Sunshine Bridge Emergency Repair

Southeast Bridge Preservation Partnership
Baton Rouge, Louisiana
4/17/2019

Zhengzheng (Jenny) Fu, P.E.
LADOTD Bridge Design Administrator

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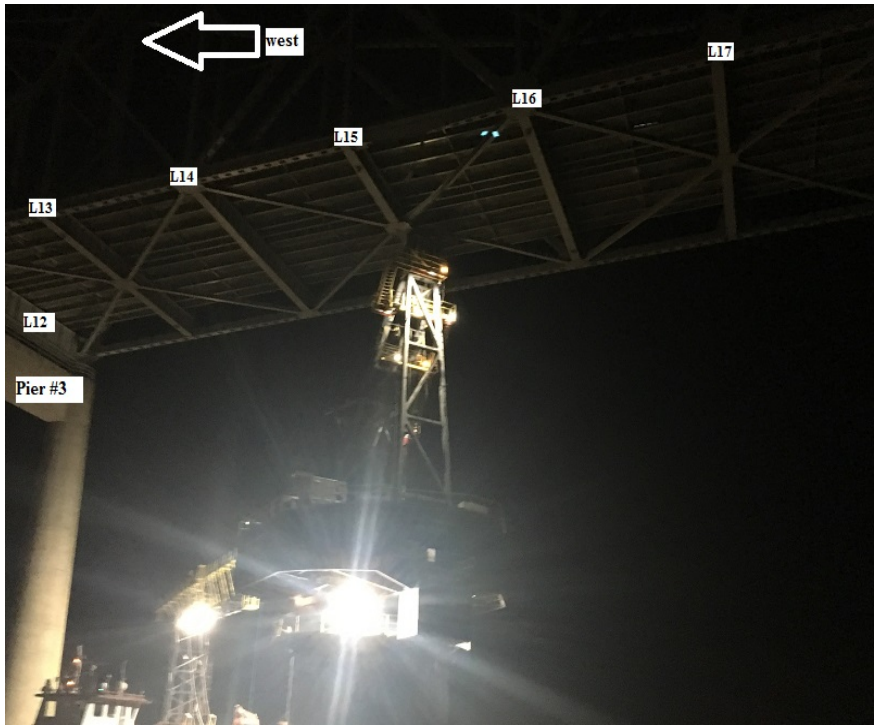
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

OUTLINE

- Damages
- Repair
- Project Team
- Timeline

Damages

10/12/18 ~3:00am Sunshine Bridge was hit



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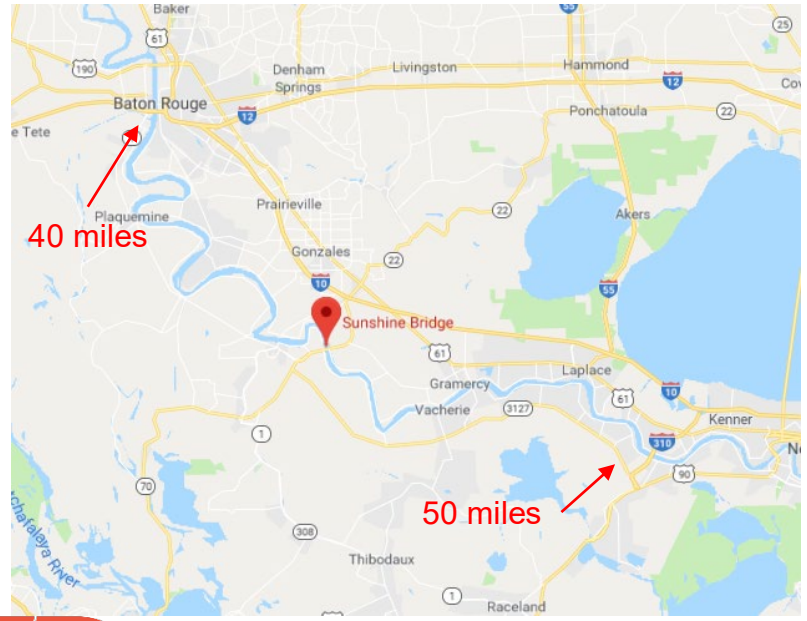

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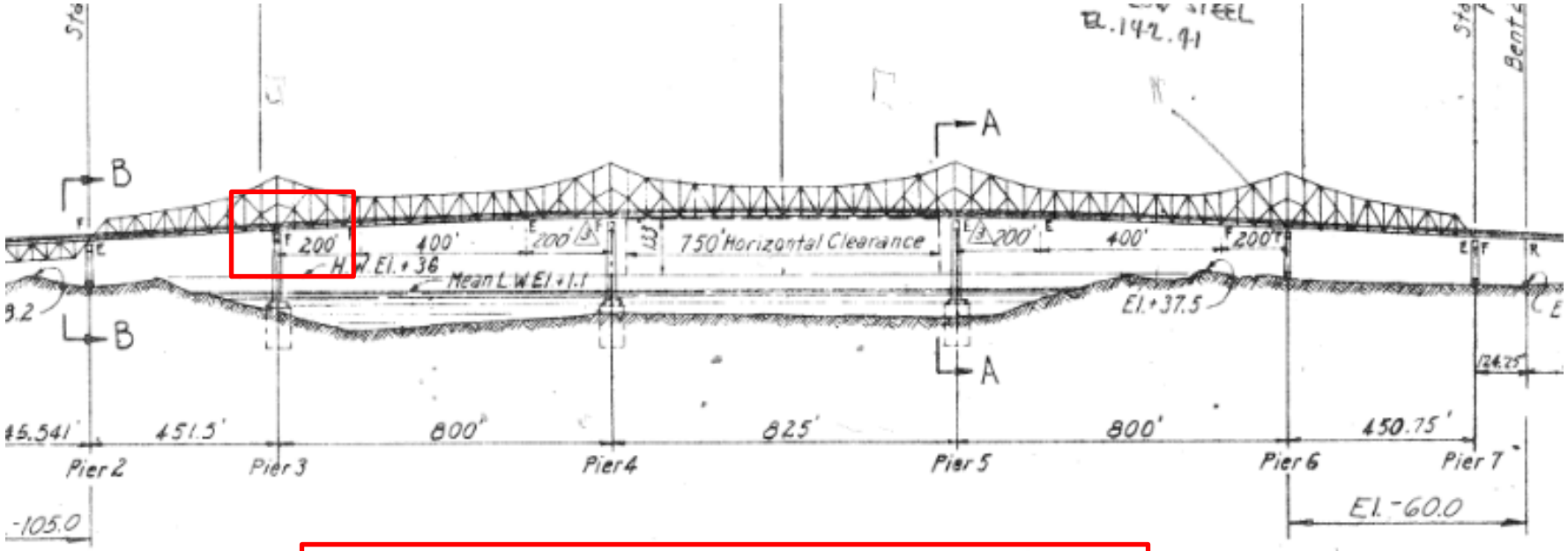

