Fracture Critical Bridge Inspection Report

NBI Bridge No.: 04085

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

Prepared for:

Oklahoma Department of Transportation

Field Division 04

Inspection Date:

10/15/2016

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
US 281 over South Canadian River
ODOT Field Division 4, Canadian County

November 11, 2016

Dear Mr. Kellogg:

Burgess & Niple (B&N) performed a fracture critical and routine inspection of the above referenced bridge on October 12th through 15th, 2016. 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 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 Dale E. Poorman, PE (Team Leader), Ed Cinadr, PE, Shaun M. Fillmore, EI, Michael J. Kronander, EI, Ben Eckert, EI.

The bridge is currently open with no load restrictions. As per the latest load rating report date March 25, 2014, the bridge does not require a load posting.

This report includes appendices containing:

- Condition photographs
- Oklahoma DOT Bridge Inspection Form
- PONTIS 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

The current and previous NBI ratings for the bridge are:

NBI Item	Previous Rating (2015)	Current Rating (2016)
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	36.0 (SD)	36.0 (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.*

- Stringer 5 at the north face of floor beam 0, span 24 should be strengthened as soon as possible.
- 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 wearing surface and approach pavement.
- Remove loose 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 table values. Drill crack tips that grow significantly.
- Repair cracks in stringer connection angles by adding seat brackets below 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 and replace with bolts throughout.
- Replace sheared rivets in the vertical connection, upper chord, and end post with bolts near west U1 in spans 31 and 37.
- Remove pack rust and apply caulking and paint along vertical edges of end gusset plates to arrest/mitigate ongoing edge bowing.
- Cleaning and painting steel below deck within 5 feet of the joints.
- Replace missing elastomeric pads at pier beams 1 and 39.
- Add rip rap around piers 5 and 6 in the main channel to arrest/mitigate the ongoing scour. Consider adding rip rap at the base of the piers adjacent to the main channel, as well.

- Install full depth pressure relief joints on 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 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 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 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 bowed members near locations of collision damage for further distress and development of cracks.
- Monitor bowed gusset plates near bearings for distress.
- Monitor inboard lower chord section loss at 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 at 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.

Dale E. Poorman

Dale E. Poorman, 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 3)**. The concrete post at the north abutment for the east rail is spalled and is severed from the base **(photo 4)**. 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 5)**.
- 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 **(photo 6).** The deck at the abutment seats has pushed towards the channel up to 3 inches.
- Many portions of the curbs exhibit spalls and/or cracking with corroding reinforcing steel, especially over the ends of the intermediate floor beams **(photo 7)**. Spalls have been patched in isolated areas throughout the deck.

Soffit – (5 = Fair condition)

- **FX –** Spalls exposing corroded reinforcing steel are common in the underside of the deck at the expansion joints **(photo 8)**. The spalls appear to be the result of deck drainage leaking through cracks in the deck adjacent to the joint.
- The deck is lifting adjacent to the floor beams due to pack rust on the top flange of the stringers and floor beams. This condition is worse at the end floor beams and is the result of deck drainage leaking through the expansion and deck joints. A transverse crack is common in the underside of the deck between 4 and 6 feet from the expansion joints as a result of the lifting deck **(photo 9)**. 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. Spalls and deteriorated concrete exist in exterior stringer bays at isolated locations **(photo 10)**. 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.

- The deck overhangs have cracks and isolated spalls with rust staining and efflorescence commonly observed near scupper outlets.

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 7, 9, 15, 25, 27, and 31 **(photo 11).** These spalls have occurred since the 2013 inspection when the previously noted spalling was repaired.
- **PX –** The poured seal joints typically are deteriorated and show evidence of leaking **(photo 12)**. 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. 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 **(photo 13)**.
- The void between floor beam 5, span 20, and floor beam 0, span 21, over pier 20 has been completely filled with asphalt from the top of the floor beam bottom flanges to the underside of the deck. 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 **(photo 14).**

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 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.

- 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** – Cracks were observed in the web of numerous stringers at the top flange cope **(photos 15 and 16)**. There are a total of 127 crack locations including 97 locations without loss (see **Appendix A**) and 30 locations where cracks extend from section loss (see **Appendix D**). 6 new cracks and 9 cracks with growth were noted during the 2016 inspection. The cracks range in length from 1/16 inch to 3 7/8 inches. The cracks are well distributed throughout the truss spans with only two spans (spans 22 and 24) having no cracks observed. Over half of the cracks exist at the end floor beams and all but one cracks exists in the exterior stringers. A definitive cause for the cracks could not be determined during the inspection; however, the force of an expanding deck and differential movements between the deck and floor beam during flexure of the floor beams are likely causes. 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 59 stringer connection angles (see **Appendix B** for locations and lengths) **(photos 17 and 18)**. Only 1 new crack was found, and 3 cracks with growth were noted during the 2016 inspection. All connection angle cracks were at the end floor beams. Cracks range from 1 1/4 inch to 7 inches in length with an average length of 3 1/2 inches. The conditions were generally worse at the odd number floor beams 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). 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** – 117 broken rivets were observed at 89 stringer connections (see **Appendix C** for locations and number of rivets) **(photo 19)**. Two locations are new for 2016. Two previously noted locations were observed to no longer have the rivet shank through the connection angle for a total of 28 rivets with this condition. 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 progressive less for each floor beam further away from the from the end of each span (only one rivet broken at floor beam 3 for the entire bridge). Broken rivets were also greatest at stringers 2, 3 and 4 with no rivets broken at stringer 5 and only one broken at stringer 1. These conditions appear to be the result of live load induced stringer end rotation causing the rivet shank to fatigue at the head.
- **PX** – Section loss, including corrosion holes, exists through the exterior stringers web at the end floor beams at numerous locations (see **Appendix D** for locations and sizes) **(photo 20)**. Exceptionally severe section loss was observed in the web of stringer 5 at the north face of floor beam 0 of span 24 **(photo 21)**. Multiple corrosion holes exist

through the web adjacent to the connection angle. Section loss is typically worst at stringers 1 and 5 at the end floor beams due to deck drainage passing through the joints. Numerous through holes also have cracks extending from the holes due to very thin remaining web thickness adjacent to the holes.

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

- **PX** – Active section loss is common in the floor beams under the expansion joints. Corrosion holes were observed through the web of the floor beams at several locations (see **Appendix F** for locations and dimensions) **(photo 22)**. Corrosion holes were also noted through the web at the top flange cope of the interior floor beams at numerous locations (see **Appendix F** for locations and dimensions) **(photos 23 and 24)**. Several areas have cracks that extend from the corrosion holes in the copes due to very thin remaining section. Nearly half of the noted locations in Appendix F show a measurable increase in deterioration.
- **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) **(photo 25)**. Horizontal cracks ranging from 1/8 inch to 9 3/16 inches in length were noted at 71 locations. 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 3 locations ranging from 1/8-inch to 3/8-inch growth. One new crack measuring 1 inch in length was found in floor beam 0, span 2 during the inspection.
- **FX** – Cracks were observed in the web cope at the truss connection of the intermediate floor beams at 36 locations and range in size from 1/8 inch to 3/4 inch long (see **Appendix G** for locations and lengths) **(photo 26)**. New cracks were observed at 9 locations and crack growth was noted at 1 locations (1/8-inch maximum growth observed). New cracks range in length from 1/8 inch to 3/4 inch. 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** – 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 3/16 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.

