



Rope Access Climbing Bridge Inspection Report

Asset #: 03719

Bridge #: L32101000+01001

District: Missoula

Location: Maclay Truss Bridge over Bitterroot River

Inspected: June 21st, 2021

Prepared for:



Prepared by:

**COLLINS
ENGINEERS** INC.

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1.0 INTRODUCTION

The Maclay Truss Bridge, Asset No. 03719, was inspected June 21st, 2021 by Collins Engineers, Inc. for the Montana Department of Transportation. The point of contact for this inspection at the Maclay Truss Bridge in Missoula County was Henry Henning at 406-781-6929. This 377 ft long 4 span bridge was originally constructed in 1935 and includes a 180 ft. through truss, a 39 ft. pony truss, and two concrete girder spans. The bridge was stationed from west to east with panel points in the main truss span labeled L0 - L4 - L0' and panel points in the Span 2 pony truss labeled L0 - L3 - L0'. The substructure units were labeled Abutment 1, Bents 2-4, and Abutment 5, from west to east. Refer to Photographs in SMS for overall views of the bridge and approaches, and all defects.

The purpose of this fracture critical climbing inspection was to identify the condition and structural deficiencies of the bridge with emphasis on the fracture critical members. Refer to Appendix A for a diagram identifying the fracture critical members on this bridge, as well as bridge nomenclature used for documentation purposes. The inspection consisted of an above water inspection using various rope access climbing techniques to obtain a visual examination of all the structural components of the bridge at a distance no greater than arm's length.

The inspection team consisted of four members led by an MDT approved fracture critical inspection Team Leader. All team members were certified by the Society of Professional Rope Access Technicians (SPRAT) to safely perform rope access work. The engineer climbers used a two-rope system in accordance with SPRAT guidelines.

2.0 INSPECTION FINDINGS

2.1 Deck

The concrete deck was in fair condition. The one lane bridge carried both eastbound and westbound North Ave W. traffic. Both edges of the bridge deck were lined with guardrails and pedestrian rails.

The asphalt wearing surface covered the deck and exhibited minor wear in wheel paths up to ½ in. deep throughout. Several areas of deterioration including 100% section loss in the wearing surface were patched, and areas of 100% loss of section in the corrugated deck (at FB2' and FB3') were replaced since the 2019 inspection. The asphalt patches were in good condition with random minor cracking. Refer to the following table for the location and description of specific wearing surface deficiencies:

<u>Location</u>	<u>Description</u>
Span 1	The end 6 ft. by full bridge width adjacent to the West Approach had a cold patch with spalling adjacent to the joint plate measuring 1 ft long by 4.5 ft wide by 1.5 in. deep.
Span 1	Transverse cracking up to 1/8 in. wide by full width spaced approximately 20 ft. apart at floor beam locations with delamination in asphalt patches.
Span 3	Transverse crack up to 3/4 in. wide located above Bent 4.
Span 4	Transverse crack up to 3/4 in. wide located above Abutment 5.

Table 1: Deck and Wearing Surface Specific Defects

The underside of the deck was in fair condition. The underside of Spans 1 and 2 consisted of galvanized, corrugated sheets that exhibited typical burn holes throughout and minor surface corrosion. The welding burn through holes allowed debris to fall through the corrugated deck onto the top and bottom flanges of the floor beams. The underside of the deck in Spans 3 and 4 consisted of top flanges of tee beams with isolated areas of efflorescence seeping through the construction joints and superficial cracking, but no notable deficiencies.

Roadway joints were located at Abutment 1 and Bents 2 and 3. The joint over Abutment 1 consisted of 11 ft. long by 30 in. wide metal plate bolted to the bridge deck on the east side of the joint. The joint over Bent 2 was an open joint, and the joint over Bent 3 was a compression joint. Refer to the following table for the location and description of specific joint deficiencies:

<u>Location</u>	<u>Description</u>
Abut. 1	Asphalt spalled along east edge and underside of the plate resulted in void under plate and approximate 1 in. vertical deflection under load accompanied by loud banging noise.
Bent 2	Joint edge had (2) 3/4 in. bends over a 1 ft. section in the south wheel path. (covered with asphalt, not observed 2021)
Bent 3	The rubber seal had failed along 90 percent of its length.
Bent 3	Joint had separated from Span 2 header over a 4 ft. length and was moving under live load.
Bent 3	Joint edge had a 1/2 in. bend over a 6 in. length in the south wheel path.

Table 2: Bridge Joint Specific Defects

2.2 Superstructure

2.2.1 Floor Beams

The painted steel floor beams were in good condition. The floor beams in Spans 1 and 2 were numbered corresponding with the truss panel points. The floor beams were steel rolled beam sections connected the verticals with a bolted/riveted connection and the lower chords with a pin connection. The floor beams typically exhibited a loss of protective coating over approximately 40 percent of their surface area with minor surface corrosion and no loss of section on the exposed areas, 40 percent of the surface protective coating 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 exhibited an upwards deflection of 1/2 in. over a 6 in. length approximately 16 in. from the north end.

