

**FRACTURE CRITICAL INSPECTION REPORT
BRIDGE 2740017
MILLER COUNTY, MISSOURI
SWINGING BRIDGE ROAD OVER GRAND AUGLAIZE**



Prepared for the Missouri Department of Transportation
and
Miller County Commission
September 17, 2018



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EXECUTIVE SUMMARY

Poepping, Stone, Bach & Associates, Inc., performed a comprehensive fracture critical inspection on the 500 foot long suspension bridge, inventoried as MoDOT structure number 2740017, on Swinging Bridge Road over Grand Auglaize, in Miller County, Missouri. The inspection was conducted during the period August 7-9, 2018, by Pat Martens (team leader) and Skip Wilson. The bridge is owned by Miller County.

The bridge was built in 1920, and is a two-span suspension type bridge. The bridge has a wooden plank deck with a 20 foot roadway width. Timber running boards dictate (along with load posting) that only one-lane traffic can accommodate the spans to cross the bridge. An average daily traffic count is estimated at 250 vehicles per day.

The bridge is posted for a 3 ton load limit.

Results of the inspection indicate the superstructure is in poor condition (item 59 = 4), due to numerous broken strands within the main suspension cable units, and worn and broken strands within various hanger cable assemblies. Overall, the superstructure elements are mainly showing minor to moderate surface rust throughout, along with minor pitting. Many hanger cables are loose, and various assemblies have slid along the main suspension cable.

Specific details with regard to each individual fracture critical member can be found in the attached ***Fracture Critical Inspection Report spreadsheet***. This includes the size and corresponding configuration of the components that make up each fracture critical member.

Based on the information gathered during this inspection, there is still continued deterioration that will limit the life of the structure. Without additional repairs to various hanger assemblies, the estimated expected life is projected at five years for vehicular traffic. Due to the historic nature of the structure, there may be an interest in continuing service on the bridge for pedestrian access only after the useful life is exhausted.

The recommended fracture critical inspection frequency is 24 months.

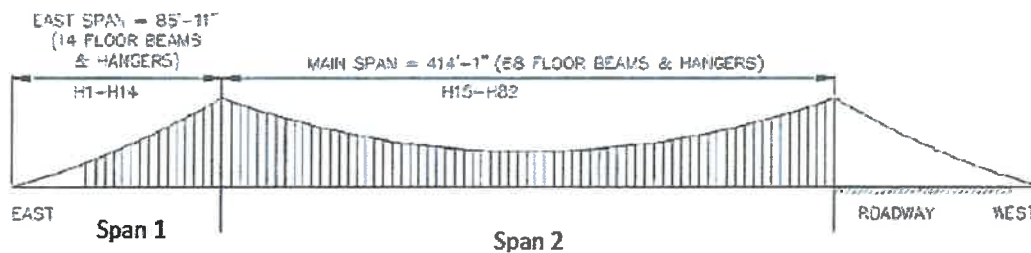
Following are fracture critical inspection procedures and general findings from the inspection.

Fracture Critical Inspection Identification and Procedures

The structure orientation is east to west, with span one being an approach span of 85' 11", and span two serving as the main span of 414' 1". The fracture critical members are identified as main suspension cables (U), hanger cables (H), and floor beams (FB).

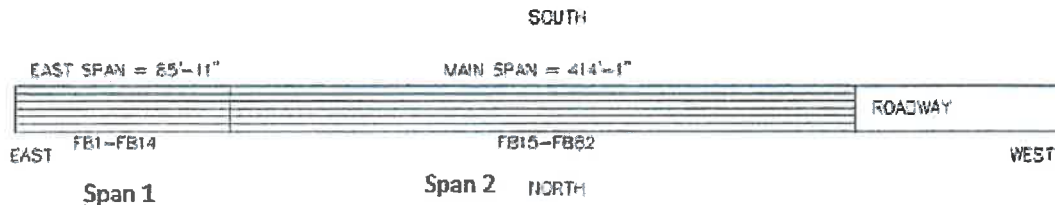
Main suspension cables are a pair of bundled steel strands of unknown quantity, with a soft wire wrap. These main cables are identified as north and south cables (U), and differentiated into segments between individual hangers that are numbered from U1 through U82, for documentation purposes. The end sections of the main cables to the anchor blocks at each bridge end are labeled U0 and U83. The end segments are numbered U0-U1 and U82-U83.

Hanger cables (H) are vertical tension members that stretch from the upper cable (U) to the floor beam (FB), with each hanger identified as either corresponding to north or south.



Suspension Spans - Elevation View

Floor beams are rolled (8") S-beams that run transversely between each north and south main cable / hanger assembly, with a total of 82 floor beams in the bridge. The floor beams are spaced at 14' 2", and support a multi stringer system that runs parallel to the roadway, and carries loading from a timber deck. The stringer system is not part of the fracture critical evaluation.



The inspection is conducted utilizing visual observation from the deck level or on ladders extended up from the deck, under live traffic (no traffic control). Disruption of the inspection process can occur as cars occasionally access the bridge. Ground level inspection is made from under span 1 and the most easterly parts of span 2, up to the waterway, utilizing ladders or

camera inspection (Go Pro on extendable pole). All aspects of the inspection are performed through visual observation from deck level, free climbing (of towers), and access with extension ladders. Cleaning of vines from the main suspension cables may be necessary, especially in the vicinity of the west tower, and between the towers and anchor blocks, in order to adequately view the members. No special access or testing equipment is necessary unless conditions dictate further investigation.

Inspection of the main cables and hanger cables can be made by deck level viewing of the lower portions of the cables, and by use of ladders for the higher reaches of the cables. A minimum 32 foot extension ladder is needed for the highest peaks of the cables.

Floor beam inspection is done through visual means at the deck end, to view beam ends. The remainder of the floor beam is visible through the gaps in the timber deck. In particular, the lower portion of the beam is in tension due to bending and is the main area of focus of the fracture critical inspection. A Go Pro camera on an extendable pole can also be used for closer documentation, as necessary.

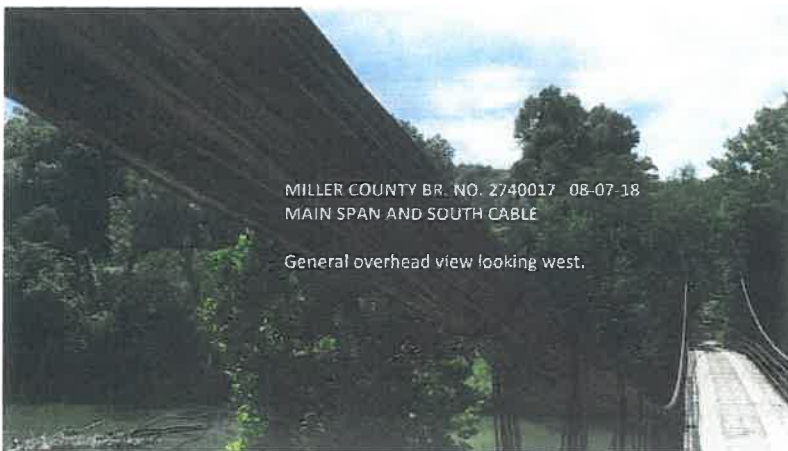
The towers are not part of the fracture critical inspection, but were generally inspected through free climbing, and the main cable saddles were inspected where they drape over the top of towers.

Steel stringers (not fracture critical) in the floor system are supported by the floor beams. The stringers were not inspected hands-on, but through a general cursory review from ground level and through the deck planking.

Inspection Results

Main Suspension Cables:

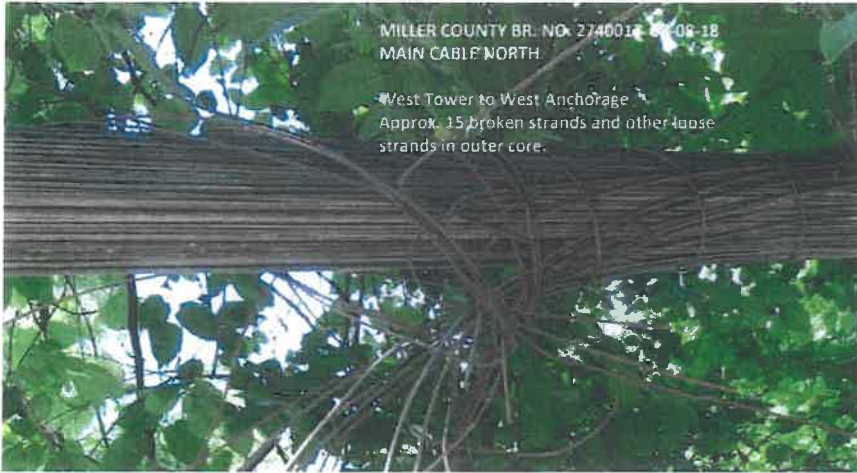
Each main cable is a larger cluster of steel wire strands (unknown quantity) with a soft wire wrap. The cables are suspended from two steel towers and then anchored into concrete blocks off of the bridge.



The strands are generally rusty in condition along the outer core, with no significant section loss. The outer strand layers that are exposed to the elements have areas of the strands that have minor pitting. Investigation of the various segments of the main cables, hands-on, reveal that there are varying degrees of loose strands evident around the outer core of the cable.

The bulk of the core though appears very solid. In certain areas individual strand breakage is evident. The exact number of strands fractured is difficult to ascertain, but for the most part, judging by the looseness of the strands, and assuming those strands are in fact failed somewhere in the main cable, there are as many as a dozen or more strands ruptured, or at least not functioning in tension.

At the far west end, in the segment between the anchor block and last hanger (H82), there is the largest concentration of broken and/or loose strands. The south main cable, approximately 10 feet from the



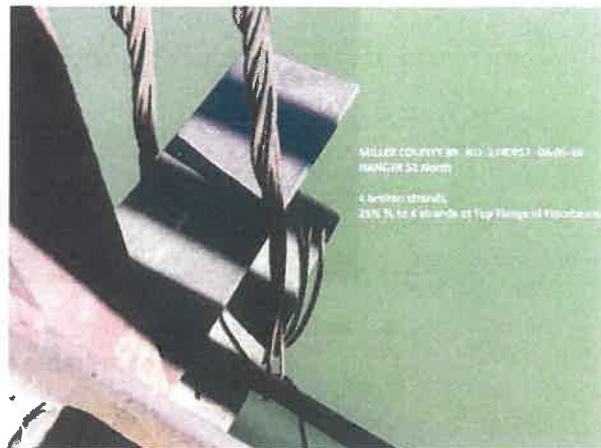
anchor, includes in excess of 40 loose strands which are not bound by any wrapping. In close proximity to that grouping, about 24 strands are observed to be severed. At the anchor itself, the interface looks good, but there are about 12 broken strands noted. In the corresponding cable to the north,

approximately 20 feet from the anchor, there are about 15 observed broken strands. The area of draping over the towers looks good. This would be locations corresponding to U14U15 and also immediately to the west of U82. There are a few observed broken cables over the saddles at U82. Strands in the saddle at U14U15 have been spliced in the past.

Vertical Members (Hanger Cables):

There are 82 pairs of hanger cables that are oriented vertically from the main suspension cables and wrap around the ends of the floor beams. There are 10 wire twisted strands that form a cable and are looped around the floor beam at each hanger location. Various hangers were observed to be loose and/or untwisted.

The hanger cables are generally rusting, and have minor to isolated areas of moderate pitting. The moderate pitting is most noticeable in the upper portions of various identified cables on the *Fracture Critical Inspection Spreadsheet*, with minor section loss. Where the bottom portion of the cables come into contact with the floor beams, wear is evident at the top flange location. This occurs in a vast majority of the floor beams, with varying degrees of section loss occurring in



strands. There are many more documented wire breaks since the last inspection. The *Fracture Critical*

Inspection spreadsheet captures the degree of wear/section loss and wire breakage for each individual hanger location.

Floor Beams:

All of the floor beams look to be in good condition with only general rusting and minor pitting. In addition, the rubbing action of the hanger cables on the top flange of the floor beam is causing minor wear in various locations. A longitudinal cable acts as bracing to tie the floor beam ends together.



Typical condition of floor beams.



Note: gouge in top flange of floor beam 1 at hanger cable.
This is one of the more extreme cases of gouging.

Towers:

The suspension towers are not fracture critical. They have general rusting and minor pitting. A cursory review of the towers indicates there are isolated areas of moderate to heavy section loss in plating, lattice and connection angles. The towers are for the most part plumb. There is also a missing anchor bolt in the base of tower 1.