[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 27)**. Longitudinal forces act through the deck to distort the pier beam. The majority 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 **(photo 28)**. 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 29).**

Floor System Bracing– (5 = Fair condition)

- **FX** - Corrosion holes were observed at numerous lower lateral bracing gusset plates **(photo 30)**. The corrosion holes typically are less than 3 1/2 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 west U1U2, span 31 **(photo 31)**. 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 off at the inboard bottom flange of U1U2 at this location with detached lacing bars.
  - Five failed lacing bars exist on the underside of east U3U4, span 9 **(photo 32).**
  - 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**.**
- Minor pack rust and laminating corrosion is forming on isolated upper chord gusset plates at the seams. The pack rust is typically 1/16-inch thick, up to 3/16 inch maximum, and section loss is minimal, 1/16-inch deep maximum.

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

- **FX** – 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; however, many of the previously noted cracks have grown significantly (up to approximately 2 inches) since the 2016 OS inspection. The following table includes locations of new crack growth (shaded in yellow) and the strengthened locations **(photo 33).**

Span	Truss	Panel Point	Length of Crack (in.)	Strengthened (Y/N)
2	East	L0	17 1/2 (2 Growth)	Yes
8	East	L0	9 (1 3/4 Growth)	Yes
14	West	L0	4 3/4	Yes
17	East	L5	9 3/4	Yes
19	West	L5	9 1/2	Yes
20	East	L0	7 1/2 (1 Growth)	Yes
24	East	L0	8 1/2 (1/2 Growth)	Yes
29	East	L5	11 1/2 (1 1/2 Growth)	Yes
30	East	L0	6 3/4	Yes
33	East	L5	14	Yes

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.

- **FX** – Lower chord gusset plates are typically bowed at L0 and L5 due to pack rust **(photo 34)**. 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 up to 50% of the plate thickness (gusset plate is 3/8 inch thick) occurs at multiple locations. This loss affects the horizontal shear capacity of the gusset plate.

- **FX** – 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 35)**. 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** – Corrosion of the lower chord is common at the floor beam/floor system bracing gusset plate connection **(photo 36)**. 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 37).** Corrosion is typically heavier at the east truss.
- 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. This is normal wear due to the repeated rotations that the end bearings undergo 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 38)**. 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 of wide flange bent in 2 1/8 inch near U1 **(photo 39)**.
  - **FX** – Span 31, west U1L2 – Inboard flange has a tear near U1 resulting in an approximate 50% loss of the flange **(photo 40)**. The adjacent gusset plate has two gouges measuring 1 7/8 inches deep at the upper chord and 1-inch deep at connection to U1L2. The 1 7/8 inch deep gouge 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 gouge 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 38)**.
    - **FX** – Span 37, west U1L2 – Inboard bottom flange is bent 1-inch near U1.
- **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 up to 1/4-inch thick is common between the diagonals and the mid gusset plates with minimal 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 41)**. 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 effectively 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 L0U1 – Bent inboard channel bottom flange and edge damage to top cover plate at U1 **(photo 42).**
    - Span 14, east L0U1 – Top inboard flange is bent down approximately 4 inches, and 5 rivet heads are sheared off.
    - Span 37, west L0U1 – 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 L0U1 – Inboard flange bent down approximately 2 inches near U1 **(photo 43)**.

  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.

- 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 5/8-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 **(photo 44)**. 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 **(photo 45)**. 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 through 4 at pier 39 with heavy pack rust forming at beam 5, pier 1 **(photo 28)**. 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. 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 **(photo 46)**.

- 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 **(photo 47)**. 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. 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 48)**. 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 49)**. 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)

Channel Scour – (5 = Fair condition)

- **PX** –Local scour exists around the columns at river piers 5 and 6 **(photo 50)**. The top of the column foundation is exposed up to 4 feet 3 inches at these locations. Local scour was also observed at the columns in the flood plain north of the river**.**

Embankment Erosion – (6 = Satisfactory condition)

- No significant erosion was observed. Heavy amounts of riprap are in place and performing at both abutments.

Debris – (6 = Satisfactory condition)

- Minor accumulations of drift exists under spans 5 through 10 **(photo 51)**. 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 9 with large trees and vegetation in the floodplain. The floodplain south of pier 9 contains sparse vegetation.

NBI Item 72 – Approach (5 = Fair condition)

Approach Alignment – (6 = Satisfactory condition)

- The approaches are straight with no reduction in sight distances across the bridge.

Approach Roadway Condition – (5 = Fair condition)

- **PX** – The concrete approach roadway is overlaid with asphalt which has unsealed joints and cracks **(photo 52)**. 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.
- Cracks and patches exist in the south approach roadway resulting in a relatively level yet rough riding surface with minor rutting in the wheel lines. A few moderately sized potholes between 4 and 8 square feet exist in the south approach asphalt.

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 9. Column footings were exposed up to 4-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.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 1 - Looking north at the bridge end view.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 2 - Looking northwest at the bridge elevation.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 3 - Looking northeast at the east bridge railing near the south abutment. Note: Collision damage to end railing post and broken bottom railing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 4 - Looking southeast at the northeast bridge railing. Note: First railing post is severed from base.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 5 - Looking west at the deck above pier 34. Note: Typical 1/8-inch wide transverse crack in the wearing surface.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 6 - Looking west at the end of the deck and face of the north abutment backwall. Note: 1 3/4-inch longitudinal offset between end of deck and face the backwall.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 7 - Looking southwest at the east edge of the deck over floor beam 1, span 30. Note: Large spall and portion of failed curb with corroding reinforcing steel and scaling concrete.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 8 - Looking northeast at the deck soffit along floor beam 5, span 16, between stringers 1 and 2. Note: 2 1/2-inch deep spall with exposed reinforcing steel.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 9 - Looking west at the deck soffit between stringers 3 and 4, near floor beam 0, span 19. Note: Transverse crack in deck due to pack rust on floor beam top flange lifting the deck.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 10 - Looking north at deck soffit between floor beams 2 and 3 in span 13. Note: Deck soffit exhibits transverse cracking with light efflorescence.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 11 - Looking east at joint at pier 7. Note: Elastomeric header is spalled in northbound lane.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 12 - Looking east at joint over pier 27. Note: Joint seal is separated from the adjacent header allowing water to flow through joint.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 13 - Looking west at along the underside of the expansion joint at pier 5. Note: Joint closed at 65F.

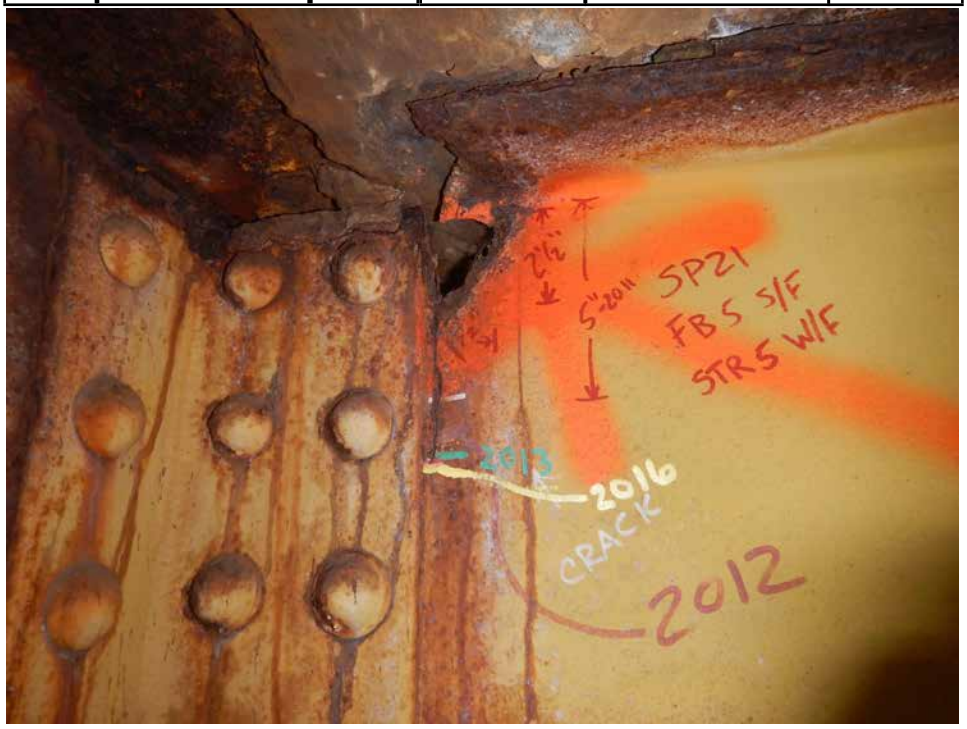
NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 14 - Looking east at west deck overhang, span 1 at pier 1. Note: Joint armor is heavily twisted due to pavement pressure and pack rust.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 15 - Looking east at west face of stringer 1, south face of floor beam 1, span 27. Note: No change or growth to previously noted 1" crack in stringer top cope of web.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016