2.2.2 Stringers

The stringers were typically in poor condition. For documentation purposes, the stringers were numbered 1 through 8 from north to south. Approximately 90 percent of the stringers were painted, while other 10 percent were replaced with unpainted steel stringers. 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. 20 percent of the stringers that were left unpainted and had minor to moderate corrosion with negligible section loss. 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 inspectors cleaned the debris from around the stringer ends for inspection. Refer to the following table for the locations and descriptions of specific stringer defects.

Span	Location	Stringer	Defect Description
1	A1	2	The stringer web exhibited heavy corrosion and section loss over a 14 in. long by 2 in. high area with a 2.5 in. long by ¾ in. high hole 2 in. from the stringer end.
1	A1	5	Stringer 5 had a ¼ in. gap between its bottom flange and Abutment 1 beam seat and deflected under load See video of movement uploaded to Inspection Documents in SMS.
1	A1	4, 5, 6	The stringer web and both flanges exhibited delamination up to 1/8 in. thick from the west end for up to ½ the span length.
1	A1	7	The stringer web exhibited heavy corrosion and section loss over a 17 in. long by 2 in. high area with a 1 in. high by 10 in. long hole 10 in. from the stringer end.
1	FB3	6	(2) of 2 bolts were loose at the stringer to floor beam connection.
1	FB3'	1	(2) of 2 bolts were loose at the stringer to floor beam connection.
2	B2	2	The stringer web exhibited heavy corrosion and section loss with (2) holes; 10 in. long by 1.5 in. high and 6 in. long by 1 in. high centered 16 in. from the stringer end.
2	B2	4	The stringer web exhibited an area of delamination on the bottom of the north face at the west end measuring 18 in. long by 2 in. high and up to ¼ in. thick.
2	B2	5	The stringer web exhibited a 16 in. long by 2 in. high area of delamination up to ¼ in. thick on the bottom of the south face located 12 in. from the end of the stringer.
2	B3	4, 8	The east anchor rod of the bearing tube at Stringer 4 and the west anchor rod of the bearing pipe at Stringer 8 were sheared off. The west anchor rod at Stringer 4 exhibited up to 50% loss of section. The bearing tube moved up to ½ in. vertically under live load. See video of movement uploaded to Inspection Documents in SMS.

2	B3	3	The stringer web exhibited 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.
2	B3	5	The stringer web exhibited heavy corrosion and section loss with a 6 in. long by 1 in. high through hole near the stringer end. The bottom flange was knife edged in this area.
2	B3	4,5,7,8	A gap was noted between the bottom flange and the hollow bearing pipe at Bent 3. Movement of the stringers was observed when traffic passed over this area (video uploaded to SMS).
2	B3	7	The stringer web had heavy corrosion with up to 50 percent section loss over a 10 in. long by 2 in. high area 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.
2	B3	8	The stringer web exhibited heavy corrosion and section loss with three through holes ranging in size from 1/4 in. to 1/2 in. diameter located at the web to lower flange interface at the stringer end.

Table 3: Stringer Specific Defects

2.2.3 Precast Concrete T-Beams

The concrete T-beams of Spans 3 and 4 were in good condition. The joints between beams in Span 3 exhibited efflorescence with light build up and some light rust staining. No other significant defects were noted.

2.2.4 Bearings

The bearings and bearing assemblies were in fair condition. Roller bearings were located at Abutment 1. Fixed bearings were located at Bent 2. Sliding bearings were located at Bent 3. At the time of the inspection the temperature was 80° F.

The North and South Truss roller bearings at Abutment 1 exhibited 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. There was heavy corrosion under the rollers and roller keepers. The roller keepers had split due to heavy corrosion and the nested roller assemblies had failed.

The North Truss roller bearing at Abutment 1 had two rollers along with a portion of the keeper that had worked 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 exhibited up to 50 percent section loss at the concrete interface due to heavy corrosion. The top plate was displaced 2.25 in. to the west (in expansion) in relation to the bottom plate, an increase of 0.5 in. since the 2019 inspection.

The South Truss roller bearing keeper at Abutment 1 had broken away from the bearing due to heavy corrosion and was pushed against the abutment backwall. Two of the original rollers were still within the bearing. The top plate was displaced 1 in. to the west (in expansion) in relation to the bottom plate, a decrease of 0.5 in. since the 2019 inspection. The anchor rods had up to 50% loss of section.

The North and South Truss fixed bearings at Bent 2 of both Spans 1 and 2 exhibited 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.

The North and South Truss sliding bearings at Bent 3 were unpainted and had moderate corrosion with pitting up to 1/16 in. deep. The top plates were displaced 1-1/2 in. at the north bearing and 1-7/8 in. at the south bearing to the east (in expansion) in relation to the upper flanges of the bearings.

2.2.5 Truss

The lower chord typically exhibited approximately 15 percent loss of coating with moderate corrosion and negligible loss of section on the exposed areas, 25 percent had failed with exposed primer underneath, and the remaining painted coating was bubbling and peeling.

The remaining truss members were in fair condition. Approximately 5 percent of the painted coating on truss members had failed 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.

