



Bridge No. L32101000+01001
Missoula, Montana
Condition Evaluation Report:
Routine and Fracture Critical Inspection
Inspection Date: August 8 and 10, 2017



Prepared By:

FICKEIT

Structural Solutions

Formerly Fish & Associates, Inc.

250 East Wisconsin Avenue, Suite 1800
Milwaukee, WI 53202

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1 EXECUTIVE SUMMARY

The Maclay Bridge had the following NBI ratings: Item 58 Deck – (6) Satisfactory Condition; Item 59 Superstructure – (5) Fair Condition; Item 60 Substructure – (5) Fair Condition. The following conclusions and recommendations are suggested to maintain the long term serviceability of the bridge.

- The approaches should be monitored during future inspections for additional cracking and cold patch deterioration
- The bituminous overlay should be monitored during future inspections for additional wear, cracking, and potholes; it is recommended the potholes be patched throughout the bridge deck
- The corrugated forms should be monitored during future inspections for additional corrosion
- The areas of seepage through the concrete top flange gaps should be monitored during future inspections for signs of cracking and spalling.
- The rail should be monitored during future inspections for corrosion and impact damage
- The areas of spalling with exposed reinforcing steel on the concrete curb should be repaired, and the remainder of the curb should be monitored during future inspections for cracking, spalling, and delaminations
- The deteriorated seal on the joint at Bent 3 should be replaced and the joint should be monitored during future inspections for additional impact damage, seal separation, and seal deterioration
- The floor beams should be monitored during future inspections for additional failed paint and corrosion
- The stringer ends should be cleaned each inspection cycle to prevent trapped moisture from the debris accumulation, and monitored during future inspections for additional section loss. The stringer ends on Span 2, Bent 3 should be shimmed to remove the movement from passing vehicles. The stringers should also be monitored during future inspections for additional failed painted coating and corrosion

- The approach span concrete beams should be monitored during future inspections for cracking and spalling
- The abutments and bents should be monitored during future inspections for cracking, delaminations, and spalling
- The roller bearings on Abutment 1 should be replaced and the remaining bearings should be monitored during future inspections for additional failed painted coating and corrosion
- The truss should be monitored during future inspections for additional failed painted coating, missing hardware, and impact damage
- The cross bracing should be monitored during future inspections for additional failed painted coating and impact damage

2 INTRODUCTION

The inspection of the Maclay Bridge (Bridge No. L32101000+01001) for the Montana Department of Transportation was performed on August 8 and 10th, 2017 by Fickett Structural Solutions. The following SPRAT (Society of Professional Rope Access Technicians) trained team members performed the inspection services:

- Fickett Structural Solutions
 - Todd Demski, PE, CWI, SPRAT III
 - Ryan Sievers, PE, CWI, SPRAT II
 - Zach Williams, CWI, SPRAT I
 - Traa Haase, EIT

Prior to arriving on-site, our inspection team converted the plans to an editable PDF format for ease of use during inspection. Tablets were used to record and review all inspection notes and photographs. After the inspection was complete, all notes were placed on the Maclay Bridge Plans in MicroStation to give MDT a visual representation of deficiencies on the bridge. The bridge was accessed using SPRAT certified techniques. No scaffolding, ladders, lifts, or under bridge inspection vehicles were required to access any portion of the bridge during this inspection cycle.

The inspection was performed in accordance with the following documents:

- MDT Bridge Inspection and Rating Manual, December 2015
- Bridge Inspector's Reference Manual, (Federal Highway Administration), 2012

The following tasks were performed at the Maclay Bridge by the inspection engineers from Fickett:

- Mobilization to the site daily and set up traffic control to warn oncoming motorists that work is being performed on the bridge
- Hands-on inspection of all steel members in the plane of the primary truss lines, and secondary bracing member connections
- Cursory inspection of secondary bracing members
- Hands-on inspection of the floor system
- Obtain all applicable photographs and note all deficiencies using tablets
- Perform element level inspection and NBI inspection

During inspection the bridge was inspected for:

- Steel deficiencies including corrosion, section loss, cracking of welds or base metal, bolting or welding issues, and load induced distortion or damage
- Concrete deficiencies including delamination, spalls, patched areas, exposed rebar, cracking, abrasion, wear, and load induced distortion or damage
- Substructure deficiencies including wing wall tipping, settlement, and scour
- Joint deficiencies including leakage, seal adhesion/damage/cracking, debris impaction, adjacent deck or header damage, and damage
- Bearing deficiencies including corrosion, connection issues, movement, alignment, loss of bearing area, and damage

3 CONDITION FINDINGS

The following sections outline the general conditions for each of the structure components inspected during the 2017 inspection cycle. Specific defects and member specific photographs for each structure component can be found in the Appendices.

3.1 APPROACH, DECK, BRIDGE RAIL, AND SIGNAGE



Both the East and West Approaches consisted of asphalt pavement with minor wear over the entire surface area of the approaches (**Photo 18**). The West Approach had a 5 ft. long by bridge width area of cold patch which was sound with no noted cracking (**Photo 19**). A 1/4 in. wide by full width transverse crack was noted approximately 18 ft. from the west transition (**Photo 20**). A 1/2 in. wide by full width transverse crack was noted approximately 4 ft. from the east transition (**Photo 21**).

The asphalt wearing surface covered the deck and had minor wear throughout (**Photo 22**). The following defects were found on the wearing surface:

- Span 1: An 18 in. long by 6 in. wide area of the overlay had formed a pothole with penetration up to 1 in. located 6 ft. from the west end of the deck in the south wheel path (**Photo 23**)
- Span 1: The end 6 ft. by bridge width adjacent to the West Approach had cold patch with minor wear and hairline map cracking (**Photo 24**)
- Span 1: Transverse cracking up to 1/8 in. wide by full width spaced approximately 20 ft. apart at the floor beam locations (**Photo 25**)
- Span 1: Approximately 1 percent of the wearing surface had been repaired with cold patch that had map cracking up to 1/8 in. wide
- Span 3: A transverse crack up to 1/2 in. wide was located over Bent 4 (**Photo 26**)
- Span 4: A transverse crack up to 1/2 in. wide was located over Abutment 5 (**Photo 27**)

The underside of the deck in Spans 1 and 2 were galvanized, corrugated stay-in-place formwork that had welding burn through holes on throughout its surface area with minor surface corrosion and negligible section loss to the burn hole edges (**Photo 28**). These areas of burn

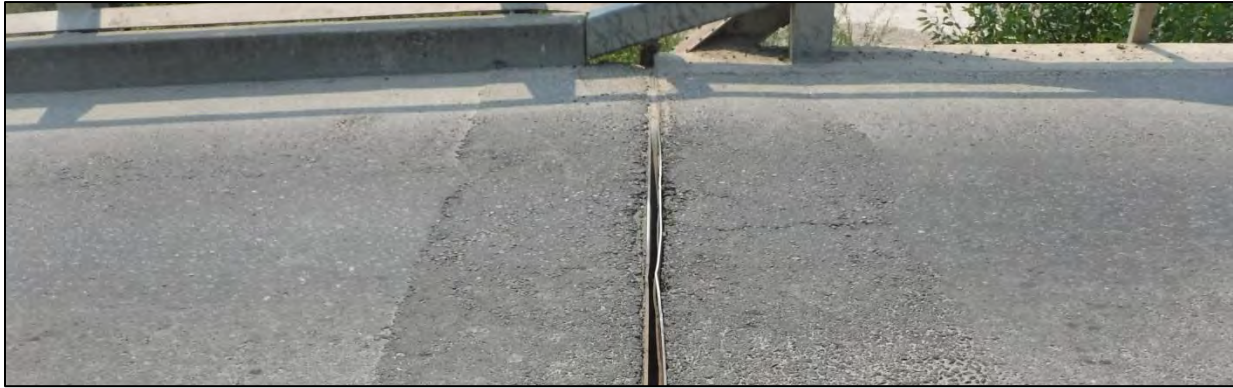
through allowed debris to fall through the stay-in-place formwork on to the floor beams. The underside of the deck in Spans 3 and 4 were top flanges of tee beams with isolated areas of efflorescence seeping through the construction joints (**Photo 29**).

A 5-1/2 in. high by 8 in. wide concrete curb spanned both edges of Spans 3 and 4. The North Curb on Span 4 had section loss up to 1-1/2 in. on the top and interior faces with no exposed reinforcing steel (**Photo 30**). The North Curb had section loss up to 5 in. with exposed longitudinal and stirrup reinforcing steel for 4 ft. over Bent 4 (**Photo 31**).

The bridge rail in Spans 1 and 2 consisted of a 6 in. by 6 in. galvanized steel rail located 10 in. above the bridge deck. Three 2 in. angles spanned the length of the bridge deck and were riveted to the vertical members (**Photo 32**). Approximately 50 percent of the painted coating on the railing had failed with minor surface corrosion and negligible section loss, 20 percent failed with exposed primer, 10 percent was bubbling and peeling, and the remaining painted coating was in good condition. Lateral displacement up to 3 in. between verticals was typical along the length of the rail. The vertical angle on the South Rail in Span 1 between Panel Point 4' and 3' was bent 1-1/2 in. over a 2 ft. length due to impact damage (**Photo 33**). The bottom angle on the North Rail in Span 2 at Panel Point 1' was bent 3/4 in. upwards (**Photo 34**).

The bridge rail in Spans 3 and 4 consisted of a 6 in. diameter top rail, a 12 in. tall W-beam mid rail and a 5 in. vertical steel plate at the bridge deck (**Photo 35**). Approximately 5 percent of the painted coating had failed with minor surface corrosion and negligible section loss primarily on the vertical steel plate at the bridge deck, 5 percent failed with exposed primer, and the remaining painted coating was in good condition. Three vertical members had impact damage that bent the interior flange 3/4 in. over a 6 in. length with gouging on the North Rail near the East Approach (**Photo 36**). The top rail was bent downward 1-1/2 in. over a 5 ft. length on the east end of the South Rail.

3.2 JOINTS



Joint 1 over Abutment 1 was a 11 ft. long by 30 in. wide metal plate bolted to the bridge deck on the east side of the joint (**Photo 38**).

Joint 2 over Bent 2 was an open joint. The joint edge had two 3/4 in. bends over a 1 ft. section in the south wheel path (**Photo 39**). The joint opening measured at 1/2 in. on the South Rail on a 90 degree day.

Joint 3 over Bent 3 was a compression joint that was fully compressed on the South Rail on a 90 degree day (**Photo 40**). The rubber seal had failed on 90 percent of its length (**Photo 41**). The joint had separated from the Span 2 header over a 4 ft. length (**Photo 42**). The joint edge had a 1/2 in. bend over a 6 in. length in the south wheel path.

3.3 FLOOR SYSTEM



The floor beams were steel rolled beam sections connected to the lower chord by a pinned connection. Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling. The bottom west flange of Floor Beam 1' on Span 1 had bent upwards 1/2 in. over a 6 in. length approximately 16 in. from the north end (**Photo 43**).