Stringers:

Stringers, like the floor beams, are in good condition overall, with general rusting and minor pitting. One stringer was observed out of alignment.

Maintenance Recommendations:

Review Fracture Critical Inspection Spreadsheet and consider replacing or retrofitting those vertical hanger locations with observed wire breaks.

A complete set of photos taken during the inspection is included as an attachment to this report.

Missouri Department of Transportation
Fracture Critical Inspection Report

Structure #: 2740017
Federal ID #: 20779

District: CD	Year Built: 1920	Inspection Date: 8/9/2018
County: Miller	Structure Status: P-Posted	Inspection Frequency: 24 Months
Facility Carried: Swing Bridge Road	Approved Posting: 3 Tons	Inspector: PSBA
Feature Intersected: Grand Auglaize	Field Posting: 3 Tons	Latitude: 38 D 4 M 37 S
Location: S 36 T 39N R 15W	Layout Description: East to West	Longitude: 92 D 31 M 36 S

PRIMARY SUPERSTRUCTURE MEMBERS

MEMBER	FRACTURE CRITICAL	DESCRIPTION
MAIN SUSPENSION	YES	Bundled Steel Strands (0.15" each)
VERTICAL (HANGER)	YES	10 twisted wire cable
FLOOR BEAM	YES	Rolled 8" I-Beam
STRINGERS	NO	Rolled 4" S-Beam + 4" Channel

MEMBER CONDITIONS: FLOOR BEAMS

BRIDGE
Miller County
Swinging Bridge Road

TYPICAL CONDITIONS:	Minor wear to top flange of floor beams due to rubbing of cables. General rusting and minor pitting overall.
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FB #	
1	North side -gouged due to hanger.
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

MEMBER CONDITIONS: FLOOR BEAMS

TYPICAL CONDITIONS:	Minor wear to top flange of floor beams due to rubbing of cables. General rusting and minor pitting overall.
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FB #	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	

MEMBER CONDITIONS: FLOOR BEAMS

TYPICAL CONDITIONS:	Minor wear to top flange of floor beams due to rubbing of cables. General rusting and minor pitting overall.
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FB #	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	

MEMBER CONDITIONS: FLOOR BEAMS

TYPICAL CONDITIONS:	Minor wear to top flange of floor beams due to rubbing of cables. General rusting and minor pitting overall.
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FB #	
37	Minor debris on lower flange
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	

MEMBER CONDITIONS: FLOOR BEAMS

TYPICAL CONDITIONS:	Minor wear to top flange of floor beams due to rubbing of cables. General rusting and minor pitting overall.
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FB #	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	

MEMBER CONDITIONS: FLOOR BEAMS

TYPICAL CONDITIONS:	Minor wear to top flange of floor beams due to rubbing of cables. General rusting and minor pitting overall.
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FB #	
61	
62	
63	
64	
65	
66	
67	
68	
69	
70	
71	
72	

MEMBER CONDITIONS: FLOOR BEAMS

TYPICAL CONDITIONS:	Minor wear to top flange of floor beams due to rubbing of cables. General rusting and minor pitting overall.
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FB #	
73	
74	
75	
76	
77	
78	
79	
80	
81	
82	Dirt, debris collected at lateral bracing connection.

BRIDGE 2740017
 Miller County
 Swinging Bridge Road

MEMBER CONDITIONS: MAIN CABLES

TYPICAL CONDITIONS:	Rusting with minor areas of pitting in outer layer of strands.
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UPPER	NORTH	SOUTH
U0 (Anchor)- U1	2 broken strands at anchor. Wrap wire broken and loose.	18 broken strands at anchor point. 5 broken strands at U1. Wrap wire broken, loose.
U1-U2	4 broken/loose strands in outer core at U2.	
U2-U3		6 broken strands at U3.
U3-U4		3 broken strands at U4.
U4-U5		10 strands loose/broken in outer core.
U5-U6	4 broken/loose strands in outer core.	10 strands loose/broken in outer core.
U6-U7	4 broken/loose strands in outer core.	10 strands loose/broken in outer core.
U7-U8	4 broken/loose strands in outer core.	11 strands loose/broken in outer core.
U8-U9	5 broken/loose strands in outer core.	12 strands loose/broken in outer core.
U9-U10	6 broken/loose strands in outer core.	12 strands loose/broken in outer core.
U10-U11		12 strands loose/broken in outer core.
U11-U12		

BRIDGE 2740017
 Miller County
 Swinging Bridge Road

MEMBER CONDITIONS: MAIN CABLES

TYPICAL CONDITIONS:	Rusting with minor areas of pitting in outer layer of strands.
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UPPER	NORTH	SOUTH
U12-U13		
U13-U14	3 broken/loose strands in outer core.	
U14-U15	3 broken/loose strands in outer core. Tower in between. Saddle area looks good.	Tower in between. Saddle area looks good.
U15-U16		
U16-U17		
U17-U18		
U18-U19		
U19-U20	6 loose strands in outer core (top).	
U20-U21		
U21-U22	12 broken/loose strands in outer core (bottom).	
U22-U23	12 broken/loose strands in outer core.	12 broken strands (bottom) at U23.
U23-U24	12 broken/loose strands in outer core.	14 loose/hanging strands.

BRIDGE 2740017
 Miller County
 Swinging Bridge Road

MEMBER CONDITIONS: MAIN CABLES

TYPICAL CONDITIONS:	Rusting with minor areas of pitting in outer layer of strands.
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UPPER	NORTH	SOUTH
U24-U25	11 loose strands in outer core.	14 broken/loose strands in outer core.
U25-U26	11 loose strands in outer core.	14 broken/loose strands in outer core.
U26-U27	11 loose strands in outer core.	14 broken/loose strands in outer core.
U27-U28	11 loose strands in outer core.	14 broken/loose strands in outer core.
U28-U29	11 loose strands in outer core.	14 broken/loose strands in outer core.
U29-U30	11 loose strands in outer core.	
U30-U31	11 loose strands in outer core.	At U30, loose strands in main cable.
U31-U32	6 loose strands in outer core. 1 severed strand. At U31, loose strands have been secured to vertical.	3 loose strands in outer core + 3 broken strands.
U32-U33	6 loose strands in outer core.	3 loose strands in outer core + 2 broken strands.
U33-U34	4 loose stands in outer core.	3 loose strands in outer core.
U34-U35	4 loose stands in outer core (bottom).	12 loose strands.
U35-U36	4 loose stands in outer core (bottom).	12 loose strands.

BRIDGE 2740017
 Miller County
 Swinging Bridge Road

MEMBER CONDITIONS: MAIN CABLES

TYPICAL CONDITIONS:	Rusting with minor areas of pitting in outer layer of strands.
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UPPER	NORTH	SOUTH
U36-U37	4 loose strands in outer core (bottom).	6 loose strands in outer core (bottom).
U37-U38	4 loose strands in outer core (bottom).	6 loose strands in outer core (bottom).
U38-U39	4 loose strands in outer core.	6 loose strands in outer core.
U39-U40	4 loose strands in outer core.	6 loose strands in outer core. 2 strands reconnected.
U40-U41	4 loose strands in outer core.	6 loose strands in outer core.
U41-U42	4 loose strands in outer core.	6 loose strands in outer core.
U42-U43	5 loose strands in outer core.	6 loose strands in outer core.
U43-U44	5 loose strands in outer core.	4 loose strands in outer core. 1 broken strand.
U44-U45	4 loose strands in outer core.	4 loose strands in outer core.
U45-U46	4 loose strands in outer core.	5 loose strands in outer core.
U46-U47	3 loose strands in outer core.	3 loose strands in outer core.
U47-U48	3 loose strands in outer core.	3 loose strands in outer core.

MEMBER CONDITIONS: MAIN CABLES

BRIDGE 2740017
 Miller County
 Swinging Bridge Road

TYPICAL CONDITIONS:	Rusting with minor areas of pitting in outer layer of strands.
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UPPER	NORTH	SOUTH
U48-U49	3 loose strands in outer core.	2 loose strands in outer core.
U49-U50	3 loose strands in outer core.	2 loose strands in outer core. 1 broken strand.
U50-U51	4 loose strands in outer core.	3 loose strands in outer core.
U51-U52	4 loose strands in outer core.	3 loose strands in outer core.
U52-U53	4 loose strands in outer core. 1 broken strand.	3 loose strands in outer core. 1 broken strand.
U53-U54	4 loose strands in outer core. 1 broken strand.	3 loose strands in outer core.
U54-U55	7 loose strands in outer core.	6 loose strands in outer core.
U55-U56	7 loose strands in outer core.	6 loose strands in outer core.
U56-U57	5 loose strands in outer core.	3 loose strands in outer core.
U57-U58	5 loose strands in outer core.	3 loose strands in outer core.
U58-U59	3 loose strands in outer core.	2 loose strands in outer core.
U59-U60	3 loose strands in outer core.	3 loose strands in outer core.

BRIDGE 2740017
 Miller County
 Swinging Bridge Road

MEMBER CONDITIONS: MAIN CABLES

TYPICAL CONDITIONS:	Rusting with minor areas of pitting in outer layer of strands.
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UPPER	NORTH	SOUTH
U60-61	5 loose strands in outer core. 1 broken strand.	3 loose strands in outer core.
U61-62	4 loose strands in outer core.	3 loose strands in outer core.
U62-63	4 loose strands in outer core. 1 broken strand.	3 loose strands in outer core. 1 broken strand.
U63-64	6 loose strands in outer core. 2 broken strands.	4 loose strands in outer core. 1 broken strand.
U64-65	7 loose strands in outer core.	6 loose strands in outer core.
U65-66	5 loose strands in outer core. 1 broken strand.	7 loose strands in outer core. 1 broken strand.
U66-67	7 loose strands in outer core. 1 broken strand.	11 loose strands in outer core.
U67-68	5 loose strands in outer core.	11 loose strands in outer core. 1 broken strand.
U68-69	6 loose strands in outer core.	11 loose strands in outer core.
U69-70	6 loose strands in outer core.	11 loose strands in outer core.
U70-71	7 loose strands in outer core.	11 loose strands in outer core.
U71-72	6 loose strands in outer core.	11 loose strands in outer core.

BRIDGE 2740017
 Miller County
 Swinging Bridge Road

MEMBER CONDITIONS: MAIN CABLES

TYPICAL CONDITIONS:	Rusting with minor areas of pitting in outer layer of strands.
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UPPER	NORTH	SOUTH
U72-U73	6 loose strands in outer core.	11 loose strands in outer core.
U73-U74	7 loose strands in outer core.	9 loose strands in outer core.
U74-U75	6 loose strands in outer core.	8 loose strands in outer core.
U75-U76	6 loose strands in outer core.	7 loose strands in outer core.
U76-U77	6 loose strands in outer core. 1 broken strand at U76.	7 loose strands in outer core.
U77-U78	4 loose strands in outer core.	6 loose strands in outer core.
U78-U79	3 loose strands in outer core.	2 loose strands in outer core.
U79-U80	2 loose strands in outer core.	3 loose strands in outer core.
U80-U81	2 loose strands in outer core.	3 loose strands in outer core.
U81-U82	2 loose strands in outer core.	2 loose strands in outer core. 1 broken strand.
U82-Tower	2 loose strands in outer core. Saddle good.	2 loose strands in outer core. Saddle good.
Tower-Anchor		

MEMBER CONDITIONS: HANGERS

BRIDGE
Miller County
Swinging Bridge Road

TYPICAL CONDITIONS:	10 wires wrapped per cable - Wrapped around Floor beam. General rusting and minor to moderate pitting in cables. Minor wear in strands at top flange of floor beam (TFFB), except as noted. Section loss in top of cables from general pitting.
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HANGER	NORTH	SOUTH
H1	1 strand broken - top. Cable well twisted tight.	Cable well twisted - tight.
H2	1 broken strand - bottom. Slight wear to cable at floor beam. Cable unwrapping - loose.	1 broken strand - bottom. Cable well twisted - tight.
H3	2 broken strands - bottom. Various untwisting of cable - loose.	4 broken strands - bottom; 1 broken strand top. No wear in cables but cables are loose.
H4	4 broken strands - bottom. 2 broken strands - top. 50% section loss in 1 strand (TFFB). Various untwisting of cable - tight.	Cables were replaced with new strands in past. No wear. Cable twisted but loose.
H5	Cable tight.	1 broken strand - bottom. 50% section loss in 2 strands (TFFB). Cable is taught.
H6	No wear in cable strands. Cable is untwisted - loose.	50% section loss in 1 strand (TFFB). Cable is taught.
H7	1 broken strand - bottom. 50% section loss in 1 strand (TFFB). Cable is untwisting - but taught.	2 broken strands - bottom. Cable is taught.
H8	1 broken strand - bottom. 75% section loss in 1 strand (TFFB). Cable is tight.	50% section loss in 1 strand (TFFB). Cable is untwisted but tight.
H9	Saddle wrap around bottom of floor beam has shifted. 50% section loss in 1 strand. Cable is loose.	50% section loss in 3 strands. Cable is loose.
H10	50% section loss in 3 strands Cable is untwisting but taught.	50% section loss in 3 strands. Cable is untwisting and loose.
H11	50% section loss in 3 strands Cable is loose.	Cable is untwisting and taught.
H12	Minor wear in 3 strands. Cable is tight.	50% section loss in 3 strands. Various parts of cable untwisting. Cable is loose.

