

**PHYSICAL CONDITION REPORT
FOR THE 2011 ROUTINE INSPECTION**

LORAIN-CARNEGIE BRIDGE

BR#: CUY-10-1613

SFN: 1801503

OHIO DEPARTMENT OF TRANSPORTATION

DISTRICT 12

PID #87601



Inspected: July 18 through August 25, 2011

Report: March , 2012



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

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

CLEVELAND, OHIO

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**OHIO DEPARTMENT OF TRANSPORTATION
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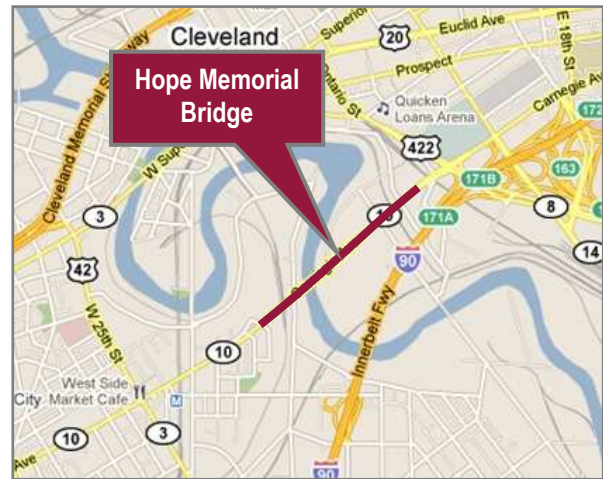
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BRIDGE DESCRIPTION

The CUY-10-1613 (Hope Memorial) Bridge carries four lanes of State Route 10 traffic approximately 3,200 feet on the southwest side of Cleveland, Ohio. The bridge passes through downtown Cleveland and over the Cuyahoga River, Norfolk Southern/CSX railroad tracks and numerous local streets. Constructed in 1932, the bridge was originally designed to carry two rapid transit tracks on a lower deck alongside a utility deck for truck access. The main truss spans include a 13-span cantilevered Pratt deck truss consisting of 4 truss lines and an additional simply supported Pratt deck truss with 3 truss lines at the east end of the bridge (see **Figures 1 and 2**). The west approach spans consist of steel beam simple spans, supported by both steel bents and concrete piers, while the each approach is a concrete cellular unit.



Location Map

The Lorain-Carnegie Bridge maintains a straight horizontal alignment for the full length of the structure. The bridge is oriented from west to east with nomenclature following ODOT standards, and the four truss lines are labeled A through D from north to south. Gusset plate nomenclature is based on the shop drawings, with labels consisting of the 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 each section labeled can be found in **Appendix A**.

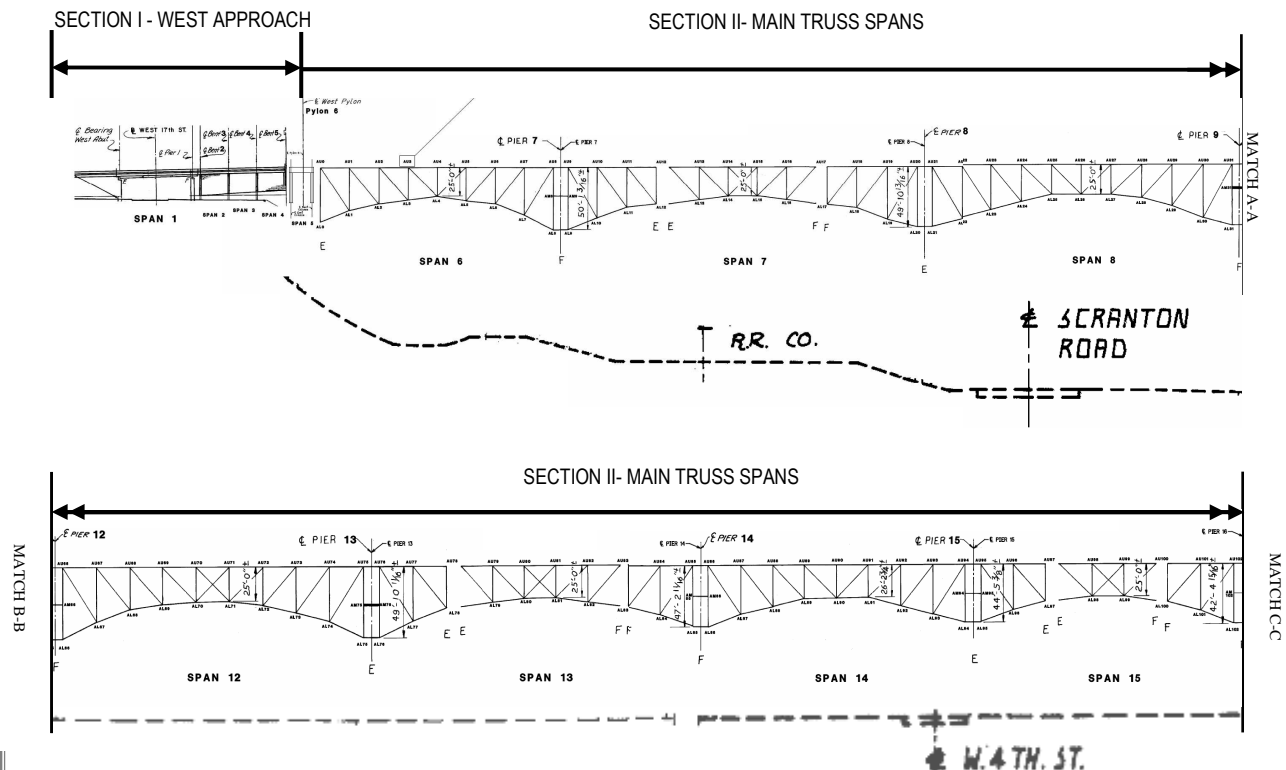


Figure 1 – Partial south elevation of the Lorain-Carnegie Bridge.

INSPECTION PROCEDURE

A routine inspection of the structure was performed between July 18 and August 25, 2011. The inspection findings for the various elements 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, a UB-50 under bridge inspection unit, ladders, and modified technical climbing were utilized.

INSPECTION TEAM

The inspection team members are as follows:

- Anthony Koloze, PE – TranSystems
- Brian Corson-Marquess, PE – TranSystems
- Noemy Roman, PE – TranSystems
- Donald Cartwright, EI – TranSystems
- Nicholas Fisco, EI – TranSystems
- William Holman – TranSystems
- Ken Jansing, PE – Northwest Consultants
- Brett Russell, EI – Northwest Consultants

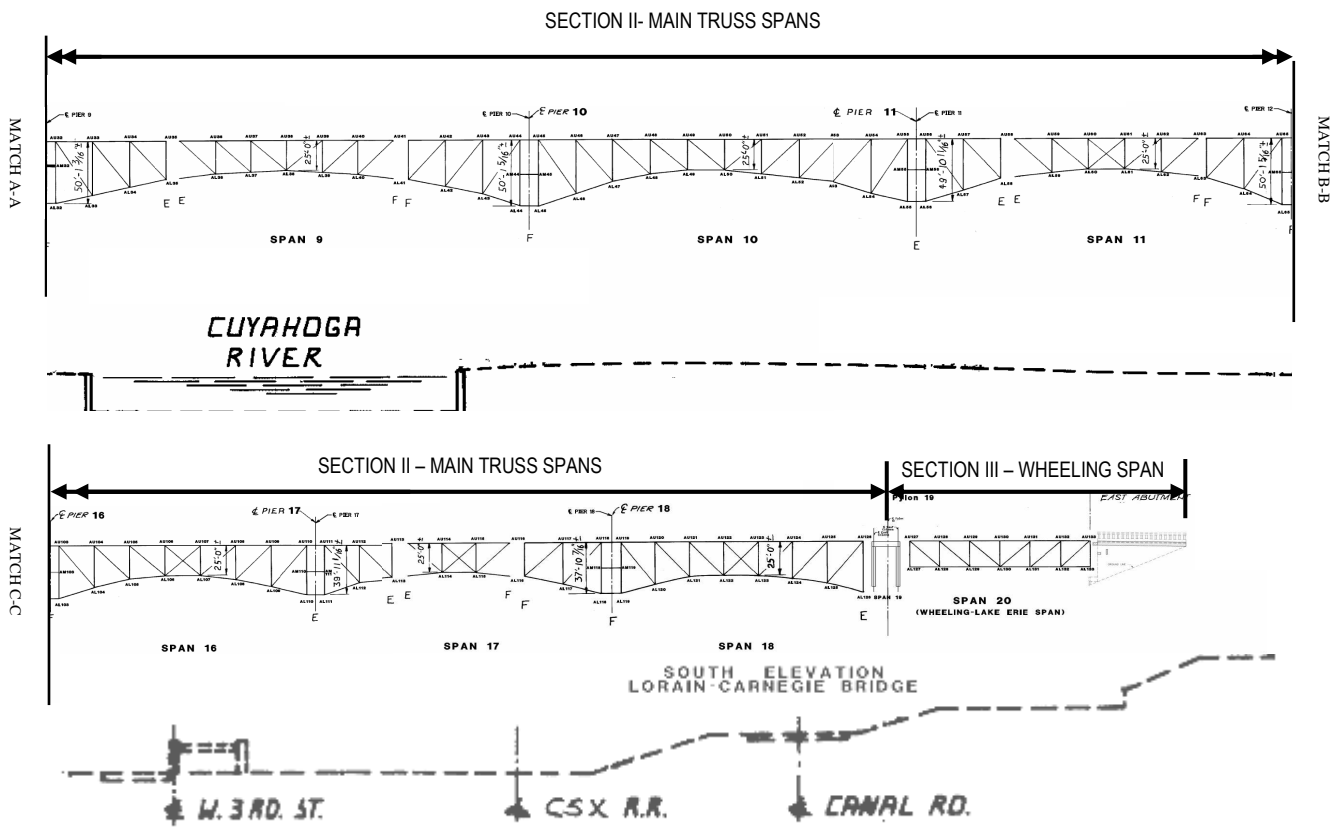


Figure 2 – Partial south elevation of the Lorain-Carnegie Bridge.

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. Manual of Bridge Inspection, Ohio Department of Transportation (ODOT), 2010.
2. Manual for Condition Evaluation of Bridges, American Association of State Highway and Transportation Officials (AASHTO), 2011.
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, (NBIS); Code of Federal Regulations – CFR Title 23 Part 650, 2004.
6. Manual for Inspecting Bridges for Fatigue Damage Conditions, Commonwealth of Pennsylvania Department of Transportation, 1990
7. Inspecting Steel Bridges for Fatigue Damage, Dr. John W. Fisher, Lehigh University, 1981

ITEM 8 – DECK SUMMARY

The deck is in FAIR CONDITION [5-NBIS] due to localized areas of advanced spalling with corroded reinforcing on the deck underside. The east cellular unit exhibits one 10-foot diameter spall with 7 consecutive transverse bars with 100% section loss. Transverse cracking is present at ten foot spacing. Expansion joints are typically leaking with torn neoprene glands in isolated locations.

ITEM 1 – FLOOR

The bridge floor is in POOR CONDITION [3] overall with spalls and exposed rebar noted on the roadway deck underside throughout. Spalls and delaminations are present in the utility deck adjacent to floorbeam top flanges. Transverse hairline cracks with efflorescence are present in both the roadway and utility decks, spaced at approximately 10 feet.

Roadway Deck

The east cellular unit exhibits a 10' diameter spall with 7 consecutive transverse reinforcing bars exhibiting 100% section loss (**see photo 1**). Spalls with minor section loss to exposed reinforcing are present over approximately ten percent of the remaining deck area. Transverse 1/16" cracks with efflorescence and rust staining were noted in numerous locations throughout the east cellular unit.

The main truss roadway deck soffit exhibits spalls with exposed reinforcing bars over approximately five percent of the area (**see photo 2**). The majority of spalls with exposed rebar have been patched or sealed, although isolated patches have failed or delaminated. Transverse hairline cracks at 10' spacing with efflorescence are present on the roadway deck underside (**see photo 3**), and stalactite formations of efflorescence have formed above the exterior truss lines at subdrain locations.

Utility Deck

The underside of the utility deck exhibits widespread spalling adjacent to floorbeams due to 1" to 2" thick concrete that was poured below the underside of floorbeam top flanges (**see photo 4**). Spalls have



Photo 1 – 10' diameter spall with 100% section loss to 7 consecutive transverse reinforcing bars within the east cellular unit.



Photo 2 – Roadway deck underside in Span 16 between Floorbeams 107 and 108. Note several spalls have been sealed.



Photo 3 – Transverse cracks with efflorescence and stalactite formations between Floorbeams 28 and 29.

occurred at several floorbeam locations, while some locations have partial spalls with delaminations, and nearly all remaining locations exhibit cracks which may eventually lead to spalls. These incipient spalls represent potential falling hazards over the streets and industrial yards below.

Transverse hairline cracks with efflorescence are present at 10' spacing throughout the utility deck underside.

ITEM 2 – WEARING SURFACE

The wearing surface is in GOOD CONDITION [1] overall with hairline map cracking and minor wear in isolated locations throughout. Several shallow voids typically less than 4" in diameter are present in the wearing surface.

ITEM 3 – CURBS, SIDEWALKS AND WALKWAYS

The sidewalks are in GOOD CONDITION [1] with shallow spalls less than 2" deep and hairline cracking in isolated locations (see photo 5). The north sidewalk adjacent to the joint between the east approach slab and east approach roadway exhibits a buckled section, resulting in a 9" vertical misalignment (see photo 6). This deficiency has been repaired since the inspection.

ITEM 5 – RAILING

The railing is in GOOD CONDITION [1] overall with areas of hairline cracks with rust staining present throughout (see photo 7). Isolated locations of the fascia soffit exhibit minor spalls with exposed reinforcing (see photo 8). Cracks are more prevalent at parapet construction joint locations.

ITEM 6 – DRAINAGE

The drainage is in GOOD CONDITION [1] with all drains functioning properly despite isolated vegetation growth and debris.



Photo 4 – Typical utility deck haunch spall in Bay 5 adjacent to the top flange of Floorbeam 53.



Photo 5 – Shallow spalls in north sidewalk surface adjacent to East Abutment joint.



Photo 6 – Buckled section of north sidewalk adjacent to the joint between the east approach slab and east approach roadway.



Photo 7 – Typical parapet hairline cracks with rust staining.



Photo 8 – Spall with exposed reinforcing in fascia soffit over Panel Point AU12.

ITEM 7 – EXPANSION JOINTS

The expansion joints are in FAIR CONDITION [2] overall, with joints typically leaking onto the structural steel below due to torn neoprene drainage troughs (see photo 9). Heavy granular debris has accumulated in the majority of the expansion joints over the full length.

Expansion joint gaps were measured during the field inspection on July 18 and July 20, 2011. The openings recorded at that time are within reasonable limits and are consistent along the joint lengths (see Table 1). The joint measurements were also relatively consistent with those taken in 2010. No significant vertical misalignment was noted at any of the joints during the inspection.



Photo 9 – Isolated torn neoprene trough and active corrosion to framing members adjacent to Panel Point DU35.

Joint Measurements				
Joint Location	2011 Inspection (90° and Sunny)		2010 Inspection (72° and Sunny)	
	WB	EB	WB	EB
	7/18/11	7/20/11	10/11/10	10/11/10
W. Abutment	1 1/2"	1 1/2"	1 7/8"	1 1/2"
Joint 1	1 1/8"	1 3/8"	1 9/16"	1 1/2"
Joint 2	1 3/4"	1 3/4"	1 3/4"	1 3/4"
Joint 3	1 1/4"	1 1/4"	1 3/4"	1 5/8"
Joint 4	8 1/2"	8 3/8"	8 3/4"	9 1/8"
Joint 5	2 1/2"	2 1/4"	2 3/16"	2 1/4"
Joint 6	4 1/2"	4 1/2"	5 1/4"	5 3/16"
Joint 7	2 1/4"	2 1/4"	2 3/16"	2 1/4"
Joint 8	5"	5 1/4"	5 7/8"	5 5/8"
Joint 9	2 1/2"	2 1/2"	2 1/4"	2 7/16"
Joint 10	4"	4 1/2"	5"	5 1/4"
Joint 11	2 1/8"	2 1/4"	2 1/8"	2 1/4"
Joint 12	5"	4 3/4"	5 1/4"	4 7/8"
Joint 13	2 1/4"	2 5/16"	2 1/4"	2 1/4"
Joint 14	4 3/8"	4 7/8"	4 3/4"	4 15/16"
Joint 15	2 1/4"	2 1/4"	2 1/4"	2 1/4"
Joint 16	1 1/2"	1 1/2"	1 5/8"	1 7/8"
E. Abutment	1 1/8"	1"	1 5/8"	1 1/8"

Table 1 – Joint opening measurements. Note the similarity in joint measurements at each location.