The stringers were steel rolled beams, and were bearing on the top flange of the floor beams. Approximately 90 percent of the stringers were painted, while the other 20 percent of the stringers were replaced with an unpainted steel stringer. Approximately 30 percent of the painted coating on the stringers had failed with moderate corrosion with up to 1/16 in. thick rust scale, 15 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

The 20 percent of the stringers that were left unpainted and had minor to moderate corrosion with negligible section loss (**Photo 44**). The stringer ends at Abutment 1, Bent 2, and Bent 3 had debris accumulation on top of the abutment seat and bent caps, and around the ends of the stringer webs and bottom flanges. The inspector cleaned the debris from around the stringer ends for inspection. The specific stringer defects can be seen in **Table 1**.

Span	Bent	Stringer	Comment	Photo
1	1	7	The stringer web had heavy corrosion and section loss over a 17 in. long by 2 in. high area with a 1 in. diameter hole center 10 in. from the stringer end	Photo 45
1	1	4	The stringer web had heavy corrosion and up to 50 percent section loss over a 10 in. long by 1 in. high hole adjacent to the stringer end	Photo 46
1	1	2	The stringer web had heavy corrosion and section loss over a 14 in. long by 2 in. high area with a 2 in. long by 1/2 in. high hole center 2 in. from the stringer end	Photo 47
2	2	2	The stringer web had heavy corrosion and section loss with two holes; 7 in. long by 1 in. high and 6 in. long by 2 in. high centered 16 in. from the stringer end	Photo 48
2	2	5	The south face had a 16 in. long by 2 in. high area of pack rust up to 1/4 in. thick on the bottom of the web located 12 in. from the end of the stringer	Photo 49
2	3	All	The hollow pipe that the stringers were bearing on had movement up to 1/4 in. when vehicles passed. The south anchor rod for the south pipe had failed and this edge of the pipe had vertical movement up to 1/2 in. when vehicles passed	Photo 50
2	3	2	The stringer web had heavy corrosion with up to 1/8 in. thick rust scale on both sides of the stringer web at the web to lower flange interface adjacent to the stringer end	Photo 51
2	3	4	The stringer web had heavy corrosion and section loss with a 5 in. long by 1 in. high through hole near the stringer end. The bottom flange was knife edged in this area	Photo 52
2	3	4	A gap was noted between the bottom flange and the supporting bearing seat of the abutment. Significant movement was observed when traffic passed over this area (gap closes with passing traffic)	N/A
2	3	7	The stringer web had heavy corrosion with up to 50 percent section loss over a 6 in. long by 2 in. high adjacent to the stringer end that had a 1/2 in. diameter hole 6 in. from the stringer end at the web to lower flange interface	Photo 53
2	3	8	The stringer web had heavy corrosion and section loss with three through holes ranging in size from 1/4 in. to 1/2 in. in diameter located at the web to lower flange interface at the stringer end	Photo 54

Table 1: Stringer End Defects

The approach spans were concrete Tee beams. The concrete beams had superficial cracking, but no notable deficiencies.

3.4 ABUTMENTS, WING WALLS, AND EMBANKMENTS



Abutment 1 (**Photo 13**) was constructed of reinforced concrete. The abutment had one full height, vertical crack up to 1/8 in. wide in the middle of the abutment (**Photo 55**). The abutment had rust staining under the truss due to corrosion from the steel members above the abutment.

Abutment 5 (**Photo 17**) was constructed of reinforced concrete and had no notable deficiencies.

3.5 BENTS



The bents were constructed of reinforced concrete. At the time of inspection, the bents were located on dry land and could be fully inspected.

Bent 2 (**Photo 14**) had random hairline temperature and shrinkage cracking over its entire surface area. The west elevation had seven areas of delaminations up to 60 in. wide by 12 in. high. The east elevation had five areas of delaminations up to 15 in. wide by 30 in. wide. The edges of the delaminations were spalling with up to 1 in. of penetration and no exposed reinforcing steel (**Photo 56**).

Bent 3 (**Photo 15**) had random hairline map cracking throughout its surface area with minor efflorescence build-up in random, isolated areas. The top, southeast corner of the bent had a 12 in. wide by 10 in. high area of delamination (**Photo 57**). A 5 ft. long horizontal crack up to 1/16 in. wide was located near the bottom, northeast corner of the bent (**Photo 58**).

Bent 4 (**Photo 16**) had a 3 ft. wide by 2 ft. high spall with exposed reinforcing steel on the west face of the bent cap. The exposed reinforcing steel had moderate corrosion with negligible section loss (**Photo 59**).

3.6 BEARINGS



Abutment 1, North Truss roller bearing (**Photo 60**) had a failed painted coating on approximately 25 percent of the surface area with moderate corrosion and pitting up to 1/16 in. to the steel underneath, 10 percent had failed with exposed primer underneath, and the remaining paint was chalking. The heavy corrosion was under the rollers and roller keeper (**Photo 61**). The roller keeper had split due to heavy corrosion and the nested roller assembly had failed. Two of the rollers along with a portion of the keeper were out from underneath the truss to the west of the bearing and one roller was sticking out from underneath the bearing to the east of the bearing (**Photo 62**). The anchor rods had up to 25 percent section loss at the concrete interface due to heavy corrosion. The top plate was displaced 1-7/8 in. to the west (in expansion) in relation to the bottom plate.

Abutment 1, South Truss roller bearing (**Photo 63**) had a failed painted coating on approximately 25 percent of the surface area with moderate corrosion and pitting up to 1/16 in. to the steel underneath, 10 percent had failed with exposed primer underneath, and the remaining paint was chalking. The heavy corrosion was under the rollers and roller keeper. The roller keeper had split due to heavy corrosion and the nested roller assembly had failed. The roller keeper had broken away from the bearing due to heavy corrosion and was pushed against the abutment backwall (**Photo 64**). Half of the rollers were still within the bearing, but were not fully in contact with the bearing plates. The top plate was displaced 1-1/2 in. to the west (in expansion) in relation to the bottom plate.

Bent 2, North Truss, Span 1 fixed bearing (**Photo 65**) and Span 2 fixed bearing (**Photo 67**) had a failed painted coating on approximately 5 percent of the surface area with minor surface

corrosion and negligible section loss, 10 percent had failed with exposed primer underneath, and the remaining painted coating was chalking.

Bent 2, South Truss, Span 1 fixed bearing (**Photo 66**) and Span 2 fixed bearing (**Photo 68**) had a failed painted coating on approximately 10 percent of the surface area with minor surface corrosion and negligible section loss, 15 percent had failed with exposed primer underneath, and the remaining painted coating was chalking.

Bent 3, North Truss sliding bearing (**Photo 69**) was unpainted and had moderate corrosion with pitting up to 1/16 in. deep. The top plate was displaced 1-3/8 in. to the east (in expansion) in relation upper flange of the bearing.

Bent 3, South Truss sliding bearing (**Photo 70**) was unpainted and had moderate corrosion with pitting up to 1/16 in. deep. The top plate was displaced 1-3/4 in. to the east (in expansion) in relation upper flange of the bearing.

3.7 TRUSS MEMBERS



The verticals and upper chords were built up steel members consisting of C-channels with supporting lacing bars, batten plates, rolled beams. The diagonals consisted of eyebars connected at either end by a pinned connection. The pony truss consisted of built up steel members consisting of rolled members with supporting lacing bars and batten plates. Approximately 5 percent of the painted coating had failed on the truss members with minor surface corrosion and negligible section loss, 5 percent had failed with exposed primer underneath, 5 percent was chalking, and the remaining painted coating was in good condition.

- Span 1, North Truss, Vertical L1-U1: the exterior flange of the vertical was bent 1 in. to the north due to impact damage approximately 5 ft. above the bridge deck (**Photo 71**)
- Span 1, South Truss, Top Chord at U4: one bolt was sheared off of the horizontal brace to top chord connection plate (**Photo 72**)
- Span 2, North Truss, Vertical L2'-U2': the interior flange of the vertical was bent 1 in. over a 6 in. length due to impact damage (**Photo 73**)
- Span 2, North Truss, Diagonal L2'-U1': the interior flange was bent 1-3/8 in. over a 24 in. length due to impact damage (**Photo 74**)
- Span 2, North Truss, Gusset Plate U1': the exterior gusset plate had two misdrilled 3/4 in. diameter holes (**Photo 75**)
- Span 2, North Truss, Member L0'-U1': the diagonal had seven areas of impact damage up to 3/4 in. long and 1/4 in. of deflection spaced over a 15 in. length (**Photo 76**)

The lower chord of the main truss consisted of two steel eyebars connected at each panel point by a pinned connection. Approximately 15 of the painted coating had failed on the lower chord with moderate corrosion with negligible section loss, 25 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

3.8 BRACING



Approximately 40 percent of the painted coating on the bracing had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

- Panel Point 3': the lower, horizontal bracing member was bent 2 in. to the east, and bent upward and downward 1 in. due to impact damage (**Photo 77**)

4 CONCLUSIONS AND RECOMMENDATIONS

The Maclay Bridge had the following NBI ratings: Item 58 Deck – (6) Satisfactory Condition; Item 59 Superstructure – (5) Fair Condition; Item 60 Substructure – (5) Fair Condition. The various components/elements associated with this bridge are in varying conditions as described below. The following conclusions and recommendations are suggested to maintain the long term serviceability of the bridge.

The approaches were in fair condition with transverse cracking up to 1/2 in. wide and deteriorated cold patch repairs. It is recommended that the approaches be monitored during future inspections for additional cracking and cold patch deterioration.

The bituminous overlay was in fair condition with minor wear, transverse cracking, and numerous isolated potholes. It is recommended the potholes be patched throughout the bridge deck. It is recommended that the bituminous overlay be monitored during future inspections for additional wear, cracking, and potholes.

The corrugated steel stay-in-place forms on the underside of the deck were in satisfactory condition with areas of weld burn through with corrosion and negligible section loss. It is recommended that the corrugated forms be monitored during future inspections for additional corrosion.

The concrete top flange was in good condition with areas of seepage through the construction joints. It is recommended that the areas of seepage be monitored during future inspections for signs of cracking and spalling.

The bridge rail was in fair condition with failed painted coating and minor corrosion with negligible section loss and areas of impact damage that did not result in cracking or tearing of the steel. It is recommended that the rail be monitored during future inspections for additional corrosion and impact damage. The areas of spalling with exposed reinforcing steel on the concrete curb should be repaired, and the remainder of the curb should be monitored during future inspections for additional spalling.

The joints were in fair condition with areas of impact damage and separation from the bridge deck. The seal on the joint over Bent 3 had deteriorated and failed on over 90 percent of its length. The minor areas of impact damage to the joint headers should be monitored for separation from the wearing surface. It is recommended that the deteriorated seal on the joint at Bent 3 be replaced and that the joint be monitored during future inspections for additional impact damage, seal separation, and seal deterioration.