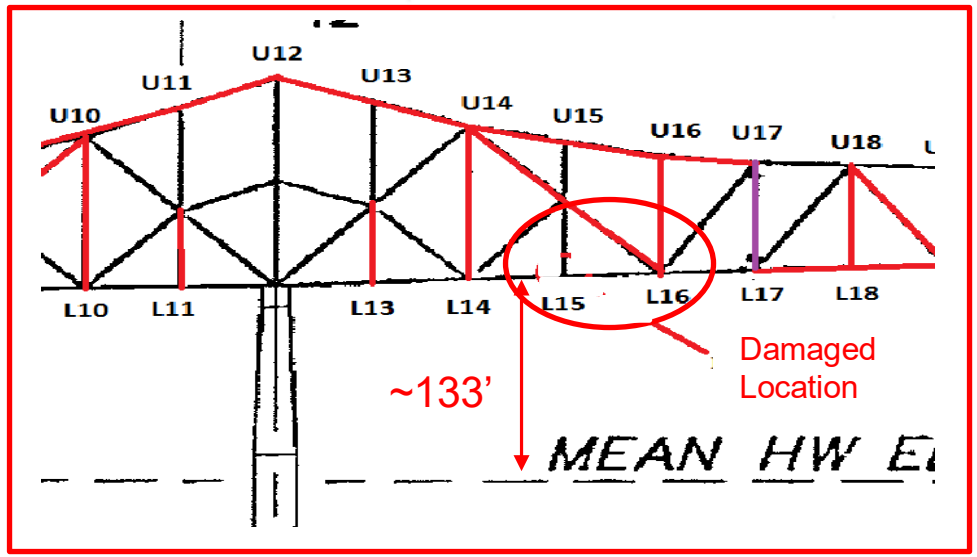

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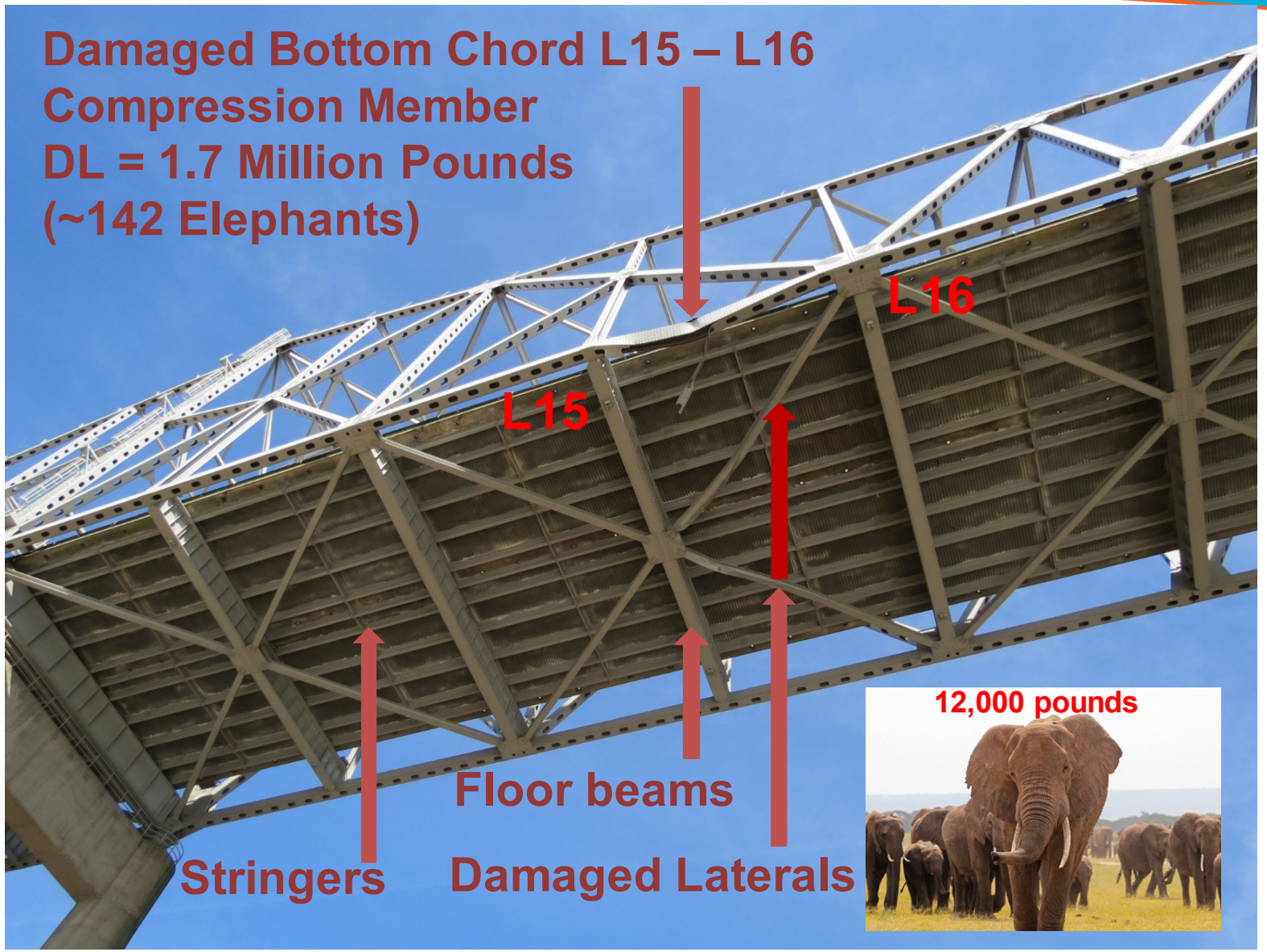

Where did these elephants go after impact?
How many trapped in the damaged chord?

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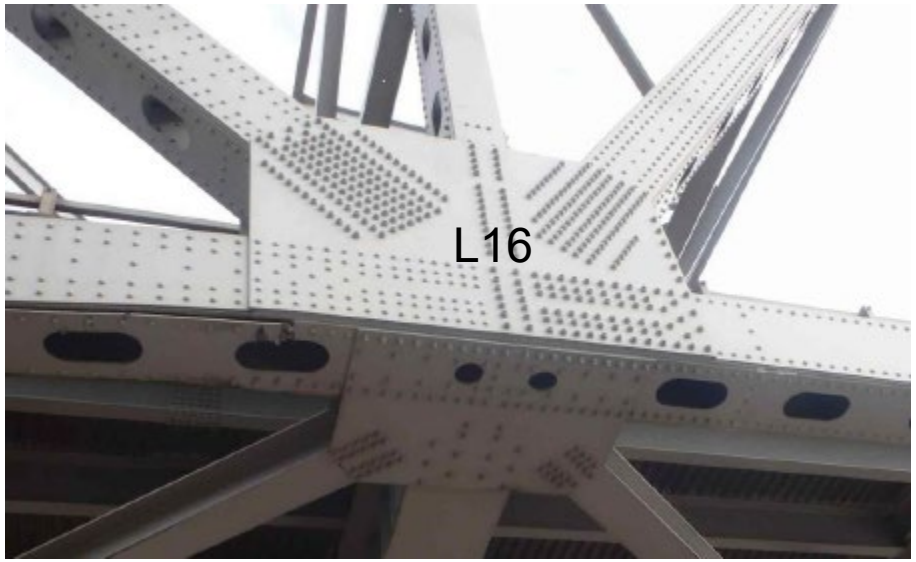
Damaged Bottom Chord
Damaged Laterals



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49 locations

160+ misc. damages

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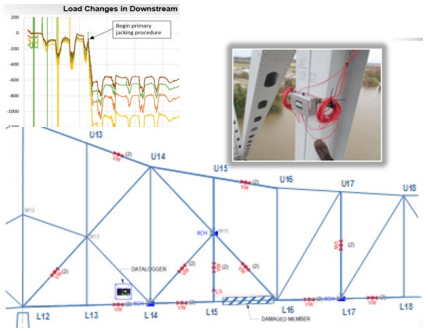
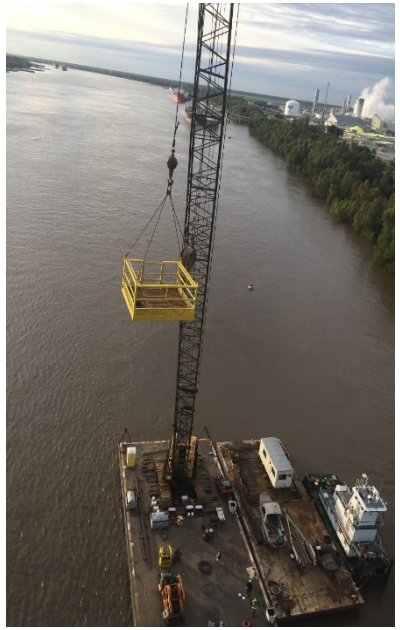
Repair





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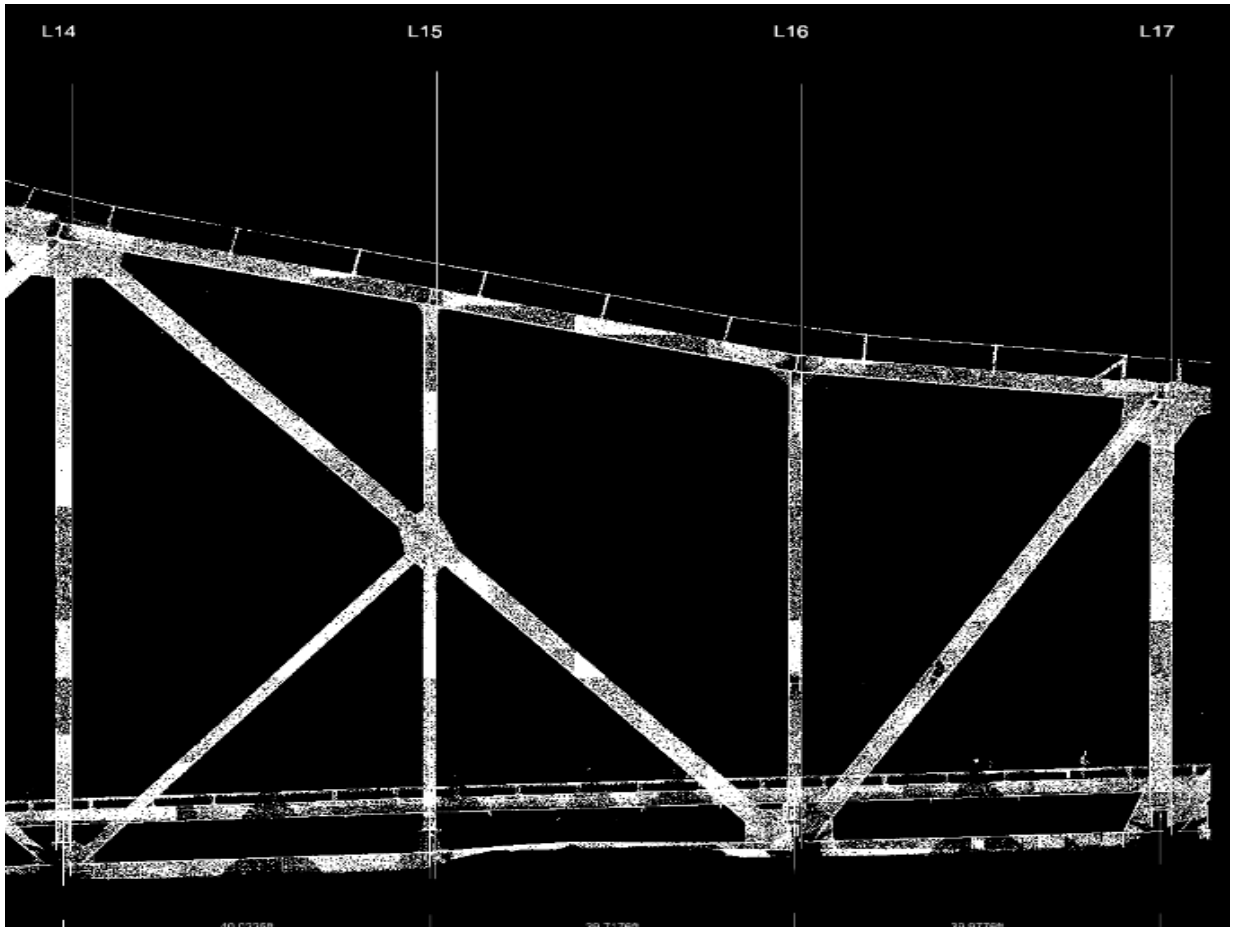