ITEM 32 – SUPERSTRUCTURE SUMMARY

The superstructure is in POOR CONDITION [4-NBIS] overall due to isolated areas of advanced section loss noted on the truss lower chord members and gusset plates (see photo 10). Truss upper chord, vertical and diagonal members typically exhibit minor to moderate section loss. Minor section loss was noted on steel girders in the west approach spans.

ITEM 9 – ALIGNMENT

The alignment is in GOOD CONDITION [1] with no deficiencies noted in the horizontal or vertical alignment of structural members.

ITEM 10 – GIRDERS

The girders are in GOOD CONDITION [1] with minor section loss to the web and bottom flange in isolated locations. Pitting is primarily located adjacent to the west abutment and is less than 1/16" deep (cleaned and painted).

ITEM 11 – DIAPHRAGMS AND CROSS FRAMES

The diaphragms and cross frames are in GOOD CONDITION [1] with minor surface corrosion noted on cross frames near the west abutment.

ITEM 12 - STRINGERS

The stringers are in FAIR CONDITION [2] overall due to 1/16" pitting typical primarily on the web and bottom flange of the first interior roadway deck stringers. Numerous web locations exhibit pin holes with isolated holed through sections up to 3" in diameter. One fascia stringer exhibits a crack at the bottom cope adjacent to the floorbeam connection.

Stringers typically exhibit 1/16" pitting (cleaned and painted) along the bottom half of the web and throughout the bottom flange. In isolated locations, there is up to 1/8" deep pitting with holed through sections up to 1" in diameter along the full height of the first interior stringer webs. The first interior stringer



Photo 10 – 4" high by 5" wide holed-through section in south web plate of member CL113-CL114 near CL113 pin location.



Photo 11 – 3" diameter holed-through section on the first interior stringer near AU118N.

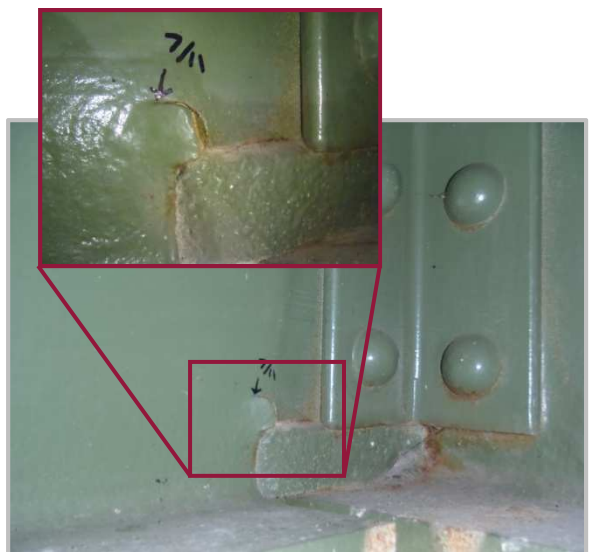


Photo 12 – West end of Stringer 1 at connection to Floorbeam 24 with hooked crack in bottom flange cope. Note bow in stringer web at this location.

adjacent to Panel Point AU118N exhibits a 3" diameter holed through section at the base of the web roughly 18" from the floorbeam connection (see photo 11). The surrounding areas have approximately 1/8" section loss.

The north fascia stringer on the west side of Floorbeam 24 exhibits a hooked crack in the bottom flange cope, measured 3/4" vertical and 3/4" horizontal at the time of inspection due to a 1/4" bow in the web (see photo 12). The north fascia stringer just east of Floorbeam 25 has a bow in the web, causing a 4" long tear and adjacent 1" tear, with concrete seeping through (see photo 13).



Photo 13 – Tears in web of north fascia stringer just east of Floorbeam 25 with concrete seepage.

ITEM 13 - FLOORBEAMS

The floorbeams are in FAIR CONDITION [2] overall due to section loss up to 1/4" deep with moderate active corrosion, primarily adjacent to roadway deck joint locations. Several utility deck floorbeams exhibit up to 3" long cracks in the web immediately adjacent to floorbeam connections (see photo 14). Isolated cracks without arrest holes have propagated since the last inspection.

Roadway Deck

Floorbeams typically exhibit 1/8" pitting with moderate active corrosion adjacent to joints and deck drains. Isolated floorbeams exhibit up to 1/4" deep pitting on the lower third of the web and bottom flange, as well as in isolated locations on the top flange. The outstanding legs of numerous web stiffener angles exhibit up to 100% section loss (see photo 15).



Photo 14 – Crack in utility deck floorbeam at connection to gusset plate CL37S.

The concrete floorbeams in Span 5 and throughout the east cellular unit exhibit localized areas of advanced spalling with corroded reinforcing on the floorbeam undersides. The west end floorbeam in Span 5 exhibits a spall 9 feet long by 32" wide at the north end; this spall is 3" deep with exposed longitudinal and transverse reinforcing, including section loss up to 70% on a longitudinal bar (see photo 16). The east end floorbeam in Span 5 exhibits transverse hairline cracks throughout the underside. The concrete floorbeams in the east cellular unit exhibit spalls in the underside up to the full length by full width of the beams. These



Photo 15 – East face of Floorbeam 100 with 100% section loss to web stiffeners adjacent to Truss A.

spalls exhibit exposed, corroded reinforcing bars with up to 20% section loss (see photo 17).

Utility Deck

Several utility deck floorbeams exhibit cracks up to 3" long due to a lack of radial coping at truss connections (see Item 30 – Fatigue Prone Details). Isolated cracks in these floorbeams have not been arrested, and these locations were marked and dated in order to monitor future propagation.

ITEM 30 - FATIGUE PRONE DETAILS

The fatigue prone details are in GOOD CONDITION [1] overall with no significant deficiencies noted in Category E or E' details. Isolated lower chord bottom flange angles have welded retrofit plates, and because bottom flanges are less than 0.8" thick, these represent a Category E detail. No signs of distress were noted at these locations. Many pin plates throughout the truss structure exhibit minor section loss in the net section with moderate section loss noted in the gross section. The base metal in the net section represents a Category E detail, but no evidence of distress was noted in the net section in these areas.

Utility deck floorbeam webs in 23 locations exhibit cracks up to 3" long adjacent to truss connections. There is a 2" long crack in the web of Floorbeam 37 near the connection to Panel Point CL36 which has propagated 1/4" since the 2010 inspection (see photos 18 and 19).



Photo 16 – Spall with exposed reinforcing at north end of west end floorbeam in Pylon Span 5.



Photo 17 – Spall with exposed, corroded reinforcing bars in Floorbeam 5 underside in the north bay of the east cellular unit.



Photo 19 – View of same crack location during 2010 inspection



Photo 18 – Crack in utility deck floorbeam at connection to gusset plate CL36N.

ITEM 14 – FLOORBEAM CONNECTIONS

The floorbeam connections are in GOOD CONDITION [1], with isolated locations of impacted rust between the girder webs and utility deck floorbeam connection angles (see photo 20). The utility deck floorbeam connection angle to gusset plate BL15S exhibits a 3" long rolling flaw which has not propagated since the previous inspection.



Photo 20 – Pack rust at utility deck floorbeam web and connection angles to gusset plate CL4S.

TRUSS INSPECTION FINDINGS

The truss members are in POOR CONDITION [3] overall due to numerous locations of advanced section loss on lower chord members and gusset plates. Vertical members, diagonal members, sway bracing and lateral bracing members also exhibit isolated areas of advanced section loss with moderate section loss common on these components. The upper chord members and gusset plates exhibit moderate section loss at isolated locations. For a detailed layout of truss member deficiencies, see [Appendix C](#).

ITEM 15 – VERTICAL TRUSS MEMBERS

The vertical truss members are in FAIR CONDITION [2] overall with isolated members exhibiting moderate to advanced section loss up to 1/4" deep. The condition of pitting on these members has not changed from the previous inspection. There is pack rust between web plates and flange angles up to 1" with isolated areas beginning to show signs of reactivation.



Photo 21 – 1/8" pitting on member BL0-BU0 with isolated 1/4" pitting over the lower half of the north web plate.

The verticals consist of riveted, built-up box members, with web channel sections on the north and south faces and lacing bars on the east and west. The verticals located below joints and at pin locations typically exhibit the most significant section loss, with 1/4" pitting primarily on the web plates noted in several locations (see photo 21). Vertical member AL0-AU0 exhibits 5/16" pitting for the full width of the north web plate with isolated losses of the same magnitude on the south web plate. Moderate pitting was also noted along the full width of web plates along the gusset plate interface, as well as around sway bracing connection angles (see photo 22).



Photo 22 – AL65-AU65 with 3/16" pitting on south web plate along lower chord gusset plate.

Isolated pitting up to 1/4" was also noted on flange angles around lacing bars. Several vertical members exhibit pack rust up to 1" (cleaned and painted) between flange angles and cover plates (**see photo 23**).



Photo 23 – Pack rust between the north web plate and flange angles of member CL65-CU65 up to 3/4" thick.

ITEM 16 – DIAGONAL TRUSS MEMBERS

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

There are numerous locations with pack rust up to 2" thick between diagonal members and gusset plates. The diagonal member web plates in these areas exhibit section loss typically up to 1/4" deep over the full width of the web plate, with isolated loss up to 3/8" (**see photo 24**).



Photo 24 – Member DL116-DU117 with 3/8" pitting on the north web plate along the lower chord gusset plate.



Photo 25 – 3/8" pitting (cleaned and painted) on interior face of the south web plate of member DL35-DU34 between flange angles adjacent to the lower chord gusset plate.

Diagonal member DL35-DU34 exhibits 3/8" pitting to the interior face of the south web plate with 1/8" pitting over the exterior face at the same location (**see photo 25**).

Pitting up to 1/4" deep (cleaned and painted) was noted on top flange angles around lacing bar connections in isolated locations throughout the diagonal members (**see photo 26**).

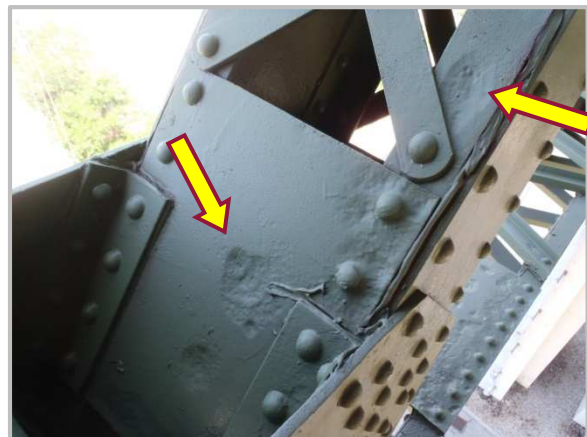


Photo 26 – Pitting up to 1/4" deep on AL108-AU109 batten plate and top flange angle at lacing bar connection adjacent to lower chord gusset plate.

ITEM 18 – TOP CHORD TRUSS MEMBERS

The top chord members are in GOOD CONDITION [1] overall due to only one area of moderate section loss and isolated locations of active corrosion.

The top chord consists of riveted, built-up box sections. Chord members below deck joints and subdrains typically exhibit areas with active minor to moderate surface corrosion (see photos 27 and 28).

Member AU120-AU121 exhibits holed through sections up to 2" in diameter to the batten plate and full section loss to the top and bottom flange angles for the first 12" of the member within the bounds of gusset plate AU120. In addition, the last upper lacing bar at this location has 100% section loss.

Numerous locations along Trusses A and D exhibit welded steel attachments to the top chord web plates. Many of these field welds are of poor quality, although there were no signs of distress at the time of the inspection.

ITEM 19 – BOTTOM CHORD TRUSS MEMBERS

The bottom chord members are in POOR CONDITION [3] due to isolated areas of advanced section loss in the web plates and flange angles (see photo 29), as well as typical minor pitting to batten plates, areas of the web plates and lacing bars. All of these losses have been cleaned and painted. Pack rust has accumulated between web plates and flange angles, as well as between flange angles and lacing bars or batten plates. For a detailed layout of lower chord member deficiencies, see Appendix C.

The lower chord consists of riveted, built-up box sections with web plates on the north and south faces, lacing channels on top and lacing bars on the bottom. Section loss up to 1/4" was commonly found on the lower 3" of exterior web plates at the interface with the vertical legs of bottom flange angles, with isolated areas of advanced section loss and holed-through sections at these locations (see photo 30). The north



Photo 27 – Active corrosion on DU4-DU5 top flange angles and lacing bars near Panel Point 5.



Photo 28 – Pitting up to 1/8" on top flange angles and lacing bars with active corrosion at DU80-DU81 subdrain location.



Photo 29 – Advanced section loss up to 3/8" across the hull height of the CL95-CL96 south web plate along gusset plate CL96S.

web plate of member DL0-DL1 exhibits a 24" long by 2" high hole adjacent to Panel Point DL0 (see photo 31).

Section loss on the interior surfaces of lower chord web plates is typical along the edge line of the gusset plates. Member DL13-DL14 exhibits 1/4" pitting over the full height of the north web plate with a 1" diameter hole at the bottom adjacent to DL14.

Previously cleaned and sealed pack rust, typically 1" with isolated locations up to 2" thick, is beginning to reactivate in many locations throughout the truss spans (see photo 32).



Photo 31 – Holed-through section of DL0-DL1 north web plate 24" long by 2" high adjacent to gusset plate DL0N.

On lower chord member BL13-BL14 adjacent to Panel Point BL13, the north bottom flange angle exhibits a longitudinal crack 30" long with rust staining. A similar 24" long crack was noted at the north top flange angle of member DL15-DL16 near Panel Point DL15 (see photo 33). Both crack locations are within the bounds of the top and bottom batten plates, which exhibit heavy pack rust between flange angle legs and batten plates. Neither crack has propagated since the previous inspection cycle.

Extensive impacted rust was noted between the free web plates of CL12-CL13 and the gusset plates at the CL12 pin location. This condition has caused a 2-1/2" lateral misalignment of the north and south web plates and pin plates with respect to the gusset plates.



Photo 30 – South web plate of AL0-AL1 with 1/8" pitting along the bottom flange angle.



Photo 32 – Previously sealed impacted rust beginning to reactivate between the north web plate and top flange angle of member BL53-BL54.



Photo 33 – Crack in top flange angle of DL15-DL16 near DL15 within bounds of top batten plate. This crack has not propagated since the last inspection.

ITEM 20 – GUSSET PLATES

The gusset plates are in POOR CONDITION [3] overall. The lower chord gusset plates typically exhibit 10-20% loss (cleaned and painted) on the exterior of the plates for a 3"-6" height above the lower chord, with the heaviest loss located underneath the vertical and diagonal connections. Nine plates exhibit 35% average section loss over their global horizontal shear plane, with isolated loss up to 70%. Forty-eight additional gusset plates have an average loss of 20% over their global horizontal shear plane. These plates with advanced deterioration were typically noted at pin locations. Gusset plate nomenclature is based on the shop drawings, with labels consisting of the truss letter (A through D, with A being the northernmost truss), upper or lower (U or L), panel point number, and north or south plate (N or S).

