

**PHYSICAL CONDITION REPORT  
FOR THE 2010 IN-DEPTH INSPECTION**

**LORAIN-CARNEGIE BRIDGE**

**BR#: CUY-10-1613**

**SFN: 1801503**

**OHIO DEPARTMENT OF TRANSPORTATION**

**DISTRICT 12**

**PID #87601**



**Inspected: September 21 through December 17, 2010**  
**Report: March 23, 2011**



**IN-DEPTH PHYSICAL CONDITION REPORT  
Of The  
LORAIN-CARNEGIE BRIDGE  
S.R. 10**

**BRIDGE NO. CUY-10-1613  
SFN: 1801503**

**CLEVELAND, OHIO**

**Prepared by:**

Anthony D. Koloze, EI \_\_\_\_\_

**Reviewed by:**

Wesley R. Weir, PE \_\_\_\_\_  
OH PE#: 69991

Inspected on:

September 21 through December 17, 2010

Inspected by:  
Wesley R. Weir, PE  
Carolyn Guion, PE  
Anthony Koloze, EI  
Donald Cartwright, EI  
Nicholas Fisco, EI  
Jeffrey Hill, EI  
Kevin Williams

Prepared for:

**OHIO DEPARTMENT OF TRANSPORTATION  
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Report Submitted March 23, 2011

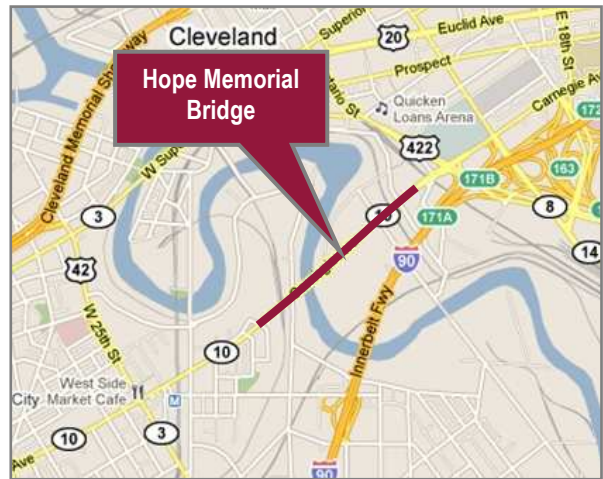
TranSystems  
55 Public Square, Suite 1900  
Cleveland, OH 44113

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## BRIDGE DESCRIPTION

The CUY-10-1613 (Hope Memorial) Bridge carries four lanes of State Route 10 traffic, 3200 feet through downtown Cleveland, over numerous local streets, Norfolk Southern/CSX railroad tracks and the Cuyahoga River. Constructed in 1932, the bridge was originally intended to carry two rapid tracks on a lower deck as well as a utility deck for truck access. The main truss spans include a 13 span cantilevered Pratt deck truss consisting of 4 truss lines and a 3 truss line simply supported Pratt deck truss at the east end of the bridge (See Figures 1 and 2). Approach spans consist of a cellular unit at the east end of the bridge and steel beam simple spans at the west end, supported by both steel bents and concrete piers.



Location Map

The horizontal alignment of the Lorain-Carnegie Bridge does not vary over the length of the structure. The nomenclature for the bridge follows ODOT standards and is oriented from west to east. The four truss lines are labeled A through D with A being the northernmost truss. Gusset plate nomenclature is based on the shop drawings. The labels consist of truss letter (A through D), upper or lower (U or L), panel point number, and north or south plate (N or S). Site plans of the structure with the sections labeled can be found in Appendix A.

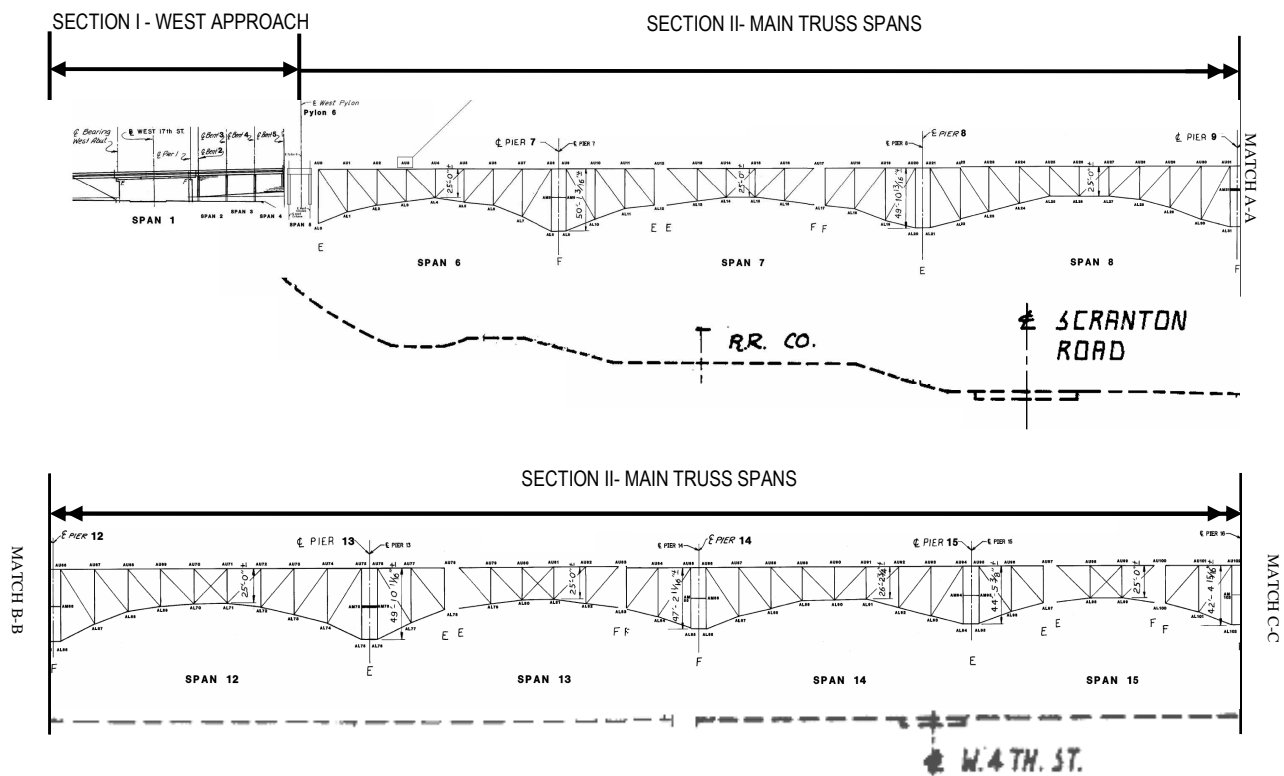


Figure 1 – Partial south elevation of the Lorain-Carnegie Bridge.

## INSPECTION PROCEDURE

An in-depth inspection of the structure was performed between September 21 and December 17, 2010. The inspection findings were recorded on bridge specific field inspection forms. Field sketches were prepared to detail specific conditions. Color digital photographs were taken to document areas of deterioration as well as typical details of the structure. In order to achieve the hands-on access required for this type of inspection, ladders, a 42' aerial bucket truck, a 35' towable boom lift, a UB-50 under bridge inspection unit, and modified technical climbing were utilized. An underwater inspection was performed by KCI Associates of Ohio.

## INSPECTION TEAM

The inspection team members are as follows:

- Wesley R. Weir, PE – TranSystems
- Carolyn Guion, PE – TranSystems
- Anthony Koloze, EI – TranSystems
- Donald Cartwright, EI – TranSystems
- Nicholas Fisco, EI – TranSystems
- Jeff Hill, EI – TranSystems
- Kevin Williams – TranSystems
- Rich Spino, EI – Proudfoot
- Pat Luginbihl – Proudfoot

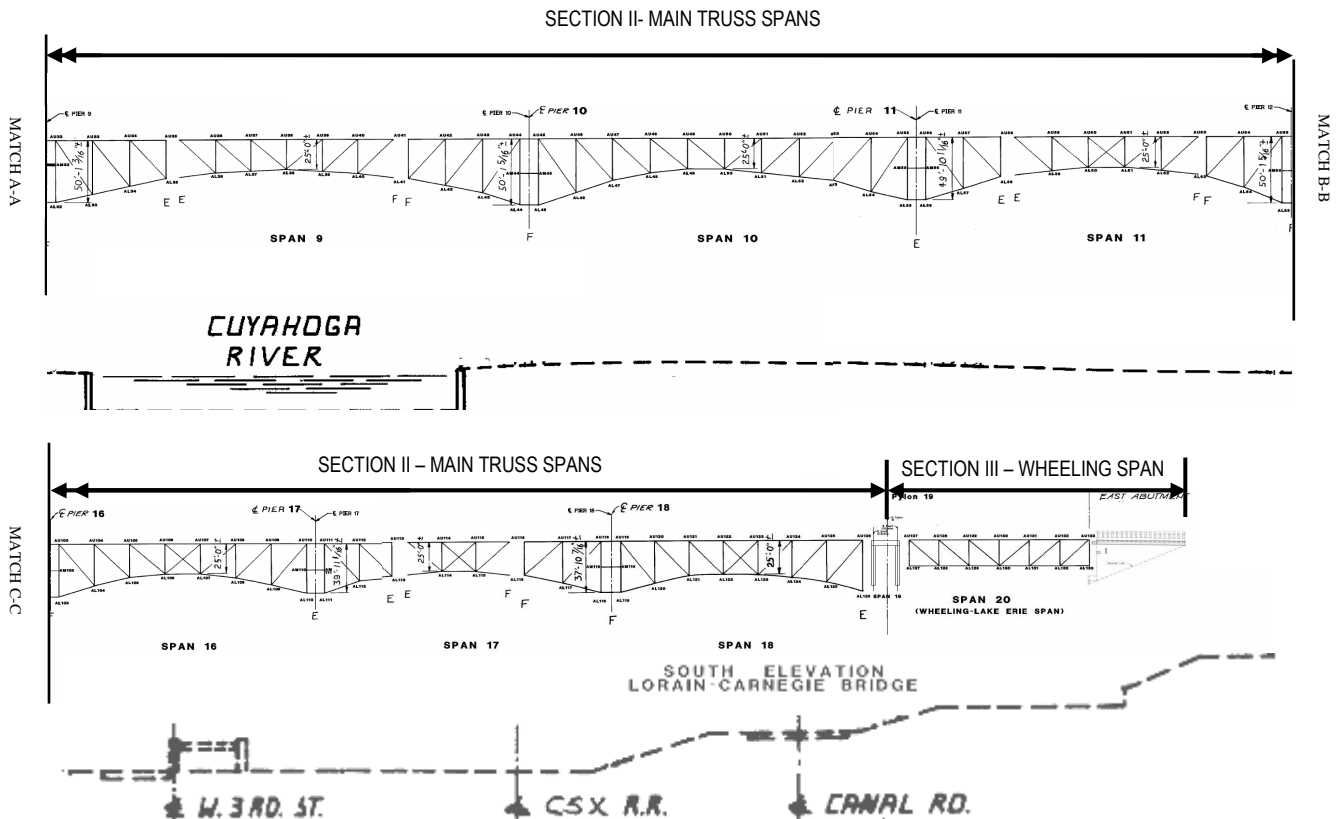


Figure 2 – Partial south elevation of the Lorain-Carnegie Bridge.

**CONDITION RATING**

State and federal guidelines for evaluating the condition of bridges have been developed to promote uniformity in the inspections performed by different teams and at different times. Condition ratings are used to describe the existing, in-place bridge as compared to the as-built condition. The following table was used as a guide in evaluating the condition of the various fracture critical members of the bridge.

INDIVIDUAL ITEMS (ODOT)	SUMMARY ITEMS (NBIS)	CONDITION	DEFECTS
1 GOOD	9	Excellent	Excellent condition.
	8	Very Good	No problem noted.
	7	Good	Some minor problems.
2 FAIR	6	Satisfactory	Structural elements show some minor deterioration.
	5	Fair	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
3 POOR	4	Poor	Advanced section loss, deterioration, spalling or scour.
	3	Serious	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
4 CRITICAL	2	Critical	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action.
	1	"Imminent" Failure	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put it back in light service.
	0	Failed	Out of service - beyond corrective action.

The inspection of this bridge was performed in accordance with the following documents:

1. *Bridge Inspection Manual*, Ohio Department of Transportation (ODOT), 2006.
2. *Manual for Condition Evaluation of Bridges, 2<sup>nd</sup> Edition*, American Association of State Highway and Transportation Officials (AASHTO), 2000.
3. *Bridge Inspector's Reference Manual*, U. S. Department of Transportation, 2002 (rev 2006).
4. *Inspection of Fracture Critical Bridge Members*, U.S. Department of Transportation, 1986.
5. *National Bridge Inspection Standards*, U.S. Department of Transportation, 2004.
6. *Manual for Inspecting Bridges for Fatigue Damage Conditions*, Commonwealth of Pennsylvania Department of Transportation, 1990

## ITEM 8 - DECK SUMMARY

The deck is in SATISFACTORY CONDITION [6-NBIS] with spalls noted on the deck underside with exposed rebar. Typically these spalls have been sealed. Transverse cracks are present at ten foot spacing. Expansion joints are typically leaking with isolated torn glands.

### ITEM 1 - FLOOR

The bridge floor is in FAIR CONDITION [2] overall with spalls and exposed rebar noted on the roadway deck underside. The utility deck exhibits spalls adjacent to floor beam top flanges. Both decks exhibit hairline cracks with efflorescence spaced at approximately 10'.

#### Roadway Deck

Spalls with exposed reinforcing bars were noted over five percent of the roadway deck underside (**see photo 1**). The majority of spalls with exposed rebar have been patched or sealed. Isolated patches are starting to delaminate. Transverse hairline cracks with efflorescence were noted on the roadway deck underside at 10' spacing. Isolated locations exhibit stalactite formations above the exterior trusses (**see photo 2**).

#### Utility Deck

The utility deck underside exhibits haunch spalls, delaminations and cracks primarily located adjacent to floor beams. This condition is typical throughout and has increased since the last inspection. The majority of utility deck spalls are associated with 1" to 2" thick concrete that was poured below the underside of the top flange of the floor beam (**see photo 3**). Incipient spalls that were potential falling hazards were removed at the time of the inspection. A detailed layout of bays with full and partial haunch spalls can be found in **Appendix C**.

Transverse hairline cracks with efflorescence were noted at 10' spacing throughout the utility deck underside.



Photo 1 – Span 9 between FB 33 and FB34 roadway deck underside. Note several spalls have been sealed.



Photo 2 – Isolated location exhibiting a stalactite formation dripping onto Truss D at Panel Point DU47.



Photo 3 – Typical utility deck haunch spall adjacent to floor beam 53 top flange in Bay 5.

## ITEM 2 - WEARING SURFACE

The wearing surface is in GOOD CONDITION [1] with isolated hairline map cracking and areas exhibiting minor wear throughout the length of the structure (see photo 4).



Photo 4 – Isolated area of worn wearing surface in bike lane.

## ITEM 3 – CURBS, SIDEWALKS AND WALKWAYS

The sidewalks are in GOOD CONDITION [1] with hairline cracking and isolated spalls less than 2" in depth (see photo 5).

## ITEM 5 - RAILING

The railing is in GOOD CONDITION [1] with isolated hairline cracks and rust staining present throughout. Cracks are located at most parapet construction joints (see photo 6).



Photo 5 – Isolated sidewalk spall in Span 19 on the north sidewalk.

## ITEM 6 - DRAINAGE

The drainage is in GOOD CONDITION [1] with isolated areas of pooling water along the sidewalk curbs. Isolated drains exhibited minor vegetation growth but all drains are functioning as originally intended (see photo 7).



Photo 6 – Typical parapet hairline cracks with rust staining.



Photo 7 – Typical roadway drain with minor water pooling around drain.



## ITEM 7 - EXPANSION JOINTS

The expansion joints are in FAIR CONDITION [2] overall, with typical leaking joints and isolated torn neoprene troughs (see photos 8 and 9). Most joints exhibit heavy granular debris buildup over the full length of the joints (see photo 10).



Photo 9 – Isolated torn neoprene trough with debris spilling onto roadway framing members adjacent to Panel Point DU35.



Photo 8 – Isolated torn gland with debris spilling onto roadway framing members adjacent to Panel Point DU35.



Photo 10 – Typical granular debris buildup in Joint 0 at West Abutment.

Expansion joint gaps were measured on October 11, 2010. Noted openings are within reasonable limits and are consistent along the length of each joint (see Table 1). Vertical misalignment at joints was negligible.

Joint Measurements (10/11/10 - 72° and Sunny)		
Joint	2010 Inspection	
	Westbound	Eastbound
West Abutment	1 7/8"	1 1/2"
Joint 1	1 9/16"	1 1/2"
Joint 2	1 3/4"	1 3/4"
Joint 3	1 3/4"	1 5/8"
Joint 4	8 3/4"	9 1/8"
Joint 5	2 3/16"	2 1/4"
Joint 6	5 1/4"	5 3/16"
Joint 7	2 3/16"	2 1/4"
Joint 8	5 7/8"	5 5/8"
Joint 9	2 1/4"	2 7/16"
Joint 10	5"	5 1/4"
Joint 11	2 1/8"	2 1/4"
Joint 12	5 1/4"	4 7/8"
Joint 13	2 1/4"	2 1/4"
Joint 14	4 3/4"	4 15/16"
Joint 15	2 1/4"	2 1/4"
Joint 16	1 5/8"	1 7/8"
East Abutment	1 5/8"	1 1/8"

Table 1 – Joint opening measurements. Note similarity of measurements along joints.

## ITEM 32 - SUPERSTRUCTURE SUMMARY

The superstructure is in FAIR CONDITION [5-NBIS] overall with isolated areas of advanced section loss noted on the truss lower chord members and gusset plates. Truss upper chord, diagonal and vertical members also exhibited minor to moderate losses. Throughout the approach sections, isolated minor losses were noted on the girders.

### ITEM 9 - ALIGNMENT

The structure alignment is in GOOD CONDITION [1] with no problems in the horizontal or vertical alignment noted.

### ITEM 10 - GIRDERS

The girders are in GOOD CONDITION [1] with isolated areas of minor section loss to the web and bottom flange with pitting less than 1/16" (cleaned and painted), primarily adjacent to the west abutment.

### ITEM 11 – DIAPHRAGMS AND CROSS FRAMES

The diaphragms and cross frames are in GOOD CONDITION [1] with no signs of deterioration noted.

### ITEM 12 - STRINGERS

The stringers are in SATISFACTORY CONDITION [2] overall with typical 1/16" pitting primarily on the web and bottom flange of the first interior stringers of the roadway deck. There are isolated locations of holed through sections up to 3" in diameter.

Stringers typically exhibit 1/16" pitting (cleaned and painted) along the bottom half of the web and bottom flange. There is 1/8" pitting with up to 1" holed-through sections along the first interior stringer webs (see photos 11 and 12). The first interior stringer adjacent to Panel Point AU118N exhibits a 3" diameter holed through section on the lower half of the web adjacent to the floor beam connection (see photo 13). The surrounding areas have 1/8" section losses.



Photo 11 – First interior stringer adjacent to Panel Point DU165 with holed-through sections up to 1" diameter.



Photo 12 – First interior stringer near DU16 with isolated holed through sections.

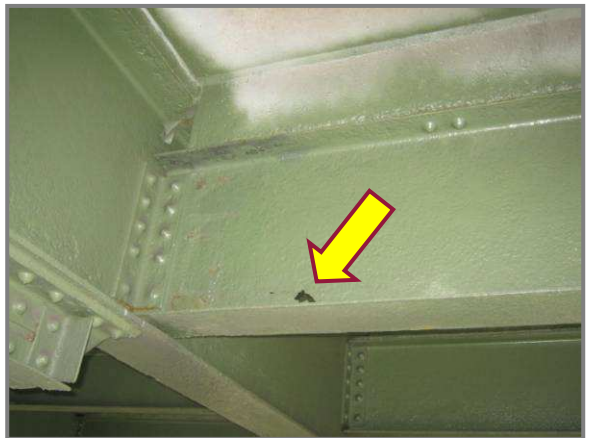


Photo 13 – 3" Diameter holed through section on the first interior stringer near AU118N.

## ITEM 13 – FLOOR BEAMS

The floor beams are in FAIR CONDITION [2] overall with section loss up to 1/4" deep and moderate rust, primarily adjacent to roadway joint locations. Several utility deck floor beams exhibit up to 3" long cracks in the web adjacent to floor beam connections. Cracks without arrest holes have been marked and dated to determine further crack propagation.

### Roadway Deck

Floor beams exhibit up to 1/8" pitting with moderate active rusting, primarily adjacent to joints. Isolated floor beams exhibit up to 1/4" pitting on the lower third of the web (see photo 14) and bottom flange.

### Utility Deck

Several utility deck floor beams exhibit up to 3" long cracks adjacent to connections due to a lack of radial coping (see Item 30 – Fatigue Prone Connections).



Photo 14 – Isolated 1/4" pitting over the lower fifth of the web of floor beam 78 adjacent to Panel Point CU78.

## ITEM 30 – FATIGUE PRONE CONNECTIONS

The fatigue prone connections are in POOR CONDITION [3] with several utility deck floor beams and floor beam connections exhibiting fatigue cracks due to a lack of adequate radial coping.

Several utility deck floor beam webs exhibit cracks up to 3" long (see photo 15). There is a 2" crack in the web of Floor Beam 37 at Panel Point CL37 where the top flange has been torch cut tapered (see photo 16). The majority of these cracks have crack arrest holes. Isolated cracks in floor beams do not have arrest holes and have been marked and dated to determine further crack propagation.



Photo 16– Crack in web of FB37 at CL37.

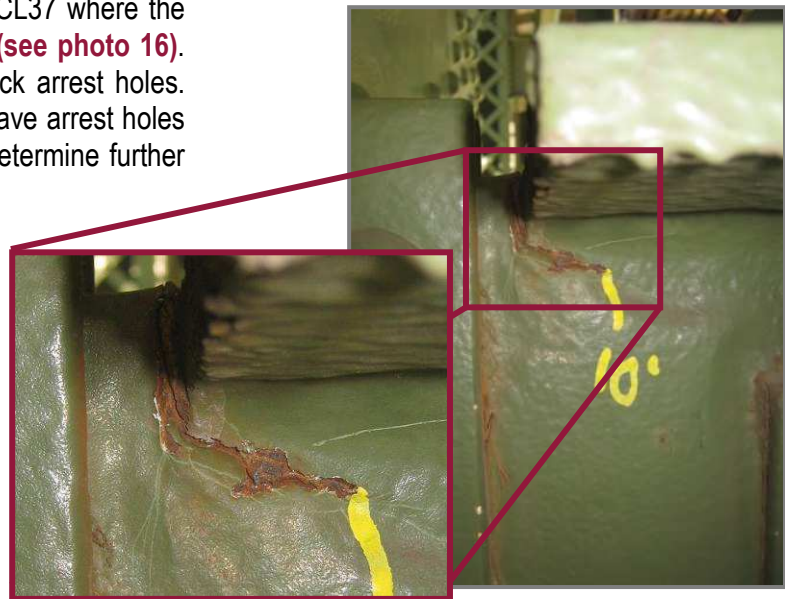


Photo 15 – Crack in utility deck floor beam at gusset plate CL36N connection.

## ITEM 14 – FLOOR BEAM CONNECTIONS

The floor beam connections are in GOOD CONDITION [1], with isolated locations of impacted rust between the girder web and connection angles. The utility deck floor beam connection angle to gusset plate BL15S exhibits a 3" long rolling flaw which has been marked to determine future propagation (see photo 17).

### TRUSS INSPECTION FINDINGS

The truss members are in FAIR CONDITION [2] overall with numerous areas of moderate section loss and isolated areas of advanced section loss on the lower chord members and gusset plates, vertical members, diagonal members, sway bracing and lateral bracing. The upper chord members and gusset plates exhibit moderate section loss at isolated locations. A detailed layout of truss member deficiencies can be found in Appendix D.

## ITEM 15 – VERTICAL TRUSS MEMBERS

The vertical members are in FAIR CONDITION [2] overall with isolated members exhibiting moderate to advanced pitting up to 1/4" section loss. This condition has not changed since the last inspection. There is impacted rust between flange angles and web plates up to 1/2" and is beginning to show signs of active corrosion.

The verticals consist of riveted built up box members. Vertical members at joints and pin locations typically exhibited the worst section losses up to 1/4" primarily on the web plates (see photo 18). Moderate pitting was also noted along the full width of the web plates along the gusset plates, and around sway bracing connections to the verticals (see photo 19).



Photo 17 – Utility deck floor beam connection angle to gusset plate BL15S exhibits 3" long rolling flaw.



Photo 18 – BL0-BU0 1/8" pitting with isolated 1/4" pitting over the lower half of the north web plate.



Photo 19 – Pitting up to 1/8" surrounding the sway bracing connection to the north web plate of member BL59-BU59.

Isolated pitting up to 1/4" was noted on flange angles adjacent to lacing bars (see photo 20). Isolated members exhibit up to 1" impacted rust, cleaned and painted, between the flange angles and cover plates (see photo 21).

**ITEM 16 - DIAGONAL TRUSS MEMBERS**

The diagonal members are in FAIR CONDITION [2] overall with members typically exhibiting minor to moderate pitting and isolated areas of advanced section loss up to 1/4", primarily along the web plates. This condition has not changed since the last inspection.

There is up to 2" impacted rust between gusset plates and diagonal web members at several locations. Diagonal web plate section loss in this region is up to 1/4" deep over the full width of the web plate (see photos 22 and 23).



Photo 20 – Isolated pitting up to 1/4" on vertical DL21-DU21 adjacent to lacing bars.

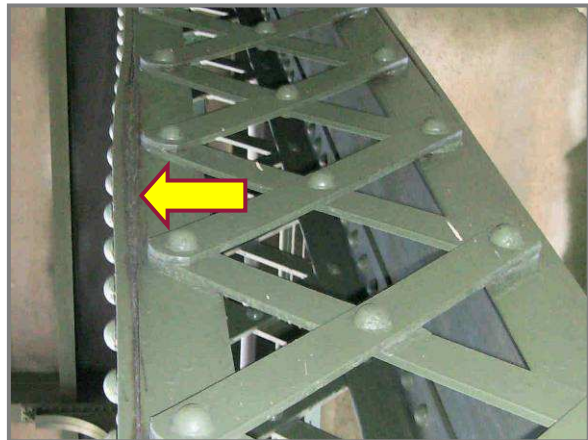


Photo 21 – Impacted rust between the web plate and flange angle of member BL76-BU76 up to 7/8" thick.



Photo 22 – Pitting up to 1/4" on the north web of member DL43-DU44 at interface with DL43 gusset plate. Note impacted rust present.



Photo 23 – Typical pitting up to 1/4" (circled in yellow) along interface with gusset plate.

Diagonal member DL36-DU35 exhibits 3/8" pitting on the interior of the south web plate between flange angles and 1/8" pitting over the exterior face at this same location (**see photo 24**).

Isolated pitting up to 1/4" deep was noted along the top flange angles at the interface with lacing bar connections (**see photo 25**).



Photo 24 – 3/8" pitting (cleaned and painted) on the interior face of the south web plate near the interface with gusset plate DL36 between flange angles.

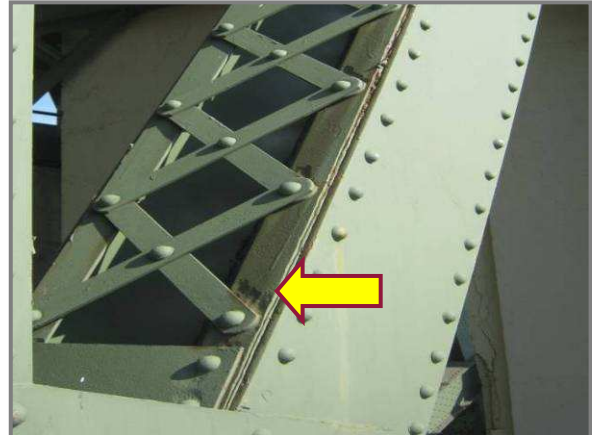


Photo 25 – Pitting up to 1/4" on top flange angle adjacent to lacing bar (DL7-DU8 shown).

## ITEM 18 - TOP CHORD TRUSS MEMBERS

The top chord members are in GOOD CONDITION [1] overall with only one area of moderate section loss and isolated areas of active rusting.

The top chord consists of riveted built up box sections. Chord members below deck leaks exhibited areas of active minor to moderate surface corrosion (**see photo 26**).

Chord member AU120-AU121 exhibits 2" diameter holed through sections to the batten plate and full section loss to the end upper lacing bar and to the horizontal leg of the top and bottom flange angles for the first 12" of the member within the bounds of gusset plate AU120 (**see photo 27**).



Photo 26 – Active surface corrosion to lacing bars and batten plate beneath area of leaking deck at AU120.



Photo 27 – AU120-AU121 exhibits 100% section loss to lacing bars and horizontal leg of flange angles over a 1' length within the bounds of gusset plate AU120.

Isolated locations along Truss A and Truss D exhibit steel attachments which have been field welded to the chord web plates. Several of these welds are poor quality but showed no signs of cracking at the time of the inspection (see photo 28).

**ITEM 19 - BOTTOM CHORD TRUSS MEMBERS**

The bottom chord members are in FAIR CONDITION [2] with isolated areas of advanced section loss in the web plate and flange angles, typical minor pitting along the top batten plates, and typical isolated areas of minor pitting along the web plates and lacing bars. All losses have been cleaned and painted. Impacted rust was noted between flange angles and lacing bars or batten plates. A detailed layout of lower chord member deficiencies can be found in Appendix D.



Photo 28 – Abandoned platform connection to the top chord member AU120-AU121 with typical field welds.

The bottom chord members consist of riveted built up box sections. Exterior section loss up to 1/4" was primarily found on the lower 3" of exposed web plates at the interface with the bottom flange angles (see photo 29). There are isolated areas of advanced section loss with holed through sections along the web plate at the interface with the bottom flange angle. Member DL0-DL1 exhibits a 2' long by 2" high hole near gusset plate DL0 on the north web plate (see photo 30).



Photo 29 – North web plate of CL0-CL1 with 1/4" pitting up to 3" tall along the interface with the bottom flange angle.

Section loss on the interior surfaces of chord members is typical along the interface with the gusset plate. Member DL7-DL8 exhibits 1/4" pitting over the full height of the north web plate (see photo 31).



Photo 30 – Holed-through section of north web plate 2'Lx2"H of member DL0-DL1 adjacent to gusset plate DL0N.



Photo 31 – DL7-DL8 1/4" pitting over full height of south web at DL8.

Throughout the truss spans, previously cleaned and sealed impacted rust of up to 2" is beginning to reactive. This reactivating impacted rust is predominantly found at the interface between the chord web plates and the top or bottom flange angles (see photo 32).

At chord member DL15-DL16 near gusset plate DL15, the north top flange angle exhibits a longitudinal crack 24" long with rust staining (see photo 33). A similar crack 30" long was noted at the north bottom flange angle of member BL13-BL14 near gusset plate BL13 (see photo 34). Both locations are within the bounds of the top and bottom flange batten plates, which exhibit heavy impacted rust between the leg of the flange angle and the batten plates. The crack to member BL13-BL14 has not propagated since the last inspection, and the crack on member DL15-DL16 has been marked to determine future crack propagation.

Truss C, member CL12-CL13, at the CL12 pin plate location exhibits a 2-1/2" lateral misalignment of the north and south web plates and pin plates with respect to the gusset plates. This misalignment is due to extensive impacted rust between the free web plates and gusset plates (see photo 35).



Photo 32 – Typical evidence of sealed impacted rust reactivating.



Photo 33 – Crack in top flange angle of DL15-DL16 near DL15 within Bounds of top batten plate.



Photo 34 – Crack in bottom flange angle of BL13-BL14 near BL13 within the bounds of the bottom flange batten plate.



Photo 35 – Impacted rust up to 2 1/2" between the south web plate of CL12-CL13 and gusset plate CL12S.



## GUSSET PLATES

The gusset plates are in poor condition overall, with typical 1/16" – 1/8" losses (cleaned and painted), 3"-6" high along the top of the lower chord flange angles (see photo 36). Isolated gusset plates exhibit advanced pitting up to 1/4" deep between 30-50% of the surface area on the exterior and interior faces. The gusset plates with advanced deterioration were typically noted at the deck joints and pins. Gusset plate nomenclature is based on shop drawings. The labels consist of truss letter (A through D with A being the northernmost truss), upper or lower, panel point number, and north or south plate.



Photo 36 – Typical section loss along the chord member. Exterior of gusset plate DL2N shown.

Gusset plates were inspected utilizing a Pocket UT device for a detailed inspection of the plate losses. Typical measurements were taken along the intersection of the truss members and the gusset plate, particularly a horizontal scan along the top of the bottom chord and a vertical scan below the vertical member.

Gusset plates located at pin panel points exhibited typical 1/8" pitting for a 12" diameter area around the pin (see photo 37). Additional losses were noted between rivets and at the interface between pin plates and gusset plates (see photo 38).



Photo 37 – Typical pitting at a lower pin gusset plate (AL100N). Note pitting around pin and chord members as well as isolated peeling top coat.

Isolated gusset plate locations exhibit up to 1-1/4" of impacted rust between the gusset plate and the lower chord web plate, causing a concave bow along the gusset plate free edge within the bounds of the lower chord web plate (see photo 39).



Photo 38 – Up to 1/4" pitting (highlighted in yellow) at gusset plate (BL12N). Note pitting around pin and chord members.

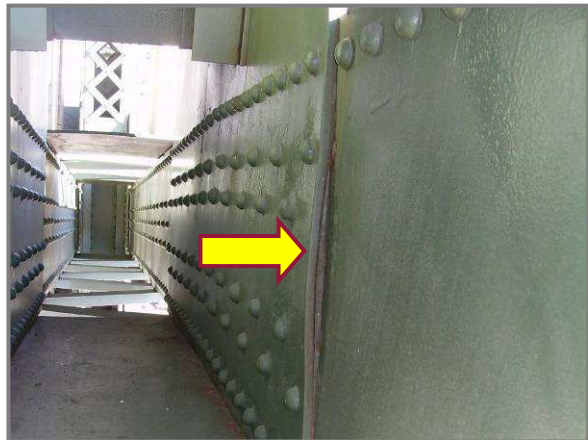


Photo 39 – 3/4" bow between gusset plate DL43S and DL42-DL43 web.

Gusset plate CL70S exhibits a lamellar tear under the west diagonal, reducing the gusset plate thickness to 1/4" remaining over a 2' length (see photos 40 and 41).



Photo 40 – Bounds (marked by yellow paint stick) of lamellar tear at CL70S (west end of plate).



Photo 41 – Laminar split of gusset plate CL70S.

Gusset plates at lower sliding pin locations exhibit advanced section loss up to 1/2" remaining along the free edge. This section loss is primarily the result of the lower chord web rubbing against the gusset plate at the sliding pin location (see photo 42). Gusset plate DL12S exhibits 1/4" pitting along the full length of the interior diaphragm in line with the lower chord. Along this line there is a 1" diameter hole (see photo 43).

## ITEM 20 – LOWER LATERAL BRACING

The lower lateral bracing is in GOOD CONDITION [1] overall with isolated areas of minor to moderate section loss and rust staining.

Wind lock assemblies are in good condition with room for lock to deflect. Isolated areas exhibit minor surface corrosion (see photo 44).



Photo 42 – Typical gusset plate loss measurable along the free edge at sliding pin locations.



Photo 44– Typical wind lock with minor surface corrosion at strut.



Photo 43 – 1" diameter hole in DL12S along interface with interior diaphragm.

## ITEM 22 – SWAY BRACING

The sway bracing is in GOOD CONDITION [1] overall with minor surface corrosion and pitting at isolated locations.

## ITEM 24 – BEARING DEVICES

The bearings are in FAIR CONDITION [2] overall with isolated areas of moderate pitting to bearing pins and impacted rust between bearing gusset plates and bearing castings. Utility deck bearings exhibit isolated gaps between rockers and bearing plates and excessively rotated rockers.

Several bearing pins exhibited isolated pitting up to 1/4" cleaned and painted (see photo 45). Impacted rust was noted between gusset plates and casting plates at the majority of bearing locations, preventing the gusset plates from rotating freely (see photo 46). Roller nest assemblies exhibited minor laminate rusting at isolated locations and active minor surface corrosion (see photo 47).

Isolated rocker bearings for the utility deck stringers are not in contact with the bearing plates (see photo 48).



Photo 45– Bearing pin at AL119 with up to 1/4" pitting (cleaned and painted) around the bearing casting.



Photo 46– CL119 impacted rust between bearing casting and gusset plate seizing panel point from free rotation.



Photo 47– Roller nest assembly at AL21 with active surface corrosion present.

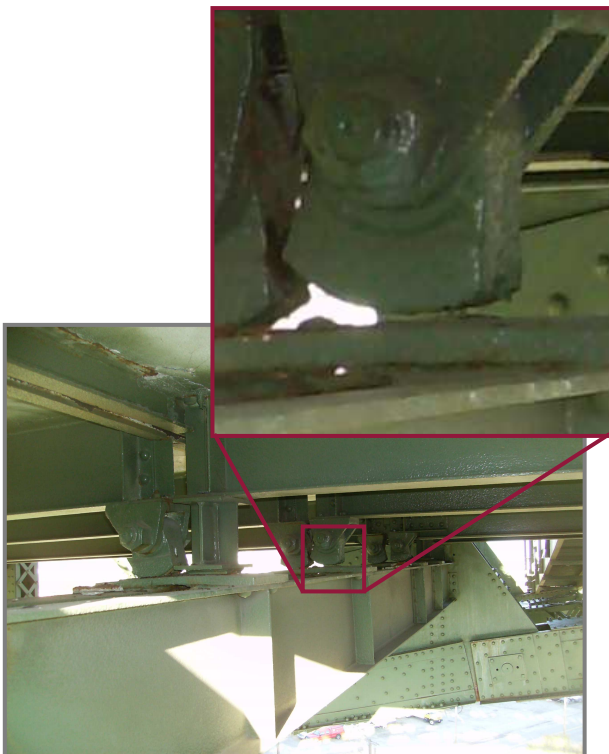


Photo 48 – Gap between Stringer 3 rocker bearing and bearing plate at FB 35.

The utility deck rocker bearings for Stringers 3 and 4 at Floor Beam 78 exhibit excessive rotation (see photo 49).

