching exists along outside wheel lines at isolated locations.										
107 / 1	Steel Opn Girder/Beam	ft	259.00	67%	174.00	33%	85.00	0%	0.00	0%	0.00
	Surface corrosion along top flange of exterior beams.										
113 / 1	Steel Stringer	ft	9,501.00	0%	0.00	65%	6,175.60	35%	3,325.40	0%	0.00
	Section loss of the top flange is typical in the exterior stringers. Pack rust is lifting the deck from the exterior stringers.										
120 / 1	Steel Truss	ft	7,600.00	0%	0.00	65%	4,940.00	35%	2,660.00	0%	0.00
	PX – Impact damage at E U3U4 span 9 and W U1U2 span 31 has sheared rivets for the bottom lacing bars. FX– W U1 span 37 has a 5/16-inch long crack in the bottom edge of the inboard gusset plate; Impact damage exists to the truss web members at multiple locations; West U1U2 in span 37 is bowed globally to the east 1/4in.; Impact damage exists on the inboard flanges of the upper chord. Pack rust is common at the end post connection to the inboard gusset plate at the lower chord connection; Horizontal cracks were observed in the inboard truss gusset plate between the bearing pin and the end floor beam. All eight locations noted during the previous Fracture Critical inspection have been strengthened with the addition of a welded steel angle on the inboard face. Vehicular collision damage exists at numerous locations of the truss end posts. See FC Report.										
515 / 1	Steel Protective Coating	sq.ft	406,533.00	0%	0.00	0%	0.00	100%	406,533.00	0%	0.00

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	SD
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PX – Corrosion and significant section loss are occurring at many locations on the lower chord, floor beams, and stringers due to deck drainage passing through joints. Widespread section loss and corrosion holes exist in the exterior stringers and end floor beams.

152 / 1	Steel Floor Beam	ft	6,155.00	0%	0.00	62%	3,816.10	38%	2,338.90	0%	0.00

PX – Section loss with corrosion holes is common in the end floor beams and floor beams at the east truss connection (57 locations - See Appendix F).
FX – Horizontal cracks in the end floor beams between the top flange and connection angle range between 5/8 inch to 9 3/16 inches (71 locations - See Appendix G)

162 / 1	Stl Gus Plate	each	1,672.00	0%	0.00	45%	758.00	55%	914.00	0%	0.00

PX- Horizontal cracks in the inboard truss gusset plates above the bearings range in length between 6 3/4 inches to 17 5/8 inches long (10 locations - See Appendix H); Noted cracks have been strengthened; Numerous locations where paint cracks exists at this location suggesting eminent development of cracks.
FX- Cracks in edge of E U4 in spans 32 and 37 due to pack rust (NEW 2018) and W U1 span 37 due to collision damage; LC inboard gusset plates typically bowed at L0 and L5 due to pack rust; West U1 span 31 has tears (1 7/8 inch and 1 inch) in edge of inboard gusset plate Bullet strike damage to E M2.5 span 4.

205 / 1	Re Conc Column	each	78.00	0%	0.00	99%	77.00	1%	1.00	0%	0.00

FX – A 7/8-inch maximum wide crack exists in the capital of the east column of pier 3 which is emanating from the span 2 bearing anchor bolt.

215 / 1	Re Conc Abutment	ft	49.20	50%	24.60	50%	24.60	0%	0.00	0%	0.00

No significant deficiencies were noted in the abutments except for moderate debris on the bearing seats of both abutments and map cracking exposing a few reinforcing bars at the ends of the south abutment.

301 / 1	Pourable Joint Seal	ft	495.00	0%	0.00	0%	0.00	50%	247.50	50%	247.50

PX – Spalling of the headers was observed along the joints at piers 1, 13, 27, 33, 35 and 39; The poured joint seals typically are deteriorated and show evidence of leaking. Many of the poured seals were never installed at many of the repaired header locations leaving only the form board to fill the joint.

310 / 1	Elastomeric Bearing	each	7.00	50%	5.00	0%	0.00	50%	2.00	0%	0.00

PX – Elastomeric bearing pads missing under beams at supplemental pier beams (beams 1-4 at pier 1, beams 1-3 at pier 39). The pads appear to be walking at pier 39 under beams 4 and 5.
Unreinforced elastomeric bearing pads exists under the supplemental pier beams.

311 / 1	Moveable Bearing	each	86.00	0%	0.00	71%	61.00	29%	25.00	0%	0.00

FX – Wear causing grooving in the expansion bearing pins and enlarging of the pin hole in the connecting gusset plates are common throughout the spans. The wear is a result of bearing rotation under live loads. This condition is most severe at L0 span 38 over pier 37 which has 3/16-inch total wear to the pin and gusset plate.
Heavy pack rust with minor associated pitting is wide spread on and between the bearing components. Bronze sliding plate between the sole and masonry plates has slid out and broken at several bearings. Anchor bolts have corroded away at many of the sliding bearings.

313 / 1	Fixed Bearing	each	84.00	0%	0.00	100%	84.00	0%	0.00	0%	0.00

Surface corrosion exists at the fixed bearings.

330 / 1	Metal Bridge Railing	ft	7,600.00	0%	0.00	95%	7,220.00	5%	380.00	0%	0.00

FX- Pack rust is typical between the metal bridge railing, truss end posts, and web members. Small cracks were observed in the railing where the flange and web have been coped.

859 / 1	Soffit	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

FX- Spalls exposing corroded rebar are common in the underside of the deck at the expansion joints due to leakage thru joints.
The underside of the deck exhibits transverse cracks with light efflorescence. Spalls and deteriorated concrete exist in exterior stringer bays at isolated locations.