During the 2010 in-depth inspection, gusset plates were inspected utilizing a Pocket UT device to measure significant section loss. Where the Pocket UT was not utilized, either due to clearance issues or the unevenness of the plate surface, recorded losses were based on visual inspection. Pocket UT measurements were primarily taken along the intersection of the truss members and the gusset plate, particularly along the top of the bottom chord, and along each side of the vertical member. Refer to **Appendix D** for a detailed table of losses taken during the 2010 inspection. All recorded losses have been cleaned and painted, with active surface corrosion present at gusset plates adjacent to deck joints.



Photo 34 – Typical 1/4" pitting surrounding pin (gusset plate DU113S shown).

The upper chord gusset plates are typically free of deterioration, except for below expansion joints. The gusset plates at pin locations typically exhibit pitting up to 1/4" for a two foot diameter surrounding the pin (**see photo 34**).

Gusset plate CL70S exhibits a 12" tall lamellar tear on the west free edge with approximately 1" of pack rust within the tear that has reduced the thickness of the plate to 1/4" remaining for a length of 16" (**see photos 35 and 36 and figure 3**). No change was noted in the tear limits since the 2010 inspection.



Photo 35 – Lamellar tear along west edge of gusset plate CL70S.

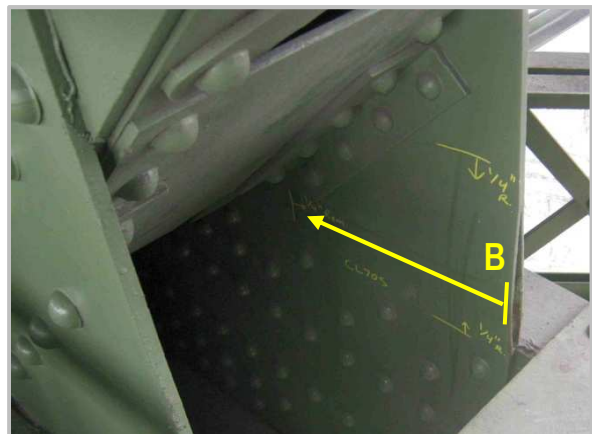


Photo 36 – Lamellar tear along west edge of gusset plate CL70S (Photo taken in 2010).

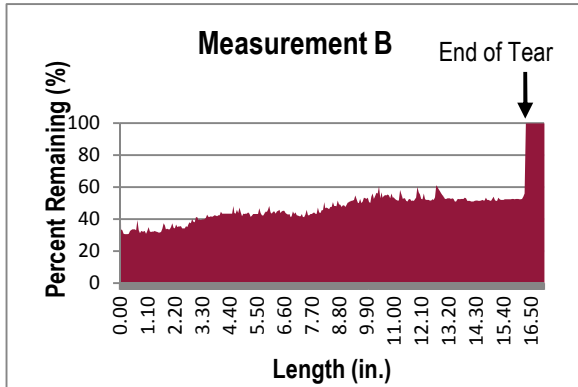


Figure 3 – Lamellar tear along west edge of gusset plate CL70S (measurement taken along bottom chord interface).

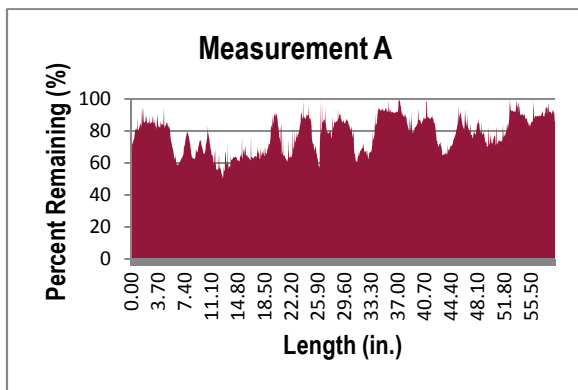


Figure 4 – Advanced section loss measured along bottom chord interface with gusset plate AL19S.

Gusset plate AL19S exhibits isolated loss up to 50% and an average loss of 21.7% along the horizontal global shear plane (see photo 37 and figure 4).

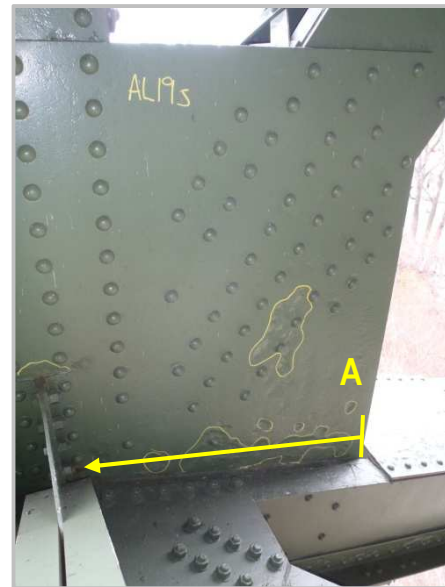


Photo 37 – Advanced section loss along horizontal global shear plane of gusset plate AL19S (Photo taken in 2010).

Gusset plate DL120N exhibits an average loss of 28.9% with isolated loss up to 60% beneath the diagonal member (see photo 38 and figure 5).

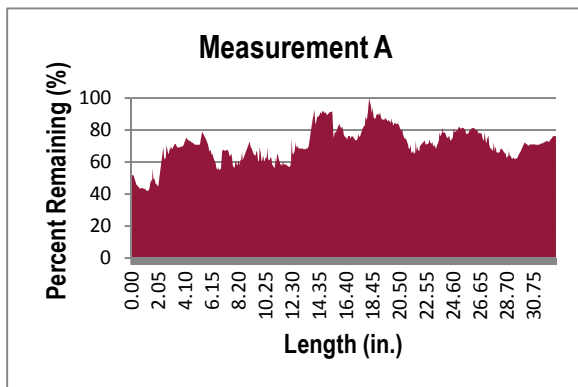


Figure 5 – Advanced section loss along bottom chord of gusset plate DL120N beneath diagonal.

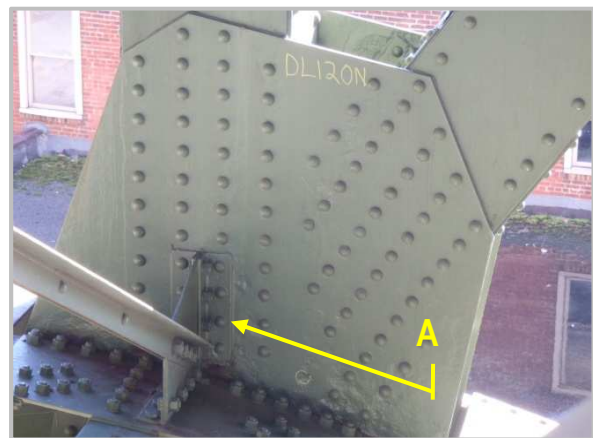


Photo 38 – Advanced section loss along bottom chord of gusset plate DL120N beneath diagonal (Photo taken in 2010).

Gusset plate BL92N has consistent loss between 40% and 50% beneath the diagonal with an average loss of 29.7% (see photo 39 and figure 6).

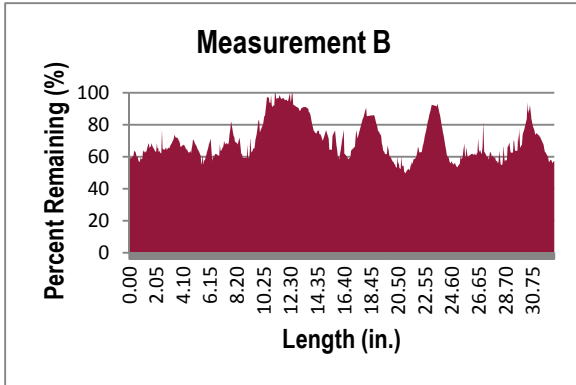


Figure 6 – Advanced section loss along bottom chord of gusset plate BL92N beneath diagonal.

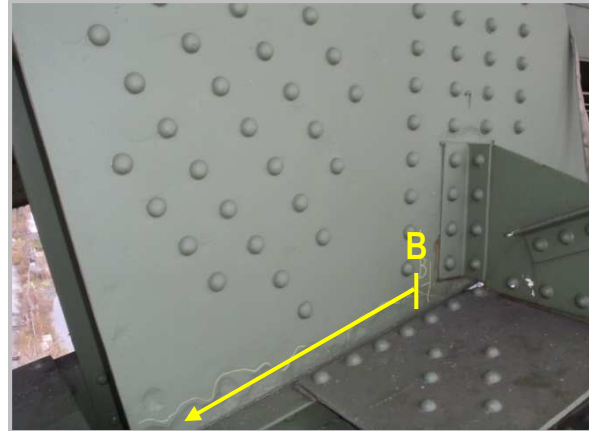


Photo 39 – Advanced section loss along bottom chord of gusset plate BL92N beneath diagonal (Photo taken in 2010).

Gusset plate DL25N exhibits advanced section loss under the diagonal, with isolated loss up to 70% and an average loss beneath the diagonal of 22.5% (see photo 40 and figure 7).

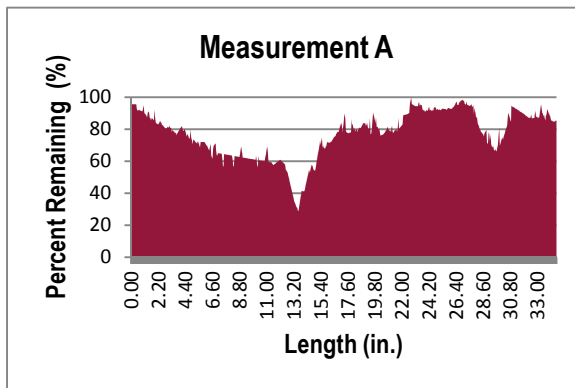


Figure 7 – Advanced section loss along bottom chord of gusset plate DL25N beneath diagonal.

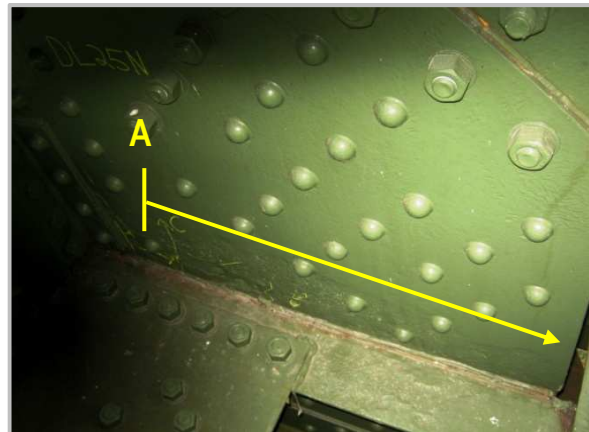


Photo 40 – Advanced section loss along bottom chord of gusset plate DL25N beneath diagonal (Photo taken in 2010).

Gusset plate AL53S exhibits advanced section loss along both the bottom chord and the vertical. The plate has average loss along the lower chord and vertical of 24.1% and 16.7%, respectively, with both planes with isolated loss up to 50-60% (see photo 41 and figures 8 and 9).

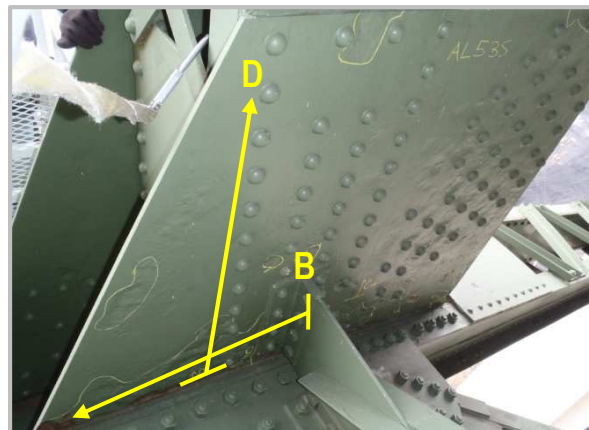


Photo 41 – Advanced section loss along bottom chord and vertical of gusset plate AL53S (Photo taken in 2010).

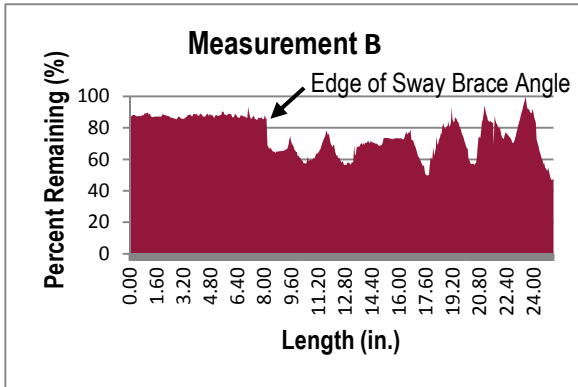


Figure 8 – Advanced section loss along bottom chord of gusset plate AL53S.

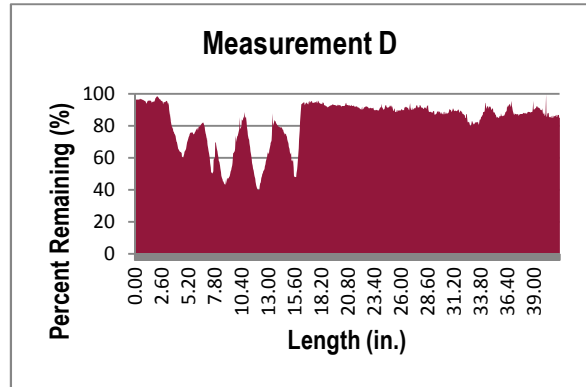


Figure 9 – Advanced section loss along vertical of gusset plate AL53S.

Figure 10 shows a sketch of plate AL10S based on the shop drawings with the associated lines indicating where Pocket UT scans were taken in 2010. Figures 11-13 show the percentage of remaining plate thickness over the A-Line (along the bottom chord), C-Line (along the west side of the vertical), and G-Line (along bottom of vertical). The average losses along the A-Line, C-Line, and G-Line were 17.4%, 23.8%, and 23.1%, respectively, with isolated loss up to 50% occurring beneath the vertical.

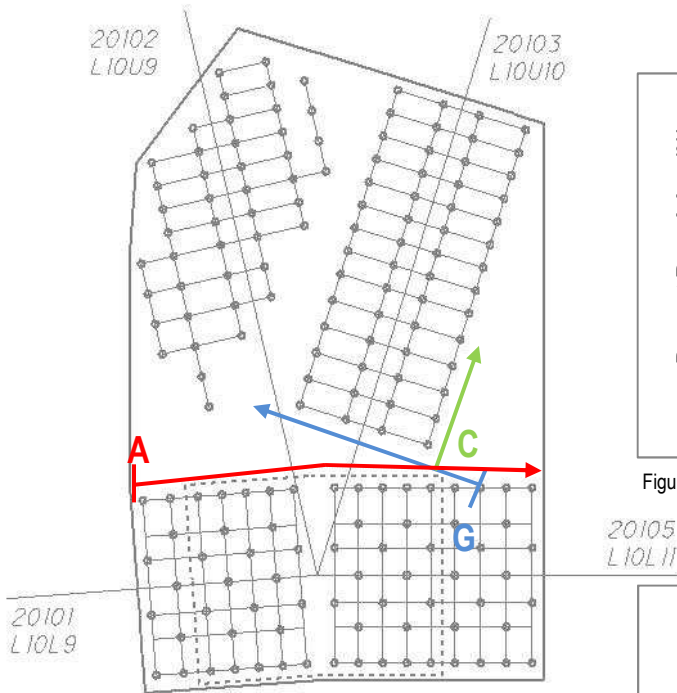


Figure 10 – AL10S (Report Components) Sketch of AL10S and associated Pocket UT scan lines.

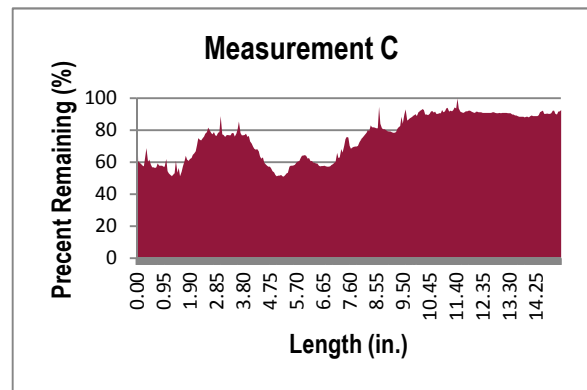


Figure 11 – Advanced section loss along vertical of gusset plate AL10S.