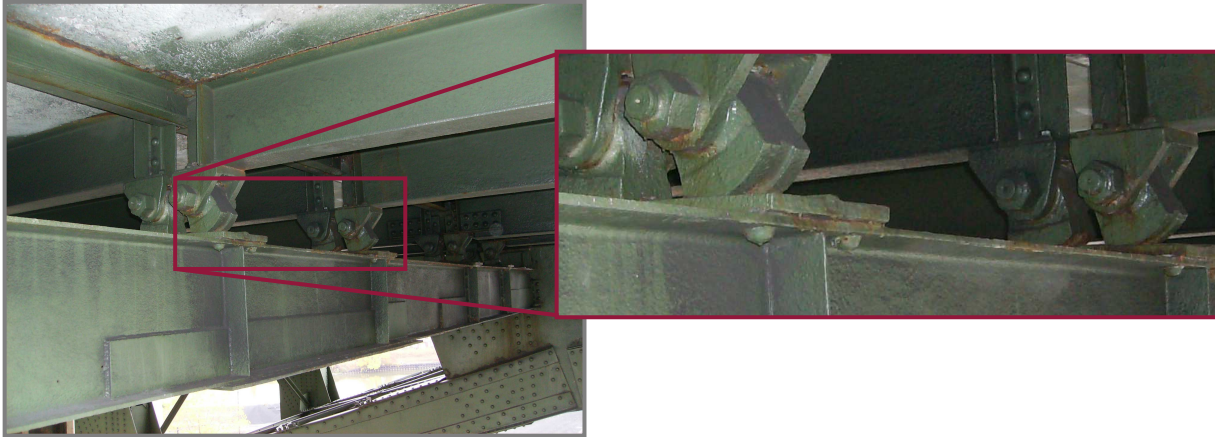


Photo 49– Excessive rotation of bearings at utility deck FB 78 for Stringers 3 and 4.

## ITEM 28 – PROTECTIVE COATING SYSTEM

The protective coating system is in GOOD CONDITION [7] with isolated paint failures and light surface corrosion at isolated locations. The condition has not deteriorated significantly since the last inspection. The paint date is March 4, 2004.

Truss members located at pin and joint locations exhibit severe surface corrosion with rust staining (see photo 50). Members at other locations exhibit isolated top coat paint failures over less than one percent of the truss area with no active corrosion present (see photo 51).



Photo 50– Active minor surface corrosion at DU12.



Photo 51– Isolated peeling paint in Span 21.

## ITEM 29 – PINS AND HANGERS

The pins are in FAIR CONDITION [2] overall with isolated moderate section loss and impacted rust. Pins appear to be functioning as designed.

Pin sleeves exhibited moderate section loss, cleaned and painted. As previously mentioned, the chord web plates at gusset plate CL12S are bent due to impacted rust between the gusset plate and the web plate. Due to this misalignment the sliding pins for member CL12-CL13 are not bearing on the outermost chord pin plate (1 of 3 plates) (see photo 52). Other sliding pin gusset plates which are not fully bearing by up to 1/4" on the outermost pin plate include BL97, DL83, and CL100.

Where pins were free to rotate, several pins exhibit advanced wear up to 1/4" along a third of the pin circumference (see photo 53).

Lower chord sliding pins at panel points AL17 and BL41 appear to be seized due to impacted rust (see photos 54 and 55).



Photo 52 – Sliding pin at CL12S not fully bearing on the outermost pin plate due to impacted rust between the web plate and gusset plate.



Photo 53– Wear along vertical pin at AL12 up to 5/16" loss over the lower half of the pin circumference.



Photo 54– Sliding pin at AL17 seized due to impacted rust which has been painted over.



Photo 55– Sliding pin at BL41 seized due to impacted rust.

## ITEM 42 – SUBSTRUCTURE SUMMARY

The substructure is in SATISFACTORY CONDITION [6-NBIS] with typical large spalls with exposed rebar throughout the pier towers above the truss bearings. Concrete pier walls exhibit hairline cracks and isolated corner spalls.

## ITEM 33 – ABUTMENTS

The abutments are in GOOD CONDITION [1] with minor hairline cracks present.

## ITEM 34 – ABUTMENT SEATS

The abutment seats are in GOOD CONDITION [1] with typical hairline cracks at isolated locations.

## ITEM 35 –PIERS

The piers are in FAIR CONDITION [2], with the concrete architectural pier towers exhibiting large spalls with exposed rebar throughout (see photos 56 and 57). Several of the spalls with exposed rebar have been sealed and painted. Pier faces below the truss bearings exhibit hairline map cracking with rust staining (see photo 58). The Pier 13 tower exhibits a 1" vertical crack extending through the top section of the pier tower above Truss A and Truss B bearings (see photo 59).



Photo 56– Typical spall with exposed rebar pier tower.



Photo 57– Advanced spall with exposed rebar on roof of Pier 12 tower above bearings. Note hanging exposed rebar.



Photo 58– Isolated patch of map cracking on pier wall with rust staining.



Photo 59– Vertical crack in Pier 13 north tower section.

Bent 1 columns exhibit vertical hairline cracks extending from the base, spaced at 12" (see photo 60).

**ITEM 36 –PIER SEATS**

The pier seats are in GOOD CONDITION [1], with typical hairline cracks at isolated locations.

**ITEM 37 – BACKWALLS**

The backwalls are in GOOD CONDITION [1], with isolated hairline cracks and minor map cracking present.

**ITEM 38 – WINGWALLS**

The wingwalls are in GOOD CONDITION [1], with a minor 6" diameter animal hole along the northwest wingwall.

**ITEM 39 – FENDERS AND DOLPHINS**

The fenders are in CRITICAL CONDITION [4] exhibiting severe rot and collision damage. The fender system has failed and no longer functions as intended. This condition does not appear to have changed since the last inspection.

The east fender has collapsed towards the centerline of the Cuyahoga River (see photos 61 and 62). The west fender exhibits severe collision damage adjacent to the southernmost pier column (see photo 63).



Photo 60– Vertical hairline cracks in Bent 1 columns.



Photo 61– South half of the east bank fender system collapsed towards river centerline.



Photo 62– East fender system collapsed towards river centerline (looking south).



Photo 63– West bank fender system with collision damage at the southernmost pier column.

**ITEM 40 – SCOUR**

The scour condition of the structure is in SATISFACTORY CONDITION [2], with a portion of the southernmost pier column footing at Pier 10 exposed. Large rip rap which was held back by rotting timber has since fallen towards the waterway. For a detailed report on the scour condition, see the Underwater Inspection in **Appendix E**.

**ITEM 54 – CHANNEL SUMMARY**

The channel is in SATISFACTORY CONDITION [6-NBIS] due to a sharp curve directly upstream (south) of the bridge as well as an area of sheet piling along the west bank which has washed out just downstream (north) of the bridge.

**ITEM 51 – ALIGNMENT**

The alignment is in SATISFACTORY CONDITION [2], with the Cuyahoga River exhibiting a sharp bend just upstream (south) of the bridge crossing (**see photo 64**). A slightly more gradual bend exists downstream (north) from the bridge crossing (**see photo 65**). This engineered alignment did not exhibit any signs of migrating from the designed path.

**ITEM 52 – PROTECTION**

The protection is in SATISFACTORY CONDITION [2] with an area of west bank sheet piling washed out just upstream (north) of the bridge crossing.

**ITEM 53 – WATERWAY ADEQUACY**

The waterway adequacy is in GOOD CONDITION [1] with adequate freeboard to allow channel vessels to pass under the bridge (**see photo 66**).

**ITEM 60 – APPROACHES SUMMARY**

The approaches are in VERY GOOD CONDITION [8-NBIS] with minor map cracking and previously patched areas noted.



Photo 64– Bend upstream (south) of the bridge crossing.



Photo 65– Bend downstream (north) of the bridge crossing.



Photo 66– Vertical clearance between truss and top of vessel under Truss D.



**ITEM 55 – PAVEMENT**

The pavement is in GOOD CONDITION [1] with minor map cracking and previously patched potholes (see photo 67).



Photo 67– Map cracking around patched pothole in approach pavement.

**ITEM 56 – APPROACH SLABS**

The approach slabs are in GOOD CONDITION [1] with only minor map cracking present.

**ITEM 57 – GUARDRAIL**

The guardrail is in GOOD CONDITION [1] and no noteworthy deficiencies to note.

**ITEM 59 – EMBANKMENT**

The embankment is in GOOD CONDITION [1] overall with no significant deficiencies noted.



Photo 68– Old mattress and trash piles at Pier 7.

**ITEM 66 – GENERAL APPRAISAL & OPERATIONAL STATUS**

The overall condition of the bridge is FAIR CONDITION [NBIS – 5], OPEN WITH NO RESTRICTIONS [ODOT - A], due to advanced section losses in the truss members and gusset plates of the Main Truss Spans.

**HABITATION**

No active habitation was noted on the structure. However, there is evidence of previous habitation at Pier 7 (see photo 68). There is also a buildup of aluminum cans in the northernmost column of Pier 11 where a 2' by 2' hole has been drilled into the west side of the column (see photo 69).

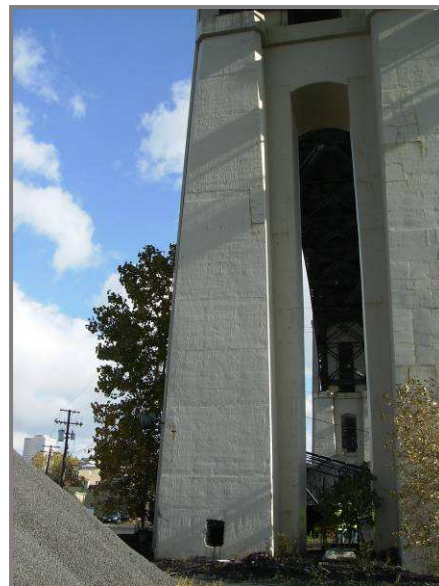


Photo 69 – 2'x2' drilled hole in the west face of the northernmost column at Pier 11.

## INSPECTION SAFETY ITEMS

The inspection walkways and ladders are in good condition with no significant deficiencies noted.

### ITEM 61 – NAVIGATION LIGHTS

The navigation lights are in GOOD CONDITION [1] and appear to be functioning as intended. No navigation lights were noted along the banks of the river or along the fender systems.

### ITEM 64 – UTILITIES

The utilities are in POOR CONDITION [3] with a misaligned gas main support, advanced deterioration to electrical conduit pipes, spalls in light poles and open electrical box covers.

Several precast concrete luminaire poles exhibit cracking and isolated spalls (see photo 70). Access covers for electrical boxes on light poles are missing.

Resting on the overhangs beyond the pedestrian railing, several electrical boxes have missing covers with exposed wires (see photo 71).

One support for the 40" gas main on the utility deck near Pier 15 is misaligned (see photo 72). Several utility conduits on the utility deck are broken as noted in previous inspections.

Void electrical conduit throughout the utility deck is breaking apart at isolated locations and falling onto the utility deck.



Photo 70– 5'x6" spall in light pole with exposed rebar located along the south sidewalk in Span 10.



Photo 71– Broken electrical box cover with exposed electrical wires in Span 14 of the north sidewalk overhang.



Photo 72– Misaligned support for 40" gas main on utility deck adjacent to Pier 15.

## CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of our in-depth inspection, the Hope Memorial Bridge CUY-10-1613 is in FAIR CONDITION [5-NBIS] overall. The main truss spans exhibit advanced section loss to lower chord members and gusset plates, primarily adjacent to pin or joint locations. Other truss members also exhibit moderate section loss adjacent to gusset plates.

Concrete falling from pier tower spalls and utility deck haunches pose a safety concern to public below the structure.

We present our recommendations for CUY-10-1613 in the following four categories:

- **Priority Work:**  
(Within 1 Year Period) Work which should be performed as soon as possible to address deficiencies which affect the capacity of the structure or public safety.
- **Rehabilitation/Evaluation:**  
(Within 5 Year Period) Recommendations for large-scale deficiencies which are extensive in nature and require engineering analysis.
- **Maintenance:**  
(Within 2-4 Month Period) Recommendations that are minor in nature and can be easily repaired.
- **Monitoring:**  
(As Recommended) Regular field observation of deficiencies which are not currently in need of repair, but will require corrective action if deterioration continues.

Additionally, we have prioritized these four recommendation categories into levels of corrective action required, as follows:

- [Minor Deficiency] – Deficiencies which are minor in nature and generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion to steel, Minor scouring, Clogged drainage, etc.
- [Major Deficiency] – Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroding reinforcing steel, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.
- [Safety Hazard Deficiency] – A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic and pedestrians, a hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

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**CUY-10-1613 RECOMMENDATIONS****Priority Work:**General

1. Repair light posts which exhibit spalls [**Minor Deficiency**].
2. Install navigation lights to fender system [**Safety Hazard Deficiency**].

Deck

3. Remove concrete from utility deck floor beam haunch areas. [**Safety Hazard Deficiency**].

Substructure

4. Remove and patch areas of loose concrete and spalls with exposed rebar from pier towers [**Safety Hazard Deficiency**].

**Rehabilitation/Evaluation:**General

5. Replace failed fender system [**Minor Deficiency**].

Deck

6. Repair spalls with exposed reinforcing bars on the deck underside [**Minor Deficiency**].
7. Remove and replace torn expansion joint neoprene troughs [**Minor Deficiency**].

Superstructure

8. Clean, caulk and paint lamellar tear in gusset plate CL70S [**Minor Deficiency**].
9. Perform load rating and gusset plate analysis for the main truss spans to include all section losses (Estimated to be completed in 2011).

**Maintenance:**General

10. Remove debris from and secure areas under Pier 7 [**Minor Deficiency**].
11. Re-align gas main utility pipe bearing which is misaligned [**Minor Deficiency**].

Top of Deck

12. Replace missing and broken covers to light post electrical boxes [**Minor Deficiency**].
  13. Clean debris from expansion joint glands [**Minor Deficiency**].
  14. Repair sidewalk spalls [**Minor Deficiency**].
-

Superstructure

15. Drill arrest holes in utility deck floor beam cracks [**Major Deficiency**].

**Monitoring:**

Deck

16. Monitor utility deck floor beam haunch delaminations [**Minor Deficiency**].

Substructure

17. Monitor areas around pier tower spalls and delaminations [**Minor Deficiency**].

Superstructure

18. Monitor cracks in utility deck floor beam connections which have not been arrested [**Minor Deficiency**].

19. Monitor sliding pins which are not fully bearing on pin plates for further loss of bearing area [**Minor Deficiency**].

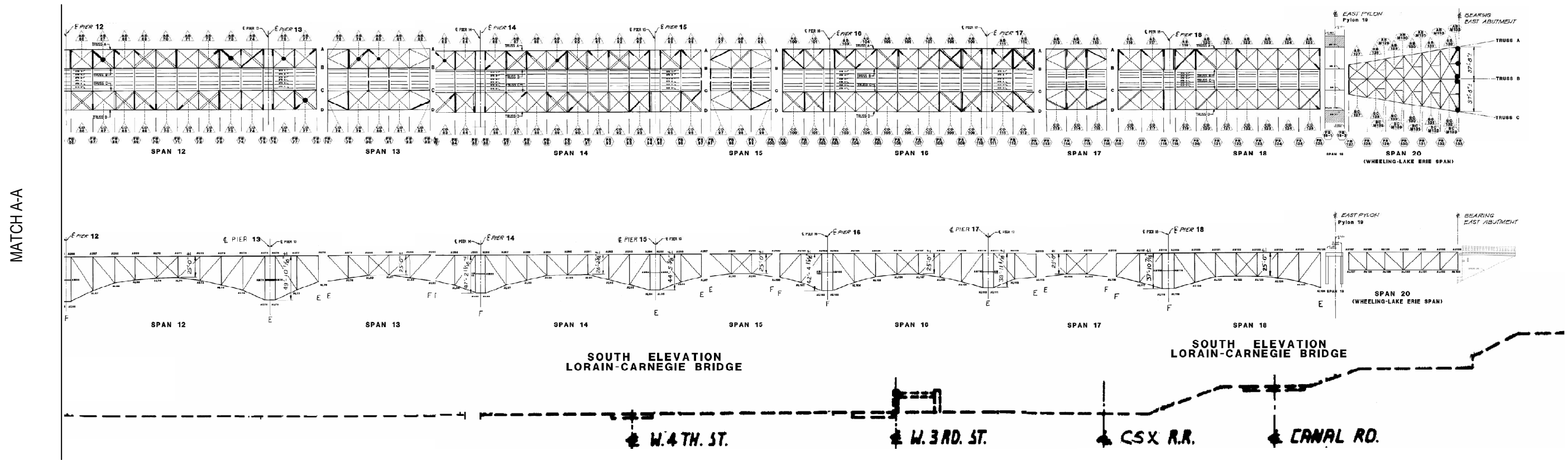
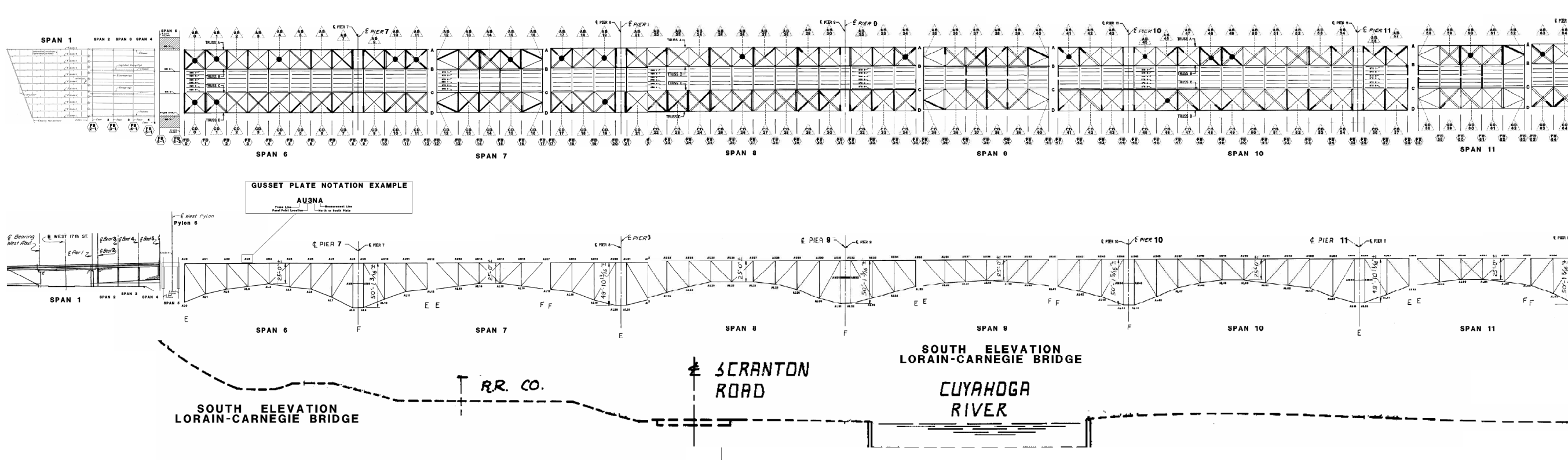
20. Monitor cracks in flange angles adjacent to batten plates at gusset plate locations [**Minor Deficiency**].

21. Continue to monitor pins & hangers in Main Truss Spans [**Minor Deficiency**].



# APPENDIX A

## Plan and Profile of Bridge



**PLAN AND PROFILE**  
 Overview



## **PLAN AND PROFILE**

West Approach and Main Truss Spans (1 of 5)

**PLAN AND PROFILE**

Main Truss Spans (2 of 5)

**PLAN AND PROFILE**

Main Truss Spans (3 of 5)

## **PLAN AND PROFILE**

Main Truss Spans (4 of 5)

**PLAN AND PROFILE**

East Approach, Wheeling-Lake Erie Span, and Main  
Truss Spans (5 of 5)

# APPENDIX B

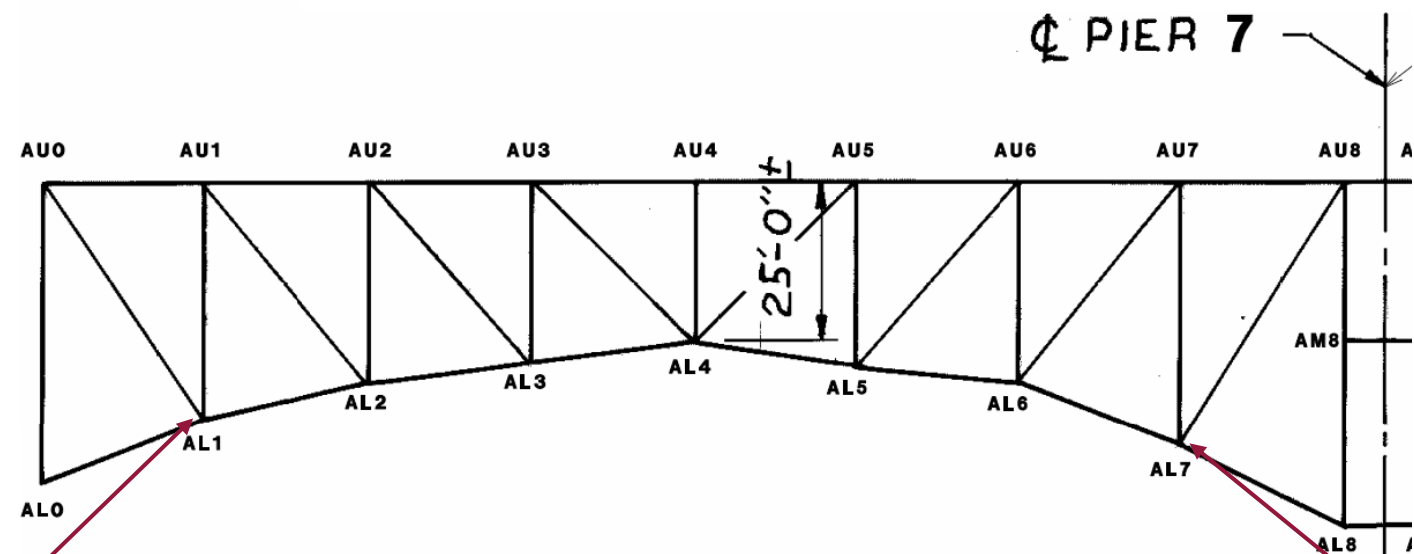
## Top of Deck Deficiencies

Element	Location	Spall Dimension	Additional Notes
North Electrical Utility Box	Sta. 25+00		Top cover of utility box is missing.
North Scuppers	Sta. 29+00		Scuppers are partially filled with debris and vegetation.
North Electrical Utility Boxes	Sta. 31+00		Top cover of utility boxes are missing, also filled with debris.
North Parapet	Sta. 32+00		Minor vehicular damage to parapet as well as sidewalk is evident.
North Parapet	Sta. 35+00	7"x3"	Spall has left exposed steel in parapet post.
North Parapet	Sta. 36+00	14"x7"x1"	Spall on top face of parapet rail.
North Parapet	Exp. Jt. 9	10"x12"	Delamination of parapet rails in two locations.
North Light Pole	Sta. 41+00		5' long by 1/4" wide crack on the south face of the light pole with exposed steel
North Parapet	Sta. 41+00	32"x9"x2"	Group of 5 spalls on south face of north parapet, Span 12 near Pier 1
North Electrical Utility Boxes	Sta. 42+00		Multiple electrical utility boxes are missing covers and filled with debris
North Parapet	Sta. 43+60	13"x9"x1"	One spall and two delaminations present
North Electrical Utility Box	Sta. 43+00		Cover is broken leaving exposed wires.
North Electrical Utility Box	Near Joint 14		Cover is missing and box is filled with water, wires are exposed to sidewalk
North Sidewalks	Near Joint 12		Minor sidewalk deterioration with surface spalls up to 1".
North Sidewalks	Near Joint 13		Minor sidewalk deterioration with surface spalls up to 1".
North Sidewalks	Near Joint 10		Sidewalk cracking with efflorescence near scuppers and joint
North Sidewalks	Near Joint 8		Sidewalk cracking with efflorescence near scuppers and joint
Wearing Surface in Bike Lane	Near Joint 16		Cracks are present within the bounds of the bike lane.
Light Pole	Sta. 55+00	5"x1"x1/4"	2 separate 1/4" wide cracks approximately 4' long with minor spalls
South Sidewalks	Near Joint 15		Hairline cracks with efflorescence present on sidewalks.
South Sidewalks	Near Joint 14		Vegetation growth between sidewalk and parapet.
South Sidewalks	Near Joint 14		Hairline cracks with efflorescence present on sidewalks.
South Light Pole	Near Joint 14		Up to 1/2" wide crack in light pole up the north face with spall and exposed steel
South Parapet	Near Joint 13		Minor spall on underside of railing with 1/16" cracks.
South Light Pole	Near Joint 12		1/4" crack up the north face of the light pole.
South Parapet	Sta. 25+00	8"x1"x1"	Bottom railing exhibits hairline cracks and spall.
South Light Pole	Near Joint 4		Up to 1/4" vertical crack extends up the light pole.
South Wearing Surface of Curb Lane	Near Joint 5		Minor map cracking present.
South Sidewalks	Near Joint 5		Hairline cracks with efflorescence present near curb.
South Sidewalks	Sta. 33+00		Longitudinal hairline crack 30' long is present adjacent to curb with efflorescence
South Light Pole	Sta. 33+00		1/8" crack extending up the light pole.
South Light Pole	Sta. 34+00		8' tall by 6" wide spall in light pole with exposed steel.
South Sidewalks	Near Joint 9		10' long hairline crack with efflorescence is present near curb.
South Parapet	Sta. 39+00	3"x5"x1"	Minor spall on north face of railing.
South Sidewalks	Sta. 40+00		Longitudinal hairline cracks 25' long with efflorescence present
South Wearing Surface of Curb Lane	Sta. 40+00		Map cracking is present in the curb lane.
South Light Pole	Sta. 41+00		1/8" vertical crack extends up the light pole.
South Sidewalks	Near Joint 10		45' long hairline crack on the sidewalk is beginning to spall near scuppers
South Electrical Utility Box	Near Joint 10		Vegetation growth present.
South Light Pole	Sta. 44+27		3'x6" spall with exposed steel in light pole with associated 12' L by 1/4" W crack
South Wearing Surface in Bike Lane	Sta. 45+00		Worn down wearing surface in bike lane.
North Parapet	Sta. 22+19		1/16" vertical cracks present in rail posts.
North Parapet	Near Joint 1	8"x5"x4"	Minor spall in bottom rail at parapet joint.
North Parapet	Near Joint 1		Hairline cracks to bottom rail of parapet over a 25' section with rust staining
North Curb Lane	Sta. 27+00		Grooves in wearing surface of curb lane.
North Parapet	Near Joint 5		Minor pop out spalls and cracking on bottom railing of parapet
North Sidewalks	Sta. 29+00		Sidewalk exhibits minor spalls near scuppers.
North Parapet	Near Joint 6	10"x4"	Minor spalls and delaminations are present on the bottom railing of parapet

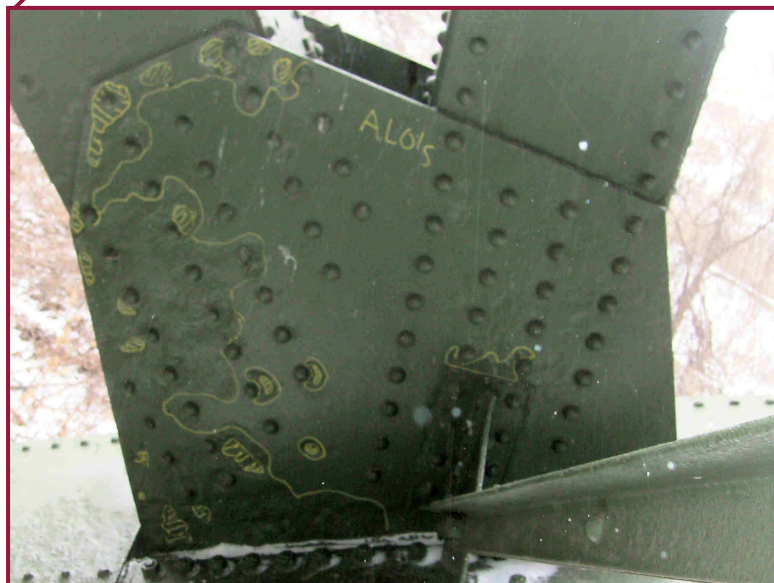
# APPENDIX D

## Main Truss Spans Top and Bottom Chord Deficiencies





**SPAN 6  
TRUSS A**



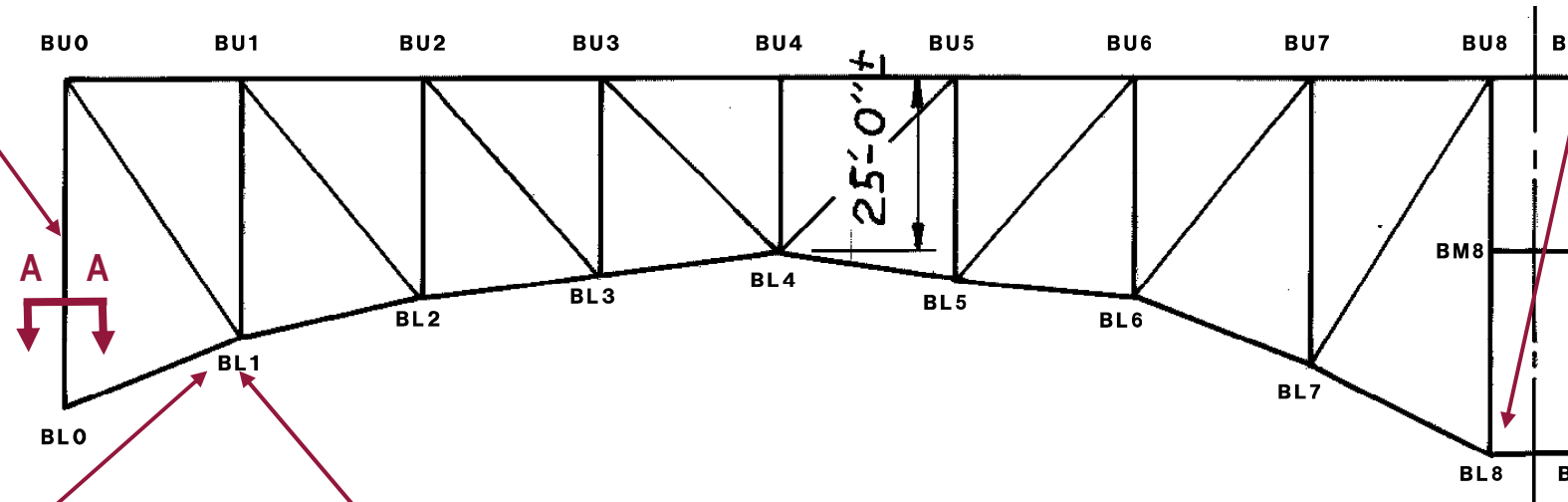
The south gusset plate at AL1 exhibits widespread 1/4" deep pitting throughout the west end of the plate (left), with small areas of pitting greater than 1/4" deep scattered throughout (shown as hatched markings).



Small areas of pitting 1/4" deep pitting are scattered throughout the south face of AL7s, as indicated with field markings.



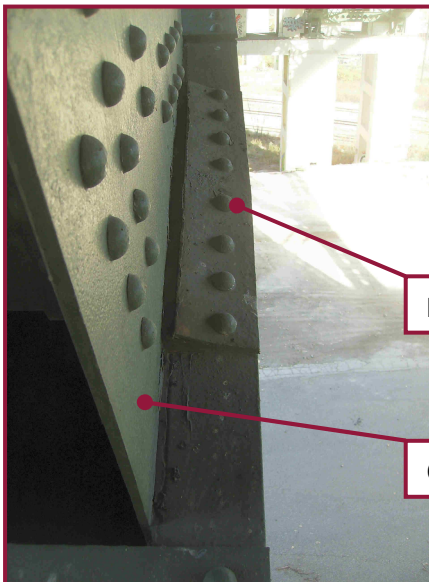
The north web plate of BL0-BU0 exhibits 1/8" to 1/4" deep pitting (see Section A-A).



**SPAN 6  
TRUSS B**



Advanced corrosion at the south web fill plate at BL8 has resulted in a 6" diameter hole.



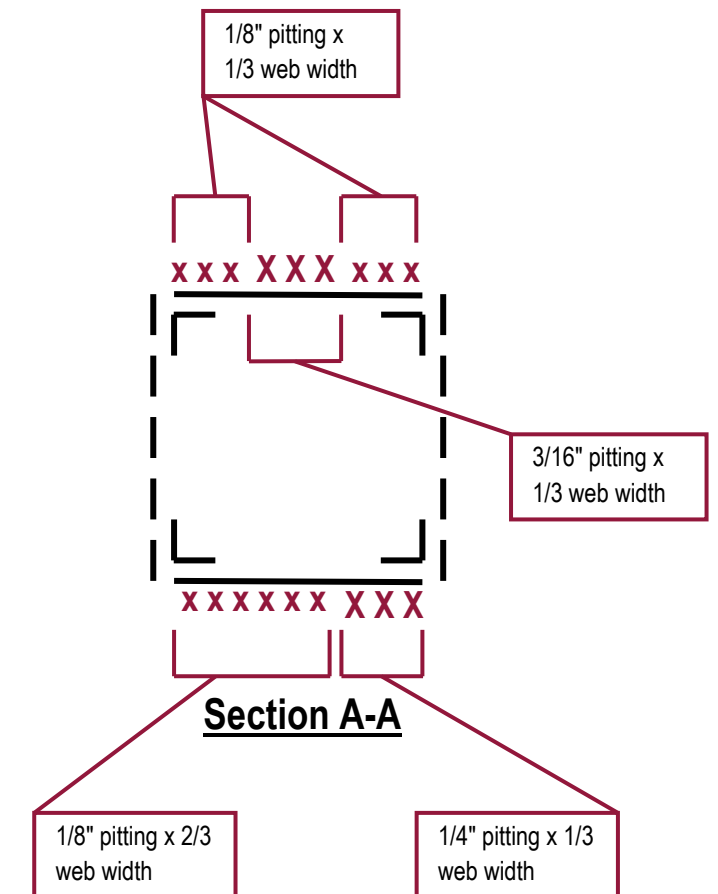
Flange Splice Plate

Gusset Plate

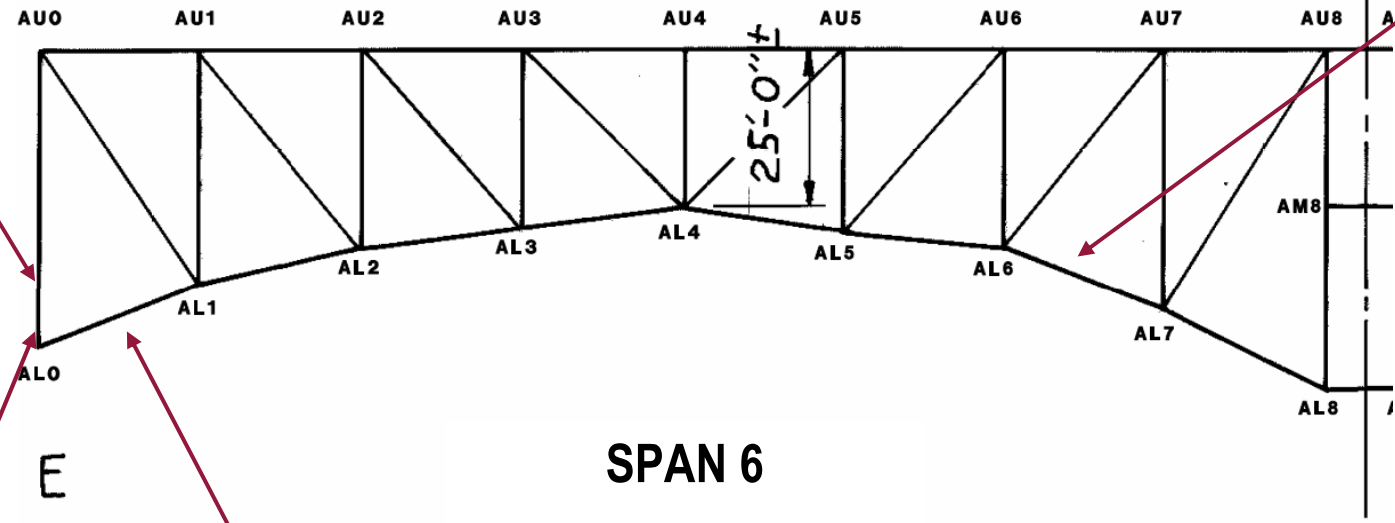
Heavy pack rust up to 1" has formed between the lower chord top flange and the flange splice plate at BL1. The pack rust is lifting the interior edge of the splice plate and is distressing the connection.



Pitting up to 1/8" deep is present in the bottom 4" of the north web plate along the bottom flange angle at BL0-BL1.



PIER 7



**SPAN 6  
TRUSS C**



The north web plate of CL0-CU0 exhibits heavy pitting throughout with areas with pits up to 3/8" deep.



The interior of the lower chord box section is typically cleaned and painted, typically with little or no active rusting (CL6-CL7 shown).



The north gusset plate at CL0 exhibits heavy pitting throughout with areas with pits up to 3/8" deep.



The north web plate of CL0-CL1 exhibits 6" tall, 1/4" pitting throughout the bottom half of the web.



Active heavy corrosion with 1/16" pitting on the bottom flange and lower 1/3 of the web of Floorbeam 0, adjacent to a failed deck joint.



DL0-DL1 exhibits a 2'L x 3"H hole in the north web plate near the bottom flange angle and a 6"L x 2"H hole adjacent to the top flange angle, 5' from DL0.