Refer to the following table for locations and descriptions of specific truss member deficiencies:

<u>Member/ Location</u>	<u>Span</u>	<u>Truss</u>	<u>Defect Description</u>
L1-U1	1	North	East interior and exterior flanges of vertical were bent 1 in. to the north due to impact damage approximately 5 ft. above the bridge deck.
U2	1	South	(1) loose bolt at upper horizontal strut to top chord connection plate.
U4	1	South	(1) loose and (1) sheared off bolt on horizontal strut to top chord connection plate.
U3'	1	North/South	Lower horizontal sway brace member was bent 2 in. to the east and upward and downward 1 in. due to impact damage.
U2'	1	North	(2) loose bolts at upper horizontal strut connection.
L2, L2'	2	North/South	Up to ¼ in. thick pack rust between lower chord and both interior and exterior gusset plates.
L2, L2'	2	North	Up to ¾ in. thick pack rust between lower strut angles of exterior sway brace frames.
L2'-U2'	2	North	Vertical interior flange bent 1 in. over 6 in. height due to impact damage.
L2'-U1'	2	North	Interior flange bent 1-3/8 in. over 24 in. length due to impact damage.
L2'-U1'	2	South	Diagonal bent ¾ in. over 12 in. at L2'.
U1'	2	North	Exterior gusset plate had (2) misdrilled ¾ in. diameter holes.
U1'-L0'	2	North	(7) areas of impact damage up to ¾ in. long and ¼ in. deflection spaced over 15 in. length.
Lower Chord	2	North/South	Random areas of delamination up to 1/8 in. deep along interior channel of lower chord.

Table 4: Truss Member Specific Defects

2.3 Substructure

The abutments were in satisfactory condition and constructed of reinforced concrete. Abutment 1 exhibited one full height vertical crack up to 1/8 in. wide in the middle of the abutment. Abutment 1 exhibited rust staining under the truss due to corrosion from the steel members above. Abutment 5 had no notable deficiencies.

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

Bent 3 exhibited 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. The northeast corner of the bent exhibited a 5 ft. long horizontal crack up to 1/16 in. wide located near the bottom.

Bent 4 exhibited a 3 ft. wide by 2 ft. high by 3.5 in. deep spall with exposed reinforcing steel on the west face of the bent cap. The exposed reinforcing steel had moderate corrosion with 5% loss of section. The northeast corner exhibited a spall measuring 1 ft high by 3 in. wide by ½ in. deep with exposed reinforcing steel with 10% loss of section.

2.4 Concrete Approach Slabs

The asphalt paved approach roadways were in satisfactory condition. No settlement was noted between either approach and the bridge deck. Refer to the following table for the location and description of approach deficiencies.

<u>Location</u>	<u>Defect Description</u>
West Approach	Sound cold patch measuring 5 ft. long by bridge width with no noted cracking.
West Transition	Full width transverse cracks up to 1/4 in. wide approximately 18 ft. from west transition.
East Approach	Transverse crack ½ in. wide, 5 ft east of Abutment 5.

Table 5: Concrete Approach Specific Defects

2.5 Miscellaneous

A 5-1/2 in. high by 8 in. wide reinforced concrete curb lines both sides of Spans 3 and 4. The curb was in poor condition. The north concrete curb on Span 4 exhibited section loss up to 2 in. on the top and interior faces with areas of exposed reinforcing steel. The north curb exhibited an area of spalling over Bent 4 measuring 5 ft. long by full width and height with exposed longitudinal and stirrup reinforcing steel. The utility pipe on the north side of the bridge was broken for a 1 ft. length at Floor Beam 4.

The bridge railings in Spans 1 and 2 were 14 in. high and constructed of a 6 in by 6 in. galvanized steel tube. There was a 42 in. high pedestrian rail behind each bridge rail constructed of three steel angles which were attached to the truss verticals with plates. The pedestrian railing exhibited failure of approximately 50 percent of the painted coating with minor surface corrosion and negligible section loss, 20 percent had failed with exposed primer, 10 percent was bubbling and peeling, and the remaining coating was in good condition. The vertical angle on the south rail in Span 1 between Panel Points 4' and 3' was bent 1-1/2 in. over a 2 ft. length due to impact damage. The bottom angle on the north rail in Span 1 at Panel Point 1' was bent 3/4 in. upwards.

The bridge rails in Spans 3 and 4 were constructed 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. All parts of the railing had a painted coating. Approximately 5 percent of the painted coating exhibited failure with minor surface corrosion and negligible section loss primarily on the vertical steel plate at the bridge deck, 5 percent had failed with exposed primer, and the remaining painted coating was in good condition. Three consecutive vertical members had impact damage that bent the interior flange 3/4 in. over a 6 in. height with gouging on the north rail near the east approach. The top rail was bent downward 1-1/2 in. over a 5 ft. length on the far east end of the south rail.

3.0 CONCLUSION

3.1 NBI Ratings

Overall, the Maclay Truss Bridge was in fair condition. This rating is based on the above water condition of the bridge only. Refer to the following table for the NBI ratings based on the completed climbing/routine inspection:

<u>NBI Item</u>	<u>NBI Description</u>	<u>NBI Rating Previous</u>	<u>NBI Rating New</u>
58	Deck	5	5
59	Superstructure	5	5
60	Substructure	5	5
61	Channel	7	7

Table 6: NBI Ratings

3.2 Load Rating Recommendations

Load postings were present at both approaches, were visible, and were in good condition:

<u>Truck</u>	<u>Posting (tons)</u>
Type 3	11
Type 3S2	-
Type 3-3	-

Table 7: Load Postings

Load Posting Form in SMS?	No
Load Rating Document in SMS?	Yes 12/27/2019
Criteria met for review of load rating?	No

Table 8: Load Ratings/Recommendations

SMS lists the Type 3 Truck Inventory Rating at 11-ton. As such, NBI Item (41) Structure Open, Posted, or Closed to Traffic should remain coded "P – Posted for Load".