865 / 1	St.Open Gird End(5Ft	(LF)	100.00	100%	0.00	0%	80.00	0%	20.00	0%	0.00

FX - Connection angles to pier beam 39 are deformed due to longitudinal force from approach pavement.
Elastomeric bearing pads missing at supplemental pier beams (beams 1-4 at pier 1, beams 1-3 at pier 39).

877 / 1	St. Stringer End(5Ft)	(LF)	9,501.00	0%	0.00	50%	4,750.50	50%	4,750.50	0%	0.00

PX - Significant loss including corrosion holes through exterior stringer webs at end floor beams (59 locations - See Appendix D); Cracks in the web at the top flange cope range from 1/8 inch to 2 1/2 inches long (98 locations - See Appendix A); Cracks in the stringer connection angles at the end floor beams range from 1 1/4 inches to 7 inches long (61 locations - See Appendix B); Broken rivets at the stringer connections to the end floor beams (121 rivets at 92 locations - See Appendix C).

909 / 1	Pourable Fix Jt.Seal	(LF)	495.40	0%	0.00	0%	0.00	50%	247.70	50%	247.70

Fixed joints are paved over with transverse crack in asphalt above joint. Space between floor beams under joint at pier 20 has been filled with asphalt.

916 / 1	St.Bearing Assembly	(LF)	4.00	100%	4.00	0%	0.00	0%	0.00	0%	0.00

Surface corrosion with no significant deficiencies.
Note: Bearing assemblies do not exist between beams and supplemental pier beams

956 / 1	St. Cracking/Fatigue	(SF)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

PX- Cracks in the stringer web at the top flange cope range from 1/8 inch to 2 1/2 inches long (98 locations - See Appendix A); Cracks in the stringer connection angles at the end floor beams range from 1 1/4 inches to 7 inches long (61 locations - See Appendix B).
FX- Cracks in edge of E U4 in spans 32 and 37 due to pack rust (NEW 2018) and W U1 span 37 due to collision damage; Horizontal cracks in the end floor beams between the top flange and connection angle range between 5/8 inch to 9 3/16 inches (71 locations - See Appendix G).

957 / 1	Pack Rust Smart Flag	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

NBI No.:	Structure No.:	Local ID:	Suff. Rating:	SD
04085	0902 0000 X	-1	21.10	

PX – Pack rust is common at the end post connection to the inboard gusset plate at the lower chord connection causing bowing of the gusset plates.
FX – Cracks in edge of E U4 in spans 32 and 37 due to pack rust (NEW 2018); Pack rust is forming at many of the bridge railing to inboard end post channel connections.
Pack rust occurs between the lower chord components and at the gusset plates at M2.5.

961 / 1	Scour SF	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

PX - Local scour exists around the columns at piers 5 through 9 and pier 23. The top of the column foundation is exposed up to 4 1/2 feet at these locations. Local scour was also observed at the columns in the flood plain north of the river.

962 / 1	Super.Traffic Impact	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

Collision damage has bent or damaged the above deck truss members with no significant loss in capacity at
PX - E U3U4 span 9, W U1U2 U1L1 and the U1 gusset plate span 31,
FX- W U1L2 span 6, W U1U2 and U1L2 span 37.

963 / 1	Steel Section Loss SF	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

PX - Significant loss including corrosion holes through exterior stringer webs at end floor beams (59 locations - See Appendix D); Section loss with corrosion holes is common in the end floor beams and floor beams at the east truss connection (57 locations - See Appendix F).
FX- Corrosion of the lower chord has caused section loss on inboard top flange.

965 / 1	Debris SF	(EA)	1.00	0%	0.00	100%	1.00	0%	0.00	0%	0.00

Drift consisting of large trees exists on the west flood plain under and around spans 5 through 10.

969 / 1	OutOfPlane Dist./Load	(EA)	1.00	0%	0.00	100%	1.00	0%	0.00	0%	0.00

FX – Pier beams 1 and 39 have severe sweep and have been sistered.

973 / 1	Horizontal Force SF	(EA)	1.00	0%	0.00	0%	0.00	100%	1.00	0%	0.00

PX- Significant approach pavement pressure occurs at both abutments pushing inward from both ends as evidenced by the movement of the deck, and sheared rivets and cracks in stringer to floor beam connections.

975 / 1	Supplemental Support	(EA)	76.00	100%	76.00	0%	0.00	0%	0.00	0%	0.00

Shim plate between floor beam 5, span 26 and the stiff leg is rotating out from under the floor beam bottom flange.

Stringer Cope Cracks

Span	Floor beam	Floor beam face	Stringer	Length (inches)	Comment
2	0	North	5	1 1/2 vertical, 1 horizontal	
2	2	South	1	3/8	
2	4	South	1	1/8	
2	5	South	1	1/2	
3	0	North	1	1 1/4	
3	0	North	5	1/2	
3	5	South	1	3/8	
4	0	North	1	5/8	
4	2	South	5	1/4	Overcut
4	5	South	5	1 1/4	Crack arrested by drilled hole, 2007
5	0	North	5	1/2	
6	2	North	1	1/8	
6	3	North	1	1/4	
6	3	North	1	1/8	
7	0	North	5	2 1/4	
7	5	South	5	3/4	Adjacent 50% section loss to the web 3 inches high
8	4	North	5	1 1/4, 7/8 (exterior), 1 1/4, 1 1/4 (interior)	
8	5	South	1	1 3/8	
9	1	North	1	1/4	
9	3	North	1	3/8	
9	3	South	1	3/8	
9	4	North	1	3/8	
10	0	North	1	5/8	
10	1	South	2	3/4	
10	2	North	1	5/8	
10	5	South	5	1	
11	0	North	1	3/4	
11	0	North	5	9/16	
12	5	South	1	1 1/2, 1 1/2	
13	5	South	5	5/8	
14	5	South	1	1 1/4	
15	0	North	1	3/8	
16	1	South	5	1 5/8	
16	4	North	5	1/2	Crack grew 1/8"
17	0	North	5	1 3/8	
18	0	North	1	7/8	
18	2	South	1	3/8	
18	2	North	1	1/4	
19	0	North	5	1/2	
19	5	South	3	5/16	
19	5	South	5	1 1/4	

