



INFORMATIONAL MEMORANDUM

TO: Transportation and Infrastructure Committee
FROM: Hari Ponnekanti, Interim Public Works Director
BY: Adam Cox, Transportation Project Manager
CC: Mayor Allan Ekberg
DATE: September 18, 2020
SUBJECT: 42nd Avenue South Bridge In-Depth Inspection
Project No. 91810404
Bridge Results

ISSUE

Provide results from the in-depth inspection of the 42nd Avenue South Bridge. The Committee received a status report in August 2020 on the bridge closure that was necessary for the inspection to be safely completed and the feedback the City received during and after the closure.

BACKGROUND

Currently, the 42nd Ave S Bridge has a sufficiency rating of 7.56 out of 100, per King County Road Division’s inspection. Sufficiency ratings are calculated by a formula implemented by the Federal Highway Administration to inventory the nation’s infrastructure, and to determine allocation of federal funds for bridge replacement. Some of the considerations in establishing a bridge’s rating include:

- Structural Adequacy
- Serviceability and Functional Obsolescence
- Special Reductions

In December 2019, the full Council supported staff’s recommendation to perform additional analysis beyond the routine scope of inspection that King County normally performs on the City’s bridges. The City contracted with TranTech Engineering for a more in-depth structural inspection in the amount of \$39,884.00. This in-depth inspection provides a better understanding of how the bridge steel is performing internally. During the inspection, the 42nd Ave S Bridge was closed to all vehicular traffic to allow the inspectors to safely maneuver on the bridge. The inspection was delayed due to the Seattle Department of Transportation (SDOT) restricting the use of the Under-Bridge Inspection Truck (UBIT) due to the West Seattle Bridge closure and COVID-19 measures.

The UBIT inspection was conducted on July 22 and 23, 2020, allowing inspectors access to the steel members under the 42nd Ave S Bridge. The inspectors then used a boom lift on July 24 to access the connection points at the top of the bridge.

ANALYSIS

The 42nd Ave S Bridge has areas of section loss and corrosion (i.e. an element has lost area from its original design/constructed area, affecting its engineering properties) that had been painted over in the last painting of the bridge. This analysis shows that the corrosion is particularly true along the lower chord and gusset plates. In some areas, the corrosion is becoming active again with minimal

section loss at the panel points. Most diagonal members that are in compression have rust along seams where two of the steel beams have been secured together with rivets. The corrosion along the seam is causing the rivet heads to deflect along the diagonal members. Additionally, there is seam rust along most vertical steel members and along sway bracing with areas of rust with minimal section loss. Several sway bracing members have high load impact damage due to oversized trucks striking the overhead members, which have caused upward deflection in flange angles. The observed section loss and deflection in the steel members are within design standards given the age of the bridge but should continue to be monitored to observe if the corrosion or section loss is expanding or becoming an issue.

According to the attached TranTech report, the results of in-depth inspection and the subsequent analysis showcase that the deficiencies observed/measured do not require further weight restrictions for the 42nd Ave S Bridge. It is of the opinion of the Professional Engineer who performed the analysis, that if the truck traffic continues to abide by the posted weight, speed, and occupancy restrictions, the deterioration of the bridge will be minimal. However, in the event of a catastrophic event (e.g., earthquake, flood, or major impact damage), the bridge is highly susceptible to damage that could require a full shutdown and further analysis.

The results from the inspection and analysis also confirm that the 42nd Ave S Bridge is approaching the end of its service life. Without replacement or major maintenance repairs, it will require more and more restrictions for its continued safe use in the coming years. Maintenance projects have been studied from the past and it has been determined that the cost of repairing the bridge would exceed the replacement cost and a full replacement of the bridge would still need to occur.

NEXT STEPS

The 42nd Ave S Bridge will continue to receive interim inspections to monitor its concrete piers and will continue to receive annual inspections and biennial fracture critical inspections performed by King County. Public Works staff will continue with the bridge replacement design and explore multiple funding sources to replace the structure. Following receipt of the in-depth inspection, staff continues to believe that this is an important project to pursue diligently.

As early as 2016, the City recognized the issues with this important bridge, the magnitude of required rehabilitation, and the scope of a potential replacement project. Projects of this scale historically take years and sometimes decades to develop and fund. As such, the City has been correctly prudent to start the work on the 42nd Ave S Bridge before the end of the bridge's designed service life.

Attachments: Bridge Memo Report
Bridge Inspection Pictures

42nd AVE S BRIDGE INSPECTION EXECUTIVE SUMMARY

Date: September 9, 2020

To: City of Tukwila

From: Kash Nikzad, PhD, P.E.

Re: 42nd Ave S Bridge Inspection Executive Summary

TranTech Engineering (TranTech) and Fickett Structural Solutions (Fickett) teamed up to provide an in-depth fracture critical inspection of the 42nd Avenue South Bridge under City of Tukwila (Tukwila) Contract Number 20-030. The field inspection was performed by Fickett on July 22-24, 2020. The inspection details are presented in Appendix A and have been used to form an opinion of the ability of the existing truss to continue to safely serve with continued proper management and monitoring.

Background

The 42nd Avenue South Bridge is a 3-span 280-foot-long bridge built in 1949. The bridge is composed of a 220-foot-long fracture critical steel thru-truss main span with 30-foot-long concrete T-beam approach spans at each end. A critical feature of the bridge is its extreme 38° skew, a design aspect that has contributed to its current condition rating. The existing bridge has a sufficiency rating of 7.53 and is both Structurally Deficient and Functionally Obsolete.

The Sufficiency rating (SR) is a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value which is indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge. The four factors are:

1. Structural Adequacy and Safety
2. Serviceability and Functional Obsolescence
3. Essentiality for Public Use
4. Other Special Reductions for bridges where the first three factors sum to less than a score of 50.

The SR is not a direct indication of the service life remaining but is an evaluation of the condition of the bridge, how it fits the route it serves, and what kind of demand route puts on the bridge. Historically, the SR has been used as a funding eligibility measurement and ranking tool. In addition, structural deficiency has been given priority over functionality and risk-based deficiencies in funding decisions. As long as the bridge is managed properly, it can be safely used. This management of the structure usually means a reduction in service to the travelling public. As a result, the 42nd Avenue Truss has been load-restricted to limit additional damage from the high volume of trucks crossing the bridge each day. The current SR is a combination of its functional problems, how important it is to the traveling public, and its deteriorating condition.