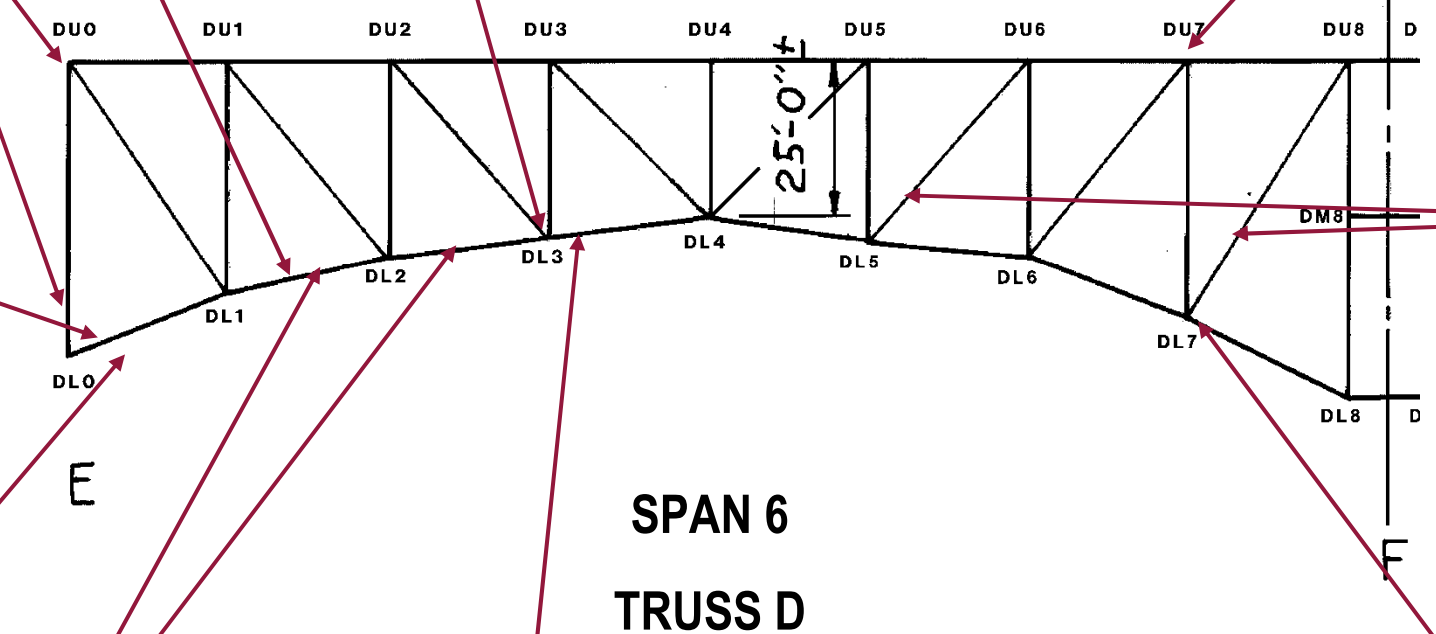


The horizontal legs of bottom flange angles are warped slightly throughout the bridge at isolated lacing connections due to pack rust between the angles and the lacing channels.

DL1-DL2 exhibits two 4" Ø holes in the bottom half of the web plate.

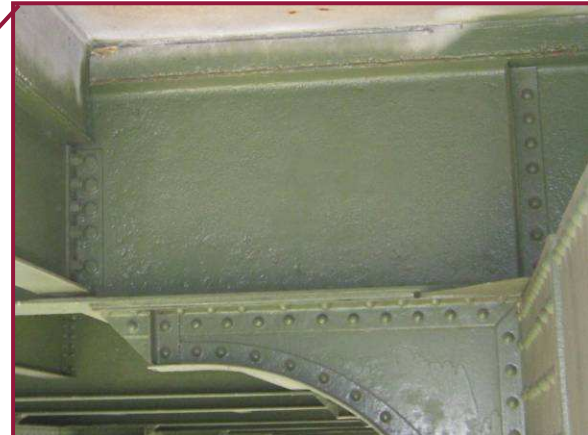
1/4" pitting of the top flange splice plate

Isolated 1/4" pitting on north stay plate

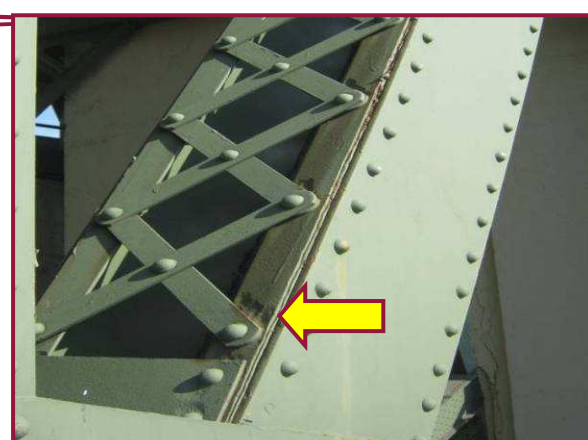


**SPAN 6  
TRUSS D**

1" Ø hole in the north bottom flange angle



Floorbeam webs in Span 6 typically exhibit 1/8" pitting along the bottom 3" of the first 2' adjacent to the connection at Truss D.



Isolated pitting up to 1/4" deep was noted along the top flange angles at lacing connections (DL7-DU8 shown).



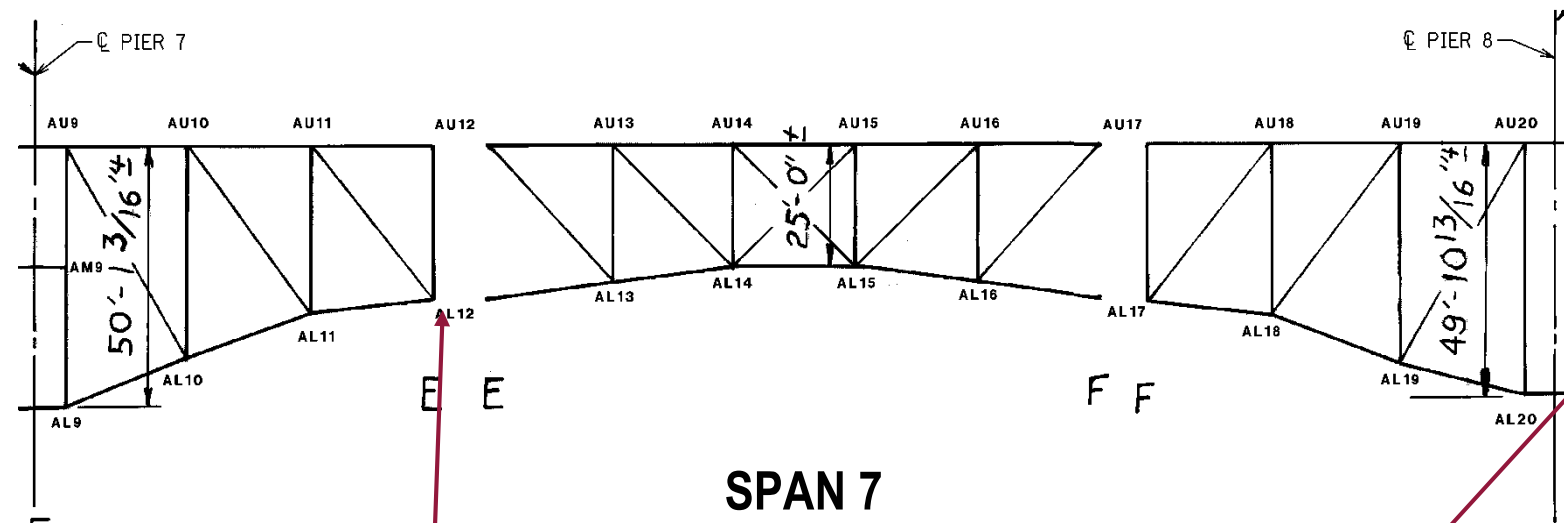
Typical evidence of pack rust reactivating between top flange angle and web plate (DL1-DL2 shown).



Bottom chord members in Span 6 typically exhibit localized 1/4" pitting (cleaned and painted) on the top flange angles and cover plates (DL1-DL2 shown).



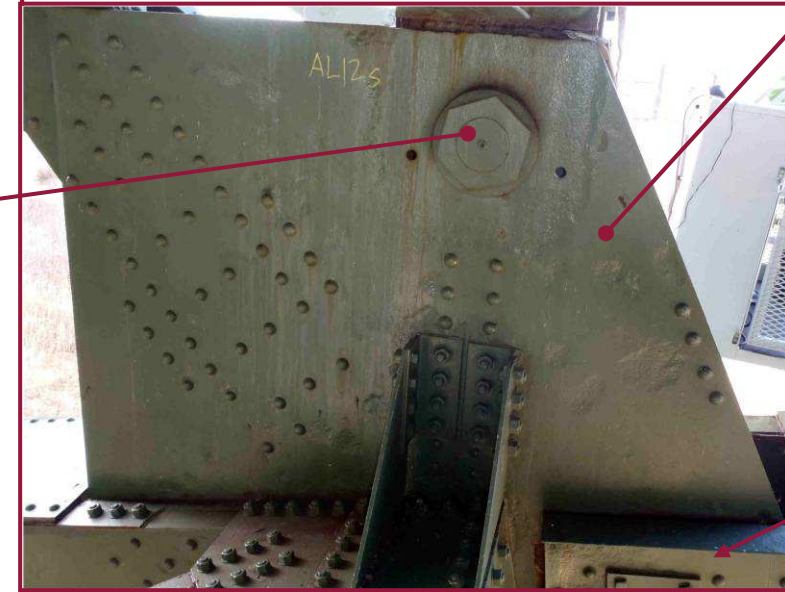
Pitting up to 5/16" deep was noted over the full height of the north web plate of DL7-DL8 adjacent to DL7.



**SPAN 7  
TRUSS A**



The north face of the south gusset plate exhibits isolated areas of pitting up to 1/4" deep.



The south face of the south gusset plate at AL12 exhibits widespread areas of 3/16" deep pitting, with one 2"Ø area with 5/16" loss below the bearing pin. The north gusset plate has a 6"Ø area along the west free edge with as little as 1/4" material remaining.



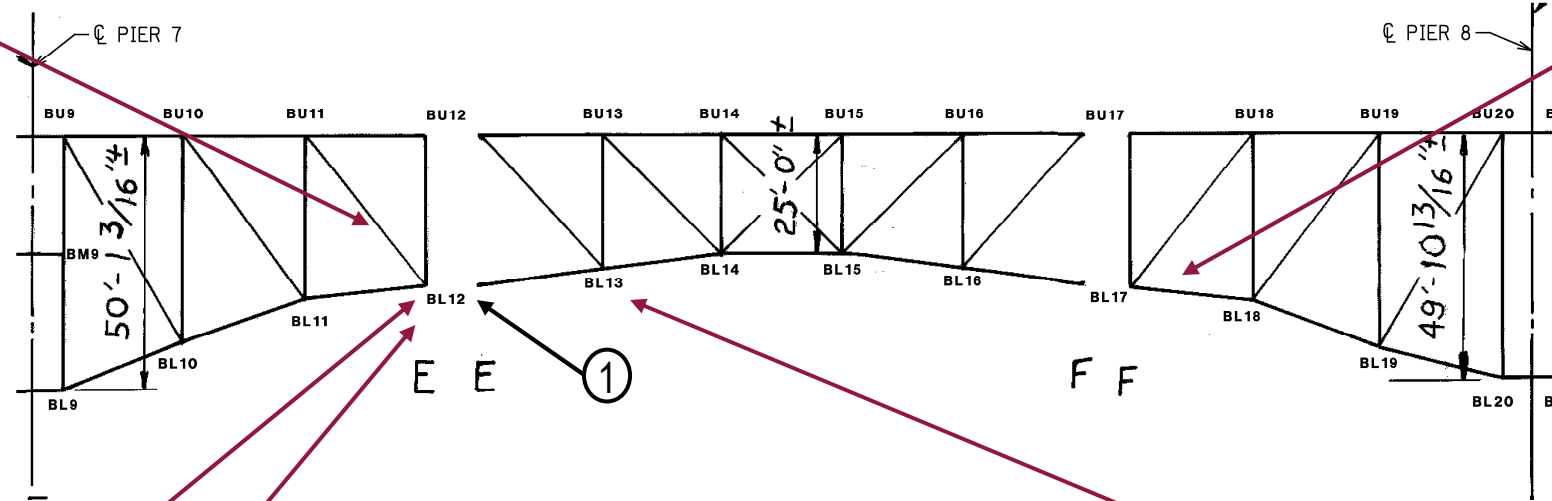
The bearing pin at AL12 exhibits 3/16" deep loss along the circumference adjacent to the pin plates. Additionally, the innermost pin plates exhibit 1/8" deep pitting throughout the interior face adjacent to the pin.



The north gusset plate at AL12 shows wear from abrasion with AL12-AL13.



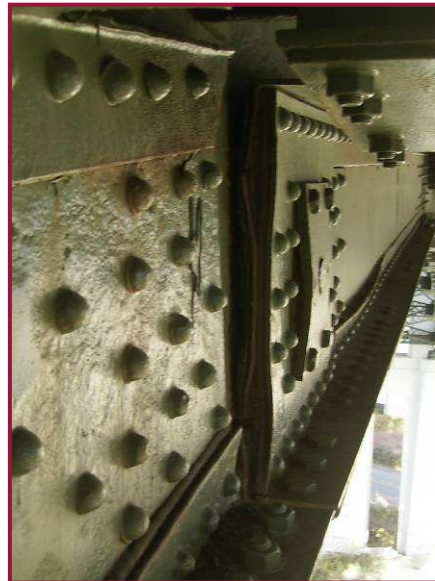
The interior face of the south web plate at BL12-LU11 exhibits 1/8" deep pitting along the lower flange angle.



### SPAN 7 TRUSS B



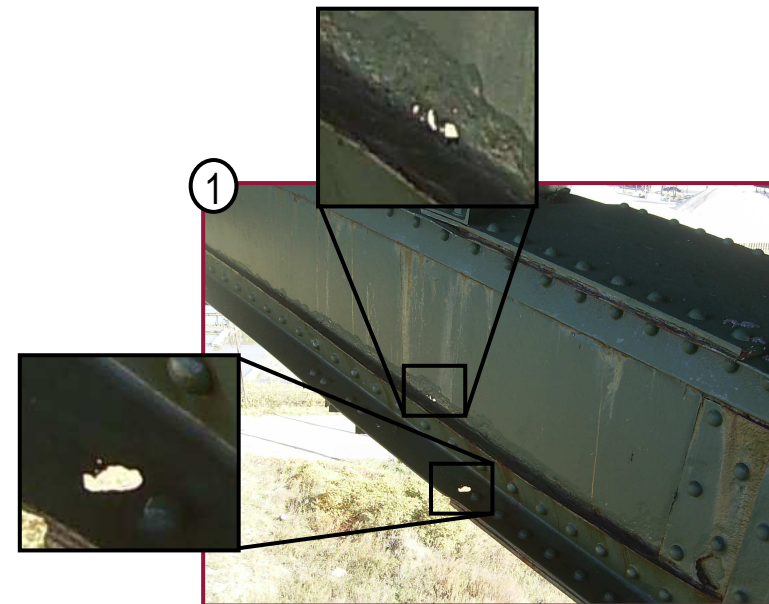
BL17-BL18 exhibits a 5" diameter hole in the south bottom flange near BL17.



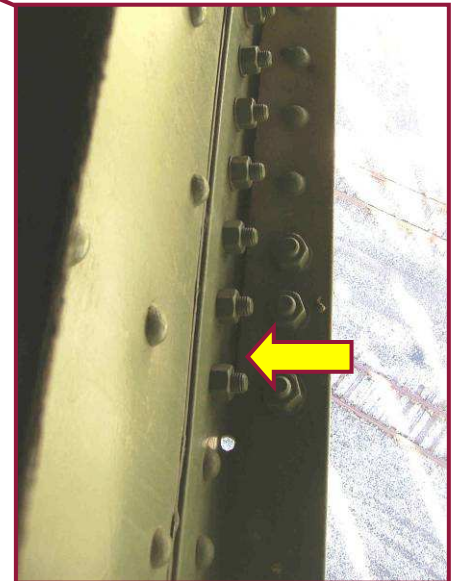
Heavy pack rust between the plates at the lower sliding pin location near BL12 has caused significant distortion of the plates. Heavy pitting is present on the web plate of BL11-BL12 (foreground).



Gusset plate BL12N exhibits small areas of deep pitting up to 5/16" throughout. All locations exhibiting greater than 3/16" deep pitting are highlighted with field markings. The south plate at BL12 exhibits conditions similar to those shown, while losses at BL17 are considerably less severe, typically 1/8" deep.



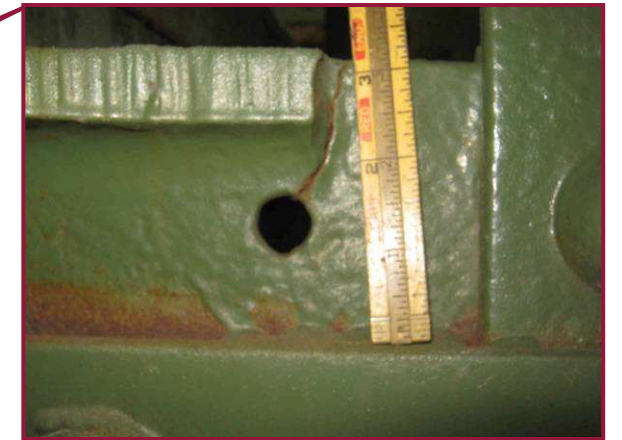
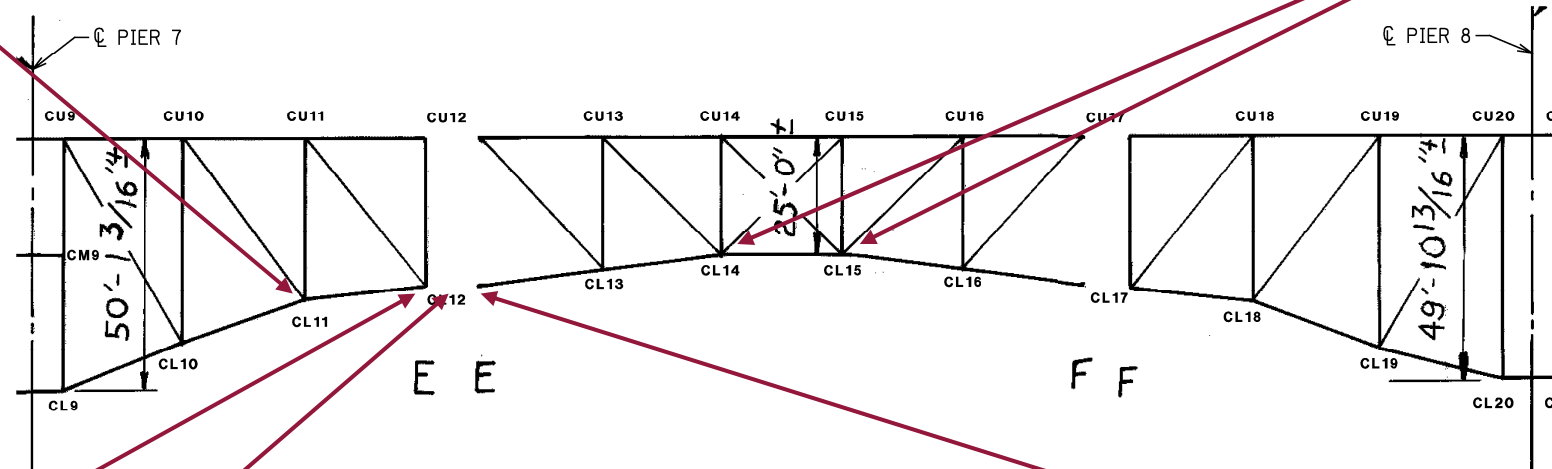
The lower flange angle of BL12-BL13 exhibits a 1" diameter hole. The adjacent web plate exhibits 1/8" pitting and is perforated due to isolated advanced corrosion at one location.



The south bottom flange angle at BL13 exhibits longitudinal cracking due to pack rust between the outstanding leg of the flange and the bottom lateral bracing connection plate. Arrest holes have been drilled and the bottom connection plate has been replaced at this location.



The bottom flange angle splice plate at CL11 is bowed out approximately 1.5" due to heavy pack rust.



Utility deck Floorbeams 14 and 15 exhibit cracking at the top flange coping near Truss C, extending down into stress relief holes. These cracks are approximately 1.75" long and do not appear to have propagated beyond the stress relief holes

## SPAN 7 TRUSS C



The internal diaphragm plate at CL12 exhibits heavy pitting around the rivet heads and along the edge of the plate at the gusset plate interfaces. Note the active rust throughout.



CL12-CL13 exhibits advanced section loss and heavy pack rust at the sliding pin location at CL12. A thin internal fill plate has rusted away at this location, and built up member connections are becoming distressed due to the pack rust and subsequent distortion of the web members, as shown.



At the lower chord sliding pin at CL12, heavy pack rust has forced the pin plates away from the end of the pin. The end of the pin is approximately 1" from flush with the keeper plate.



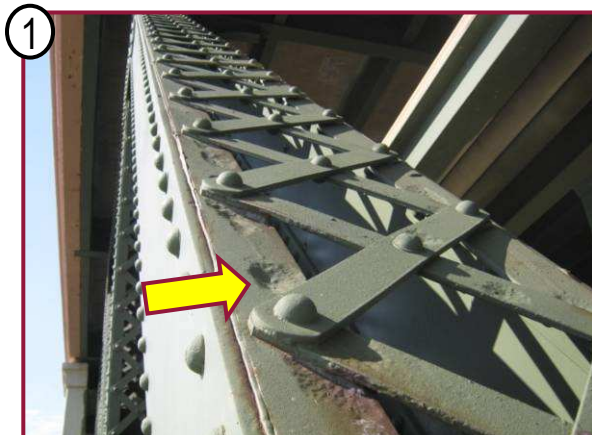
The lower chord sliding pin at CL12 is not bearing on the keeper plate, exhibiting lateral misalignment.



Floorbeams in Span 7 typically exhibit 1/16" pitting with isolated 1/4" pitting on the web and flanges between Truss D and Stringer 2 (first interior stringer) (Floorbeam at DU18 shown).



Stringer 2 exhibits pitting up to 1/4" deep on the top of the bottom flange and typical 1/16" pitting with isolated 1/4" pitting throughout the web.



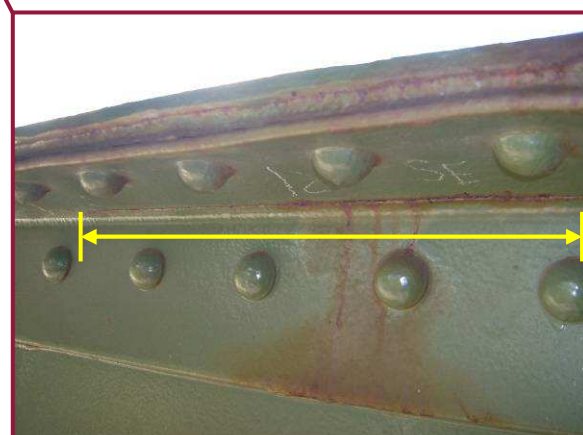
Pitting up to 1/4" is isolated on top flange angles at lacing connections on diagonal members throughout Span 7.



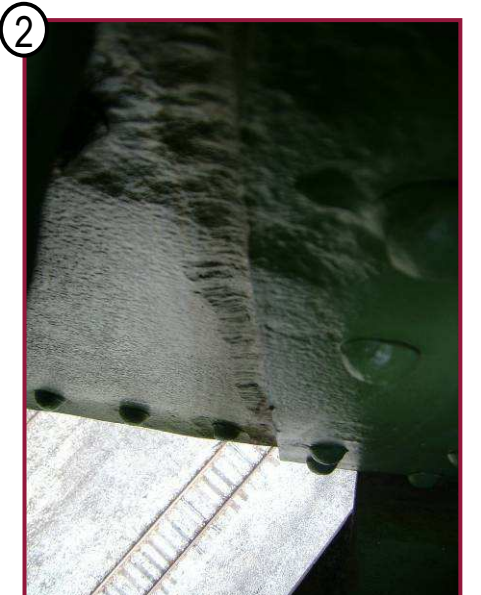
Active pack rust between the north gusset plate and vertical member angle at DL12



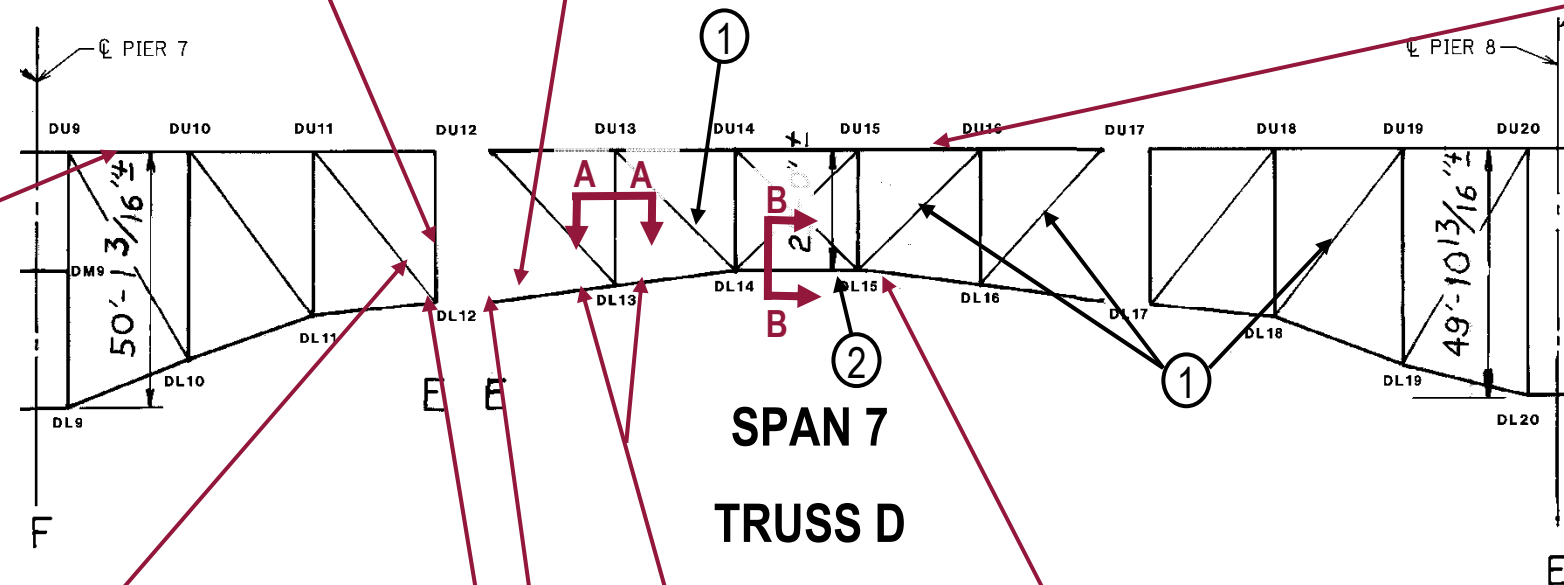
DL12-DL13 exhibits moderate corrosion and pitting up to 1/4" deep over the lower 1/3 of north web plate, with a 2" Ø hole near the bottom cover plate interface.



Longitudinal crack is located between legs of the north upper flange angle measuring 24" long at DL15-DL16.



Up to 1/4" pitting (cleaned and painted) extends the full height of the north web of DL14-DL15 adjacent to DL15. This condition is typical for Span 7 lower chord members.



Pack rust is typical between web plates and flange angles and between flange angles and lacing channels. Isolated areas have reactivating rust.

Isolated 1/4" pitting on the interior of north web plate

1/4" deep pitting x 12" wide (adjacent to lower gusset plate)

3"Ø hole in the north angle leg of DL13-DL14

Section A-A

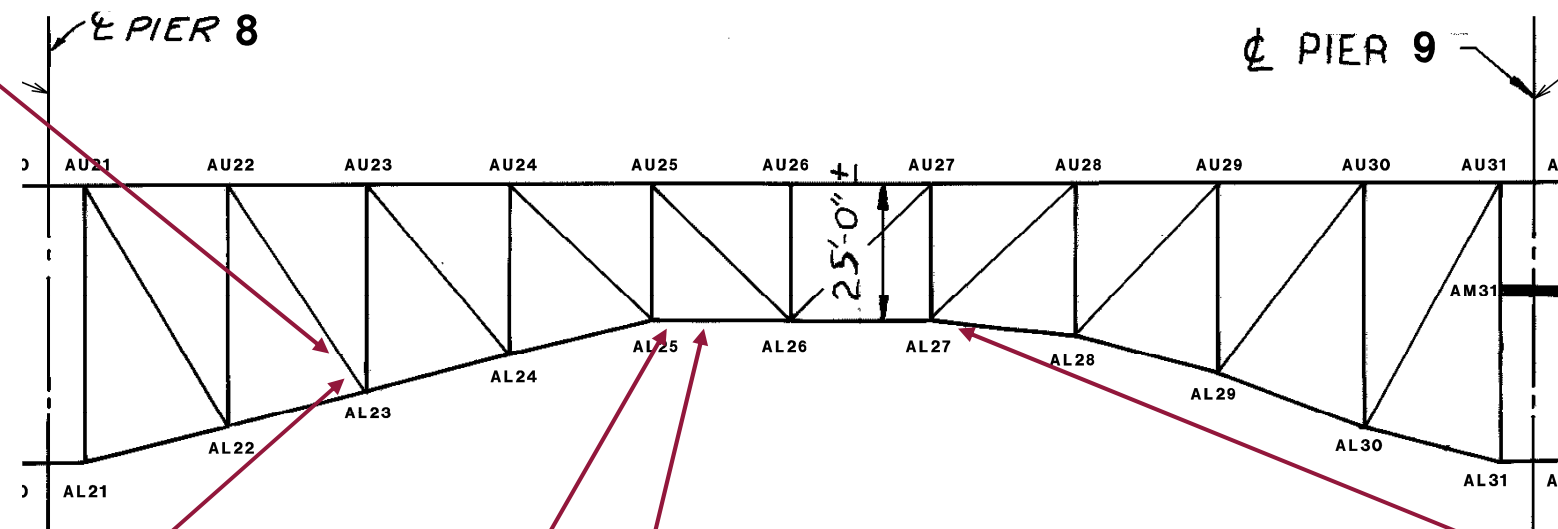
Section B-B

**SPAN 7 TRUSS D**





The south web plate of AL23-AU22 exhibits pitting up to 3/16" deep along the gusset plate interface.



### SPAN 8 TRUSS A

1/2"Ø hole in the lower lateral bracing connection plate



The lower cover batten plate of AL23-AU22 has been flame-cut to accommodate previous repair work done at this location. Note retrofit bolt at the lower lacing connection.



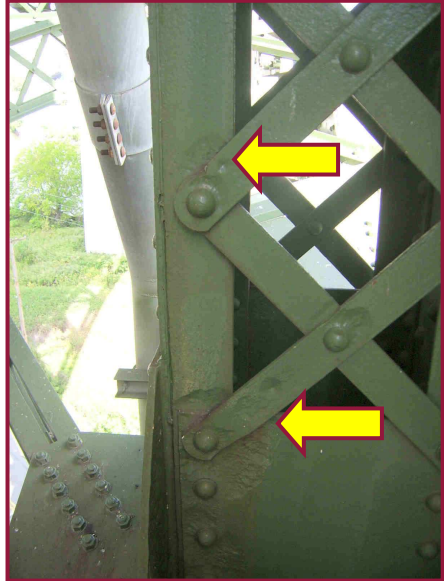
The north web plate of AL26-AL27 exhibits isolated advanced loss of section with a 2" diameter perforation within the bounds of the vertical leg of the bottom flange.



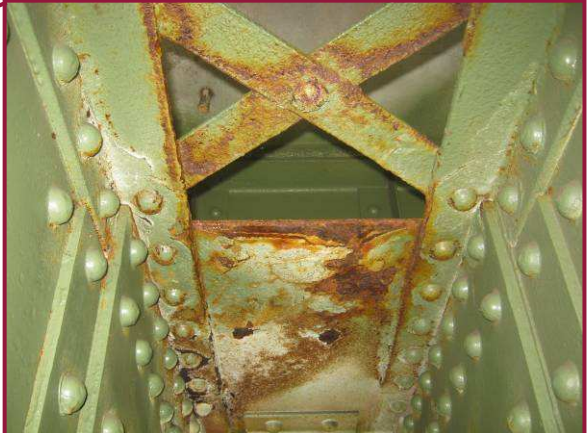
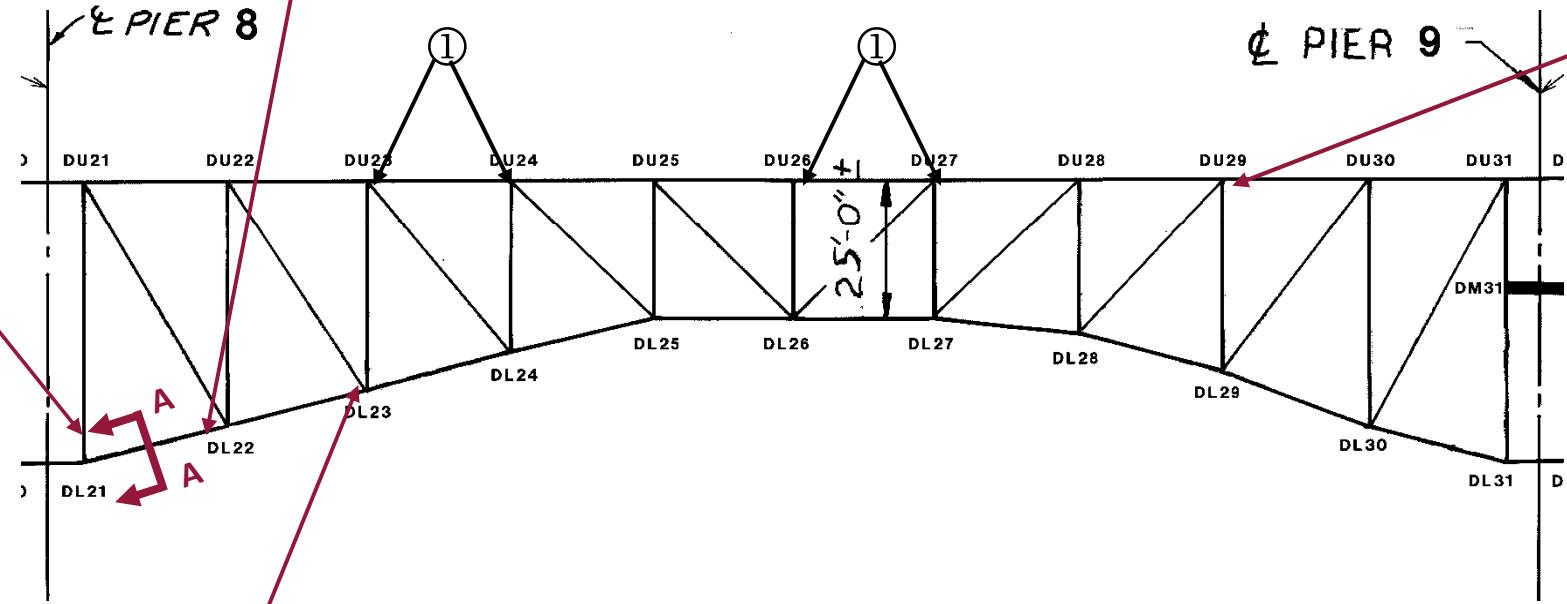
The south web splice plate at AL27 exhibits 1/4" pitting with reactivating rust along the lower flange. Additionally, the adjacent bottom flange exhibits pitting up to 1/4" deep and the rivet heads connecting the lateral bracing connection plate exhibit significant loss of section.

① The floorbeams in Span 8 typically exhibit 1/16" deep pitting throughout the east face between Stringer 2 and Truss D, with up to 1/4" pitting found in isolated areas.

1/16" deep pitting is typical over the full height of the north web plate adjacent to gusset plates throughout Span 8. Pitting at DL22 is up to 1/8" deep at this location.



DL21-DU21 exhibits areas of heavy pitting (up to 1/4" deep) adjacent to the lacing connections on the flange angle legs and the lacing bars near the lower panel point.

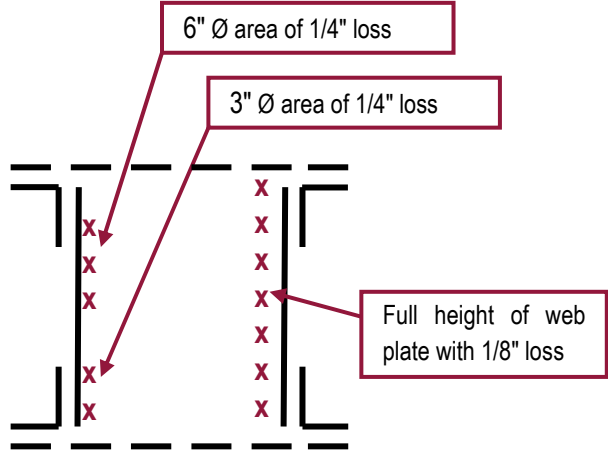


The interior of the upper chord between the gusset plates at DU29 exhibits active rusting with only minor surface pitting.

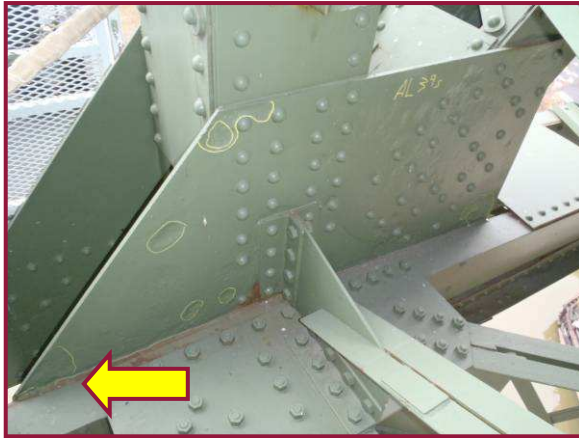
**SPAN 8  
TRUSS D**



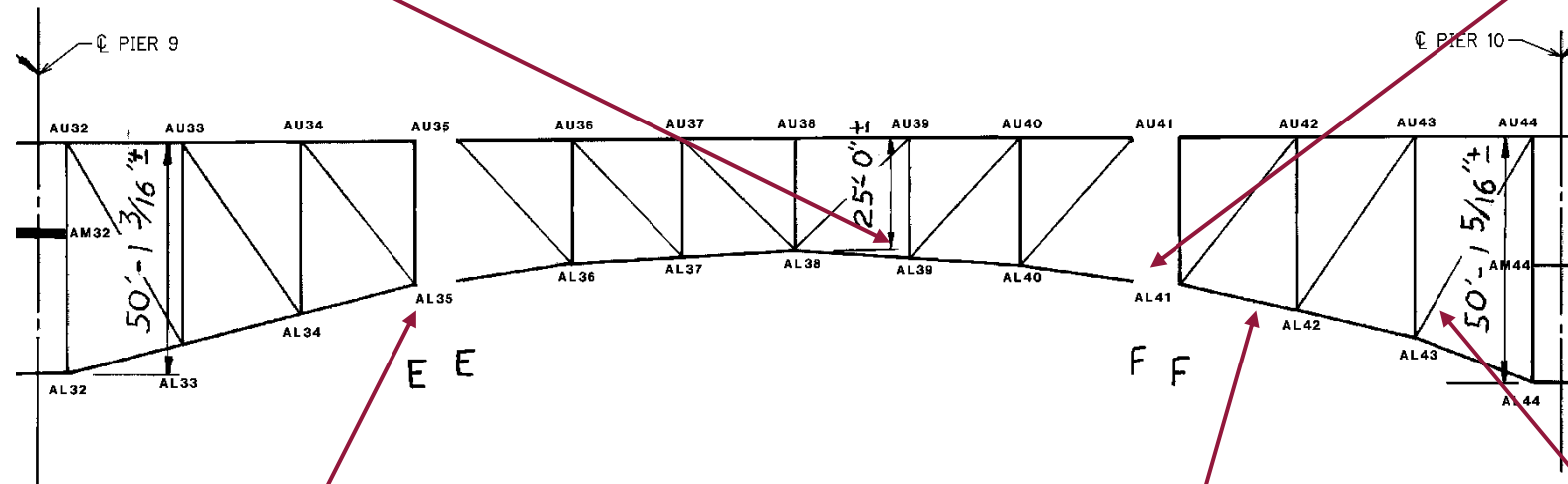
Heavy pitting is typical along the horizontal surfaces of members at DL23, including approximately 50% loss of 9 of the 20 rivet heads connecting the lower lateral gusset plate to the lower chord flange at this location (cleaned and painted).