MEMBER CONDITIONS: HANGERS

TYPICAL CONDITIONS:	10 wires wrapped per cable - Wrapped around Floor beam. General rusting and minor to moderate pitting in cables. Minor wear in strands at top flange of floor beam (TFFB), except as noted. Section loss in top of cables from general pitting.
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HANGER	NORTH	SOUTH
H13	50% section loss in 3 strands. Cable is loose.	50% section loss in 2 strands (TFFB). Cable twisted and taught.
H14	4 broken strands - bottom. 50% section loss in 1 strand (TFFB). Cable is untwisting and loose.	Cable untwisted and loose.
H15	3 broken strands - bottom; 1 broken strand top. 75% section loss in 2 strands (TFFB). Cable is untwisting and loose.	1 broken strand. 50% section loss in 1 strand (TFFB). Cable is taught.
H16	50% section loss in 3 strands (TFFB). Cable is semi-twisted, but loose.	1 broken strand. 50% section loss in 2 strands (TFFB). Cable is taught.
H17	50% section loss in 2 strands (TFFB). Cable mainly untwisted and loose.	50% section loss in 4 strands (TFFB). Cable is loose.
H18	25% section loss in 2 strands (TFFB). Cable is semi-twisted and taught.	25% section loss in 4 strands (TFFB). Cable is loose.
H19	50% section loss in 3 strands (TFFB). Cable is untwisted but taught.	50% section loss in 3 strands (TFFB). Cable is twisted and loose.
H20	50% section loss in 2 strands (TFFB). Cable is untwisted but taught.	75% section loss in 2 strands (TFFB). Cable is semi-twisted and taught.
H21	75% section loss in 2 strands (TFFB). Cable is untwisting, but tight.	50% section loss in 2 strands (TFFB). Cable is twisted and taught.
H22	75% section loss in 1 strand + 25% section loss in 1 strand (TFFB). Cable untwisting but tight.	2/3 up cable - pitting (15% section loss). 75% section loss in 4 strands - bottom (TFFB). Cable semi-twisted and taught.
H23	20% section loss in general in top of cables. 75% section loss in 2 strands + 25% section loss in 1 strand - bottom (TFFB). Cable untwisting loose but tight.	Rehabbed in past. Mainly cable is untwisted and loose.
H24	20% section loss in top of cables. 75% section loss in 1 strand + 25% section loss in 2 strands (TFFB).	50% section loss in 3 strands (TFFB). Heavier pitting at 2/3 point up the cable. Cable untwisted and loose.

MEMBER CONDITIONS: HANGERS

TYPICAL CONDITIONS:	10 wires wrapped per cable - Wrapped around Floor beam. General rusting and minor to moderate pitting in cables. Minor wear in strands at top flange of floor beam (TFFB), except as noted. Section loss in top of cables from general pitting.
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HANGER	NORTH	SOUTH
H25	20% general section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight.	20% general section loss in upper 1/3 of hanger assembly. 15% section loss in 3 strands (TFFB). Cable tight.
H26	20% general section loss in upper hangers. 50% section loss in 1 strand + 25% section loss in 2 strands. (TFFB). Cable is taught.	20% general section loss in upper 1/3 of hanger assembly. 25% section loss in 4 strands (TFFB). Cable is loose.
H27	20% section loss in upper hangers. 25% section loss in 2 strands (TFFB). Cable is tight.	1 broken strand - bottom. 20% general section loss in top of hanger cables. 10% section loss in 1 strand (TFFB). Cable loose. Out of alignment.
H28	20% section loss in upper hangers. 50% section loss in 2 strands + 25% section loss in 1 strand (TFFB). Cable is loose.	20% general section loss in top of hanger assembly. 25% section loss in 2 strands (TFFB). Cable is tight.
H29	15% general section loss in upper hangers. 50% section loss in 4 strands (TFFB). Cable is tight.	20% general section loss in top of hanger assembly. 50% section loss in 4 strands (TFFB). Cable is taught.
H30	20% general section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight.	2 broken strands - bottom. 20% general section loss upper cables. 15% section loss in 3 strands (TFFB). Cable is loose.
H31	20% general section loss in upper hangers (pitting). 50% section loss in 2 strands (TFFB). Cable is taught.	1 broken strand - top. 20% general section loss in upper cables. 50% section loss in 4 strands (TFFB). Cables tight.
H32	20% general section loss in upper hangers (pitting). 25% section loss in 4 strands (TFFB). Cable is tight.	20% general section loss in upper cables. 25% section loss in 2 cables (TFFB). Cables are tight.
H33	1 broken strand - bottom. 20% general section loss in upper hangers. 50% section loss in 2 strands (TFFB). Cable is tight.	1 broken strand top. 20% general section loss in upper cables. 50% section loss in 3 strands (TFFB). Cables tight.
H34	20% general section loss in upper hangers. 25% section in 2 strands (TFFB). Cable is tight.	20% general section loss in upper cables. 50% section loss in 4 strands (TFFB). Cables tight.
H35	20% general section loss in upper hangers. 75% section loss in 1 strand + 50% section loss in strands (TFFB). Cables tight.	15% general section loss in upper hangers. 50% section loss in 3 strands + 25% section loss in 3 strands. Cables tight.
H36	15% general section loss in upper hangers. 75% section loss in 2 strands + 25% section loss in 1 strand (TFFB). Cable is tight.	1 broken strand in top. 20% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cables tight.

MEMBER CONDITIONS: HANGERS

TYPICAL CONDITIONS:	10 wires wrapped per cable - Wrapped around Floor beam. General rusting and minor to moderate pitting in cables. Minor wear in strands at top flange of floor beam (TFFB), except as noted. Section loss in top of cables from general pitting.
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HANGER	NORTH	SOUTH
H37	20% general section loss in upper hangers (pitting). 50% section loss in 4 strands (TFFB). Cable is tight.	1 broken strand bottom. 20% section loss in upper hangers. 75% section loss in 4 strands (TFFB).
H38	20% general section loss in upper hangers. 75% section loss in 2 strands (TFFB). Cable tight, but not twisted.	20% section loss in upper hangers. 25% section loss in 2 strands (TFFB). Cable tight.
H39	1 broken strand - bottom. 20% general section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable tight but untwisted.	1 broken strand bottom. 20% section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable tight.
H40	20% general section loss in upper hangers. 75% section loss in 3 strands (TFFB). Cable tight but untwisted.	20% section loss in upper hangers. 75% section loss in 2 strands +25% section loss in 3 strands (TFFB). Cable tight.
H41	20% general section loss in upper hangers. 50% section loss in 5 strands (TFFB). Cable is tight.	1 broken strand bottom. 20% section loss in upper hangers. 75% section loss in 2 strands + 25% section loss in 2 strands (TFFB). Cable is tight.
H42	1 broken strand -bottom. 20% general section loss in upper hangers. 50% section loss in 2 strands (TFFB). Cable tight, but untwisted.	2 broken strands - bottom. 15% section loss in upper hangers. 25% section loss in 4 strands (TFFB). Cable tight.
H43	2 broken strands - bottom. 20% general section loss in upper hangers. 50% section loss in 4 strands (TFFB). Cable is tight.	1 broken strand bottom. 20% section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight, untwisted.
H44	20% general section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight.	20% section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable tight.
H45	20% general section loss in upper hangers. 50% section loss in 4 strands (TFFB). Cable is tight.	2 broken strands bottom. 15% section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight.
H46	2 broken strands -bottom. 20% general section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight.	1 broken strand bottom. 10% section loss in upper hangers. 25% section loss in 4 strands (TFFB). Cable is tight.
H47	1 broken strand-bottom + 1 broken strand - top. 20% general section loss in upper hangers. 25% section loss in 5 strands (TFFB). Cable tight, but untwisted.	4 broken strands bottom + 1 broken -top. 15% section loss in upper hangers. 75% section loss in 2 strands (TFFB). Cable is tight.
H48	4 broken strands -bottom + 1 broken strand top. 20% general section loss in upper hangers. 25% section loss in 4 strands (TFFB). Cable is tight.	1 broken strand bottom. 15% section loss in upper hangers. 50% section loss in 1 strand (TFFB).

MEMBER CONDITIONS: HANGERS

TYPICAL CONDITIONS:	10 wires wrapped per cable - Wrapped around Floor beam. General rusting and minor to moderate pitting in cables. Minor wear in strands at top flange of floor beam (TFFB), except as noted. Section loss in top of cables from general pitting.
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HANGER	NORTH	SOUTH
H49	1 broken strand-top. 20% general section loss in upper hangers. 75% section loss in 3 strands + 25% section loss in 2 strands (TFFB). Cable tight, untwisted.	10% general section loss in upper hangers. 50% section loss in 2 strands (TFFB). Cable tight, untwisted.
H50	20% general section loss in upper hangers. 25% section loss in 6 strands (TFFB). Cable tight, untwisted.	1 broken strand top and bottom. 10% general section loss in upper hangers. 50% section loss in 2 strands (TFFB). Cable tight, untwisted.
H51	1 broken strand-bottom. 20% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable tight, untwisted.	3 broken strands - bottom. 10% general section loss in upper hangers. 75% section loss in 3 strands (TFFB). Cable tight.
H52	4 broken strand-bottom. 20% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable tight.	1 broken strand - bottom. 15% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable tight.
H53	20% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable tight.	1 broken strand - bottom. 10% general section loss in upper hangers. 75% section loss in 2 strands (TFFB). Cable tight.
H54	1 broken strand-bottom. 20% general section loss in upper hangers. 25% section loss in 4 strands (TFFB). Cable tight.	2 broken strands - bottom. 15% general section loss in upper hangers. 25% section loss in 4 strands (TFFB). Cable tight.
H55	1 broken strand-bottom. 20% general section loss in upper hangers. 25% section loss in 2 strands (TFFB). Cable tight.	1 broken strand - bottom. 15% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable tight, 3" out of vertical.
H56	1 broken strand-bottom. 20% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable tight.	1 broken strand - bottom. 15% general section loss in upper hangers. 25% section loss in 4 strands (TFFB). Cable tight.
H57	20% general section loss in upper hangers. 50% section loss in 4 strands (TFFB). Cable tight.	1 broken strand - bottom. 20% general section loss in upper hangers. 25% section loss in 4 strands (TFFB). Cable tight.
H58	1 broken strand-bottom. 20% general section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable tight.	20% general section loss in upper hangers. 25% section loss in 4 strands (TFFB). Cable tight.
H59	20% general section loss in upper hangers. 50% section loss in 5 strands (TFFB). Cable tight.	20% general section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable tight, untwisted.
H60	1 broken strand-bottom. 25% general section loss in upper hangers. 25% section loss in 2 strands (TFFB). Cable tight, twisted.	1 broken strand - bottom. 20% general section loss in upper hangers. 50% section loss in 1 strands (TFFB). Cable tight.