3.3 Underwater Inspection Recommendations

The NBI rating for substructure is based on the above water condition of the bridge. At the time of inspection, the water depth and current prohibited safe access to Bent 4 due to high water. Therefore, Collins recommends an underwater Type I inspection be performed, MDT061 Type I Underwater Inspection Required was confirmed as “Y.” with the next inspection date as 1/29/2023.

3.4 Fracture Critical Inspection Procedures Update

Fracture critical inspection procedures were updated to the new comprehensive format and uploaded to the Inventory tab of SMS. Specific fatigue prone details, such as forged eye bar heads at pin connections, were added as risk factors to consider. Traffic volume and narrow bridge width were added as on-site safety risks.


3.5 Maintenance Recommendations

Maintenance recommendations are detailed in SMS.

The above report summarizes our inspection findings for Bridge 03719 over the Bitterroot River. Per FHWA regulations, fracture critical bridges are to be inspected at intervals not to exceed 24 months. If you have any questions or concerns regarding the content of this report, please do not hesitate to contact us.

Respectfully Submitted,

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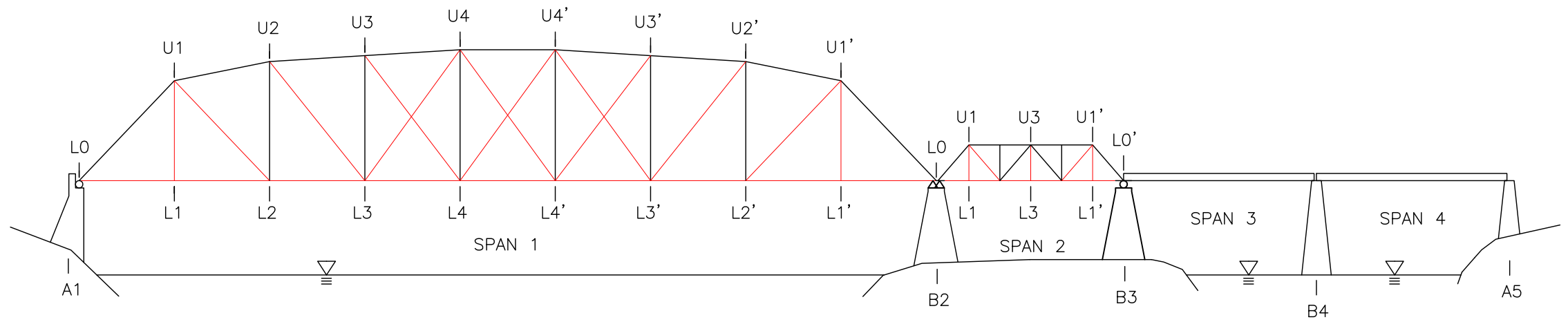
APPENDIX A – Fracture Critical Member Diagram, Defect Sketches, and
Floor Beam Summary Sheet



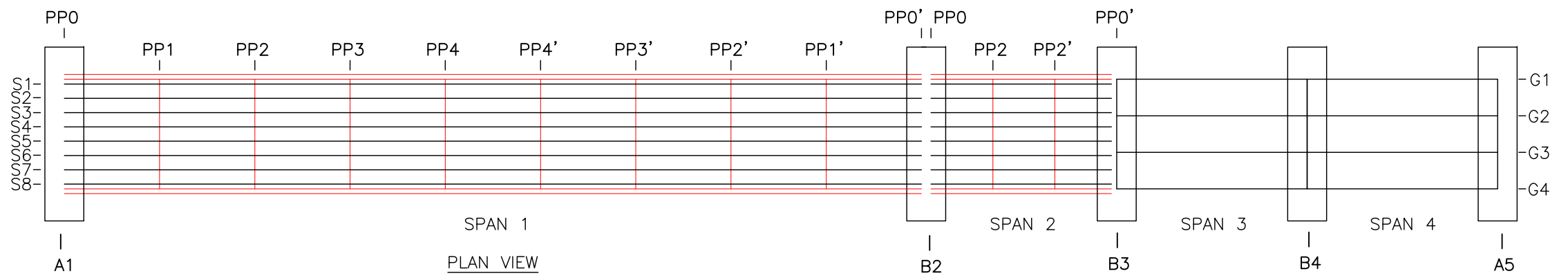
Fracture Critical Member Diagram
Maclay Bridge
Asset # 03719, Bridge # L32101000+01001
 Missoula, MT

CEI PROJECT
 11696-25
 INSPECTED BY:
 MJB, WBW, BTS, STM
 DRAWN BY:
 BTS
 CHECKED BY:
 MJB
 DATE:
 6-21-2021
 SHEET NO:
A-1