Analysis shows that the 42nd Avenue Truss is at risk during a seismic event, but in order to seek funding from the Local Agency Bridge Program, Tukwila must show condition issues. This has been done through analysis and inspection. While the bridge's condition does not indicate imminent collapse, it does point to the risk of collapse during a major seismic event and/or the continued accumulation of fatigue stresses in the fracture critical bridge which at some point may result in a fracture collapse. A fracture critical bridge is constructed of steel and has only two major load carrying components. In the

case of the 42nd Ave S Bridge, these primary load carrying components are the two longitudinal steel trusses.

In-depth Inspection

To further ensure the safety of the load-posted 42nd Ave S Bridge, Tukwila requested that TranTech provide an in-depth inspection to ensure its continued safe use. The attached inspection report tabulates and locates the condition of each main span truss element. Below is a summary of the in-depth inspection results provided by the bridge inspectors from Fickett Structural Solutions:

The structure has areas of painted over section loss in localized areas along the lower chord and gusset plates. In some areas, the corrosion is becoming active again with minimal section loss at panel points. There are large amounts of debris and guano in most lower panel points and some upper panel points. Most diagonal compression members have pack rust along seams between rivet heads causing up to 1/8" deflection along the member. There is seam rust along most vertical members and along sway bracing with areas of pack rust up to 1/4" and 1/16" section loss. Several sway bracing members have high load impact damage which have caused upward deflection in flange angles. The paint system has widespread areas of peeling paint with surface corrosion present.

Concluding Remarks

Based on this in-depth inspection, it is TranTech's opinion that the bridge can safely continue to serve at a restricted level barring a large-scale seismic event. This continued use must be monitored by more frequent inspections and adjusted as necessary while the process of funding and designing the replacement bridge continues.

These results also confirm that the bridge is approaching the end of its service life. Without replacement or major maintenance repairs, it will require more and more restrictions for its continued safe use in the coming years. Maintenance projects have been investigated in the past and it has been determined that the cost of repairing the bridge would not be justified as compared to the replacement cost. Especially the cost to strengthen an old fracture critical bridge to allow unrestricted legal loads.

TranTech concurs with Tukwila's timely decision to begin the development of a replacement project. As early as 2016, the City recognized the issues with this important bridge, the magnitude of required rehabilitation, and the scope of a potential replacement project. Projects of this scale historically takes years and sometimes decades to fund /develop and was correctly started well before the end of the bridge's designed service life.

Should you have any questions, please call me at 425.453.5545 or email me at knikzad@trantecheng.com

Best regards,
Kash Nikzad, PhD, PE
Project Manager
TranTech Engineering, LLC



Attachments: Appendix A – In-depth Inspection Tabulated Results
Appendix B - Select Inspection Photos

APPENDIX A | In-depth Inspection Tabulated Results



Bridge # 08109700

42nd Ave South Bridge, Span 2

Owner: City of Tukwila

SUMMARY:

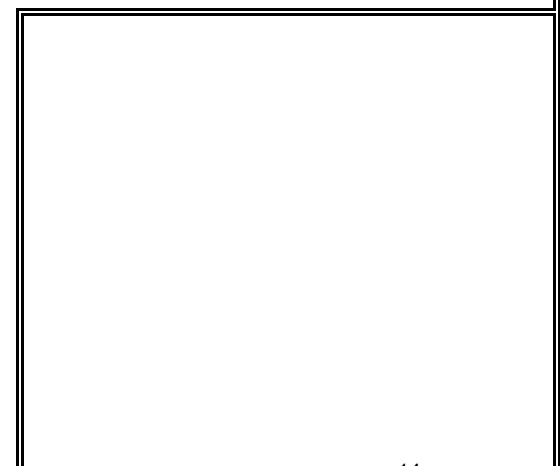
Bridge #08109700 is 3 span bridge built in 1949 carrying 42nd Ave South. The main span is a 220 ft. steel riveted through truss built with a 38° skew over the Duwamish River. There is one 32 ft. concrete T-girder approach span on each end. An in-depth inspection of the main span was completed by Fickett Structural Solutions on behalf of TranTech Engineering and the City of Tukwila to determine the extent of section loss throughout the structure. A 62-ft UBIT was used to inspect the lower chords, lower panel points, floor beams, and lower lateral system. A 45-ft. man-lift was used to inspect the upper chords, upper panel points, sway bracing, and upper lateral system.

DATE: July 22, 2020-July 24, 2020

Agency: Fickett Structural Solutions

Lead Inspector Signature:

Co-Inspector Signature:



Inspection Summary

Condition Notes:

The structure has areas of painted over section loss in localized areas along the lower chord and gusset plates. In some areas, the corrosion is becoming active again with minimal section loss at panel points. There are large amounts of debris and guano in most lower panel points and some upper panel points. Most diagonal compression members have pack rust along seams between rivet heads causing up to 1/8" deflection along the member. There is seam rust along most vertical members and along sway bracing with areas of pack rust up to 1/4" and minimal section loss. Several sway bracing members have high load impact damage which have caused upward deflection in flange angles. The paint system has widespread areas of peeling paint with surface corrosion present.

Legend:

IB - Inboard side of member OB = Outboard side of member

General Notes:

Note 1: Pack rust with section loss in gusset plates along seam with member.

Note 2: Section loss in gusset plate.

Note 3: Section loss in member flanges

Note 4: Section loss in member webs

Note 5: Pack rust between cover plates

Note 6: Section loss in tie plates

Note 7: Pack rust with section loss in bottom flange along transverse seam with wind plate.

Note 8: Section loss to rivet heads

Note 9: Surface corrosion

Note 10: Debris accumulation

Note 11: Pack rust along seam stressing exterior rivet line.

Note 12: Peeling paint, exposed steel with surface corrosion.

Note 13: Pack rust along top and bottom edges of interior web plate, near full member length w/ 1/4" distortion along the edge bulging out up to 1/2" between rivets

Note 14: Pack rust between vertical flanges with distortion in wind bracing.

Note 15: Seam rust along gusset plate and lower chord outboard web vertical seam.

Note 16: Seam rust along top chord cover plates.

Note 17: Seam rust along sway brace angle connection to truss.

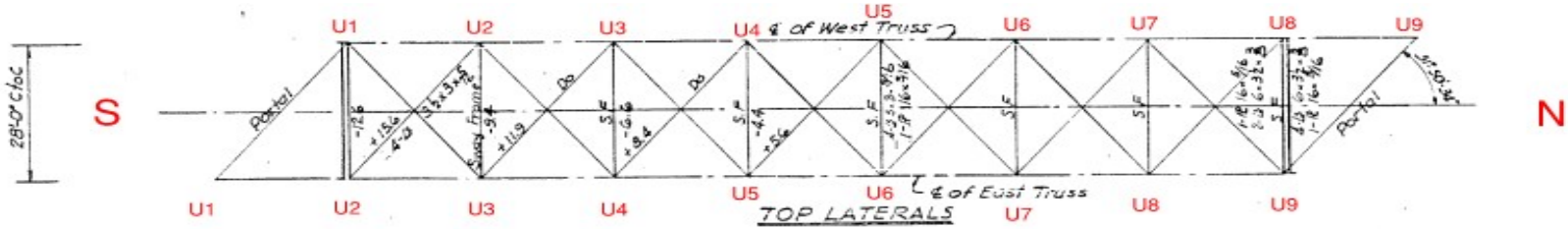
Note 18: Spots of peeling paint with surface corrosion present on exposed steel. No measurable section loss or pack rust.