L15 (39.72’) L16 (40’) L17

Panel between L15 – L16 Shorten by ~ 3 3/8”’

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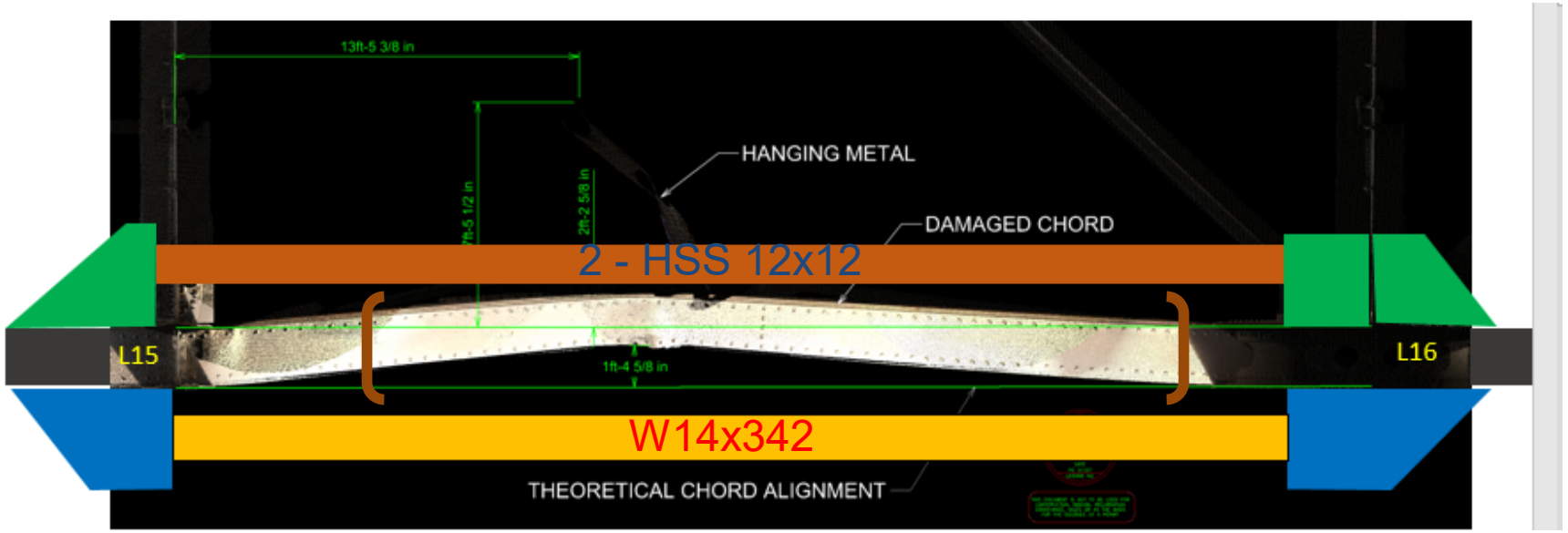
Two Goals

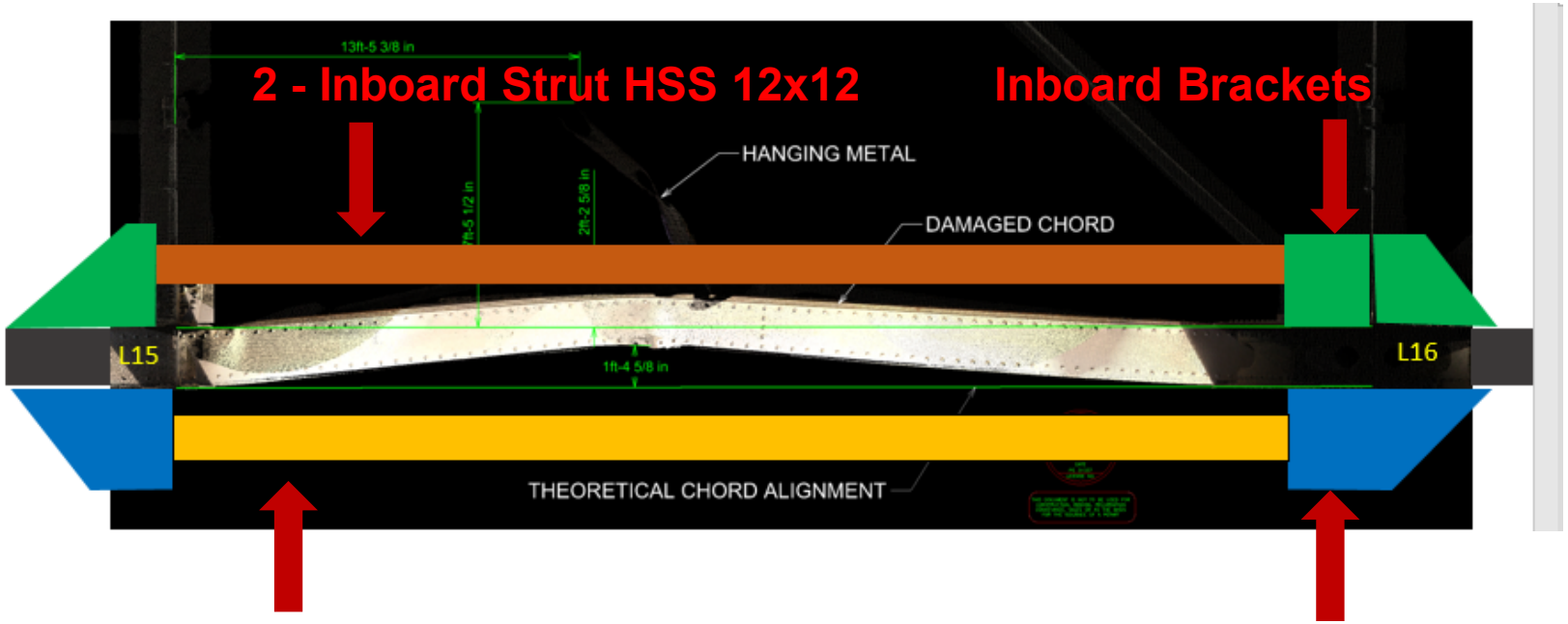
- Restore Original Geometry
- Restore Load – 1700 k or 142



Repair Steps

1. Design and install jacking frame (load bypass system)
2. Cut middle section of damaged chord
3. Heat straightening remaining ends
4. Jacking the structure to original geometry
5. Install replacement chord and splice ends
6. Transfer load from jacking frame to replacement chord