MEMBER CONDITIONS: HANGERS

TYPICAL CONDITIONS:	10 wires wrapped per cable - Wrapped around Floor beam. General rusting and minor to moderate pitting in cables. Minor wear in strands at top flange of floor beam (TFFB), except as noted. Section loss in top of cables from general pitting.
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HANGER	NORTH	SOUTH
H61	20% general section loss in upper hangers. 75% section loss in 3 strands (TFFB). Cable is tight, untwisted.	20% section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight.
H62	25% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable is tight, untwisted.	20% section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable is tight - 3" out of vertical.
H63	25% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable is tight.	20% section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight -4" out of vertical.
H64	20% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable is taught, untwisted.	1 broken strand - bottom. 20% section loss in upper hangers. 75% section loss in 2 strands (TFFB). Cable is tight - 3" out of
H65	1 broken strand - bottom. 20% general section loss in upper hangers. 75% section loss in 2 strands (TFFB). Cable is taught.	20% section loss in upper hangers. 50% section loss in 2 strands (TFFB). Cable is tight - 2" out of vertical.
H66	1 broken strand - bottom. 20% general section loss in upper hangers. 75% section loss in 3 strands (TFFB). Cable is tight.	20% section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is tight - 2" out of vertical.
H67	20% general section loss in upper hangers. 50% section loss in 4 strands (TFFB). Cable is tight.	1 broken strand - bottom. 25% section loss in upper hangers. 75% section loss in 2 strands (TFFB). Cable is tight.
H68	20% general section loss in upper hangers. 50% section loss in 2 strands (TFFB). Cable is loose.	20% section loss in upper hangers. 50% section loss in 3 strands (TFFB). Cable is loose, untwisted.
H69	20% general section loss in upper hangers. 25% section loss in 1 strand (TFFB). Cable is taught, but out of vertical.	25% section loss in upper hangers. 25% section loss in 5 strands (TFFB). Cable is tight.
H70	20% general section loss in upper hangers. 25% section loss in 2 strands (TFFB). Cable is tight.	20% section loss in upper hangers. 50% section loss in 1 strand (TFFB). Cable is loose. Out of vertical.
H71	25% general section loss in upper hangers. Cable is loose, untwisted.	25% section loss in upper hangers. 25% section loss in 2 strands (TFFB). Cable is taught, untwisted.
H72	20% general section loss in upper hangers. Cable is loose.	1 broken strand - top and bottom. 25% section loss in upper hangers. 25% section loss in 1 strand (TFFB). Cable is taught, but way out of alignment.

MEMBER CONDITIONS: HANGERS

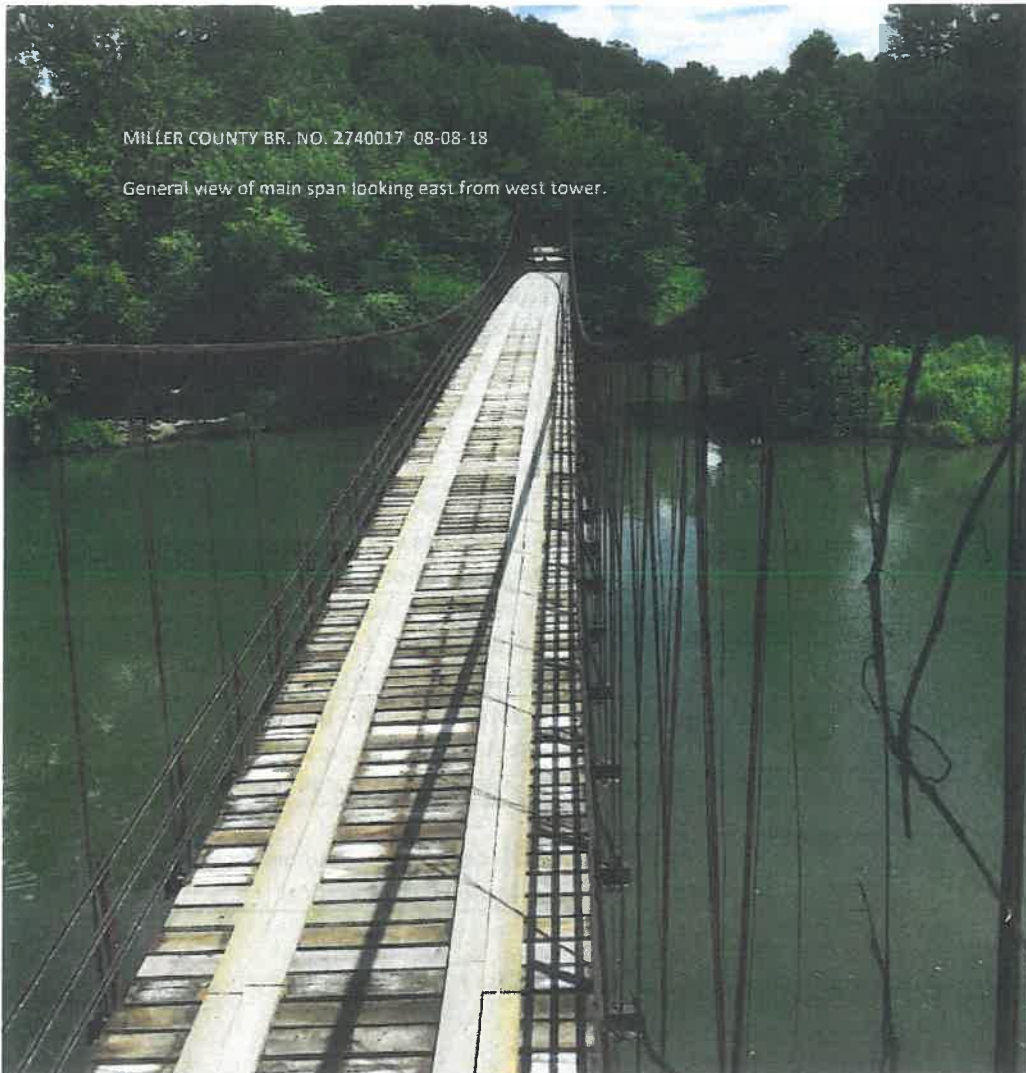
TYPICAL CONDITIONS:	10 wires wrapped per cable - Wrapped around Floor beam. General rusting and minor to moderate pitting in cables. Minor wear in strands at top flange of floor beam (TFFB), except as noted. Section loss in top of cables from general pitting.
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HANGER	NORTH	SOUTH
H73	20% general section loss in upper hangers. 25% section loss in 3 strands (TFFB). Cable is tight.	1 broken strand - bottom. 20% section loss in upper hangers. 25 % section loss in 2 strands (TFFB). Cable is tight.
H74	20% general section loss in upper hangers. 25% section loss in 1 strand (TFFB). Cable is loose.	15% section loss in upper hangers. 75 % section loss in 1 strand + 50% section loss in 2 strands (TFFB). Cable is loose.
H75	15% general section loss in upper hangers. 25% section loss in 1 strand (TFFB). Cable is loose.	15% section loss in upper hangers. 10 % section loss in 2 strands (TFFB). Cable is loose.
H76	15% general section loss in upper hangers. 50% section loss in 1 strand (TFFB). Cable is taught.	20% section loss in upper hangers. 25 % section loss in 2 strands (TFFB). Cable is taught.
H77	20% general section loss in upper hangers. 25% section loss in 2 strands (TFFB). Cable is taught.	1 broken strand - bottom. 15% section loss in upper hangers. 25 % section loss in 2 strands (TFFB). Cable is tight.
H78	20% general section loss in upper hangers. Cable is loose.	20% section loss in upper hangers. 10% section loss in 2 strands (TFFB). Cable is loose.
H79	20% general section loss in upper hangers. 10% section loss in 1 strand (TFFB). Cable is loose.	15% section loss in upper hangers. 25 % section loss in 2 strands (TFFB). Cable is taught. Out of vertical.
H80	15% general section loss in upper hangers. 25% section loss in 1 strand (TFFB). Cable is loose.	20% section loss in upper hangers. 10% section loss in 2 strands (TFFB). Cable is loose. Out of vertical.
H81	15% general section loss in upper hangers. 10% section loss in 2 strands (TFFB). Cable is loose.	2 broken strands - bottom. 20% section loss in upper hangers. 10 % section loss in 1 strand (TFFB). Cable is loose. Out of
H82	1 strand is broken -bottom. 10% general section loss in upper hangers. 25% section loss in 1 strand (TFFB). Cable is loose.	15% section loss in upper hangers. Cable is loose. Out of vertical.

**FRACTURE CRITICAL INSPECTION REPORT
BRIDGE 2740017
MILLER COUNTY, MISSOURI**

INSPECTION PHOTOGRAPHS

GENERAL VIEWS



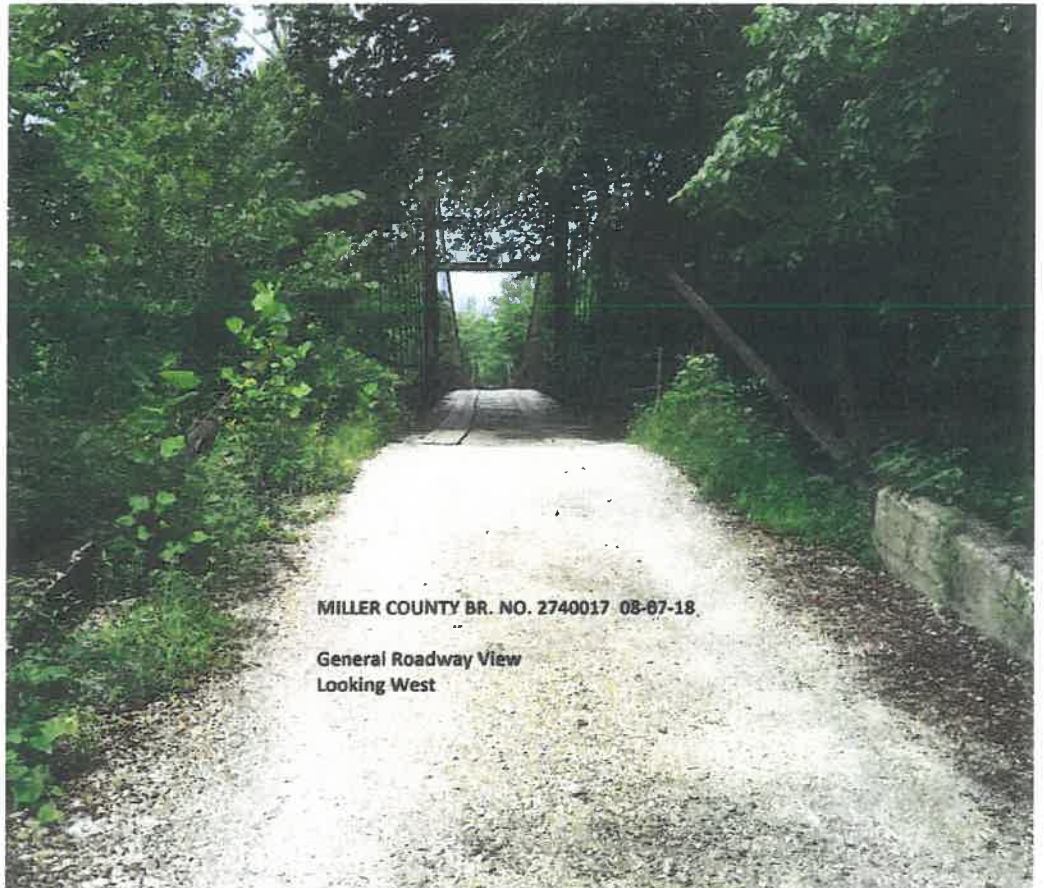
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| <input type="checkbox"/> 3523 MAIN STREET | <input type="checkbox"/> P.O. BOX 817 | <input type="checkbox"/> KEOKUK, IA 52632 | <input type="checkbox"/> PHONE 319/524-8730 | <input type="checkbox"/> FAX 217/223-1546 |
| <input type="checkbox"/> 801 BROADWAY SUITE 248 | <input type="checkbox"/> P.O. BOX 190 | <input type="checkbox"/> HANNIBAL, MO 63401 | <input type="checkbox"/> PHONE 573/406-0541 | <input type="checkbox"/> FAX 217/223-1546 |

GENERAL VIEWS: (cont.)