The floor beams were in satisfactory condition with failed painted coating and minor surface corrosion with negligible section loss. It is recommended that the floor beams be monitored

during future inspections for additional failed paint and corrosion.

The stringers were in fair to poor condition with areas of heavy corrosion with section loss and through holes on the stringer ends over the abutments and piers on Spans 1 and 2. It is recommended that the stringer ends be cleaned of debris during each inspection cycle for proper inspection and to prevent trapped moisture, and be monitored during future inspections for additional section loss. The stringer ends on Span 2, Bent 3 had ¼ in. to ½ in. of vertical movement from passing vehicles. The stringers should be shimmed to remove the excess movement from passing vehicles. It is also recommended that the stringers be monitored during future inspection for additional failed painted coating and corrosion.

The approach span girders were in good condition with superficial, hairline cracking but no other notable deficiencies. It is recommended that the approach span concrete beams be monitored during future inspections for cracking.

The abutments were in satisfactory to good condition with cracking up to 1/8 in. wide on Abutment 1 and no notable deficiencies on Abutment 5. It is recommended that the abutments be monitored during future inspections for cracking and spalling.

The bents were in fair condition with cracking up to 1/16 in. wide, delaminations, and spalling with exposed reinforcing steel. It is recommended that the bents be monitored during future inspections for cracking, delaminations, and spalling.

The bearings were in poor condition with failed painted coating and moderate to heavy corrosion. Both of the roller bearings on Abutment 1 had failed due to heavy corrosion and significant section loss to the anchor rods and nested rollers. The roller bearings were no longer functioning as intended with a majority of the rollers no longer between the bearing plates. It is recommended that the roller bearings on Abutment 1 be replaced, and that the remaining bearings be monitored during future inspections for additional failed painted coating and corrosion.

The truss members were in satisfactory condition with failed painted coating and minor corrosion. The truss members had areas of impact damage, missing connection hardware, and misdrilled holes. It is recommended that the truss be monitored during future inspections for additional failed painted coating, missing hardware, and impact damage.

The cross bracing members were in fair condition with failed painted coating and minor surface corrosion with isolated areas of impact damage. It is recommended that the cross bracing be monitored during future inspections for additional failed painted coating and impact damage.

The above summarizes our inspection findings on the 2017 Maclay Bridge Inspection services. Per FHWA requirements, the Maclay Bridge should be inspected at intervals not to exceed 24 months. If you have any questions regarding the report, please do not hesitate to contact me.

Respectfully Submitted,
Fickett Structural Solutions, INC.



Todd Demski, PE, CWI
Project Manger

5 APPENDICES

APPENDIX A: OVERVIEW PHOTOS



Photo 1: South Elevation looking north at bridge



Photo 2: North Elevation looking south at bridge



Photo 3: Looking downstream (north) at mid span

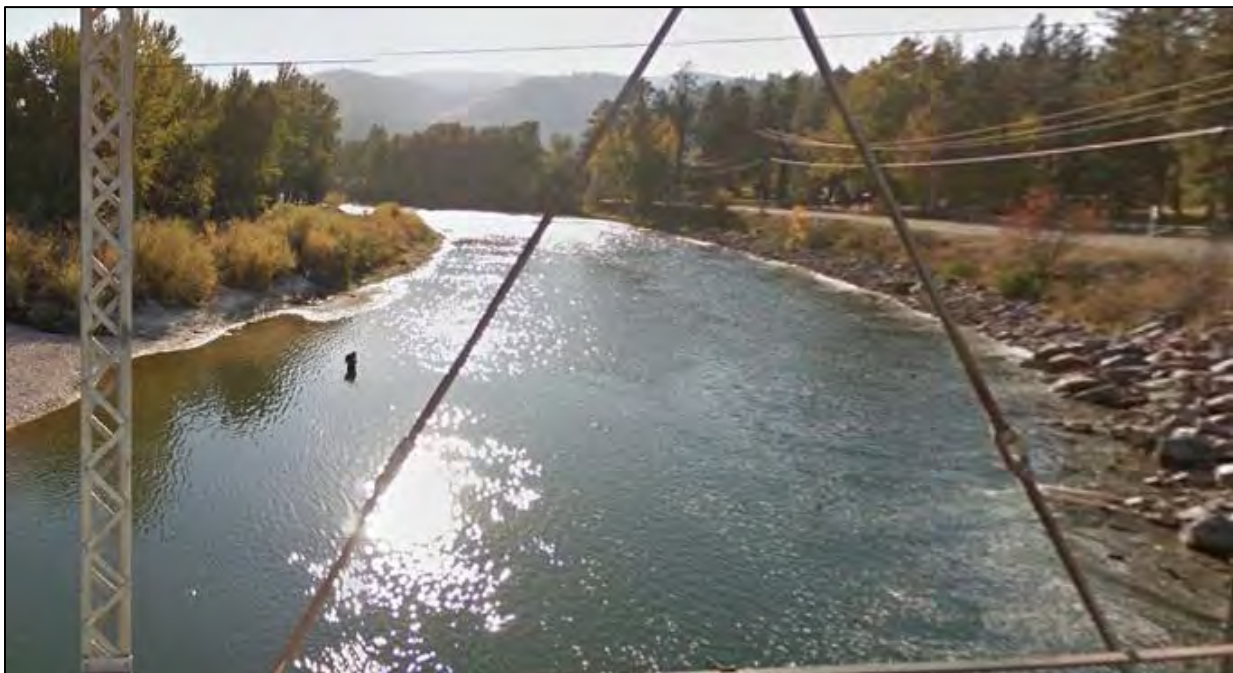


Photo 4: Looking upstream (south) at mid span



Photo 5: East Portal



Photo 6: Weight Limit Sign on East End of bridge



Photo 7: West Portal with Weight Limit Sign



Photo 8: East Approach



Photo 9: West Approach



Photo 10: Main Span Underside Framing Plan



Photo 11: Pony Truss Span Underside Framing Plan



Photo 12: Approach Span Underside Framing Plan



Photo 13: Abutment 1 East Elevation looking west



Photo 14: Bent 2 East Elevation looking west



Photo 15: Bent 3 East Elevation looking west



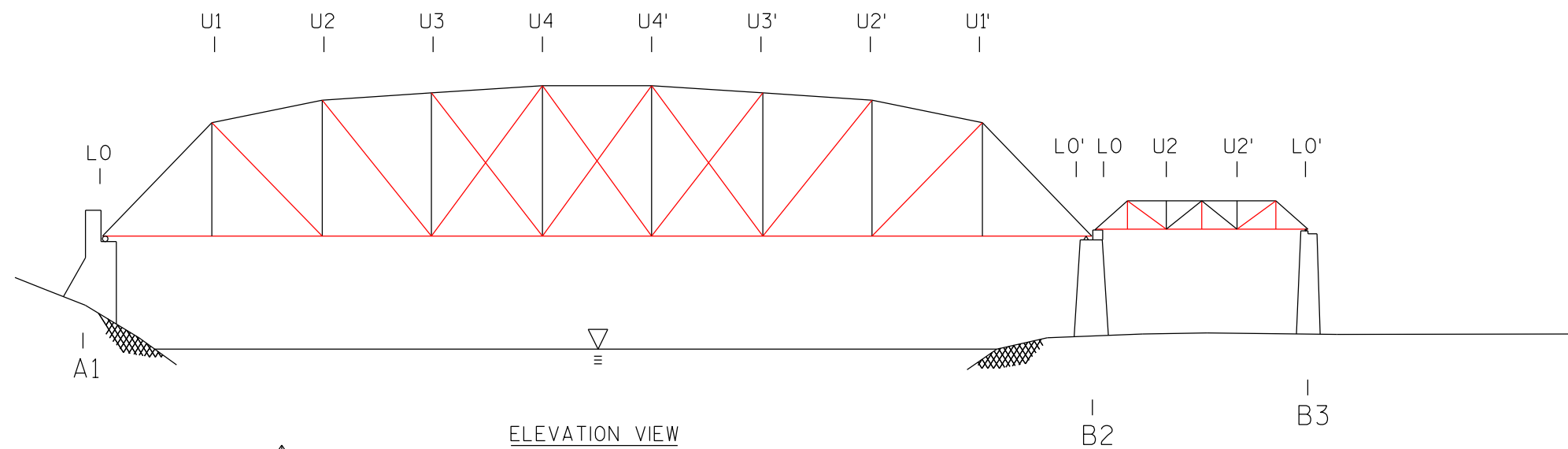
Photo 16: Bent 4 East Elevation looking west



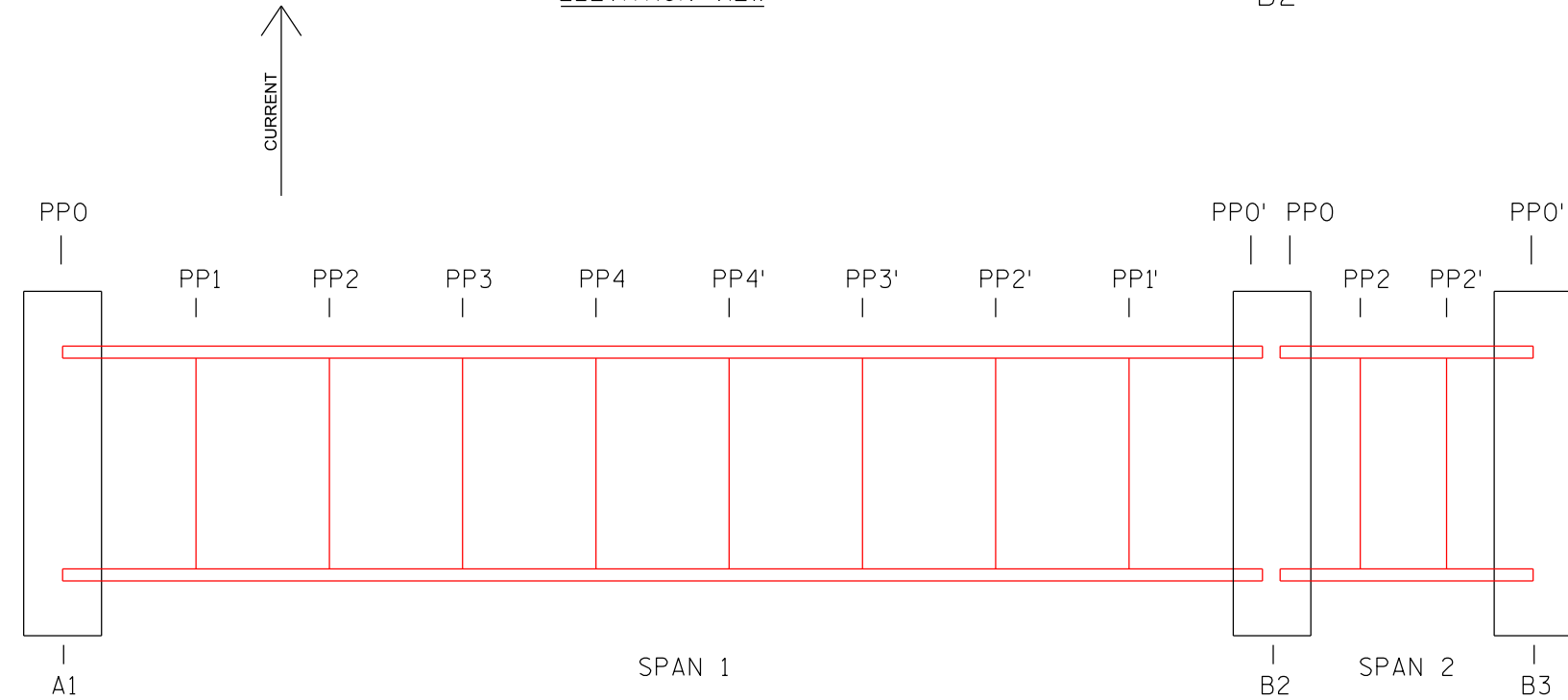
Photo 17: Abutment 5 West Elevation looking east

APPENDIX B: FRACTURE CRITICAL INSPECTION PLAN

The following drawing shows the members in red that were considered fracture critical during inspection. Fracture critical inspection requires visual inspection from no further away than arm's length, which was achieved via rope access methods.