Photograph 16 - Looking east at stringer 5 connection to floor beam 5, span 21. Note: 2 1/2-inch vertical corrosion hole with 3 7/8-inch long vertical crack.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 17 - Looking north at stringer 3 at connection to floor beam 5, span 15. Note: 3 7/8-inch long crack in connection angle.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 18 - Looking northeast at stringer 4 west connection angle to floor beam 5, span 33. Note: 7-inch long crack.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 19 - Looking southwest at stringer 2 connection to floor beam 0, span 22. Note: Broken rivet.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 20 - Looking west at stringer 5 connection to floor beam 5, span 9. Note: Corrosion hole with growth of vertical crack to 11/16 inch.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 21 - Looking southwest at stringer 5 at floor beam 0, span 24. Note: Corrosion holes through web and section loss on east face.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 22 - Looking southeast at floor beam 0 connection to the east truss, span 23. Note: 2 3/4-inch vertical by 5/8-inch horizontal corrosion hole through floor beam web.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 23 - Looking northeast at south face of floor beam 3, west truss, span 16. Note: 7/8-inch long crack in top cope of floor beam web.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 24 - Looking south at floor beam 3 at east truss connection, span 34. Note: heavy web section loss over top 15 inches with corrosion holes with cracks.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 25 - Looking north at floor beam 5 connection to the east truss, span 8. Note: 3 1/4-inch long crack in the cope.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 26 - Looking north at floor beam 3 at the west truss connection, span 38. Note: 7/16-inch long crack in floor beam cope.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 27 - Looking west at pier beam at pier 1. Note: Pier beam is rotated north 2 1/4 inches.

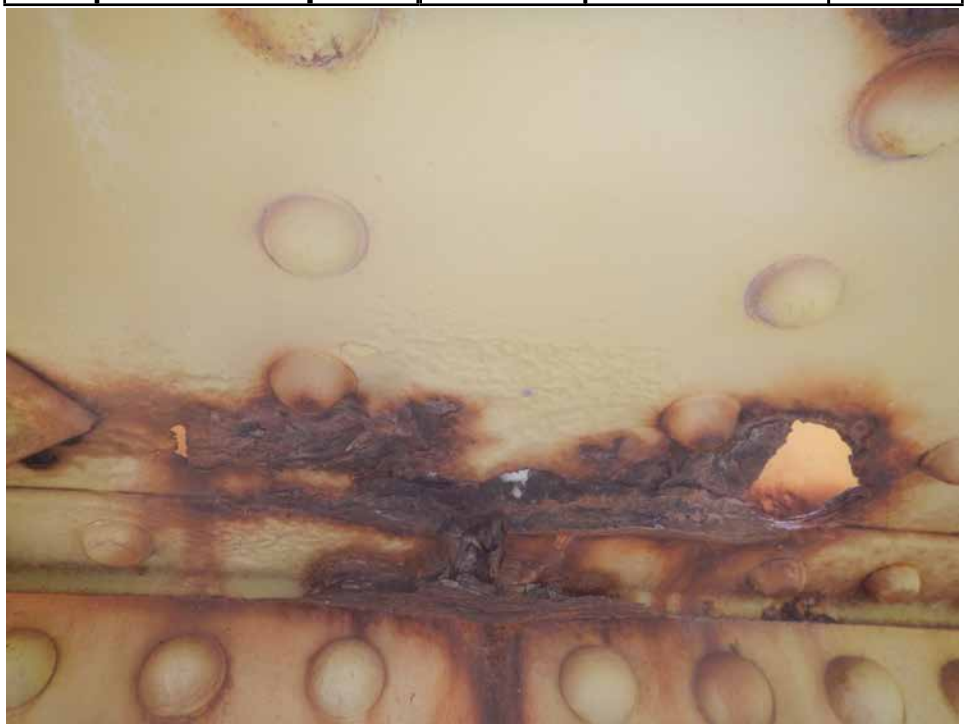
NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 28 - Looking north at beam 2 at sister pier beam at pier 1. Note: Missing elastomeric pad between beam and pier beam.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 29 - Looking southeast at recently installed stiff leg at pier 1: Note: The north face of pier beam 1 is likely in contact with the stiff leg at higher temperatures, and has 1/16 inch deep wear.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016



Photograph 30 - Looking east at lower lateral bracing gusset plate at east L3, span 38. Note: 14-inch by 3 1/2-inch corrosion hole through bracing gusset plate adjacent to lower chord.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 31 - Looking northwest at west U1L2 at U1, span 31. Note: Multiple sheared rivets exist for the bottom batten plate and lacing bars for the member.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 32 - Looking north at east U3U4, span 9. Note: Several lacing bar rivets are sheared from the inboard flange of upper chord.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 33 - Looking southwest at inboard gusset plate at east L5, span 29. Note: Gusset plate crack has grown 3/4 inch to 11 1/2 inches total, repaired on inside face.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 34 - Looking south at west L0, span 37. Note: 3/8-inch bow in inboard gusset plate due to pack rust.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 35 - Looking east at east L2, span 7. Note: Pack rust and laminating corrosion exists at the lower chord web splice plates.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 36 - Looking east at east L2, span 25. Note: Section loss up to knife edging on top flange of lower chord.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 37 - Looking northeast at inboard bottom flange of west L2L3 at L3, span 25. Note: 1 1/4-inch wide corrosion hole exists through the bottom inboard flange of the lower chord.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 38 - Looking southwest at west U1, span 37. Note: 5/16-inch long crack in gusset plate due to collision damage and sheared rivet heads for vertical.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 39 - Looking south at west L2U1, span 6. Note: The inboard flange is bent 2 1/8 inches due to impact damage.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 40 - Looking southwest at west U1L2 at U1, span 31. Note: Collision damage to inboard face of truss.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 41 - Looking south at inboard gusset plate at west L0, span 23. Note: Pack rust accumulation has caused the end gusset plates to bow inwards.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 42 - Looking southwest at west L0U1, span 7. Note: Collision damage exists to the top and bottom flanges of the end post near U1.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 43 - Looking northeast at east L0U1, span 39. Note: Collision damage to end post has bent the inboard flange and top cover plate down approximately 2 inches.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 44 - Looking east at east column of pier 3. Note: 1/2-inch wide cracks with 3/4-inch offset radiating from the span 3 east truss expansion bearing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 45 - Looking north at web wall of pier 12. Note: Horizontal cracking up to 1/8-inch wide with a spall approximately 6 inches wide by 3 feet long with exposed corroded reinforcing steel.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 46 - Looking northwest at east L0, span 38, over pier 37. Note 3/16 inch combined wear of pin and gusset plate.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 47 - Looking east at east truss expansion bearing for span 24 at pier 23. Note: Bearing has slid to limits of expansion.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 48 - Looking southeast at beam 5 bearing at the south abutment. Note: Anchor bolts missing from bearing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 49 - Looking northwest at the east truss expansion bearing for span 38 at pier 37. Note: Typical missing anchor bolt in expansion bearing.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 50 - Looking east at east column for pier 6. Note: Pier column foundation is exposed up to 4 feet 3 inches.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 51 - Looking east at west column foundation, pier 5. Note: Minor accumulation of drift exists at piers 5 through 10.