Stringer Cope Cracks

Span	Floor beam	Floor beam face	Stringer	Length (inches)	Comment
19	5	South	1	3/4	
20	0	North	1	5/8	
20	1	North	5	1/8	
20	2	North	1	3/8	
20	2	South	1	3/4	
20	4	North	1	3/16	
20	4	North	5	1/8	
20	5	South	1	1/8	New crack
21	0	North	5	7/8	
21	3	North	1	1/8	
21	4	South	1	1/8	
23	0	North	5	1/4	
23	1	South	5	3/16	
25	0	North	5	3/4	
25	2	South	1	1/4	
26	3	North	1	3/16	
26	5	South	1	2 1/2	
27	1	North	1	1/2, 1 1/16	
27	1	South	1	1 1/4	
27	1	South	5	1/4	
27	2	South	1	3/16	
28	1	North	1	3/16	
28	2	North	1	5/8	
28	2	South	1	1/4	
28	3	North	5	3/8	
28	5	South	1	5/8	
29	4	South	5	1 3/4, 1/4	
30	1	South	5	1/2	
30	1	South	5	3/8, 5/8	Two new cracks in west face
30	4	North	5	1/2	
31	1	North	1	1/4	
31	2	North	1	1/4	
32	0	North	5	5/8	
32	2	South	1	1/4	
32	4	North	1	1/8	
32	5	South	1	1/4	
33	2	South	1	1/8	
33	3	South	1	1/4	
33	5	South	1	1 1/4	
34	1	South	1	1/4	

Stringer Cope Cracks

Span	Floor beam	Floor beam face	Stringer	Length (inches)	Comment
34	2	South	1	5/16	
34	5	South	1	1/2	
35	0	North	1	1/2	
35	4	South	1	1/8	
36	0	North	1	1/2	
36	1	North	1	3/8	
36	2	South	1	3/8	
36	5	South	1	2 1/4	
36	4	North	1	1/8	
37	0	North	5	1/2	
37	3	North	1	1/4	
38	2	North	1	3/4	
38	2	South	1	5/8	
38	5	South	1	1/2	
39	1	North	1	1/8	
39	1	South	1	1/2	
39	3	South	1	3/8	

Stringer Connection Angle Cracks

Span	Floor beam	Floor beam face	Stringer	Stringer face	Length (inches)	Comment
2	0	North	2	West	3 1/4	
3	5	South	4	West	2 1/2	
4	0	North	2	West	3	Grew 1/4"
5	5	South	3	East	3 1/4	
8	0	North	3	West	3 1/2	
9	5	South	3	East	2 1/4	
9	5	South	3	West	3 5/8	
10	0	North	3	West	3	
12	0	North	2	West	2 7/8	New
12	0	North	2	East	3	
13	5	South	4	West	4	
15	5	South	4	West	3 7/8	
17	5	South	4	East	4 1/2	
18	0	North	3	East	2 3/4	
18	0	North	4	East	2 3/4	
22	0	North	1	East	3 3/4	
22	0	North	3	East	4	Grew 1/8"
22	0	North	4	East	2 3/4	
23	5	South	4	West	3 1/2	
24	0	North	2	West	2 3/4	
24	0	North	3	East	4	
24	0	North	3	West	4	
24	0	North	4	East	3 1/4	
25	5	South	2	West	3 1/2	Grew 1/4"
25	5	South	3	West	4 1/2	
25	5	South	3	East	1 1/4	
25	5	South	4	West	3 5/8	
25	5	South	5	West	5 1/2	
26	0	North	2	East	2 7/8	
26	0	North	2	West	3 1/4	
26	0	North	3	East	5 1/2	Grew 1/8"
26	0	North	3	West	2 1/2	
26	0	North	4	East	3 1/2	
27	5	South	3	East	2 1/2	
27	5	South	3	West	3 3/4	
27	5	South	4	West	4 1/4	
28	0	North	2	East	4 1/4	
28	0	North	3	East	3 7/8	
29	5	South	3	West	4	
29	5	South	4	East	1 1/2	
29	5	South	4	West	2 1/8	
30	0	North	2	East	5 5/8	
30	0	North	3	East	4 5/8	
30	0	North	4	East	3 3/4	
31	5	South	4	East	3 3/4	
31	5	South	4	West	6 1/8	
33	5	South	3	West	4	
33	5	South	4	West	7	
34	0	North	2	East	3 1/2	
34	0	North	2	West	2	

Stringer Connection Angle Cracks

Span	Floor beam	Floor beam face	Stringer	Stringer face	Length (inches)	Comment
34	0	North	3	West	2 1/4	
34	5	South	5	West	3 1/2	
35	5	South	3	West	4 1/4	
35	5	South	4	West	4	
35	5	South	2	West	1 1/4	
36	0	North	2	West	3	
36	0	North	3	West	2	
36	0	North	4	East	4 1/8	
38	0	North	2	West	2 1/8	
38	0	North	3	West	2 1/2	
39	5	South	4	West	4 5/8	