ELEVATION VIEW



PLAN VIEW

MEMBERS HIGHLIGHTED IN RED ARE CONSIDERED FRACTURE CRITICAL

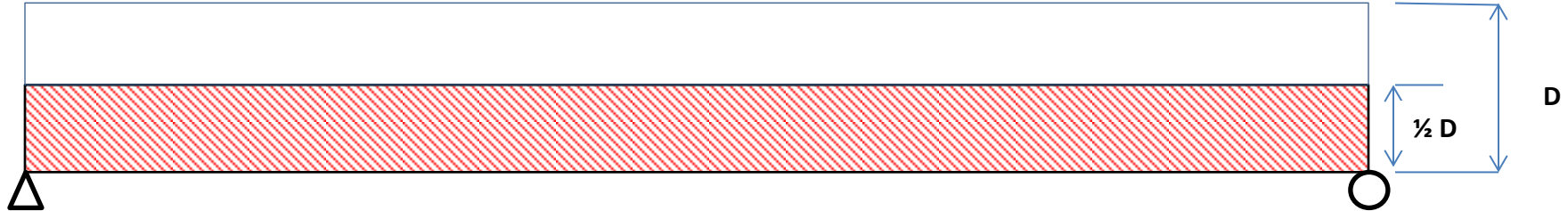
BRIDGE NUMBER	L32101000+01001
FICKEIT Structural Solutions	250 EAST WISCONSIN AVENUE SUITE 1800 MILWAUKEE, WISCONSIN 53202 (414) 223.5775
FISH PROJECT NUMBER	16057
MONTANA DEPARTMENT OF TRANSPORTATION	
MDT Montana Department of Transportation	
BY _____ CONSULTANT DESIGN ENGINEER	DATE _____
DATE OF INSPECTION	August 2017
SHEET DESCRIPTION MACLAY FRACTURE CRITICAL PLAN	

DRAWN BY	RYAN A SIEVERS				
REVIEWED BY	TODD DEMSKI				

Fracture Critical Bridge Inspection Plan and Reporting Form



Solid Floor Beam: TEMPLATE



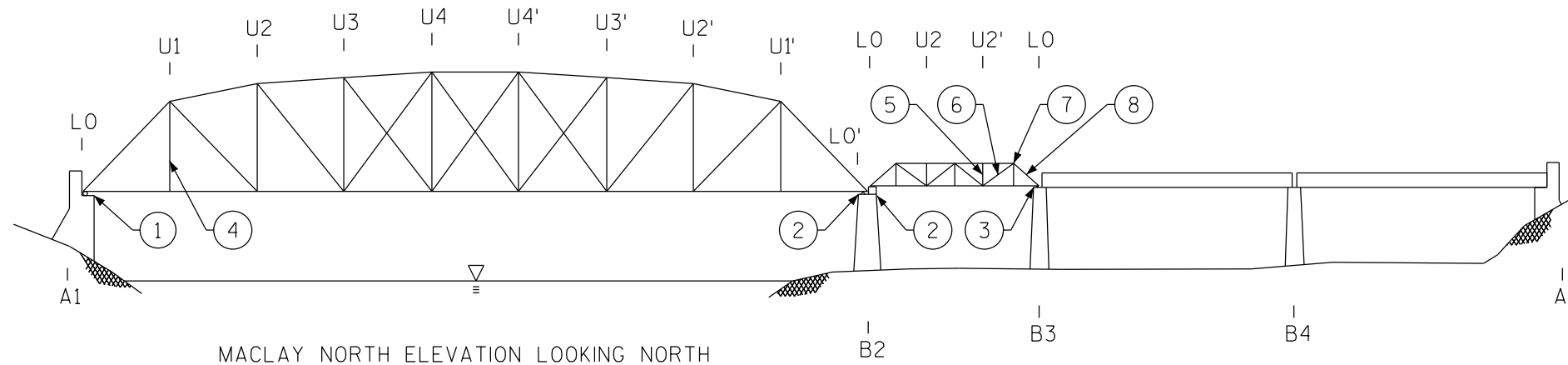
Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

Inspection Comments: Template of floor beam form. Individual floor beam forms can be found in Appendix C.

Previous Inspection Comments:

APPENDIX C: INSPECTION NOTES

The following drawings show where specific defects were noted during the inspection.



MACLAY NORTH ELEVATION LOOKING NORTH

GENERAL NOTES:

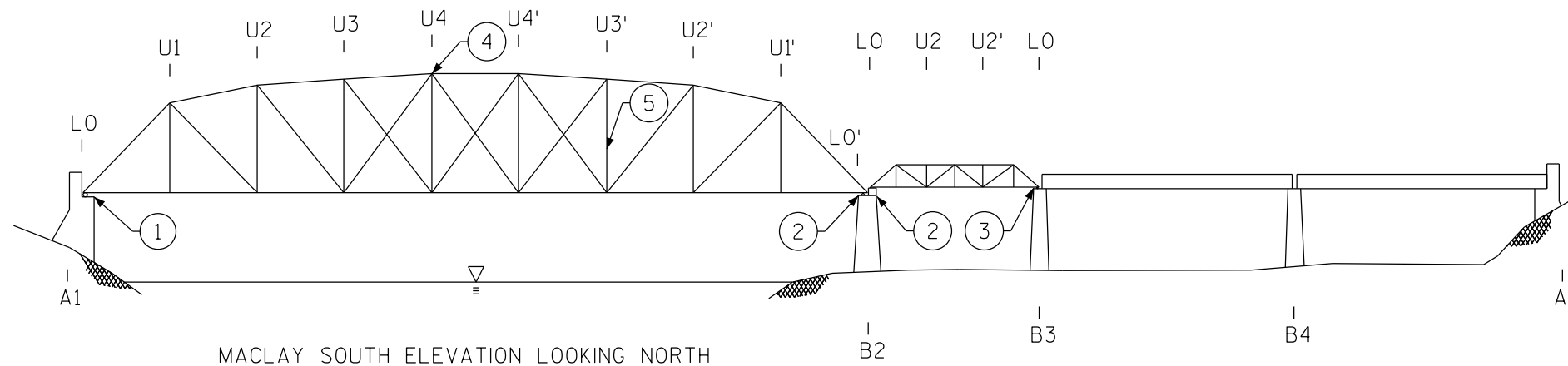
- a. APPROXIMATELY 5 PERCENT OF THE PAINTED COATING HAD FAILED ON THE VERTICALS, UPPER CHORD, AND DIAGONAL MEMBERS WITH MINOR SURFACE CORROSION AND NEGLIGIBLE SECTION LOSS, 5 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, 5 PERCENT WAS CHALKING, AND THE REMAINING PAINTED COATING WAS IN GOOD CONDITION.
- b. APPROXIMATELY 15 OF THE PAINTED COATING HAD FAILED ON THE LOWER CHORD WITH MODERATE CORROSION WITH NEGLIGIBLE SECTION LOSS, 25 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINTED COATING WAS BUBBLING AND PEELING.
- c. APPROXIMATELY 40 PERCENT OF THE PAINTED COATING ON THE BRACING HAD FAILED WITH MINOR SURFACE CORROSION AND NEGLIGIBLE SECTION LOSS, 40 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINTED COATING WAS BUBBLING AND PEELING.

INSPECTION NOTES:

1. ABUTMENT 1, NORTH TRUSS ROLLER BEARING HAD A FAILED PAINTED COATING ON APPROXIMATELY 25 PERCENT OF THE SURFACE AREA WITH MODERATE CORROSION AND PITTING UP TO 1/16 IN. TO THE STEEL UNDERNEATH, 10 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINT WAS CHALKING. THE HEAVY CORROSION WAS UNDER THE ROLLERS AND ROLLER KEEPER. THE ROLLER KEEPER HAD SPLIT DUE TO HEAVY CORROSION AND THE NESTED ROLLER ASSEMBLY HAD FAILED. TWO OF THE ROLLERS ALONG WITH A PORTION OF THE KEEPER WERE OUT FROM UNDERNEATH THE TRUSS TO THE WEST OF THE BEARING AND ONE ROLLER WAS STICKING OUT FROM UNDERNEATH THE BEARING TO THE EAST OF THE BEARING. THE ANCHOR RODS HAD UP TO 25 PERCENT SECTION LOSS AT THE CONCRETE INTERFACE DUE TO HEAVY CORROSION. THE TOP PLATE WAS DISPLACED 1-7/8 IN. TO THE WEST (IN EXPANSION) IN RELATION TO THE BOTTOM PLATE.
2. THE NORTH SPAN FIXED BEARINGS HAD A FAILED PAINTED COATING ON APPROXIMATELY 5 PERCENT OF THE SURFACE AREA WITH MINOR SURFACE CORROSION AND NEGLIGIBLE SECTION LOSS, 10 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINTED COATING WAS CHALKING.
3. BENT 3, NORTH TRUSS SLIDING BEARING WAS UNPAINTED AND HAD MODERATE CORROSION WITH PITTING UP TO 1/16 IN. DEEP. THE TOP PLATE WAS DISPLACED 1-3/8 IN. TO THE EAST (IN EXPANSION) IN RELATION UPPER FLANGE OF THE BEARING.
4. THE EXTERIOR FLANGE OF THE VERTICAL WAS BENT 1IN. TO THE NORTH DUE TO IMPACT DAMAGE APPROXIMATELY 5 FT. ABOVE THE BRIDGE DECK.
5. THE INTERIOR FLANGE OF THE VERTICAL WAS BENT 1IN. OVER A 6 IN. LENGTH DUE TO IMPACT DAMAGE.
6. THE INTERIOR FLANGE WAS BENT 1-3/8 IN. OVER A 24 IN. LENGTH DUE TO IMPACT DAMAGE.
7. THE EXTERIOR GUSSET PLATE HAD TWO MISDRILLED 3/4 IN. DIAMETER HOLES.
8. THE DIAGONAL HAD SEVEN AREAS OF IMPACT DAMAGE UP TO 3/4 IN. LONG AND 1/4 IN. OF DEFLECTION SPACED OVER A 15 IN. LENGTH.