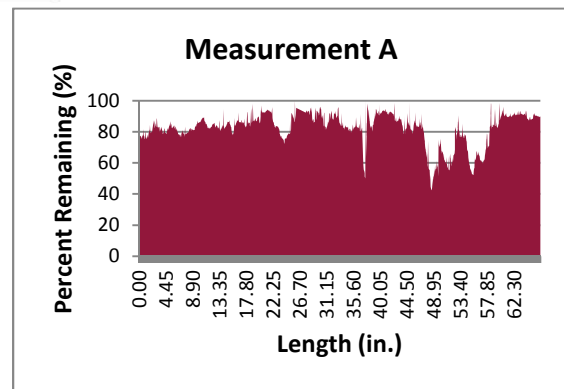


Figure 12 – Advanced section loss along horizontal global shear plane of gusset plate AL10S.

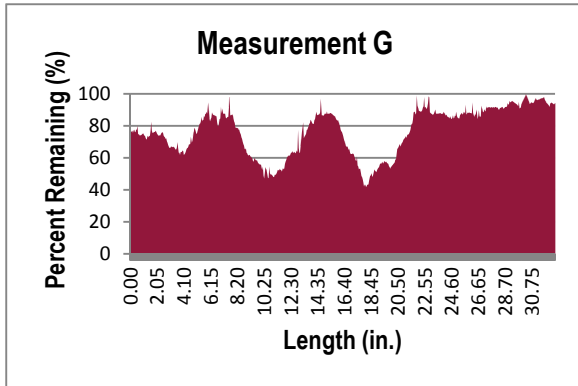


Figure 13 – Advanced section loss under vertical of gusset plate AL10S.

Isolated locations exhibit up to 1 1/4" thick pack 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 (see photo 42). Isolated locations where this pack rust is occurring have not been cleaned and caulked. Additionally, isolated plates exhibit up to 1 1/2" of pack rust between the gusset plate and the vertical and horizontal member web plates (see photo 43).



Photo 42 – Pack rust between BL57S free edge and BL57-BL58 south web plate.



Photo 43 – 1 1/2" pack rust between CL58S free edge and CL58-CU58 south web plate.



Photo 44 – 1/2" bow on east free edge of CL43S. Note that this plate does not meet the edge stiffness requirements of AASHTO 10.16.11.3

Isolated gusset plates exhibited bows up to 1/8" along their free edge, with one bow at gusset plate CL43S measuring 1/2" along the east free edge (see photo 44). Due to gusset plate geometry and plate thickness, 1614 of 2116 gusset plates (76.3%) do not meet the edge stiffness requirements of AASHTO 10.16.11.3.

ITEM 21 – LATERAL BRACING

The lateral bracing is in GOOD CONDITION [1] with isolated locations of minor to moderate section loss and rust staining. Numerous lateral bracing connection plates exhibit 1/16" to 1/8" pitting with isolated pin holes.

The wind lock assemblies are in good condition, with isolated areas exhibiting minor surface corrosion. At the time of inspection, the wind lock assemblies appeared to have sufficient room for the lock to deflect.

ITEM 22 – SWAY BRACING

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

ITEM 24 – BEARING DEVICES

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

Impacted rust was noted between gusset plates and casting plates at the majority of bearing locations, restricting free rotation of the gusset plates (**see photo 45**). Roller nest assemblies exhibited minor laminate rust in isolated locations with minor active surface corrosion. Several bearing pins exhibit pitting up to 1/4" deep (cleaned and painted) in isolated locations (**see photo 46**), and the remaining bearing surfaces commonly have pitting up to 1/8".

Isolated rocker bearings for the utility deck stringers are not in contact with bearing plates. The utility deck rocker bearings at Floorbeam 78 exhibit excessive rotation below Stringers 3 and 4 (**see photo 47**).



Photo 45 – Pack rust between truss bearing at BL127 and gusset plate BL127N.



Photo 46 – Section loss up to 1/4" on east face of Pier 18 east bearing at Truss A.



Photo 47 – Excessive rotation of rocker bearings at utility deck Floorbeam 78 below Stringers 3 and 4.

ITEM 28 – PROTECTIVE COATING SYSTEM

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

Truss members at pins and below joint locations exhibit widespread surface corrosion with rust straining (**see photo 48**). Members at other locations exhibit isolated paint failures of the top coat over less than one percent of the surface area with no active corrosion evident (**see photo 49**).



Photo 48 – Active minor surface corrosion at Panel Point AL58.



Photo 49 – Isolated paint peeling on diagonal member CL106-CU107 in Span16.

ITEM 29 – PINS AND HANGERS

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

The pin sleeves exhibit moderate section loss, cleaned and painted. The lower chord web plates at gusset plate CL12S are bent due to impacted rust between the gusset plate and web plate, causing the sliding pins for CL12-CL13 to no longer bear on the outermost chord pin plate (1 of 3 plates). Numerous sliding pin gusset plates are not fully bearing at other locations throughout the structure, with pins at Panel Points BL83, BL97, CL100, and DL83 not fully bearing on the outermost pin plate by up to 5/16" (**see photo 50**).



Photo 50 – Sliding pin at BL83 with impacted rust causing 5/16" of pin not to bear on north BL82-BL83 pin plates.

The lower chord sliding pins at AL17 and BL41 appear to have seized due to the presence of impacted rust (**see photo 51**).

At locations where pins are free to rotate, several pins exhibit advanced wear up to 1/2" along up to one-third of the pin circumference (**see photo 52**).



Photo 51 – Sliding pin at AL17 seized due to impacted rust which has been painted over.



Photo 52 – North side of pin at DL97 with laminate rust and isolated section loss up to 1/2".

ITEM 42 – SUBSTRUCTURE SUMMARY

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

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 hairline cracking typical in isolated locations.

ITEM 35 – PIERS

The piers are in FAIR CONDITION [2] overall due to large spalls with exposed reinforcing in the concrete architectural pier towers (see photos 53 and 54). Several spalls with exposed rebar have been sealed and painted. The Pier 13 north tower exhibits a 1" wide vertical crack extending through the top section of the pier above the Truss A and Truss B bearings.

Pier faces below the truss bearings exhibit hairline map cracking with rust staining in isolated locations throughout.



Photo 53 – Pier 15 tower between Truss A and Truss B with 8' by 3' hole in top.



Photo 54 – Pier 12 tower with 20' by 5' spalled area with exposed reinforcing.

Pier 1 columns exhibit vertical hairline cracks at the base, spaced at approximately 12", with three 1/8" wide cracks in the second column from the south.

ITEM 36 – PIER SEATS

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

ITEM 37 – BACKWALLS

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

ITEM 38 – WINGWALLS

The wingwalls are in GOOD CONDITION [1] overall with no significant deficiencies noted.

ITEM 39 – FENDERS AND DOLPHINS

The fenders are in CRITICAL CONDITION [4] due to severe timber rot and collision damage. The fender system has failed and no longer functions as originally intended. This condition has not changed since the 2010 inspection.

The east fender has collapsed away from the bridge and into the Cuyahoga River (see photo 55). The west fender has experienced severe collision damaged adjacent to the southernmost column of Pier 10.



Photo 55 – South half of the east bank fender system collapsed toward river centerline.

ITEM 40 – SCOUR

The scour condition of the structure is in SATISFACTORY CONDITION [2], with a portion of the southernmost pier column footing exposed at Pier 10. There are no indications of change in scour condition since the previous inspection cycle.

ITEM 54 – CHANNEL SUMMARY

The channel is in SATISFACTORY CONDITION [6-NBIS] due to the presence of a sharp bend directly upstream (south) of the bridge (see photo 56), as well as a portion of the west bank sheet piling which has washed away approximately 200 yards downstream (north) of the bridge.



Photo 56 – General view upstream (south) of bridge crossing, showing bend in channel.

ITEM 51 – ALIGNMENT

The alignment is in SATISFACTORY CONDITION [2] overall, as the Cuyahoga River exhibits a sharp bend just upstream (south) of the bridge crossing. A more gradual bend exists downstream (north) of the bridge. This alignment does not show any signs of migration from the originally designed path.

ITEM 52 – PROTECTION

The protection is in SATISFACTORY CONDITION [2] with a portion of the sheet piling along the west bank washed out roughly 200 yards downstream (north) of the bridge crossing.

ITEM 53 – HYDRAULIC OPENING

The hydraulic opening is in GOOD CONDITION [1] with sufficient freeboard and clearance to allow channel vessels to pass safely under the bridge (**see photo 57**).

ITEM 60 – APPROACHES SUMMARY

The approaches are in VERY GOOD CONDITION [8-NBIS] due to minor map cracking and numerous previously patched areas noted in approach pavement.

ITEM 55 – PAVEMENT

The pavement is in GOOD CONDITION [1] overall with minor map cracking present and several potholes that have been patched, as well as a 1/8" to 3/4" wide transverse crack in the west approach pavement (**see photo 58**).

ITEM 56 – APPROACH SLABS

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

ITEM 57 – GUARDRAIL

The guardrail is in GOOD CONDITION [1] with no significant deficiencies noted during the inspection.

ITEM 59 – EMBANKMENT

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



Photo 57 – Vertical clearance between structure and top of vessel under Truss A.



Photo 58 – Transverse crack up to 3/4" wide in west approach pavement.

ITEM 54 – GENERAL APPRAISAL & OPERATIONAL STATUS

The overall condition of the structure is POOR CONDITION [4-NBIS], OPEN WITH NO RESTRICTIONS [ODOT – A], due to advanced section loss in the lower chord truss members and gusset plates in the main spans of the bridge.

VAGRANT HABITATION

No active habitation was noted on the structure at the time of inspection; however, there is evidence of previous habitation at Pier 7. There is also a 2' by 2' hole which has been drilled into the west face of the Pier 11 northernmost column.

INSPECTION SAFETY ITEMS

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

ITEM 61 – NAVIGATION LIGHTS

The existing navigation lights are in GOOD CONDITION [1] and appear to be functioning properly. However, no navigation lights are present along the fender systems or the banks of the river.

ITEM 64 – UTILITIES

The utilities are in POOR CONDITION [3] due to advanced deterioration of electrical conduit pipes, spalls in light poles and open electrical box covers.

Widespread cracking with isolated spalls was noted on numerous precast concrete light poles (see photo 59). Many access covers for electrical boxes on light poles are missing. Located on the overhangs beyond the pedestrian bridge railing, several electrical boxes exhibit missing covers with exposed wires (see photo 60).

Several utility conduits on the utility deck are broken, as noted in the previous inspections. Utility conduits are damaged more significantly within the east cellular unit.



Photo 59 – 8' high by 6" wide spall with exposed rebar and cracking in Span 10 light pole.



Photo 60 – Light post above AU120 with exposed wires and broken access box cover.

CONCLUSIONS AND RECOMMENDATIONS


Based upon the results of our in-depth inspection, the Hope Memorial Bridge CUY-10-1613 is in POOR CONDITION [4-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 and in isolated locations.

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: concrete spalls, minor pot holes, minor corrosion to steel, minor scouring, clogged drainage devices, 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 or pedestrian areas, a hole in a sidewalk that may cause injuries to pedestrians, missing section of bridge railing, etc.
-
- 

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 poured below floorbeam top flanges [**Safety Hazard Deficiency**].

Substructure

4. Remove and patch areas of loose concrete and spalls with exposed reinforcing bars 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. Retrofit lamellar tear in gusset plate CL70S [**Minor Deficiency**].

Maintenance:

General

9. Remove debris from and secure areas under Pier 7 [**Minor Deficiency**].

Top of Deck

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

Superstructure

13. Drill arrest holes in utility deck floorbeam cracks [**Major Deficiency**].

Monitoring:Deck

14. Monitor utility deck delaminations adjacent to floorbeam top flanges [**Minor Deficiency**].

Superstructure

15. Monitor cracks in utility deck floorbeam connections which have not been arrested [**Minor Deficiency**].


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

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

18. Continue to monitor pins and hangers in Main Truss Spans [**Minor Deficiency**].

Substructure

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



RECOMMENDATION SUMMARY

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Priority									
1. Repair spalls in luminaire posts.		x							
2. Install navigation lights to fender system.	x								
3. Remove concrete from utility deck poured below floorbeam top flanges.	x								
4. Remove and patch areas of loose concrete and spalls from pier towers.	x								
Rehabilitation / Evaluation									
5. Replace failed fender system.				x					
6. Repair spalls with exposed rebar on the deck underside.		x							
7. Remove and replace torn neoprene troughs at expansion joints.		x							
8. Retrofit lamellar tear in gusset plate CL70S.		x							
Maintenance									
9. Remove debris from and secure area under Pier 7.	x								
10. Replace missing and broken covers to light post electrical boxes.	x								
11. Clean out joint glands of granular debris.	x								
12. Repair sidewalk spalls.	x								
13. Drill arrest holes in utility deck floorbeam cracks.		x							
Monitoring									
14. Monitor utility deck delaminations adjacent to floorbeam top flanges	x	x	x	x	x	x	x	x	x
15. Monitor cracks in utility deck floorbeam connections.	x	x	x	x	x	x	x	x	x
16. Monitor sliding pins not fully bearing on pin plates.	x	x	x	x	x	x	x	x	x
17. Monitor cracks in flange angles adjacent to batten plates near gusset plates.	x	x	x	x	x	x	x	x	x
18. Continue to monitor pins and hangers in the Main Truss Spans.	x	x	x	x	x	x	x	x	x
19. Monitor areas around pier tower spalls and delaminations.	x	x	x	x	x	x	x	x	x

APPENDIX A

Plan and Profile of Bridge

APPENDIX B

Top of Deck Deficiencies

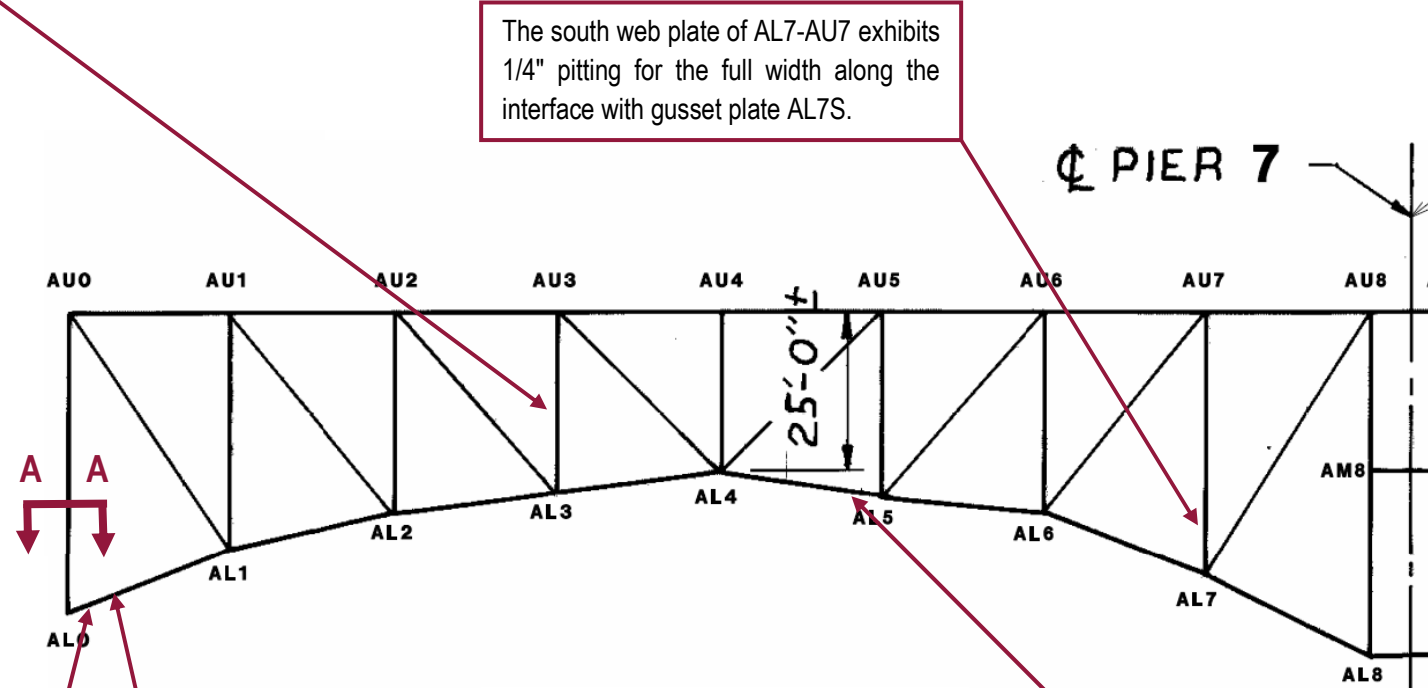
Element	Location	Spall Dimension	Additional Notes
North Electrical Utility Box	Sta. 25+00		Top cover of utility box is missing.
North Scuppers	Sta. 29+00		Scuppers are partially filled with debris and vegetation.
North Electrical Utility Boxes	Sta. 31+00		Top cover of utility boxes are missing, also 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 12
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 C