Step 1a – Design Jacking Frame



Jacking System Capacity = 1.5 x 1,700,000 lbs = 2,550,000 lbs

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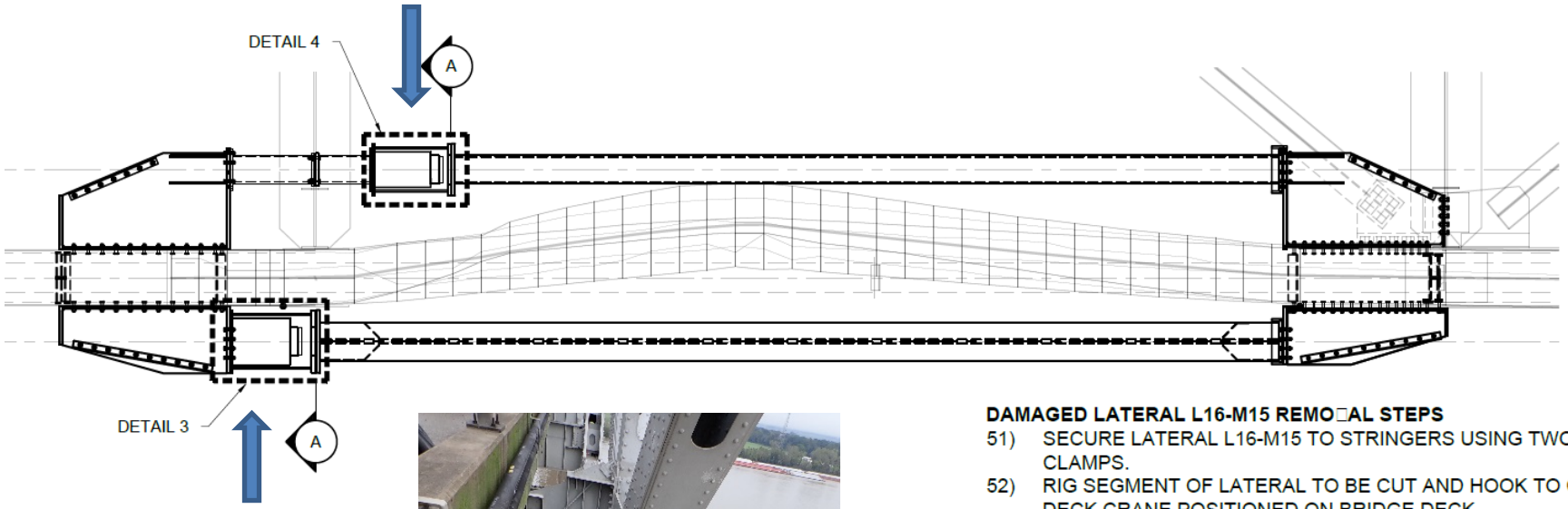
2 - 500 Ton Jacks



1000 Ton Jack

DAMAGED LATERAL L16-M15 REMO□AL STEPS

51) SECURE LATERAL L16-M15 TO STRINGERS USING TWO BEAM CLAMPS.
52) RIG SEGMENT OF LATERAL TO BE CUT AND HOOK TO CARRY DECK CRANE POSITIONED ON BRIDGE DECK.
53) CREATE DOGBONE STRAIN RELIEF PER DETAIL 2 IN LATERAL APPROXIMATELY 3 FT FROM L16 END
54) ADJUST JACK PRESSURES PER PROCEDURE
55) SEVER LATERAL
56) UNBOLT LATERAL AND REMOVE SEGMENT

Installation Procedure 50+ Steps

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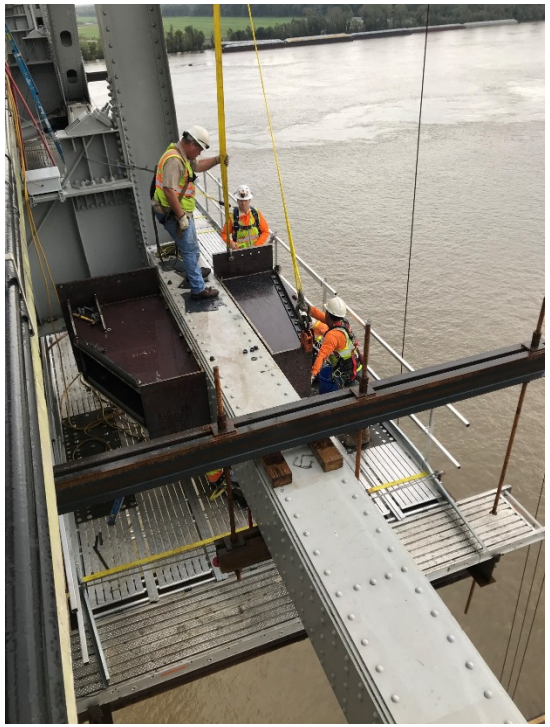

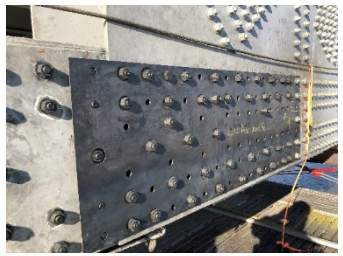

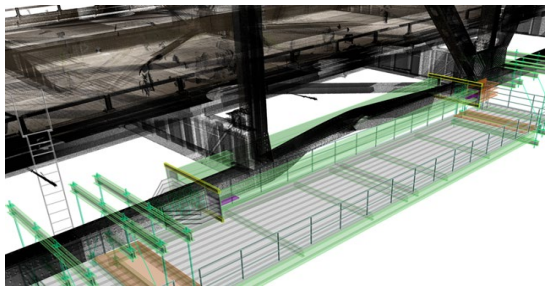

Step 1b – Install Jacking Frame

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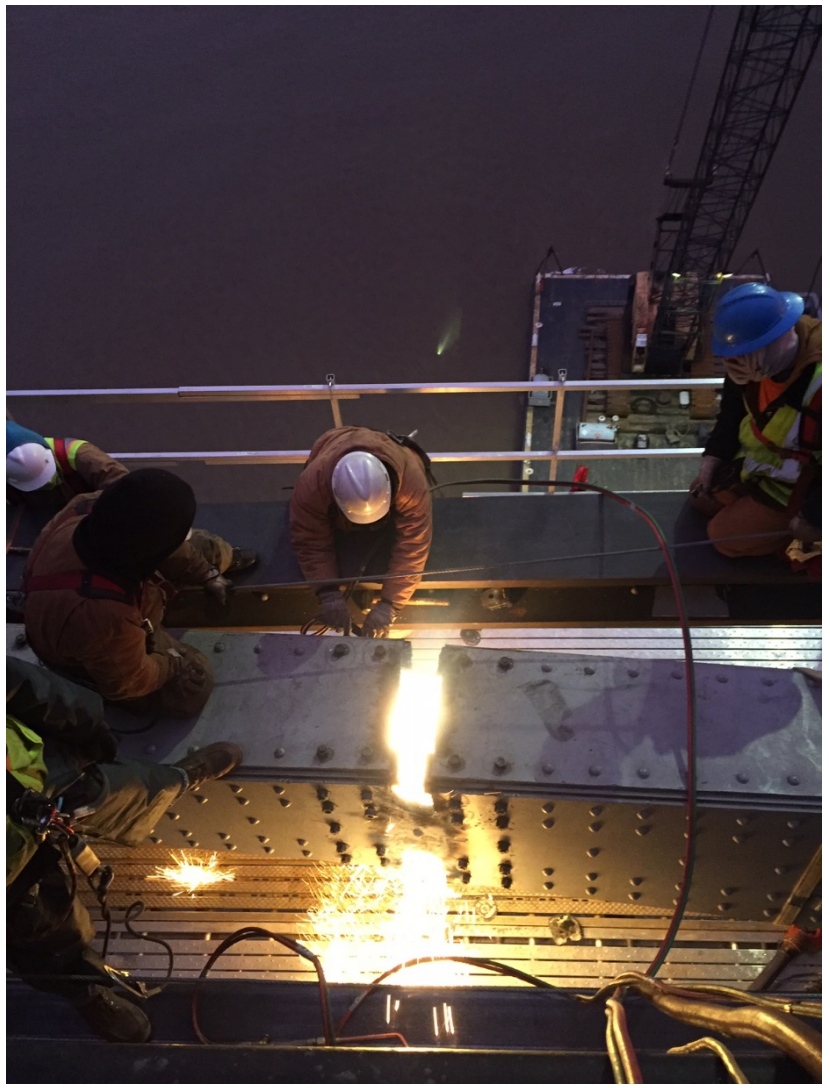