Missing Stringer Rivets

Span	Floor beam	Floor beam face	Stringer	Number	Comment
2	0	North	2	1	
2	0	North	3	2	
4	0	North	2	1	Shank not in shear plane.
4	1	South	2	1	
4	3	South	3	1	
5	1	North	2	1	
5	1	North	3	1	
5	2	North	2	1	
5	4	South	4	1	
5	5	South	4	1	
6	0	North	2	2	East shank not in shear plane
6	0	North	3	1	Shank not in shear plane.
6	1	North	2	1	
6	2	North	2	2	
7	1	North	2	1	
7	2	North	2	2	
7	2	North	3	1	
7	5	South	3	2	Shanks not in shear plane.
7	5	South	4	2	Shanks not in shear plane.
8	0	North	2	2	Shanks not in shear plane.
8	0	North	3	1	Rivet shank is welded to connection angle, weld has broken away from rivet. Rivet shank no longer in shear plane.
8	1	North	2	1	
9	1	North	2	2	
9	4	South	4	1	
9	5	South	4	2	
10	0	North	2	2	
10	0	North	3	1	Shank not in shear plane.
10	1	North	2	2	
10	1	North	3	2	
10	4	South	4	1	
11	1	North	2	1	
11	4	South	4	2	
11	5	South	3	2	Shanks not in shear plane.
11	5	South	4	2	
12	0	North	2	1	
12	0	North	3	2	Shanks not in shear plane.
12	0	North	4	1	
13	2	North	2	2	
13	3	North	3	1	New missing rivet
14	0	North	2	2	Shanks not in shear plane.
14	1	North	2	1	
15	5	South	3	2	West shank not in shear plane.
15	5	South	4	1	Shank not in shear plane.
16	0	North	2	2	Shanks not in shear plane.
16	0	North	3	1	
17	5	South	4	1	

Missing Stringer Rivets

Span	Floor beam	Floor beam face	Stringer	Number	Comment
18	0	North	2	2	Shanks not in shear plane.
18	0	North	3	1	Shank not in shear plane.
18	4	South	3	1	
20	0	North	1	1	
20	0	North	2	1	
22	0	North	2	2	Shanks not in shear plane.
22	0	North	3	1	Shank not in shear plane.
23	2	North	2	1	
23	4	South	4	1	
24	0	North	2	2	East shank not in shear plane.
24	4	South	4	2	
25	2	North	2	1	
25	5	South	4	1	Shank not in shear plane
26	0	North	2	1	
28	1	North	2	1	
29	1	North	2	2	
29	2	North	2	1	
30	0	North	3	1	
31	2	North	2	1	
31	5	South	3	2	
32	0	North	2	2	East rivet shank not in shear plane.
32	0	North	3	1	Shank not in shear plane.
33	1	North	2	1	
33	5	South	3	1	Shank not in shear plane
34	0	North	3	1	Shank not in shear plane
34	1	North	2	1	
34	1	North	3	1	
35	2	North	2	2	
35	4	South	4	1	
35	5	South	3	1	Shank not in shear plane.
35	5	South	4	1	Shank not in shear plane.
36	0	North	2	1	Shank not in shear plane.
36	0	North	3	1	Shank not in shear plane.
36	1	North	2	2	
36	1	North	3	2	
36	4	South	3	1	
36	4	North	3	1	
37	1	North	2	1	
37	2	North	2	1	Shank not in shear plane.
37	5	South	3	2	
37	5	South	4	1	
38	0	North	2	2	East shank not in shear plane.
38	0	North	3	1	Shank not in shear plane.
38	1	North	2	1	
39	5	South	3	1	
39	5	South	4	1	

Stringer Loss

Span	Floor beam	Floor beam face	Stringer	Comment
2	0	North	1	3/4" diameter with 1/4" crack and 3” high knife edge loss below hole
4	0	North	5	1 1/4" diameter with with 1/2" horizontal crack and 5/8" horizontal crack with 3" H, 3/16" remaining below hole
5	5	South	5	1" diameter with horizontal crack, 1/2" long, and vertical crack, 3/8" long
6	0	North	1	1 1/2" diameter with 1 1/8" vertical crack & 2" H knife edge loss below hole
6	0	South	5	1 3/8" diameter, 1/2" vertical crack & 3" H knife edge loss below hole
7	5	South	1	1/2" diameter, 1/4” crack
8	0		5	3” long x 2 1/2” high through hole (New 2018)
9	1	South	5	2 3/8" x 1" corrosion hole
9	5	South	1	2 7/8"H x 1 1/4"W with 1" vertical crack & 2" H x 50% web loss below hole
9	5	South	5	1" W x 1 1/4" H with 1/8" crack.
10	0	North	5	1/2" diameter hole with 3" H x 3/16", 4" H x 1/8", and 3" H x 1/16" pitting extending below the hole, and two cracks above hole, 3/4" & 1/2". One crack below hole, 1/2"
10	5	South	5	4" W x 1 1/8" H with 1/2" knife edging adjacent in lower web.
11	5	South	1	25% web loss at cope, 3" H
11	5	South	5	5/8" diameter with 7/8" long crack & knife edge loss below hole, 3" H
12	0	North	1	1" diameter with 5/16" vertical crack.
12	0	North	5	1-1/8" H x 5/8" W with 3/4" vertical crack
12	1	North	5	1" H x 3/4" W
13	5	South	1	1/4" crack extends below through hole, 1 5/8"H x 1/2"W, & 2" H knife edge loss below hole
14	0	North	5	1/2" diameter hole with 1 3/4" vertical crack. 10% average loss full web height.
15	1	South	5	Grown to a 1 1/2" high x 1" wide corrosion hole.
15	5	South	1	1/2” diameter corrosion hole adjacent to cope with adjacent loss, 1/8” deep x 3” high x 1 1/2” wide (New 2018)
15	5	South	5	1 1/4" diameter at cope & 2"H x 5"W below connection angle & 3/8” crack below top hole. RECOMMEND STRENGTHENING
16	0	North	5	5” H x 1 1/2” W corrosion hole with adjacent 3/4” crack below hole. Also, 5” W x 1” H corrosion hole below connection angle. RECOMMEND STRENGTHENING
17	4	North	5	2 1/2" x 1" with 1 1/8" long crack
17	5	South	1	Two holes: 1 3/4"H x 1/4"W and 1 3/4” W x 3/4"H hole with 3/16" crack