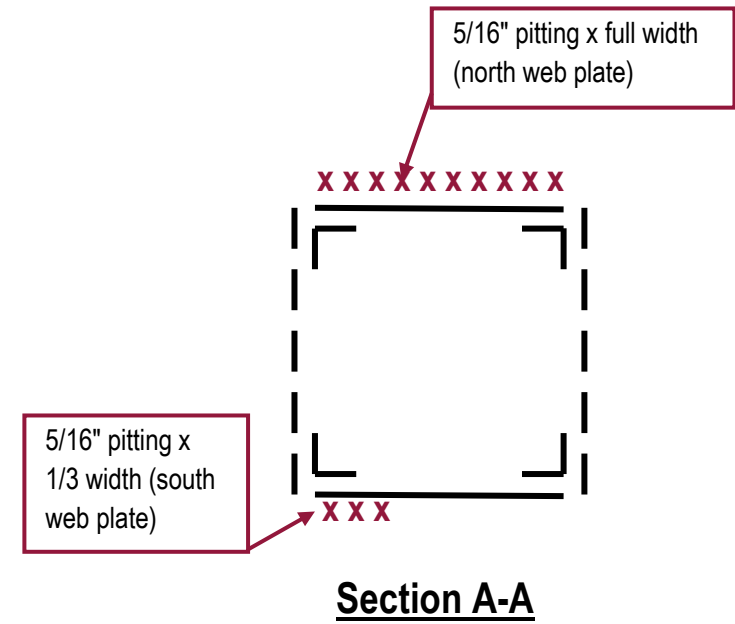
Main Truss Spans Top and Bottom Chord Deficiencies



The sway strut between Truss A and Truss B at Panel Point 3 exhibits areas of 100% section loss to the web stiffeners and 1/4" pitting on the web 3" high with isolated holed through sections.



The south web plate of AL7-AU7 exhibits 1/4" pitting for the full width along the interface with gusset plate AL7S.



**SPAN 6
TRUSS A**



Gusset plate AL0N rivets above the lower chord exhibit section loss up to 100% on 17 of 25 rivet heads. 12 of 25 rivet heads exhibit at least 50% loss.



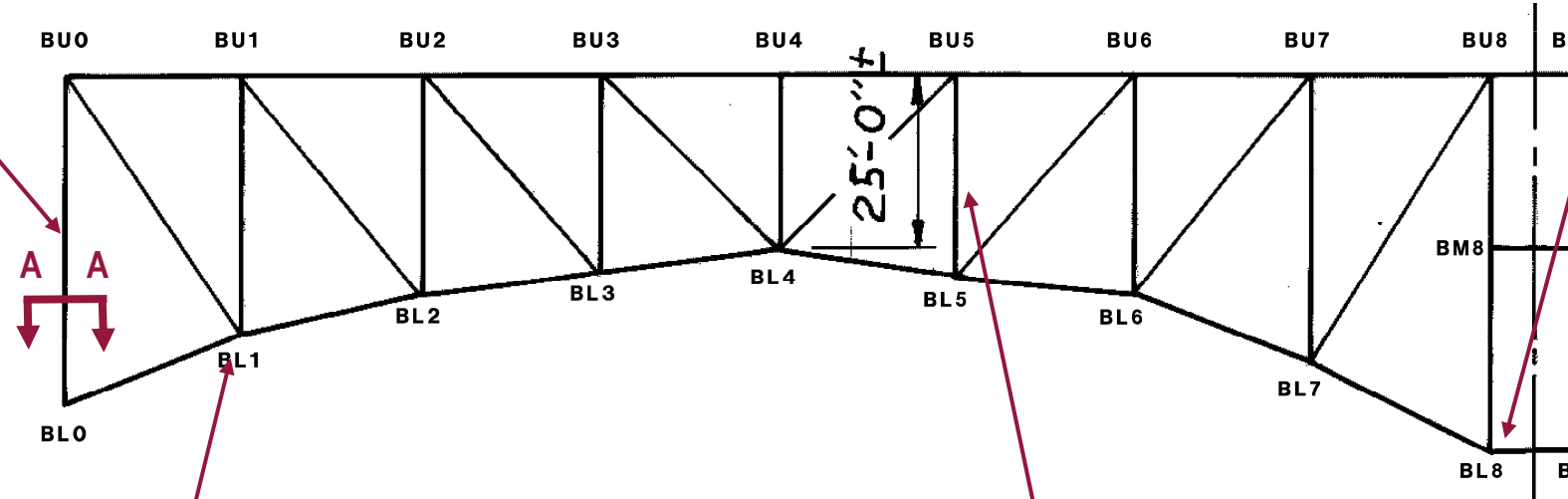
The south web plate of AL0-AL1 exhibits a 2" high by 6" long hole along the bottom flange angle. Note the bolted retrofit plate on the bottom flange outstanding leg at this location.



There is active corrosion on gusset plate AL5N along the top flange angle of AL4-AL5 with associated 1/16" pitting.



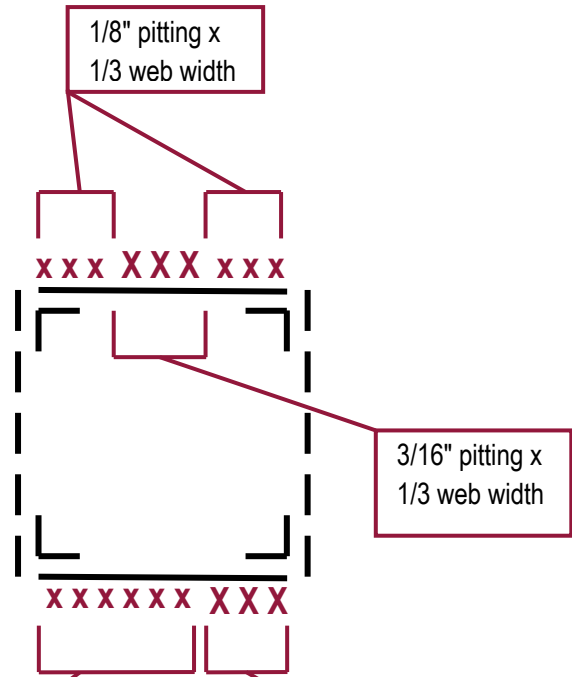
The north and south web plates of BL0-BU0 exhibit 1/8" to 1/4" deep pitting (see Section A-A).



**SPAN 6
TRUSS B**



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



Section A-A



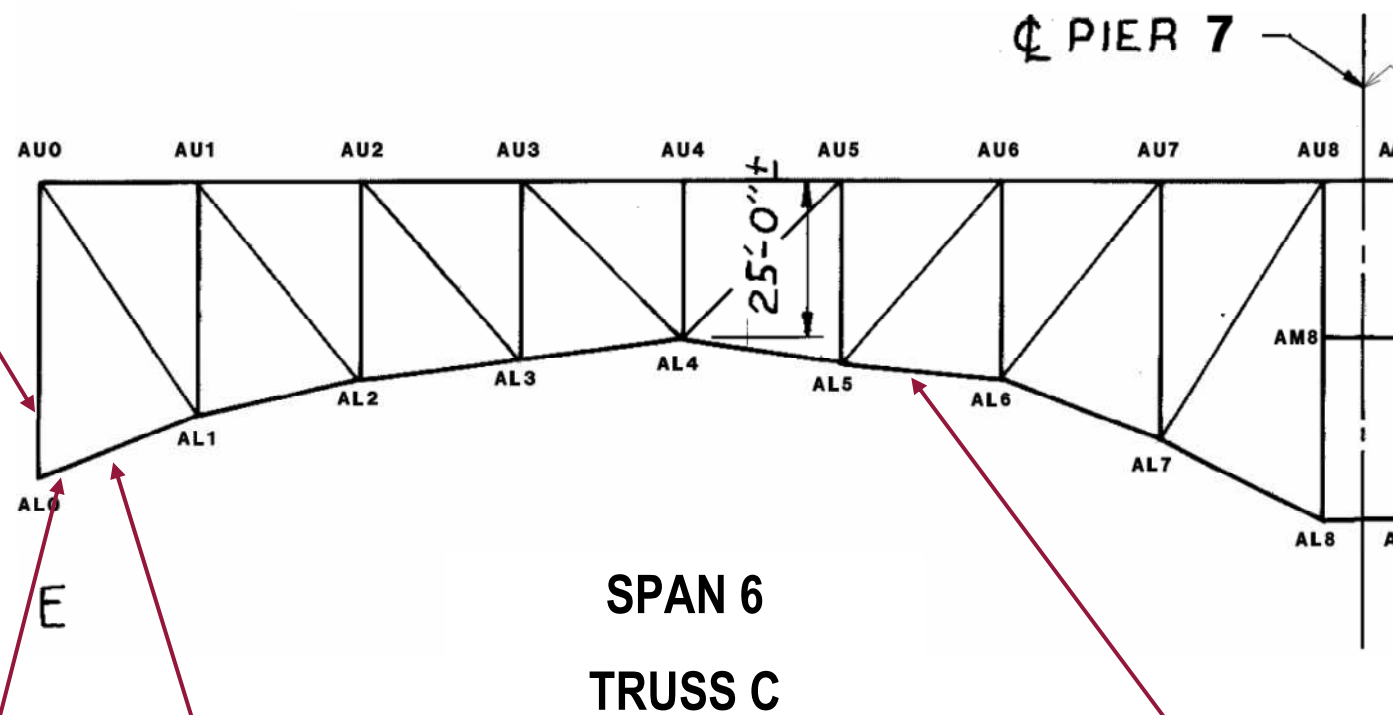
Heavy pack rust up to 1" has formed between the lower chord top flange and flange splice plate at BL1S.



The north web plate of vertical member BL5-BU5 exhibits 1/8" pitting around the sway brace connection.



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



The north top and bottom flange angles adjacent at CL0 exhibit up to 100% section loss as large as 1/2" diameter within the bounds of the gusset plate.



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

CL5-CL6 exhibits typical minor section loss less than 1/16" throughout the interior faces of both web plates with isolated 1/8" pitting around the last 4 rivets adjacent to the lower batten plate at CL6.



section of 1/8" to bottom of the north side, approximately 9" high and

pitting of the top edge splice plate

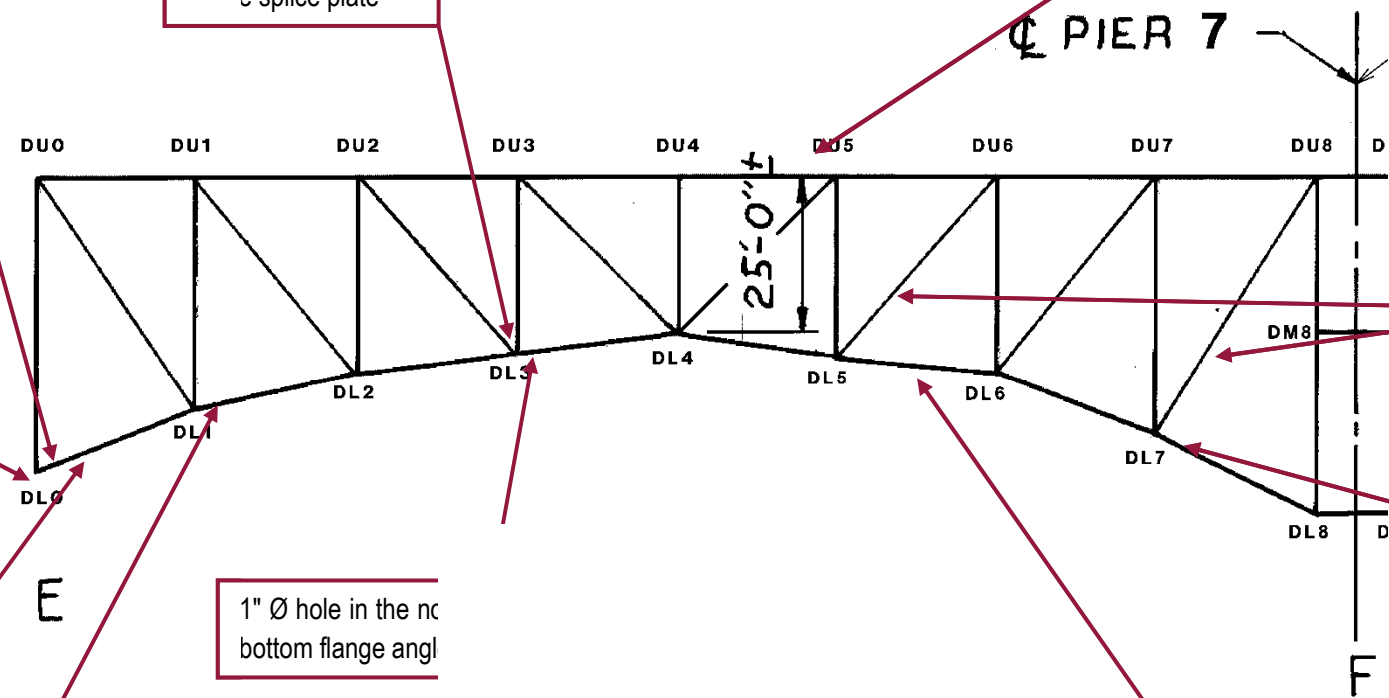


extensive rust and corrosion



water

is



1" Ø hole in the north bottom flange angle



a 32" above the top of the 4"



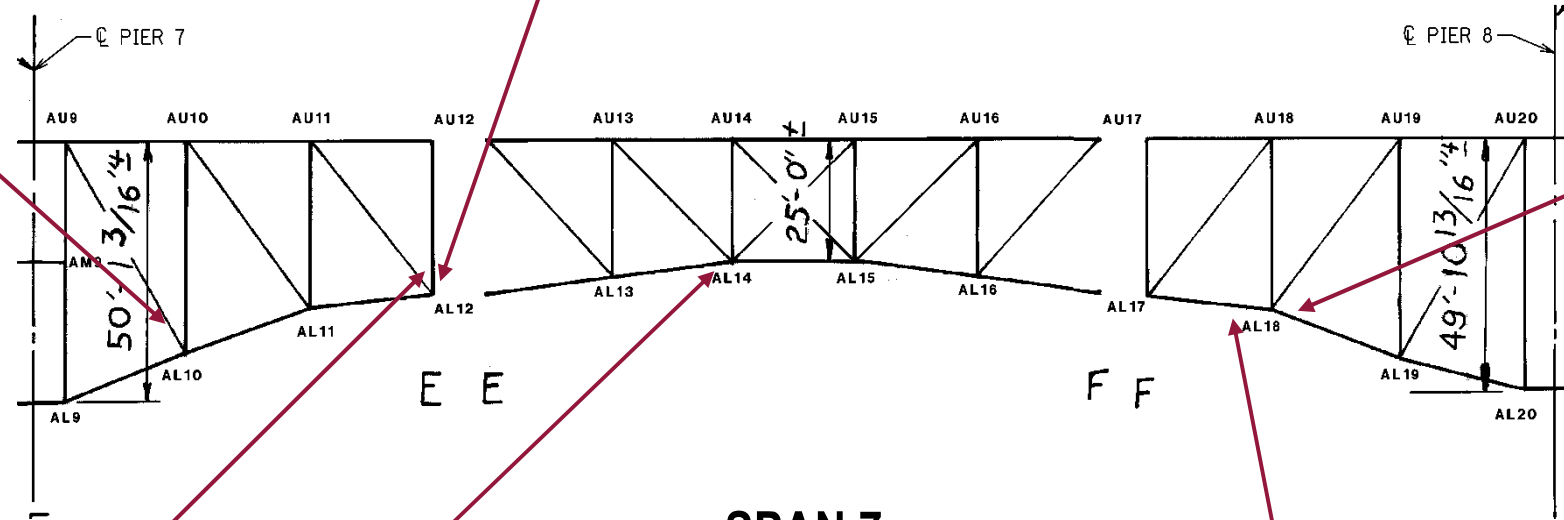
area of DL1-DL2 exhibits a section loss adjacent to area of 1/4" pitting with a



welded plate retrofits on the north side of the outstanding leg of DL5-DL6.