**Section A-A**



AL39S exhibits heavy isolated pitting throughout the south face of the plate. The remaining plate thickness at one location adjacent to the lower chord is 1/4".



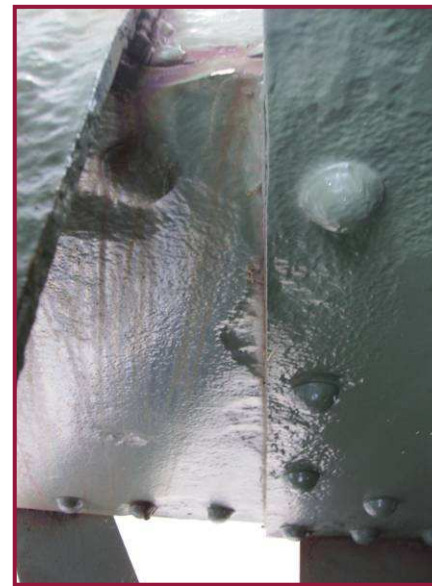
### SPAN 9 TRUSS A



The built up strut at AL41 exhibit active surface corrosion throughout.



AL35S exhibits heavy pitting throughout the south face of the plate, with 1/4" losses in isolated areas.



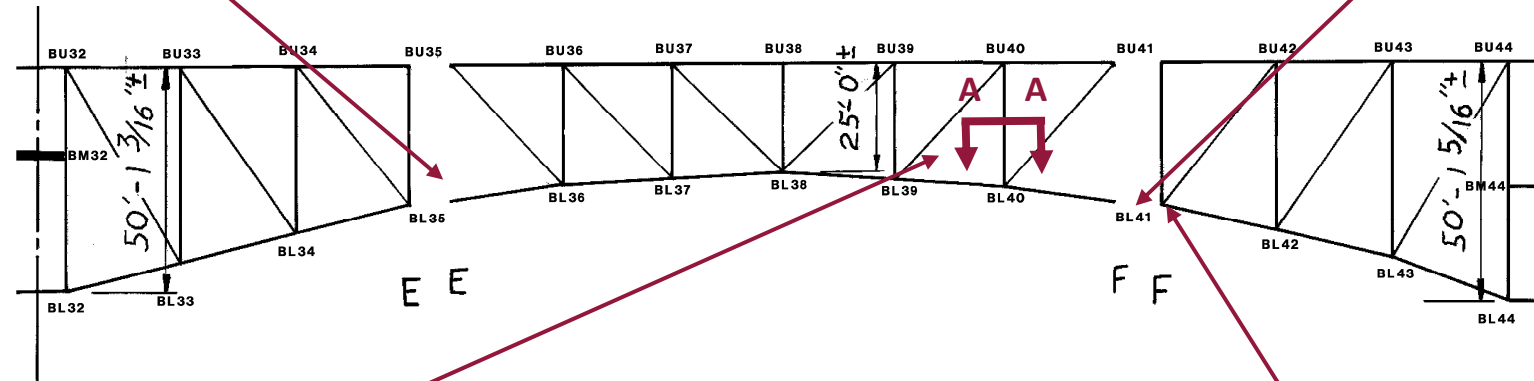
The south web plate of AL41-AL42 exhibits 1/4" deep pitting along the gusset plate interface.



The south web plate of AL43-AU44 exhibits 1/4" deep pitting across the full height of the plate at the lower gusset plate interface.



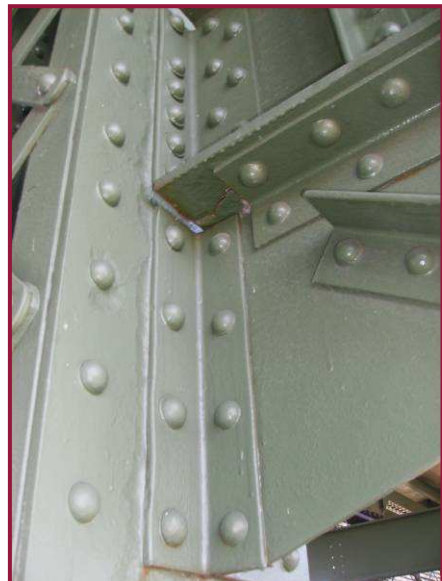
Heavy pitting of the north web plate along the bottom flange angle is typical for the lower half of BL35-BL36. The pitting on this member progressively worsens from west to east, with up to 5/16" deep pitting near BL36 (shown in photo).



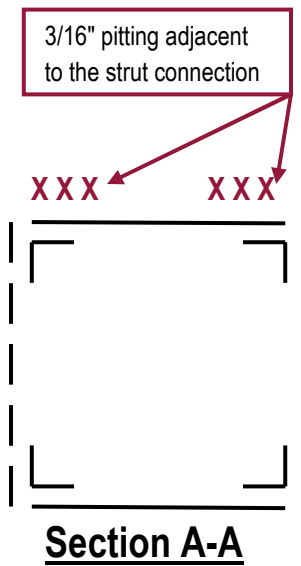
**SPAN 9  
TRUSS B**



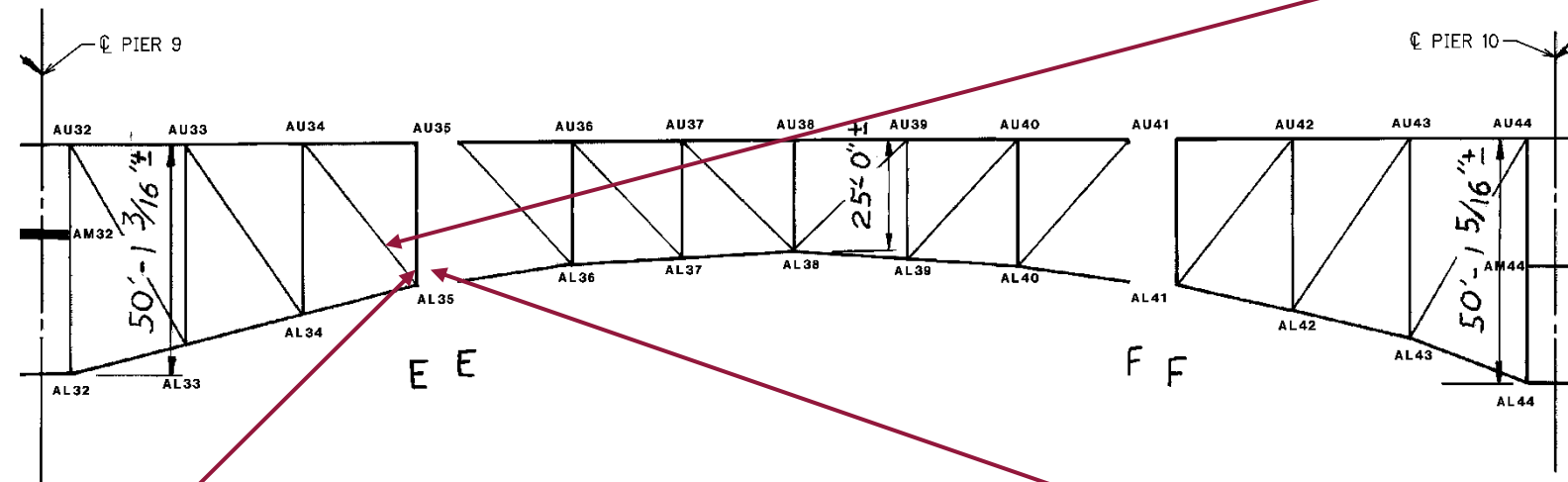
The lower sliding pin at BL41 exhibits losses up to 1/8" adjacent to the pin plates along the pin circumference. The pin at BL35 exhibits similar conditions in addition to minor corrosion throughout the surface of the pin.



BL40-UL40 exhibits up to 3/16" deep pitting adjacent to the sway strut connection (see Section A-A).



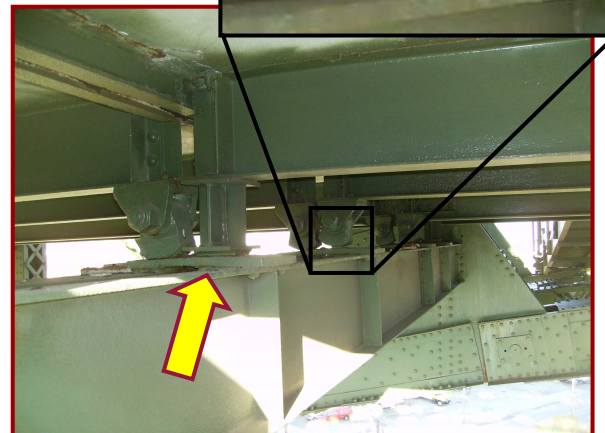
The north gusset plate at BL41 exhibits isolated areas of pitting up to 1/4" with losses between 1/16" and 1/8" common throughout the north face. The north and south gusset plates at BL35 exhibit similar conditions.



**SPAN 9  
TRUSS C**



The south web plate of CL35-CL34 exhibits 1/8" deep pitting along the full width of the plate at the interface with the lower gusset plate.



Stringer 3 is not bearing properly at the utility deck Floorbeam 35 bearing plates. Stringers 1 and 4 have retrofitted bearings, consisting of modified beam sections with welded vertical stiffeners. Note that pack rust between the top floorbeam flanges and the bearing plate has caused the plates to bow up.



The south gusset plate at CL35 exhibits 1/8" deep pitting throughout areas of the south face, with small areas with up to 1/4" deep pits on the north face of the plate along the lower chord.



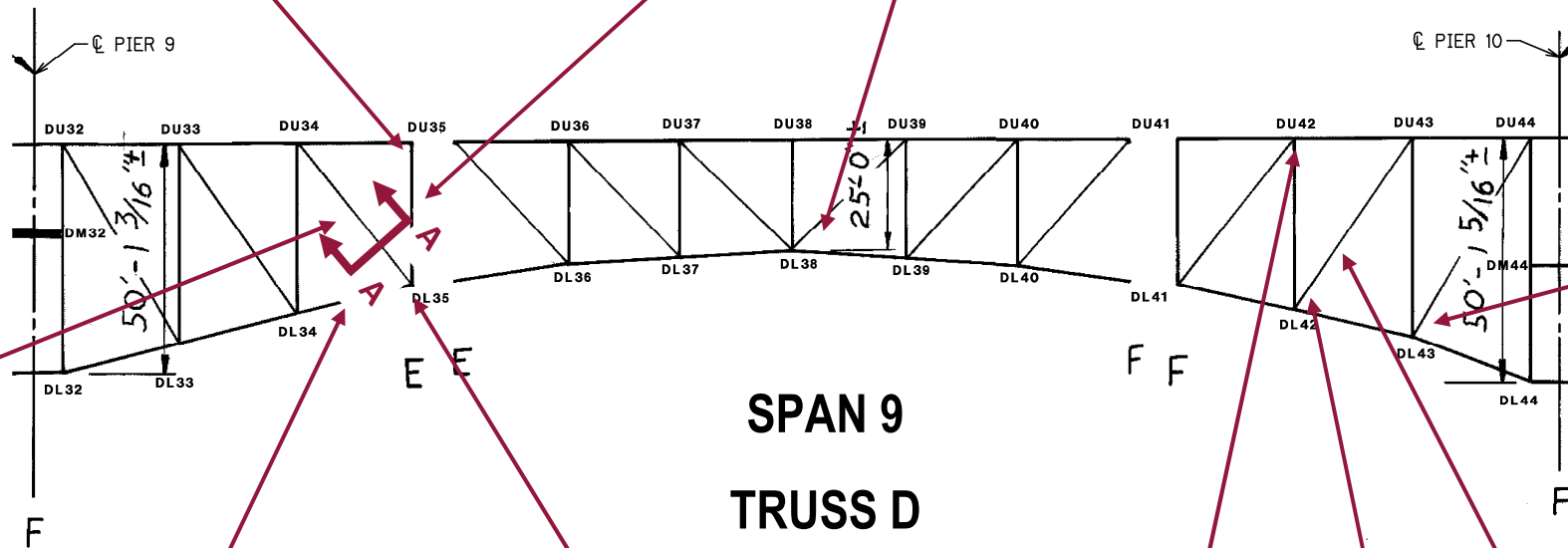
Floorbeam 35 exhibits active corrosion of the bottom flange and the adjacent web and vertical stiffeners with up to 1/16" deep pitting. The joint trough has failed and water and debris are leaking onto the floorbeam.

The bearing pin at DL35-UL35 exhibits pitting up to 1/4" deep along the circumference adjacent to the pin plates. This condition is common, though typically less severe, among the main bearing pins throughout the structure.

The top cover plates on the lower chord exhibit isolated pitting up to 1/8" deep throughout Span 9. Note: this condition is typical for both Trusses A & D throughout the entire structure.



Rust reactivation is typical at the pinned gusset plates due to joint failures above (DL35N shown).



### SPAN 9 TRUSS D



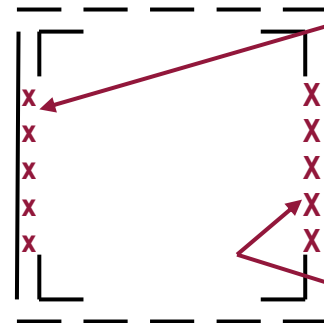
The south web plate of DL35-UL34 exhibits 3/8" deep pitting on the interior face between the flange angle legs. This area is located approximately 1' above the lower gusset plate (see Section A-A).

Eight of the 16 rivet heads at the lower lateral connection for DL35-CL35 exhibit significant loss at Truss D, with adjacent heavy pitting of the lower chord flange.

Between Truss D and Stringer 2, Floorbeam 42 exhibits a 1/4"Ø hole in the lower half of the web with 1/16" pitting typical in the surrounding area along the bottom flange.



3/4" thick pack rust has formed between the DL43 south gusset and the lower chord web plate resulting in localized minor distortion. This condition was also noted at DL37 in Span 9.



Pitting up to 1/4" deep for half the web width

Pitting up to 3/8" deep

#### Section A-A



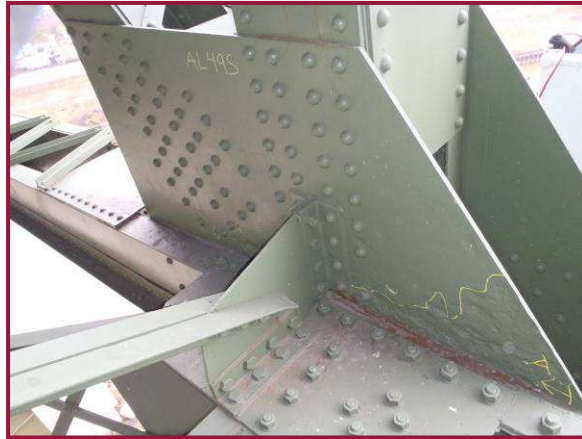
Lower chord members typically exhibit north web plate pitting along the bottom flange interface throughout the structure. DL34-DL35 exhibits up to 1/4" deep pitting (4" tall) for 3/4 of its length.



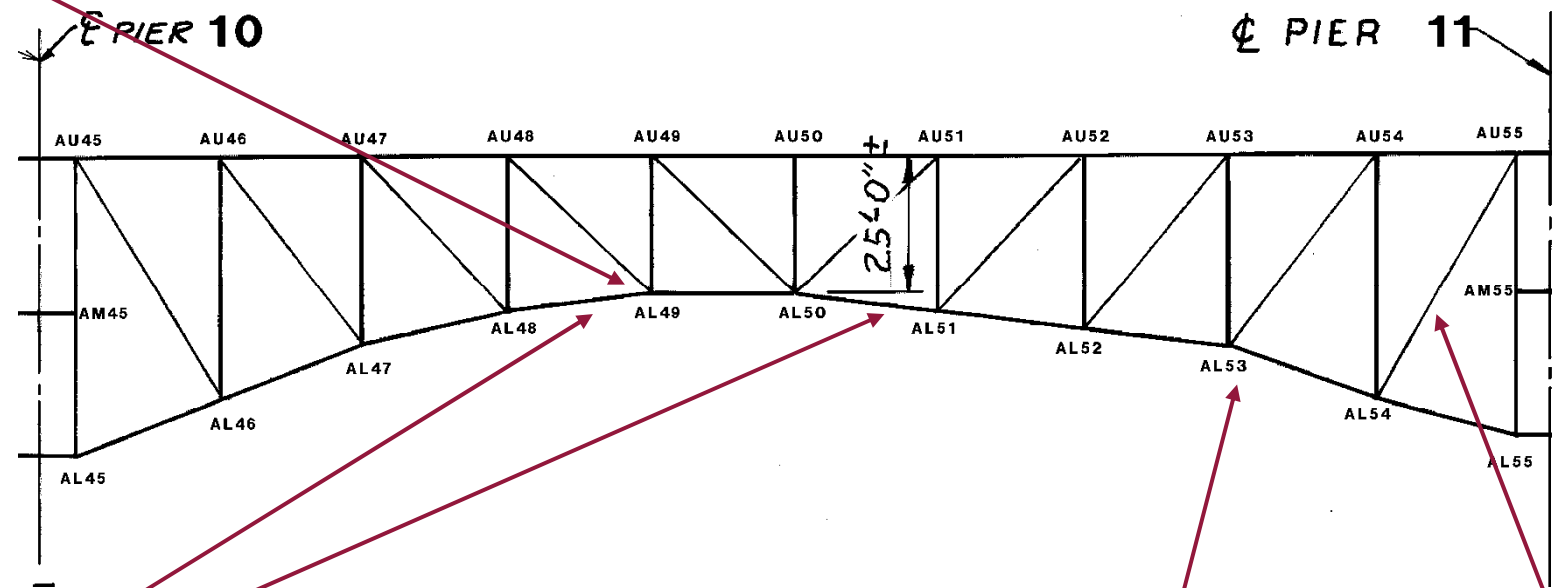
At the seam between the interior lower gusset plate and the diagonal web plate, 1/4"-5/16" deep pitting was noted on member DL42-DU43. Note also the 1/4" deep pitting of the northwest flange angle.



Pack rust between the bottom flange angle and web plate of diagonal members is common throughout the structure. Minor distortion can be seen as a result of the 1/2" thick pack rust at DL42-DU43.



AL49S exhibits heavy pitting up to 1/4" deep along the lower chord interface, as outlined on the plate.



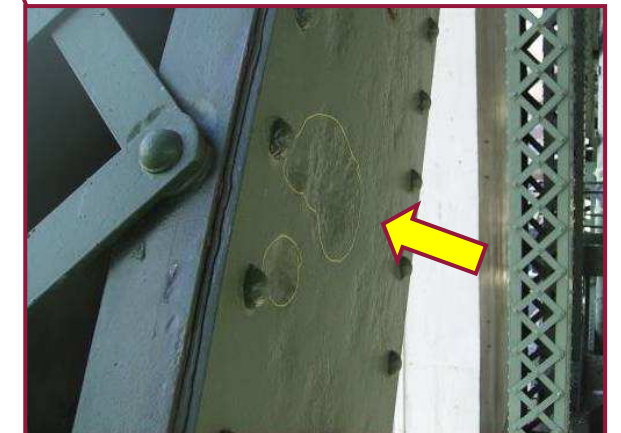
**SPAN 10  
TRUSS A**



The south web plate of AL48-AL49 has heavy pitting up to 1/4" deep for approximately half the web height near AL49. Similar conditions are found at AL 51.



The top flange splice at AL53 exhibits minor distortion due to pack rust forming. Note the adjacent active rust on the gusset plate.

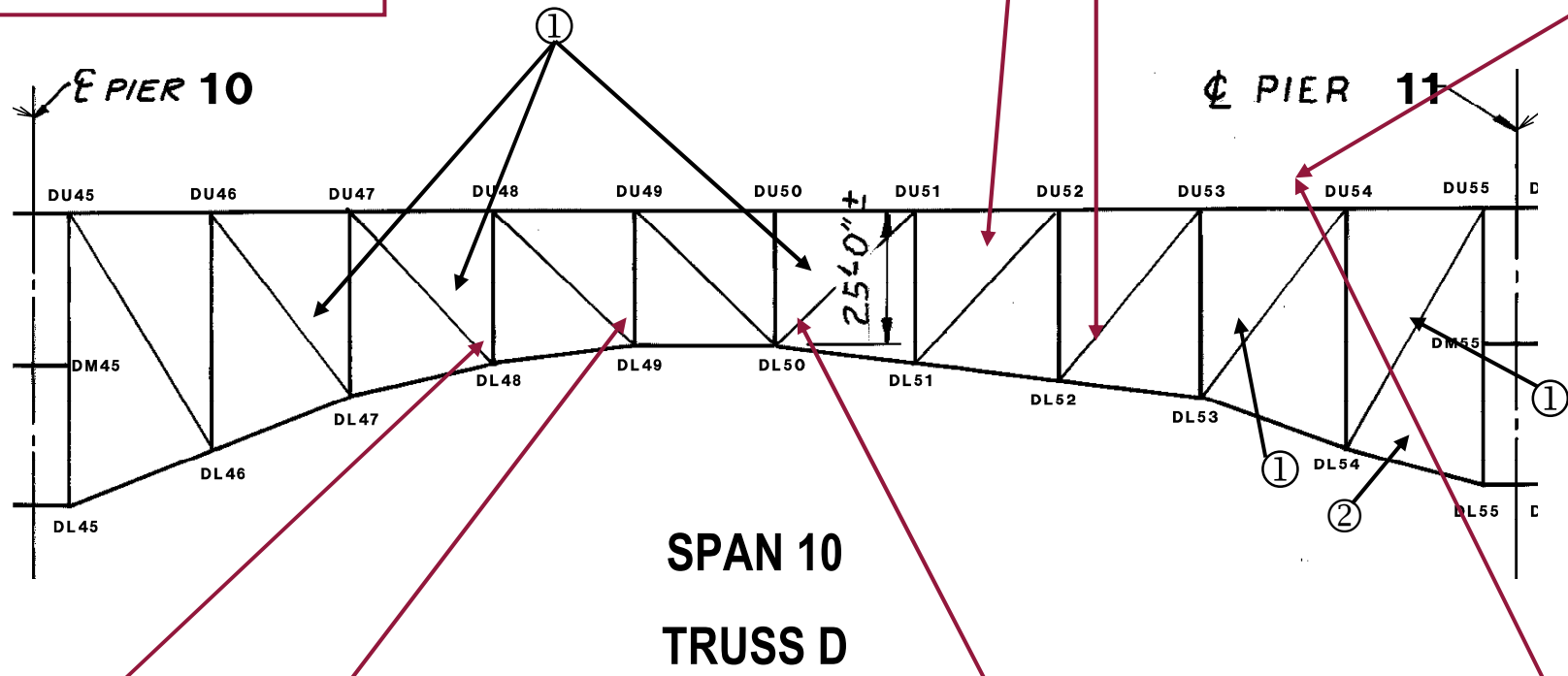


The south web plate of AL54-AU55 exhibits isolated areas with up to 3/8" deep. The largest area measures 6"Ø and is shown above.

② Similar to other spans throughout the structure, the lower chord north web plates exhibit losses along the lower flange angles. Losses in Span 10 are typified by 1/16"-1/8" deep pitting occurring within the lower 2" of the web and along 1/3 to 1/2 the length of each bay. This condition is typical throughout the structure on Truss D. The adjacent flange angles exhibit similar pitting. One location in member DL54-DL55 exhibits advanced section loss with "pinholes" in the outstanding leg.

Pack rust up to 1/8" is typical (isolated up to 3/4") between the diagonal member web plates and the lower flange angles along the length of the members.

2" diameter hole in the lower chord north angle leg at DL52.



Member DL50-DU51 exhibits pitting of the north web plate at the interface with the lower gusset plate. Pitting at this location averages between 1/8" to 1/4" deep for the width of the plate.



Pitting up to 1/8" deep is freckled throughout the south face of Stringer 2 between Floorbeams 53 and 54. This condition is common for Stringer 2 throughout Span 10.



The lower lateral bracing connection plates typically exhibit pitting between 1/16" and 1/8" deep, with localized pitting up to 1/4" deep. The adjacent bottom flange angles exhibit similar pitting. Light surface corrosion is typically forming at these locations.



At the flange splice plate at panel DL49, 1/2" thick pack rust has developed and is deforming the flange angles. Reactivating pack rust at this detail is typical of lower chord splices throughout Span 10.

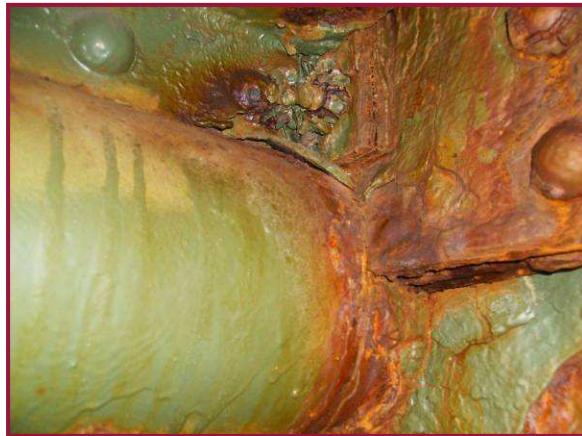


DL50-DL51 exhibits up to 1/4" deep pitting over the full height of the north web at DL50. 1/8" pitting is typically found at similar locations throughout the lower panels in Span 10.

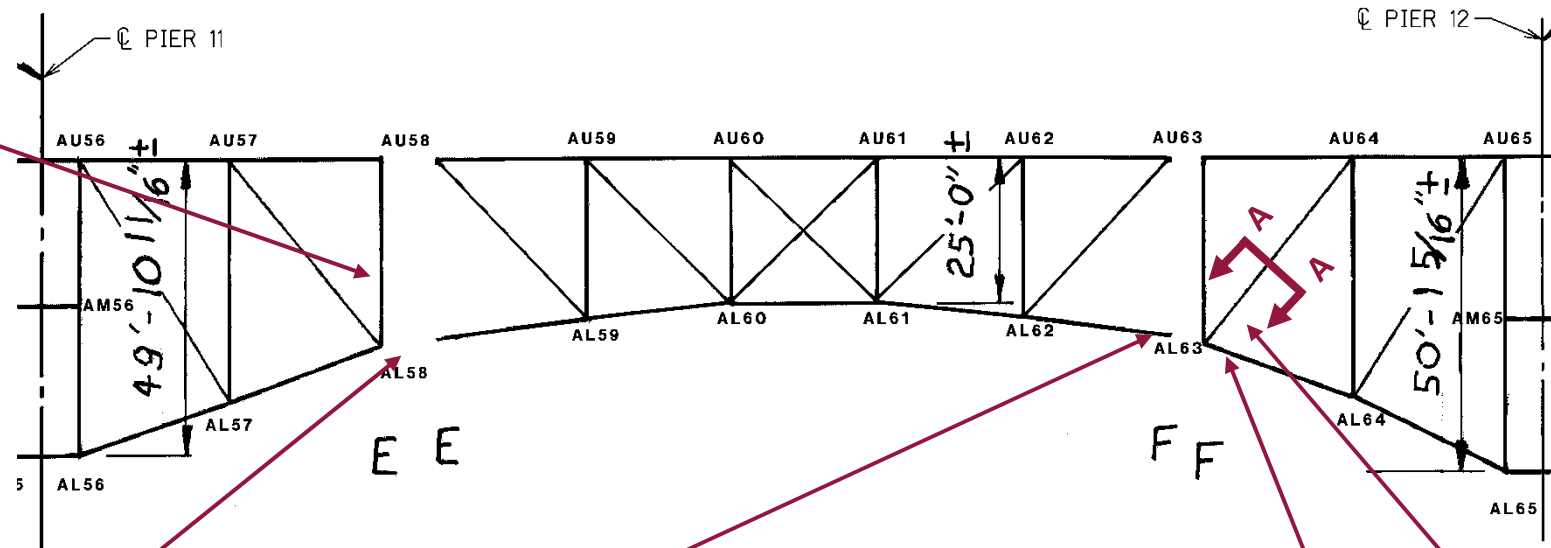


Between Floorbeams 53 and 54 an appurtenance (platform) is stitch welded to Stringer 1 and the interior face of the upper chord of Truss D.

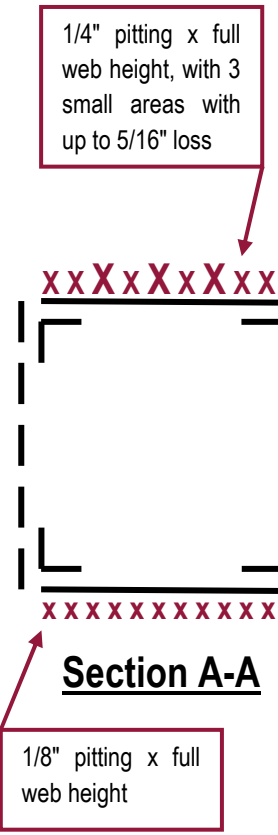




Heavy corrosion is present throughout the interior of AL58-AU58 at the lower panel bearing pin.



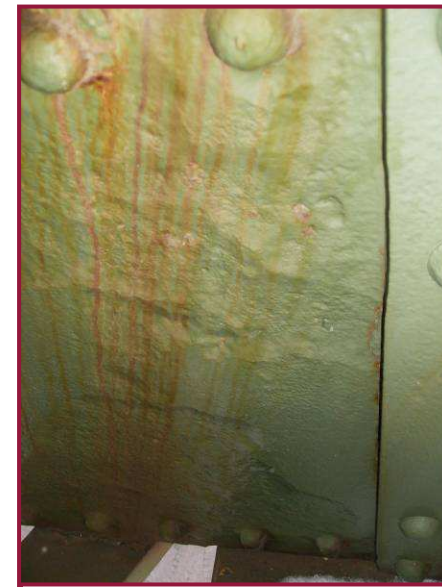
**SPAN 11  
TRUSS A**



Pitting up to 1/4" deep is present on both members at the interface of the south pin plates and the south web plate of AL58-AL59.



The lower sliding pin at AL63 is heavily corroded with rust scaling at the pin to pin plate interface. Rust is reactivating throughout these components.



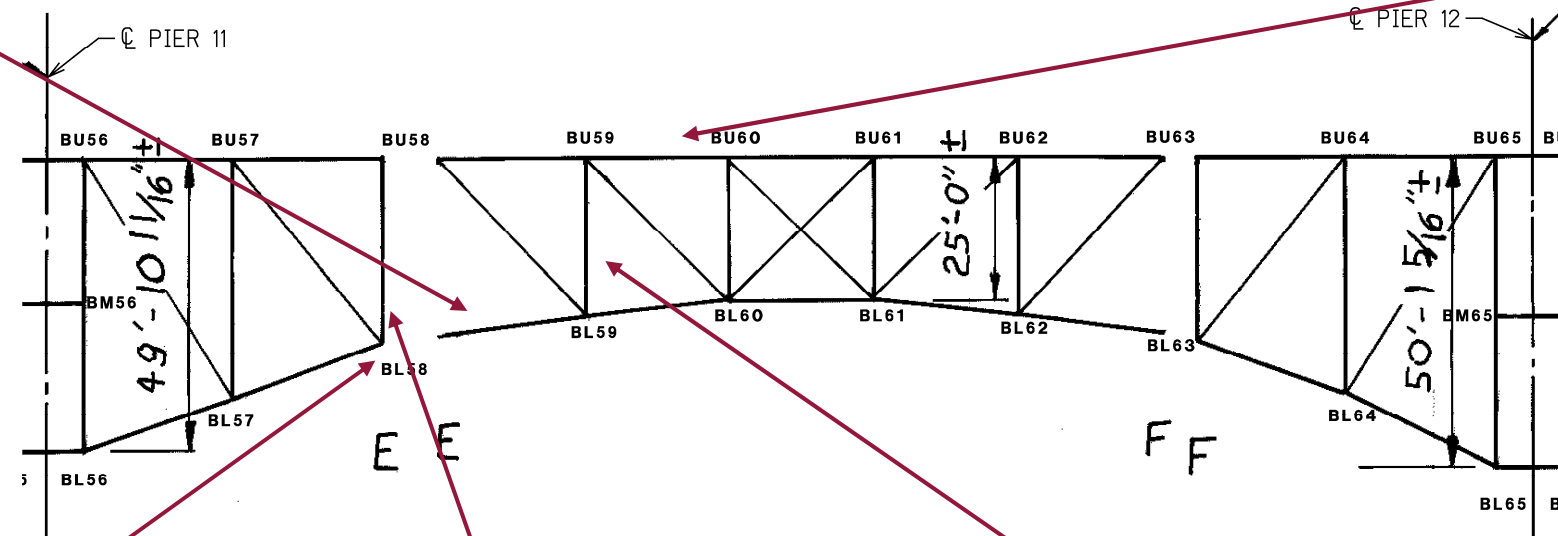
The south face of the AL63-AL64 south web exhibits 1/4" deep pitting along the full height of the plate at the AL63 gusset plate interface.



The south web plate of AL63-AU64 exhibits 1/4" deep pitting across the full height of the web, with three small areas with 5/16" loss. The north plate exhibits 1/8" loss in the same section (see Section A-A).



Localized heavy pitting up to 1/4" deep is present throughout the north face of the south web plate at BL58-BL59.



Framing members throughout the structure are typically cleaned and painted. Floorbeam 59 is shown looking east.

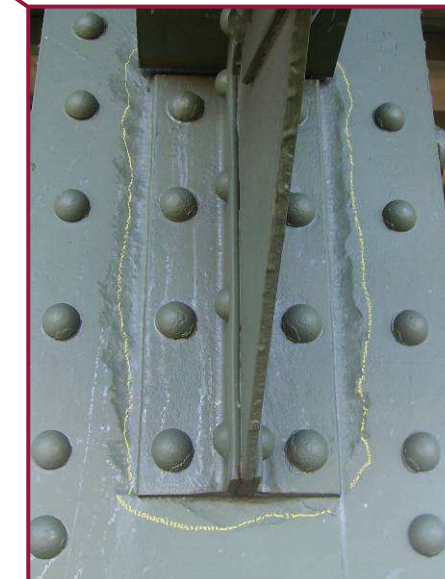
## SPAN 11 TRUSS B



The north gusset plate at BL58 shows signs of abrasion with the lower chord at the sliding pin location, indicating movement of the suspended span. Note also the swelling of the pin plates between rivets on the lower chord member.



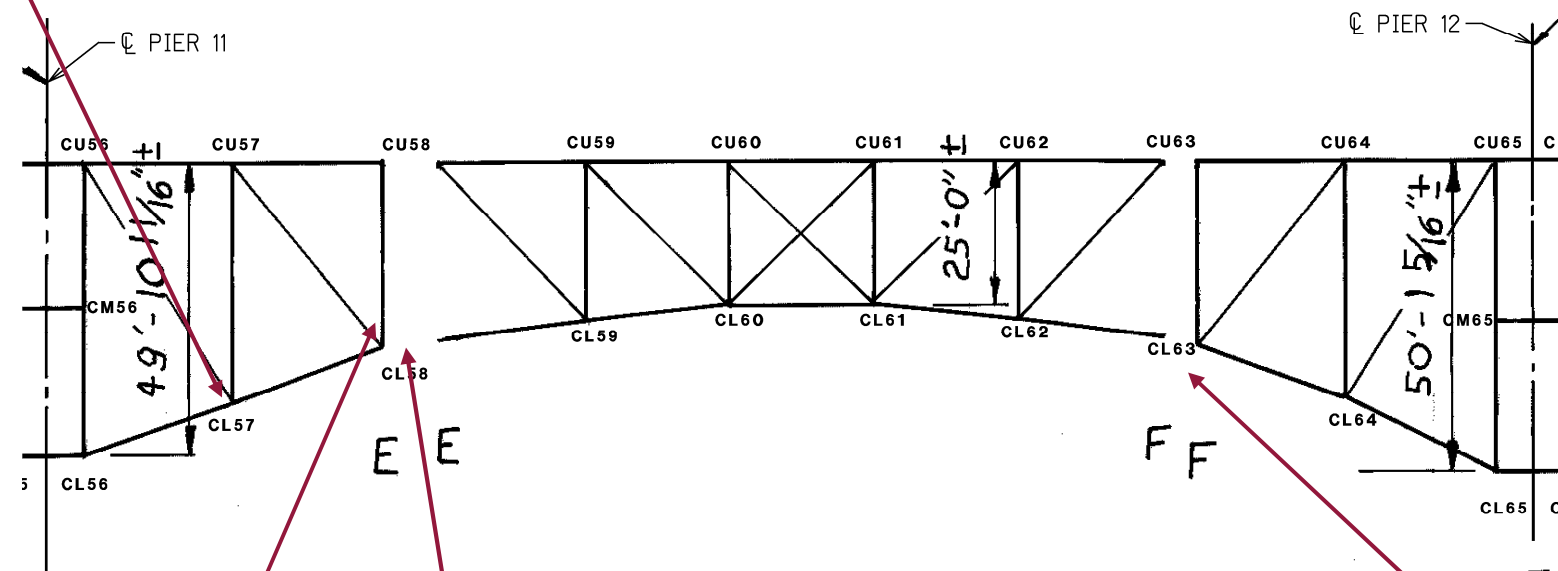
Pack rust up to 1.25" has formed between the north gusset plate and the vertical member near the lower vertical pin at BL58.