Stringer Loss

Span	Floor beam	Floor beam face	Stringer	Comment
17	5	South	5	2 1/4"H x 1" with 5/8" long crack
18	0	North	5	2 1/4" diameter hole with 3/16" pitting for 7"+J19 H
18	5	South	1	2 1/2" long by 5/8" wide. No longer cracked and web below has 25% loss.
19	5	South	1	5/8" hole with 3/4" crack
19	5	South	5	7 1/2"W x 4"H in lower web and 3/8" crack from top of hole & 2”H knife edge loss above hole, approx 50% total web loss
20	0	North	5	1 1/4" diameter
21	5	South	1	1 1/4" W x 1/4" H with 1/4" vertical crack
21	5	South	5	2 1/2" H x 1 1/2" W with 4 1/2" long crack. RECOMMEND STRENGTHENING
22	0	North	1	2 1/4" W x 1/2" H
23	5	South	5	2 3/4"H x 5/8”W
24	0	North	1	1 1/4" H x 3/4" W with 3/16" max loss over 6" below hole
24	0	North	5	10 1/2" W x 2" H with 1/16" to 1/8" remaining full height at edge of connection angle; 1" and 3/4" diameter corrosion holes in web adjacent to connection angle with multiple holes emanating from lower holes, 1/4" max L. RECOMMEND STRENGTHENING
24	5	South	5	1” diameter hole in web adjacent to bottom flange, approx 10" from end
25	1	North	1	1” corrosion thru hole at stringer cope. (New 2018)
25	2	North	5	Heavy section loss on south stringer around floor beam connection. North stringer exhibits a 1" by 1/2” hole with 1/2” crack at top cope.
25	5	South	1	2" H x 5/8" W with 5/8" crack
25	5	South	5	1/8" section loss, full height
26	0	North	1	1/2" diameter with 3/8" crack & 3”H knife edge loss below hole
26	0	North	5	2" H x 5/8" W with 2” H x 1” W area of 3/16” loss.
27	5	South	1	3 3/4"H X 1"W with 1/4" vertical crack
29	4	South	5	1 3/4" long crack (1/4" growth) to crack below 5/8" diameter corrosion hole
29	5	South	5	1 1/2" H X 1" W with two cracks, 1" crack extends cope to hole & 1 1/4" crack below hole. Two additional through holes, 1/2" and 5/8" diameter in lower web
30	0	North	5	1 1/2" x 1 1/2" & 1” vertical crack
31	5	South	5	Three corrosion holes: 1” H x 1” W (top), 1 1/2" H x 1/8" W (mid height of web), & 1 3/4" H x 1 1/4" W (near bottom flange), total web section loss = approx 75%, with 5” vertical crack extending below top crack. RECOMMEND STRENGTHENING

Stringer Loss

Span	Floor beam	Floor beam face	Stringer	Comment
33	5	South	5	Severe section loss to east connection angle, top 2 rivet heads have near 100% head loss (west connection angle is good). 6 1/4" W x 2 1/2" H corrosion hole through bottom of stringer web.
34	3	South	5	2 3/4" H x 1/2" W with 1/2" crack at bottom of hole
34	4	South	5	1" high by 1 1/4" wide corrosion hole with 3/4" vertical crack at bottom of hole (crack grew 2018). Additional two corrosion holes in lower web, 2" wide x 1" high and 3/4" diameter.
35	5	South	5	6 1/4" W x 1 3/4" H with 6"W x 1"H x 1/4" adjacent section loss.
36	0	North	5	2 1/2" H x 1 1/2" W corrosion hole at cope with 1 3/4" vertical crack. Also, 1/4" pitting for 3" H and 1/8" pitting for remaining height. Approx 50% section loss to this location. Heavy rivet head loss on stringer connection rivets on outside face due to laminating corrosion. Additional corrosion holes in lower web, 8" W x 1 1/4"H max. RECOMMEND STRENGTHENING.
38	0	North	5	1" diameter hole in stringer cope with up to 1/4" section loss of web full height. Heavy section loss to top two rivets on both faces of stringer, up to 90%. RECOMMEND STRENGTHENING
38	5	South	5	1 1/2" H x 4 1/2" W below connection angle and 1/2" cope crack
39	0	North	5	1 1/4" H x 1/2" W below connection angle
39	1	South	5	1/2" H x 1/4" wide corrosion hole within 1/2" long crack extending below corrosion hole. Also 1/8" deep section loss over the full height of the beam.
39	5	South	1	1" diameter hole below connection angle with 1/2" crack at cope.

Floor Beam Sweep

Span	Floor Beam	Sweep (in.)	Sweep Direction	Stiff Leg Installed	Description
1	pier 1			Yes	Sister pier beam added due to severe sweep
2	0	-	-	Yes	
2	5	-	-	Yes	
3	0	1/2	North	Yes	
3	5	1/4	South	Yes	
4	0	1/4	North	Yes	
4	5	1/4	South	Yes	
5	0	3/4	North	Yes	
5	5	-	-	Yes	
6	0	-	-	Yes	
6	5	1/2	South	Yes	
7	0	1/2	North	Yes	
7	5	-	-	Yes	
8	0	1/4	North	Yes	
8	5	1/2	South	Yes	
9	0	3/8	North	Yes	
9	5	-	-	Yes	
10	0	-	-	Yes	
10	5	1/2	South	Yes	
11	0	5/8	North	Yes	
11	5	-	-	Yes	
12	0	1/4	North	Yes	
12	5	5/8	South	Yes	
13	0	1/2	North	Yes	
13	5	3/16	South	Yes	
14	0	5/8	North	Yes	
14	5	1/2	South	Yes	
15	0	5/8	North	Yes	
15	5	3/16	South	Yes	
16	0	3/16	North	Yes	
16	5	3/4	South	Yes	
17	0	1/2	North	Yes	
17	5	1/4	South	Yes	
18	0	5/16	North	Yes	