Note 19: Pockets of pack rust along seams between diagonal channels and web plates. North and South webs are deflecting from painted over pack rust. No strained rivets.

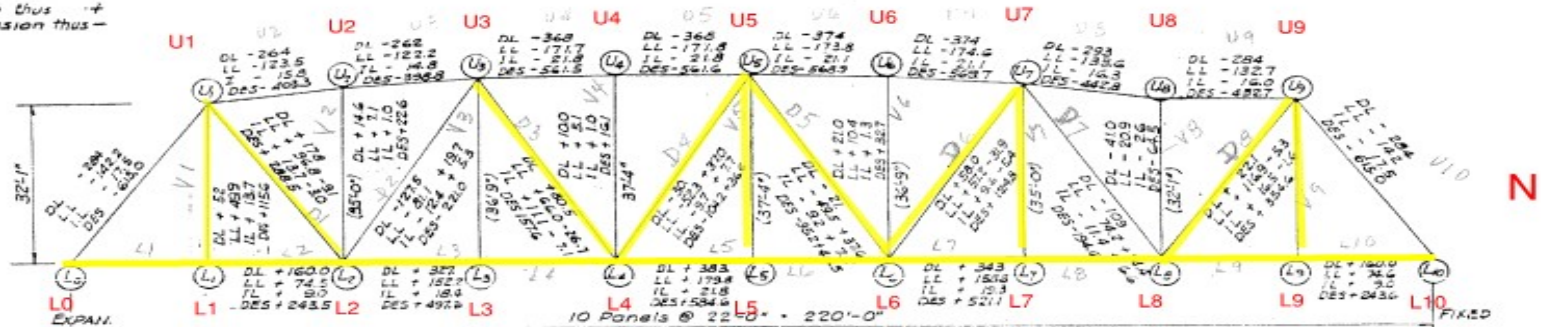
Note 20: Pack rust along bottom seam of handrail plate and between member angles, IB face of member.

Note 21: Some corrosion along member seams.

Span 2 Layout and Nomenclature

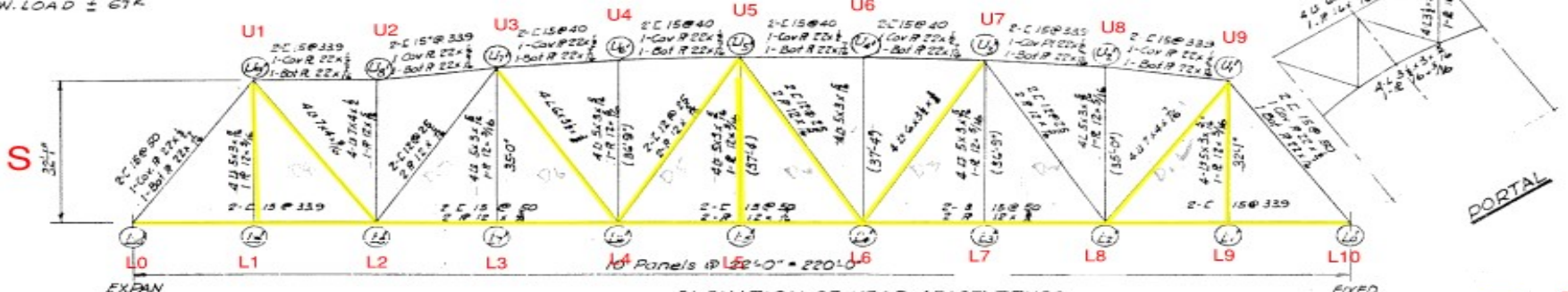


NOTE
Tension thus +
Compression thus -



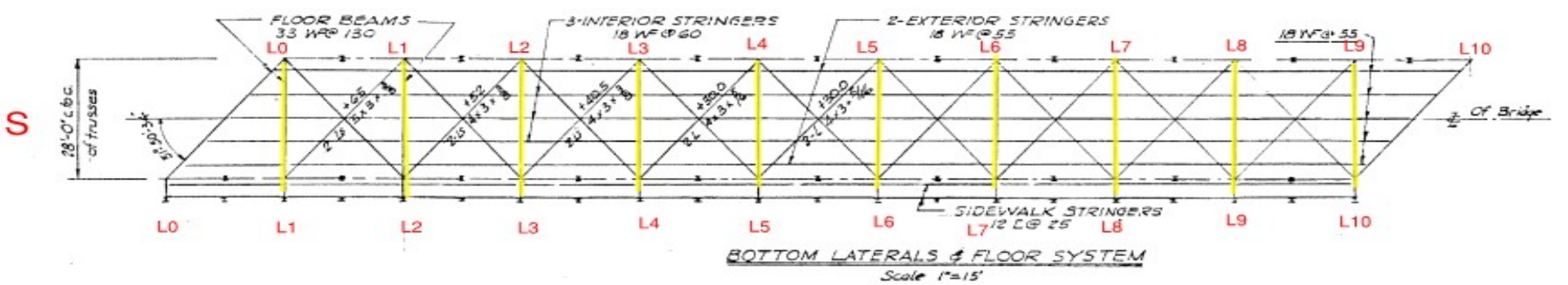
ELEVATION OF FAR (WEST) TRUSS
Scale 1"=15'

PER REACTION
EACH TRUSS
D. LOAD = 360'S
L. LOAD = 181'K
W. LOAD = 67'K



ELEVATION OF NEAR (EAST) TRUSS
Scale 1"=15'

■ = TENSION MEMBER



BOTTOM LATERALS & FLOOR SYSTEM
Scale 1"=15'

Bridge: TUKxNx14 42nd Avenue South Bridge
 Structure ID: 08109700
 Date Inspected: 7/22/2020-7/24/2020