LEGEND
 △ — FIXED BEARING
 ○ — MOVEABLE BEARING
 — RED DENOTES FRACTURE—
 CRITICAL MEMBER

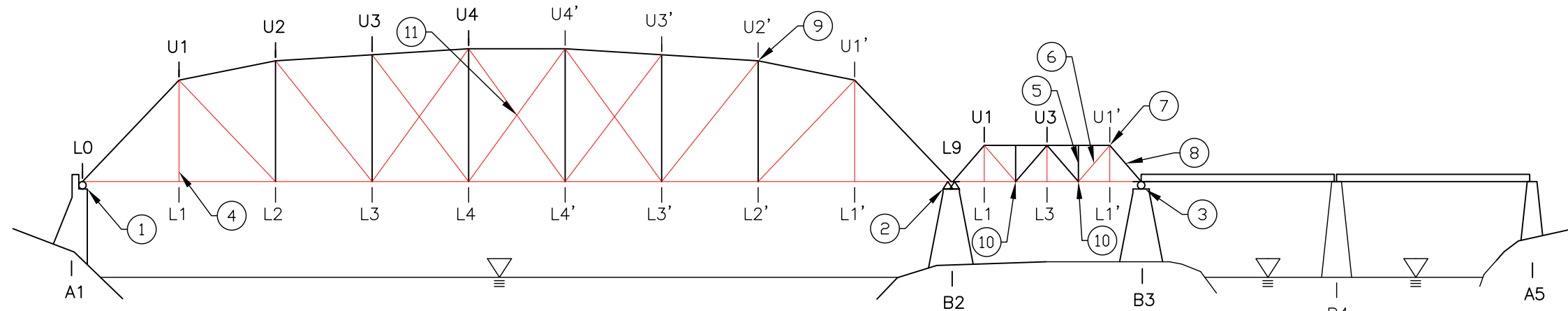


ELEVATION LOOKING NORTH



PLAN VIEW





NORTH TRUSS 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, 5 PERCENT HAD FAILED WITH EXPOSED PRIMER, 5 PERCENT WAS CHALKING, AND THE REMAINING PAINTED COATING WAS IN GOOD CONDITION.
- b. APPROXIMATELY 15 PERCENT OF THE PAINTED COATING HAD FAILED ON THE LOWER CHORD WITH MODERATE SURFACE CORROSION. THERE WAS DELAMINATION UP TO $\frac{1}{8}$ IN. DEEP ALONG 10% OF THE INTERIOR CHANNEL OF THE LOWER CHORD IN SPAN 2.
- c. APPROXIMATELY 40 PERCENT OF THE PAINTED COATING ON THE BRACING HAD FAILED WITH MINOR SURFACE CORROSION, 40 PERCENT HAD FAILED WITH EXPOSED PRIMER, AND THE REMAINING PAINTED COATING WAS BUBBLING AND PEELING.

SPECIFIC NOTES:

1. ROLLER BEARING AT ABUTMENT 1 HAD FAILED PAINTED COATING ON APPROXIMATELY 25 PERCENT OF THE SURFACE AREA WITH MODERATE CORROSION AND PITTING UP TO $\frac{1}{16}$ IN. HEAVY CORROSION UNDER THE ROLLERS AND ROLLER KEEPER RESULTED IN THE ROLLER KEEPER SPLITTING. THE NESTED ROLLER KEEPER HAD FAILED. TWO OF THE ROLLERS WENT OUT FROM UNDERNEATH THE TRUSS. THE ANCHOR RODS HAD UP TO 50 PERCENT SECTION LOSS AT THE CONCRETE INTERFACE DUE TO HEAVY CORROSION. THE PIN AND PIN SLEEVE WERE SEPARATED BY 2.25 IN. DUE TO PACK RUST.
2. THE SPAN 1 FIXED BEARINGS HAD A FAILED PAINTED COATING ON APPROXIMATELY 5 PERCENT OF THE SURFACE AREA WITH MINOR SURFACE CORROSION.

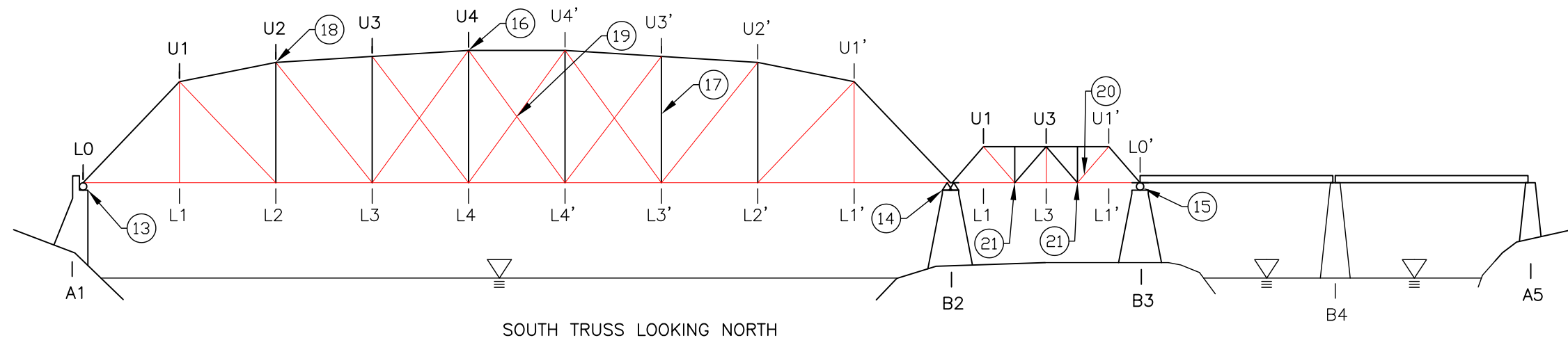
SPECIFIC NOTES (CONTINUED)