Floor Beam Sweep

Span	Floor Beam	Sweep (in.)	Sweep Direction	Stiff Leg Installed	Description
18	5	3/4	South	Yes	
19	0	5/8	North	Yes	
19	5	-	-	Yes	
20	0	-	-	Yes	
20	5	7/8	South	Yes	
21	0	5/8	North	Yes	
21	5	-	-	Yes	
22	0	1/4	North	Yes	
22	5	3/8	South	Yes	
23	0	1/2	North	Yes	
23	5	-	-	Yes	
24	0	1/4	North	Yes	
24	5	3/4	South	Yes	
25	0	3/8	North	Yes	
25	5	7/16	North	Yes	
26	0	3/8	North	Yes	
26	5	1/2	South	Yes	
27	0	3/4	North	Yes	
27	5	5/8	South	Yes	
28	0	1/2	North	Yes	
28	5	3/4	South	Yes	
29	0	3/4	North	Yes	
29	5	-	-	Yes	
30	0	-	-	Yes	
30	5	7/8	South	Yes	
31	0	1/2	North	Yes	
31	5	-	-	Yes	
32	0	-	-	Yes	
32	5	3/4	South	Yes	
33	0	3/8	North	Yes	
33	5	-	-	Yes	
34	0	-	-	Yes	
34	5	3/4	South	Yes	
35	0	1/2	North	Yes	
35	5	-	-	Yes	
36	0	-	-	Yes	
36	5	5/8	South	Yes	
37	0	1/2	North	Yes	
37	5	-	-	Yes	

Floor Beam Sweep

Span	Floor Beam	Sweep (in.)	Sweep Direction	Stiff Leg Installed	Description
38	0	-	-	Yes	
38	5	3/8	South	Yes	
39	0	3/8	North	Yes	
39	5	-	-	Yes	
40	pier 39				Sister pier beam added due to severe sweep

Floor Beam Loss

Span	Floor beam	Location	Comment
2	0	Full Length of Floor Beam	4" x 8" x 3/8" angle added to bottom of web and bottom flange with stitch welds.
3	5	Between Stringers 3 and 4	1 1/2" diameter corrosion hole
4	0	Between Stringers 4 and 5	14" long x 1" vertical corrosion hole
5	5	Between Stringers 1 and 2	3/4" diameter and 1" vertical x 2" horizontal corrosion hole
5	5	Between Stringers 3 and 4	2" vertical x 1" horizontal corrosion hole
6	0	Between Stringers 3 and 4	1" vertical x 16 1/2" horizontal corrosion hole
6	0	Between Stringers 1 and 2	6" horizontal x 1 1/4" vertical corrosion hole
7	2	East Truss Connection	1 1/2" long corrosion hole with crack
7	3	East Truss Connection	5/8" x 5/8" corrosion hole with 5/16" long vertical crack
8	3	East Truss Connection	3/4" vertical by 1/2" horizontal corrosion hole
9	0	Near Stringer 3	3/4" and 3/8" corrosion holes just in lower web above stiff leg.
9	1	West Truss Connection	3/4" diameter corrosion hole with adjacent knife edging in cope
9	1	East Truss Connection	2 3/4" diameter corrosion hole with a 1 1/8" long crack that has self-arresting into the corrosion hole
10	1	East Truss Connection	5/8" vertical x 3/16" horizontal corrosion hole
11	5	Between Stringers 4 and 5	4" vertical x 1 1/2" horizontal corrosion hole and four 3/8" diameter corrosion holes
11	5	Near Stringer 3	29 1/2" horizontal crack with slight offset and a 6" horizontal x 1 1/2" vertical corrosion hole (occurs above stiff leg)
12	0	Near Stringer 4	Multiple corrosion holes over a 48 1/2" horizontal x 1 5/8" vertical area
12	3	East Truss Connection	1 3/8" vertical x 1" horizontal corrosion hole
13	5	Near Stringer 2	1 3/8" horizontal x 1" vertical corrosion hole
15	5	Between Stringers 1 and 2	Multiple corrosion holes over a 21" length, max size 6" horizontal x 2" vertical
15	3	East Truss Connection	9/16" diameter corrosion hole with 1/4" long corrosion crack
15	4	East Truss Connection	1/2" horizontal x 1/4" vertical corrosion hole in floor beam cope with corrosion crack starting to form
16	4	East Truss Connection	3-1/2" vertical x 4 1/4" horizontal corrosion hole
18	2	East Truss Connection	1" vertical by 5/8" horizontal and 1/4" diameter corrosion holes with 1" horizontal crack extending between holes
19	3	East Truss Connection	Section loss up to knife edging in cope with crack forming
19	5	Between Stringers 3 and 4	6 1/4" long horizontal crack along the base of the web with heavy corrosion and corrosion holes
19	5	Near Stringer 5	3" horizontal x 3/8" deep section loss adjacent to floor beam web below the stringer connection angle
20	0	Between Stringers 1 and 2	3/4" diameter and 1 1/4" horizontal x 3/4" vertical corrosion holes
20	0	Between Stringers 3 and 4	14 1/2" long horizontal crack with multiple corrosion holes up to 1" vertical
20	3	East Truss Connection	1 1/8" horizontal x 9/16" vertical corrosion hole with adjacent knife edging
22	5	Near Stringer 4	1 1/2" horizontal x 3/4" vertical corrosion hole in lower web adjacent to bottom flange
22	5	West Truss Connection	1" horizontal x 3" vertical corrosion hole
23	0	East Truss Connection	2 3/4" vertical x 5/8" horizontal corrosion hole in lower web
24	0	Near Stringer 1	3/4" diameter corrosion hole in lower web
24	2	East Truss Connection	3/4" vertical x 3/4" horizontal corrosion hole at cope with 1/4" diagonal crack
25	2	East Truss Connection	3 1/2" vertical x 2" horizontal corrosion hole in floor beam cope, with adjacent knife edging
26	5	Between Stringers 1 and 2	1 3/4" horizontal x 1" vertical corrosion hole