Developing Partnerships ■ Creating Innovative Solutions ■ Delivering Proven Results

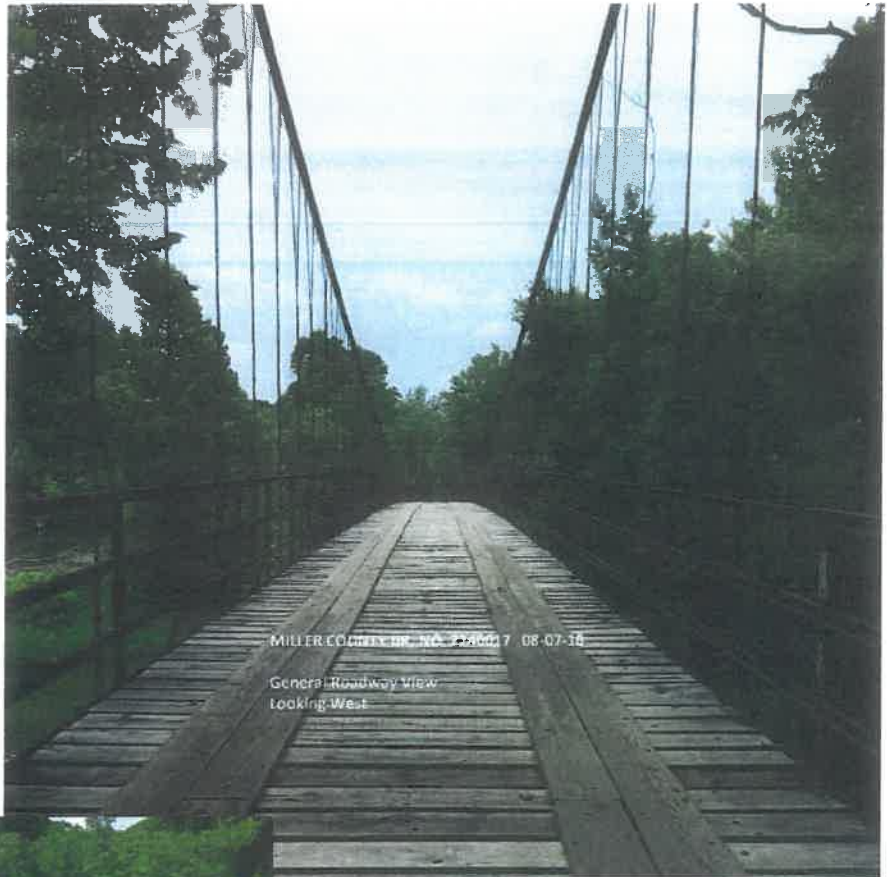
GENERAL VIEWS: (cont.)



MILLER COUNTY BR. NO. 2740017 08-07-18

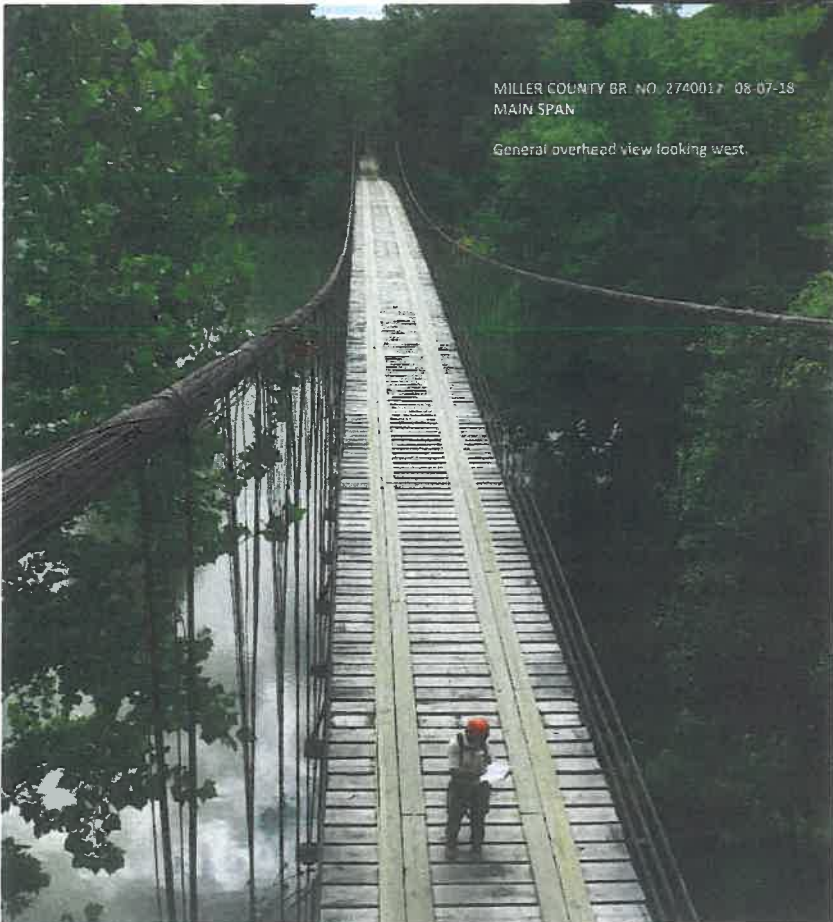
General Roadway View
Looking West

GENERAL VIEWS: (cont.)



MILLER COUNTY BR. NO. 2740017 08-07-18

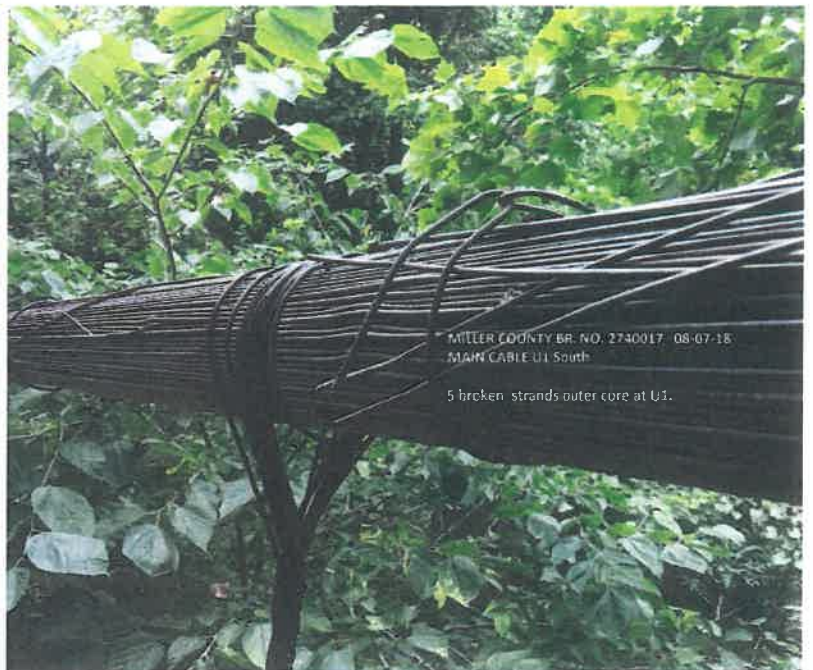
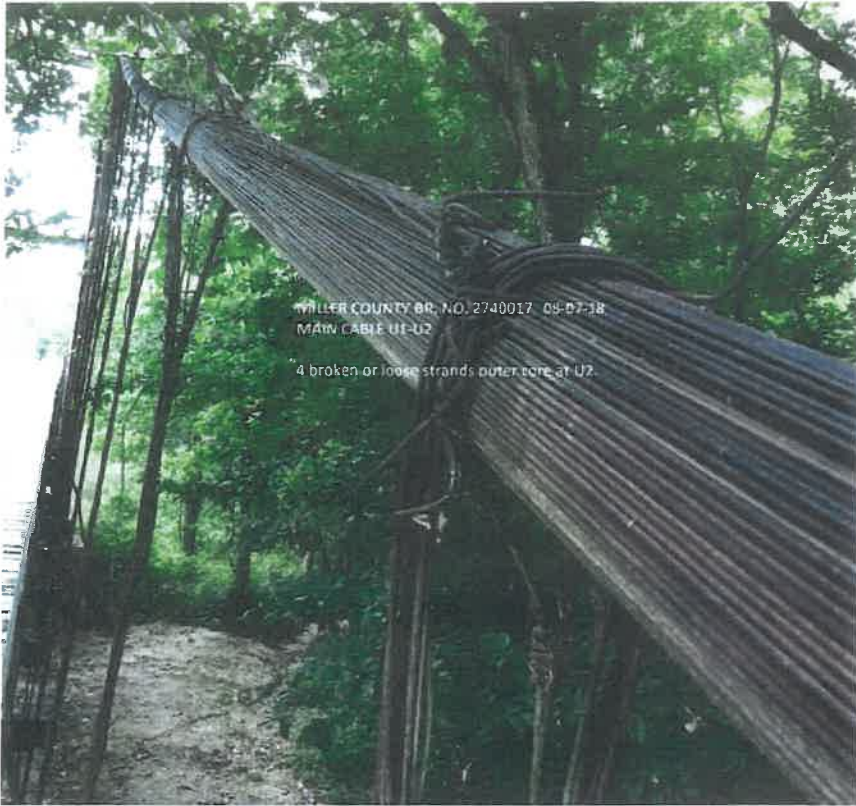
General Roadway View
Looking West



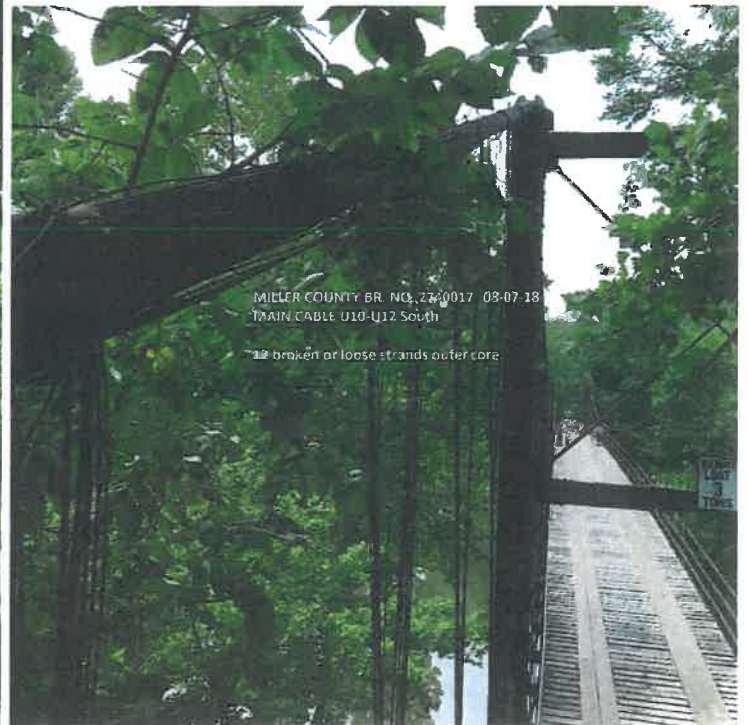
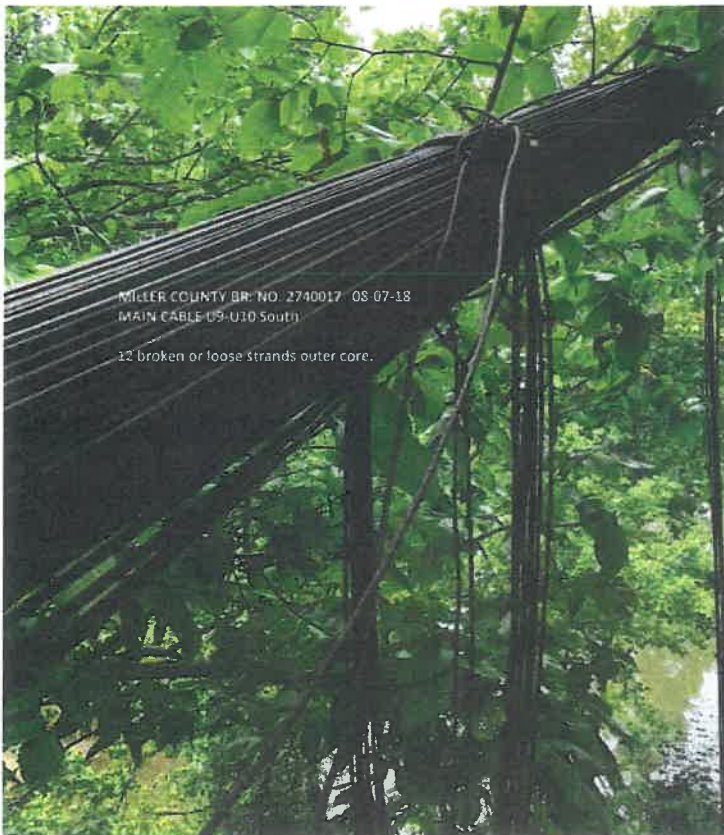
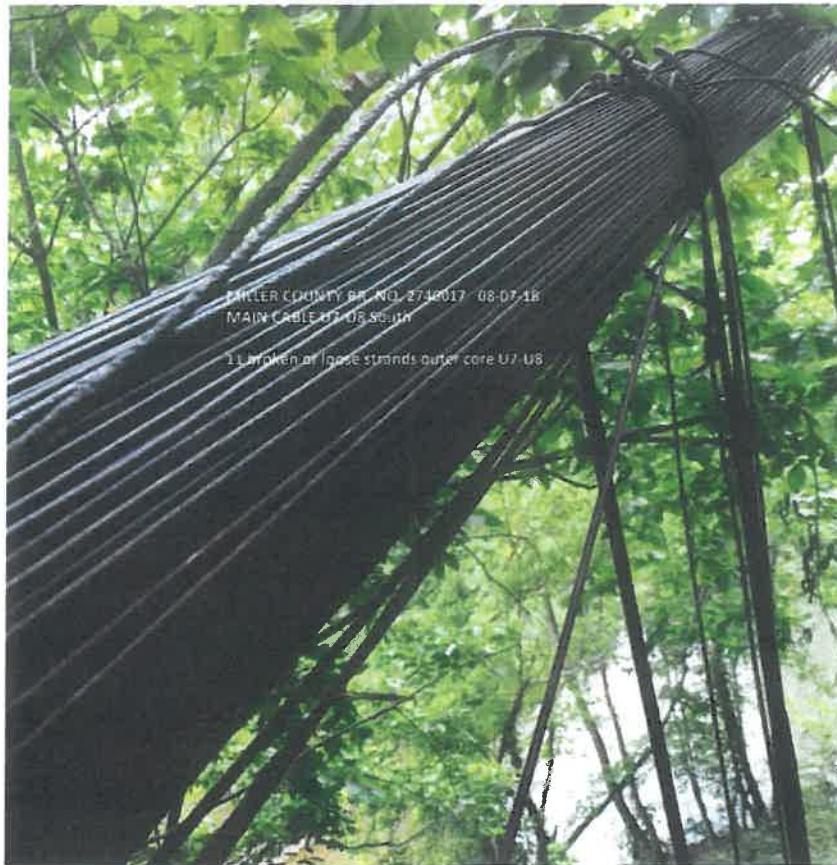
MILLER COUNTY BR. NO. 2740017 08-07-18
MAIN SPAN