Step 2 – Cut Damaged Chord

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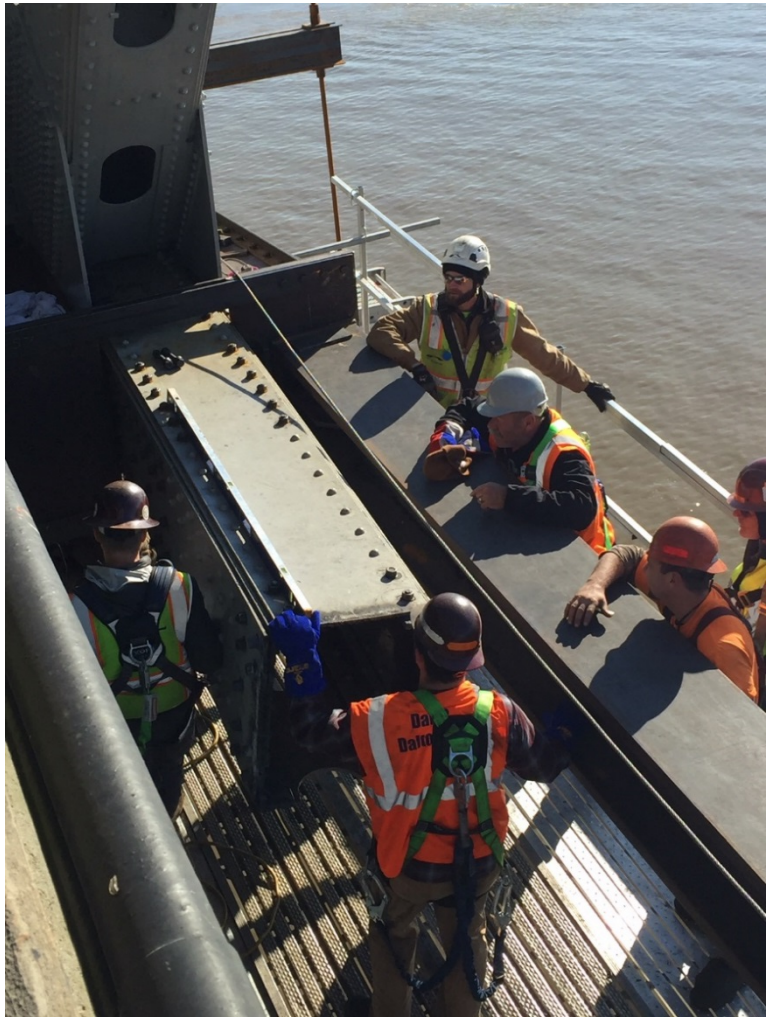

Step 3 – Heat Straightening

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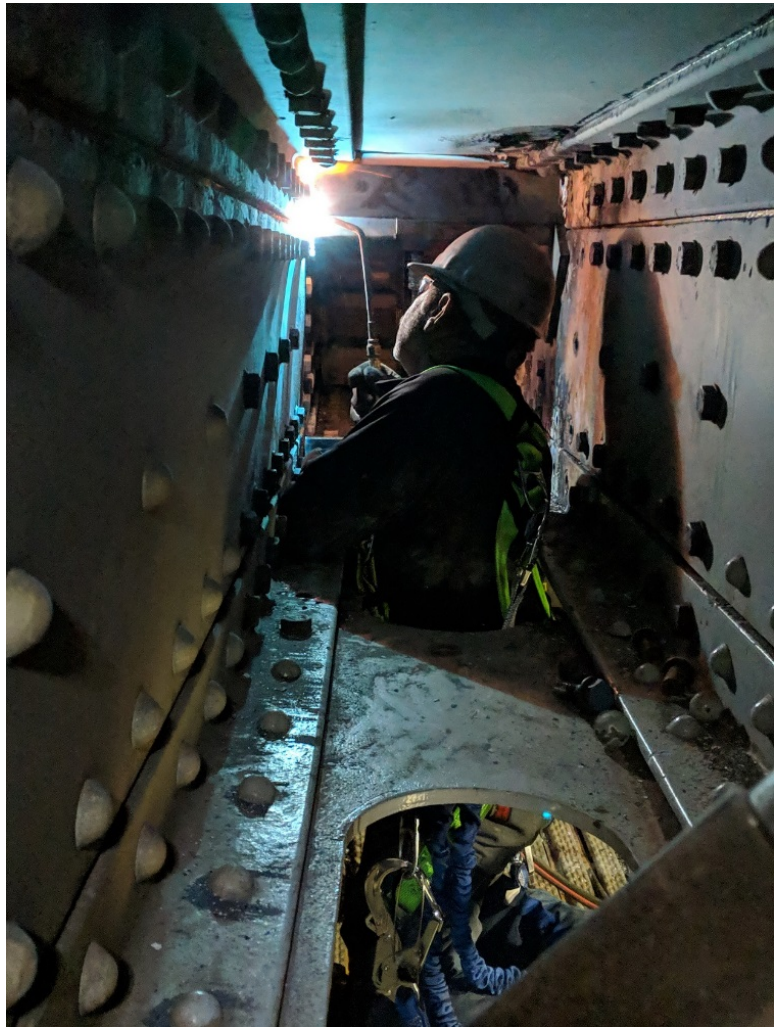

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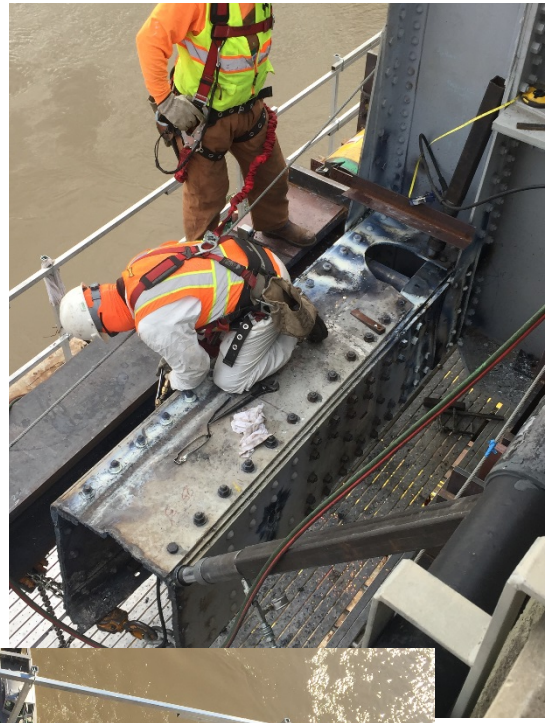

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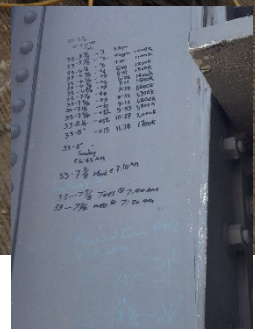

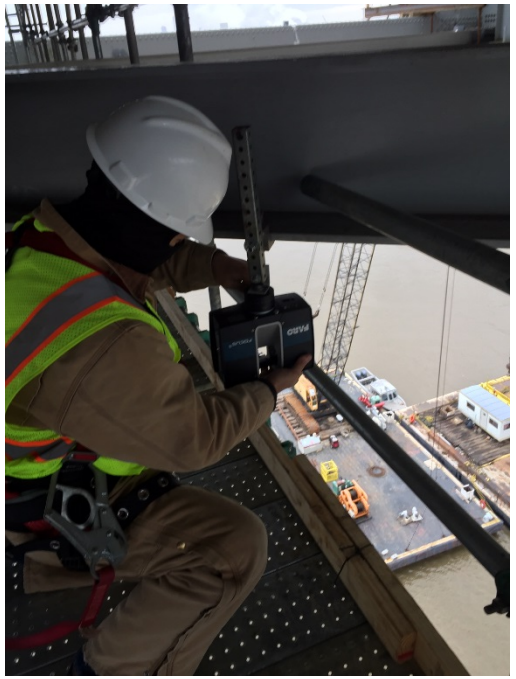

Jacking Up to 2.1 Million Pounds at 50k increments.
Critical, Slow, and Long Process
<u>100+ Steps</u>

Step 4 – Jacking Structure to Original Geometry

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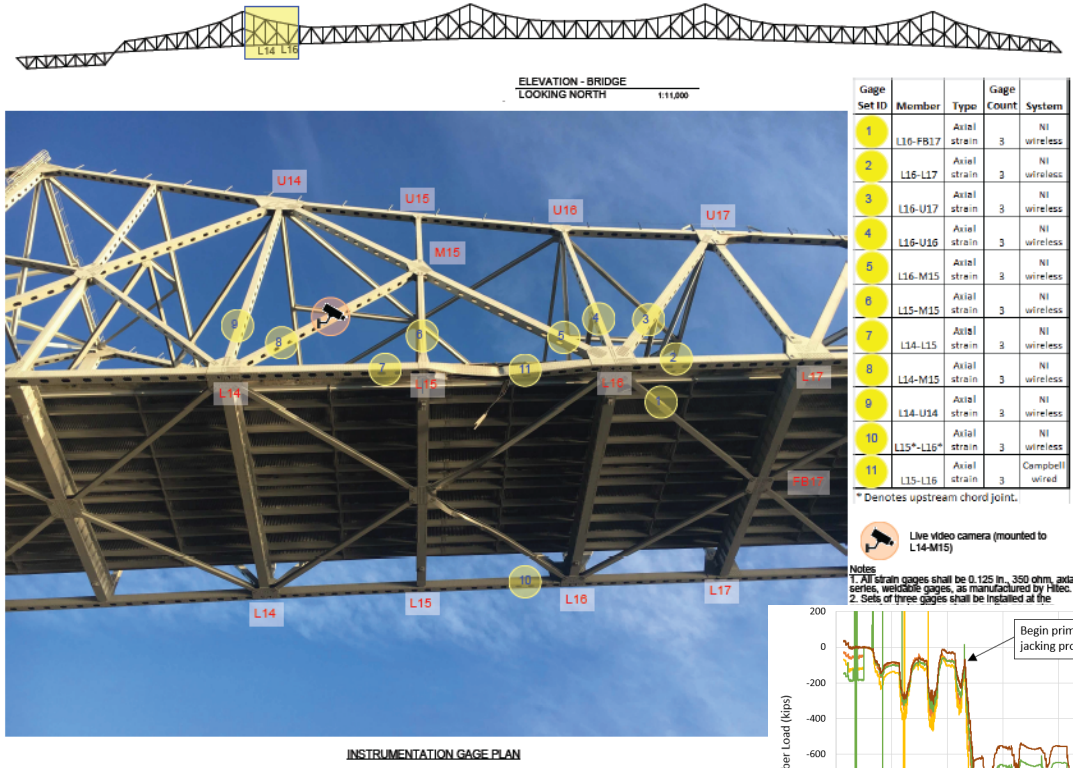
Jacking Monitoring System