Member		West Truss	East Truss
L0-L1	Bottom Chord	L1: Note 1, 1/8" pack rust, no section loss, between wind plate and bottom flange of chord. Note 14.	L1: Note 1, 1/8" pack rust along OB vertical seam with gusset plate, no section loss. Note 1, 1/4" pack rust along OB horizontal seam between gusset plate and web and between wind plate and bottom flange of chord, no section loss. Surface corrosion forming along top flange of chord below seam with wind plate, no section loss.
L1-L2	Bottom Chord	L1: Note 1, 1/8" pack rust, no section loss, between wind plate and bottom. Note 14. L2: Note 14.	L2: Note 10.
L2-L3	Bottom Chord	L2: Note 10. Paint along top flanges of chord and wind plate is bubbling and peeling. Note 14. Along member: Note 13. L3: Note 1, 1/4" pack rust, active, no section loss, between top size of wind plate and bottom flange of lower chord, along full length of OB gusset plate. Note 3, 1/32" OB and IB. Note 14, along bracing.	L2: Note 10. L3: Note 4, 1/16" section loss along bottom edge of web plate. Note 13. Note 14.
L3-L4	Bottom Chord	L3: Note 1, 1/4" pack rust, active, no section loss, between top size of wind plate and bottom flange of lower chord, along full length of OB gusset plate. Note 3, 1/32" OB. Along member: Note 13. L4: Note 10. Note 14, up to 1/2" pack rust.	Along member: Note 13. L4: Note 10. Note 14, along wind plate.
L4-L5	Bottom Chord	L4: Note 1, 1/4" pack rust, no section loss between wind plate and bottom flange. Note 10. Note 14, up to 1/2" pack rust. Short fillet welds between OB gusset plate and member. Along member: Note 13. L5: Note 10. Note 14, up to 1/2" pack rust.	L4: Note 10. Note 14, along wind plate. Along member: Note 13. L5: Note 14, along wind plate.
L5-L6	Bottom Chord	L5: Note 10. Note 14 up to 1/2" pack rust. Along member: Note 13. L6: Note 4, 1/16" section loss to top of wind plate along end 1", IB and OB. Note 10. Note 14, up to 1/2" pack rust along end 4 ft.	L5: Note 14, along wind plate. L6: Note 9. Note 10. Note 14, along wind plate.
L6-L7	Bottom Chord	L6: Note 10. Note 14, up to 1/2" pack rust along end 4 ft. Along member: Note 13, web bracing. L7: Note 1, 1/8" pack rust, no section loss, along horizontal seam between wind plate and OB bottom flange. Note 9, no section loss, along top side of top flange, 3" OB, 6" IB. Note 14, up to 1/2" pack rust along end 4 ft.	L6: Note 4, 1/16" section loss to thickness along bottom edge of interior web plates, IB and OB, no section loss. Note 7, no pack rust, 1/16" loss of bottom flange along seam with IB gusset plate. Note 8, 10% section loss, 6 rivets, along bottom flange. Note 9. Note 10. Note 14, along wind plate. No paint on member from last tie plate to end of member. Along member: Note 13, web bracing.
L7-L8	Bottom Chord	L7: Note 1, 1/8" pack rust, no section loss, along horizontal seam between wind plate and OB bottom flange. Note 14, up to 1/2" pack rust, along end 4 ft. Along member: Pack rust along top and bottom edges of interior web plate, near full member length, with 1/4" distortion along edge, bulging out up to 1/2" between rivets. Note 12.	Along member: Note 13, web bracing. L8: Note 10. Note 15. Note 14, along wind plate. Note 15.

Member		West Truss	East Truss
L8-L9	Bottom Chord	L8: Note 8, 10% head loss, 8 rivets, along bottom flange. Note 10. Note 14, 1/2" pack rust along vertical flanges of sway bracing. Note 12. L9: Note 1, 3/8" pack rust, no section loss between wind plate and bottom flange. Note 3, 1/32" pitting type corrosion. Note 9. Note 12.	L8: Note 4, 1/16" section loss to thickness along bottom edge of web plate. Note 8, 10% section loss, 8 rivets along bottom flange. Note 10. Note 14, along wind plate. L9: Note 9, along top tie plate surface, no section loss. Note 10. Note 14, along wind plate.
L9-L10	Bottom Chord	L9: Note 1, 3/8" pack rust, no section loss between wind plate and bottom flange. Note 3, 1/32" pitting type corrosion. Note 12.	L9: Note 10. Note 14, along wind plate.
U1-U2	Upper chord	U1: Note 16, 1/8", no section loss. Note 17, along seams with angle connections.	U1: Note 16, 1/4", no section loss.
U2-U3	Upper chord	U2: Note 10. Note 16, 1/8", no section loss.	Along member: Note 5, 1/8", 3 ft. long. U3: Note 16, 1/8" between bottom wind plate and bottom cover plate.
U3-U4	Upper chord	U3: Note 5, 20 ft. long, 1/4" along bottom flange, 1/16" top flange. Note 12. U4: Note 16, 1/8" top, no section loss, 1/4" bottom, no section loss.	Along member: Note 5, along bottom flange, 1/8", 10 ft. long
U4-U5	Upper chord	U4: Note 16, 1/8" top, no section loss, 1/4" bottom, no section loss. U5: Note 12.	U4: Note 10. Along member: Note 5, along bottom flange, 1/8", 10 ft. long
U5-U6	Upper chord	U5: Note 12. U6: Note 10. Note 12. Note 16.	U6: Note 12. Note 16, 1/8" along top wind plate and top cover plate.
U6-U7	Upper chord	U6: Note 12. Note 16.	U6: Note 12. Note 16, 1/8" along top wind plate and top cover plate. U7: Note 12, along top and bottom wind plates.
U7-U8	Upper chord	Along member: Note 5, 1/8" along center 10 ft.	U8: Note 12, along top wind plate and top cover plate.
U8-U9	Upper chord	U9: Note 16, 1/16".	U9: Note 12, along top wind plate and top cover plate.
L0-U1	Diagonal	No defects observed.	Along member: Note 18.
L1-U1	Vertical	Note 20, 1/4" pack rust, with up to 1/32" section loss in each member angle, for 4".	Along member: Note 18.
L2-U1	Diagonal	No defects observed.	Along member: Note 10, with moss growth along member. Note 18. U1: Note 16.
L2-U2	Vertical	Note 20, 1/4" pack rust, no section loss, for 1".	Along member: Note 10, with moss growth along member. Note 18. At 4.5 ft. from deck level, 3 areas of scattered pitting corrosion up to 2" long, along seam between member web plate and IB south angle with up to 5/32" painted over section loss. Paint is starting to peel from active corrosion in areas.
L2-U3	Diagonal	No defects observed.	Along member: Note 10, with moss growth along member. Note 18. Note 19, up to 1/16" active pack rust along seams and 1/8" deflection of members. Peeling paint along top web. U3: Note 1, no pack rust, with 1/32" section loss in member web. Tack welds along end of member and IB side web plates along rivet line.
L3-U3	Vertical	No defects observed.	Along member: Note 18.
L4-U3	Diagonal	No defects observed.	L4: Pitting corrosion with less than 1/32" section loss for 4 in. along vertical gusset plate seam. Corrosion has been painted over, but is active again with peeling paint.
L4-U4	Vertical	L4: Note 1, seam rust only.	L4: Up to 1/32" pitting corrosion, painted over but becoming active, along angle leg at IB gusset plate vertical seam for 6".
L4-U5	Diagonal	Along member: Note 18, along top member web. Note 19, starting at 6 ft. above deck level. U5: Tack welds along top and IB web, no cracking observed.	Along member: Note 19, up to 1/16" active pack rust along seams and 1/8" deflection of members. Peeling paint along top web. U5: Note 1, 1/4" pack rust, 2" long, no section loss. Short tack welds along top and IB web, no cracking observed.