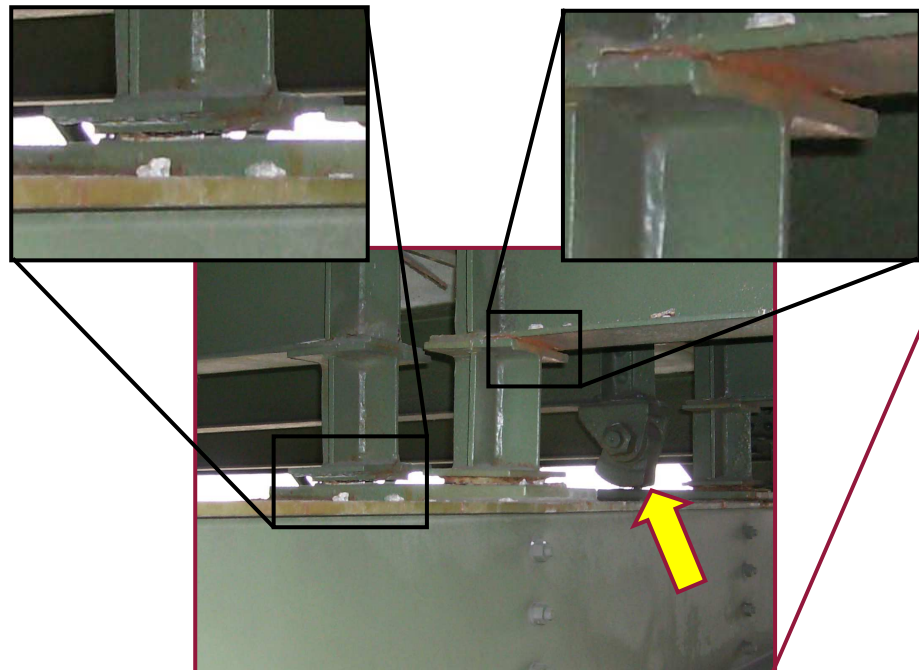
BL59-BU59 exhibits web pitting up to 1/8" surrounding the sway strut knee brace connection.



Pack rust at CL57S has caused distortion of the top flange and web splice plates. Approximately 1" thick pack rust is present between the localized areas at each plate.



### SPAN 11 TRUSS C



Isolated stringer bearings at utility deck Floorbeam 58 exhibit poor contact with the bearing plates (left). Additionally the retrofitted bearing for Stringer 4 in the near span (between L58 and L59) exhibits a cracked bearing to stringer bottom flange weld and is producing abrasion dust (right). The far span Stringer 3 rocker bearing is not in contact with the bearing plate (arrow).



1/8" deep pitting is typical (isolated locations up to 1/4" deep) along the full width of both the north and south web plates of CL58-CU58 above the lower gusset plate interface



The sliding pin at CL63 exhibits pitting up to 1/4" deep along the pin circumference. The pin plates also exhibit heavy pitting, especially along the pin interface.



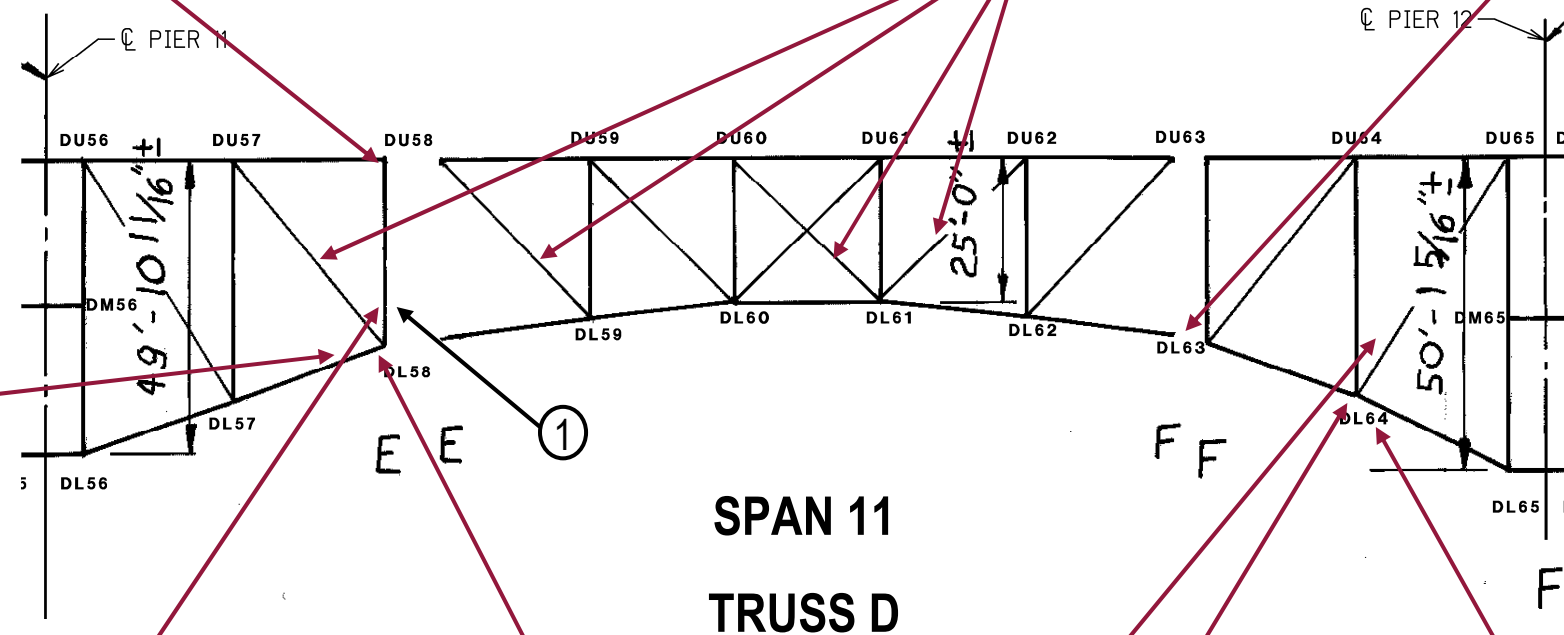
Floorbeam 58 exhibits widespread moderate corrosion with 1/16"-1/8" pitting adjacent to the drainage trough. This condition is typical for floorbeams at expansion joint locations due to joint deficiencies.



DL58-DL59 exhibits pack rust measuring approximately 1.5" thick between the two outermost pin plates at DL58. Losses surrounding the pack rust are approximately 1/8" on each plate. Similar conditions were noted at DL63 with 1/2" thick pack rust.



At the main bearing pin at vertical member DL58-UL58, surface rust is typical throughout with light to moderate pitting of adjacent components. Note: this condition is common among the truss pins, especially those below failed deck joints.



Similar to other spans throughout the structure, the lower chord north web plates exhibit losses along the lower flange angles. Losses in Span 11 are typified by 1/16"-1/8" deep pitting occurring within the lower 2" of the web and most of the length of each bay. The adjacent flange angles exhibit similar pitting.

Pack rust up to 3/4" is found between the diagonal member web plates and the lower flange angles along the length of the members.



The lower sliding pin at DL63 has a 4" diameter area exhibiting up to 5/16" deep pitting. This location has been cleaned and painted with no active rusting.



The north gusset plate at DL58 exhibits up to 3/16" pitting, a condition typically found at the expansion locations throughout the structure.



Active rusting is typical along the seams of the built up members at DL58. The south face of the north gusset plate exhibits 1/8" pitting that has been cleaned and painted, while the same location on the south gusset plate exhibits up to 1/4" loss (arrow). Additionally, note that the horizontal stiffener plate between the two gussets is bowed up, measuring approximately 1" from its original plane.

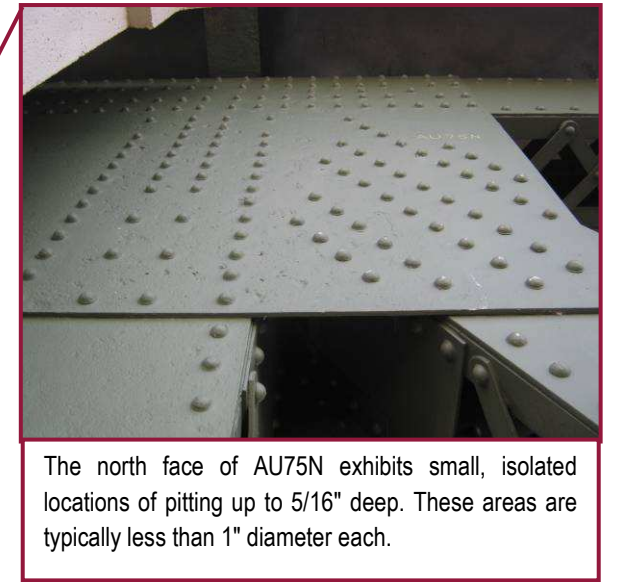
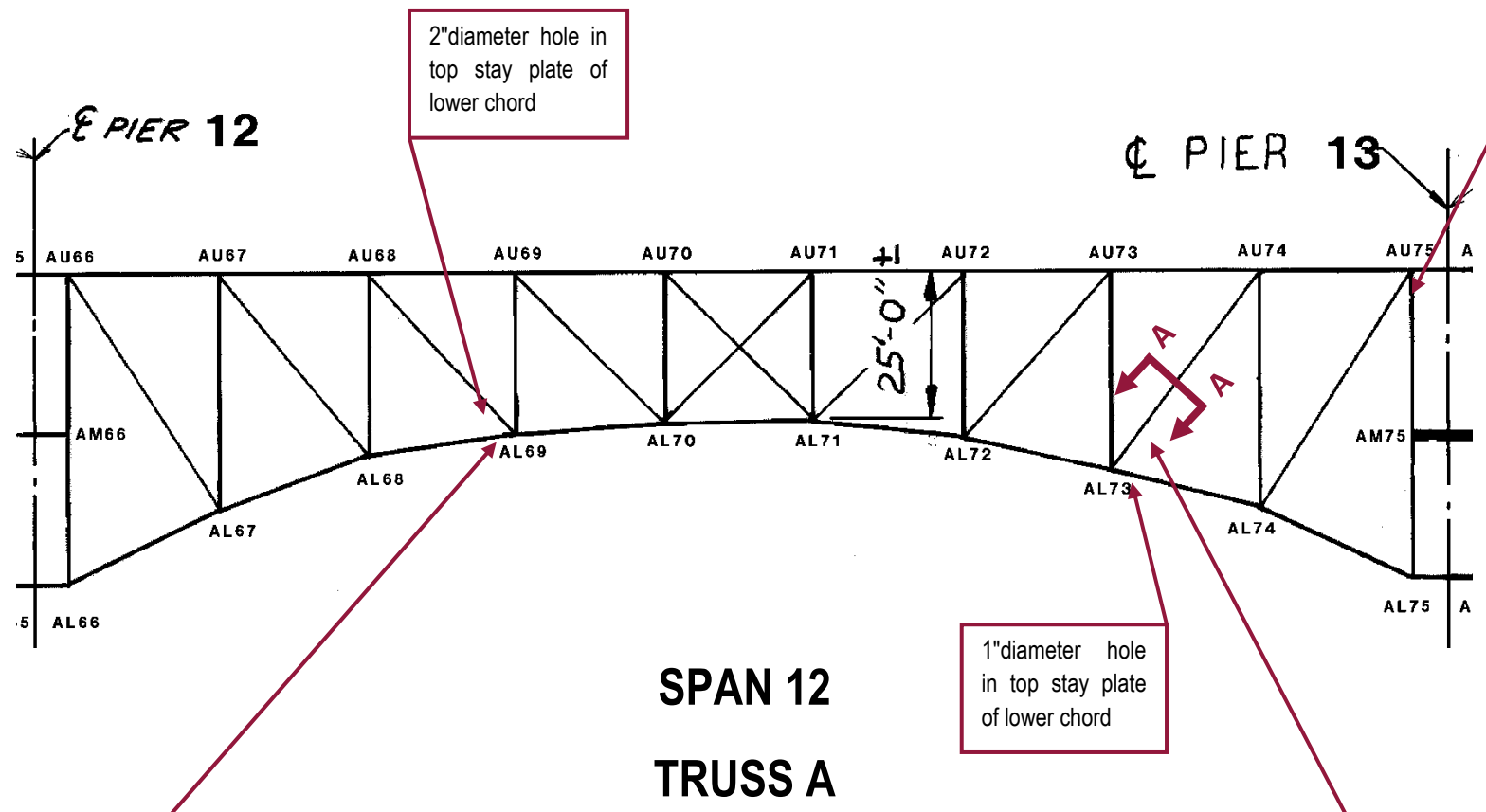
Both gusset plates at DL64 are bowed approximately 3/16" out of plane to the north.



Pitting of the north web plate at the gusset plate interface on diagonal member DL64-UL65 is up to 3/16" deep with light surface corrosion along the seam between the two plates. This condition is typical for Span 11, Truss D for other web members. Only member DL59-UL58 in Span 11 exhibited heavier pitting at this interface, with up to 5/16" loss.



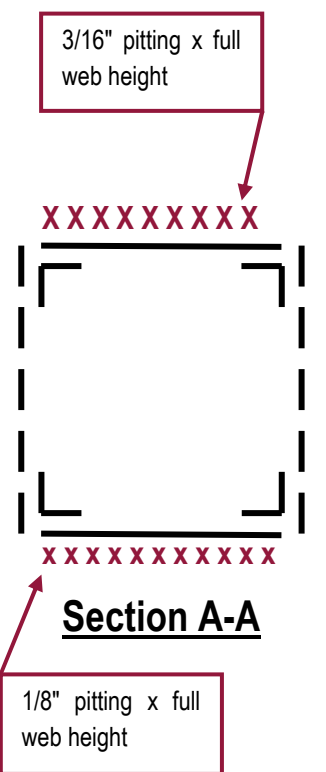
The lower half of the interior face of the DL64-DL65 north web plate exhibits pitting up to 5/16" deep adjacent to the DL64 gusset plate. This condition is typical for Truss D lower chord web plates at the panel interfaces throughout Span 11; however, pitting varies from 1/8" to the 5/16" depth at DL64.

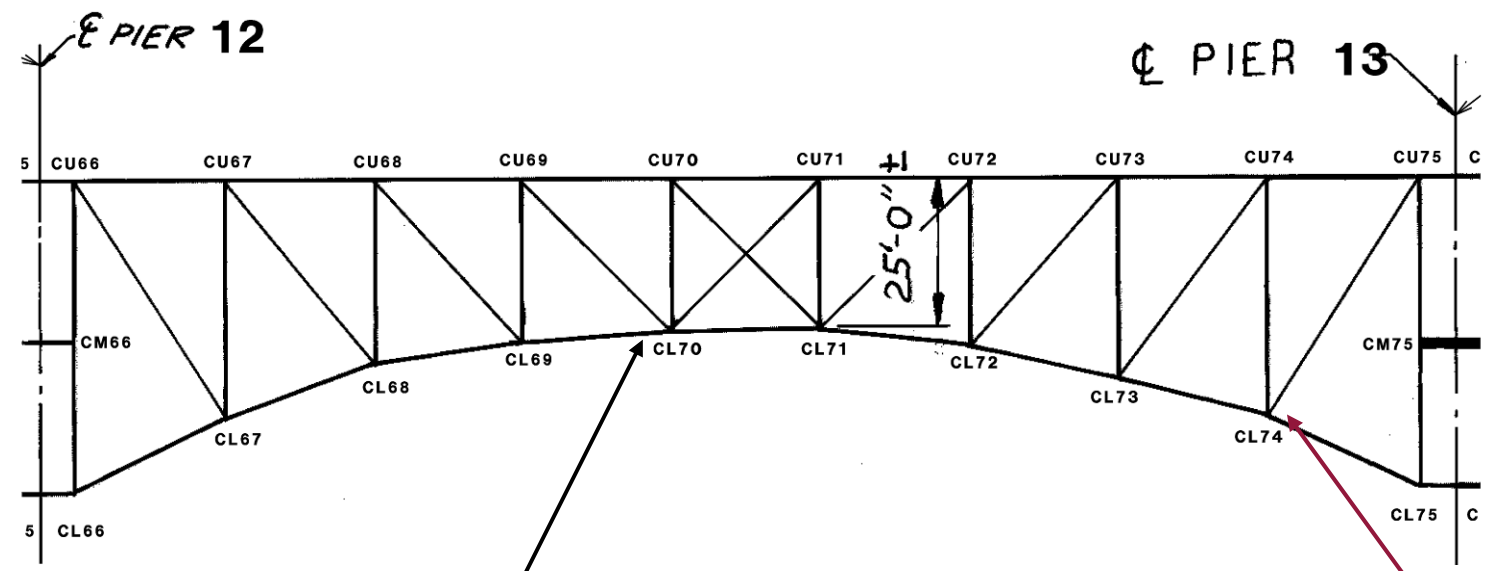


The south face of the south gusset plate at AL69 exhibits heavy pitting along the lower chord interface and adjacent to isolated rivet heads. Note the heavy pitting of the lateral connection plates at this location as well.

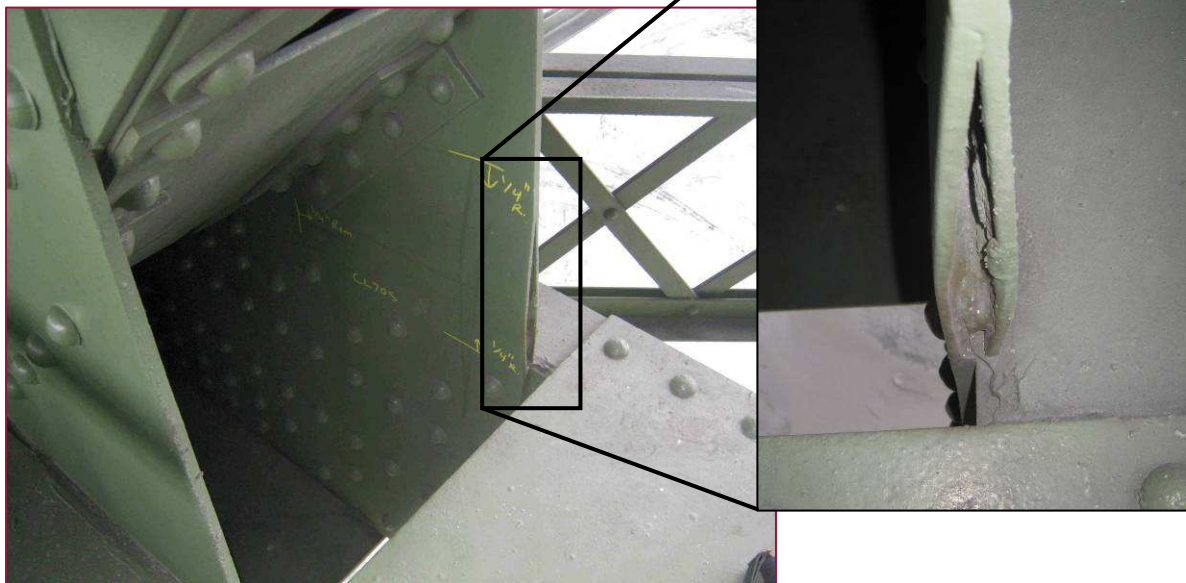


Heavy pitting is present along the web of AL73-AU74 at the lower gusset plate interface (Section A-A).





**SPAN 12  
TRUSS C**



The south gusset plate at CL70 exhibits lamellar separation along the western free edge, with an effective remaining plate thickness of approximately 1/4".



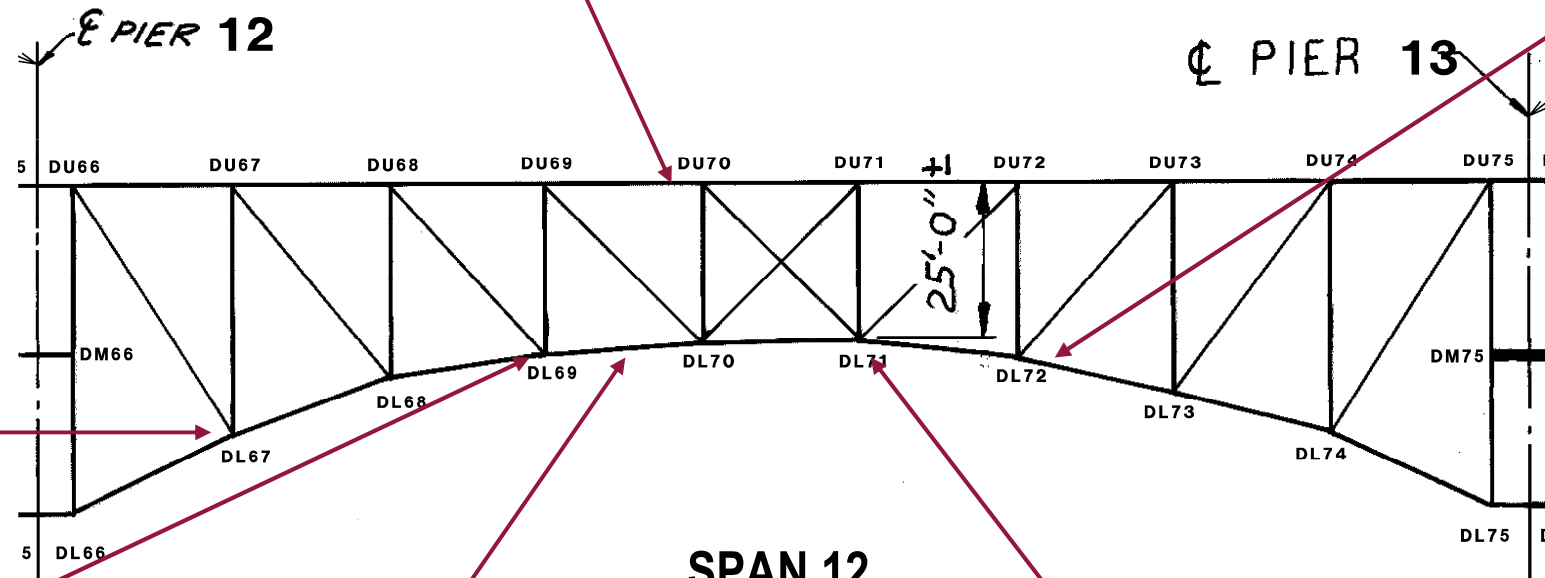
The top flange splice plate at CL74S is distorted due to pack rust.



Pack rust between the gusset plates and web plates at DL67 has caused 1/2" bowing of the gusset plates.

Stringer 1 exhibits up to 1/4" pitting in the bottom half of the south face of the beam near the connection to Floorbeam 70.

The diagonal members throughout Span 12 typically exhibit 1/16" - 1/8" pitting along the gusset plate interfaces at the north web plates. This condition is typical throughout the structure.



**SPAN 12  
TRUSS D**



Adjacent to the north gusset and above the bounds of the lower flange angle, the lower chord web plate at DL72 is perforated by a 1" diameter hole.



The lower chord, north web plate at DL69 exhibits pitting up to 1/4" deep along the gusset plate interface. This condition is common throughout Span 12; however, losses are typically less, consisting of 1/8" deep across the section. Also note the minor pitting along the interior face of the gusset plate adjacent to the lower chord.

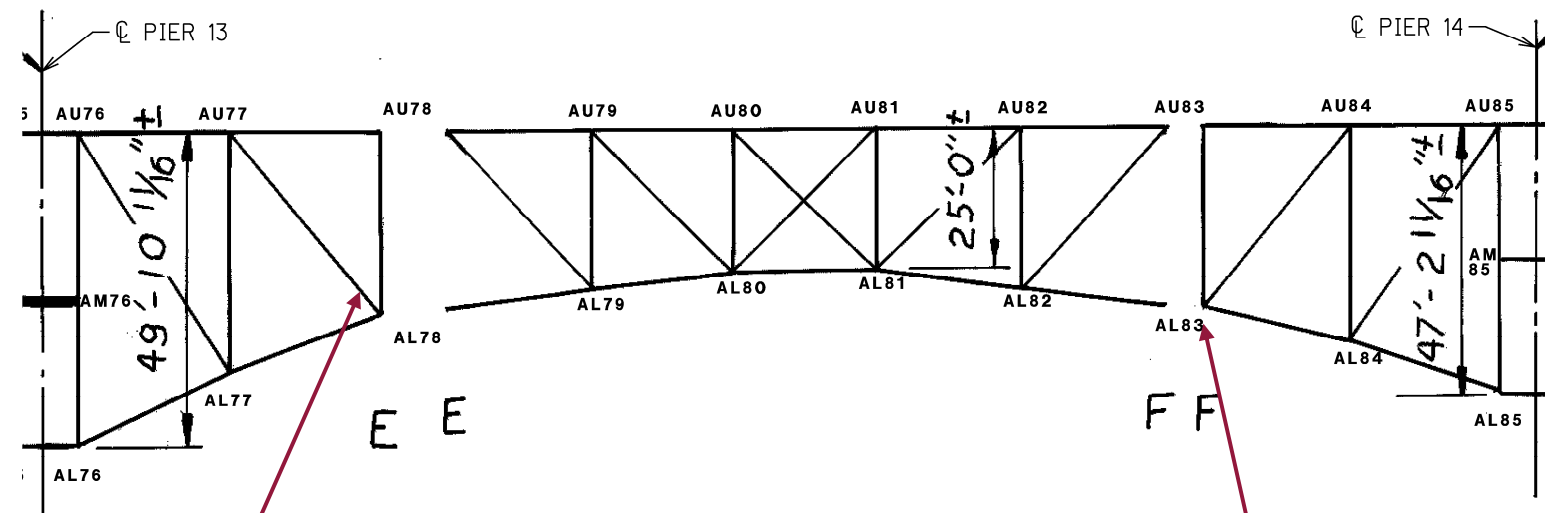


The lower chord member DL69-DL70 exhibits pack rust up to 2" thick between the north web plate and the lower flange angle. Pitting up to 3/16" was noted on the north web plate along the flange angle.

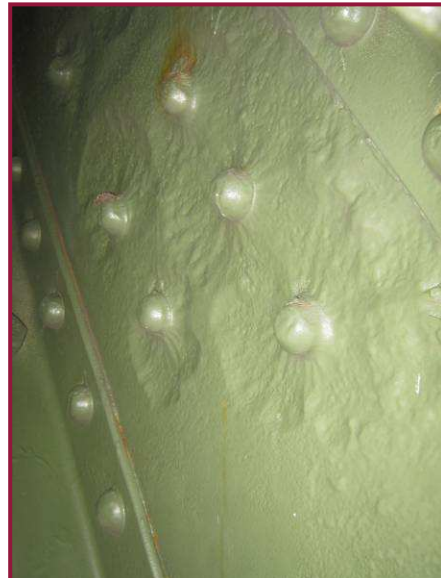


Both gusset plates at DL71 have misplaced drill/punch holes along the east free edge.

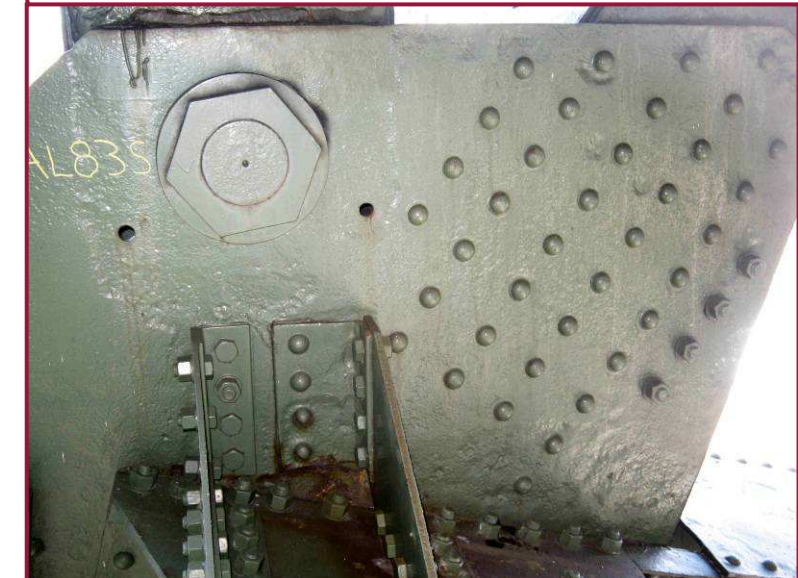
Similar to other spans throughout the structure, the lower chord north web plates exhibit losses along the lower flange angles. Losses in Span 11 are typified by 1/16"-1/8" deep pitting occurring within the lower 2" of the web and most of the length of each bay. The adjacent flange angles exhibit similar pitting.



**SPAN 13  
TRUSS A**



1/4" deep pitting is present across the width of the north web plate of AL78-AU77 adjacent to the lower gusset plate rivets. The south web plate exhibits pitting up to 1/8" deep.

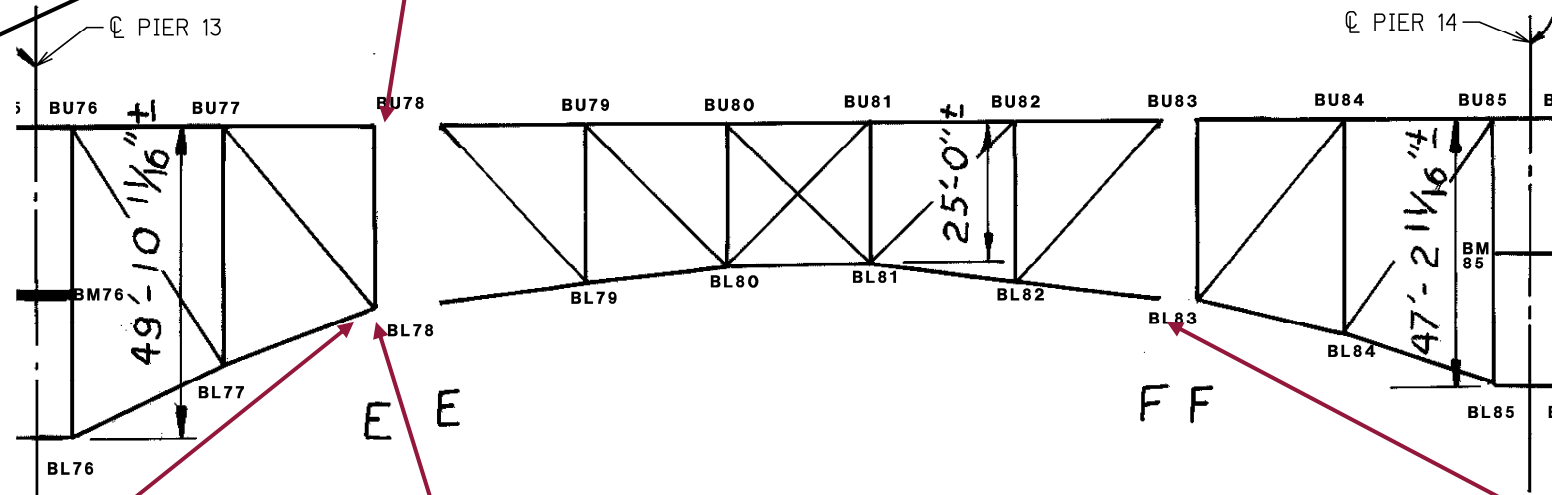


The south gusset plate at AL83 exhibits heavy pitting throughout the south face, with pitting up to 1/4" deep along the lower chord interface. Similar conditions are exhibited by the south plate at AL78.





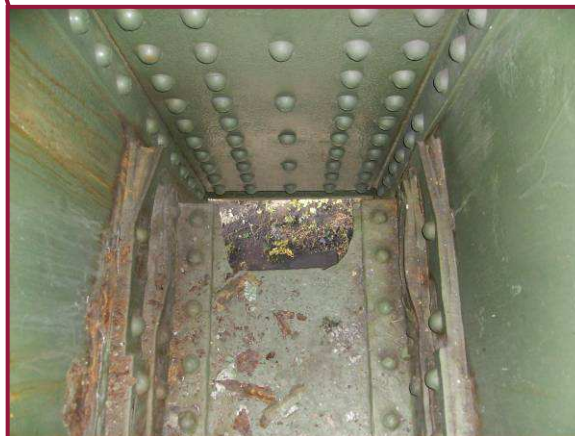
The utility deck Floorbeam 78 has received extensive web retrofits throughout the length of the member.



**SPAN 13  
TRUSS B**



The south web plate of BL77-BL78 near BL78 is perforated, exhibiting a 2" diameter hole opposite the bottom flange angle. Adjacent 1/4" deep pitting is present at this location.



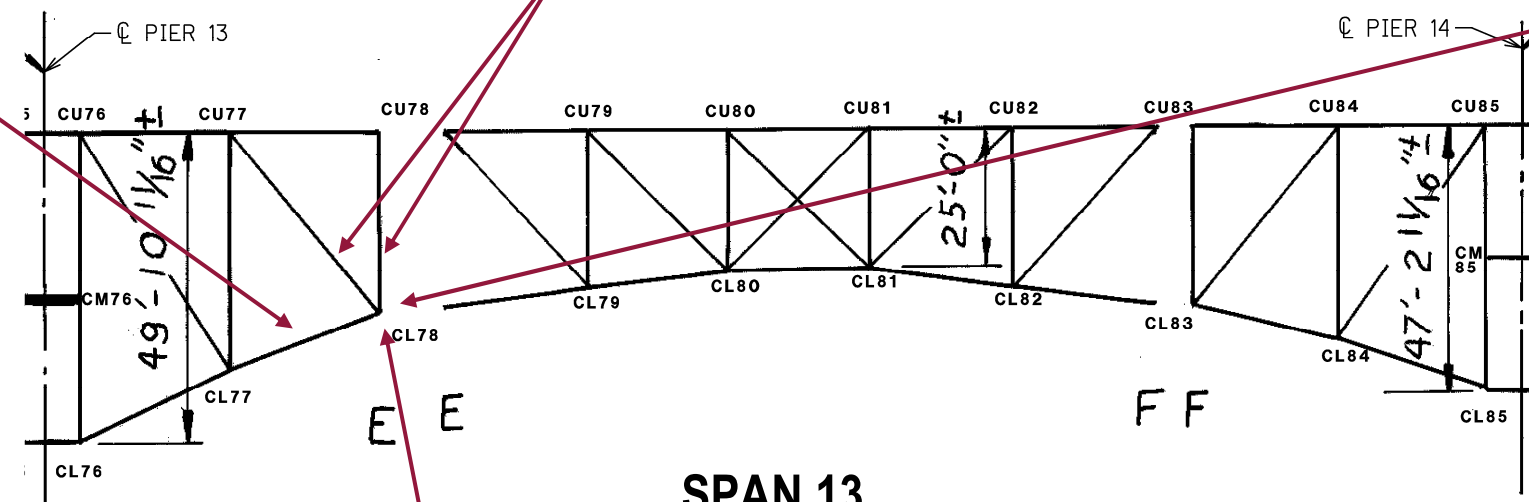
The internal pin plates at BL78 exhibit pack rust up to 1.5" thick at the plate corners with localized distortion.



Pack rust at BL83 has pushed the sliding pin plates outward.



Pack rust between the bottom flange angle and south web of CL77-CL78 has distorted the vertical angle leg. The rust is reactivating, as indicated by rust staining. This condition is common among the lower chord members throughout Truss C.

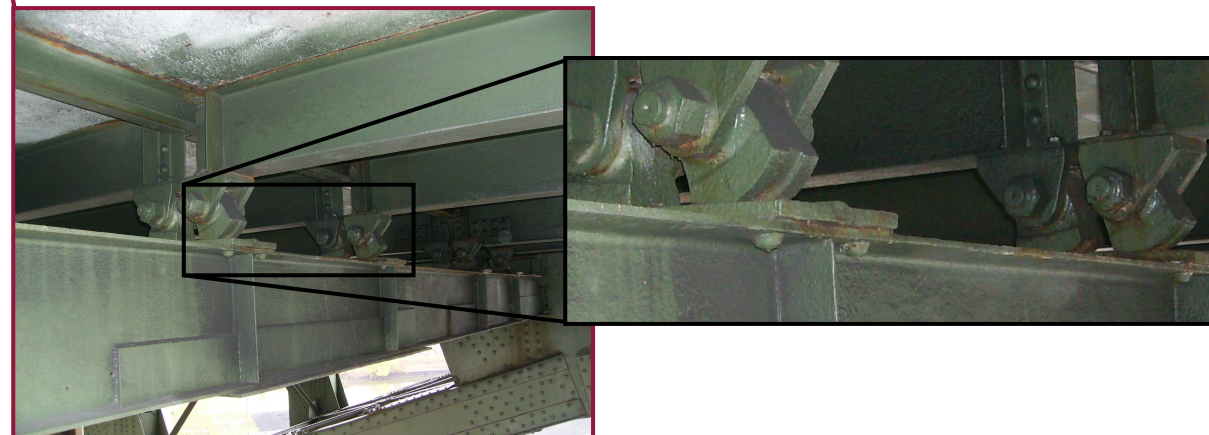


The north web plates exhibit 1/8" deep pitting along the full width of the member at the gusset plate interface.



The lower half of the north gusset plate at CL78 exhibits 1/8" deep pitting throughout the north face, with small, isolated 1/4" deep pits.

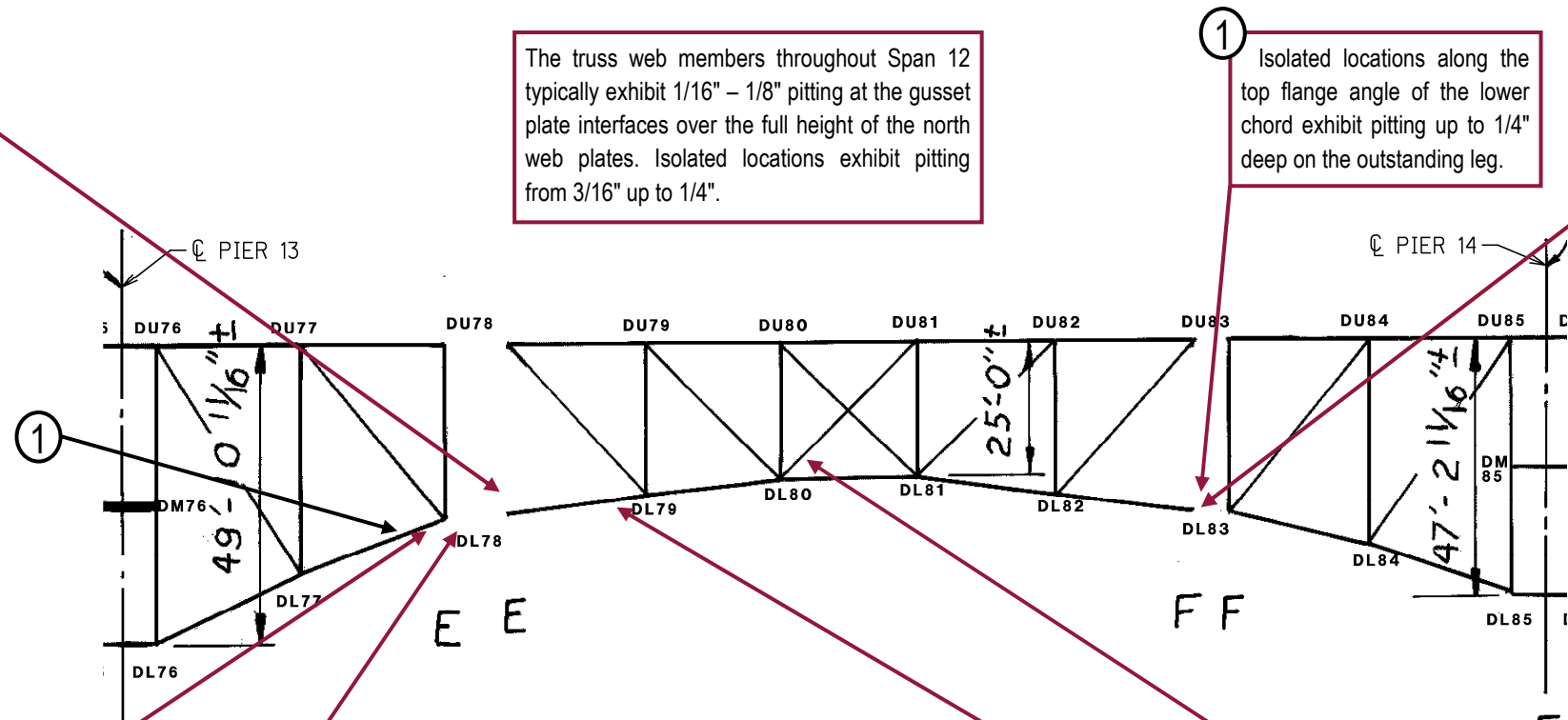
**SPAN 13  
TRUSS C**



Utility deck Stringers 3 and 4 at Floorbeam 78 exhibit excessive rotation. Note the extensive retrofitting of the web and bottom flange of Floorbeam 78.