NBI #	Structure #	County	Fac. Carried	Fac. Intersected	Insp. Date
04085	0902 0000 X	Canadian	U.S. 281	S. CANADIAN RIVER	10/15/2016

Photograph 52 - Looking south at the south approach. Note: Cracks in asphalt pavement over concrete roadway.

OKLAHOMA DEPARTMENT OF TRANSPORTATION - Bridge Inspection Report

NBI No.: **04085** Structure No.: 0902 0000 X Local ID:-1 Suff. Rating: 36.0 SD Health Index : 53.8

IDENTIFICATION

Description:
38-100' PONY TRUSS & 2-36' I-BM. SPANS(BRIDGEPORT BR.)
1. State: Oklahoma 2. SHD District: Division 4
3. County Code: CANADIAN 4. Place Code: Unknown
Admin. Area: LT Snooper Truss
5. Inventory Route (Route On Structure) : 1 - 2 - 1 - 00281 - 0
6. Feature Intersected: S. CANADIAN RIVER
7. Facility Carried: U.S. 281 U.S. 281
9. Location: CADDO CANADIAN CL 11. Mile Post: 0.000 mi
13. LRS Inv. Route./ Subroute.: 0902 0000 01
16. Latitude: 35 32 25.00 17. Longitude: 098 19 22.00
98. Border Br. Code: Unknown (P) % Resp. : 0 99. Border Br. #: Unknown

INSPECTION

Type	Insp Req.	Insp Done	Freq:	Insp. Date:	Next Insp.:
NBI:		Y	12	10/15/2016	10/15/2017
FC Freq.:	Y	Y	12	**10/15/2016**	**10/15/2017**
UW Freq.:	N	N	NA	**NA**	**NA**
OS Freq.:	Y	N	12	**4/5/2016**	**4/15/2017**

STRUCTURE TYPE AND MATERIALS

43. Main Span Material and Design Type
Steel Truss-Thru
44. Approach Span Material and Design Type
Steel Stringer/Girder
45. No. of Spans Main Unit: 38 46. No. of Approach Spans: 2
107. Deck Type: 1 Concrete-Cast-in-Place
108A. Wearing Surface: 6 Bituminous
108B. Membrane: 8 Unknown
108C. Deck Protection: 8 Unknown

CLASSIFICATION

12. Base Hwy Network : On Base Network
20. Toll Facility: 3 On free road
21. Custodian: 01 State Highway Agency
22. Owner: 01 State Highway Agency
26. Functional Class: 06 Rural Minor Arteri
37. Historical Sig.: 2 Br eligible for NRHP
100. Defense Highway: 0 Not a STRAHNET h
101. Parallel Structure: No || bridge exists
102. Dir. of Traffic: 2 2-way traffic
103. Temp. Structure: Not Applicable (P)
104. Highway System: 0 Not on NHS
105. Fed. Land Hwy 0 N/A (NBI)
110. National Truck Network: 0 Not part of na
112. NBIS Length: Long Enough

AGE AND SERVICE

27. Year Built: 1933 106. Year Reconstructed: Unknown
28A. Lanes on: 2 28B. Lanes Under: 0 19. Detour Length: 11.8 mi
29. ADT: 1100 30. Year of ADT: 2014 109. Truck ADT %: 16
42A. Type of Service on: 1 Highway
42B. Type of Service under: 5 Waterway

CONDITION

58. Deck: 5 Fair
59. Super.: 4 Poor
60. Sub.: 5 Fair
62. Culvert: N N/A (NBI)
61. Channel/Channel Protection: 5 Bank Prot Eroded
Flowline Notes:

OCT-2016: 27.3 TOC at L3, west truss, span 6
[2016] FL to top of curb = 27.3' measured at E L5, span 6
[2015] FL to TOC = 27.7' measured @ L5, east truss.

GEOMETRIC DATA

10. Inv. Rte. Min. Vert. Clr.: 328.1 ft
32. Approach Roadway Width (W/ Shoulders): 30.0 ft
Deck Area: 102,364.8 sq. ft 33. Median: 0 No median
34. Skew: 0 35. Structure Flared: 0 No flare
47. Inv. Rte. Total Horiz. Clr.: 24.0 ft
48. Length Maximum Span: 100.1 ft 49. Structure Length: 3,937.0 ft
50A. Curb/Sdwlk Wdth L: 1.0 ft 50B. Curb/Sidewalk Width R: 1.0 ft
51. Width Curb to Curb: 24.0 ft 52. Width Out to Out: 26.0 ft
53. Minimum Vertical Clearance Over Bridge: 328.1 ft
54A/54B. Min. Vert. Underclearance : N Feature not hwy or RR 0.0 ft

	N/E			S/W		
Meas.	-1	-1	-1	-1	-1	-1
Post.	DO NOT U	DO NOT U	DO NOT U	DO NOT U	DO NOT U	-1

55A/55B. Minimum Lateral Undrclearance R: N Feature not hwy or RR 327.8 ft
56. Minimum Lateral Undrclearance L: 327.8 ft

LOAD RATING AND POSTING

31. Design Load: 2 M 13.5 (H 15)
41. Posting status: A Open, no restriction
63. Op. Rating Method: 1 LF Load Factor-Ton
Alt. Op. Rating Meth.: 1 LF Load Factor-To

64. Operating Rating (H / HS / 3-3):	24.4	36.3	65.4
66. Inventory Rating (H / HS / 3-3) :	14.5	21.8	37.7

65. Inv. Rating Method: 1 LF Load Factor-Ton
Alt. Inv. Rating Meth.: 1 LF Load Factor-To
70. Posting: 5 At/Above Legal Loads
Date Rated : 3/25/2014

PROPOSED IMPROVEMENTS

94. Bridge Cost: $6,781,689
75. Type of Work: 31 Repl-Load Capacity
95. Roadway Cost: $4,500,000
76. Lgth. of Improvment: 3,937.0 ft
96. Total Cost: $11,920,275
114. Future ADT: 1760
97. Year of Cost Est.: 2009
115. Year of Future ADT: 2034

NAVIGATION DATA

38. Navigation Control: Permit Not Required
39. Vertical Clearance: 0.0 ft
40. Horizontal Clearance: 0.0 ft
111. Pier Protection: 1 Not Required
116. Lift Bridge Vert. Clear.: 0.0 ft

APPRAISAL

36A. Bridge Rail: 0 Substandard
36C. Approach Rail: 0 Substandard
36B. Transition: 0 Substandard
36D. Approach Rail Ends: 0 Substandard
67. Str. Evaluation: 4 Minimum Tolerable
68. Deck Geometry: 4 Tolerable
69. Underclearance, Vertical and Horizontal: N Not applicable (NBI)
71. Waterway Adequacy: 5 Above Tolerable
72. Approach Alignment: 6 Equal Min Criteria
113. Scour Critical: 7 Countermeasures

200c. Temperature: 75
200d. Weather: PARTLY CLOUDY
201. Structural Steel ASTM Desig.: -1 -1
202. Waterproof Membrane : -1
Date Installed : 1/1/1901
203. Type Exp. Dev. : Pourable
-
204. Type of Handrail: Metal Railing (other)
205. Material and Quantity : 10.0
208. Type of Abutment : Pedestal
Type of Foundation : Natural Foundation Matl.
209. Type of Pier / Found.: 2 Piers Yes
No Piling or Drilled Shaft
210. Foundation Elev. -1.0 -1.0
-1.0 -1.0 -1.0
211. Wear. Surf. Prot. System : None
Date Installed : 1/1/1901
213. Utilities Attached : -1
-1 -1 -1
-1 -1 -1