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



**SPAN 7
TRUSS A**

6 of the first 12 rivet heads connecting the bottom flange angle of AL18-AL19 to the north web plate have at least 70% section.



Pack rust up to 1" thick between diagonal member AU9-AL10 and the free edge of gusset plate AL10N, as well as 1/4" pitting on the north web plate of the member at this location.



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.



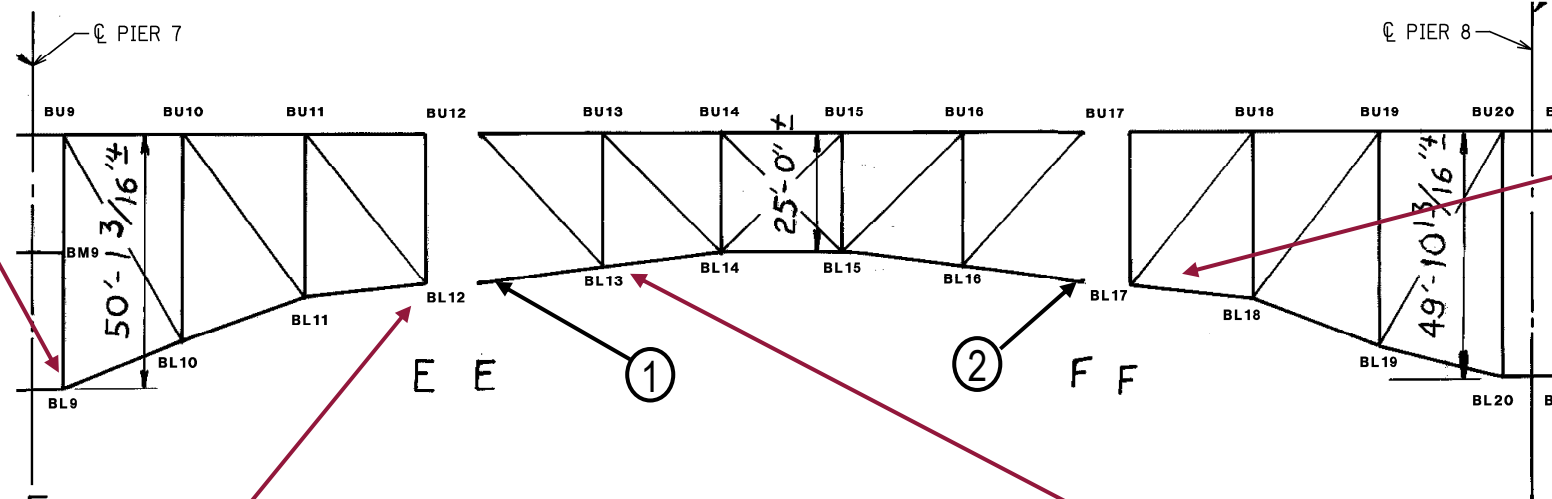
At Panel Point AL14, pack rust is present up to 5/8" thick between the web plates of lower chord member AL13-AL14 and both gusset plates (AL14N shown). Pack rust has not been cleaned and sealed.



The north web plate of lower chord member AL17-AL18 exhibits 1/4" pitting on the interior face for half the height of the section.



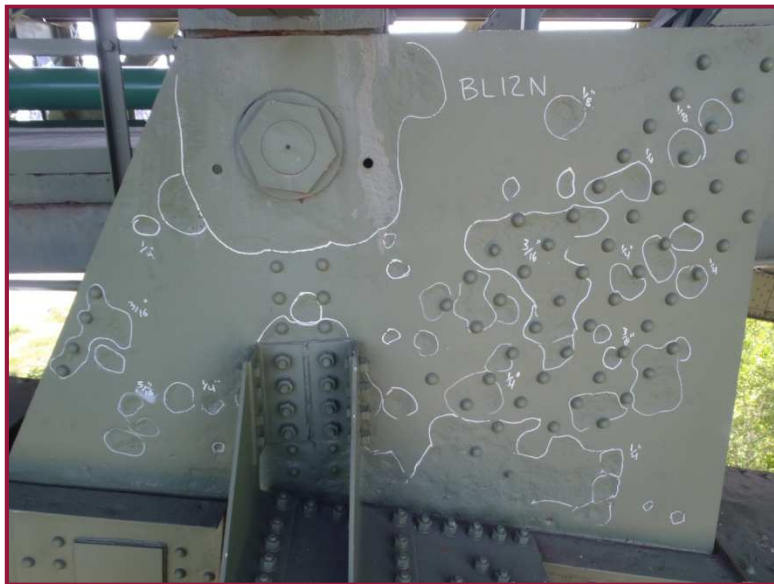
The top flange splice plate at BL9 exhibits 1/8" pitting.



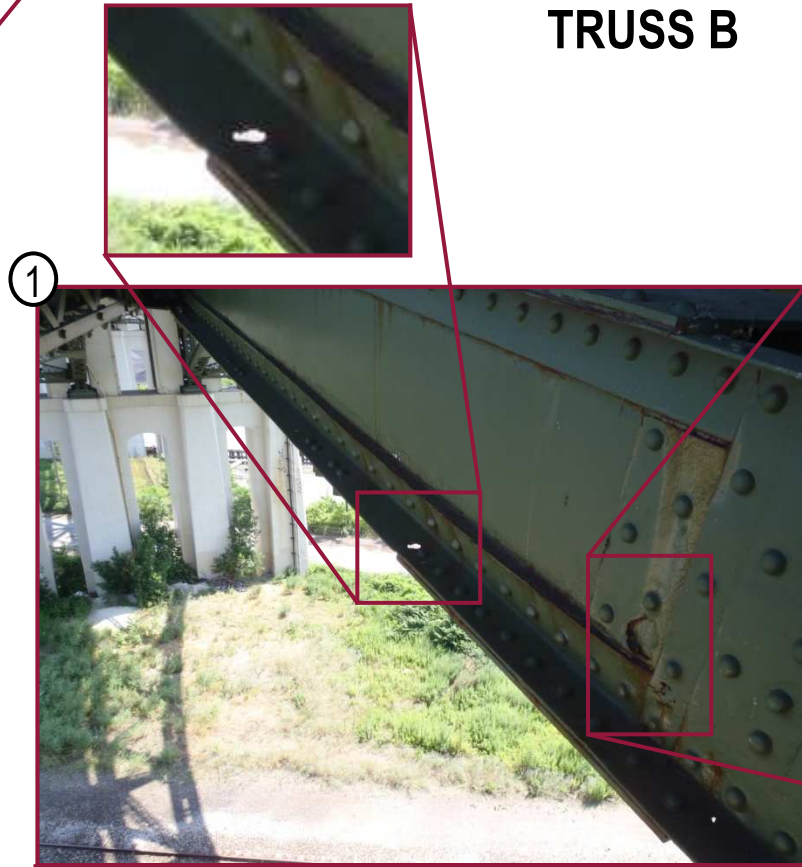
SPAN 7 TRUSS B

BL17-BL18 exhibits a 6" diameter hole in the south bottom flange near BL17.

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.



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.



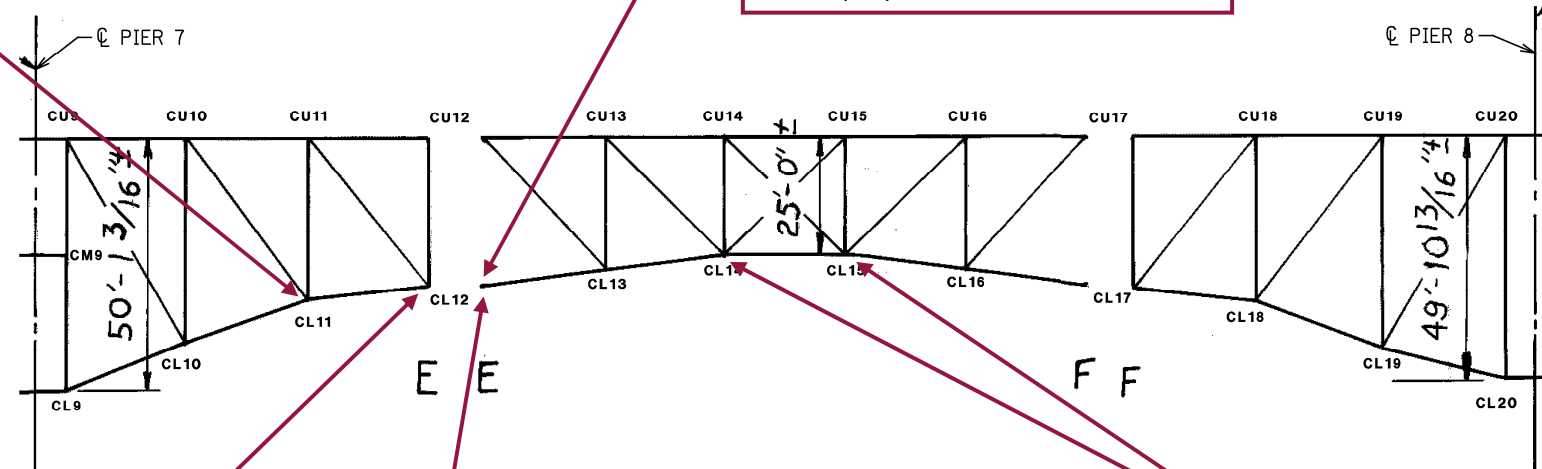
The second pin plate on the north side of lower chord member BL12-BL13 at BL12 has a 3" diameter hole in the bottom corner. Similarly, the third pin plate has a 2" diameter hole in the bottom corner, and the fill plate has a 4" diameter hole at the bottom. 1/8" pitting is typical on the pin plates. A 1-1/2" diameter hole in the north bottom flange is present roughly 5' east of this location.



The pin diaphragm plate for lower chord BL16-BL17 at BL17 exhibits 3" diameter holed through sections at the east end. There are isolated holes up to 3/4" diameter in the top lower chord batten plate near this location, as well as minor pitting to top flange angles within the gusset plate bounds.



The bottom flange angle splice plate at CL11 is bowed out approximately 1-1/2" due to heavy pack rust.



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.

SPAN 7 TRUSS C



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

CL12-CL13 exhibits advanced section loss and heavy pack rust at the sliding pin location of gusset plate 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.



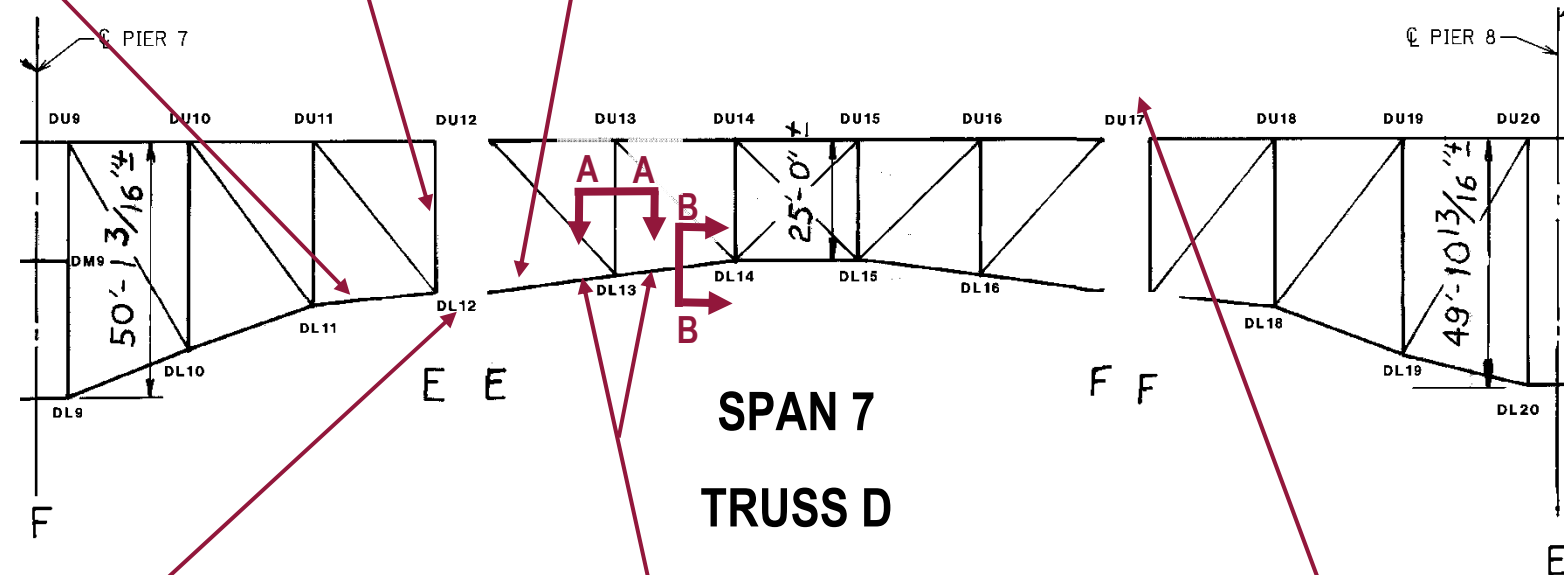
Utility deck Floorbeams 14 and 15 exhibit cracking at the top flange coping near Truss C, extending down into stress relief holes. These cracks are roughly 1-3/4" long and do not appear to have propagated beyond the stress relief holes (Floorbeam 14 shown).



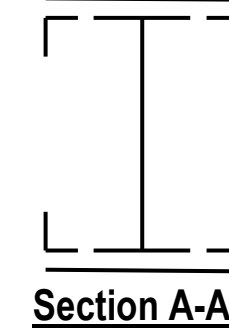
DL11-DL12 has a welded retrofit plate on the outstanding leg of the north bottom flange. A similar plate is located on the south bottom flange at this location.

Isolated 1/4" pitting on north web plate of DL12-DU12.

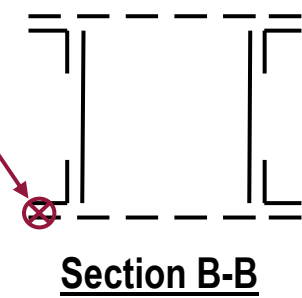
Pack rust is typical between web plates and flange angles and between flange angles and lacing channels. Isolated areas have reactivating rust.



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



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



The sliding pins at gusset plate location DL12 are worn. The internal diaphragm between gusset plates above the pin appears to have buckled due to pack rust.



Note active corrosion and wear on north DL12-DL13 lower chord sliding pin at DL12.