3. THE SPAN 2 SLIDING BEARINGS AT BENT 3 WAS UNPAINTED AND HAD MODERATE CORROSION WITH PITTING UP TO $\frac{1}{16}$ IN. DEEP. THE TOP PLATE WAS DISPLACED $1-\frac{1}{2}$ IN. TO THE EAST (IN EXPANSION) IN RELATION TO THE UPPER FLANGE OF THE BEARING. THE ELASTOMERIC BEARING PAD WAS CRACKED/TORN.
4. THE EAST INTERIOR AND EXTERIOR FLANGES OF VERTICAL L1-U1 WERE BENT 1 IN. TO THE NORTH DUE TO IMPACT DAMAGE APPROXIMATELY 5 FT. ABOVE THE BRIDGE DECK.
5. THE INTERIOR FLANGE OF VERTICAL L2'-U2' WAS BENT 1 IN. OVER A 6 IN. HEIGHT DUE TO IMPACT DAMAGE.
6. THE INTERIOR FLANGE OF DIAGONAL L2'-U1' WAS BENT $1-\frac{3}{8}$ IN. OVER A 24 IN. LENGTH DUE TO IMPACT DAMAGE.
7. THE EXTERIOR GUSSET PLATE AT U1'N HAD TWO MISDRILLED $\frac{3}{4}$ IN. DIAMETER HOLES.
8. END POST U1'-L0' HAD (7) AREAS OF IMPACT DAMAGE UP TO $\frac{3}{4}$ IN. LONG AND $\frac{1}{4}$ IN. OF DEFLECTION SPACED OVER A 15 IN. LENGTH.
9. 2 LOOSE BOLTS AT UPPER HORIZONTAL STRUT CONNECTION U2'N.
10. UP TO $\frac{1}{4}$ IN. THICK PACK RUST BETWEEN LOWER CHORD AND BOTH INTERIOR AND EXTERIOR GUSSET PLATES AT L2 AND L2'. PACK RUST UP TO $\frac{3}{4}$ IN. THICK BETWEEN LOWER STRUT ANGLES OF EXTERIOR SWAY BRACE FRAMES AT L2 AND L2'.
11. THERE WAS MINOR ABRASION AT THE INTERSECTION BETWEEN L4-U4' and U4-L4' WITH NEGLIGIBLE LOSS OF SECTION



Defect Sketch
Maclay Bridge
Asset # 03719, Bridge # L32101000+01001
 Missoula, MT

CEI PROJECT 11696-25
INSPECTED BY: MJB, WBW, BTS, STM
DRAWN BY: BTS
CHECKED BY: MJB
DATE: 6-21-2021
SHEET NO: A-2



GENERAL NOTES:

- a. APPROXIMATELY 5 PERCENT OF THE PAINTED COATING HAD FAILED ON THE VERTICALS, UPPER CHORD, AND DIAGONAL MEMBERS WITH MINOR SURFACE CORROSION, 5 PERCENT HAD FAILED WITH EXPOSED PRIMER, 5 PERCENT WAS CHALKING, AND THE REMAINING PAINTED COATING WAS IN GOOD CONDITION.
- b. APPROXIMATELY 15 PERCENT OF THE PAINTED COATING HAD FAILED ON THE LOWER CHORD WITH MODERATE SURFACE CORROSION. THERE WAS DELAMINATION UP TO $\frac{1}{8}$ IN. DEEP ALONG 10% OF THE INTERIOR CHANNEL OF THE LOWER CHORD IN SPAN 2.
- c. APPROXIMATELY 40 PERCENT OF THE PAINTED COATING ON THE BRACING HAD FAILED WITH MINOR SURFACE CORROSION, 40 PERCENT HAD FAILED WITH EXPOSED PRIMER, AND THE REMAINING PAINTED COATING WAS BUBBLING AND PEELING.

SPECIFIC NOTES:

- 13. ROLLER BEARING AT ABUTMENT 1 HAD FAILED PAINTED COATING ON APPROXIMATELY 25 PERCENT OF THE SURFACE AREA WITH MODERATE CORROSION AND PITTING UP TO $\frac{1}{16}$ IN. HEAVY CORROSION UNDER THE ROLLERS AND ROLLER KEEPER RESULTED IN THE ROLL TWO OF THE ORIGINAL SOUTH ROLLERS WERE STILL IN BEARING. THE ANCHOR RODS HAD UP TO 50 PERCENT SECTION LOSS AT THE CONCRETE INTERFACE DUE TO HEAVY CORROSION. THE PIN AND PIN SLEEVE WERE SEPARATED BY 1 IN. DUE TO PACK RUST.