BRIDGE NUMBER	L32101000+01001
FICKEIT Structural Solutions	250 EAST WISCONSIN AVENUE SUITE 1800 MILWAUKEE, WISCONSIN 53202 (414) 223.5775
FISH PROJECT NUMBER	16057
MONTANA DEPARTMENT OF TRANSPORTATION	
MDT Montana Department of Transportation	
BY _____ BY _____	DATE _____
CONSULTANT DESIGN ENGINEER	
DATE OF INSPECTION	August 2017
SHEET DESCRIPTION MACLAY NORTH ELEVATION VIEW	

	DRAWN BY	RYAN A SIEVERS				
	REVIEWED BY	TODD DEMSKI				



GENERAL NOTES:

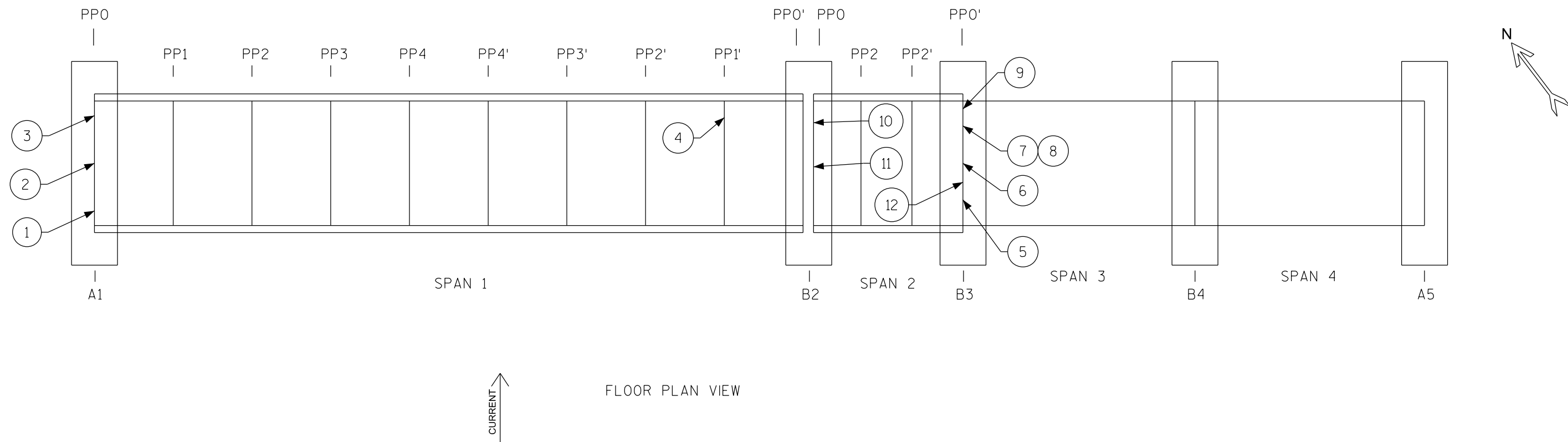
- a. APPROXIMATELY 5 PERCENT OF THE PAINTED COATING HAD FAILED ON THE VERTICALS, UPPER CHORD, AND DIAGONAL MEMBERS WITH MINOR SURFACE CORROSION AND NEGLIGIBLE SECTION LOSS, 5 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, 5 PERCENT WAS CHALKING, AND THE REMAINING PAINTED COATING WAS IN GOOD CONDITION.
- b. APPROXIMATELY 15 OF THE PAINTED COATING HAD FAILED ON THE LOWER CHORD WITH MODERATE CORROSION WITH NEGLIGIBLE SECTION LOSS, 25 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINTED COATING WAS BUBBLING AND PEELING.
- c. APPROXIMATELY 40 PERCENT OF THE PAINTED COATING ON THE BRACING HAD FAILED WITH MINOR SURFACE CORROSION AND NEGLIGIBLE SECTION LOSS, 40 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINTED COATING WAS BUBBLING AND PEELING.

INSPECTION NOTES:

1. ABUTMENT 1, SOUTH TRUSS ROLLER BEARING HAD A FAILED PAINTED COATING ON APPROXIMATELY 25 PERCENT OF THE SURFACE AREA WITH MODERATE CORROSION AND PITTING UP TO 1/16 IN. TO THE STEEL UNDERNEATH, 10 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINT WAS CHALKING. THE HEAVY CORROSION WAS UNDER THE ROLLERS AND ROLLER KEEPER. THE ROLLER KEEPER HAD SEVERED DUE TO HEAVY CORROSION AND THE NESTED ROLLER ASSEMBLY HAD FAILED. THE ROLLER KEEPER HAD BROKEN AWAY FROM THE BEARING DUE TO HEAVY CORROSION AND WAS PUSHED AGAINST THE ABUTMENT BACKWALL. ONLY HALF OF THE ROLLERS WERE STILL WITHIN THE BEARING BUT THEY WERE NOT FULLY IN CONTACT WITH THE BEARING PLATES. THE TOP PLATE WAS DISPLACED 1-1/2 IN. TO THE WEST (IN EXPANSION) IN RELATION TO THE BOTTOM PLATE.
2. THE SOUTH SPAN FIXED BEARINGS HAD A FAILED PAINTED COATING ON APPROXIMATELY 5 PERCENT OF THE SURFACE AREA WITH MINOR SURFACE CORROSION AND NEGLIGIBLE SECTION LOSS, 10 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINTED COATING WAS CHALKING.
3. BENT 3, SOUTH TRUSS SLIDING BEARING WAS UNPAINTED AND HAD MODERATE CORROSION WITH PITTING UP TO 1/16 IN. DEEP. THE TOP PLATE WAS DISPLACED 1-3/4 IN. TO THE EAST (IN EXPANSION) IN RELATION UPPER FLANGE OF THE BEARING.
4. ONE BOLT WAS SHEARED OFF OF THE HORIZONTAL BRACE TO TOP CHORD CONNECTION PLATE.
5. THE LOWER, HORIZONTAL BRACING MEMBER WAS BENT 2 IN. TO THE EAST, AND UPWARD AND DOWNWARD 1 IN. DUE TO IMPACT DAMAGE.

BRIDGE NUMBER	L32101000+01001
FICKETT Structural Solutions	250 EAST WISCONSIN AVENUE SUITE 1800 MILWAUKEE, WISCONSIN 53202 (414) 223.5775
FISH PROJECT NUMBER	16057
MONTANA DEPARTMENT OF TRANSPORTATION	
MDT Montana Department of Transportation	
BY _____ BY _____	DATE _____
CONSULTANT DESIGN ENGINEER	
DATE OF INSPECTION	August 2017
SHEET DESCRIPTION	MACLAY SOUTH ELEVATION VIEW

	DRAWN BY	RYAN A SIEVERS				
	REVIEWED BY	TODD DEMSKI				



FLOOR PLAN VIEW

GENERAL NOTES:

- a. FLOOR BEAMS: APPROXIMATELY 40 PERCENT OF THE PAINTED COATING HAD FAILED WITH MINOR SURFACE CORROSION AND NEGLIGIBLE SECTION LOSS, 40 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINTED COATING WAS BUBBLING AND PEELING.
- b. STRINGERS: APPROXIMATELY 30 PERCENT OF THE PAINTED COATING ON THE STRINGERS THAT WERE PAINTED HAD FAILED WITH MODERATE CORROSION WITH UP TO 1/16 IN. THICK RUST SCALE, 15 PERCENT HAD FAILED WITH EXPOSED PRIMER UNDERNEATH, AND THE REMAINING PAINTED COATING WAS BUBBLING AND PEELING. THE 20 PERCENT OF THE STRINGERS THAT WERE LEFT UNPAINTED AND HAD MINOR TO MODERATE CORROSION WITH NEGLIGIBLE SECTION LOSS

INSPECTION NOTES:

1. STRINGER 7 ON ABUTMENT 1: THE STRINGER WEB HAD HEAVY CORROSION AND SECTION LOSS; 17 IN. LONG BY 2 IN. HIGH WITH A 1 IN. DIAMETER HOLE CENTERED 10 IN. FROM THE STRINGER END.
2. STRINGER 4 ON ABUTMENT 1: THE STRINGER WEB HAD HEAVY CORROSION AND UP TO 50 PERCENT SECTION LOSS; 10 IN. LONG BY 1 IN. HIGH HOLE ADJACENT TO THE STRINGER END.
3. STRINGER 2 ON ABUTMENT 1: THE STRINGER WEB HAD HEAVY CORROSION AND SECTION LOSS; 14 IN. LONG BY 2 IN. HIGH WITH A 2 IN. LONG BY 1/2 IN. HIGH HOLE CENTERED 2 IN. FROM THE STRINGER END.