General overhead view looking west.

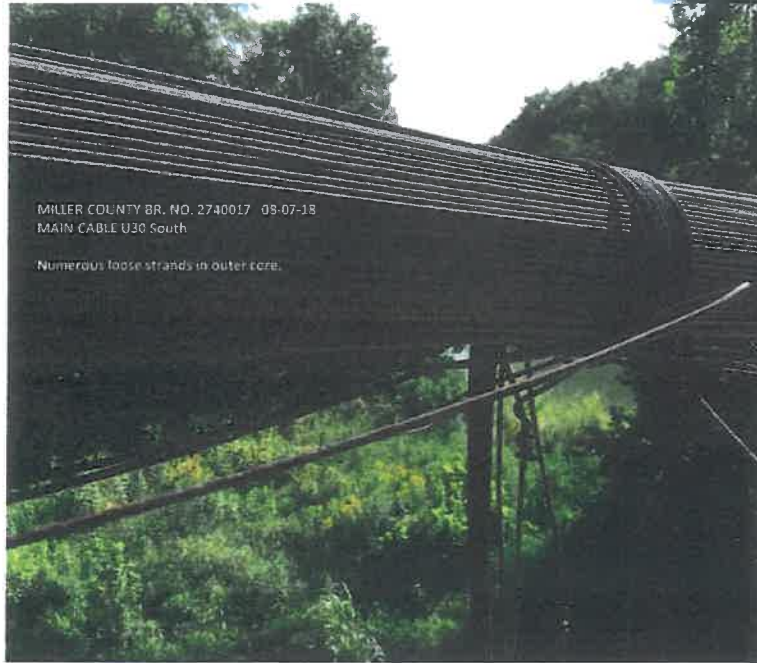
MAIN SUSPENSION CABLES



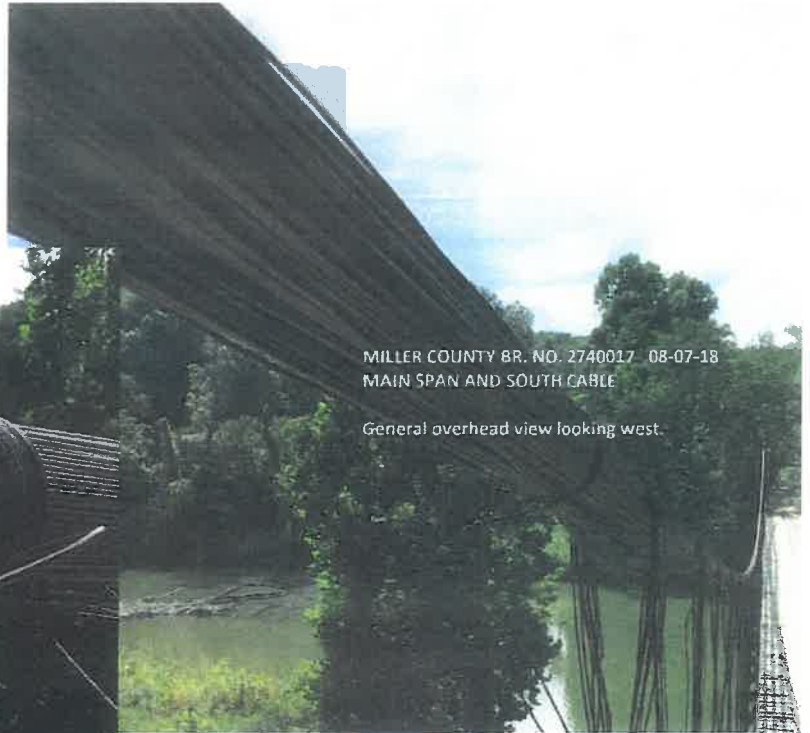
MAIN SUSPENSION CABLES: (cont.)



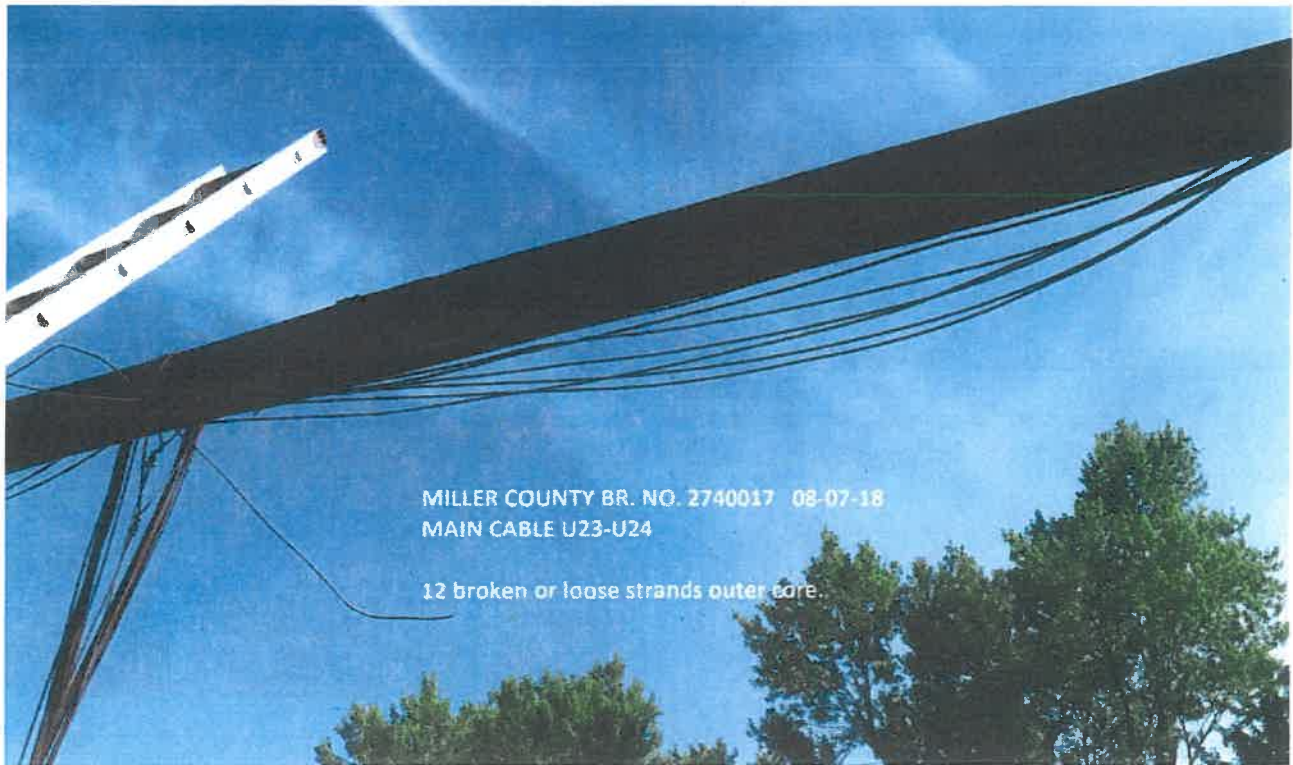
MAIN SUSPENSION CABLES: (cont.)



MILLER COUNTY BR. NO. 2740017 08-07-18
MAIN CABLE U30 South
Numerous loose strands in outer core.

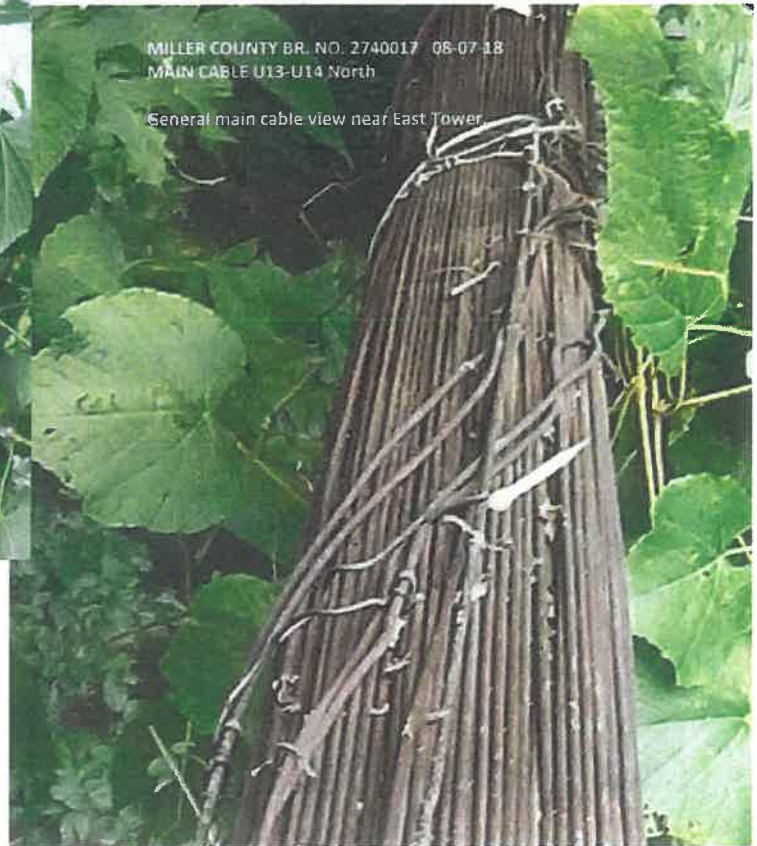
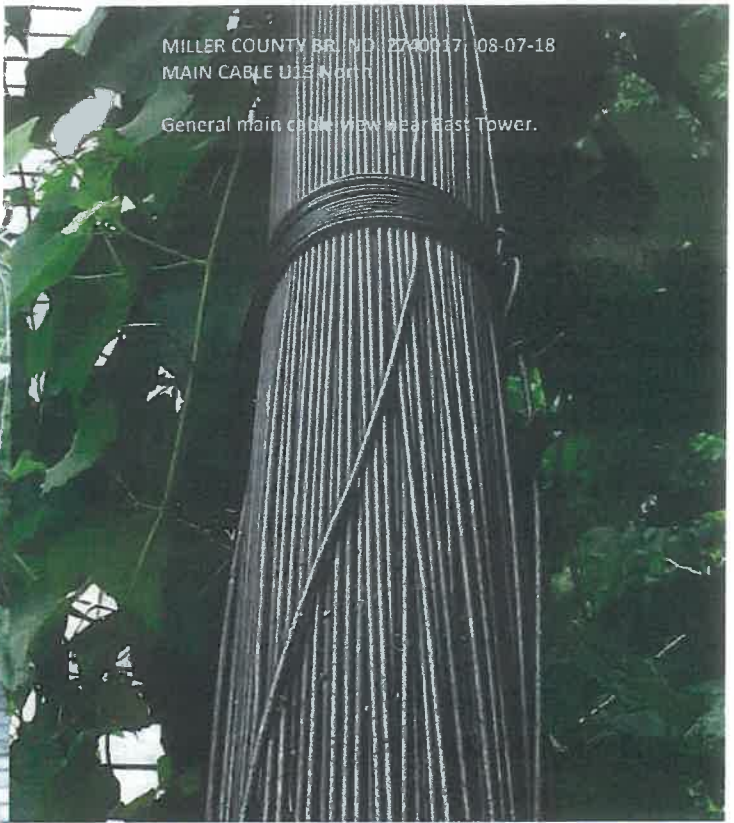


MILLER COUNTY BR. NO. 2740017 08-07-18
MAIN SPAN AND SOUTH CABLE
General overhead view looking west.