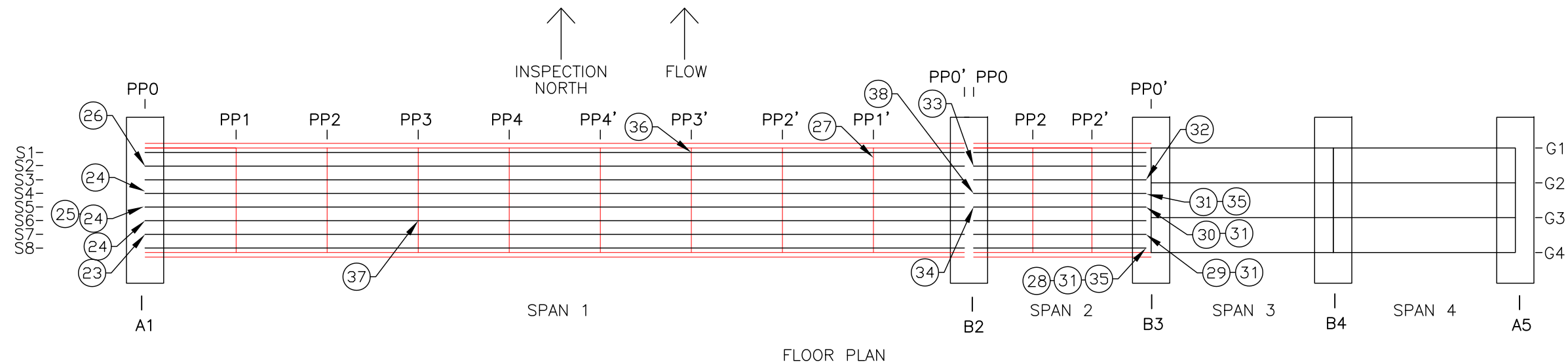
SPECIFIC NOTES (CONTINUED)

- 14. THE SPAN 1 FIXED BEARINGS HAD A FAILED PAINTED COATING ON APPROXIMATELY 5 PERCENT OF THE SURFACE AREA WITH MINOR SURFACE CORROSION.
- 15. THE SPAN 2 SLIDING BEARINGS AT BENT 3 WAS UNPAINTED WITH MODERATE CORROSION AND PITTING UP TO $\frac{1}{16}$ IN. DEEP. THE TOP PLATE WAS DISPLACED $1-\frac{3}{4}$ IN. TO THE EAST (IN EXPANSION) IN RELATION TO THE UPPER FLANGE OF THE BEARING.
- 16. ONE BOLT WAS SHEARED OFF AND ONE BOLT WAS LOOSE AT UPPER HORIZONTAL STRUT TO TOP CHORD U4S CONNECTION PLATE.
- 17. THE LOWER HORIZONTAL SWAY BRACING AT U3' WAS BENT 2 IN. TO THE EAST, AND UPWARD AND DOWNWARD 1 IN. DUE TO IMPACT DAMAGE.
- 18. ONE BOLT WAS LOOSE AT UPPER HORIZONTAL STRUT TO TOP CHORD U2S CONNECTION PLATE.
- 19. THERE WAS MINOR ABRASION AT THE INTERSECTION BETWEEN L4-U4' and U4-L4' WITH NEGLIGIBLE LOSS OF SECTION
- 20. DIAGONAL L2'-U1' WAS BENT $\frac{3}{4}$ IN. OVER 12 IN. AT L2'.
- 21. UP TO $\frac{1}{4}$ IN. THICK PACK RUST BETWEEN LOWER CHORD AND BOTH INTERIOR AND EXTERIOR GUSSET PLATES AT L2 AND L2'. PACK RUST UP TO $\frac{3}{4}$ IN. THICK BETWEEN LOWER STRUT ANGLES OF EXTERIOR SWAY BRACE FRAMES AT L2 AND L2'.



Defect Sketch
Maclay Bridge
Asset # 03719, Bridge # L32101000+01001
 Missoula, MT

CEI PROJECT 11696-25
INSPECTED BY: MJB, WBW, BTS, STM
DRAWN BY: BTS
CHECKED BY: MJB
DATE: 6-21-2021
SHEET NO: A-3



GENERAL NOTES:

- a. FLOOR BEAMS EXHIBITED FAILURE OF APPROXIMATELY 40 PERCENT OF THE PAINTED COATING 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. PAINTED STRINGERS EXHIBITED FAILURE OF APPROXIMATELY 30 PERCENT OF THE PAINTED COATING WITH MODERATE CORROSION WITH UP TO $\frac{1}{16}$ 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 STRINGERS THAT WERE UNPAINTED HAD MINOR TO MODERATE CORROSION WITH NEGLIGIBLE SECTION LOSS.

SPECIFIC NOTES:

- 23. STRINGER 7, ABUTMENT 1, HEAVY CORROSION AND SECTION LOSS IN THE WEB 17 IN. LONG BY 2 IN. HIGH WITH A 1 IN. HIGH BY 10 IN. LONG HOLE CENTERED 10 IN. FROM THE STRINGER END.
- 24. STRINGERS 4, 5, AND 6, ABUTMENT 1, HEAVY CORROSION AND DELAMINATION ON WEB AND FLANGES UP TO $\frac{1}{8}$ IN. DEEP FROM WEST END UP TO $\frac{1}{2}$ LENGTH OF SPAN.
- 25. STRINGER 5, ABUTMENT 1, $\frac{1}{4}$ IN. GAP BETWEEN BOTTOM FLANGE AND ABUTMENT BEAM SEAT WHICH DEFLECTED UNDER LOAD.
- 26. STRINGER 2, ABUTMENT 1, HEAVY CORROSION AND SECTION LOSS IN THE WEB 14 IN. LONG BY 2 IN. HIGH WITH A 2.5 IN. LONG BY $\frac{3}{4}$ IN. HIGH HOLE CENTERED 2 IN. FROM THE STRINGER END.
- 27. FB1', SPAN 1, BOTTOM WEST FLANGE BENT UPWARDS $\frac{1}{2}$ IN. OVER A 6 IN. LENGTH APPROXIMATELY 16 IN. FROM THE NORTH END.
- 28. STRINGER 8, BENT 3, HEAVY CORROSION AND SECTION LOSS IN THE WEB WITH (3) HOLES RANGING IN SIZE FROM $\frac{1}{4}$ - $\frac{1}{2}$ IN. IN DIAMETER LOCATED AT WEB TO LOWER FLANGE INTERFACE AT THE STRINGER END.

SPECIFIC NOTES:

- 29. STRINGER 7, BENT 3, HEAVY CORROSION AND UP TO 50 PERCENT SECTION LOSS IN WEB 10 IN. LONG BY 2 IN. HIGH ADJACENT TO THE STRINGER END AND $\frac{1}{2}$ IN. DIAMETER HOLE LOCATED 6 IN. FROM THE STRINGER END.
- 30. STRINGER 5, BENT 3, HEAVY CORROSION AND SECTION LOSS IN THE WEB WITH A 6 IN. LONG BY 1 IN. HIGH HOLE NEAR STRINGER END. BOTTOM FLANGE WAS KNIFE-EDGED IN THIS AREA.
- 31. STRINGERS 4, 5, 7, AND 8, BENT 3, GAP BETWEEN THE BOTTOM FLANGE AND THE SUPPORTING BEARING SEAT OF THE BENT. MOVEMENT OBSERVED WHEN TRAFFIC PASSED OVER (GAP CLOSED).
- 32. STRINGER 3, BENT 3, HEAVY CORROSION AND UP TO $\frac{1}{8}$ IN. THICK RUST SCALE ON BOTH SIDES OF WEB AT WEB TO BOTTOM FLANGE INTERFACE ADJACENT TO STRINGER END.
- 33. STRINGER 2, BENT 2 (PONY TRUSS), HEAVY CORROSION AND SECTION LOSS IN WEB WITH (2) HOLES: 10 IN. LONG BY 1.5 IN. HIGH HOLE AND A 6 IN. LONG BY 1 IN. HIGH HOLE CENTERED 16 IN. FROM THE STRINGER END.
- 34. STRINGER 5, BENT 2 (PONY TRUSS), 16 IN. LONG BY 2 IN. HIGH AREA OF DELAMINATION UP TO $\frac{1}{4}$ IN. THICK ON BOTTOM OF WEB LOCATED 12 IN. FROM END OF STRINGER ON SOUTH FACE.
- 35. SPAN 2 BEARING PIPE AT BENT 3: EAST ANCHOR ROD OF BEARING PIPE AT STRINGER 4 AND WEST ANCHOR ROD OF BEARING PIPE AT STRINGER 8 BROKEN. WEST ANCHOR ROD AT STRINGER 4 HAD 50% LOSS OF SECTION. EDGE OF PIPE TYPICALLY MOVED UP TO $\frac{1}{2}$ IN. UNDER LIVE LOAD.
- 36. 2 OF 2 BOLTS LOOSE AT STRINGER 1 TO FB3' CONNECTION.
- 37. 2 OF 2 BOLTS LOOSE AT STRINGER 6 TO FB3 CONNECTION.
- 38. STRINGER 4, BENT 2, 18 IN. LONG BY 2 IN. HIGH BY UP TO $\frac{1}{4}$ IN. THICK AREA OF DELAMINATION ON THE BOTTOM OF THE NORTH FACE AT THE WEST END.



**Defect Sketch
 Maclay Bridge
 Asset # 03719, Bridge # L32101000+01001
 Missoula, MT**

CEI PROJECT 11696-25
INSPECTED BY: MJB, WBW, BTS, STM
DRAWN BY: BTS
CHECKED BY: MJB
DATE: 6-21-2021
SHEET NO: A-4

Fracture Critical Floor Beam Inspection Plan and Reporting Form



Asset #: 03719 Bridge #: L32101000+01001

Feature Intersected: Bitterroot River

Inspection Date: June 21st, 2021



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. 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.

Typical Floor Beam 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.

Span	Panel Point	Inspection Comment	Photos
1	1	Typical Condition	N/A
1	2	Typical Condition	N/A
1	3	Typical Condition	N/A
1	4	Typical Condition	N/A
1	4'	Typical Condition	N/A
1	3'	Typical Condition	N/A
1	2'	Typical Condition	N/A
1	1'	The bottom west flange of FB1' had bent upwards 1/2 in. over a 6 in. length approximately 16 in. from the north end.	SMS
2	1	Typical Condition	N/A
2	2	Typical Condition	N/A
2	3	Typical Condition	N/A
2	3'	Typical Condition	N/A
2	2'	Typical Condition	N/A
2	1'	Typical Condition	N/A

APPENDIX B – Photographs

Please refer to SMS Report for all photographs.