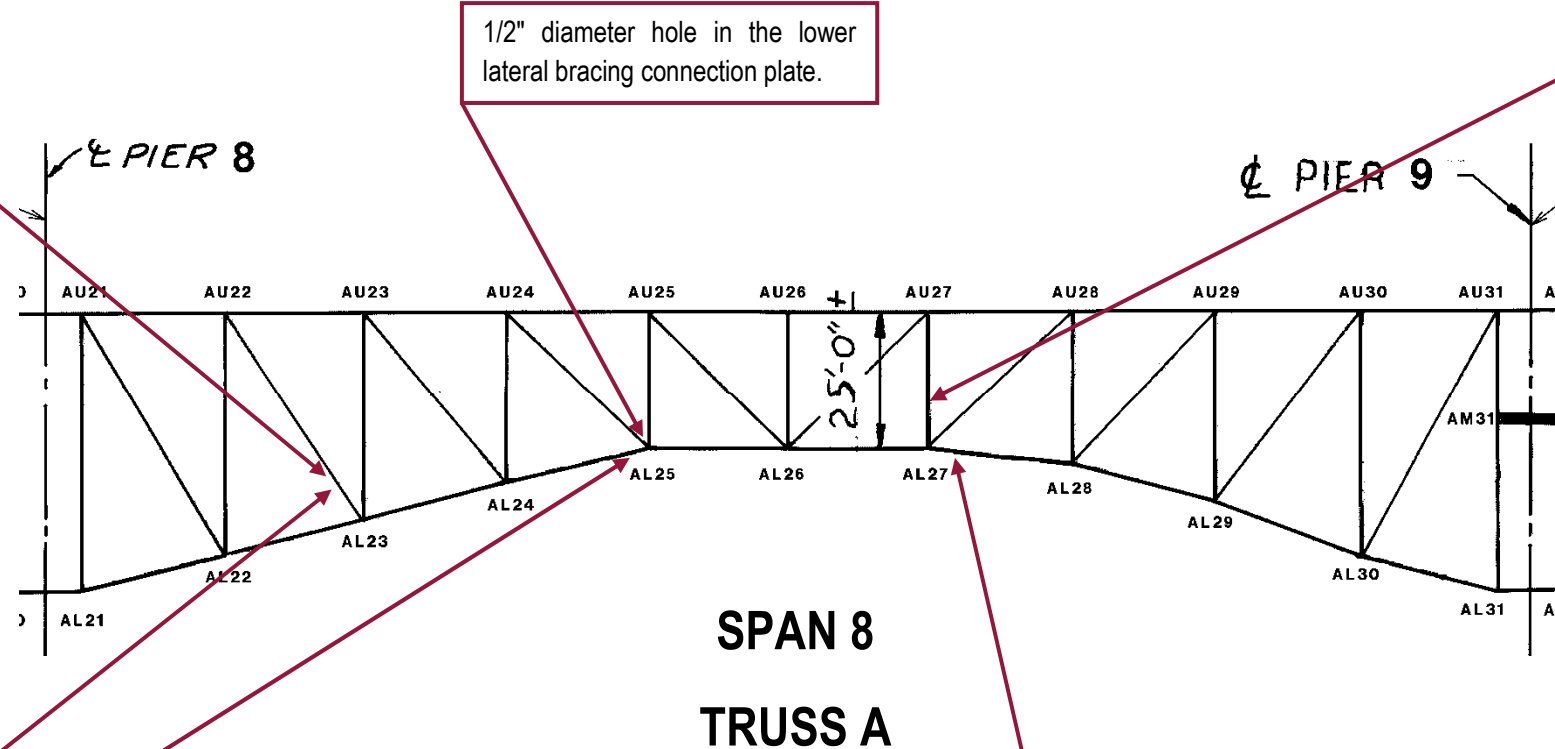
Isolated pitting up to 1/4" deep on the lower chord top stay plates is typical throughout Span 7.



Floorbeam 17 exhibits a lamellar tear approximately five feet long on the bottom of the top flange between Stringer 7 and the interior bearing stiffeners.



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" diameter hole in the lower lateral bracing connection plate.

The lower batten plate of AL23-AU22 has been flame-cut to accommodate previous repair work done at this location.



The north and south web plates of chord member AL24-AL25 exhibit 3/16" pitting over the full height of the plate along the interface with Panel Point AL25 gusset plates, with an isolated 1" diameter hole in the south plate (south plate shown).

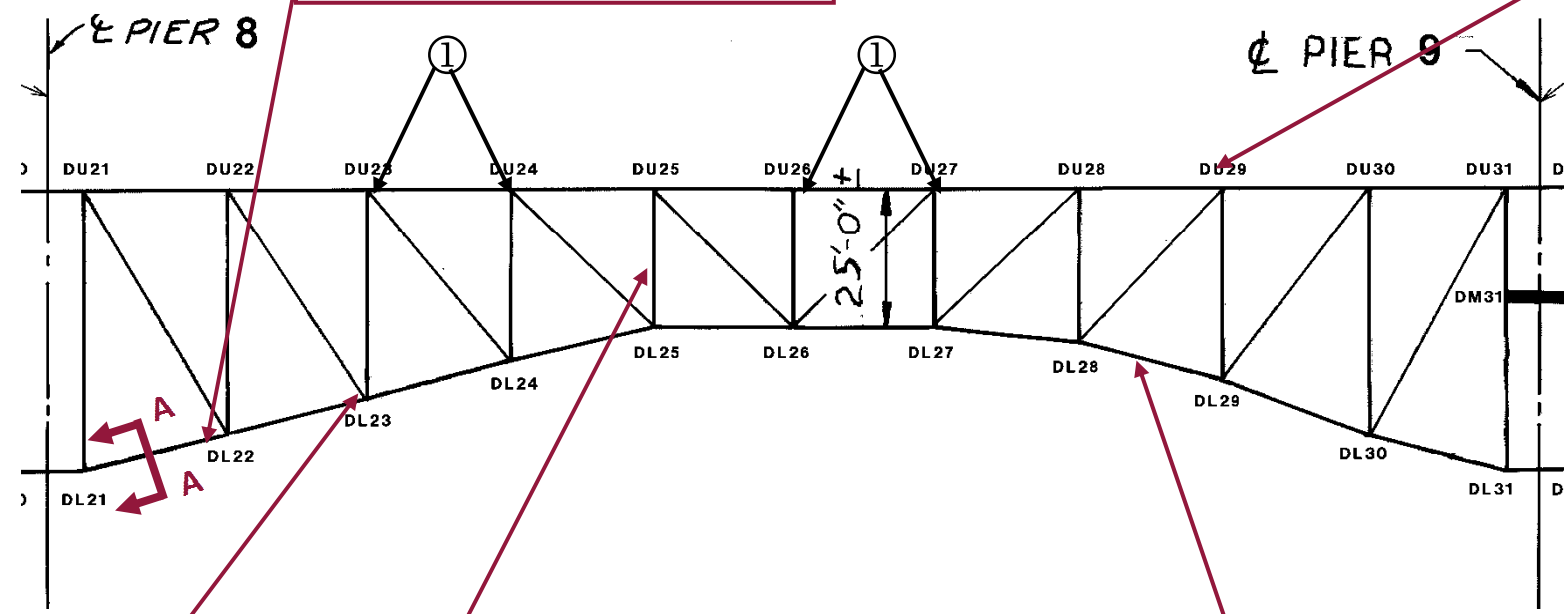
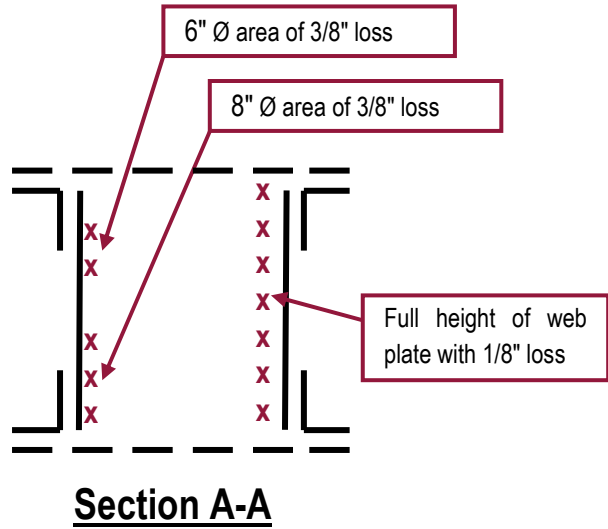


The north web plate of vertical member AL27-AU27 exhibits typical 1/8" pitting around the sway brace connection.

The south web splice plate at AL27 exhibits 1/4" pitting with reactivating rust and one 2" diameter hole 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.



Upper chord member DL28-DL29 exhibits pitting up to 1/8" on the cover plate, lacing bars and top flange angles within the bounds of gusset plates at DL29. This area has active corrosion due to the presence of a deck subdrain.

**SPAN 8
TRUSS D**

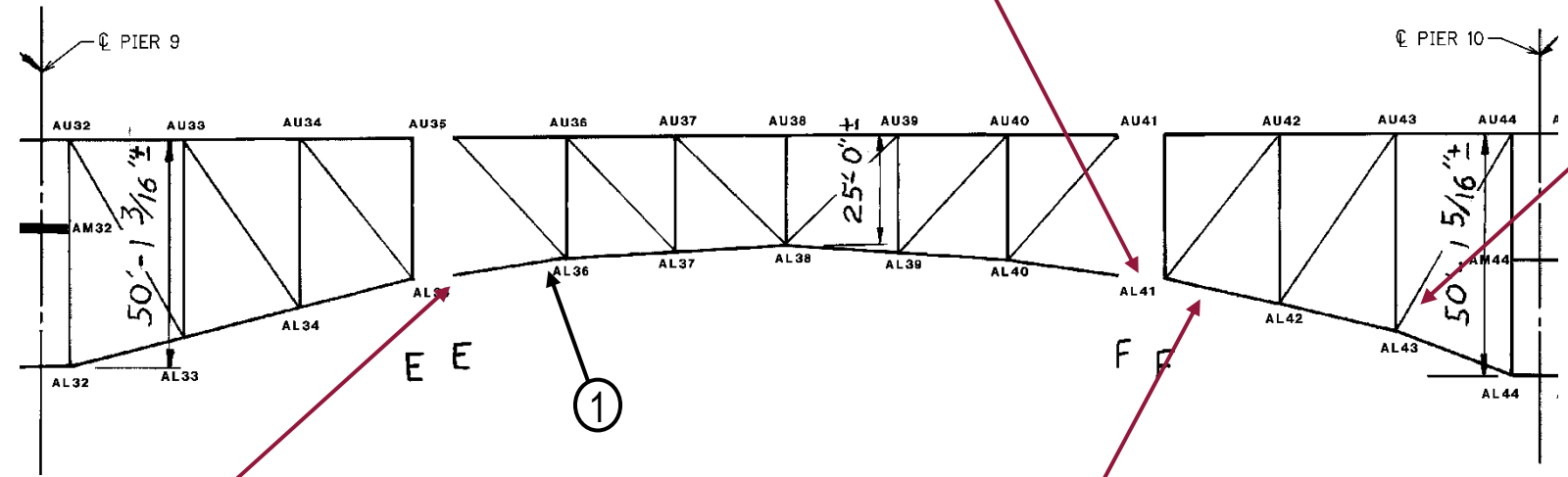
Heavy pitting is typical along the horizontal surfaces of members at DL23, including approximately 50% loss of 9 of the 20 rivet heads connecting the lower lateral bracing connection plate to the lower chord flange at this location (cleaned and painted).

The south web plate of vertical member DL25-DU25 exhibits isolated 1/4" pitting around the sway brace connection.



The lower chord members in Span 8 exhibit heavy impacted rust between web plates and flange angles.

The built-up strut at AL41 exhibits active surface corrosion throughout.



**SPAN 9
TRUSS A**



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.

The south web plate of AL41-AL42 exhibits 1/4" deep pitting along the gusset plate interface. Section loss up to 1/4" is typical along several lower chord members in Span 9.



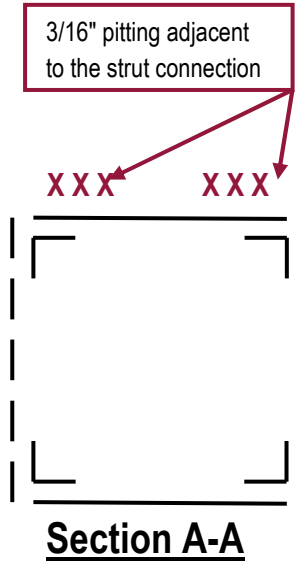
The south top flange angle of AL35-AL36 exhibits a 3" diameter hole above the pin location at AL35. The south web plate and pin plates exhibit isolated 1/8" pitting within the bounds of the gusset plate.



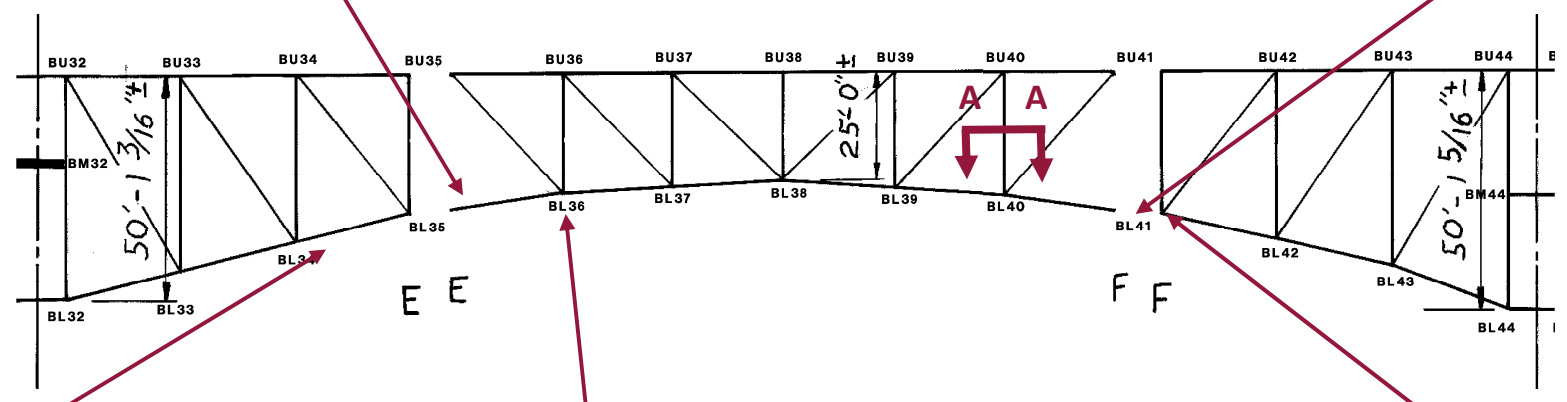
South elevation of lower chord pin location at AL35. Note isolated 1/8" pitting on web and pin plates.



Cleaned and sealed pack rust up to 1" thick is present between lower chord member AL35-AL36 and gusset plate AL36S.



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.



The lower sliding pin at BL41 exhibits loss 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.



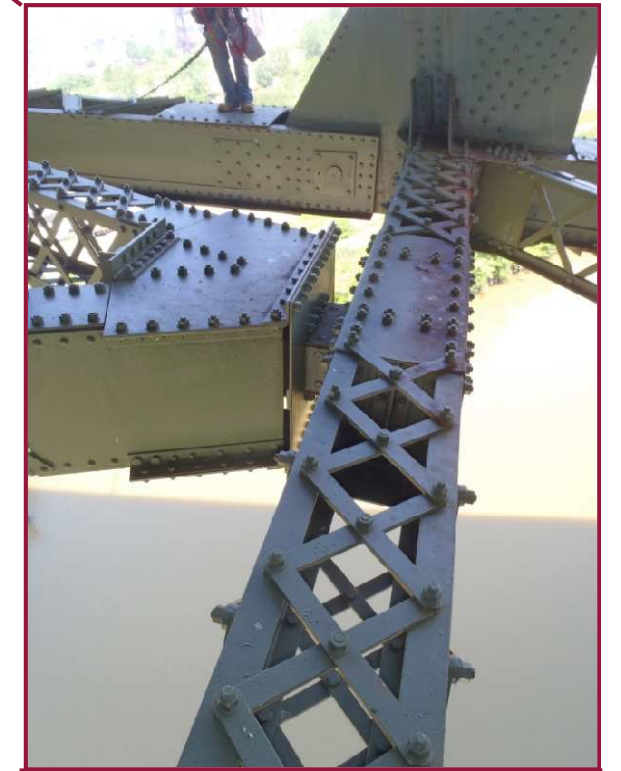
Chord member BL34-BL35 exhibits impacted rust up to 1" thick between the web plates and vertical legs of top flange angles.