MILLER COUNTY BR. NO. 2740017 08-07-18
MAIN CABLE U23-U24
12 broken or loose strands outer core.

MAIN SUSPENSION CABLES: (cont.)



MAIN SUSPENSION CABLES: (cont.)



MILLER COUNTY BR. NO. 2740017 08-08-18

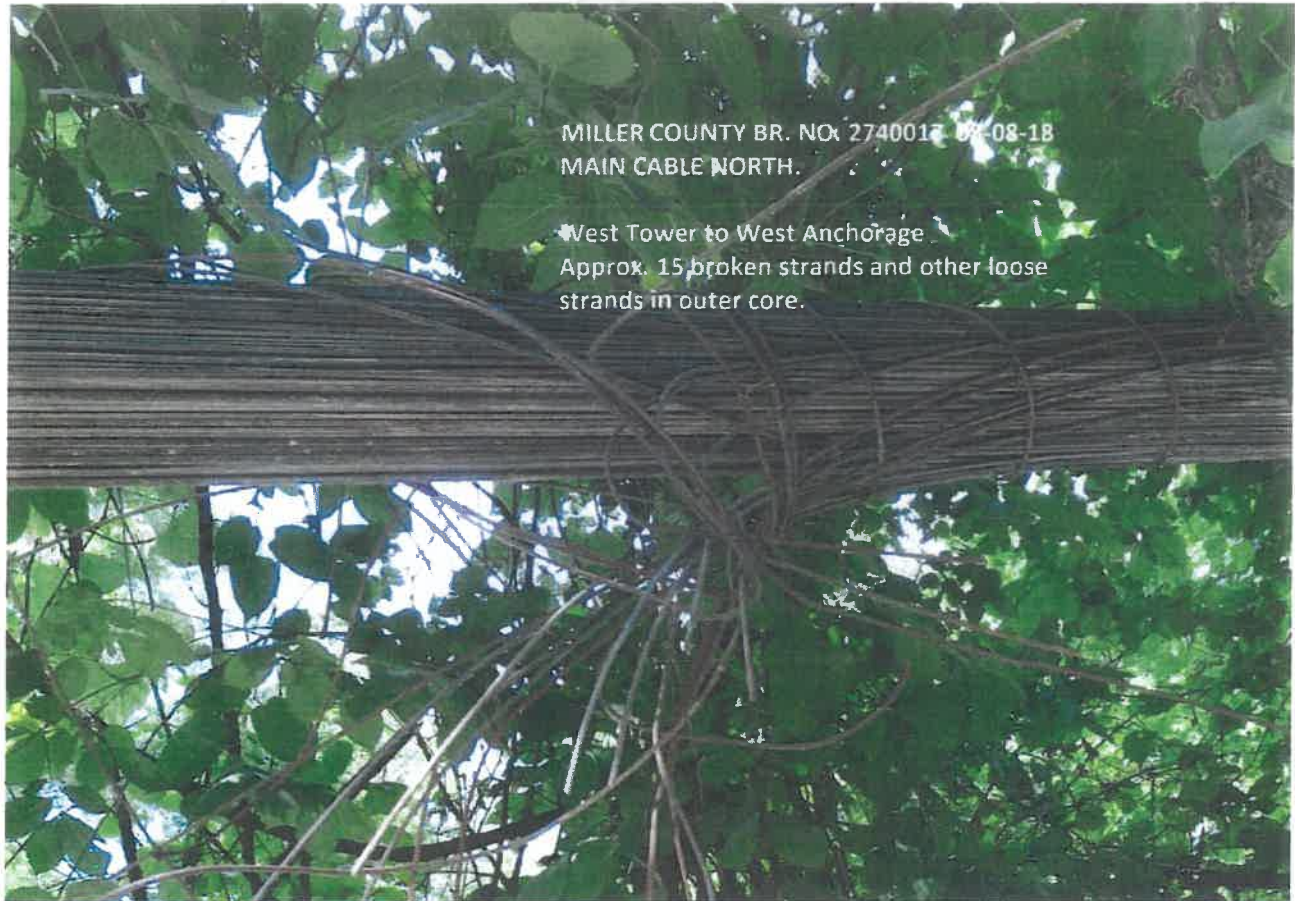
General view of main cable south at west anchorage



MILLER COUNTY BR. NO. 2740017 08-08-18
MAIN CABLE SOUTH.

West Tower to West Anchorage
Numerous loose strands near W. Anchor.

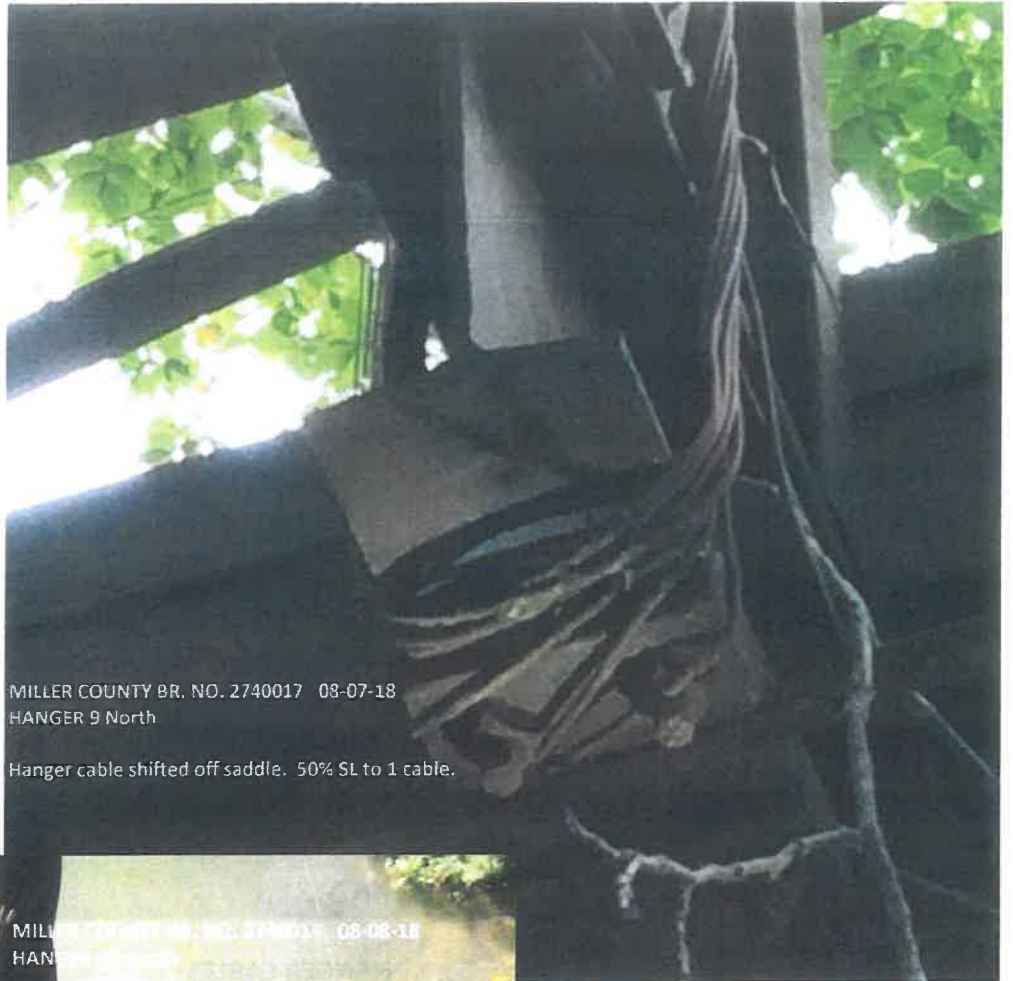
MAIN SUSPENSION CABLES: (cont.)



HANGER CABLES



HANGER CABLES: (cont.)



MILLER COUNTY BR. NO. 2740017 08-07-18
HANGER 9 North

Hanger cable shifted off saddle. 50% SL to 1 cable.



MILLER COUNTY BR. NO. 2740017 08-08-18
HANGER 9 North

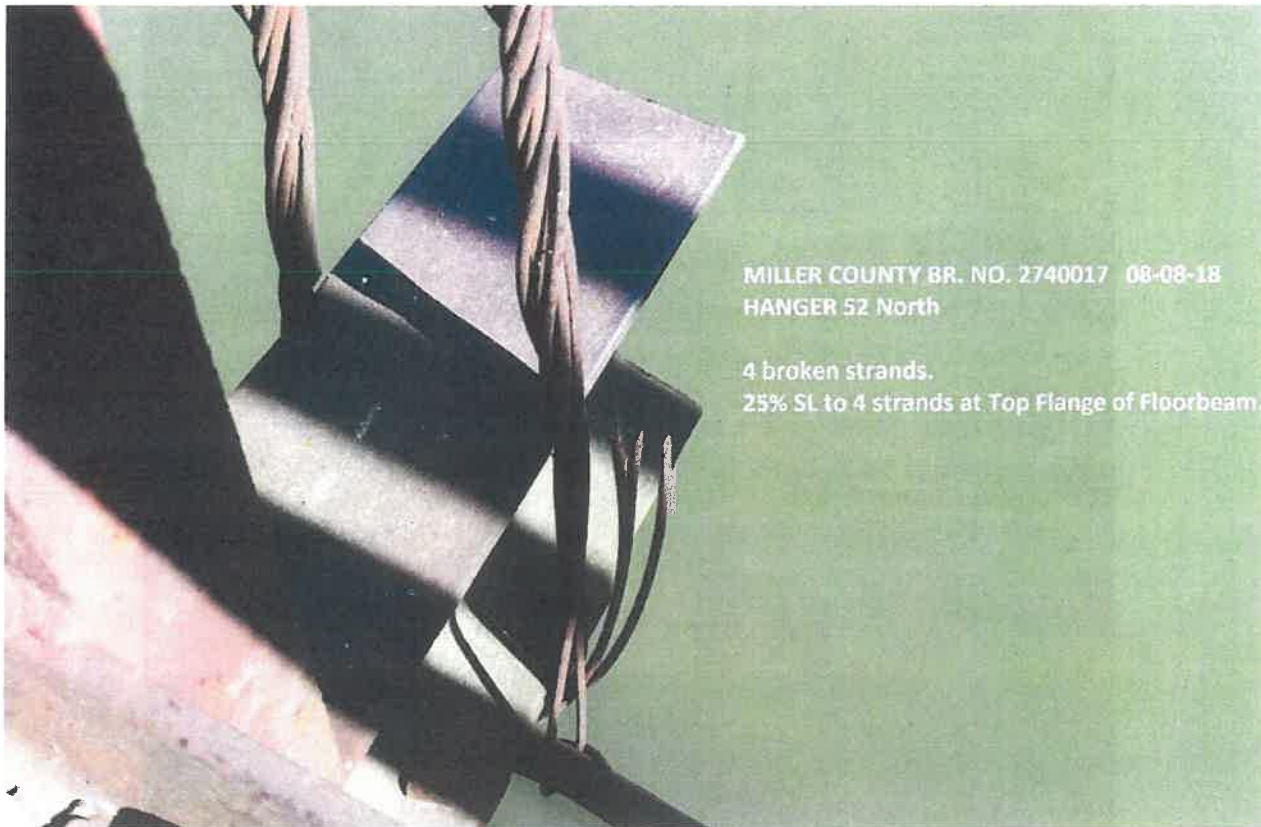
2 broad cables 25% SL to edge of floorbeam.

HANGER CABLES: (cont.)