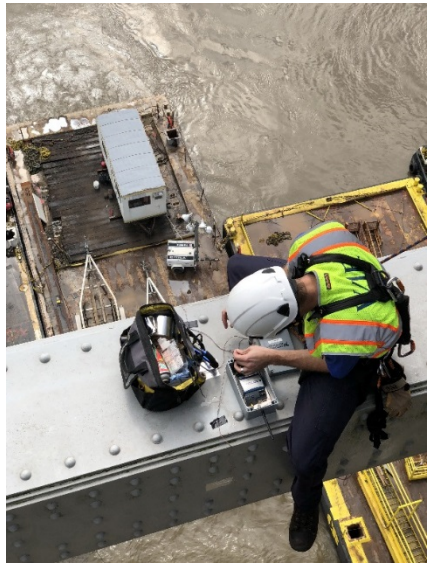
INSTRUMENTATION GAGE PLAN

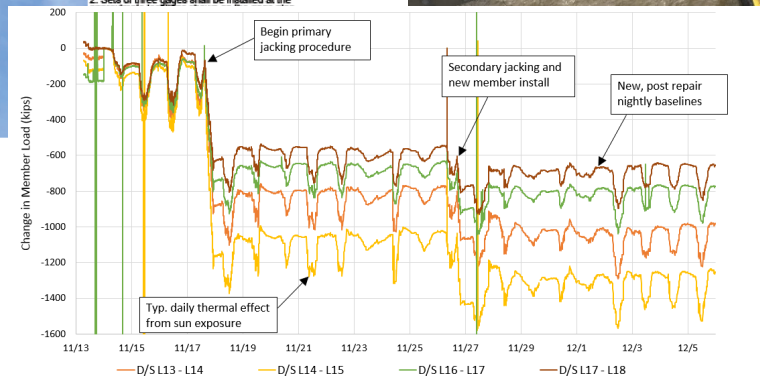
Gage Set ID	Member	Type	Gage Count	System
1	L16-FB17	Axial strain	3	NI wireless
2	L16-L17	Axial strain	3	NI wireless
3	L16-U17	Axial strain	3	NI wireless
4	L16-U16	Axial strain	3	NI wireless
5	L16-M15	Axial strain	3	NI wireless
6	L15-M15	Axial strain	3	NI wireless
7	L14-L15	Axial strain	3	NI wireless
8	L14-M15	Axial strain	3	NI wireless
9	L14-U14	Axial strain	3	NI wireless
10	L15*-L16*	Axial strain	3	NI wireless
11	L15-L16	Axial strain	3	Campbell wired

* Denotes upstream chord joint.

Live video camera (mounted to L14-M15)

Notes
1. All strain gages shall be 0.125 in., 350 ohm, axial series, weldable gages, as manufactured by Hitec.
2. Sets of three gages shall be installed at the





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Step 5a – Install Replacement Chord

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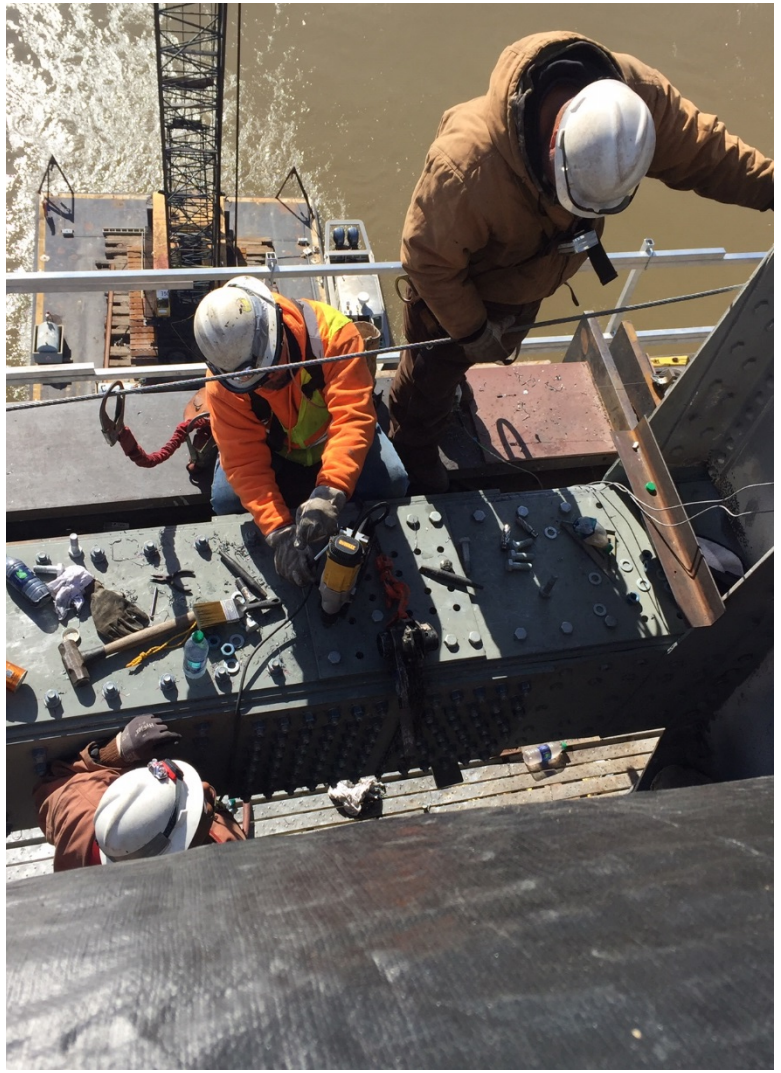

Step 5b – Splice Ends

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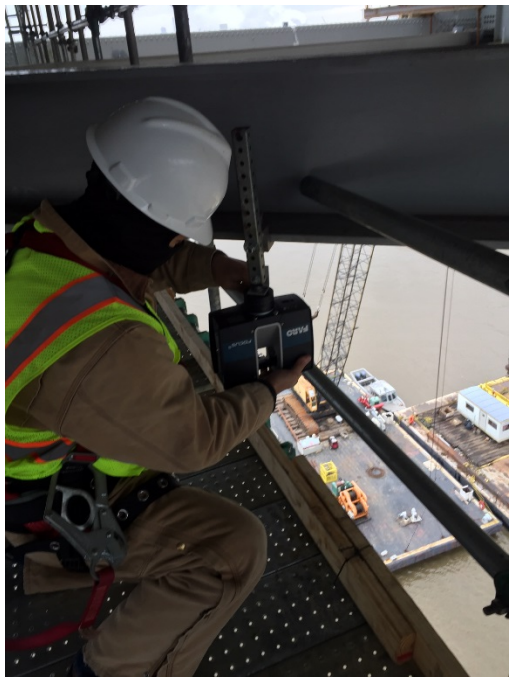