214a. Posted Weight Limit: NR
b. Posted Speed Limit : -1
c. Narrow/One Lane Bridge sign : -1
d. Vertical Clearance Sign: NO
Advanced Warning Sign : NO
e. Navigation Lights : NO
Working/Not Working : NO
215. Overpass : C - US Highway
221. Substructure Cond. (U/W) : -
222. Fill over RCB: -1
223. Appr. Slab/Rdwy Cond.: Satisfactory
225. Paint Type : Red Lead Ready
Overcoat : Not Applicable
226. Date Painted: 3301
227. Paint Coloring: Silver
233. Deck Forming: -
238. School Bus Rte: Current and Desired Route
240. Appr. Roadway Type: Concrete

243. Girder Spacing/Number : -1.0 / -1
244. Span Lengths :
-1 -1 -1
-1 -1 -1
-1 -1
245. Girder Depth : 48.000
246. Type of Overlay : AC Overlay
246. Overlay Thickness : 3.0
246. Overlay Date : 12/4/2003
246. Overlay Depth Changed > 1"? _
247. Protective Systems : 1: _
2: _ 3: _
4: _ 5: _
248. No. of Field Splices w/ Corrosion : -1
249. Scour Crit. POA exists?: _
250. Culvert Headwall Dist.: -1.0
256. Chan. Profile Up/Down Stream?: _
257a. OkiePROS Auto. Truck Routing Yes
258. Plans w/ found. are in file at ODOT:
259. Scour Eval. is in file at ODOT:
263. Interchange at Intersection: No Interchange
264. Interstate Milepoint: -1.00

OKLAHOMA DEPARTMENT OF TRANSPORTATION - Bridge Inspection Report

NBI No.: **04085** Structure No.: 0902 0000 X Local ID:-1 Suff. Rating: 36.0 SD Health Index : 53.8

Inspection Date: 10/15/2016 Reported By: DPOORMAN

Invoice No.: -1 Inspected With: -1

Agency :

Dale Poorman

Digitally signed by Dale Poorman
DN: cn=Dale Poorman, o=Burgess Niple, Inc., ou, email=dale.poorman@burgessniple.com, c=US
Date: 2016.11.11 11:59:05 -05'00'

Structure / Inspection Notes

(38) 100-foot pony trusses with (2) 36-foot beam approach spans.
OS Inspection Items: 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; Sweep in end floor beams where stiff leg repairs have and have not been installed; Misalignment of WU1U2 sp 37; Stringer 5 section loss at end floor beams; Scour due to movement of stream from span 10 to span 6.

PX – Str 5 at FB 0, span 24 should be strengthened; Reinforce/replace the damaged concrete bridge railing in spans 1 and 40; Seal cracks in wearing surface and approach pavement; Remove debris from along the curbs; Remove loose concrete and patch the joint headers; Reseal the expansion joints; Install elastomeric pads or steel shims at missing locations on the supplemental pier beams over piers 1 and 39; Monitor cracks in stringer and floor beam webs. Drill crack tips that grow significantly; Repair cracks in stringer connection angles; Repair section loss in stringer and floor beam webs where corrosion holes and/or heavy section loss exists; Replace sheared rivets in the vertical connection, upper chord, and end post with bolts near west U1 in spans 31 and 37; Remove pack rust and apply caulking and paint along vertical edges of end gusset plates to arrest/mitigate ongoing edge bowing; Clean and paint steel below deck within 5 feet of the joints; Add rip rap around pier 9 in the main channel to arrest/mitigate the ongoing scour; Install full depth pressure relief joints on both approaches to mitigate ongoing effects of pavement pressure.
FX – Monitor: the beam connections to the original pier beams at piers 1 and 39 for further cracking; notches and cuts in inboard flange; notches and cuts in inboard flange and gusset plate at west U1L2, span 31; packrust and section loss in truss members; spalls and corroding rebar in soffit; lower chord gusset plates over bearings for development of horizontal cracks; cracks at FB copes and stringer connections; fatigue prone strich welds of angle strengthening at FB 0, span 2; corrosion holes in floor bracing system; bowed members near locations of collision damage; bowed gusset plates near bearings; bullet strike damage to east truss, span 4; cracking/ spall at east column capiital, pier 3 for condition which would undermine bearing; expansion bearing pins for signs of additional wear or distress.

Elm.	Env.	Description	Un.	Qty.	Qty.St. 1	% 1	Qty.St. 2	% 2	Qty.St. 3	% 3	Qty.St. 4	% 4	Qty.St. 5	% 5
12	4	Reinforced Concrete Deck	(SF)	94,488	0	0 %	0	0 %	94,488	100 %	0	0 %	0	0 %
107	4	Steel Open Girder Beam	(LF)	259	181	70 %	78	30 %	0	0 %	0	0 %	0	0 %
113	4	Steel Stringer/Floorbeam	(LF)	9,501	0	0 %	6,176	65 %	3,325	35 %	0	0 %	0	0 %
120	4	Steel Truss (Pony)	(LF)	7,600	0	0 %	4,940	65 %	2,660	35 %	0	0 %	0	0 %
152	4	Steel Floor Beam	(LF)	6,155	0	0 %	3,816	62 %	2,339	38 %	0	0 %	0	0 %
162	1	Steel Gusset Plate	(EA)	1,672	0	0 %	760	45 %	912	55 %	0	0 %	0	0 %
205	4	Reinforced Conc Column or Pile Extension	(EA)	78	0	0 %	77	99 %	1	1 %	0	0 %	0	0 %
215	4	Reinforced Conc Abutment	(LF)	49	25	50 %	25	50 %	0	0 %	0	0 %	0	0 %
301	4	Pourable Joint Seal	(LF)	495	0	0 %	0	0 %	248	50 %	248	50 %	0	0 %
310	1	Elastomeric Bearing	(EA)	4	4	100 %	0	0 %	0	0 %	0	0 %	0	0 %
311	4	Moveable Bearing (roller, sliding, etc.)	(EA)	86	0	0 %	61	71 %	25	29 %	0	0 %	0	0 %
313	4	Fixed Bearing	(EA)	84	0	0 %	84	100 %	0	0 %	0	0 %	0	0 %
330	4	Metal Bridge Railing	(LF)	7,600	0	0 %	7,220	95 %	380	5 %	0	0 %	0	0 %
331	1	Reinforced Conc Bridge Railing	(LF)	144	21	15 %	7	5 %	80	56 %	36	25 %	0	0 %
510	4	Wearing Surfaces	(SF)	94,488	75,590	80 %	9,449	10 %	9,449	10 %	0	0 %	0	0 %
515	4	Steel (Superstructure) Protective Coating	(SF)	406,533	0	0 %	0	0 %	406,533	100 %	0	0 %	0	0 %
859	4	Soffit of Concrete Decks and Slabs	(EA)	1	0	0 %	0	0 %	1	100 %	0	0 %	0	0 %
863	1	Steel Pier Beam	(LF)	114	0	0 %	57	50 %	57	50 %	0	0 %	0	0 %
865	4	Steel Open Girder/Beam End (5 Ft.)	(LF)	100	0	0 %	80	80 %	20	20 %	0	0 %	0	0 %
877	4	Steel Stringer End (5 Ft.)	(LF)	9,501	0	0 %	4,751	50 %	4,751	50 %	0	0 %	0	0 %
909	4	Pourable Fixed Joint Seal	(LF)	495	0	0 %	0	0 %	248	50 %	248	50 %	0	0 %
919	4	Steel (Railing) Protective Coating	(SF)	46,380	0	0 %	46,380	100 %	0	0 %	0	0 %	0	0 %
956	1	Steel Cracking/Fatigue	(EA)	1	0	0 %	0	0 %	1	100 %	0	0 %	0	0 %
957	4	Pack Rust	(EA)	1	0	0 %	0	0 %	1	100 %	0	0 %	0	0 %
961	1	Scour	(EA)	1	0	0 %	0	0 %	1	100 %	0	0 %	0	0 %
962	1	Superstructure Traffic Impact	(EA)	1	0	0 %	0	0 %	1	100 %	0	0 %	0	0 %
963	4	Steel Section Loss	(EA)	1	0	0 %	0	0 %	1	100 %	0	0 %	0	0 %
965	4	Debris	(EA)	1	0	0 %	1	100 %	0	0 %	0	0 %	0	0 %
969	1	Out-Of-Plane Distortion/Loading	(EA)	1	0	0 %	1	100 %	0	0 %	0	0 %	0	0 %