The south end of the lower sliding pin in member DL78-DL79 exhibits section loss in the upper half of the circumference. Losses of 1/16"-1/8" are typical for the full circumference of the pin at the south gusset plate; however, an area exhibiting approximately 3/8" is shown.



### SPAN 13 TRUSS D

The truss web members throughout Span 12 typically exhibit 1/16" - 1/8" pitting at the gusset plate interfaces over the full height of the north web plates. Isolated locations exhibit pitting from 3/16" up to 1/4".

Isolated locations along the top flange angle of the lower chord exhibit pitting up to 1/4" deep on the outstanding leg.



The suspended span sliding pin at DL83 is misaligned with the north keeper plate due to 3/8" pack rust causing localized plate distortion.



The north web plate of DL77-DL78 exhibits 1/8", full height pitting near DL78. This condition is commonly found throughout Truss D and throughout Span 13; however, losses are typically less, measuring 1/16" on average. The web plate at DL85 exhibits pitting up to 3/16" deep in this area.



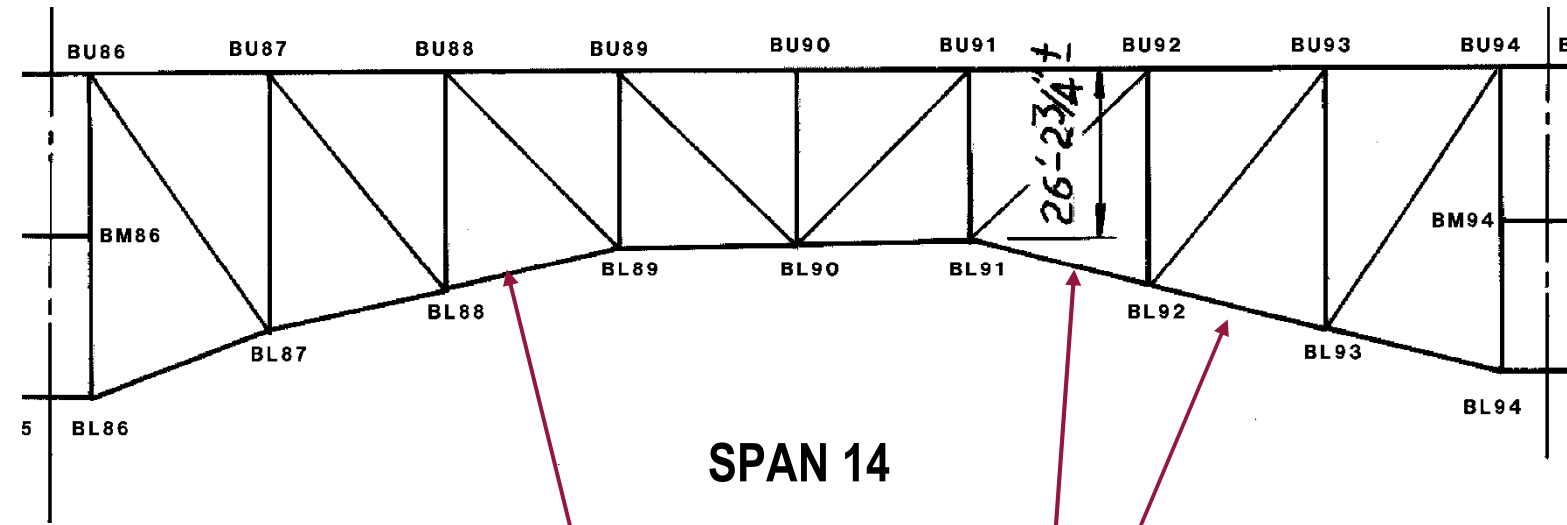
Heavy pitting (greater than or equal to 1/4" deep in isolated locations) of the lower gusset plates at the pin locations is typical with reactivating surface corrosion due to failing deck joints above.



The north gusset plate at DL79 is bowed to the south approximately 1-3/16" along the interface with the lower chord web of DL78-D79 due to heavy pack rust accumulating between the two plates. Also note the 1/16"-1/8" loss of the web plate in this area.

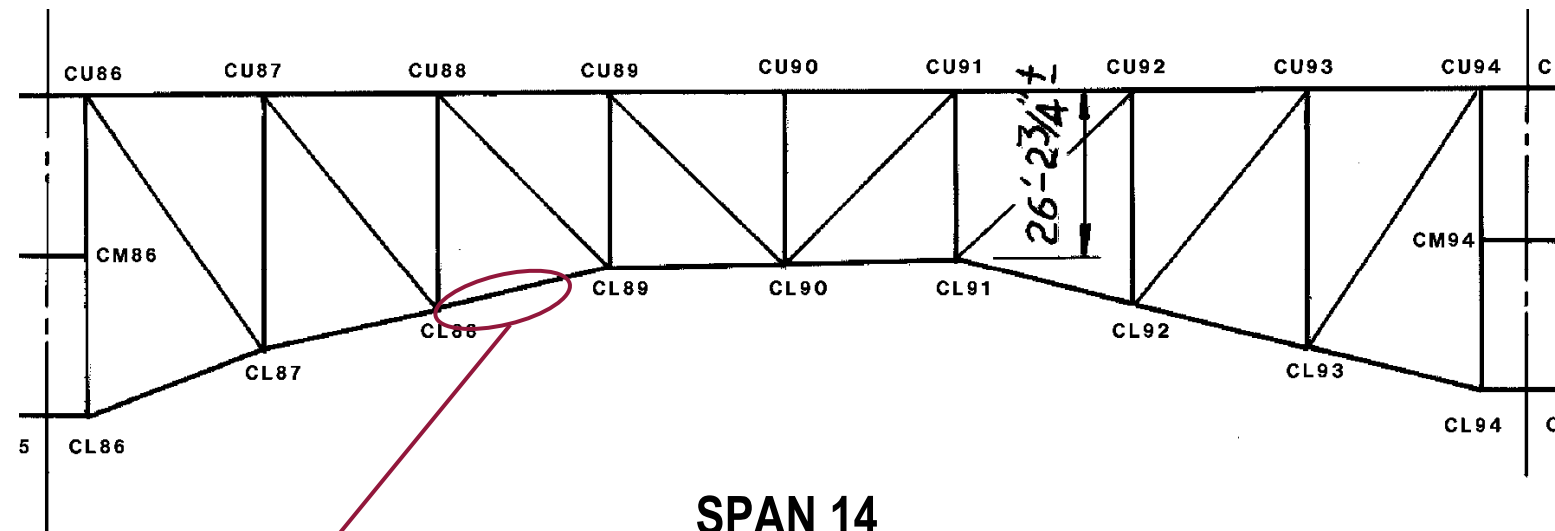


The lower batten plate on the underside of diagonal member DL80-UL81 exhibits advanced corrosion with a 2" hole and adjacent 1/4" pitting near the lacing connection.



**SPAN 14  
TRUSS B**

1/8" pitting of the north lower chord web plate along the length of the members at isolated locations



**SPAN 14  
TRUSS C**

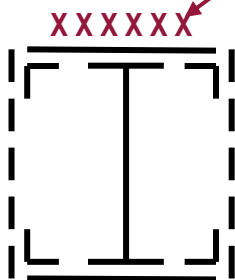
The lower chord north web plate exhibits pitting up to 3/16" deep pitting along the bottom flange angle in the lower half of the plate. The pitting extends approximately 3/4 of the length of CL88-CL89.



Between Floorbeams 89 and 90, the south face of Stringer 2 exhibits heavy pitting throughout the web. The pitting at this location was measured to be 1/8" deep on average with isolated locations up to 1/4" deep. Similar conditions are present between Floorbeams 92 and 93.



The interior face of the lower chord web near DL90 exhibits 1/4" pitting for the full height of the plate. The lower chord typically exhibits pitting between 1/16"-1/8" deep in this location throughout Span 14.

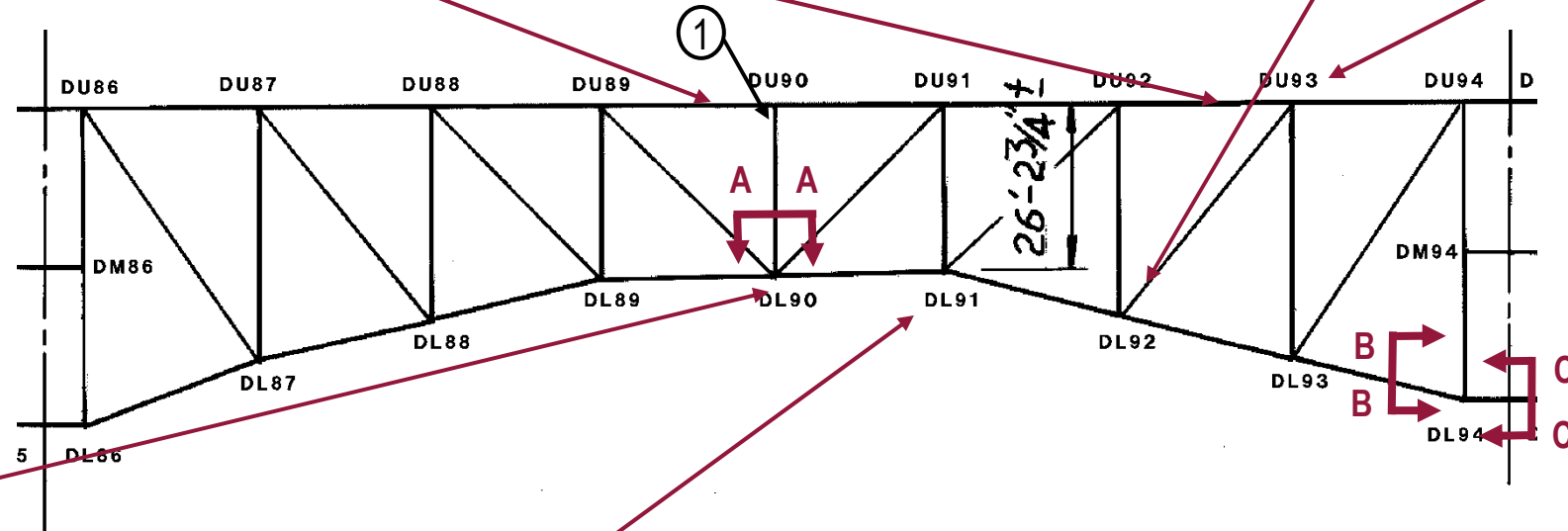


Section A-A

1/4" web pitting surrounding the strut bottom flange, extending the full width of the flange and 1" on both sides



Gusset plate DL91 exhibits conditions typical of the exterior gusset plates throughout Span 14, Truss D, with activating rust along the interface at the lower chord and associated minor pitting.



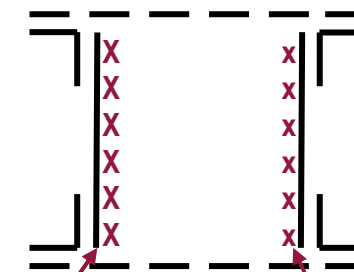
SPAN 14  
TRUSS D

The upper batten plate at the base of the diagonal member exhibits 1/4" pitting throughout, with a 2"Ø perforation.

1 Floorbeams 90 and 93 in Span 14 exhibit pitting up to 1/8" deep at isolated locations on the west face of the web between Truss D and Stringer 1.



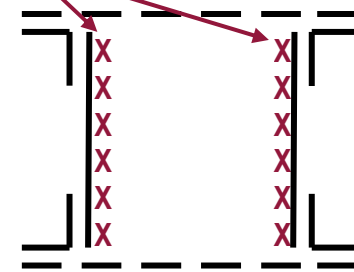
Typical framing between Trusses C and D showing the east face of Floorbeam 92. The interior portions of the floorbeams and the interior stringers are typically in good condition with isolated minor pitting (<1/16" deep) that has been cleaned and painted.



Section B-B

1/8" pitting x full height web plate

1/16" pitting x full height web plate



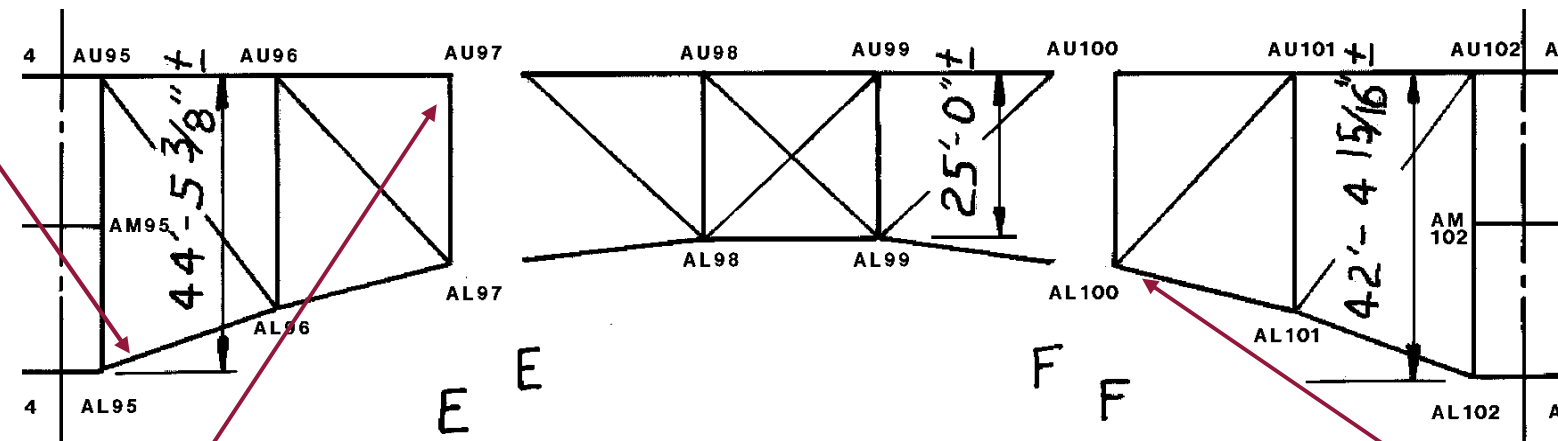
Section C-C



The upper chord of Truss D in Span 14 is in good condition overall with no significant deficiencies noted. Truss D is shown here looking northwest along the upper chord at DU89.



The south web plate of AL95-AL96 at AL95 exhibits 1/8" and 1/4" deep pitting along the top and bottom flanges, respectively. The bottom flange angle has 1/8" deep pitting on the vertical leg, with isolated pinholes measuring approximately 1/4" diameter.



**SPAN 15  
TRUSS A**



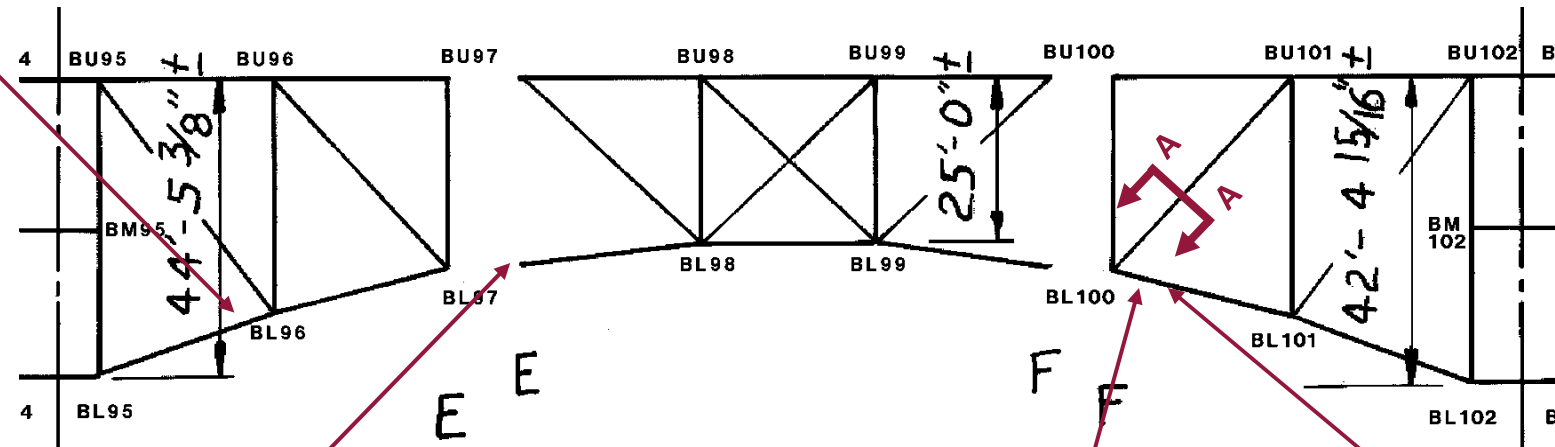
The north gusset plate at AU97 exhibits localized areas with pitting up to 1/4" adjacent to the lower pin and 1/8" pitting along the free edges of the plate.



The south gusset plate at AL100 exhibits widespread heavy pitting, with locations up to 1/4" common, especially adjacent to connecting members.



The north web plate of BL95-BL96 (left) exhibits 3/16" deep pitting for the full height of the plate adjacent to the BL96 gusset plate. This location was covered by a thin fill plate which has since completely corroded outside the bounds of the gusset plate.



**SPAN 15  
TRUSS B**



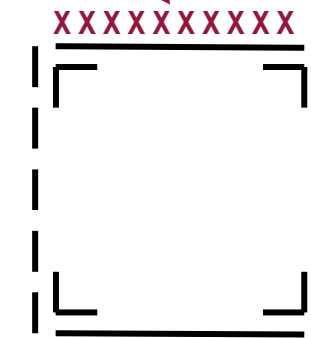
The lateral connection members at BL100 exhibit 1/8" deep pitting throughout the horizontal faces. Pack rust has formed between the knee brace connection and the gusset plate, distorting the connection angles.

1" diameter hole in outstanding leg of bottom flange angle



The south outermost pin plate at BL97 has been replaced with the welded plate shown. The end of the pin and the outer edge of the plate are 1/2" out of plane, resulting in less pin bearing area.

1/4" deep pitting for the full height of the web

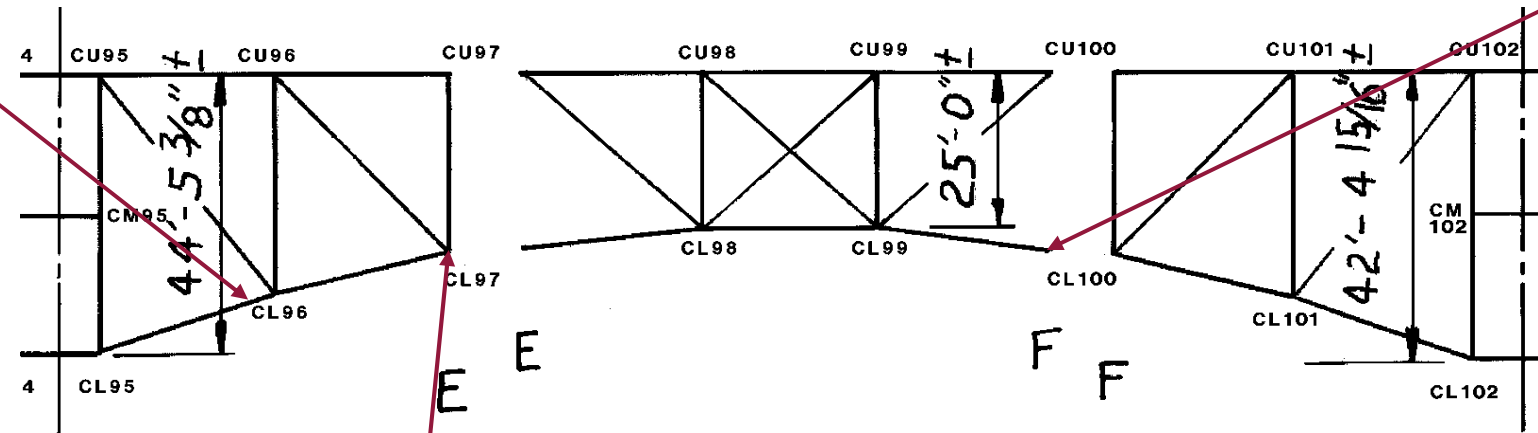


**Section A-A**

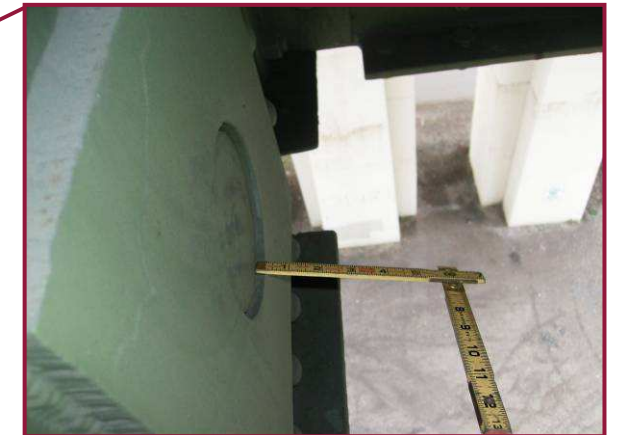




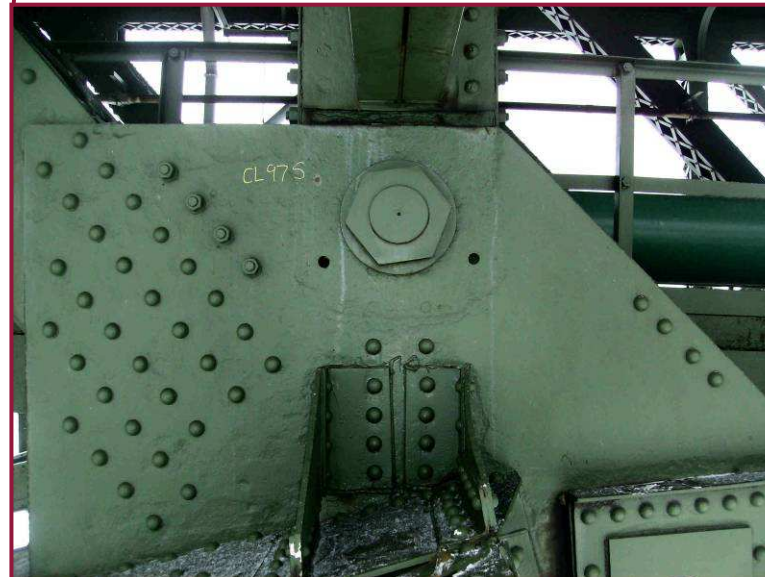
The south web plate of CL95-CL96 exhibits advanced section loss across the full height of the plate at the interface with the south gusset at CL96. Pitting up to 3/8" was noted at this location.



**SPAN 15  
TRUSS C**



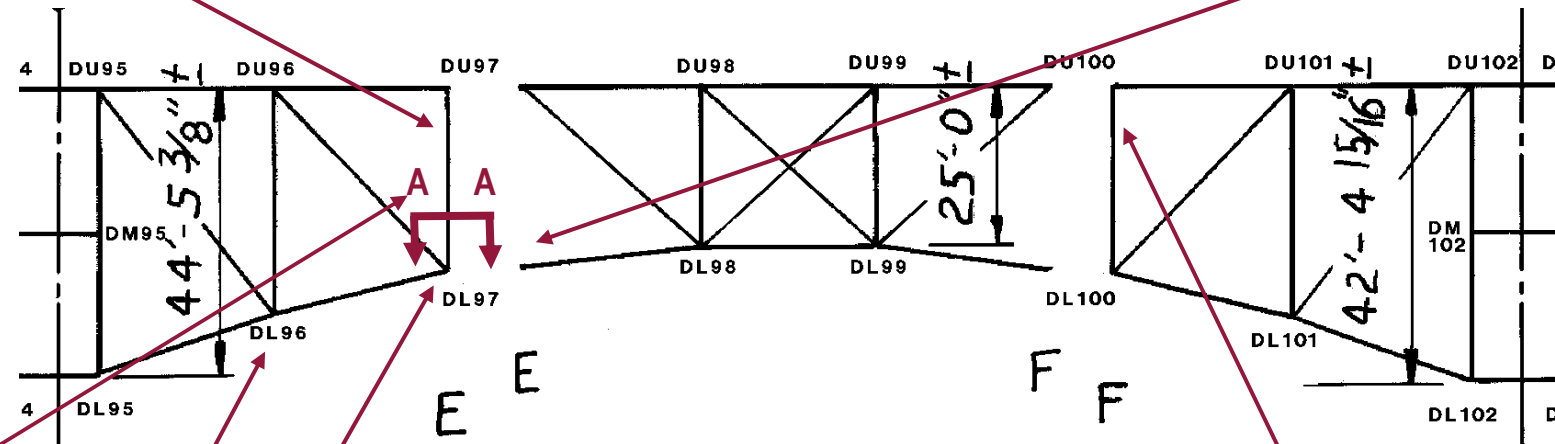
The lower chord sliding pin at CL100 is not bearing fully on the outermost pin plate.



The south gusset plate at CL97 exhibits heavy pitting throughout the south face with up to 1/4" deep areas isolated among the more typical 1/8"-3/16" deep pitting. The deepest pitting is found along the interface of the gusset with the lower chord top flanges and vertically along the lateral knee brace.



The upper vertical pin at DL97 has been retrofitted with a welded plate on the exterior face of the pin. Note the nut is not fully engaged and a gap is present. Minor pack rust is developing between the exterior web plates of the vertical near the pin.



The lower chord at DL97/DL98 exhibits distressed connections due to heavy pack rust, as well as heavy localized pitting up to 5/16" deep.



Three 1"Φ holes are present in the web of the sway strut between Truss D and Truss C at Panel 97.

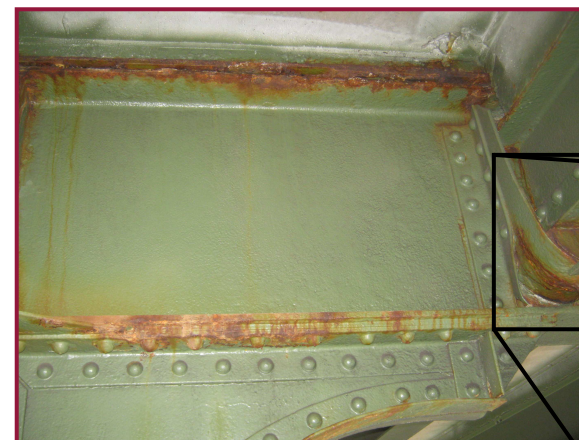
### SPAN 15 TRUSS D



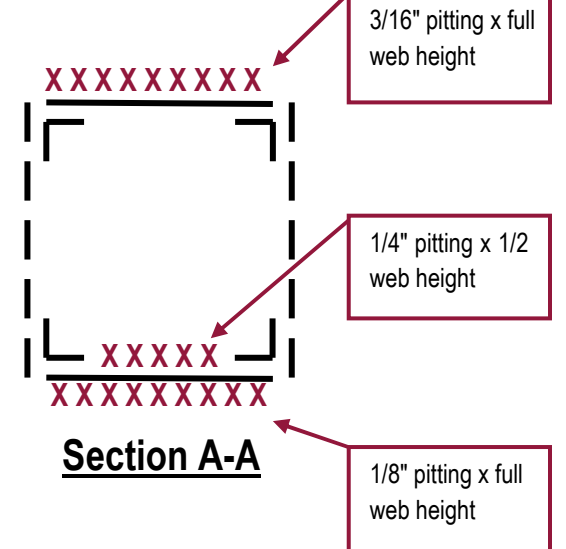
The north gusset plate at DL97 exhibits areas of heavy pitting throughout its north face. Pitting greater than or equal to 1/4" deep is indicated by the field markings, as shown. Rust is activating throughout the upper portion of the plate, as well as along the lower chord top flange interface.

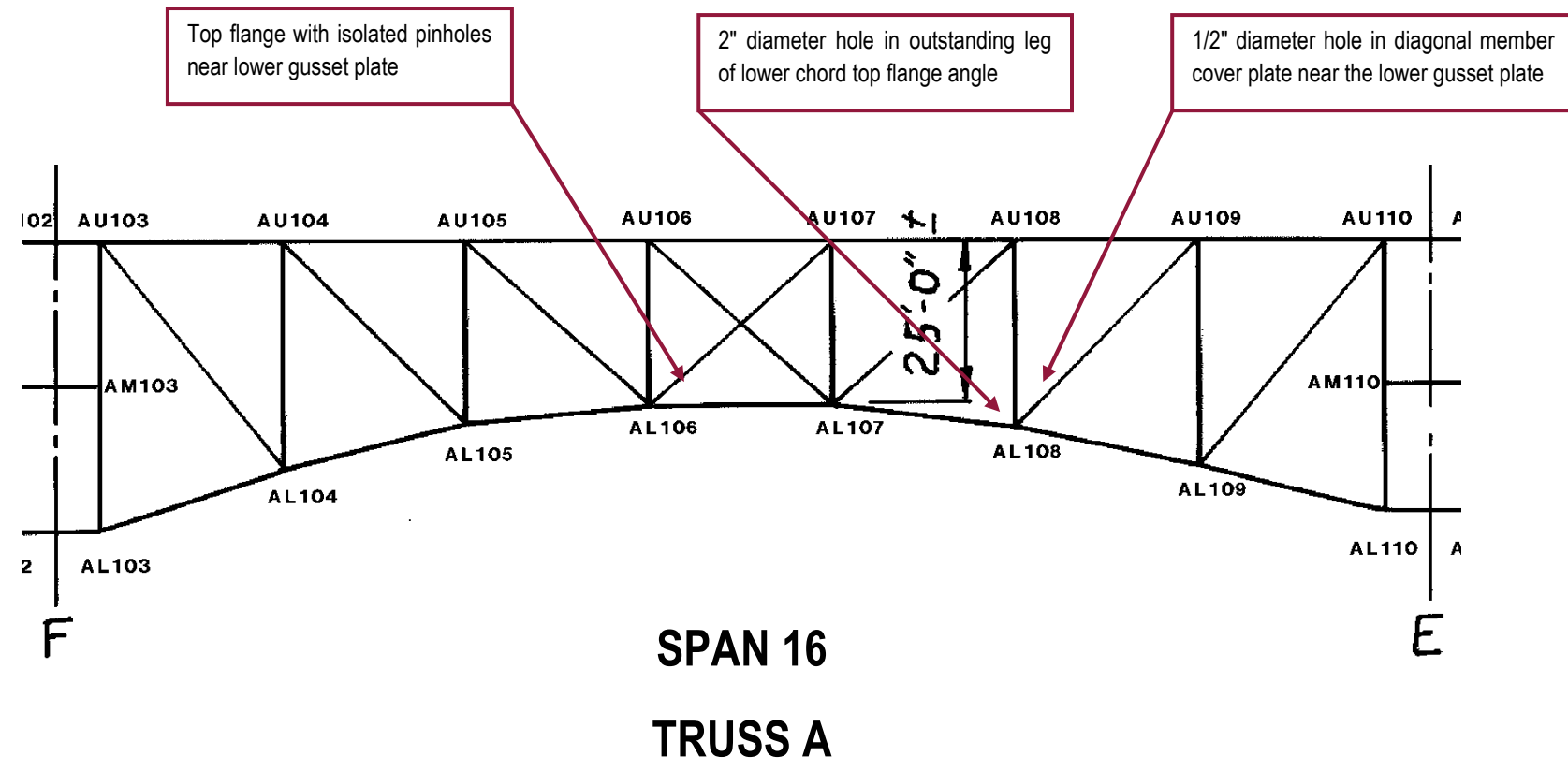


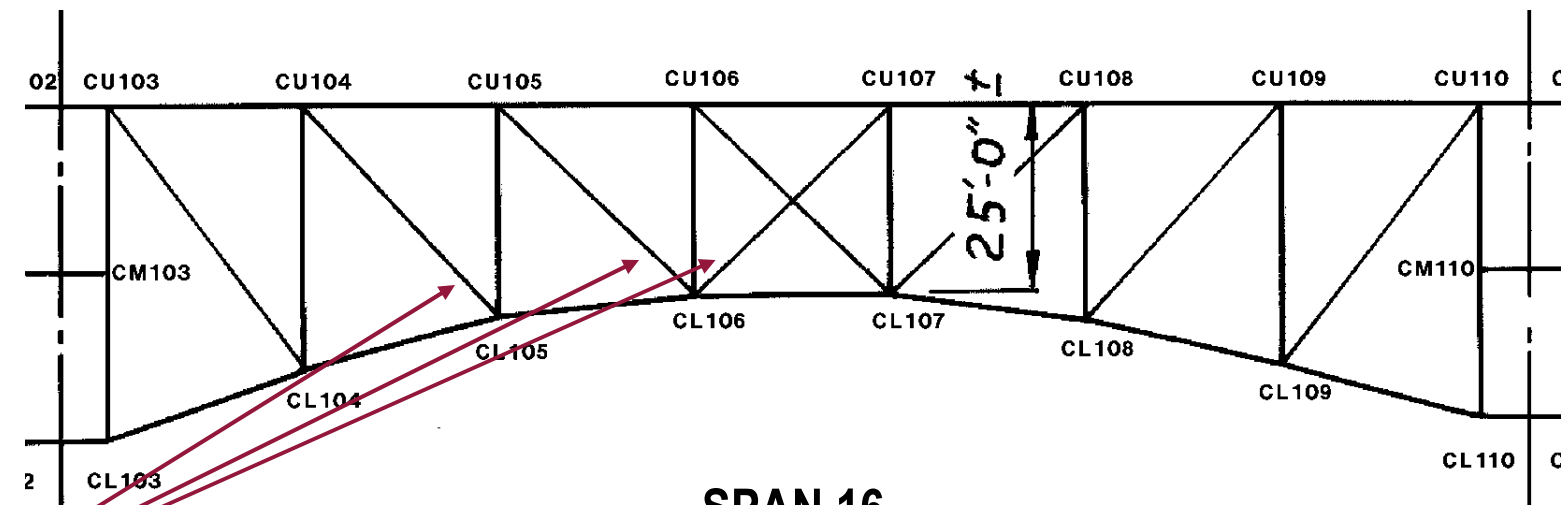
The fill plate between gusset plate DL96 and the north web plate of DL96-DL97 exhibits 100% section loss and the adjacent web plate has 1/4" pitting over the full height. The south web plate exhibits a similar condition with 1/8" pitting.



At Floorbeam 100 active rusting of the flanges is typical throughout, with advanced corrosion of the stringer connection angle below the saddle bearing rivets. The connection angle has a 1.5" diameter perforation at this location (right). Additionally, the saddle bearings typically exhibit minor pitting and reactivating rust; however, some locations exhibit pitting with minor loss of section.







**SPAN 16  
TRUSS C**



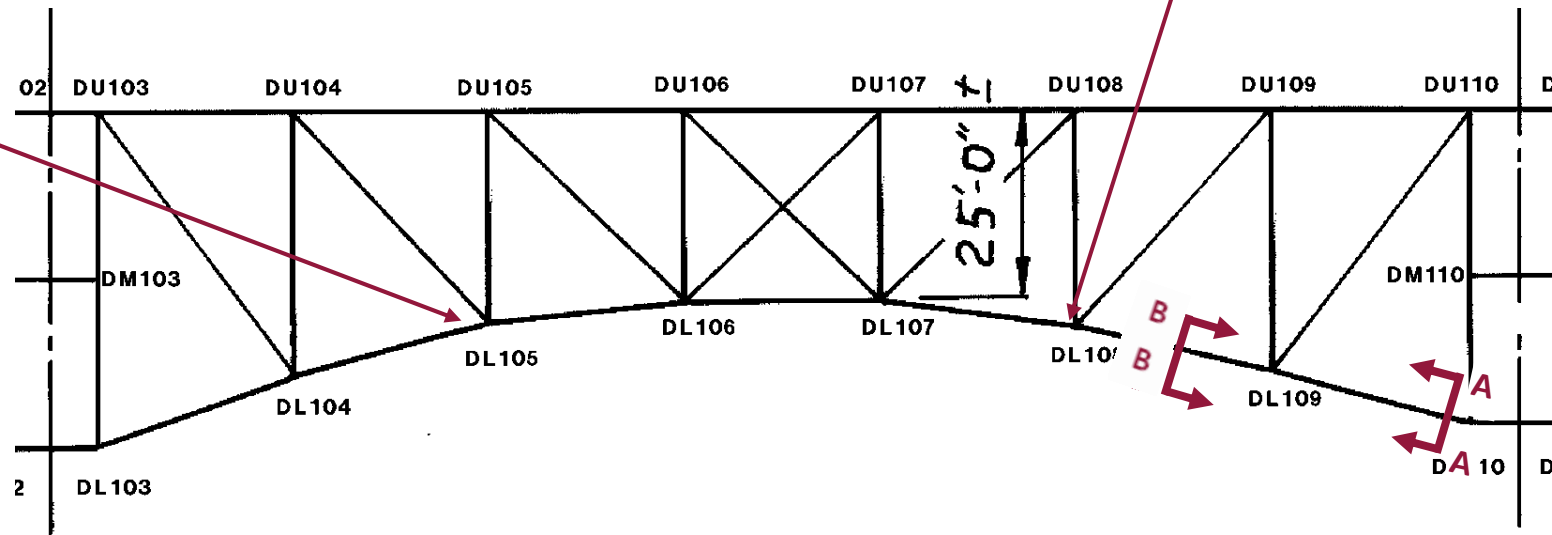
Failures of the paint top coat were found on diagonal members near the lower gusset plate connections at CL105, CL106, and CL107 in Span 16 (CL106-CU107 shown).

f

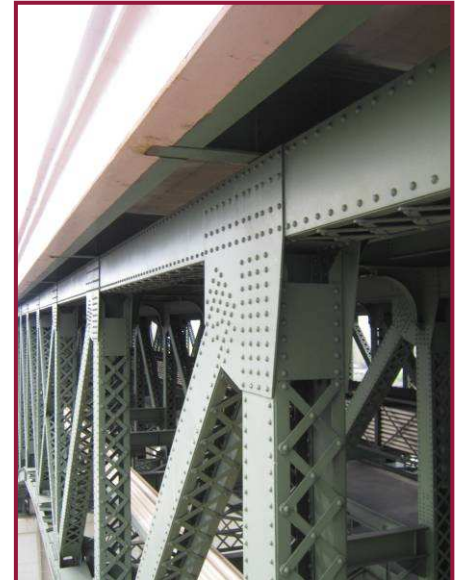
The lower chord bottom flange at panel DL108 exhibits 1/8" deep pitting with an estimated 25% loss of rivet heads at the lateral bracing gusset plate connection.