Step 6 – Transfer Load from Jacking System to New Chord

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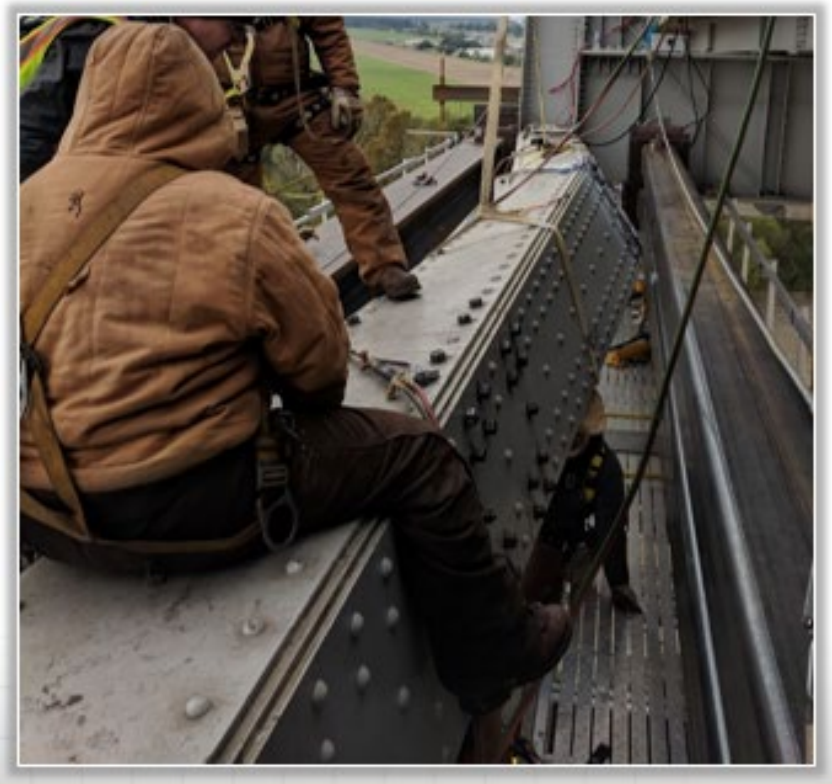
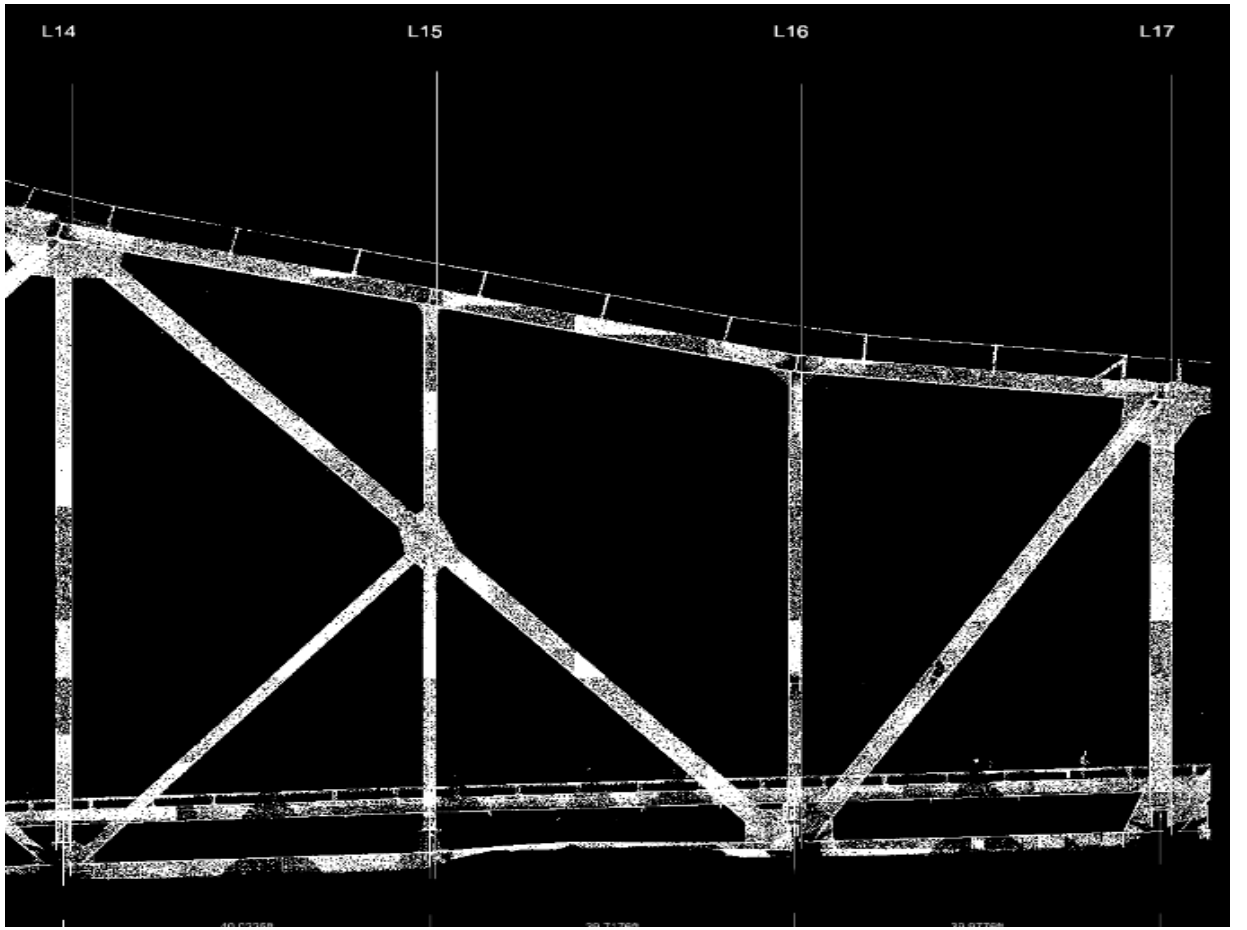
Before and After Photos





L15 (39.72’) L16 (40’) L17

Panel between L15 – L16 Shorten by ~ 3 3/8”’

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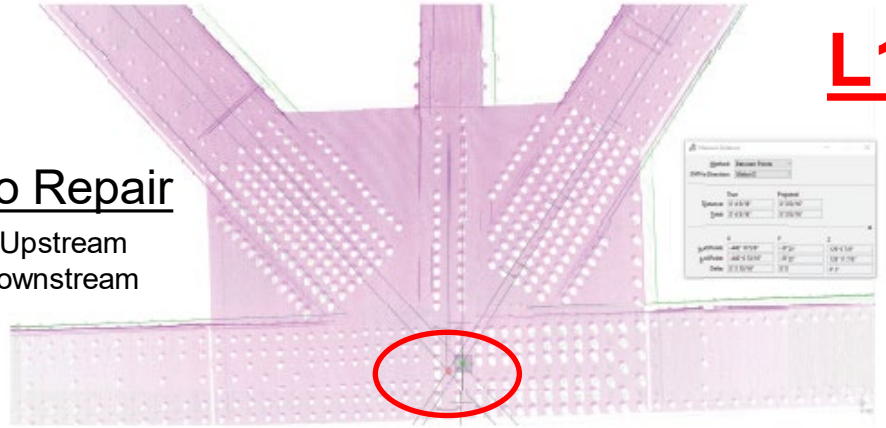
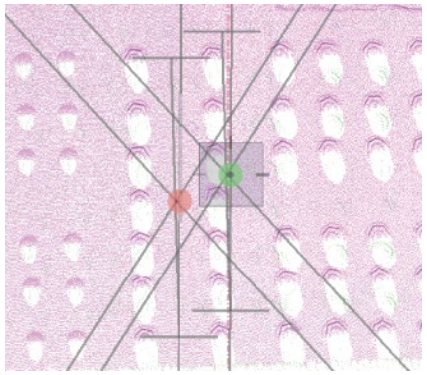
L16

Prior to Repair

Green – Upstream
Pink – Downstream

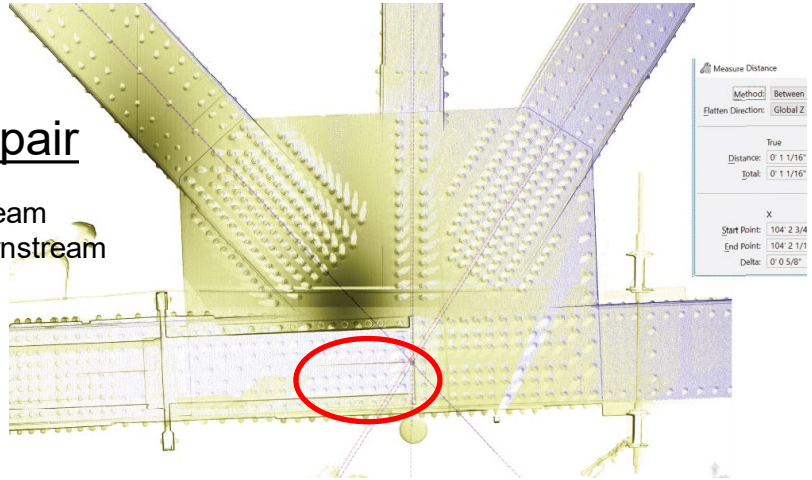


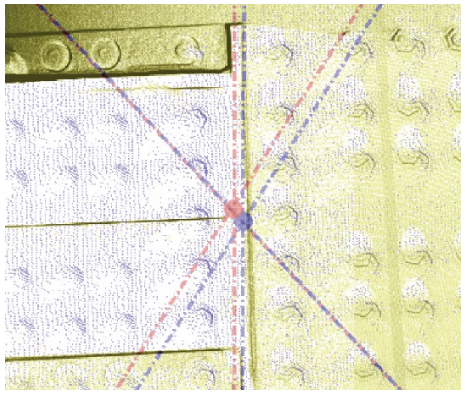


	X	Y	Z
Start Point:	-440' 10 5/8"	-31' 0"	129' 9 7/8"
End Point:	-440' 6 13/16"	-31' 0"	129' 11 7/8"
Delta:	0' 3 13/16"	0' 0"	0' 2"