Member		West Truss	East Truss
L5-U5	Vertical	No defects observed.	Along member: Active pitting corrosion, along OB face of IB angle, no section loss. Less than 1/32" section loss along 2" seam with original railing. Railing is bolted, not welded. U5: Vertical tack welds along member and gusset plate. No cracking observed.
L6-U5	Diagonal	Along member: Note 19, up to 1/8" deflection. Note 20, 1/16" pack rust, no section loss, for 4". L6: Note 21.	Along member: Note 19, up to 1/16" active pack rust along seams and 1/8" deflection of members.
L6-U6	Vertical	L6: Note 21.	L6: Note 1, 1/32" pack rust along top seam with OB gusset plate for 4", no section loss. Pitting corrosion, painted over but becoming active, along vertical seam with IB gusset plate. Paint is cracked, bulging, and peeling. Tack welds along vertical seams between member and gusset plate.
L6-U7	Diagonal	L6: Note 21.	L6: Note 1, 1/32" pack rust along OB top seam for 4", no section loss. 1 rivet with surface corrosion. U7: Note 12, especially on tie plates.
L7-U7	Vertical	No defects observed.	Along member: Note 18.
L8-U7	Diagonal	Along member: Note 19, 1/8" deflection on bottom web plate. L8: Seam rust along member near panel point.	At L8: Heavy moss growth. Along member: Note 19, up to 1/16" active pack rust along seams and less than 1/8" deflection of members. Peeling paint along top web.
L8-U8	Vertical	Along member: Note 20, corrosion just beginning, no section loss . L8: Seam rust along member near panel point.	L8: Heavy moss growth.
L8-U9	Diagonal	L8: Seam rust along member near panel point.	L8: Heavy moss growth. U9: Note 17, up to 1/16".
L9-U9	Vertical	Along member: Note 20, 1/32" section loss for 1". Scattered seam rust between angles, no section loss, full length. U9: Tack welds present between gusset plate and member.	Along member: Note 18.
L10-U9	Diagonal	No defects observed.	Along member: 1/32" pitting corrosion with up to 1/32" section loss in bottom plate near IB face at original rail bracket seam. At original rail, along topside of bottom plate and OB face of OB angle seam, peeling paint with surface corrosion and no section loss, 6" long. Bracket is bolted to member.
L0	Gusset Plate	Minor rust bleeding on OB gusset around bearing pin. No section loss.	No defects observed.
L1	Gusset Plate		No defects observed.
L2	Gusset Plate	Note 1, 1/8" pack rust, no section loss, along OB gusset plate and vertical member seam. Note 1, 1/4" pack rust, no section loss, along IB gusset plate edge seams with vertical members. Note 9, peeling paint, no section loss in OB gusset along member seams.	No defects observed.
L3	Gusset Plate		No defects observed.
L4	Gusset Plate	Note 1, 1/8" pack rust, 1/32" loss in OB gusset plate, 1/8" pack rust, no section loss in IB gusset plate. Note 9 OB.	4" active corrosion along top seam of gusset plate, OB face, no section loss. Peeling paint.
L5	Gusset Plate	Note 1, 1/4" pack rust between gusset plate and lower chord web and gusset plate and bottom flange, OB and IB. Note 8, heavy surface corrosion with pitting, 1 rivet. Note 15, OB and IB.	Note 1, 1/4" pack rust between OB gusset plate and web, no section loss.
L6	Gusset Plate	No defects observed.	Note 1, 1/32" pack rust, active, for 4" along top seams of OB gusset plate, no section loss.
L7	Gusset Plate	Note 1, 1/8" pack rust, no section loss, along vertical seams with bottom chord, OB.	Note 1, 1/8" pack rust, no section loss, along OB gusset plate top seam with U7-L7. Note 1, 1/8" pack rust, no section loss, along bottom edge of OB gusset plate.
L8	Gusset Plate	No defects observed.	No defects observed.

Member		West Truss	East Truss
L9	Gusset Plate	Note 1, up to 1/8" pack rust, no section loss along OB gusset plate edge seams. Note 1, OB gusset plate no pack rust with up to 1/32" section loss along horizontal seam with bottom chord top flange.	No defects observed.
L10	Gusset Plate	No defects observed.	No defects observed.
U1	Gusset Plate	No defects observed.	No defects observed.
U2	Gusset Plate	No defects observed.	No defects observed.
U3	Gusset Plate	No defects observed.	No defects observed.
U4	Gusset Plate	No defects observed.	No defects observed.
U5	Gusset Plate	No defects observed.	No defects observed.
U6	Gusset Plate	No defects observed.	No defects observed.
U7	Gusset Plate	No defects observed.	No defects observed.
U8	Gusset Plate	No defects observed.	No defects observed.
U9	Gusset Plate	Note 1, 1/16" pack rust, no section loss between OB gusset plate and L8-U9. Note 1, 3/8" pack rust, no section loss between OB gusset plate and bottom chord web.	Note 1, 1/8" between gusset plate and L8-U9.
U10	Gusset Plate	No defects observed.	No defects observed.
L0W-L0E	Floor beam	No defects observed.	No defects observed.
L0W-L1E	Floor beam	No defects observed.	No defects observed.
L1W-L2E	Floor beam	No defects observed.	Corrosion along edge of top flange. Full thickness of flange edge affected, no lifting of deck or adjacent deck area distress observed. Monitor for pack rust formation and lifting of deck.
L2W-L3E	Floor beam	No defects observed.	No defects observed.
L3W-L4E	Floor beam	No defects observed.	No defects observed.
L4W-L5E	Floor beam	No defects observed.	No defects observed.
L5W-L6E	Floor beam	No defects observed.	No defects observed.
L6W-L7E	Floor beam	No defects observed.	No defects observed.
L7W-L8E	Floor beam	No defects observed.	Lite surface corrosion along edge of top flange embed between stringer #1 and stringer #2. Stringer #2, south face of floor beam looking west. Typical sharp 90° cope. No cracking observed.
L8W-L9E	Floor beam	No defects observed.	No defects observed.
L9W-L10E	Floor beam	No defects observed.	No defects observed.
L10W-L10E	Floor beam	No defects observed.	No defects observed.
South Portal (U1W-U1E)	Sway Bracing	Along member: Note 1, with up to 1/8" pack rust, active along gusset seams. Up to 1/32" pitting type corrosion active along angle seams and gussets. Note 22, up to 1/4" pack rust, scattered.	Along member: Note 1, with up to 1/32" pitting type corrosion, active along gusset seams. South inboard face gusset plate has up to 1/16" pitting corrosion along gusset and horizontal sway brace angle seam. Note 22, up to 1/4" pack rust, scattered. Just east of centerline along lower portal angle, 1 high impact load hit: 7" long impact bowed 1/2" north. Paint is still in tact and no cracks observed. 2 ft. east of lower gusset plate 1 high impact load hit along lower portal angle: 21" long impact bowed 1" north with paint missing along impact area, heavy surface corrosion with no measurable section loss. Inboard face of portal angle is cracked at leg bend, approximately 50% depth, 6" long. No active crack growth observed. U1E: Lower portal connection angle web exhibits corrosion along northern seam, full length, with up to 1/8" pack rust and 1/32" of section loss in pockets near gusset plates and brackets. Paint is bubbling and cracked, scattered along length due to active corrosion underneath.
U1W-U2E	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections. High impact load hit, no cracked or peeling paint.
U2W-U3E	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.	Along member: Note 22, up to 1/4" pack rust, scattered. High impact load hit, no cracked or peeling paint. Note 23, up to 1/8" pack rust at all connections.
			U3E: Note 17, connection to truss.