Additional Elements

Elem.	Element Notes (Include Size and Location of Deterioration
12	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.
107	FX – The connection angles for the beams to pier beam 39 are deformed due to the apparent approach pavement growth and pier beam 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.
113	PX – Cracks were observed in the web of numerous stringers at the top flange cope and stringer connection angles. Numerous broken rivets wre observed at the connection angles. Section loss exists through the exterior stringers at the end floor beams at numerous locations.
120	PX – Impact damage at west U1U2, span 31 and west U1L1 span 37. FX– Span 37, west U1 gusset plate – 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 1/4"; 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.
152	PX – Active section loss with corrosion holes is common on the floor beams under the expansion joints; FX – Cracks were observed in the web of the end floor beams and intermediate floor beams in many locations.
162	PX- Numerous horizontal cracks were observed in the inboard truss gusset plates above the bearings, see report for locations and crack lengths; FX-LC inboard gusset plates typically bowed at L0 and L5 due to pack rust.

Elem.	Element Notes (Include Size and Location of Deterioration
205	FX – A 5/8-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	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	PX – Spalling of the headers was observed along the joints at piers 7, 9, 15, 25, 27, and 31; The poured joint seals typically are deteriorated and show evidence of leaking. Many of the poured seals were never installed at many of the hrepaired header locations, leaving only the form board to fill the joint.
310	PX – Elastomeric pads are missing at the supplemental pier beams under beams 1 through 4 at pier 1 and at beams 2 through 4 at pier 39 with heavy pack rust forming at beam 5, pier 1.
311	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 widespread on and between the bearing components.
313	Surface corrosion exists the the fixed bearings.
330	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.
331	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.
510	PX – The asphalt wearing surface has unsealed longitudinal and transverse cracks throughout the spans. The deck growing in each span causing rotation/sweep in floor beams.
515	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.
859	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.
863	PX – Pier beams 1 and 39 have severe sweep and have been sistered.
865	Corrosion on the top flange of the end 1-3ft of each floor beam is common.
877	PX- Cracks were observed in the web of numerous stringers at the top flange cope, see FC report for locations; Cracks in the stringer connection angles were observed at numerous locaations at the end floor beams, see FC report for locations; Severe section loss with corrosion holes exists through exterior stringer webs.
909	The poured seal joints typically are deteriorated and show evidence of leaking.
919	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.
956	PX- Numerous cracks exist in the stringer copes, stringer connection angles, end floor beams, and interior floor beams. See FC report.
957	PX – Pack rust is common at the end post connection to the inboard gusset plate at the lower chord connection; FX – Pack rust is forming at many of the bridge railing to inboard end post channel connections.
961	PX –Local scour exists around the columns at river piers 5 and 6. The top of the column foundation is exposed up to 4 feet 3 inches at these locations. Local scour was also observed at the columns in the flood plain north of the river.
962	PX-Collision damage to end posts, upper chord, verticals and diagonals at numerous locations.
963	PX- Corrosion holes through stringer webs, floor beam webs at numerous locations; FX- Corrosion of the lower chord has caused section loss on inboard top flange.
965	Minor accumulations of drift exists under spans 5 through 10.
969	PX – Pier beams 1 and 39 have severe sweep and have been sistered.

Appendix A: Stringer Cope Cracks

Span	Floor Beam	Floor Beam Face	Stringer	Length (in.)	2016 Comment
2	0	North	5	1 1/2	Crack grew 1/8" (2016)
2	2	South	1	3/8	
2	4	South	1	1/8	
2	5	South	1	3/8	
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	
4	5	South	5	1 1/2	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	New crack 1/8" (2016)
7	0	North	5	2 1/4	
7	5	South	1	3/4	
7	5	South	5	3/4	
8	4	North	5	1 1/4, 7/8	2 New diagonal cracks (2016)
8	5	South	1	1 3/8	Crack grew 1/4"
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	1	South	2	3/4	New, appears on both sides of stringer (2016)
10	2	North	1	5/8	
10	5	South	5	1	
11	0	North	5	9/16	
11	0	North	1	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	Crack grew 1/8"
16	1	South	5	1 1/8	Crack has grown 1/8"
16	4	North	5	3/8	
16	5	South	5	3/4, 1/4	
17	0	North	5	1 3/8	
17	3	North	1	1/16	
18	0	North	1	1/2	
18	2	South	1	3/8	
18	5	South	1	1	Crack grew 1/4"
19	0	North	5	1/2	
19	5	South	1	3/4	

Appendix A: Stringer Cope Cracks

Span	Floor Beam	Floor Beam Face	Stringer	Length (in.)	2016 Comment
19	5	South	5	1 1/4	
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	5	1/8	
20	4	North	1	3/16	New crack (2016)
20	5	South	1	1/8	
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 & 3/4	Crack grew 1/8" now 1/2"
27	1	South	1	1	
27	1	South	5	1/4	
27	2	South	1	3/16	
27	4	North	5	1/2	
28	1	North	1	3/16	
28	2	North	1	5/8	
28	2	North	1	1/2	
28	2	South	1	1/4	
28	3	North	5	3/8	
28	5	South	1	5/8	
30	1	South	5	1/2	
30	4	North	5	1/4	
31	1	North	1	1/4	New crack (2016)
31	2	North	1	1/4	
32	2	South	1	1/4	
32	0	North	5	5/8	
32	3	South	1	1/4	
32	4	North	1	1/8	New crack (2016)
32	5	South	1	1/4	
33	2	South	1	1/8	
33	5	South	1	1 1/2	
34	1	South	1	1/4	
34	2	South	1	5/16	Crack grew 1/16"
34	5	South	1	1/2	
35	0	North	1	1/2	

Appendix A: Stringer Cope Cracks

Span	Floor Beam	Floor Beam Face	Stringer	Length (in.)	2016 Comment
35	4	South	1	1/8	
36	0	North	1	3/8	Crack grew 1/8"
36	1	North	1	3/8	
36	2	South	1	3/4	
36	4	North	1	1/4	
36	5	South	1	2 1/4	Crack grew 1/2"
37	0	North	5	1/2	
38	2	North	1	3/4	
38	2	South	1	5/8	
39	1	North	1	1/8	
39	1	South	1	1/2	
39	3	South	1	3/8	

Appendix B: Stringer Connection Cracks

Span	Floor Beam	Floor Beam Face	Stringer	Stringer Face	Length (in.)	2016 FC Comment
2	0	North	2	West	3 1/4	
3	5	South	4	West	2 1/2	
4	0	North	2	West	2 3/4	
5	5	South	3	East	3 1/4	
8	0	North	3	West	3 1/2	
9	5	South	3	East	1 1/4	
9	5	South	3	West	3 1/2	
10	0	North	3	West	3	
12	0	North	2	East	3	
13	5	South	4	West	4	
15	5	South	4	West	3 7/8	Crack grew 1/4"
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	3 7/8	Crack grew 3/8"
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 1/4	
25	5	South	3	West	4 1/2	
25	5	South	3	East	1 1/4	
25	5	South	4	West	3 1/2	
25	5	South	5	West	6	
26	0	North	2	East	2 7/8	
26	0	North	2	West	3 1/4	
26	0	North	3	East	5 3/8	
26	0	North	3	West	2 3/8	
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	
30	0	North	2	East	5 5/8	
30	0	North	3	East	4 1/2	
30	0	North	4	East	3 3/4	