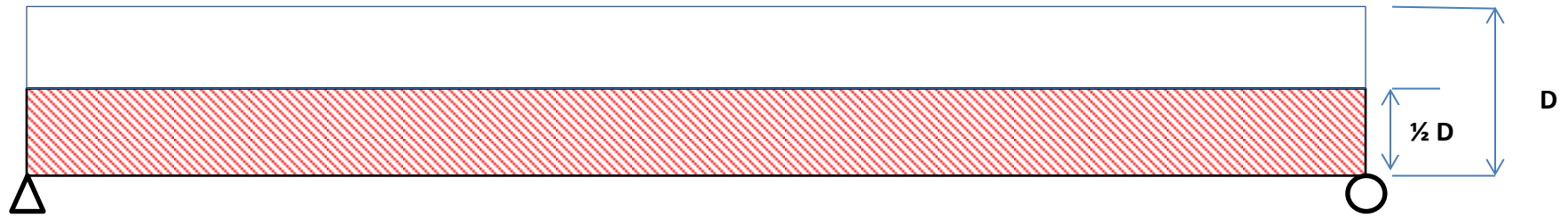
INSPECTION NOTES:

4. THE BOTTOM WEST FLANGE OF FLOOR BEAM 1' ON SPAN 1 HAD BENT UPWARDS 1/2 IN. OVER A 6 IN. LENGTH APPROXIMATELY 16 IN. FROM THE NORTH END.
5. STRINGER 8 ON BENT 3: THE STRINGER WEB HAD HEAVY CORROSION AND SECTION LOSS WITH THREE HOLES RANGING IN SIZE FROM 1/4 IN. TO 1/2 IN. IN DIAMETER LOCATED AT THE WEB TO LOWER FLANGE INTERFACE AT THE STRINGER END.
6. STRINGER 7 ON BENT 3: THE STRINGER WEB HAD HEAVY CORROSION AND UP TO 50 PERCENT SECTION LOSS; 6 IN. LONG BY 2 IN. HIGH ADJACENT TO THE STRINGER END AND HAD A 1/2 IN. DIAMETER HOLE LOCATED 6 IN. FROM THE STRINGER END.
7. STRINGER 4 ON BENT 3: THE STRINGER WEB HAD HEAVY CORROSION AND SECTION LOSS WITH A 5 IN. LONG BY 1 IN. HIGH HOLE NEAR THE STRINGER END. THE BOTTOM FLANGE WAS KNIFE-EDGED IN THIS AREA.
8. STRINGER 4 ON BENT 3: A GAP WAS NOTED BETWEEN THE BOTTOM FLANGE AND THE SUPPORTING BEARING SEAT OF THE BENT. SIGNIFICANT MOVEMENT WAS OBSERVED WHEN TRAFFIC PASSED OVER THIS AREA (GAP CLOSES WITH PASSING TRAFFIC).
9. STRINGER 2 ON BENT 3: THE STRINGER WEB HAD HEAVY CORROSION AND UP TO 1/8 IN. THICK RUST SCALE ON BOTH SIDES OF THE STRINGER WEB AT THE WEB TO BOTTOM FLANGE INTERFACE ADJACENT TO THE STRINGER END.
10. STRINGER 2 ON EAST SIDE OF BENT 2 (PONY TRUSS): THE STRINGER WEB HAD HEAVY CORROSION AND SECTION LOSS WITH TWO HOLES; 7 IN. LONG BY 1 IN. HIGH HOLE AND A 6 IN. LONG BY 2 IN. HIGH HOLE CENTERED 16 IN. FROM THE STRINGER END.
11. STRINGER 5 ON EAST SIDE OF BENT 2 (PONY TRUSS): THE SOUTH FACE HAD A 16 IN. LONG BY 2 IN. TALL AREA OF PACK RUST UP TO 1/4 IN. THICK ON THE BOTTOM OF THE WEB LOCATED 12 IN. FROM THE END OF THE STRINGER.
12. BENT 3, SPAN 2: THE HOLLOW PIPE THAT THE STRINGERS WERE BEARING ON HAD MOVEMENT UP TO 1/4 IN. WHEN VEHICLES PASSED. THE SOUTH ANCHOR ROD FOR THE SOUTH PIPE HAD FAILED AND THIS EDGE OF THE PIPE HAD MOVEMENT UP TO 1/2 IN. WHEN VEHICLES PASSED.

BRIDGE NUMBER	L32101000+01001
FICKEIT Structural Solutions	250 EAST WISCONSIN AVENUE SUITE 1800 MILWAUKEE, WISCONSIN 53202 (414) 223.5775
FISH PROJECT NUMBER	16057
MONTANA DEPARTMENT OF TRANSPORTATION	
MDT Montana Department of Transportation	
BY _____ CONSULTANT DESIGN ENGINEER	DATE _____
DATE OF INSPECTION	August 2017
SHEET DESCRIPTION MACLAY FLOOR SYSTEM	

DRAWN BY	RYAN A SIEVERS				
REVIEWED BY	TODD DEMSKI				

Solid Floor Beam: Span 1- 1



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

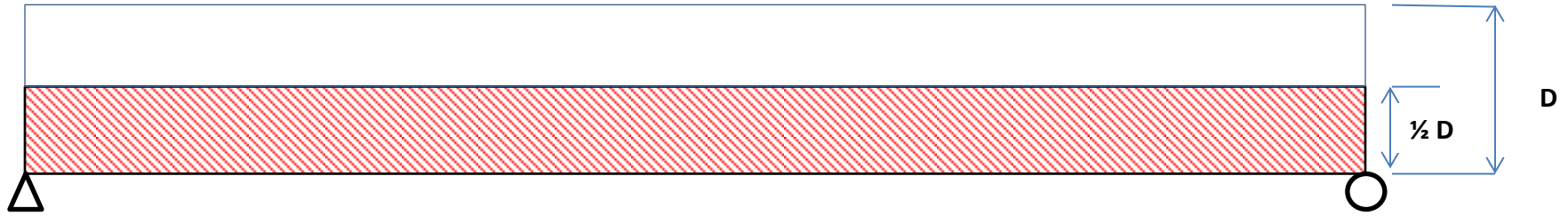
Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 1- 2



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

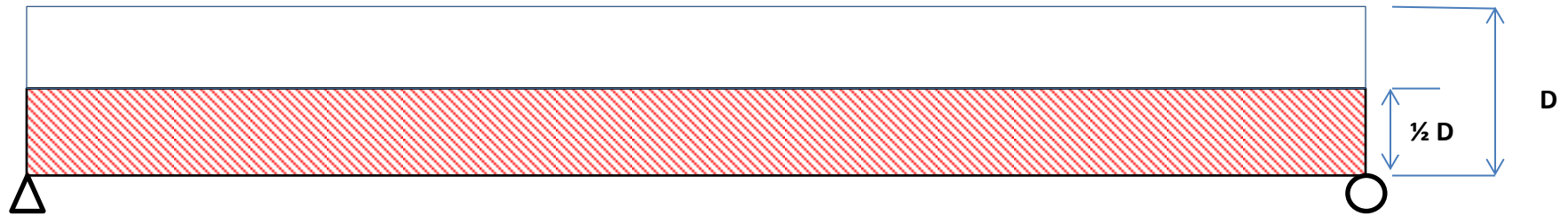
Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 1- 3



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

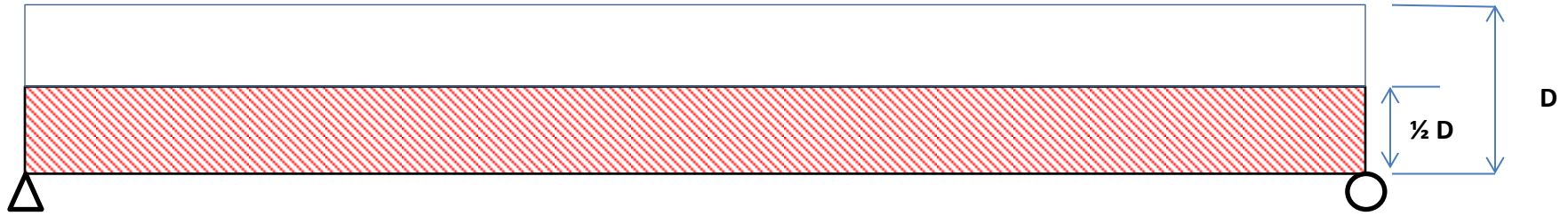
Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 1- 4



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

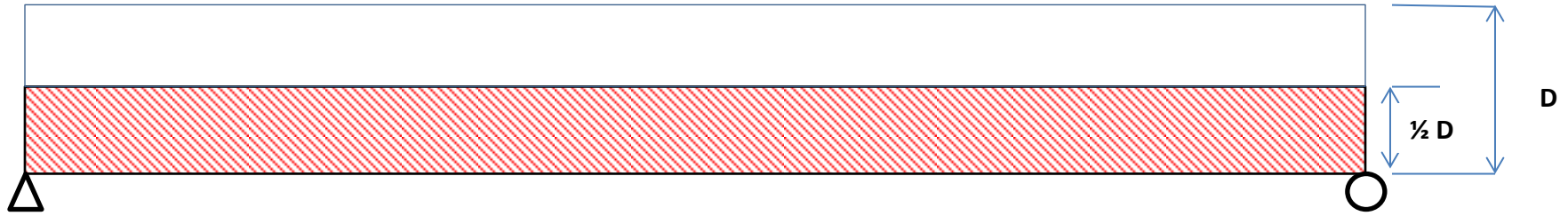
Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 1- 4'



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

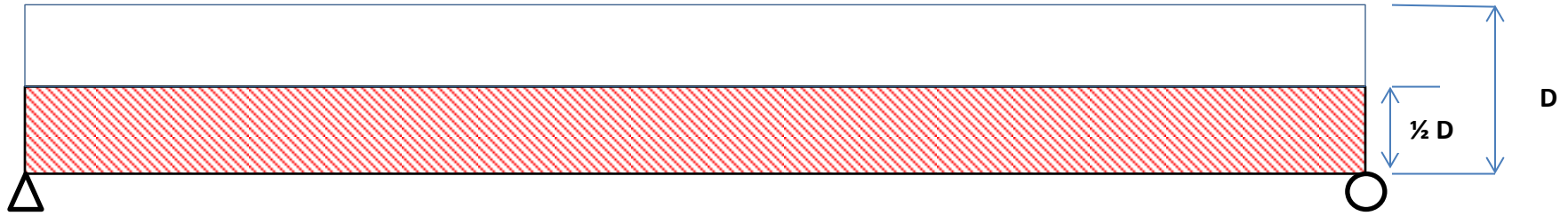
Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 1- 3'



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

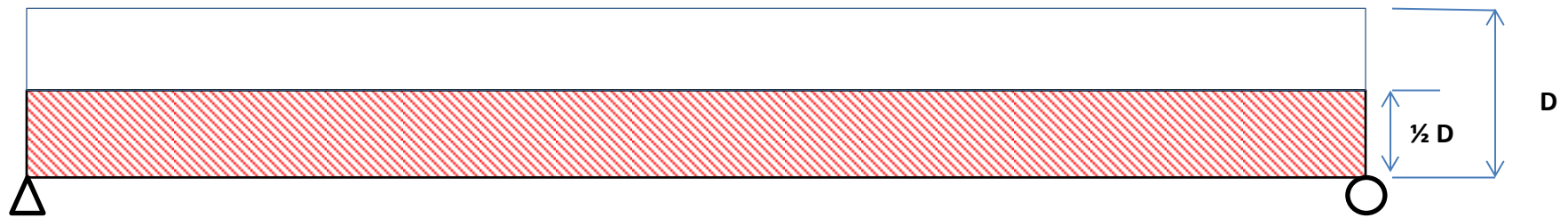
Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 1- 2'