Member		West Truss	East Truss
U3W-U4E	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.
U4W-U5E	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.
U5W-U6E	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.
U6W-U7E	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.
U7W-U8E	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.
U8W-U9E	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections. U8W: Note 17, 1/8".	Along member: Note 22, up to 1/4" pack rust, scattered. Note 23, up to 1/8" pack rust at all connections.
North Portal (U9W-U9E)	Sway Bracing	Along member: Note 22, up to 1/4" pack rust, full length. U9W: Note 1, up to 1/16" pack rust, no section loss, at all connections.	Along member: Note 22, up to 1/4" pack rust, full length. U9E: Note 1, up to 1/16" pack rust, no section loss, at all connections.
L0	Movable Bearing	Bearing in expanded position with weather: 61 ^{of} and overcast. Rocker is tilted south approx. 7°. Rust bleeding on both inboard and outboard plates indicating possible pin corrosion. No signs of pin movement.	Bearing in expanded position with weather: 61 ^{of} and overcast. Rocker is tilted south approx. 7°. Rust bleeding on inboard plate indicating possible pin corrosion. No signs of pin movement.
L10	Fixed Bearing	No defects observed.	No defects observed.
Lateral systems	General Comments	Top chord lateral bracing horizontal struts and diagonal members have seam rust scattered between bottom flange angle and web plate with cracked and peeling paint, full length. Members have similar seam between top flange angle and web, full length. No section observed in members.	

*Note: Sway bracing nomenclature does not match "Nomenclature FC Plan" Document in WSBS. See page 2 in this document titled "Nomenclature" for nomenclature used in this in-depth report.

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Co-Inspector: Alyssa Escobedo, P.E. G2001

Photo Log

Photo Number	Location	Photo Description	Inspector Initials
3518	L9W	1/32" section loss in OB gusset plate along horizontal seam with top flange of bottom chord, looking south.	ALP
3519	L9W	3/8" pack rust, no section loss between OB gusset plate and bottom chord web seam and between wind plate and bottom chord bottom flange.	ALP
3520	L10E-L9W, L9W	General floor beam photo, near panel point.	ALP
3521	L9W	"Note 12"	ALP
3522	L9W	General gusset plate photo, looking north.	ALP
3523	L8W	10% head loss, 8 rivets along bottom flange of lower chord.	ALP
3524	L8W	General gusset plate photo, looking south.	ALP
3525	L8W	1/2" pack rust between vertical flanges of sway bracing at L8W.	ALP
3526	L9E-L8W, L8W	South face of floor beam, looking north near panel point.	ALP
3530	L8W	General gusset plate photo, looking down. Note seam rust along vertical members.	ALP
3533	L8E-L7W, L7W	North face of floor beam, looking south near panel point.	ALP
3534	L7W	1/8" pack rust, no section loss, along horizontal seam between wind plate and bottom chord bottom flange OB.	ALP
3535	L7E-L6W, L6W	North face of floor beam, looking south near panel point.	ALP
3536	L6W	General gusset plate photo, looking north.	ALP
3538	L6E-L5W, L5W	General floor beam photo, near panel point.	ALP
3539	L5W	"Note 15"	ALP
3540	L6E	1/16" section loss along bottom flange transverse seam with wind plate, looking south.	ALP
3541	L6E-L5W, L6E	North face of floor beam, looking south near panel point.	ALP
3542	L6E	General gusset plate, looking south.	ALP
3545	L7E	General gusset plate photo, looking south.	ALP
3546	L8E-L7W, L8E	General floor beam photo near panel point.	ALP
3547	L8E-L7W, L8E	Lite surface corrosion along edge of top flange embed between stringer #1 and stringer #2.	ALP
3548	L8E	General gusset plate photo, looking south.	ALP
3549	L9E-L8W, L9E	General floor beam photo, near panel point.	ALP
3550	L9E	General gusset plate photo, looking south.	ALP
3566	L4W	Typical of short fillet welds between OB gusset plate and lower chord member.	ALP
3567	L5E-L4W, L4W	South face of floor beam, looking north near panel point.	ALP
3568	L4W	General gusset plate photo, looking north.	ALP
3571	L3W	General gusset plate photo, looking north.	ALP
3572	L4E-L3W, L3W	North face of floor beam, looking south near panel point.	ALP
3573	L4E-L3W, L3W	South face of floor beam, looking east near stringer #3.	ALP
3578	FB L3E-L2W, L2W	South face of floor beam, looking north near panel point.	ALP
3579	FB L2E-L1W, L1W	South face of floor beam, looking north near panel point.	ALP
3580	L1W	General gusset plate photo, looking north.	ALP
3581	L1W	General wind plate photo, looking south.	ALP
3584	FB L2E-L1W, L2E	South face of floor beam near panel point, looking north.	ALP
3585	L2E	General gusset plate photo, looking south.	ALP
3586	L2E	General gusset plate, looking south.	ALP
3586	FB L3E-L2W, L3E	South face of floor beam, looking north near panel point.	ALP
3587	L3E	General gusset plate, interior, looking north.	ALP
3588	L3E	General gusset plate photo, looking south.	ALP
3589	L4E-L3W, L4E	South face of floor beam, looking north near panel point.	ALP
3590	L4E	General gusset plate photo, looking south.	ALP
3591	L4E	Typical of debris accumulation and nesting pigeons.	ALP
3599	L5E	General gusset plate, looking south.	ALP
3600	L5E-L4W, L5E	North face of floor beam, looking south near panel point.	ALP
3605	L6E-L5W, L6E	South face of floor beam, looking north near panel point.	ALP
3659	U1W	General gusset plate photo, looking south.	ALP
3662	U2E	Top of upper chord, looking south.	ALP
3663	U2E	General gusset plate, looking south.	ALP
3667	U3E	1/32" section loss in gusset plate along seam with L2E-U3E.	ALP
3670	U1E-U3E	High load impact hit between sway bracing members U1-U3.	ALP
3671	U1E	General gusset plate, looking south.	ALP
3674	U4E	Top of upper chord, looking south.	ALP
3675	U4E	General gusset plate photo, looking south.	ALP
3678	U5E	General gusset plate photo 3678, looking north.	ALP
3681	U4W	Top of upper chord, looking north.	ALP
3682	U4W	General gusset plate photo, looking north.	ALP
3685	U3W	Top of upper chord, looking south.	ALP
3689	U5W	Top of upper chord, looking south.	ALP
3690	U5W	General gusset plate photo, looking south.	ALP
3691	U6W	General gusset plate photo, looking north.	ALP
3692	U6W	Top of upper chord, looking north.	ALP