Floor Beam Loss

Span	Floor beam	Location	Comment
26	3	East Truss Connection	1/2" diameter corrosion hole in floor beam cope
27	5	Between Stringers 1 and 2	1 1/2" diameter corrosion hole
27	1	West Truss Connection	2" vertical x 2 1/2" horizontal corrosion hole
27	1	East Truss Connection	3/4" diameter corrosion hole near cope and a 3/16" crack at cope on north face
27	2	East Truss Connection	1 1/4" vertical x 1 1/4" horizontal corrosion hole with 1/2" vertical crack below hole
28	0	Between Stringers 4 and 5	1 1/4" horizontal x 5/8" vertical corrosion hole
28	2	East Truss Connection	3/4" diameter & 1" horizontal x 3/4" vertical corrosion hole. 1/8" crack emanating from hole at cope
28	3	East Truss Connection	4 1/2" vertical x 1" horizontal corrosion hole
29	5	Between Stringers 2 and 3	2 1/4" horizontal x 3/4" vertical corrosion hole
29	1	West Truss Connection	6” vertical x 3 1/2” horizontal x 1/4” deep section loss to floor beam web with laminating corrosion on both faces of floor beam (New)
30	1	West Truss Connection	1/2" X 1/2" corrosion hole with knife edging for 3 1/4" vertically
30	2	East Truss Connection	1" vertical x 1/2" horizontal corrosion hole. 1/2" long vertical crack. Additional section loss for 8" vertical x 1" horizontal x 3/16" below corrosion hole
31	1	West Truss Connection	1/4” loss to floor beam web over 5” vertical x 2” horizontal area adjacent to truss connection at top of web
33	5	Between Stringers 4 and 5	5 1/4" horizontal x 1 1/8" vertical corrosion hole
33	2	East Truss Connection	2" vertical x 5/16" horizontal corrosion hole at cope
33	3	East Truss Connection	3/4" diameter corrosion hole
33	5	Near Stringer 5	10” horizontal x 6” vertical x 1/4” deep section loss to floor beam web below the stringer connection angle
34	3	East Truss Connection	Heavy web section loss over top 15" with 2 1/2" vertical x 1/2" horizontal and 1/2" diameter corrosion holes. Approx 33% total web loss. Crack has now become corrosion hole. RECOMMEND STRENGTHENING.
35	5	Between Stringers 4 and 5	1/2” diameter corrosion hole in floor beam web adjacent to bottom flange
37	5	Between Stringers 4 and 5	3/4" vertical X 2" horizontal corrosion hole, multiple corrosion holes over 3/4" vertical x 12" horizontal area
37	5	Near Stringer 3	3/8" vertical x 1" horizontal corrosion hole with 3/8" crack to east side and 1 1/4" long crack to west side above stiff leg
38	0	East Truss Connection	1 1/4" vertical x 3/4" horizontal corrosion hole
38	0	Between Stringers 4 and 5	4 corrosion holes: 1" vertical x 5" horizontal, 1" vertical x 1" horizontal, 1" vertical x 1 1/2" horizontal, and 1 1/2" diameter
39	0	East Truss Connection	3 1/2” vertical x 3/4” horizontal corrosion hole in the floor beam web adjacent to top flange and floor beam connection angle
39	1	East Truss Connection	3/4" vertical x 1/2" horizontal corrosion hole at cope with 3/16” long horizontal crack at corrosion hole
39	3	East Truss Connection	1/2" x 3/8" corrosion hole

Span	Floor beam	Location	Length (inches)	Comment
2	0	West Truss Cope	1	
2	0	East Truss Cope	2 1/4	
2	5	West Truss Cope	1 3/8	
3	5	West Truss Cope	1 1/2	
3	5	East Truss Cope	3 1/2	Crack grew 3/8"
4	0	West Truss Cope	3	
4	0	East Truss Cope	5	
5	3	West Truss Cope	5/16	
5	5	West Truss Cope	1	
5	5	East Truss Cope	3 1/8	
6	0	West Truss Cope	1 1/2	
6	0	Above Stiff Leg	7 1/4	Through web over stiff leg repair, below stringer 3
6	0	East Truss Cope	8	
7	0	West Truss Cope	1	
7	2	East Truss Cope	1 1/2	Previous recorded as 1/2". Crack has not grown past paint mark
7	3	East Truss Cope	5/16	
7	5	West Truss Cope	1 5/8	
7	5	East Truss Cope	3 1/8	
8	0	West Truss Cope	4 1/4	
8	0	East Truss Cope	6 1/4	
8	3	East Truss Cope	3/16	
9	1	East Truss Cope	1 1/8	
9	5	West Truss Cope	2 1/2	
9	5	East Truss Cope	3 1/4	
10	0	West Truss Cope	3	
10	0	East Truss Cope	6 5/8	
11	5	West Truss Cope	2 1/2	
11	5	East Truss Cope	2 5/8	
11	5	Above Stiff Leg	29 1/2	Horizontal crack occurs above stiff leg with slight offset and a 6" horizontal x 1 1/2" vertical corrosion hole
12	0	East Truss Cope	1 7/8	
12	0	West Truss Cope	1 7/8	
13	5	West Truss Cope	1 1/4	
13	5	East Truss Cope	2 1/2	
14	0	West Truss Cope	3	
14	0	East Truss Cope	5 7/16	
14	1	East Truss Cope	7/16	
15	3	East Truss Cope	1/4	
15	4	West Truss Cope	5/16	
15	5	East Truss Cope	4 7/8	
16	0	West Truss Cope	3 5/8	
16	0	East Truss Cope	4	Crack grew 1/8"
16	1	East Truss Cope	3/8	
16	1	West Truss Cope	1/2	
16	3	West Truss Cope	1	
17	1	West Truss Cope	1/8	
17	4	East Truss Cope	3/8	
17	4	West Truss Cope	1/2	
17	5	East Truss Cope	3 1/8	
17	5	West Truss Cope	3 1/8	
18	0	West Truss Cope	3 3/8	
18	0	East Truss Cope	5 1/8	
18	1	West Truss Cope	5/16	
19	5	East Truss Cope	1 3/8	
19	5	West Truss Cope	2 1/8	
20	0	West Truss Cope	1 3/4	