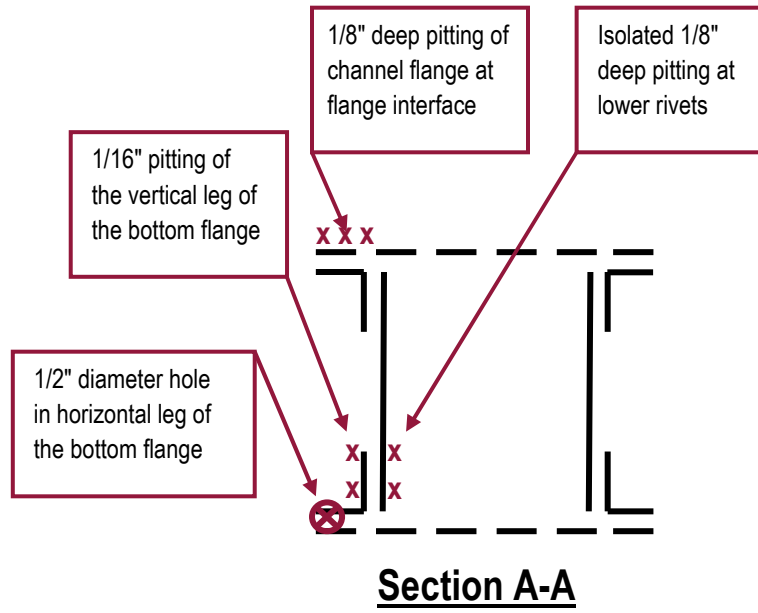
Vertical stiffeners for the lower chord at DL105 exhibit advanced section loss with both outstanding legs having 100% loss in the lower 4". Pack rust has formed between the stiffener angle and the web fill plate at this location, and heavy pitting of the lateral bracing connection plate and the lateral bracing bottom flange angles.



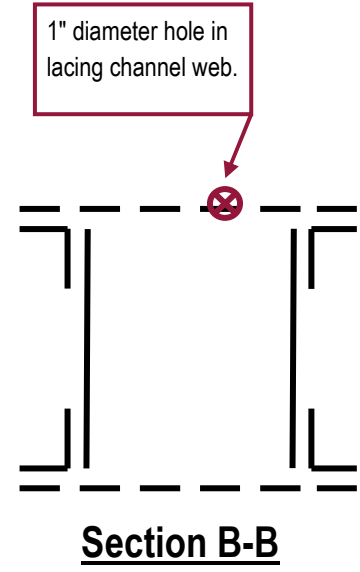
**SPAN 16  
TRUSS D**



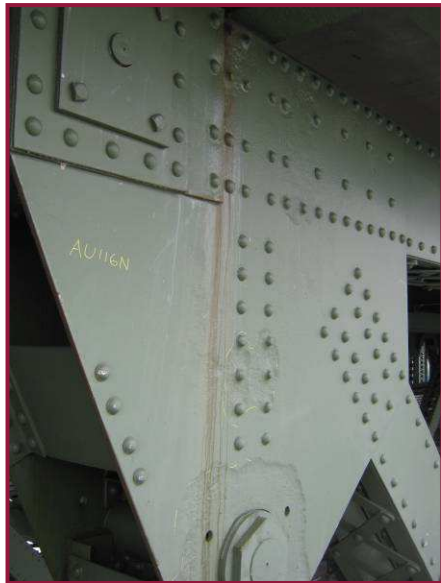
The exterior of the Truss D upper chord is clean with paint intact and no significant deficiencies noted in Span 16. Photo looking west from DL109.



**Section A-A**

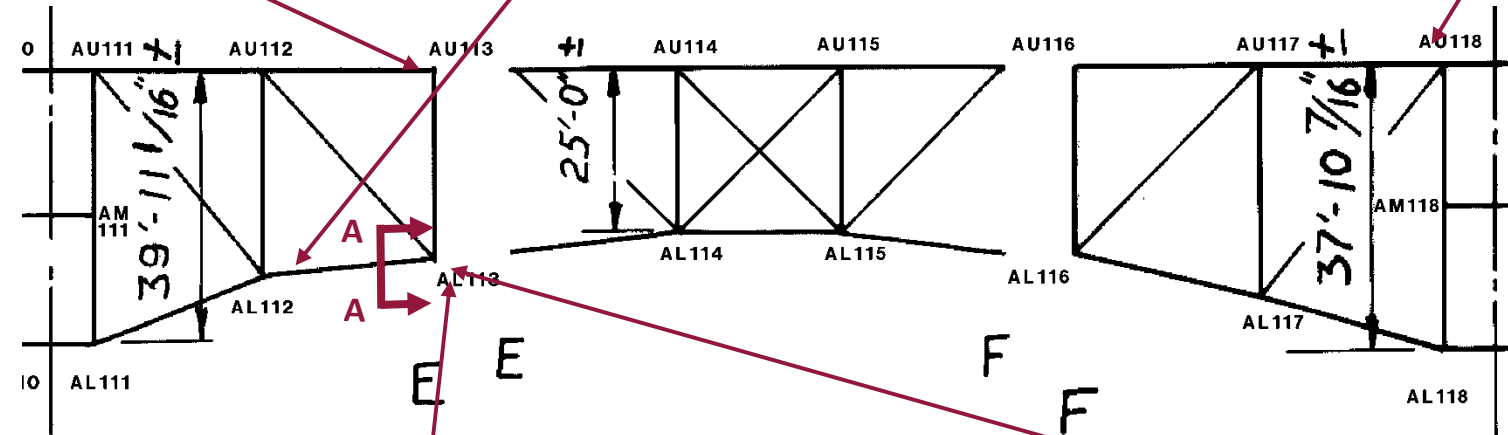


**Section B-B**



The south gusset plate at AU113 exhibits pitting up to 1/4" deep adjacent to the bearing pin, as well as isolated minor pitting throughout the upper half of the interior face of the plate.

The top and bottom flanges of AL112-AL113 have been flame-cut and removed in isolated areas, and lacing channels have been replaced along the member in some locations.

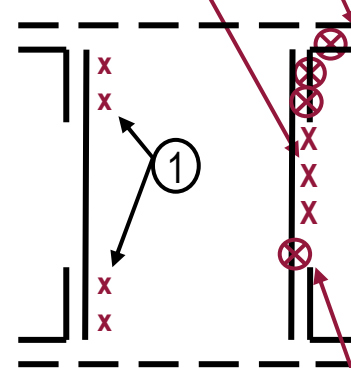


Stringer 2 between AU117 and AU118 exhibits advanced section loss with less than 1/8" section remaining for the full height of the web near AU118. A 4" diameter hole is present in the web at the flange.

### SPAN 17 TRUSS A

Flange angle with 100% loss of section

3/16" web pitting



Section A-A

⊗ = Perforated Area

Web with 1/2" diameter holes near the bottom flange

① 1/8" web pitting around top and bottom flange rivets, interior face



Lower chord member AL112-AL113 exhibits advanced section loss at several components of the built up member at AL113. These losses are depicted in Section A-A. Note multiple retrofits at this location.



The north gusset plate at AL113 exhibits areas of 1/8" pitting scattered throughout the north face. The north web plate of the diagonal member AU112-AL113 exhibits 1/8" deep pitting along the full height of the web plate.

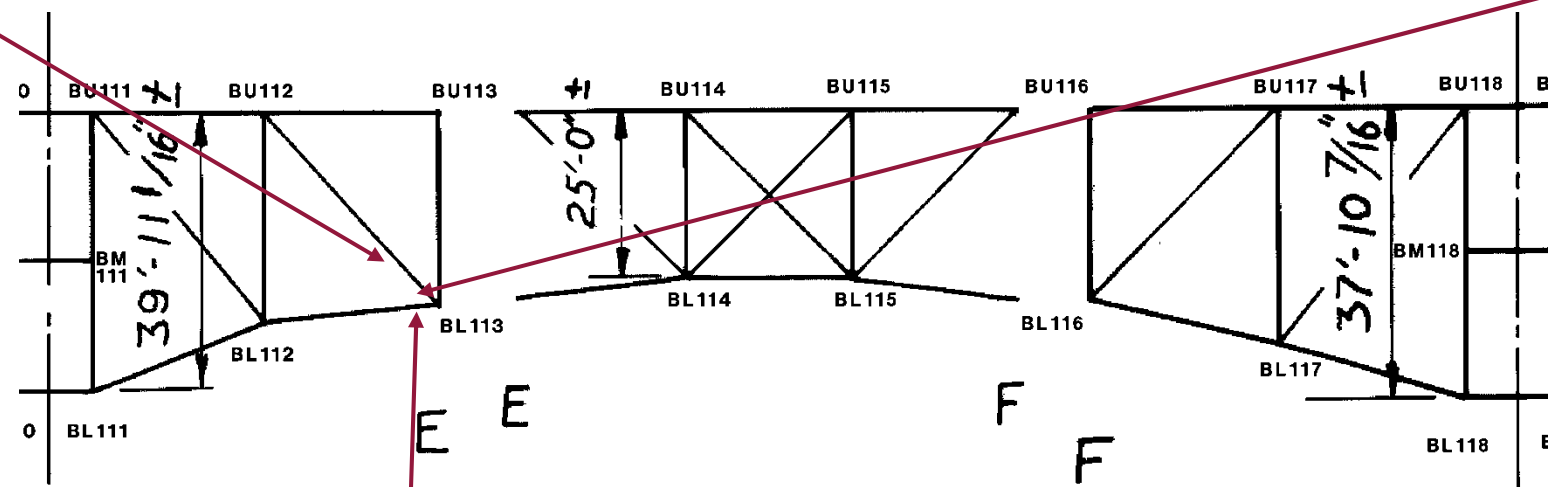


The south face of the south gusset plate at AL113 exhibits widespread heavy losses. The areas highlighted on the plate in yellow exhibit pitting of 1/4" deep or greater. The interior face of the south plate exhibits isolated areas with up to 1/4" loss. Additionally, note the 1/4" deep pitting along the full height of the web of the diagonal member AU112-AL113 near the gusset plate interface.

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The interior of BU112-BL113 exhibits failing paint throughout with minor active corrosion near BL113. The rivets connecting the diagonal member to the gusset plates are heavily pitted, with an estimated 50% loss of rivet head section.



**SPAN 17  
TRUSS B**



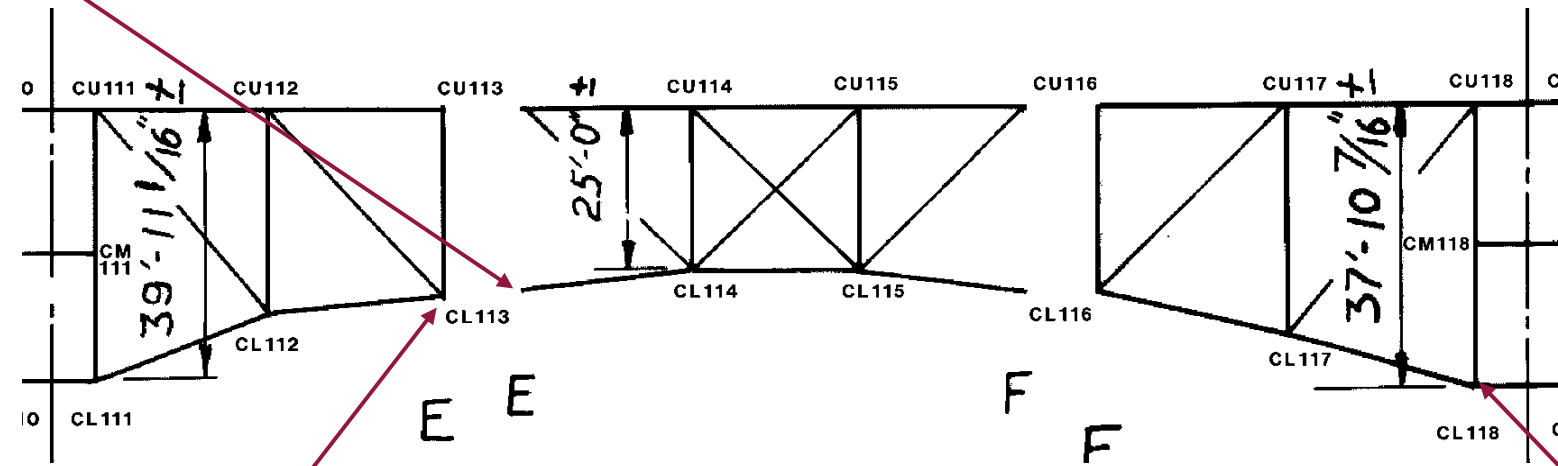
The interior face of the south web plate of BL113-BL114 exhibits full height pitting up to 1/4" deep at the interface with the BL113 gusset plate.



The north gusset plate at BL113 exhibits localized pitting up to 1/4" deep. The areas outlined on the plate are representative of typical losses at pinned gusset plates throughout the structure.



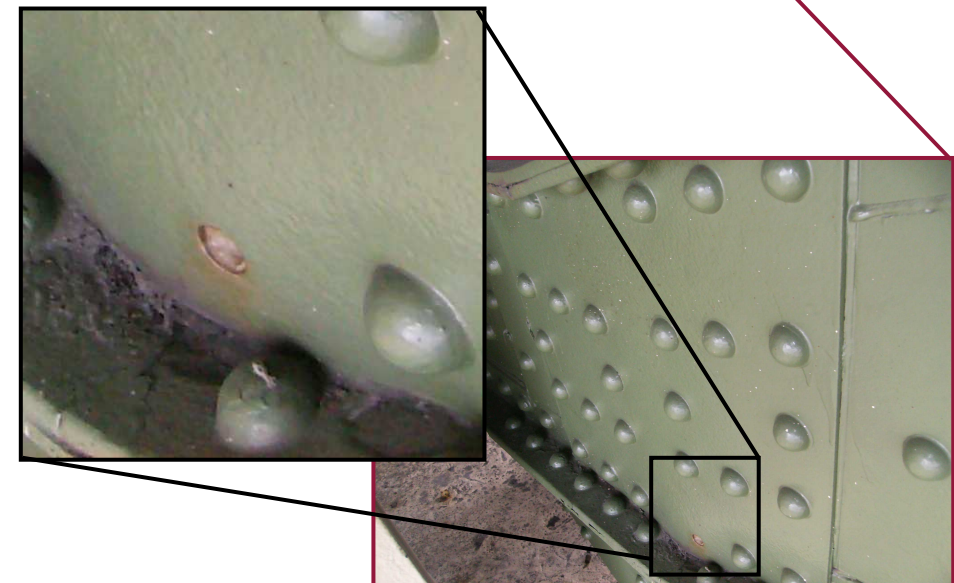
Corrosion has produced a 5"x 4" hole in the south web plate of CL113-CL114 at the bottom corner of the innermost pin plate.



**SPAN 17  
TRUSS C**



The north gusset plate at CL113 exhibits heavy pitting throughout the north face with up to 1/4" deep areas isolated among the more typical 1/8"-3/16" deep pitting. The deepest pitting is found along the interface of the gusset with the lower chord top flanges and vertically along the lateral knee brace.

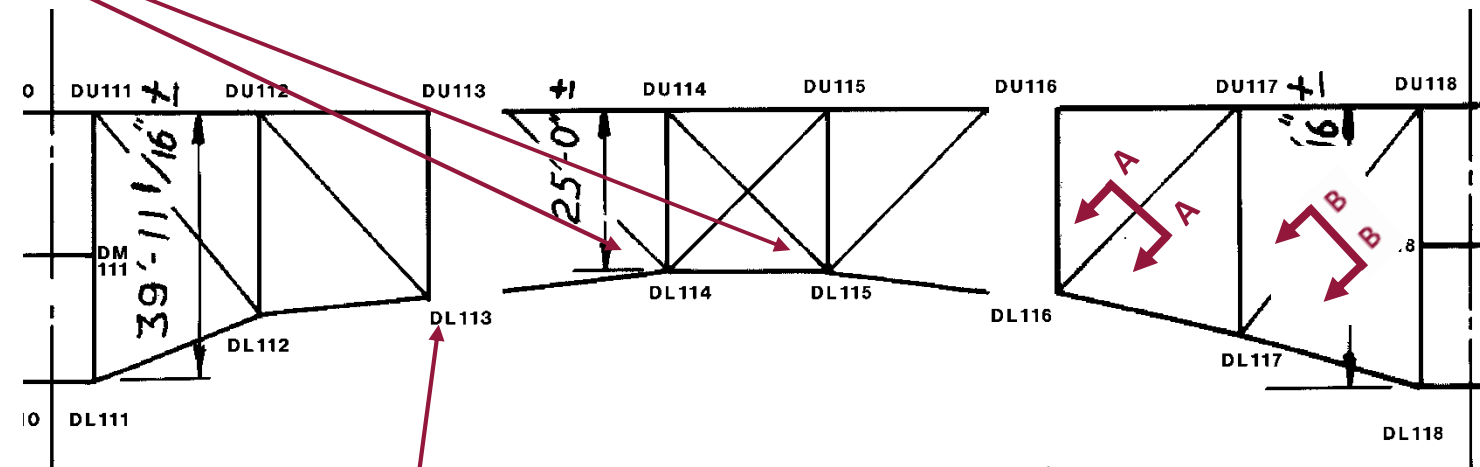


The outermost north web splice plate at CL118 is bowed along the bottom flange angle due to pack rust and a rivet has broken as a result.





DL115N exhibits heavy pitting along the lower chord interface. The pitting is typically between 6" and 12" tall and extends the length of the plate. DL114N exhibits similar conditions.

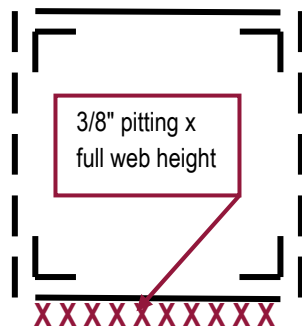


Locations of advanced section loss are isolated throughout Span 17, with isolated flange angles and lacing channels exhibiting small perforations.

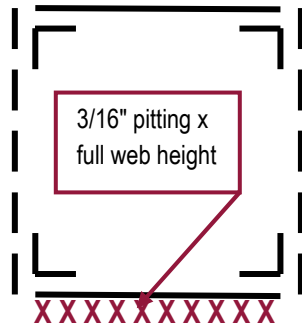


South face of DL113N at west end of plate.

**SPAN 17  
TRUSS D**



**Section A-A**



**Section B-B**

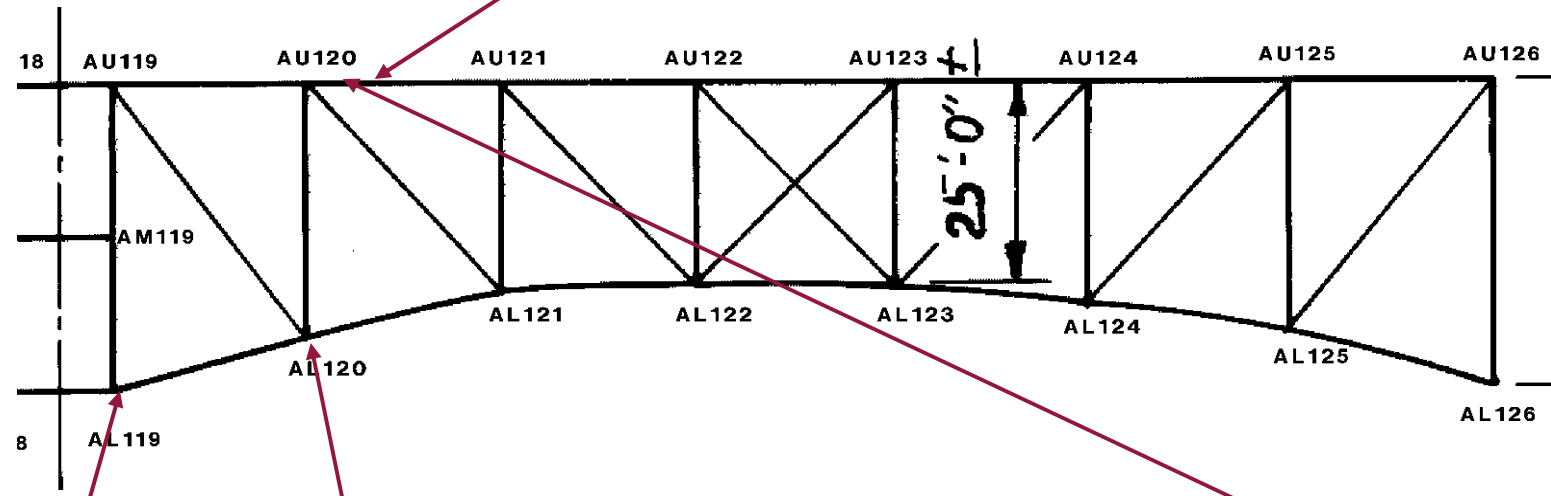


DL113N exhibits heavy pitting throughout both faces of the plate (north face shown). Active corrosion is present due to the leaking deck joint above this location.



The lower chord below DL113 exhibits heavy pitting of the north web plate and flange angles. The stay plate of the lateral bracing is perforated with a 6"Ø hole.

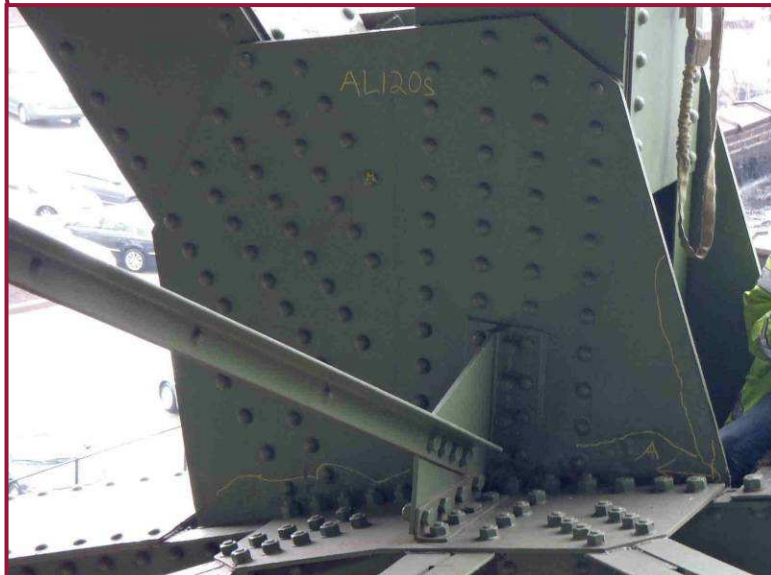
Abandoned welded appurtenances are present at multiple locations along the north web of AU120-AU121, within the tension region of the upper chord, constituting a fatigue prone detail.



**SPAN 18  
TRUSS A**



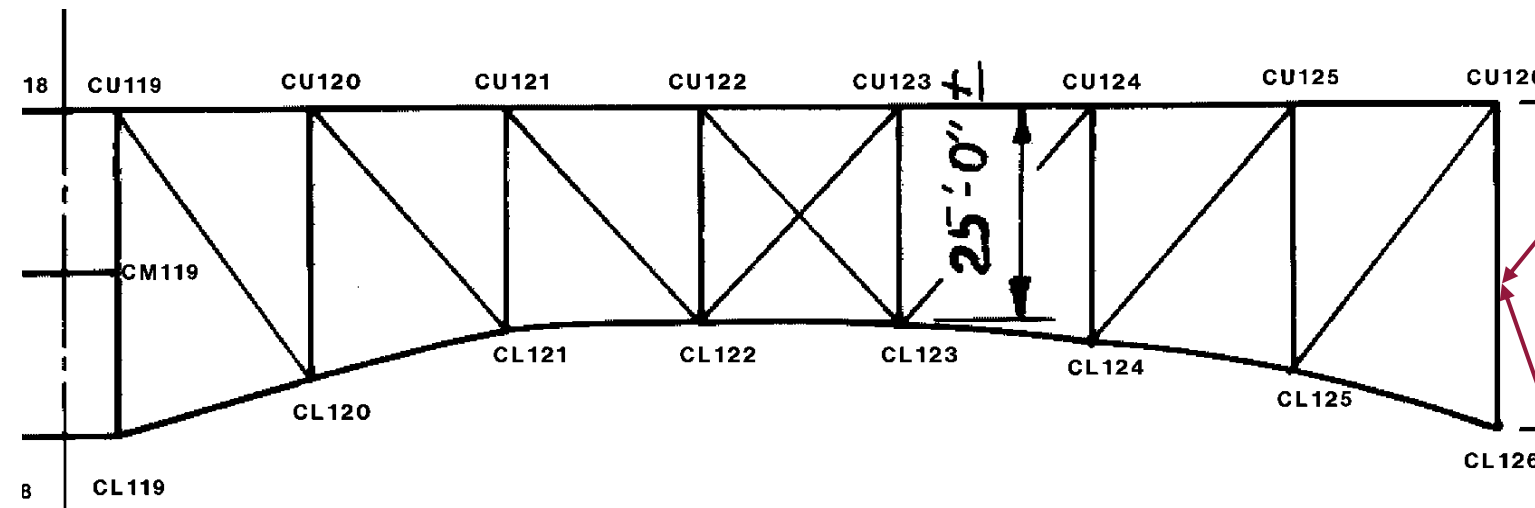
The north gusset plate at AL119 exhibits 1/4" deep around the bearing plate above the pin, with one 3" diameter area with up to 3/8" pitting.



The south gusset plate at AL120 exhibits heavy pitting along the lower chord interface for the entire length of the plate.



The horizontal leg of the flange angle of AU120-AU121 exhibits advanced section loss with a large area completely corroded. Rust is beginning to reactivate in this area.



**SPAN 18  
TRUSS C**

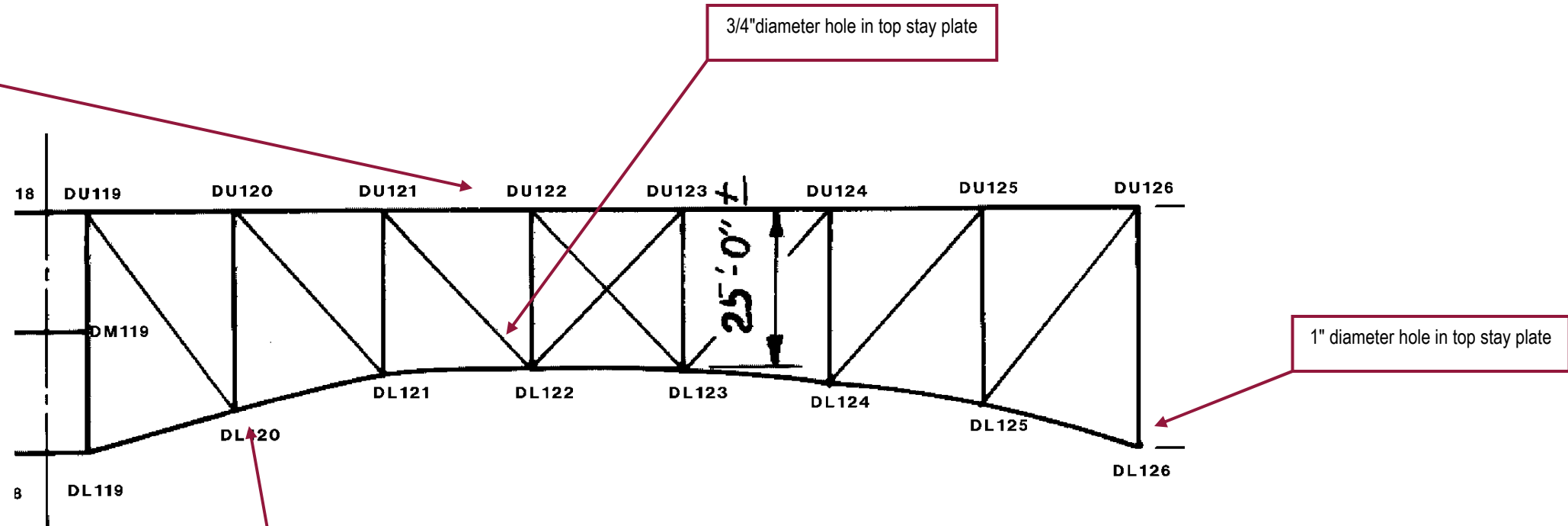
The internal stiffener plate at CL126-CU126 exhibits isolated areas of 1/4" deep pitting.



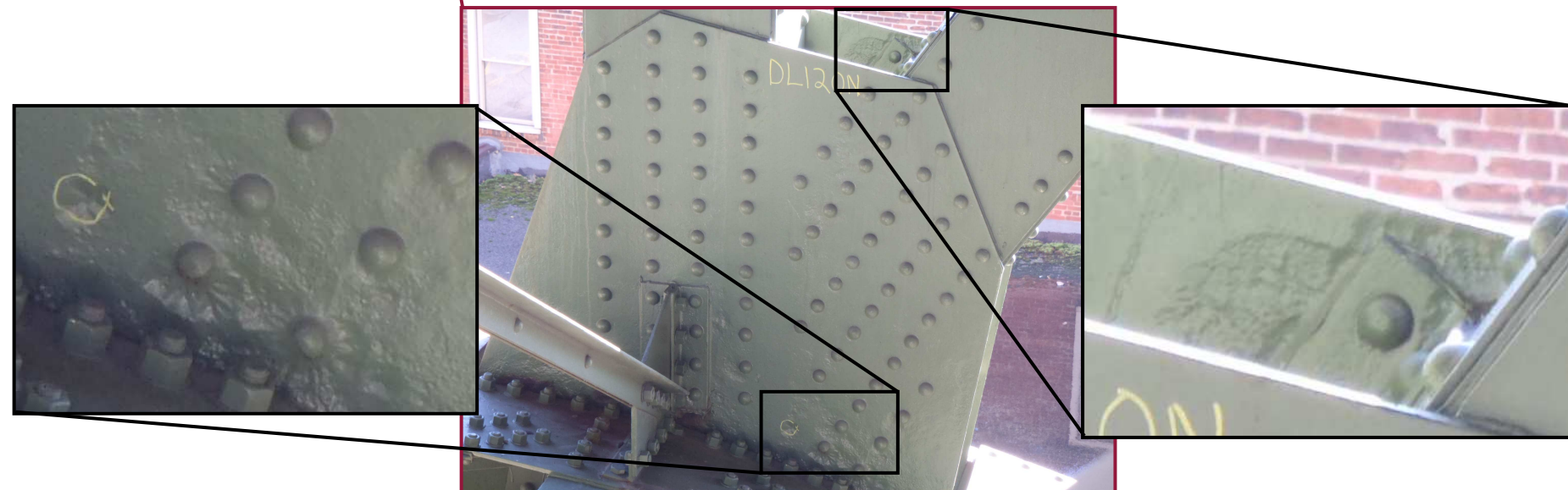
The south web plate of vertical member CL126-CU126 exhibits up to 1/4" pitting below the sway strut connection.



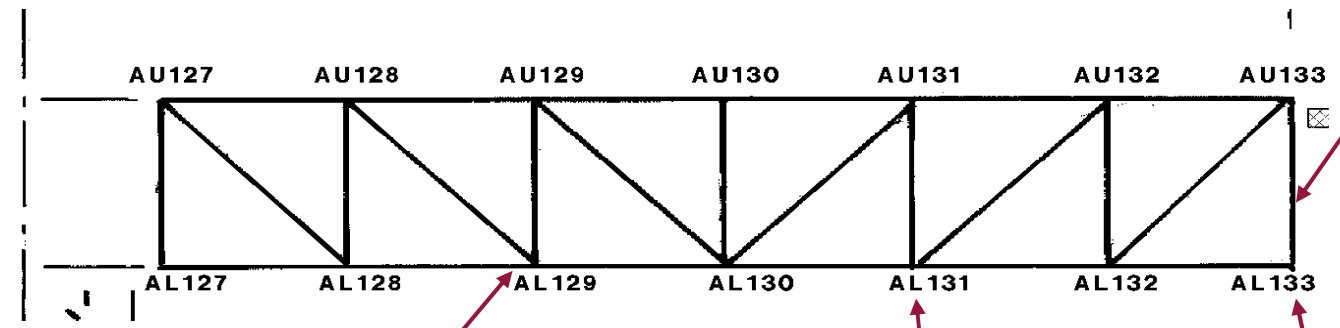
The Truss D upper chord in Span 18 is typically clean with paint intact and no significant deficiencies. DL122 is shown looking east.



### SPAN 18 TRUSS D



Both the north and south gusset plates at DL120 exhibit isolated heavy pitting that has been cleaned and painted.



**SPAN 20  
TRUSS A**



The sway strut at AL133 exhibits pitting and a 1" Ø hole approximately 10' from Truss A in the bottom 12" of the member



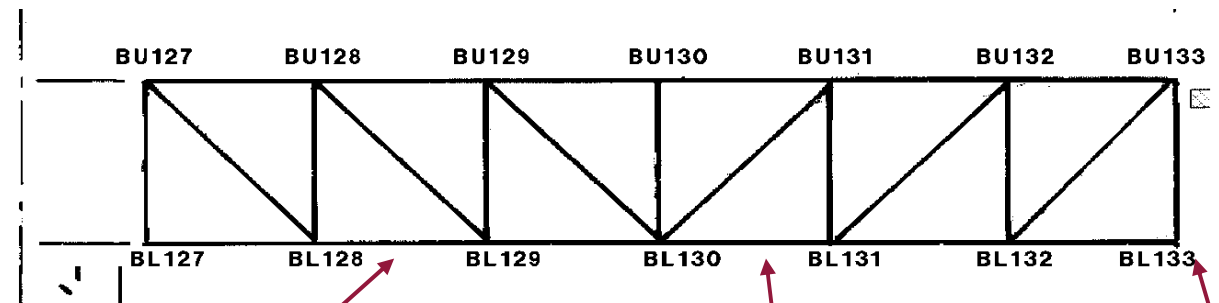
Up to 1/8" pitting is present on the south face of gusset plate AL129S along the bottom row of rivets.



The north face of AL131S exhibits pitting up to 1/4" between the lower chord rivets. The lateral bracing connection plate/bottom cover plate is perforated with a 2" diameter hole.



The bearing components at AL131 exhibit 1/8" pitting and activating surface rust throughout.



**SPAN 20  
TRUSS B**



BL128-BL129 exhibits conditions typical for lower chord members throughout Truss B in Span 20.



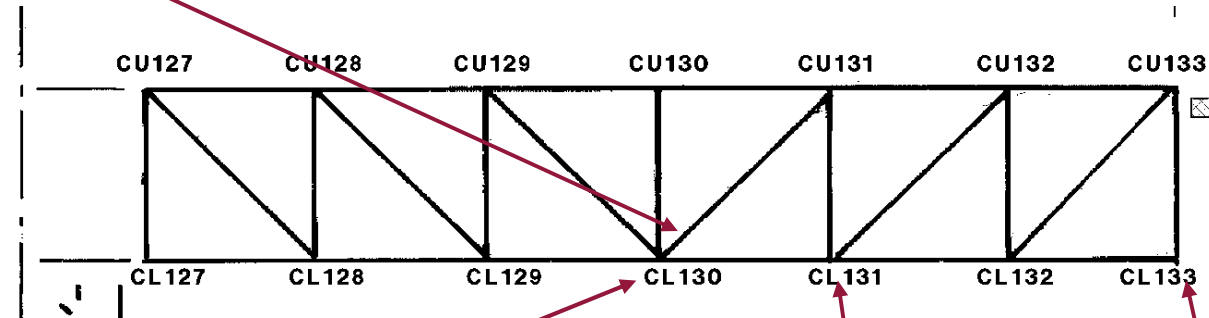
BL130-BL131 exhibits extensive areas of peeling paint.



The bearing components at BL133 exhibit 1/8" pitting on all surfaces, with isolated pitting up to 1/4". Additionally, surface rust is reactivating between built up members.



The south web fill plate exhibits 100% section loss below the bounds of the splice plate as well as 1/8" pitting on the bottom angles.



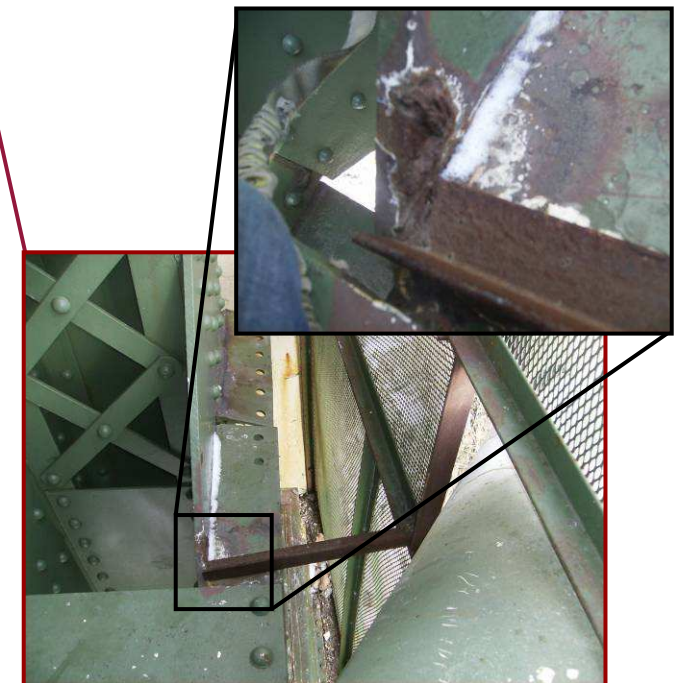
**SPAN 20  
TRUSS C**



The lateral bracing connection plate/bottom cover plate CL130 is bowed due to active pack rust up to 1" thick.