Photo Number	Location	Photo Description	Inspector Initials
3693	U7E	General gusset plate photo, looking north.	ALP
3694	U7E	Top of upper chord, looking north.	ALP
3695	U6E	Top of upper chord, looking south.	ALP
3698	U7W	General gusset plate photo, looking south.	ALP
3699	U7W	Top of upper chord, looking south.	ALP
3700	U7W	General gusset plate photo, OB, looking south.	ALP
3704	U8W	Top of upper chord, looking north.	ALP
3706	U9E	General gusset plate photo, looking north.	ALP
3708	U8E	General gusset plate photo, looking south.	ALP
3709	U8E	Top of upper chord, looking south.	ALP
3717	U9W	Top of upper chord and portal connections, looking north.	ALP
3718	U9W	General gusset plate photo, looking north.	ALP
3722	North Portal U9E U9W	North portal looking south.	ALP
3727	L10E-L10W, L10W	Leaking joint looking from below.	ALP
3730	L10W	General gusset plate photo, OB, looking south.	ALP
3731	L10E-L10W, L10W	South face of floor beam, looking north near panel point.	ALP
3750	U9E	Top of upper chord, looking north.	ALP
3752	Bearing L0W	Degree of tilt toward south.	ALP
3757	Bearing L0E	Degree of tilt toward south.	ALP
3759	Bearing L0E	Underside of deck, looking north.	ALP
3707	U9E	General picture of gusset plate exterior face at end portal.	ALP
3527-3529	L8W	Pack rust along top edges of interior web plate, near full member length, with 1/4" distortion along edge, bulging out up to 1/2" between rivets.	ALP
3532-3533	L8W	Pack rust along bottom edges of interior web plate, near full member length, with 1/4" distortion along edge, bulging out up to 1/2" between rivets.	ALP
3543-3544	L7E-L6W, L7E	North face of floor beam, looking south near panel point.	ALP
3551-3552	L8E-L7W, L8E	Stringer #2, south face of floor beam looking west. Typical sharp 90° cope. No cracking observed.	ALP
3553-3565	Diag. U7W-L8W, U7W	"Note 13" between top and bottom flange of cover plates, full length.	ALP
3564-3577	L3W	General gusset plate photo, looking north.	ALP
3569-3570	L4W	General gusset plate photo IB, looking south. Note: 1/8" pack rust between gusset plate and member seams.	ALP
3582-3583	FB L2E-L1W, L2E	South face of floor beam, looking north near panel point. Corrosion along edge of top flange. Monitor for pack rust formation and lifting of deck.	ALP
3592-3596	L1E	General gusset plate, looking north. (Up to 1/4" pack rust with no section lack along seam with member.)	ALP
3597-3598	FB L1E-L0W, L1E	South face of floor beam near panel point, looking north.	ALP
3655-3658	U1W	Top of upper chord and portal connections, looking south.	ALP
3664-3665	L2E-U3E	Rippling from pack rust along L2-U3 East compression member. Tack welds between top of member at U3 and IB side web plates of chord along rivet line.	ALP
3668-3669	U3E	Top of upper chord, looking north.	ALP
3672-3673	U1E	Top of upper chord, looking south. "Note 16"	ALP
3676-3677	U5E	Top of upper chord, looking north	ALP
3679-3680	U5E	Vertical tack welds between member and gusset plate, looking south.	ALP
3684-3685		Typical pack rust between cover plate and member.	ALP
3686-3688	U3W	General gusset plate photo, looking north.	ALP
3696-3697	U6E	General gusset plate, looking south.	ALP
3702-3703	Sway Brace U9E- U8W, U8W	"Note 17" with 1/8" seam rust, looking north.	ALP
3710-3717	Sway Braces	General photos of sway bracing conditions includes: U8E-U9W looking northeast, U8E-U7W looking south, and U9E-U9W (north portal) looking northeast.	ALP
3719-3721	North Portal U9E U9W	North portal looking north.	ALP
3728-3729	Bearing L10W	General bearing photos.	ALP
3760-3765	Span 1	General photos of underside framing, Span 1, looking south.	ALP
South Approach 1 - South Approach 6	Span 2	General Span 2 deck and structure photo, looking north.	ADE
L0E 1-L0E 4	L0E	General panel point internal, looking down.	ADE
L1E 1-L1E 2	L1E	General panel point internal, looking down.	ADE
L1E 3	L1E	General member elevation photo at deck level, looking north.	ADE
L1E 4	L1E	General member elevation photo at deck level, looking south.	ADE
L2E 1-L2E 2	L2E	General member elevation photo at deck level, looking north.	ADE
L2E 3	L2E	General panel point elevation photo at deck level, looking northeast.	ADE
L2E 4-L2E 5	L2E	General panel point internal, looking down.	ADE
L3E 1-L3E 2	L3E	General member elevation photo at deck level, looking north.	ADE
L3E 3	L3E	General member elevation photo at deck level, looking south.	ADE
L3E 4-L3E 5	L3E	General panel point internal, looking down.	ADE