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

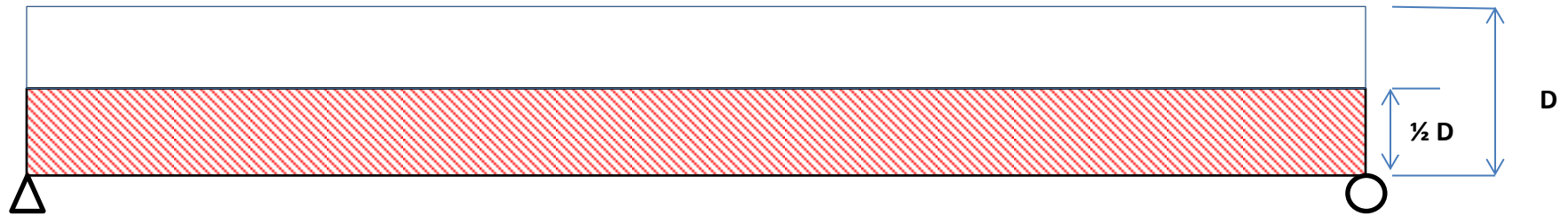
Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 1- 1'



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

Inspection Comments:

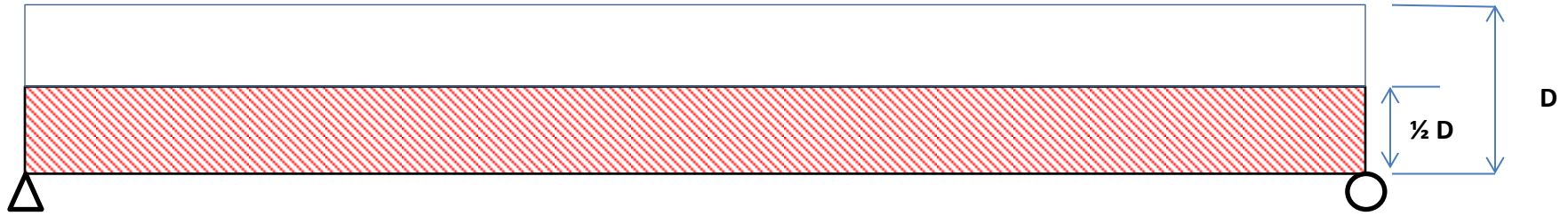
Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

The bottom west flange of Floor Beam 1' on Span 1 had bent upwards 1/2 in. over a 6 in. length approximately 16 in. from the north end.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 2 - 2



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

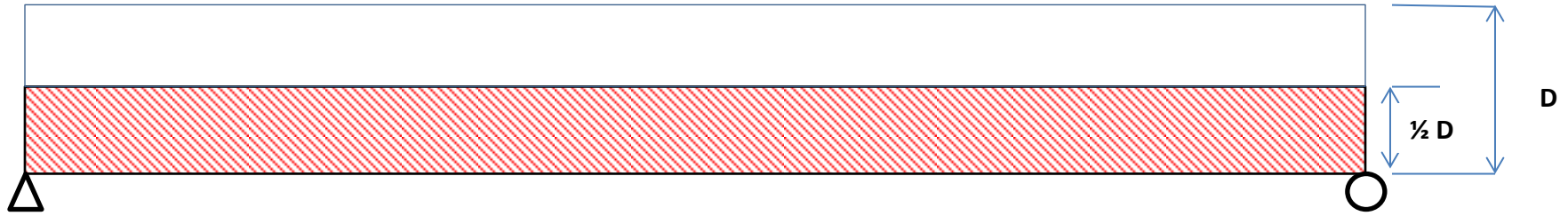
Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

Solid Floor Beam: Span 2 – 2'



Consider the fracture critical portion of the floor beam as the lower half of the beam depth, the portion below the neutral axis that is in tension. Use separate forms for each member. Note any defects and label the defect accordingly. Make sure and note that a defect is Near Face (NF), Far Face (FF) or Both Faces (BF). All notations will be recorded looking ahead on line. Use this drawing for trusses or two girders system bridges with solid rolled or built up section floor beams.

Inspection Comments:

Approximately 40 percent of the painted coating on the floor beams had failed with minor surface corrosion and negligible section loss, 40 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

Previous Inspection Comments:

Unknown

APPENDIX D: DEFECT PHOTOS



Photo 18: Minor wear to West Approach. Similar condition on East Approach



Photo 19: West Approach within 5 ft. of bridge deck had section of cold patch in good condition



Photo 20: 1/4 in. wide transverse crack located 18 ft. from the West Transition



Photo 21: 1/2 in. wide transverse crack located 4 ft. from the East Transition



Photo 22: Typical minor wear on Span 1 bituminous overlay



Photo 23: Typical minor wear on Span 1 bituminous overlay



Photo 24: End 6 ft. at the West Transition had cold patch with minor wear and hairline map cracking

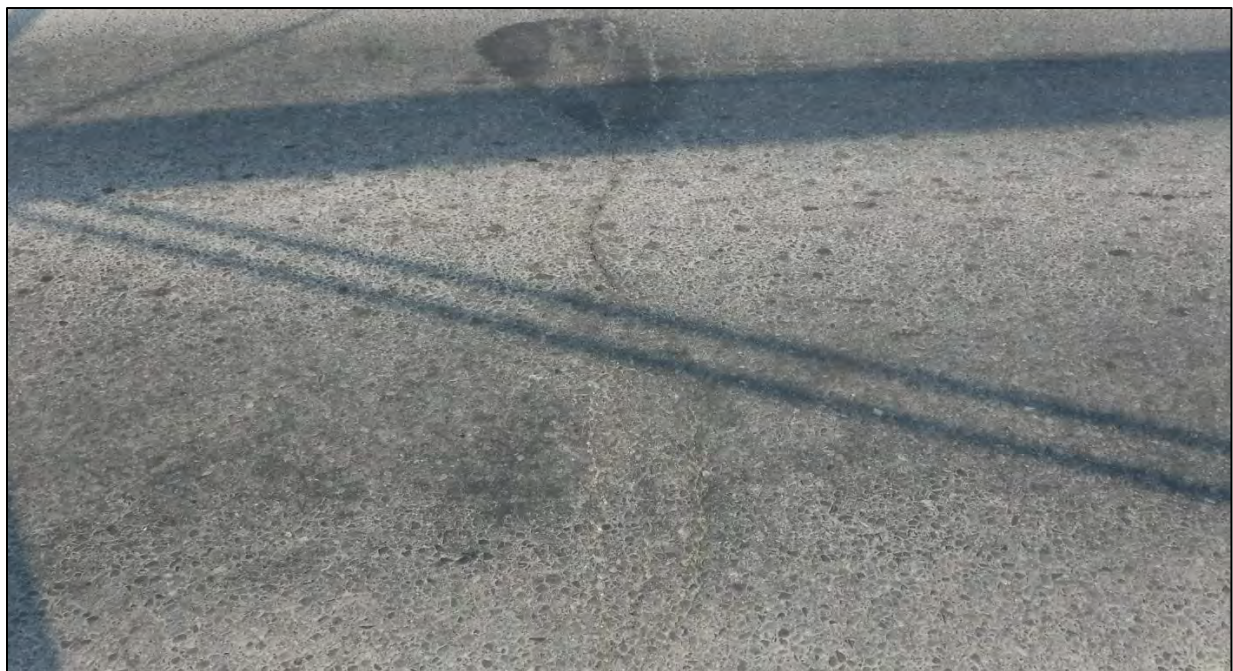


Photo 25: Typical 1/8 in. wide transverse crack located above each floor beam



Photo 26: Transverse crack up to 1/2 in. wide over Bent 4



Photo 27: Transverse crack up to 1/2 in. wide over Abutment 5



Photo 28: Typical underside of Span 1 deck; Note burn through holes in corrugated steel



Photo 29: Typical underside of Span 3 deck



Photo 30: The North Curb on Span 4 had section loss up to 1-1/2 in. on the top and interior faces with no exposed reinforcing steel



Photo 31: The North Curb had section loss up to 5 in. with exposed longitudinal and stirrup reinforcing steel for 4 ft. over Bent 4



Photo 32: Bridge rail for Spans 1 and 2



Photo 33: The vertical angle on the South Rail between Panel Point 4' and 3' was bent 1-1/2 in. over a 2 ft. length due to impact damage



Photo 34: North Rail, Panel Point 1': The bottom angle was bent 3/4 in. upwards



Photo 35: Bridge rail for Spans 3 and 4



Photo 36: Three vertical members had impact damage that bent the interior flange 3/4 in. over a 6 in. length on the North Rail near the East Approach