Appendix B: Stringer Connection Cracks

Span	Floor Beam	Floor Beam Face	Stringer	Stringer Face	Length (in.)	2016 FC Comment
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	
34	0	North	3	West	2 1/4	
34	5	South	5	West	4 1/2	
35	5	South	2	West	1 1/4	New Crack (2016)
35	5	South	3	West	4 1/4	
35	5	South	4	West	4	
36	0	North	2	West	3	Crack grew 1/8"
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	

Appendix C: Missing Stringer Rivets

Span	Floor Beam	Floor Beam Face	Stringer	Number	2016 FC Comment
2	0	North	2	1	All shanks still in shear plane unless noted otherwise.
2	0	North	3	2	
4	0	North	2	1	Shanks 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	North	2	1	
5	5	South	4	1	
6	0	North	2	2	Shanks not in shear plane.
6	0	North	3	1	
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	
7	5	South	4	2	
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	
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. (2016)
12	0	North	4	1	
13	2	North	2	2	
14	0	North	2	2	Shanks not in shear plane.
15	5	South	3	2	
15	5	South	4	1	
16	0	North	2	2	
16	0	North	3	1	
17	5	South	4	1	
18	0	North	2	2	Shanks not in shear plane.
18	0	North	3	1	Shanks 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	Shanks not in shear plane.
23	2	North	2	1	
23	4	South	4	1	

Appendix C: Missing Stringer Rivets

Span	Floor Beam	Floor Beam Face	Stringer	Number	2016 FC Comment
24	0	North	2	2	East rivet shank no longer in shear plane.
24	4	South	4	2	
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	Shank still present in shear plane. (New 2016)
30	0	North	3	1	
31	5	South	3	2	
32	0	North	2	2	East rivet shank no longer in shear plane.
32	0	North	3	1	East rivet shank no longer in shear plane.
33	1	North	2	1	
33	5	South	3	1	
34	0	North	3	1	
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	Shank still present in shear plane. (New 2016)
37	1	North	2	1	
37	2	North	2	1	
37	5	South	3	2	
37	5	South	4	1	
38	0	North	2	2	East rivet shank no longer in shear plane.
38	0	North	3	1	East rivet shank no longer in shear plane.
38	1	North	2	1	
39	5	South	3	1	
39	5	South	4	1	

Appendix D: Stringer Loss

Span	Floor Beam	Floor Beam Face	Stringer	Description
2	0	North	1	3/4" diameter with 1/4" crack
4	0	North	5	1 1/4" diameter with 3/4" crack
4	0	North	5	3" H x 3/16" remaining along top of web. New (2016)
5	5	South	5	1" diameter with horizontal crack, 1/2"L, and vertical crack, 3/8"L
6	0	North	1	1 1/2 " diameter with 1 1/8" vertical crack (grew 1/4")
6	0	South	5	1 3/8" diameter, 1/2" vertical crack
9	1	South	5	2 3/8" x 1"
9	5	South	1	2 7/8"H x 1 1/4"W with 3/4" vertical crack and 3/8" diagonal crack
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	DEP1-026, 4"W x 1 1/8"H with 1/2" knife edging adjacent in lower web. New (2016)
11	5	South	5	5/8" diameter with 7/8" long crack
12	0	North	1	1" diameter with 1/4" 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
14	0	North	5	1/2" diameter hole with 1 1/4" vertical crack. New (2016)
15	5	South	5	1" diameter at cope & 2"H x 5"W below connection angle
16	0	North	5	Web top at connection angle: 4 1/4"H x 1 1/2" hole with two cracks (5/8" & 1/4"). Web bottom just above bottom flange 5"W x 1"H Approx 33% web area remains.
17	4	North	5	2 1/2" x 1" with 9/16" long crack
17	5	South	1	Two holes: 1 1/2"W x 1/2"H and 1/2"H hole with 5/8" crack
17	5	South	5	2 1/4"H x 1" with 1/2" long crack
18	0	North	5	2 1/2"H x 1"W hole with 3/16" pitting for 7"H
19	5	South	1	1/2" 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
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 3 7/8" long crack. RECOMMEND STRENGTHENING.
22	0	North	1	2"W x 1/2"H
23	5	South	5	2 3/4"H x 1/2"W
24	0	North	1	1 1/4"H x 3/4" W with 3/16" max pitting over 6" below hole
24	0	North	5	10 1/2"W x 2"H with 1/16-1/8" 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

Appendix D: Stringer Loss

Span	Floor Beam	Floor Beam Face	Stringer	Description
25	2	North	5	1/2" diameter. Adjacent knife edging to hole.
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 3/16" crack
26	0	North	5	2"H x 5/8"W
27	5	South	1	3 1/4"H X 1"W with 1/4" vertical crack
29	4	South	5	5/8" dia corrosion hole in stringer cope with 1" vertical crack below hole
29	5	South	5	1 1/2"H X 1"W with two cracks, 1" crack extends cope to hole & 1" crack below hole. Two new through holes, 1/2" and 5/8" diameter in lower web (2016)
30	0	North	5	1 1/2" x 1 1/2"
31	5	South	5	1 1/2" H x 1" W & 1 1/4" H x 1" W, total web section loss = approx 40%
33	5	South	5	Severe section loss to east connection angle (west connection angle good)
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" vertical by 1 1/4" horizontal corrosion hole with 3/8" vertical crack at bottom of hole. Also, 2 holes in lower web, 2"W x 1"H and 3/4" diameter.
35	5	South	5	6" W X 1 3/4" H
36	0	North	5	2 1/2" H x 1 1/4" W 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.
38	0	North	5	2"H x 3/4"W hole at cope with 1/8" average (3/16" max) section loss full height on outboard face. 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"W hole within 1 1/16" crack at cope, also 1/8" average full height section loss.
39	5	South	1	1" diameter below connection angle with 1/2" crack at cope

Appendix E: Floor Beam Sweep

Span	Floor Beam	Sweep (in.)	Sweep Direction	Stiff Leg Installed	Comment
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		South	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	
18	5	3/4	South	Yes	
19	0	5/8	North	Yes	
19	5			Yes	
20	0			Yes	
20	5	7/8	South	Yes	

Appendix E: Floor Beam Sweep

Span	Floor Beam	Sweep (in.)	Sweep Direction	Stiff Leg Installed	Comment
21	0	5/8	North	Yes	
21	5		North	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	
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