After Repair

Gold – Upstream
Purple – Downstream





	X	Y	Z
Start Point:	104' 2 3/4"	144' 10 7/8"	-4' 8"
End Point:	104' 2 1/16"	144' 10 7/8"	-4' 7 3/16"
Delta:	0' 0 5/8"	0' 0"	0' 0 13/16"

Geometry Restored

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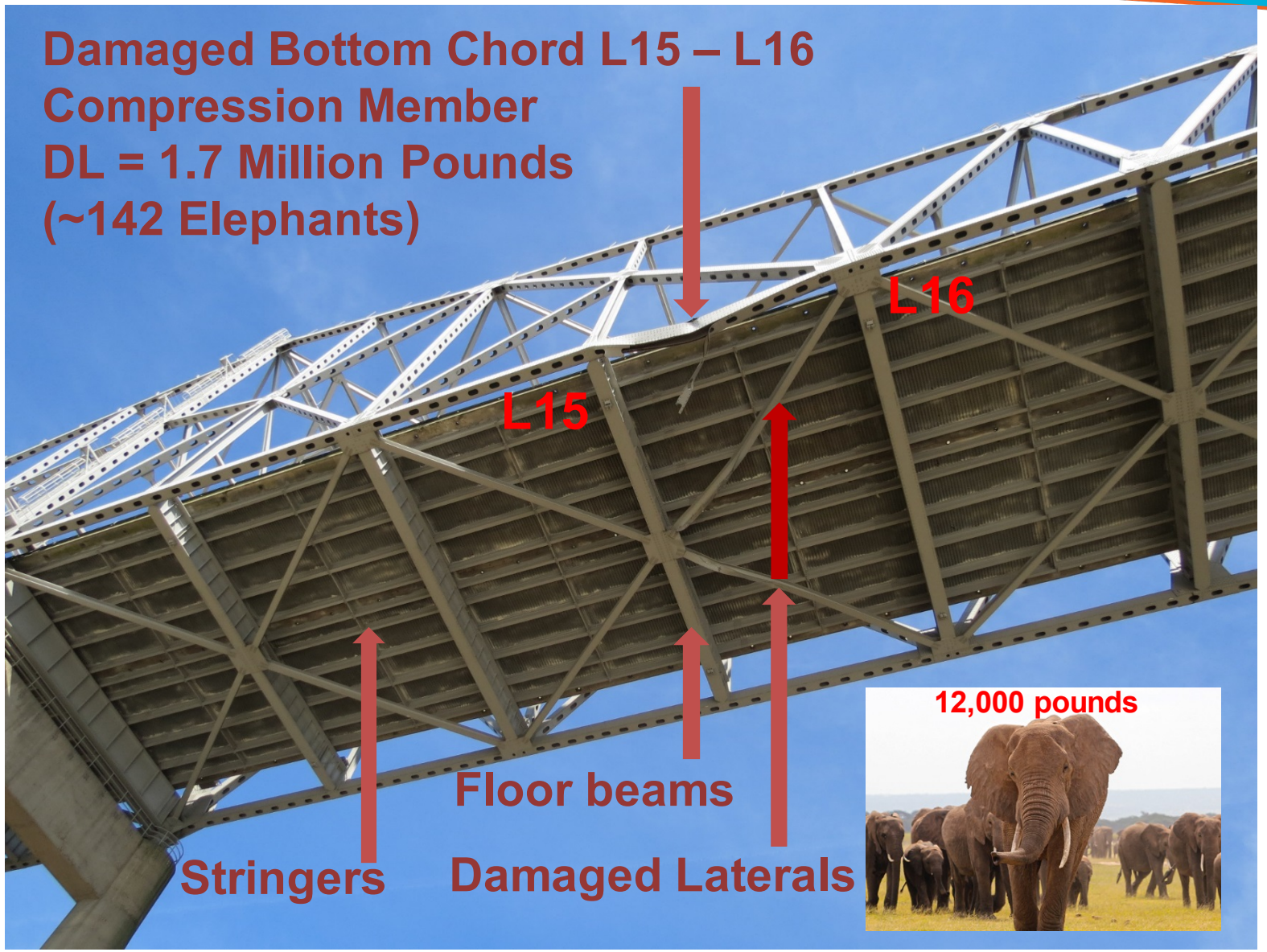

Where did these elephants go after impact?
How many trapped in the damaged chord?

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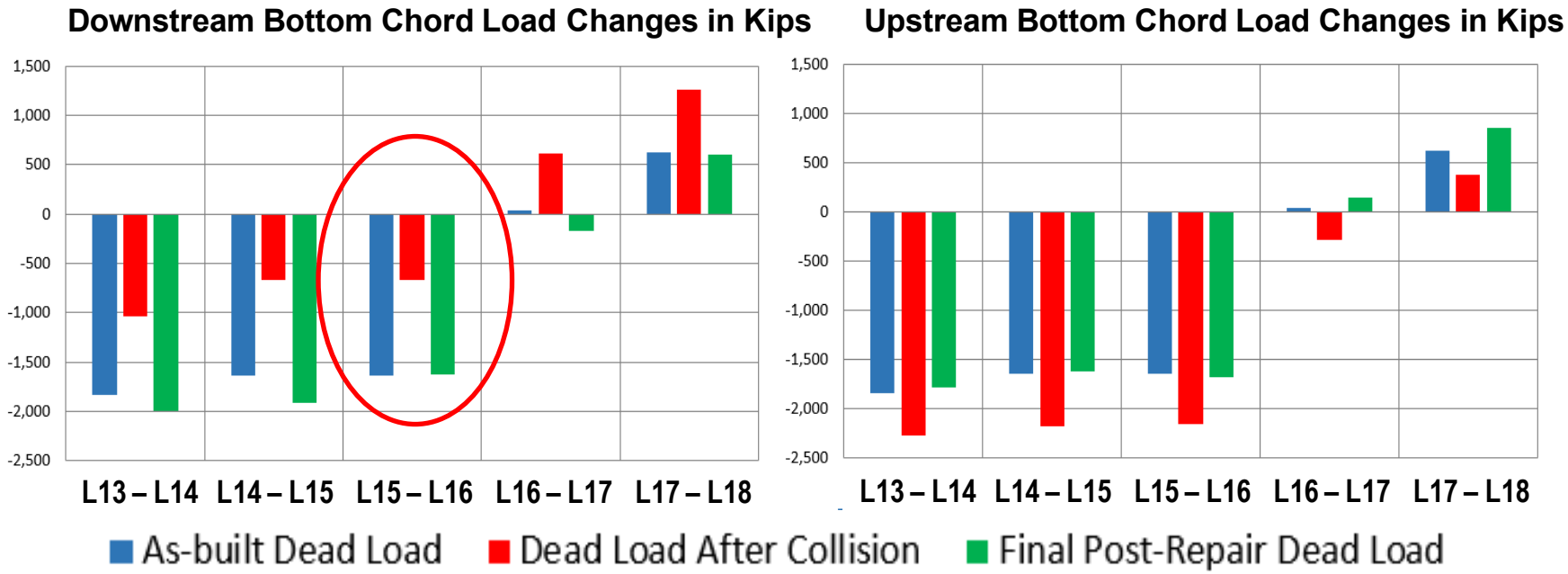

Load Restored

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Barrier Deck Joint at L17 Before and After Repair

Before

After

After 49 days (working 24/7) Sunshine Bridge Reopened to Traffic on 12/1/18

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

Project Team

Design Team

Contractor's Team

GPI

Project Engineer

MODJESKI and MASTERS

CEI

Timeline

- 10/12/2018 (Day 1) Sunshine Bridge was Hit and Closed
- 10/12/2018 (Day 1) Survey, Inspection, Repair Concept Started
- 10/20/2018 (Day 9) Crane Barge and Temp. Access in Place
- 10/22/2018 (Day 11) Repair Concept Verified on Site and Finalized
- 10/26/2018 (Day 16) Primary Work Platform Installed
- 11/04/2018 (Day 24) Jacking Frame Design and Shop Drawings Completed
- 11/08/2018 (Day 28) Jacking Frame Fabricated and Shipped
- 11/13/2018 (Day 32) Jacking Frame Installed
- 11/17/2018 (Day 36) Damaged Chord Removed
- 11/25/2018 (Day 45) Heat Straightening Completed
- 12/01/2018 (Day 49) Replacement Chord in Place; Geometry and Load Restored; Bridge Reopened to Traffic!

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