Photo 37: Typical minor wear on Span 2 bituminous overlay



Photo 38: Joint 1 over Abutment 1 looking north at joint

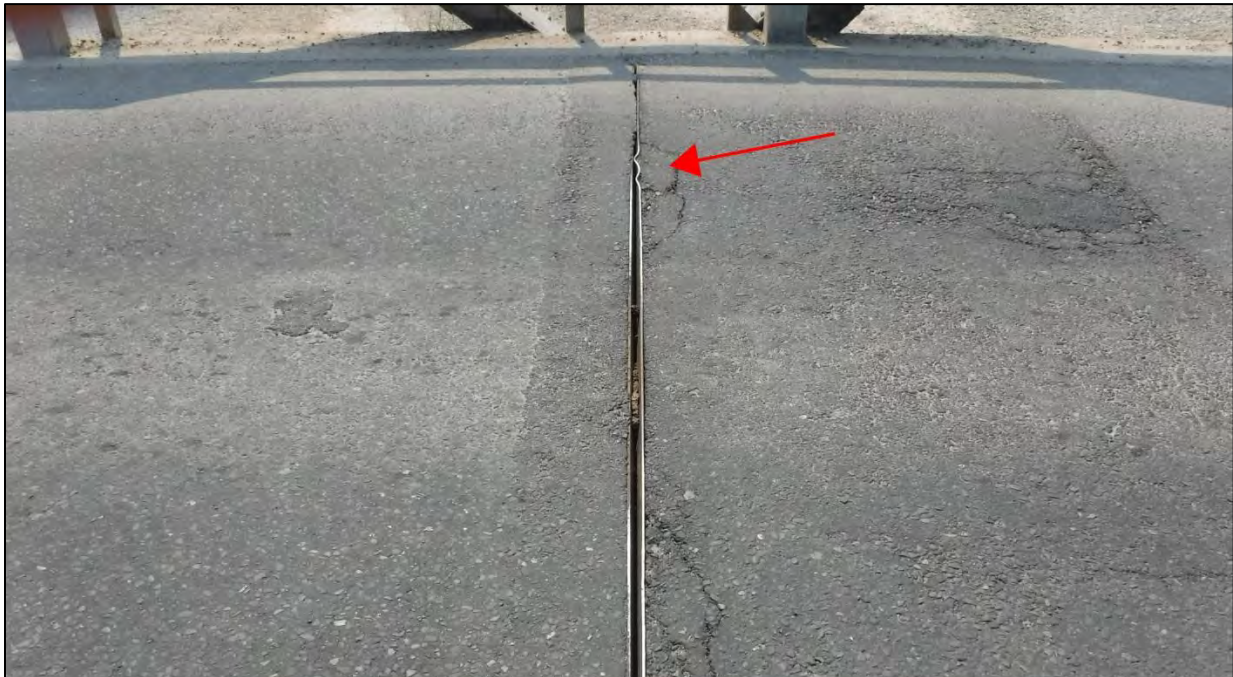


Photo 39: Joint 2 over Bent 2 with area of 3/4 in. bends in the steel plates

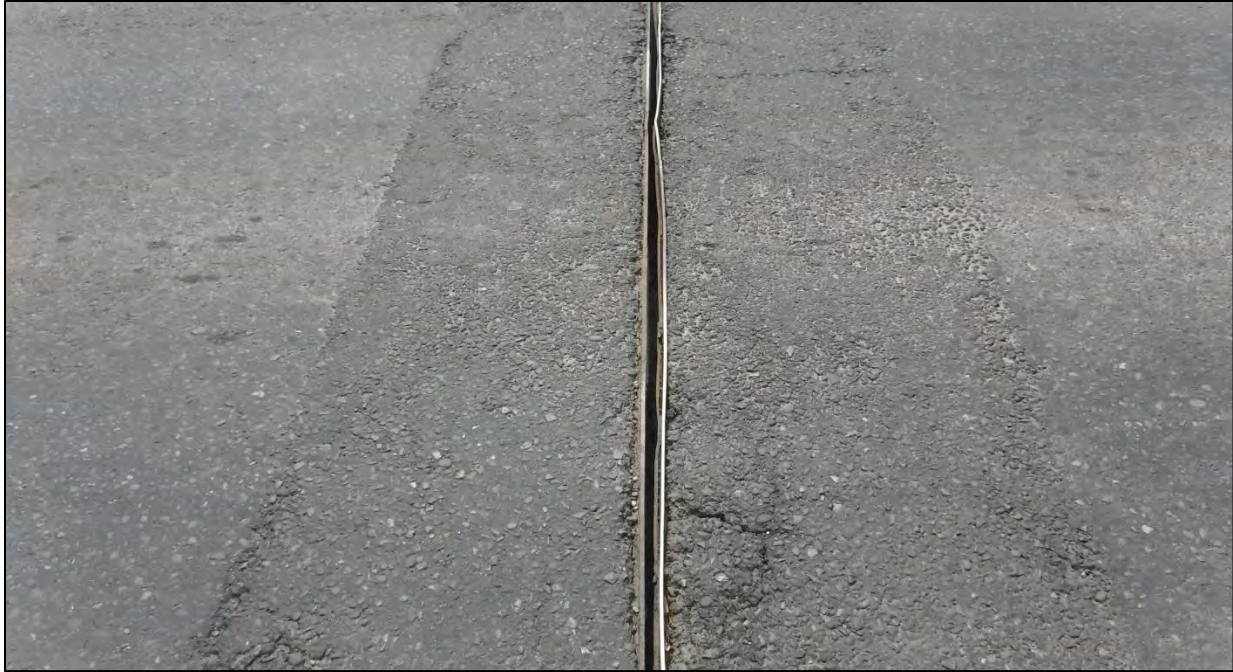


Photo 40: Joint 3 over Bent 3



Photo 41: Joint 3 over Bent 3 with seal deterioration which was typical over 90 percent of the length



Photo 42: Joint 3 over Bent 3 with separation from the Span 2 deck over a 4 ft. length



Photo 43: The bottom west flange of Floor Beam 1' on Span 1 had bent upwards 1/2 in. over a 6 in. length approximately 16 in. from the north end



Photo 44: Typical unpainted stringers with minor to moderate corrosion and negligible section loss



Photo 45: Span 1, Abutment 1, Stringer 2: the stringer web had heavy corrosion and section loss over a 17 in. long by 2 in. high area with a 1 in. diameter hole center 10 in. from the stringer end



Photo 46: Span 1, Abutment 1, Stringer 5: the stringer web had heavy corrosion and up to 50 percent section loss over a 10 in. long by 1 in. high hole adjacent to the stringer end



Photo 47: Span 1, Abutment 1, Stringer 7: the stringer web had heavy corrosion and section loss over a 14 in. long by 2 in. high area with a 2 in. long by 1/2 in. high hole center 2 in. from the stringer end



Photo 48: Span 2, Bent 2, Stringer 2: the stringer web had heavy corrosion and section loss with two holes; 7 in. long by 1 in. high and 6 in. long by 2 in. high centered 16 in. from the stringer end



Photo 49: Span 2, Bent 2, Stringer 5: the south face had a 16 in. long by 2 in. tall area of pack rust up to 1/4 in. thick on the bottom of the web located 12 in. from the end of the stringer



Photo 50: Span 2, Bent 3, All Stringers: the hollow pipe that the stringers were bearing on had vertical movement up to 1/4 in. when vehicles passed. The south anchor rod for the south pipe had failed and this edge of the pipe had movement up to 1/2 in. when vehicles passed



Photo 51: Span 2, Bent 3, Stringer 2: the stringer web had heavy corrosion with up to 1/8 in. thick rust scale on both sides of the stringer web at the web to lower flange interface adjacent to the stringer end



Photo 52: Span 2, Bent 3, Stringer 4: the stringer web had heavy corrosion and section loss with a 5 in. long by 1 in. high through hole near the stringer end. The bottom flange was knife edges in this area



Photo 53: Span 2, Bent 3, Stringer 7: the stringer web had heavy corrosion with up to 50 percent section loss over a 6 in. long by 2 in. high adjacent to the stringer end that had a 1/2 in. diameter hole 6 in. from the stringer end at the web to lower flange interface



Photo 54: Span 2, Bent 3, Stringer 8: the stringer web had heavy corrosion and section loss with three through holes ranging in size from 1/4 in. to 1/2 in. in diameter located at the web to lower flange interface at the stringer end



Photo 55: Abutment 1 had one full height, vertical up to 1/8 in. wide in the middle of the abutment



Photo 56: Bent 2 with areas of spalling on the edge of a delamination with 1 in. of penetration and no exposed reinforcing steel



Photo 57: Bent 3 had a 12 in. wide by 10 in. high area of delamination on the top, southeast corner of the bent



Photo 58: Bent 3 had a 5 ft. long horizontal crack up to 1/16 in. wide was located near the bottom, northeast corner



Photo 59: Bent 4 had a 3 ft. wide by 2 ft. high spall with exposed reinforcing steel on the west face of the bent cap. The exposed reinforcing steel had moderate corrosion with negligible section loss



Photo 60: Abutment 1, North Truss roller bearing



Photo 61: Abutment 1, North Truss roller bearing with heavy corrosion and section loss to the anchor rods



Photo 62: Abutment 1, North Truss roller bearing with two of the rollers severed and displaced from underneath the roller keepers



Photo 63: Abutment 1, South Truss roller bearing



Photo 64: Abutment 1, South Truss roller bearing with the rollers and roller keeper protruding out from underneath the bearing and resting against the abutment backwall



Photo 65: Bent 2, North Truss, Span 1 fixed bearing



Photo 66: Bent 2, South Truss, Span 1 fixed bearing



Photo 67: Bent 2, North Truss, Span 2 fixed bearing



Photo 68: Bent 2, South Truss, Span 2 fixed bearing



Photo 69: Bent 3, North Truss, Span 2 slider bearing



Photo 70: Bent 3, South Truss, Span 2 slider bearing



Photo 71: Span 1, North Truss, Vertical U1-L1: the exterior flange of the vertical was bent 1 in. to the north due to impact damage approximately 5 ft. above the bridge deck

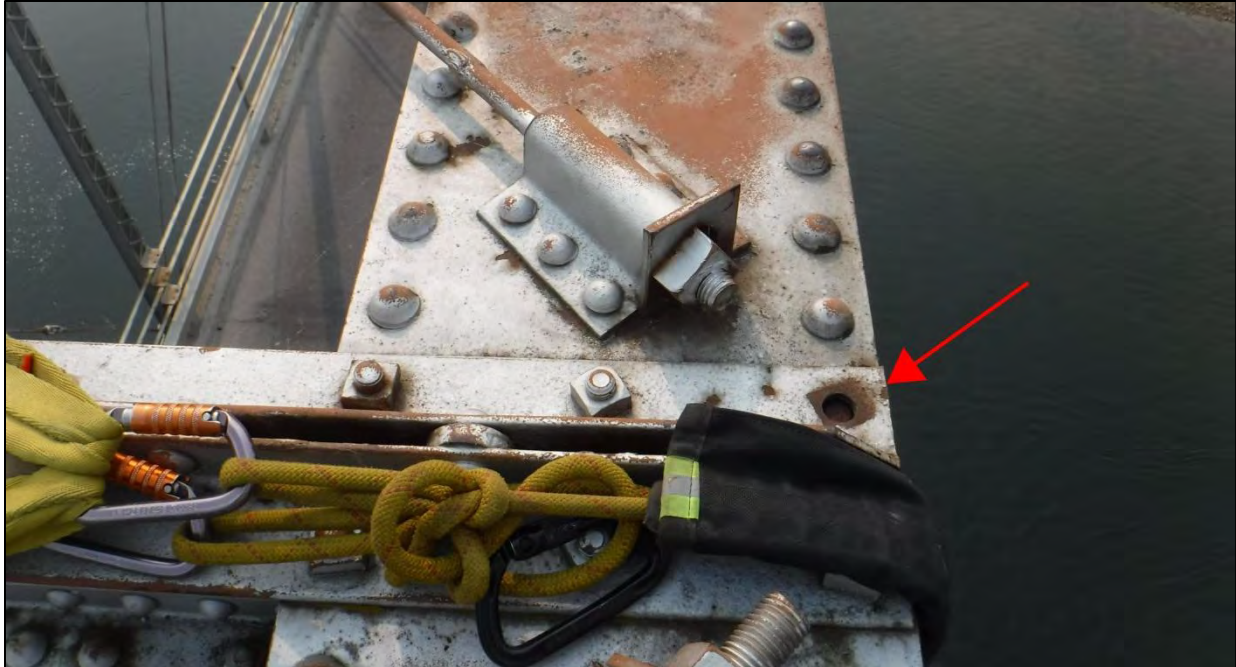


Photo 72: Span 1, South Truss, Top Chord at U4: one bolt was sheared off on the horizontal brace to top chord connection plate



Photo 73: Span 2, North Truss, Vertical L2'-U2': the interior flange of the vertical was bent 1 in. over a 6 in. length due to impact damage



Photo 74: Span 2, North Truss, Diagonal L2'-U1': the interior flange was bent 1-3/8 in. over a 24 in. length due to impact damage



Photo 75: Span 2, North Truss, Gusset Plate U1': the exterior gusset plate had two misdrilled 3/4 in. diameter holes



Photo 76: Span 2, North Truss, Diagonal L0'-U1': the diagonal had seven areas of impact damage up to 3/4 in. long and 1/4 in. of deflection spaced over a 15 in. length



Photo 77: Panel Point 3': the lower, horizontal bracing member was bent 2 in. to the east, and bent upward and downward 1 in. due to impact damage