Photo Number	Location	Photo Description	Inspector Initials
L4E 1-L4E 7	L4E-U5E	Pockets of pack rust along seams between diagonal channels and web plates. North and South webs are deflecting from painted over pack rust. No strained rivets.	ADE
L4E 8-L4E 9	L4E-U5E	General member internal photo.	ADE
L4E 10-L4E 13	L4E	General panel point internal, looking down.	ADE
L4E 14-L4E 16	L4E	General panel point external at deck level, looking down.	ADE
L5E 1	L5E-U5E	General member elevation photo at deck level, looking west.	ADE
L5E 2	L5E-U5E	General member elevation photo at deck level, looking south.	ADE
L5E 3-L5E4	L5E-U5E	General member elevation photo at deck level, looking north.	ADE
L5E 5-L5E 7	L5E	General panel point internal, looking down.	ADE
L6E 1	L6E	General panel point elevation photo at deck level, looking southwest.	ADE
L6E 2-L6E 5	L6E	General panel point internal, looking down.	ADE
L6E 6- L6E 9	L6E-U5E	Pockets of pack rust along seams between diagonal channels and web plates. South web is deflecting from painted over pack rust. No strained rivets.	ADE
L1W 1-L1W4	L1W-U1W	1/4" pack rust along bottom seam of handrail plate and between member angles and IB face of member with up to 1/32" section loss in each member angle, for 4".	ADE
L1W 5	L1W-U1W	General member elevation photo, looking south.	ADE
L1W 6	L1W	General panel point internal, looking down.	ADE
L2W 1-L2W 2	L2W-U2W	1/4" pack rust along bottom seam of handrail plate and between member angles and IB face of member with no section loss, for 1".	ADE
L2W 3-L2W 4	L2W	General panel point internal, L2W southside, looking down.	ADE
L2W 5	L2W	General panel point internal, L2W northside, looking down.	ADE
L3W 1-L3W 2	L3W	General panel point internal, L3W southside, looking down.	ADE
L3W 3-L3W 4	L3W	General panel point internal, L3W northside, looking down.	ADE
L3W 5	L3W-U3W	General member elevation photo at deck level, looking west.	ADE
L3W 6	L3W-U3W	General member elevation photo at deck level, looking northwest.	ADE
L4W 1	L4W-U4W	General member elevation photo at deck level, looking west.	ADE
L4W 2	L4W	General panel point elevation photo at deck level, looking west.	ADE
L4W 3-5	L4W-U5W	Pockets of pack rust along seams between diagonal channels and web plates. North and South webs are deflecting from painted over pack rust. No strained rivets.	ADE
L4W 6	L4W	General panel point internal, L4W northside, looking down.	ADE
L4W 7	L4W	General panel point internal, L4W southside, looking down.	ADE
L8E 1, L8E 5	L8E-U7E	General member elevation photo at deck level, looking east. Note: pockets of pack rust along seams between diagonal channels and web plates with up to 1/16" active pack rust along seams and less than 1/8" deflection of members.	ADE
L8E 2	L8E	General panel point elevation photo at deck level, looking northwest.	ADE
L8E 3	L8E	General panel point elevation photo at deck level, looking southwest.	ADE
L8E 4	L8E	General panel point internal, looking down.	ADE
L10E 1	L10E-U9E	General member elevation photo at deck level, looking northwest.	ADE
L10E 2	L10E-U9E	General member elevation photo at deck level, looking southwest.	ADE
L10E 3	L10E-U9E	At original rail, along topside of bottom plate and OB face of OB angle seam, peeling paint with surface corrosion and no section loss, 6" long. Note: Bracket is bolted to member.	ADE
L10E 4	L10E	General panel point internal, looking down.	ADE
L8W 1	L8W	General panel point elevation photo, looking west.	ADE
L8W 2	L8W-U8W	Pack rust just beginning along bottom seam of handrail plate and between member angles and IB face of member, no section loss.	ADE
L8W3 - L8W6	L8W-U7W	Pockets of pack rust along seams between diagonal channels and web plates. South web is deflecting 1/8" from painted over pack rust. No strained rivets.	ADE
L6W 1	L6W	General panel point elevation photo at deck level, looking west.	ADE
L6W 2-L6W 7	L6W-U5W	Pockets of pack rust along seams between diagonal channels and web plates. South web is deflecting 1/8". No strained rivets.	ADE
L5W 1- L5W 2	L5W-U5W	General member elevation at deck level, looking west.	ADE
L5W 3-L5W 4	L5W	General panel point internal, L5W southside, looking down.	ADE
P3 Joint 1-P3 Joint 3, P3 Joint 5	Joint at P3	General joint condition photos.	ADE
P3 Joint 4	Joint at P3	D spalling near centerline of joint.	ADE
Deck 1	Span 2	Typical deck cracking and abrasion across deck.	ADE
Deck 2	Span 2	General deck photo, looking south.	ADE
P2 Joint 1-4	Joint at P2	General joint condition photos.	ADE
B LOW 1	Bearing LOW	General bearing photos, looking east. Note: Rocker is tilted southward approx. 7°	ADE
B LOE 1, B LOE 4	Bearing LOE	General bearing photos, looking northwest. Note Rocker is tilted southward approx. 7°	ADE
B LOE 2-B LOE 3	Bearing LOE	General bearing photos, looking northeast.	ADE
SP 1-SP 3, SP 6-SP 7, SP 11	UW1-U1E	Active pack rust along gusset and angle seams.	ADE
SP 4-SP 5	UW1-U1E	21" long impact bowed 1" north with paint missing along impact area, heavy surface corrosion with no measurable section loss.	ADE
SP 8 - SP 10	UW1-U1E	21" long impact bowed 1" north with paint missing along impact area, heavy surface corrosion with no measurable section loss. Inboard face of portal angle is cracked at leg bend, approximately 50% depth, 6" long.	ADE



APPENDIX B | Select Inspection Photos



Bridge Inspection Pictures



Inspection Photo 1 – Deck View Looking South



Inspection Photo 2 – Elevation View Looking North

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Inspection Photo 3 – Lower Connections with Horizontal Gussets Retain Moisture and Guano



Inspection Photo 4 – Frozen Truss Bearings Induce Additional Stresses on the Trusses



Inspection Photo 5 – Pack Rust is Distorting some Connections



Inspection Photo 6 – Rust and Guano at Truss Bottom Chord



Inspection Photo 7 – Rust at Top Flange of Fracture Critical Floor Beams



Inspection Photo 8 – Moisture from Deck Penetrating and Corroding Top Flange of Stringers