MILLER COUNTY BR. NO. 2740017 08-08-18
HANGER 48 North

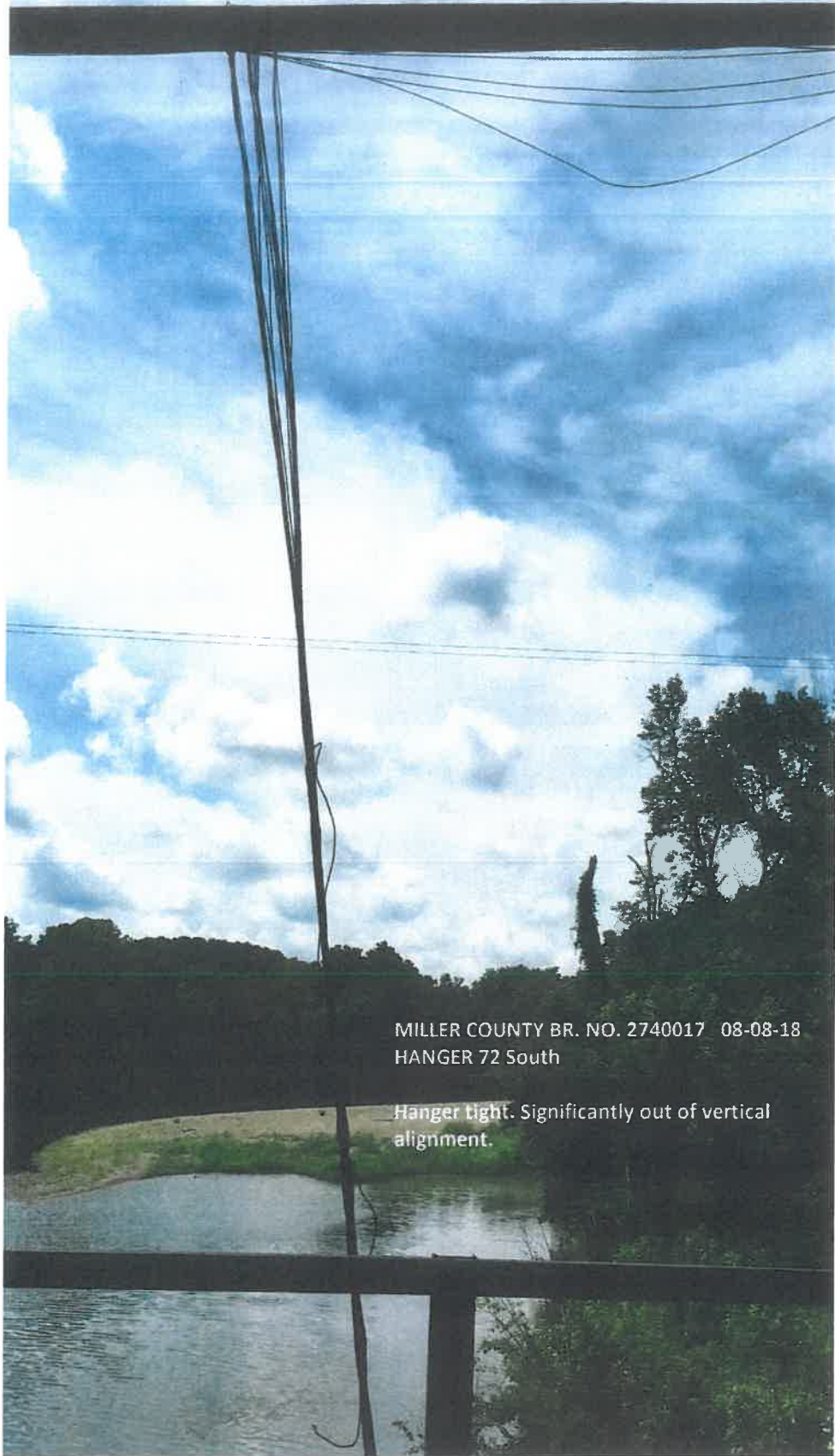
4 broken strands.
25% SL to 4 strands at Top Flange of Floorbeam.



MILLER COUNTY BR. NO. 2740017 08-08-18
HANGER 52 North

4 broken strands.
25% SL to 4 strands at Top Flange of Floorbeam.

HANGER CABLES: (cont.)



MILLER COUNTY BR. NO. 2740017 08-08-18
HANGER 72 South

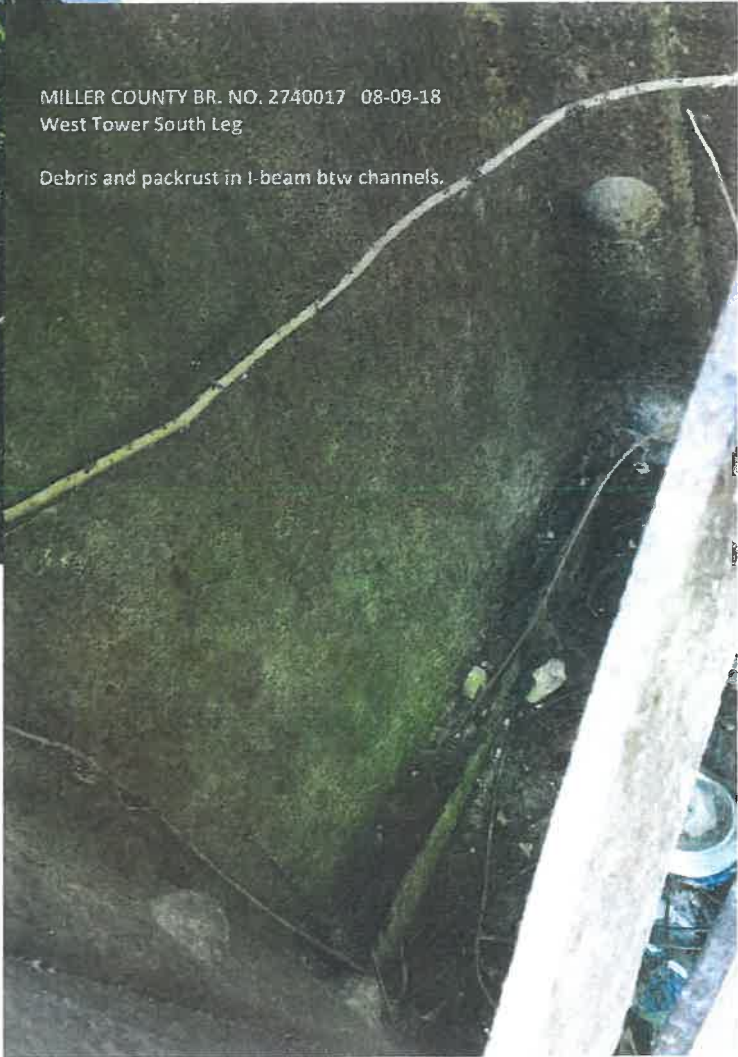
Hanger tight. Significantly out of vertical alignment.

SUSPENSION TOWERS



MILLER COUNTY BR. NO.
2740017 08-09-18
West Tower South Leg

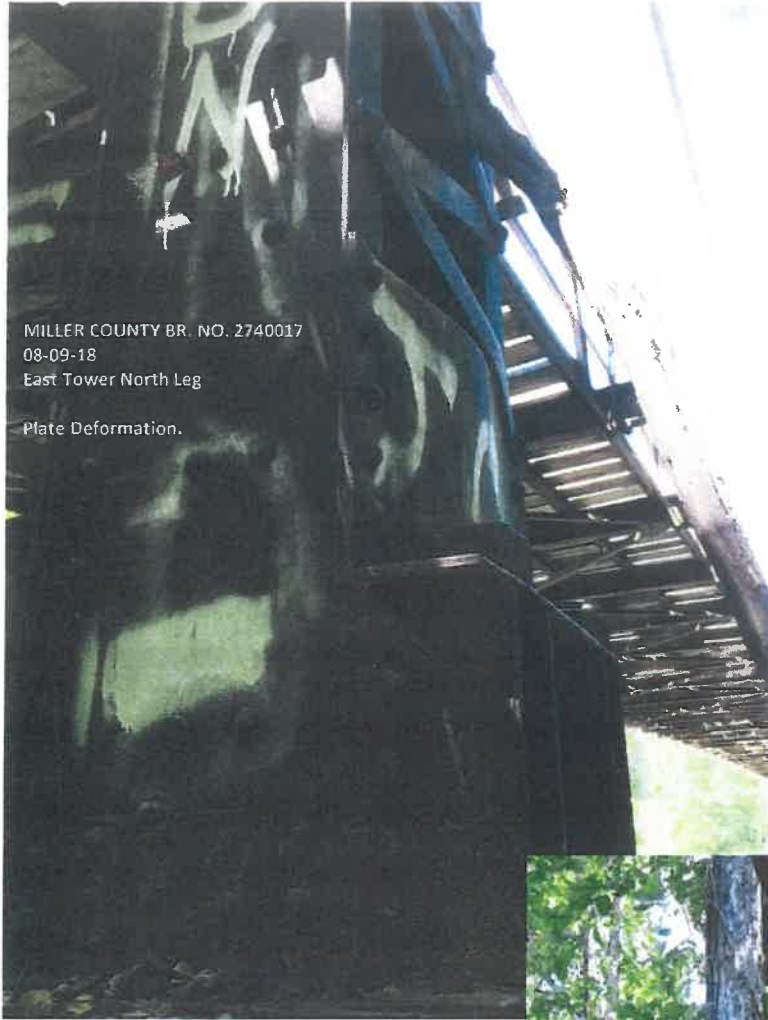
General View.



MILLER COUNTY BR. NO. 2740017 08-09-18
West Tower South Leg

Debris and packrust in I-beam btw channels.

SUSPENSION TOWERS: (cont.)

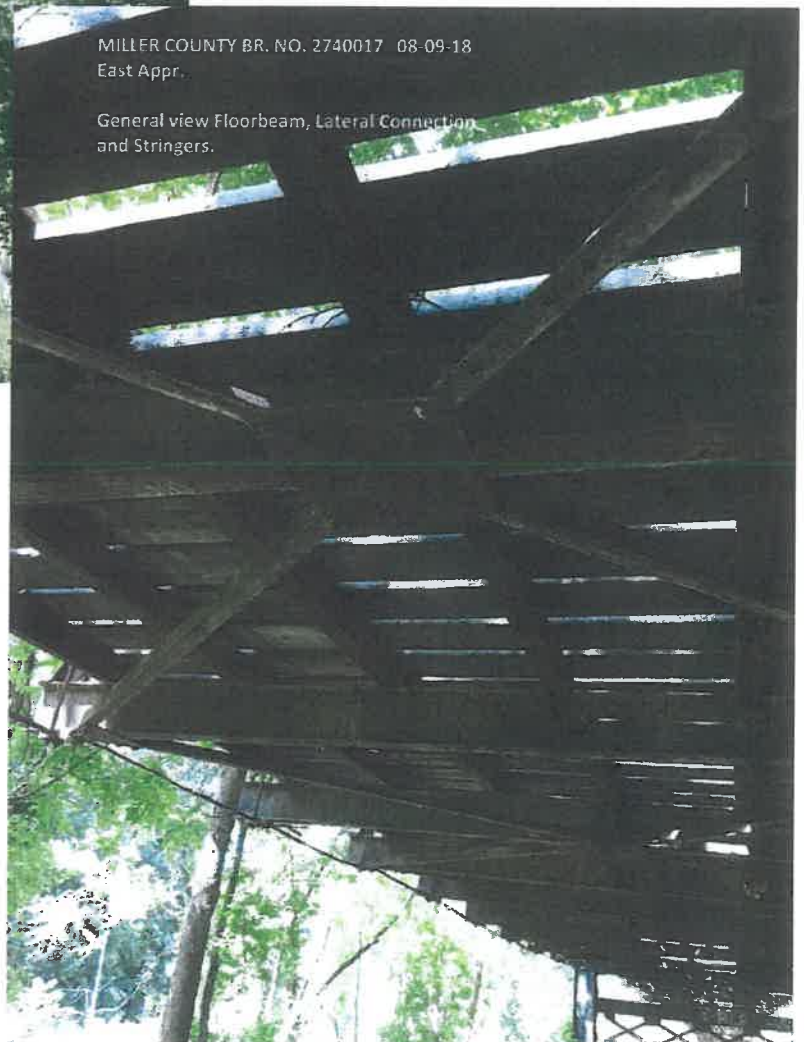


MILLER COUNTY BR. NO. 2740017
08-09-18
East Tower North Leg
Plate Deformation.



MILLER COUNTY BR. NO. 2740017 08-09-18
East Tower North Leg
Missing Anchor Bolt.

FLOOR BEAMS AND STRINGERS



FLOOR BEAMS AND STRINGERS: (cont.)