The lateral bracing connection plate/bottom cover plate CL131 is perforated with a 4" diameter hole.



The fence support angle weld to the south gusset plate of CL133 is cracked; however, the crack does not appear to have propagated into the gusset plate base metal.

# APPENDIX C

## Utility Deck Deficiencies



**Table of Utility Deck Haunch Deficiencies**

Key	
Spall	1
Partial Spall with Delamination	2
Crack Present	3

FB Location	West Face					East Face				
	Bay 1	Bay 2	Bay 3	Bay 4	Bay 5	Bay 1	Bay 2	Bay 3	Bay 4	Bay 5
0	3	3	3	3	3	3	3	3	3	3
1	1	1	3	3	3	3	3	3	3	3
2	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3
4	3	3	3	3	3	3	3	3	3	3
5	3	3	3	3	3	3	3	3	3	3
6	3	3	3	3	3	1	1	1	1	1
7	3	3	1	3	3	3	3	1	1	1
8	3	3	3	3	3	3	3	3	3	3
9	3	3	3	3	3	1	1	3	3	3
10	3	3	3	3	3	1	3	1	3	3
11	3	3	3	3	3	3	3	3	3	3
12	3	3	3	3	3	3	3	3	3	3
13	3	3	3	3	3	3	3	3	3	3
14	3	3	3	3	3	3	3	3	3	3
15	3	3	3	3	3	3	3	3	3	3
16	3	3	3	3	3	3	3	3	3	3
17	3	3	3	3	3	3	3	3	3	3
18	3	3	3	3	3	3	3	3	3	3
19	3	3	3	3	3	3	3	3	3	3
20	3	3	3	3	3	3	3	3	3	3
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23	3	3	3	3	3	3	3	3	3	3
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38	3	3	3	3	3	3	3	3	3	3
39	3	3	3	3	3	3	3	3	3	3
40	3	3	3	3	3	3	3	3	3	3
41	3	3	3	3	3	3	3	3	3	3
42	3	3	3	3	3	3	3	3	3	3

← PIER 6

← PIER 7

← PIER 8

← PIER 9

**Table of Utility Deck Haunch Deficiencies**

Key	
Spall	1
Partial Spall with Delamination	2
Crack Present	3

FB Location	West Face					East Face				
	Bay 1	Bay 2	Bay 3	Bay 4	Bay 5	Bay 1	Bay 2	Bay 3	Bay 4	Bay 5
43	3	3	3	3	3	3	3	3	3	3
44	3	3	3	3	3	3	3	3	3	3
45	3	3	3	3	3	3	3	3	3	3
46	3	3	3	3	3	1	3	3	3	3
47	3	1	1	3	3	3	3	3	1	1
48	3	3	1	3	3	3	3	3	3	3
49	3	3	3	3	3	3	3	3	3	3
50	3	3	3	3	3	3	3	3	3	3
51	3	3	3	3	3	3	3	3	3	3
52	3	3	3	3	3	3	3	3	3	3
53	1	3	1	1	1	1	1	3	1	1
54	3	3	3	3	3	3	3	1	1	3
55	1	1	1	1	1	3	3	3	3	3
56	3	3	3	3	3	3	3	3	3	3
57	3	3	3	3	3	3	3	3	3	3
58	3	3	3	3	3	3	3	3	3	1
59	3	3	3	3	3	3	3	3	3	3
60	3	3	3	3	3	3	3	3	3	3
61	3	3	3	3	3	3	3	3	3	3
62	3	3	3	3	3	3	3	3	3	3
63	3	3	3	3	3	3	3	3	3	3
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65	3	3	3	3	3	3	3	3	3	3
66	3	3	3	3	3	3	3	1	3	3
67	3	3	1	1	1	3	3	1	3	3
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72	3	3	3	3	3	3	3	3	3	3
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76	3	3	3	3	3	3	3	3	3	3
77	3	3	3	3	3	3	3	3	3	3
78	3	3	3	3	3	3	3	3	3	3
79	3	3	3	3	3	3	3	3	3	3
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81	3	3	3	3	3	3	3	3	3	3
82	3	3	3	3	3	3	3	3	3	3
83	3	3	1	1	1	1	1	1	1	1
84	3	3	3	3	3	3	3	3	3	3
85	3	3	3	3	3	3	3	3	3	3

← PIER 10

← PIER 11

← PIER 12

← PIER 13



# APPENDIX E

KCI Associates of Ohio  
Underwater Inspection Report

**Underwater Inspection Report for:**

The Hope Memorial Bridge over the Cuyahoga River in Cleveland, Ohio  
(Thirteen-span, Steel Cantilever Deck Truss Bridge with Concrete Piers)

**Contractor personnel on site during inspection:**

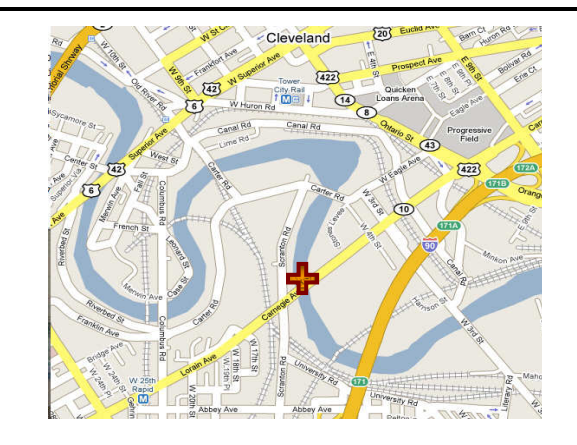
1. Capt. Travis M. Clower, MBA, P.E. (Diver / Lead Inspector)
2. Derek Zilka, (Backup Diver / Inspector)
3. William Becka, (Supervisor / Inspector)

**TranSystems Corporation of Ohio contact:**

Wesley Weir, P.E.  
55 Public Square, Suite 1900  
Cleveland, OH 44113-1901  
P: (216) 861-1780  
F: (216) 861-1028



*General Elevation View*



*Location Map*

**Prepared for:**

TranSystems Corp. of Ohio  
55 Public Square, Suite 1900  
Cleveland, OH 44113-1901  
Phone: (216) 861-1780



**Prepared by:**

KCI Associates of Ohio  
388 S. Main Street, Suite 401  
Akron, Ohio 44311  
Phone: (330) 564-9100



**DESCRIPTION**

The Hope Memorial Bridge, also known as the Lorain Carnegie Bridge or CUY-10-16.13 carries four lanes of Carnegie Avenue across the Cuyahoga River on the southwest side of Cleveland, Ohio. The bridge was completed in 1932 and renovated in the early 1980's.

The structure consists of a thirteen-span, steel cantilever deck truss bridge supported by twelve reinforced concrete piers and two abutments. Each pier consists of four reinforced concrete vertical columns. Only the piers adjacent to the riverbanks were partially submerged and considered part of this inspection. Following the nomenclature established in the original plans and used up to the 2000-02 rehabilitation, Pier 9 is on the east shore and Pier 10 is on the west shore. Likewise the columns will be lettered A to D from north to south.

Adjacent to each of these two piers is a partially failed timber pile fender system. Although referenced to in this report, the remaining timber fender system was not part of this inspection.

**INSPECTION OPERATIONS**

KCI's three-person dive team performed an underwater inspection on October 9<sup>th</sup>, 2010. The underwater inspection was conducted by a Licensed Professional Engineer and National Highway Institute (NHI) Certified Bridge Inspector. All dives were conducted by an Association of Diving Contractors International (ADCI) certified commercial diver in accordance with the Occupational Safety and Health Administration (OSHA) guidelines. A visual inspection was performed from 1-foot above the waterline (splash zone) to the mudline. Where the diver's visibility was limited, tactile methods were used. Soundings were taken along all substructure units and up to 30 feet north and south of the bridge using an ultrasonic depth sounder. Sounding data was verified using a survey rod.

The top surface of the timber retaining wall between Columns C and D on Pier 10 (West Pier) was chosen as the hydrographic reference point. This was the same location used in both the 2005 and 2008 Underwater Inspection Reports. The water surface was measured to be 5.9 feet below this point (see Photo 10).

Hazards Encountered:	<i>Visibility less than 1-foot with debris on the bottom.</i>
Inspection Mode:	<i>Surface supplied diving with hard wire communications</i>
Flow Direction / Velocity:	<i>The flow was from south to north. Little to no current.</i>
Order of Inspection:	<i>The diver inspected Pier 10 first, followed by Pier 9.</i>
Bottom Composition:	<i>Mud, small stones and debris.</i>
Scour Checked By:	<i>Soundings, probing and tactile methods.</i>
Equipment Used:	<i>Superlite 27 dive helmet and drysuit</i>
Elements Cleaned:	<i>Little to no growth present at the time of inspection. No significant cleaning required.</i>
Hydrographic Reference:	<i>The top surface of the timber retaining wall between Columns C and D on Pier 10 (West Pier). The water surface was measured to be 5.9 feet below this point.</i>

**OBSERVATIONS****GENERAL**

- Little to no biological growth was present at the time of inspection. No significant cleaning required.
- Visibility was less than 1-foot.
- The concrete surfaces were sounded with a hammer and found to be in good condition.

**CHANNEL**

- Little to no current present at the time of inspection.
- The south side of Pier 10, Column D has large (2-foot diameter) riprap stone around it. This is discussed below. The bottom composition in all other areas consists of mud, small stone and timber debris.
- The channel alignment is not perpendicular to the bridge piers. At this specific location, the Cuyahoga flows directly north. However the bridge is aligned from northeast to southwest at approximately a 30-degree angle.
- Upstream and downstream of the bridge steel sheet pile walls direct the flow. Additionally, upstream there are two abandoned concrete piers (from a previous bridge) that influence the flow. Downstream of these abandoned piers, timber pile fender systems extend to the north side of the Hope Memorial Bridge. The timber pile fender system on the east river bank has failed and is leaning into the river. Wire rope and shackles are present on both fender systems, suggesting they have been used to moor barges in the past. The timber pile fender system on the west bank was unable to be completely installed originally because of the size and location of the bridge pier footing. Neither of these timber fenders is fully capable of protecting the bridge piers from erosion and/or impact damage. These timber pile fender systems are beyond the scope of this inspection.

**DEFECTS & DEFICIENCIES****PIER 9 (EAST PIER), COLUMN A**

- The concrete surfaces had up to 1 ½-inch deep scaling with exposed aggregate at the waterline. This condition was up to 2 inches deep in the splash zone at the northwest and southwest corners. The northwest corner is protected with an 8-inch wide galvanized steel angle to prevent impact damage. The steel angle stops 2.6 feet above the water line and is in good condition (Photos 5 and 6).
- Just above the waterline on the west face there is a 10-inch diameter hole formed in the concrete. This was the location of a scupper drainpipe outlet. Pier 10 has a steel pipe in this location; however no pipe was present on Pier 9. This is shown in Photo 6.
- The 2008 adjusted sounding taken below this scupper pipe was 5.1 feet. The sounding taken during this inspection in the same location was 6.1 feet. It appears that up to 1.0 foot of material has slid down the steep slope towards the center of the channel.
- Photo 6 also shows the stone and concrete that was dumped between Columns A and B for shore protection. The material between the columns under this concrete has up to 3.7 feet of undermining. The undermining found during the 2008 inspection was only 1.0-

foot. This also supports that material is sliding down the steep slope towards the center of the channel.

- Large concrete riprap is present around the north side of Column A. The bottom material around the west and south faces is steep sloping small stones and sticks.
- No exposed footing was present and no other defects were found at the time of inspection.

#### **PIER 9 (EAST PIER), COLUMN B**

- The concrete surfaces had up to 1-inch deep scaling with exposed aggregate at the waterline. Only parts of the north and west sides were exposed to the water (Photo 6). The water at the northwest corner of this column was only 0.2 feet deep.
- The bottom consisted of small stones and timber debris sloping towards the center of the channel. This is shown in Photo 6.
- No exposed footing was present and no other defects were found at the time of inspection.

#### **PIER 9 (EAST PIER), COLUMNS C AND D**

- Dry.

#### **PIER 10 (WEST PIER), COLUMN A**

- Dry.

#### **PIER 10 (WEST PIER), COLUMN B**

- Only the south and east faces were exposed to water.
- The concrete surfaces had up to 1 ½-inch deep scaling with exposed aggregate at the waterline. This condition was up to 2 inches deep in the splash zone at the southeast corner and is shown in Photo 8.
- Soft mud and timber debris has accumulated on the bottom between Columns B and C. The bottom material on the east face is mud and small stone steeply sloping towards the center of the channel.
- No exposed footing was present and no other defects were found at the time of inspection.

#### **PIER 10 (WEST PIER), COLUMN C**

- The concrete surfaces had up to 1 ½-inch deep scaling with exposed aggregate at the waterline. This condition was up to 2 inches deep in the splash zone at the east corners and is also shown in Photo 8.
- Soft mud and timber debris has accumulated on the bottom between Columns C and D. The bottom material on the east face is mud and small stone steeply sloping towards the center of the channel.
- The timber retaining wall between Columns B and C was sounded with a hammer and found to be in good condition.



- No exposed footing was present and no other defects were found at the time of inspection.

#### **PIER 10 (WEST PIER), COLUMN D**

- The concrete surfaces had up to 1 ½-inch deep scaling with exposed aggregate at the waterline. This condition was up to 2 inches deep in the splash zone at the northeast corner. The southeast corner is protected with an 8-inch wide galvanized steel angle to prevent impact damage. The steel angle extends 5.1 feet below the water surface and is in good condition.
- The timber retaining wall between Columns C and D was sounded with a hammer and found to be in good condition. This area was used as the hydrographic reference point in the 2005, 2008 and the 2010 underwater inspections. The distance from the top of the timber wall to the water surface was measured to be 5.9 feet for this inspection and 6.3 feet for the 2008 underwater inspection. When comparing the 2010 soundings to the 2008 soundings, a 0.4 feet adjustment will be added to the 2008 numbers.
- Photo 7 shows the 10-inch diameter steel scupper pipe exiting the east face of Pier 10, Column D just above the water line. This is similar to the 10-inch scupper hole found on the west face of Pier 9, Column A.
- The southeast corner of the pier footing is exposed along the east face of Column D (Figures 1 and 2). The maximum vertical exposure was measured to be 3.7 feet in 2010 and 3.2 feet during the 2008 inspection. 9.5 horizontal feet of footing are exposed along the south side and 17 horizontal feet are exposed on the east face of the footer. The timber piles are driven into the river bottom tight up against the footing on both the south and east intersection points. This is shown above water in Photo 7. No footing undermining was detected.
- Viewing from above, the footer extends 7.3 feet east of the east face of Column D. Likewise in plan view, the footer extends 7.7 feet south of the south face of Column D. The top of footer was 23.4 feet below the water surface. The flat concrete of the southeast corner top of footer has numerous 2-foot diameter boulders laying on it that were not present during the 2008 inspection. This very large riprap material was stacked to form a nearly vertical wall eleven feet west of the exposed southeast corner during the 2008 inspection. It has since fallen down increasing the sounding midway on the south face of Pier 10, Column D from 8.0 feet in 2008 (adjusted) to 18.5 feet in 2010. This diver had the opportunity to do both the 2008 and 2010 inspections and was surprised to find this much material had fallen towards the center of the channel and was spread out across the top of the footer.
- No other defects were found at the time of inspection.

## **COMPARISON TO PREVIOUS REPORTING AND SUMMARY**

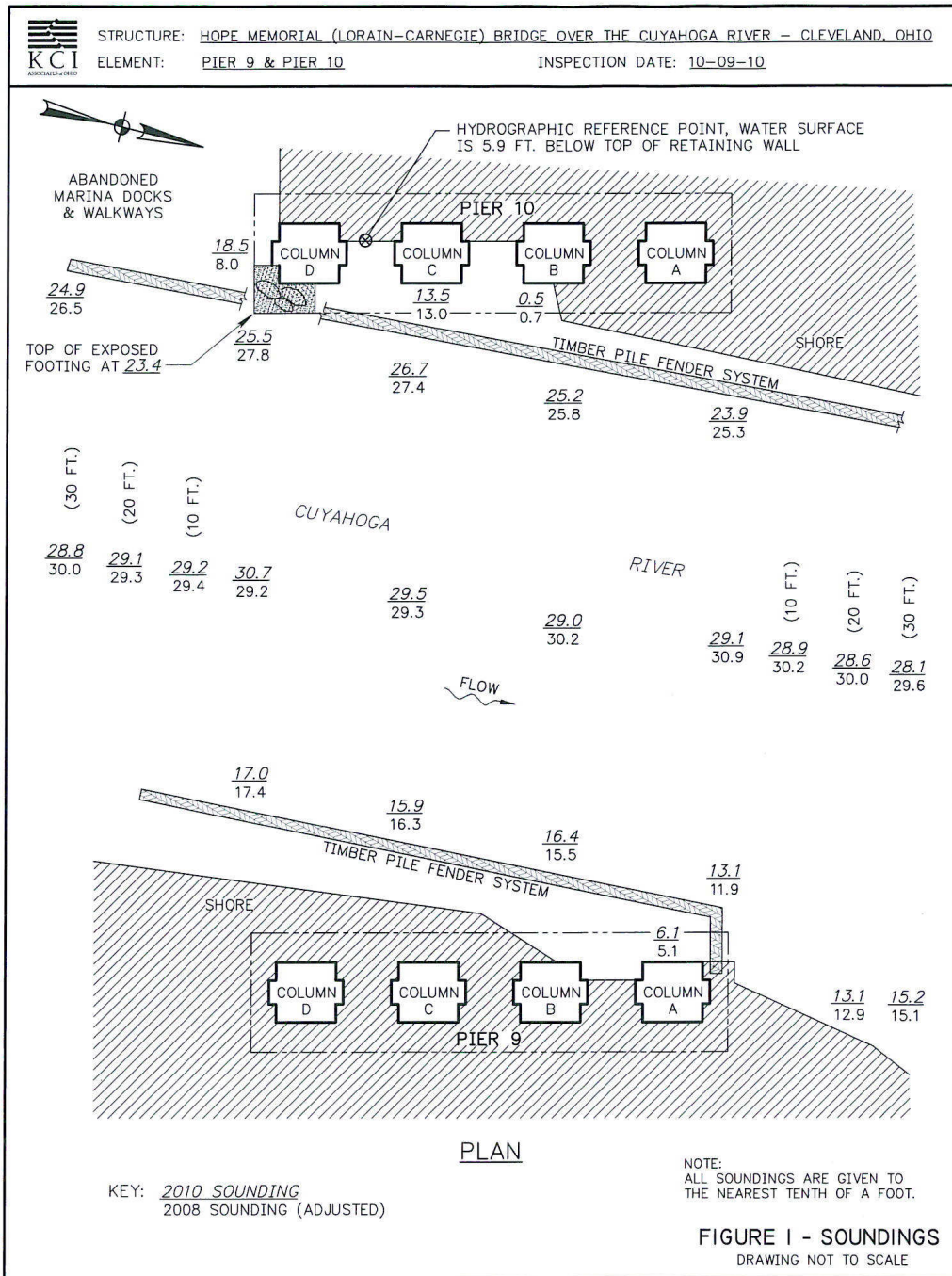
The concrete surfaces of both Pier 9 (East Pier) and Pier 10 (West Pier) were sounded with a hammer and found to be in good condition. At the waterline, the surfaces of both piers showed up to 1 ½-inch scaling with exposed aggregate. This condition was up to 2 inches deep on the corners exposed to splashing and ice buildup. Exposed reinforcing steel was not found anywhere. No significant cracks, spalls, or impact damage was found underwater on any of the pier columns.

Pier 9 (East Pier) did not have footing exposed. Both the Column A soundings and the above water loss of material between Columns A and B support that up to 1-foot of material has slid down the steep slope towards the center of the channel since the 2008 inspection. As the timber pile fender system continues to fall apart, more of this material will be removed. This is true for both Pier 9 and Pier 10. No exposed footer was found on Pier 9.

Similar to the 2008 inspection findings, the southeast corner of Pier 10 (West Pier) footing is exposed along the east face of Column D. The maximum vertical exposure was 3.7 feet in 2010 and 3.2 feet during the 2008 inspection. The flat concrete of the southeast corner top of footer has numerous 2-foot diameter boulders laying on it that were not present during the 2008 inspection. This very large riprap material was stacked to form a nearly vertical wall eleven feet west of the exposed southeast corner during the 2008 inspection. It has since fallen down increasing the sounding midway on the south face of Pier 10, Column D from 8.0 feet in 2008 (adjusted) to 18.5 feet in 2010. The large difference in soundings along this south face of Column D is an isolated incident resulting from rotting timber piles holding back a steep, unstable stack of extremely large riprap. This is not a scour issue, nor is it cause for concern. However, future inspections should continue to monitor the exposed footer in this corner.

## **RECOMMENDATIONS**

The material on the steep slopes around both piers continues to slide towards the center of the channel. As long as the timber pile fender system continues to break down, this will remain the case. It may increase in years with high water events and a year that the shipping channel is dredged. Typically, armor matting, grout bags or large riprap stone are used for erosion protection. Unfortunately those fixes would only be temporary and very dependent on the condition of the failing timber pile fender system. The only suggestion at this time would be to continue to monitor the exposed footer with underwater inspections and continue to compare soundings.



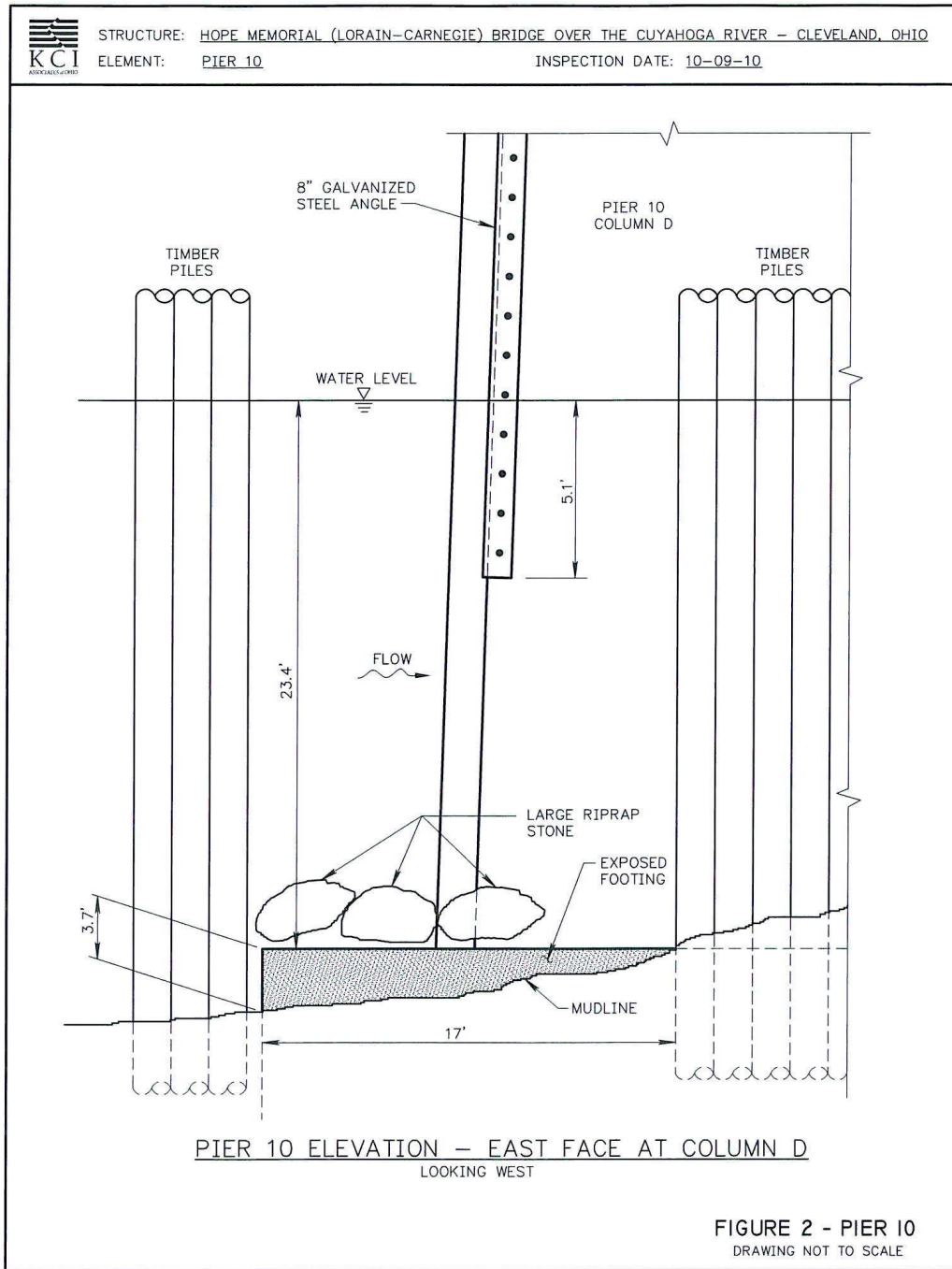




Photo by T. Clower, 10/9/10

Photo 1 – Facing North. South Elevation of the bridge.



Photo by T. Clower, 10/9/10

Photo 2 – Facing South. North Elevation of the bridge.



Photo by T. Clower, 10/9/10

Photo 3 – Facing North (downstream) from the bridge.



Photo by T. Clower, 10/9/10

Photo 4 – Facing South (upstream) from the bridge.



Photo by T. Clower, 10/9/10

Photo 5 – Facing East. West face of Pier 9.



Photo by T. Clower, 10/9/10

Photo 6 – Facing Northeast. West face of Pier 9, Columns A and B.



Photo by T. Clower, 10/9/10

Photo 7 – Facing West. East face of Pier 10.



Photo by T. Clower, 10/9/10

Photo 8 – Facing Northwest. East face of Pier 10, Columns C, B and A.





Photo by T. Clower, 10/9/10

Photo 9 – Facing North. South face of Pier 10, Column D.



Photo by T. Clower, 10/9/10

Photo 10 – Facing West. Hydrographic Reference Point  
Timber Retaining Wall 5.9 feet above water surface.

# APPENDIX F

## BR-86 Bridge Inspection Report

STATE OF OHIO DEPARTMENT OF TRANSPORTATION  
BRIDGE INSPECTION REPORT

Structure File Number **1801503**      BRIDGE NUMBER **CUY 00010 1613**      YEAR BUILT **1932**  
DIST **12**      Bridge Type **343**      TYPE SERVICE **5 7**      **CUY RIVER VALLEY & FI RR**

<b>DECK</b> out/out 83 Deck Area 272,652 sqft 1 REINF CONC (PRESTRSD, PRECAST) Left 2 SIDEWALK (>2)/Right 2 SIDEWALK (>2)	<b>2</b>	3 LATEX MODIFIED CONCRETE OVERLAY THK 1.2 <b>2. WEARING SURFACE</b>	<b>1</b>
<b>1. FLOOR</b>	<b>1</b>	Lanes on 8 <b>4. MEDIAN</b>	
<b>3. CURBS, SIDEWALKS AND WALKWAYS</b>	<b>1</b>	<b>6. DRAINAGE</b> 3 SCUPPERS & DWNSPTS	<b>1</b>
<b>5. RAILING</b> 5 REINFORCED CONCRETE PARAPET	<b>2</b>	<b>8. SUMMARY</b>	<b>6</b>
<b>7. EXPANSION JOINTS</b> 0 OTHER	<b>1</b>	<b>10. BEAMS/GIRDERS/SLAB</b> 15 Rolled Steel	<b>1</b>
<b>SUPERSTRUCTURE</b> <b>9. ALIGNMENT</b> MAX SPANS 299	<b>1</b>	<b>12. JOISTS/STRINGERS</b>	<b>2</b>
<b>11. DIAPHRAGMS or CROSSFRAMES</b>	<b>2</b>	<b>14. FLOOR BEAM CONNECTIONS</b>	<b>1</b>
<b>13. FLOOR BEAMS</b>	<b>2</b>	<b>16. DIAGONALS</b>	<b>2</b>
<b>15. VERTICALS</b>	<b>1</b>	<b>18. TOP CHORD</b>	<b>1</b>
<b>17. END POSTS</b>	<b>2</b>	<b>20. LOWER LATERAL BRACING</b>	<b>1</b>
<b>19. LOWER CHORD</b>	<b>1</b>	<b>22. SWAY BRACING</b>	<b>2</b>
<b>21. TOP LATERAL BRACING</b>	<b>1</b>	<b>24. BEARING DEVICES</b> 1 Rollers	<b>1</b>
<b>23. PORTALS</b>	<b>1</b>	<b>26. ARCH COLUMNS or HANGERS</b>	<b>7</b>
<b>25. ARCH</b>	<b>2</b>	PAINT DATE 3/4/2004    5 PAINT SYSTEM OZE <b>28. PROTECTIVE COATING SYSTEM</b>	<b>3</b>
<b>27. SPANDREL WALLS</b>	<b>S</b>	<b>30. FATIGUE PRONE CONNECTIONS</b>	<b>5</b>
<b>29. PINS/HANGERS/HINGES</b>	<b>1</b>	<b>32. SUMMARY</b>	<b>1</b>
<b>31. LIVE LOAD RESPONSE</b>	<b>2</b>	<b>34. ABUTMENT SEATS</b> 2 CANTILEVER ABUTMENT NOT ON PILING	<b>1</b>
<b>SUBSTRUCTURE</b> <b>33. ABUTMENTS</b> 3 Solid Wall	<b>1</b>	<b>36. PIER SEATS</b> 4 OPEN COLUMN PIERS NOT ON PILING	<b>1</b>
<b>35. PIERS</b>	<b>1</b>	<b>38. WINGWALLS</b>	<b>1</b>
<b>37. BACKWALLS</b>	<b>4</b>	<b>40. SCOUR</b>	<b>2</b>
<b>39. FENDERS and DOLPHINS</b> PIERS = 15 03 01 SPANS = 20	<b>3</b>	<b>42. SUMMARY</b> DIVE DATE 10/15/2010	<b>6</b>
<b>41. SLOPE PROTECTION</b> N NONE - NATURAL PROTECTION	<b>1</b>	<b>44. ALIGNMENT</b>	<b>1</b>
<b>CULVERTS</b> <b>43. GENERAL</b> N NONE/NOT APPLICABLE	<b>1</b>	<b>46. SEAMS</b> CULVERT FILL DEPTH = 0	<b>1</b>
<b>45. SHAPE</b> CULVERT LENGTH = 0	<b>1</b>	<b>48. SCOUR</b>	<b>1</b>
<b>47. HEADWALLS or ENDWALLS</b>	<b>1</b>	<b>50. SUMMARY</b>	<b>1</b>
<b>49.</b>	<b>2</b>	<b>52. PROTECTION</b> 3 SHEET PILING	<b>2</b>
<b>CHANNEL</b> <b>51. ALIGNMENT</b>	<b>1</b>	<b>54. SUMMARY</b>	<b>6</b>
<b>53. WATERWAY ADEQUACY</b> 8 SLIGHT CHANCE OVERTOPPING	<b>1</b>	<b>56. APPROACH SLABS</b>	<b>1</b>
<b>APPROACHES</b> <b>55. PAVEMENT</b> 8 BITUMINOUS	<b>1</b>	<b>58. RELIEF JOINTS</b>	<b>8</b>
<b>57. GUARDRAIL</b> 0 OTHER	<b>1</b>	<b>60. SUMMARY</b> PERCENT LEGAL = 150	<b>3</b>
<b>59. EMBANKMENT</b>	<b>1</b>	<b>62. WARNING SIGNS</b> MAINT RESP 1 OHIO TRAN DEPT	<b>3</b>
<b>GENERAL</b> <b>61. NAVIGATION LIGHTS</b>	<b>1</b>	<b>64. UTILITIES</b>	<b>5</b>
<b>63. SIGN SUPPORTS</b> SIGNS ON = N MVC on = 9999.0	<b>N</b>	<b>66. GENERAL APPRAISAL &amp; OPERATIONAL STATUS</b>	<b>A</b>
<b>65. VERTICAL CLEARANCE</b> UNDER C = 0 UNDER NC = 0	<b>5</b>		<b>5</b>
<b>67. INSPECTED BY</b>		<b>68. REVIEWED BY</b>	

SIGNED

PE Number  
TRANSYSTEMS

DATE **12/30/2010**

ADK  
INITIALS

SIGNED

69991    WRW  
PE Number    INITIALS

DATE **12/30/2010**

SURVEY

## DECK

FLOOR: TRUSS SPANS PRIMARY DECK UNDERSIDE EXHIBITS ISOLATED SPALLS WITH EXPOSED REBAR OVER UP TO 5% OF THE DECK AREA. TYPICALLY THESE SPALLS HAVE BEEN SEALED. TRANSVERSE CRACKS WITH EFFLORESCENCE AT 10' SPACINGS NOTED. EAST APPROACH 5-10% DETERIORATION.

UTILITY DECK "HAUNCH" SPALLS (1" OF CONCRETE POURED BELOW THE FLOORBEAM TOP FLANGES) NOTED THROUGHOUT.

RAILING: CONCRETE EXHIBITS HAIRLINE CRACKING WITH RUST STAINS AT SEVERAL LOCATIONS.

EXPANSION JOINTS: THE EXPANSION JOINTS EXHIBIT ISOLATED AREAS OF TORN GLANDS THAT ARE LEAKING ONTO THE SUPERSTRUCTURE.

## SUPERSTRUCTURE

STRINGERS: THE FIRST INTERIOR STRINGERS OF THE TRUSS SPANS EXHIBIT MINOR PITTING ON THE WEB AND BOTTOM FLANGE (CLEANED AND PAINTED) WITH ISOLATED HOLED THROUGH SECTIONS.

LOWER CHORD: TYPICAL MODERATE AND ISOLATED AREAS OF ADVANCED SECTION LOSS DUE TO PREVIOUS CORROSION ON WEB PLATES AND RIVET HEADS. PACK RUST IS BEGINNING TO RE-ACTIVATE BETWEEN COMPONENTS, PRIMARILY BETWEEN WEB PLATES AND TOP FLANGE ANGLES.

VERTICALS: TYPICAL MODERATE SECTION LOSS UP TO 1/4" DUE TO PREVIOUS CORROSION. PACK RUST IS BEGINNING TO REACTIVATE.

DIAGONALS: TYPICAL SECTION LOSS WITH ISOLATED AREAS OF ADVANCED SECTION LOSS UP TO 1/4" TO THE WEB AT THE INTERFACE WITH GUSSET PLATES (CLEANED AND PAINTED).

GUSSET PLATES: TYPICAL MODERATE SECTION LOSS UP TO 1/8" WITH ISOLATED AREAS OF ADVANCED SECTION LOSS UP TO 1/4". GUSSET PLATE CL70S EXHIBITS A LAMINAR SPLIT UNDER THE WEST DIAGONAL REDUCING THE GUSSET PLATE THICKNESS TO 1/4" REMAINING.

BEARINGS: WATER IS COLLECTING AT SEVERAL PIER BEARINGS WITHIN THE POCKETS OF THE CASTINGS.

PINS: SECTION LOSS ON SLEEVES (CLEANED AND PAINTED). THE CHORD WEB PLATES ARE BENT DUE TO PACK RUST BETWEEN THE GUSSET PLATE AND THE WEB PLATE, PREVENTING SLIDING PINS FROM FULLY BEARING ON THE CHORD MEMBERS. LOWER CHORD SLIDING PINS AT PANEL POINTS AL17 AND BL41 APPEAR TO BE FROZEN DUE TO PACK RUST. SEVERAL PINS EXHIBIT ADVANCED WEARING UP TO 1/4" ALONG A THIRD OF THE PIN DIAMETER.

PAINT: <1% DETERIORATION, MINOR PEELING OF TOP COAT, RUST STAINING IS OCCURRING OVER THE TOP COAT PRIMARILY TO TRUSS MEMBERS BENEATH LEAKING JOINTS.

FATIGUE PRONE CONNECTIONS: UTILITY DECK FLOORBEAMS EXHIBIT CRACKS DUE TO A LACK OF RADIAL COPING NEAR THE CONNECTION TO THE TRUSSES. ISOLATED CRACKS IN FLOORBEAMS DO NOT HAVE ARREST HOLES. CRACK ENDS THAT HAVE NOT BEEN ARRESTED HAVE BEEN MARKED AND DATED TO DETERMINE FURTHER CRACK PROPAGATION.

## SUBSTRUCTURE:

PIERS: LARGE SPALLS WITH EXPOSED REBAR ARE TYPICAL THROUGHOUT THE PIER TOWERS ABOVE BEARINGS. THOSE SPALLS HAVE BEEN SEALED. THE EXTERIOR PIER WALLS EXHIBIT HAIRLINE CRACKS AND ISOLATED CORNER SPALLS IN ISOLATED AREAS ALONG THE OUTSIDE CORBELS.

FENDERS: SEVERE ROT AND COLLISION DAMAGE. FENDERS HAVE FAILED AND NO LONGER FUNCTION AS INTENDED.

SCOUR: DIVED BY KCI ASSOCIATES OF OHIO ON 10/15/2010. SEE DIVE REPORT

## CHANNEL:

ALIGNMENT: SHARP BEND JUST UPSTREAM OF BRIDGE.

PROTECTION: WEST BANK SHEET PILING IS WASHED OUT 200 YARDS NORTH (DOWNSTREAM) OF BRIDGE.

## GENERAL:

LIGHTING: WIDESPREAD CRACKING AND ISOLATED SPALLS WERE NOTED ON PRECAST CONCRETE LIGHT POLES (MOUNTED OUTSIDE OF THE BRIDGE RAILING). SEVERAL MISSING OR DAMAGED DECORATIVE LIGHTS ON PIERS. ACCESS COVERS FOR ELECTRICAL BOXES IN SIDEWALKS AND HAND ACCESS HATCHES ON LIGHT POLES ARE MISSING.

UTILITIES: MISALIGNED SUPPORT UNDER THE 40" GAS MAIN ON UTILITY DECK. SEVERAL OF THE UTILITY CONDUITS ARE BROKEN (NO CHANGE SINCE THE LAST INSPECTION).

FOR ADDITIONAL COMMENTS SEE REPORT IN BRIDGE FILE.