Span	Floor beam	Location	Length (inches)	Comment
20	0	East Truss Cope	6 3/8	
20	2	East Truss Cope	3/16	
21	4	West Truss Cope	3/4	
21	5	East Truss Cope	1 1/4	
21	5	West Truss Cope	1 3/4	
22	0	East Truss Cope	3 3/4	
22	0	West Truss Cope	5 3/4	
22	1	West Truss Cope	1/2	
23	3	East Truss Cope	1/2	
23	4	West Truss Cope	3/8	
23	5	West Truss Cope	1 3/4	
23	5	East Truss Cope	4	
24	0	East Truss Cope	4 1/8	
24	0	West Truss Cope	4 3/4	
24	1	East Truss Cope	3/4	1 1/4” x 3/8” wide corrosion hole
25	5	East Truss Cope	6 3/4	
26	0	West Truss Cope	3 1/2	
26	0	East Truss Cope	4 1/4	
27	5	East Truss Cope	1 1/4	
29	4	East Truss Cope	3/8	1 in high x 1/2 wide corrosion hole. 1/2 in vertical crack. Additional section loss 8 in high x 1 in wide x 3/16 in below corrosion hole
29	5	West Truss Cope	5/8	
29	5	East Truss Cope	5	
30	0	West Truss Cope	5/8	
30	0	East Truss Cope	1 5/8	
30	1	West Truss Cope	9/16	
31	5	West Truss Cope	1	
31	5	East Truss Cope	4 1/4	
32	0	West Truss Cope	5/8	
32	0	East Truss Cope	2	
33	3	East Truss Cope	3/8	3/8" long crack with 3/8" diameter corrosion hole
33	4	West Truss Cope	5/16	
33	5	East Truss Cope	3 1/4	
34	0	East Truss Cope	2 1/8	
34	1	East Truss Cope	1/2	
35	3	East Truss Cope	1/4	
35	5	East Truss Cope	2 13/16	
35	5	West Truss Cope	3 1/8	
36	0	West Truss Cope	1 3/8	
36	0	East Truss Cope	2 3/8	
36	1	East Truss Cope	1/4	
36	1	West Truss Cope	3/8	
36	4	West Truss Cope	1/8	
36	4	East Truss Cope	1/4	Previously noted as 5/8" long crack. Corrosion hole has grown to 3/4" x 1/2" reducing the crack length to 1/4"
37	4	West Truss Cope	3/8	
37	5	West Truss Cope	1 3/4	
37	5	East Truss Cope	2	3/8" growth
37	5	Above Stiff Leg	2 5/8	Horizontal crack occurs above stiff leg - length includes 3/8" vertical x 1" horizontal corrosion hole with 3/8" long crack to east side and 1 1/4" long crack to west side
38	0	West Truss Cope	3 1/2	
38	0	East Truss Cope	9 3/16	
38	1	West Truss Cope	1/2	
38	2	East Truss Cope	5/8	With adjacent 9/16" x 3/8" corrosion hole

Span	Floor beam	Location	Length (inches)	Comment
38	3	West Truss Cope	1/4	New
38	3	West Truss Cope	1/4	Previous recorded as 7/16". Crack has not grown past paint mark
38	4	West Truss Cope	1/8	
39	4	East Truss Cope	1/4	
39	4	West Truss Cope	1/4	
39	5	West Truss Cope	1 1/2	
39	5	East Truss Cope	3	

Gusset Plate Cracks

Span	Truss	Panel Point	Length of Crack (in.)	Strengthened (Y/N)	2018 FC Comment
2	East	L0	17 5/8	Yes	No change
7	East	L0	Paint Crack	No	No change
8	East	L0	9 1/4	Yes	No change
13	East	L5	Paint crack	No	No change
14	West	L0	4 3/4	Yes	No change
17	East	L5	9 3/4	Yes	No change
19	West	L5	9 1/2	Yes	No change
20	East	L0	7 1/2	Yes	No change
20	East	L5	Paint Crack	No	No change
22	East	L0	Paint Crack	No	No change
23	East	L0	Paint Crack	No	No change
23	West	L0	Paint Crack	No	No change
24	East	L0	8 1/2	Yes	No change
27	East	L5	Paint Crack	No	No change
27	West	L5	Paint Crack	No	No change
28	East	L0	Paint Crack	No	No change
29	East	L5	11 1/2	Yes	No change
30	East	L0	6 3/4	Yes	No change
33	East	L5	14	Yes	No change
38	East	L0	Paint Crack	No	No change