Appendix F: Floor Beam Loss

Span	Floor Beam	Location	Comment
3	5	Between stringers 3 and 4	1 1/2" diameter
4	0	At stringer 4	14" L x 1" H
5	5	Between stringers 3 and 4	2" H x 1" W
5	5	Between stringers 1 and 2	3/4" diameter and 1" H x 2" W
6	0	Between stringers 3 and 4	1" H x 14" W
6	0	Between stringers 1 and 2	6" W x 1-1/4" H
7	2	At E Truss	3/4" X 3/4" corrosion hole with 1/2" horizontal crack
7	3	At east truss cope	5/8" X 5/8" New (2016)
8	3	At E Truss	3/4" vertical by 1/2" horizontal corrosion hole
9	0	Under stringer 3	3/4 in corrosion hole just above BTM flange.
9	1	West Truss	3/4-inch corrosion hole with adjacent knife edging in cope. New (2016)
9	1	At east truss	1 1/2" diameter. New (2016)
10	1	At east truss cope	5/8" vertical X 3/16" horizontal. New (2016)
11	5	Between stringers 4 and 5	5 through holes, 4"Hx1-1/2" and four 3/8" diameter. (2016)
11	5	Near stringer 3	Was 4 1/2"W, now 27" W x 1 1/2" H. Web crippling over stiff leg.
12	0	Near stringer 4	1.5" W x 1" H, 3.5" W x 3/4" H, 2.5" W x 1" H, 3/4in diameter, 1 1/2in x 1in. (2016)
12	3	At E Truss	1 3/8" H x 1" W. (2016)
13	5	Near stringer 2	1 1/4"W x 1"H corrosion hole
15	3	At E Truss	9/16" diameter with 1/4" corrosion crack
15	4	At E Truss	1/2"W x 1/4"H corrosion hole in floor beam cope. Corrosion crack starting to form
15	5	Between stringers 1 and 2	Multiple holes over 21" length, max size 6"W x 2"H
16	4	East truss	3-1/2"H x 4-1/4"W
18	2	At E Truss	1"H x 5/8"W & 1/4" diameter corrosion holes with 1" crack extending between holes.
20	0	between stringers 1&2	2 holes, 3/4" diameter and 1 1/4"W x 3/4"H. New (2016)
20	3	At east truss connection	1 1/8"W x 9/16"H through hole with adjacent knife edging. New (2016)
22	5	Near stringer 4	1 1/2" W x 3/4" H in lower web
23	0	At E truss	2 3/4"" H x 5/8" W in lower web. (2016)
24	0	Between stringer 1 & west truss	3/4" diameter in lower web
24	2	At east truss connection	3/4"H x 3/4"W hole at cope with 1/4" diagonal crack. New (2016)
25	2	At E Truss	3 1/2" H x 2" W corrosion hole in floor beam cope, with adjacent knife ending.
26	3	At E Truss	1/2" corrosion hole in floor beam cope
26	5	Between stringer 1-2	1 3/4"W x 1"H
27	1	At W Truss	2" H x 2 1/2" W. (2016)
27	1	At E Truss	3/4" diameter corrosion hole and a 3/16" crack at cope. New cope crack 3/16" (2016)

Appendix F: Floor Beam Loss

Span	Floor Beam	Location	Comment
27	2	At east truss connection	1 1/4"H x 1 1/4"W hole with 5/16" vertical crack below hole. New (2016)
28	0	Between stringers 4-5	Through hole, 1 1/4"W x 5/8"H. New (2016)
28	2	At E Truss	3/4" diameter & 1"W x 1/4"H holes. 1/8" crack emanating from hole at cope.
28	3	At E truss	4" H x 3/4" W
29	5	Between stringers 2-3	2 1/4" W x3/4" H
30	1	At west truss	1/2" X 1/2" with knife edging for 2 1/2" vertical. New (2016)
30	2	At E Truss	1"H x 1/4"W corrosion hole with 5/8" vertical crack. 2016
33	2	At east truss connection	1 1/2"H x 5/16"W hole at cope. New (2016)
33	5	Between stringers 4-5	Through hole, 5 1/4"W x 1 1/8"H. New (2016)
34	3	At east truss connection	Heavy web section loss over top 15" with 1 1/8"H x 1/2"W and 1/2" diameter holes. Also, 3/4" crack emanating from top hole. Approx 33% total web loss. RECOMMEND STRENGTHENING. New (2016)
37	5	Between stringers 4 and 5	3/4" H X 2" W, multiple holes (3/4"H x 12"W)
37	5	At stringer 3, over stiff leg	New corrosion hole measuring 3/8"H x 1"W with 5/8" long crack above stiff leg. (2016)
38	0	At east truss connection	1 1/4" H x 3/4" W
38	0	Between stringers 4 and 5	3 corrosion holes between: 1" H x 5" W, 1" H x 1" W, 1" H x 1 1/2" W
39	1	At east truss connection	3/4"H x 1/2"W through hole at cope. New (2016)
39	3	At east truss connection	1/2" x 3/8" (new 2015)

Appendix G: Floor Beam Cracks

Span	Truss	Floor Beam	Length (inch)	2016 FC Comment
2	East	0	2 1/4	
2	West	0	1	New crack (2016)
2	West	5	1 3/8	
3	East	5	3 1/8	
3	West	5	1 1/2	
4	East	0	5	
4	West	0	3	
5	West	3	5/16	
5	East	5	3	
5	West	5	1	
6	East	0	8	
6	West	0	1 3/8	
7	West	0	1	
7	East	2	1/2	
7	East	3	1/4	New crack (2016)
7	East	5	3 1/8	
7	West	5	1 5/8	
8	East	0	6 1/4	
8	West	0	4 1/4	Crack grew 3/8"
8	East	3	3/16	New crack (2016)
9	East	5	3 1/4	Crack grew 1/4"
9	West	5	2 1/2	
10	East	0	6 5/8	
10	West	0	3	
11	East	5	3	
11	West	5	2 1/2	
12	East	0	1 7/8	
12	West	0	1 7/8	
13	East	5	2 1/2	
13	West	5	1 1/4	
14	East	0	5 7/16	
14	West	0	3	
14	East	1	7/16	
15	West	4	5/16	
15	East	5	4 7/8	
16	East	0	3 7/8	
16	West	0	3 5/8	
16	East	1	3/8	
16	West	1	1/2	

* Highlighted rows show new or changed comments.

Appendix G: Floor Beam Cracks

Span	Truss	Floor Beam	Length (inch)	2016 FC Comment
16	West	3	7/8	
17	West	1	1/8	New crack (2016)
17	East	4	3/8	
17	West	4	1/2	
17	East	5	3 1/8	
17	West	5	3 1/8	
18	West	1	5/16	New crack (2016)
18	East	0	5 1/8	
18	West	0	3 3/8	
19	East	5	1 3/8	
19	West	5	2 1/8	
20	East	0	6 3/8	
20	West	0	1 3/4	
20	East	2	3/16	
21	East	5	1 1/4	
21	West	4	3/4	New crack (2016)
21	West	5	1 3/4	
22	East	0	3 3/4	
22	West	0	5 3/4	
22	West	1	1/2	
23	East	3	1/2	
23	West	4	3/8	New crack (2016)
23	East	5	4	
23	West	5	1 3/4	
24	East	0	4 1/16	
24	West	0	4 5/8	
24	East	1	3/4	
25	East	5	6 3/4	
26	East	0	4 1/4	
26	West	0	3 1/2	
27	East	5	1 1/4	
29	East	4	3/8	
29	East	5	5	Crack grew 1/8"
29	West	5	5/8	
30	East	0	1 5/8	
30	West	0	5/8	
30	West	1	1/2	
31	East	5	4 1/4	
31	West	5	1	

* Highlighted rows show new or changed comments.

Appendix G: Floor Beam Cracks

Span	Truss	Floor Beam	Length (inch)	2016 FC Comment
32	East	0	2	
32	West	0	5/8	
33	East	3	1/8	with 3/8 dia corrosion hole
33	West	4	5/16	New crack (2016)
33	East	5	3 1/4	
34	East	0	2 1/8	
34	East	1	1/4	New crack (2016)
35	East	3	1/4	
35	East	5	2 13/16	
35	West	5	3 1/8	
36	East	0	2 3/8	
36	West	0	1 3/8	
36	East	1	1/8	
36	East	4	1/4	New crack (2016)
36	West	1	3/8	
36	West	4	1/4	
37	West	4	1/8	
37	East	5	2	
37	West	5	1 3/4	
38	East	0	9 3/16	
38	West	0	3 1/2	
38	West	1	1/2	Crack grew 1/8"
38	East	2	7/16	Through hole is 9/16"H x 3/8"W with 7/16" diagonal crack.
38	West	3	7/16	
38	West	4	1/8	
39	East	4	1/4	
39	West	4	1/4	
39	East	5	3	
39	West	5	1 1/2	