The utility deck floorbeam connection at BL36 exhibits a 1-3/4" long crack at the top cope which has not been arrested.



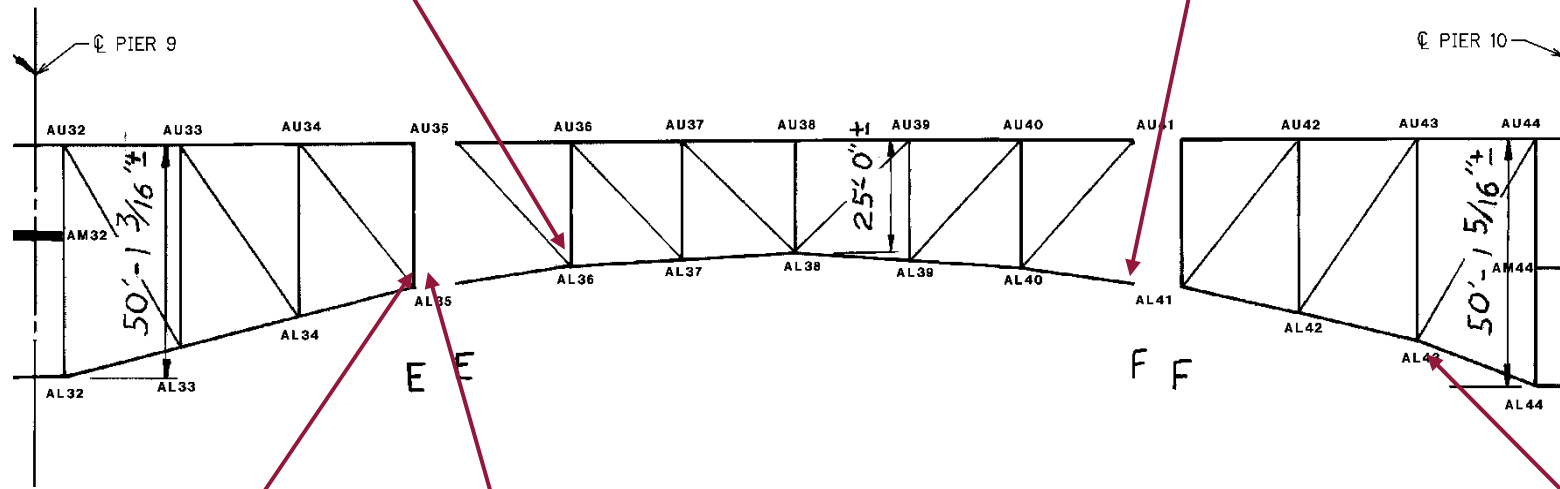
Plan view of utility deck floorbeam, showing out-of-plane deflection in the web at the crack location.



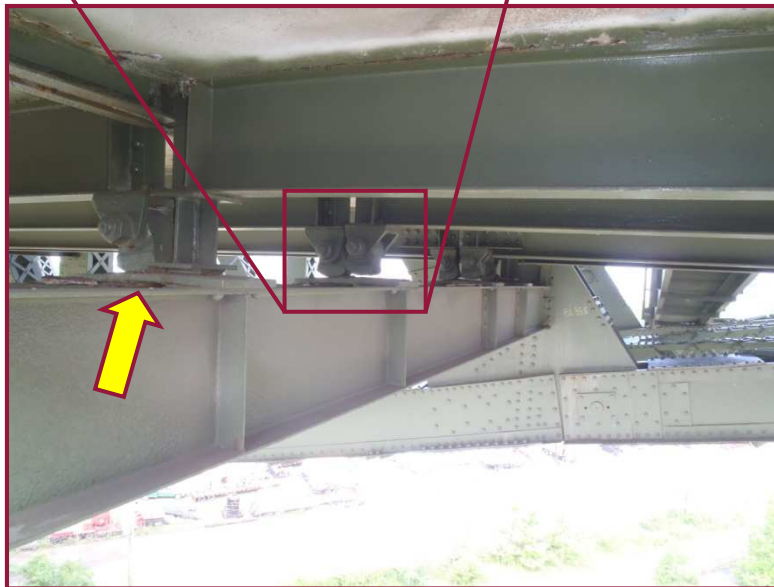
The strut between Truss A and Truss B at Panel Point 41 exhibits active surface rust throughout.

Crack in web of utility deck floorbeam measured 1-1/4" vertical and 1-3/4" horizontal. Crack has propagated 1/4" since the 2010 inspection.

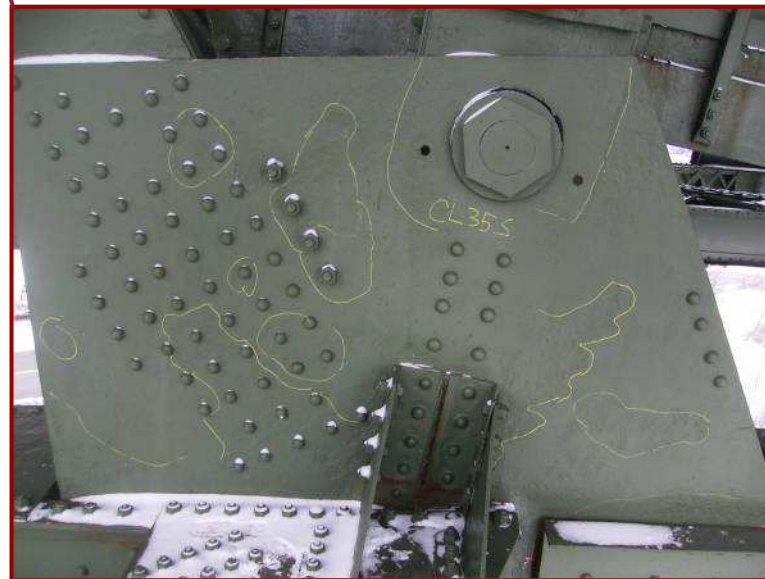
3" diameter hole in the bottom cover plate.



**SPAN 9
TRUSS C**



Stringers 2 and 3 are not bearing at the utility deck Floorbeam 35 bearing plates. Stringers 1 and 4 have bearing retrofits, 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.



Gusset plate CL35S exhibits 1/8" deep pitting throughout areas of the south face, with small areas with up to 1/4" deep loss on the north face of the plate along the lower chord (Photo taken in 2010).



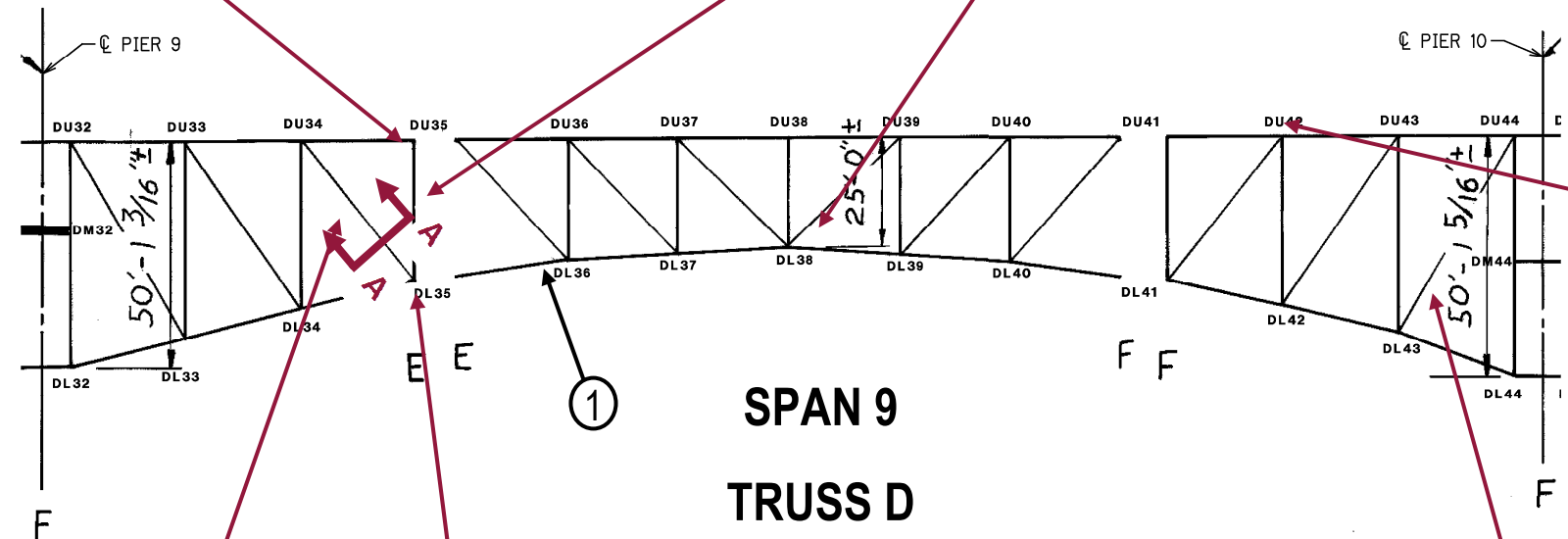
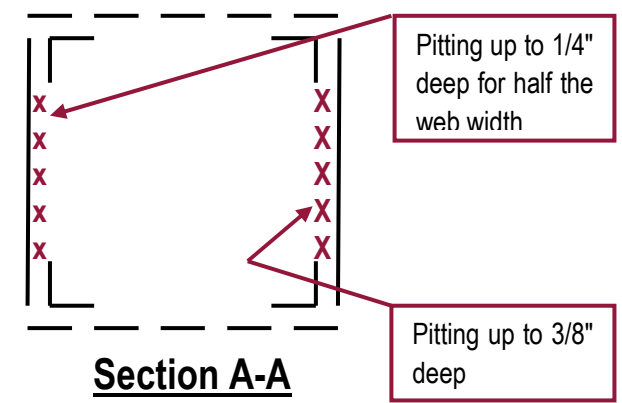
Gusset plate CL43S exhibits a bow up to 1/2" at the east free edge. The plate does not meet edge stiffness requirements of AASHTO 10.16.11.3.



Floorbeam 35 exhibits active corrosion of the bottom flange and adjacent web and vertical stiffener plates with up to 1/16" deep pitting. The joint trough at this location has failed with water and debris leaking onto the superstructure elements.

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 stay 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.

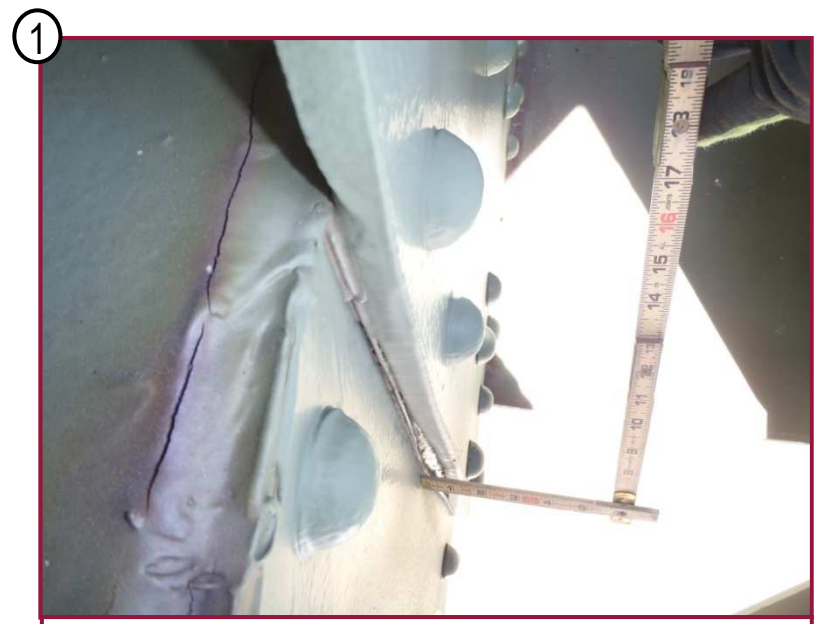


Between Truss D and Stringer 11, Floorbeam 42 exhibits a 1/4" diameter hole in the lower half of the web with 1/16" pitting typical in the surrounding area along the bottom flange.

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



The south web plate of DL35-DU34 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).



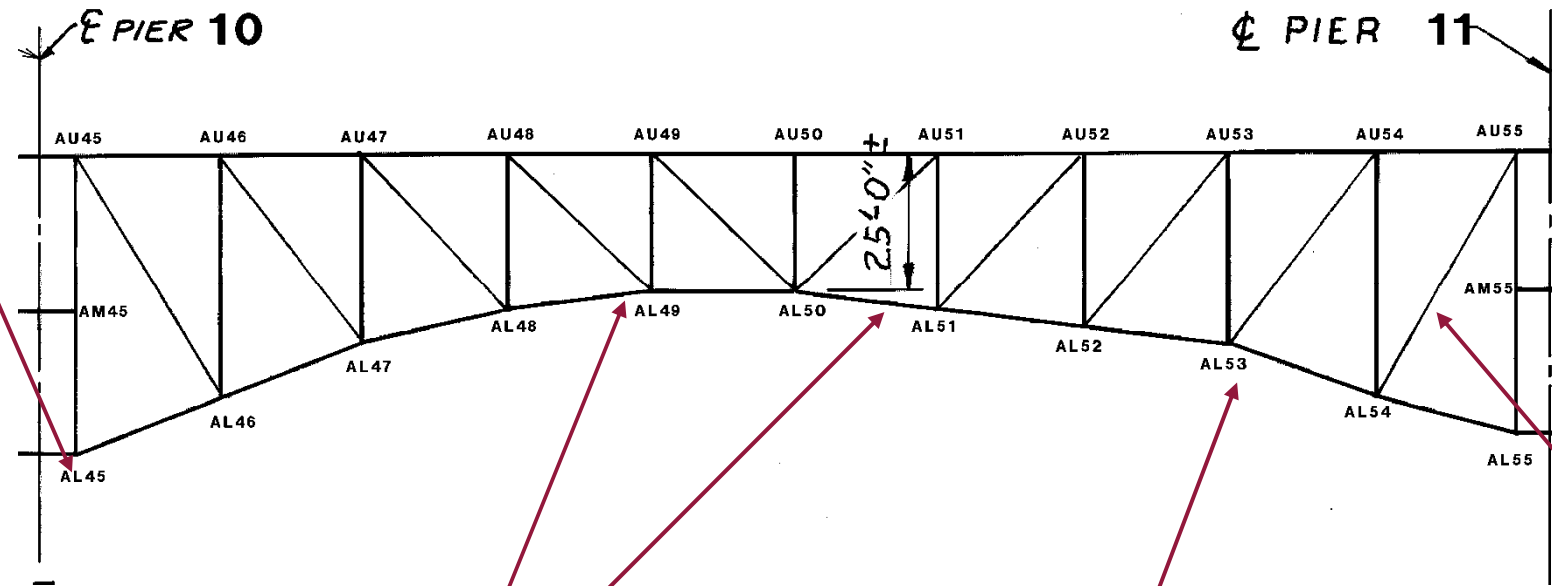
Pack rust up to 3/4" is present between the south web plate of chord member DL35-DL36 and gusset plate DL36S.



The north web plate of diagonal member DL43-DU44 exhibits 1/4" pitting with isolated 5/16" pitting along gusset plate DL43N for the full height of the section.



The truss bearing at AL45 was filled with standing water at the time of inspection.



**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 AL51.

1/16" pitting was typical on the outstanding leg of bottom flange angles on lower chord truss members within the gusset plate bounds throughout Span 10.

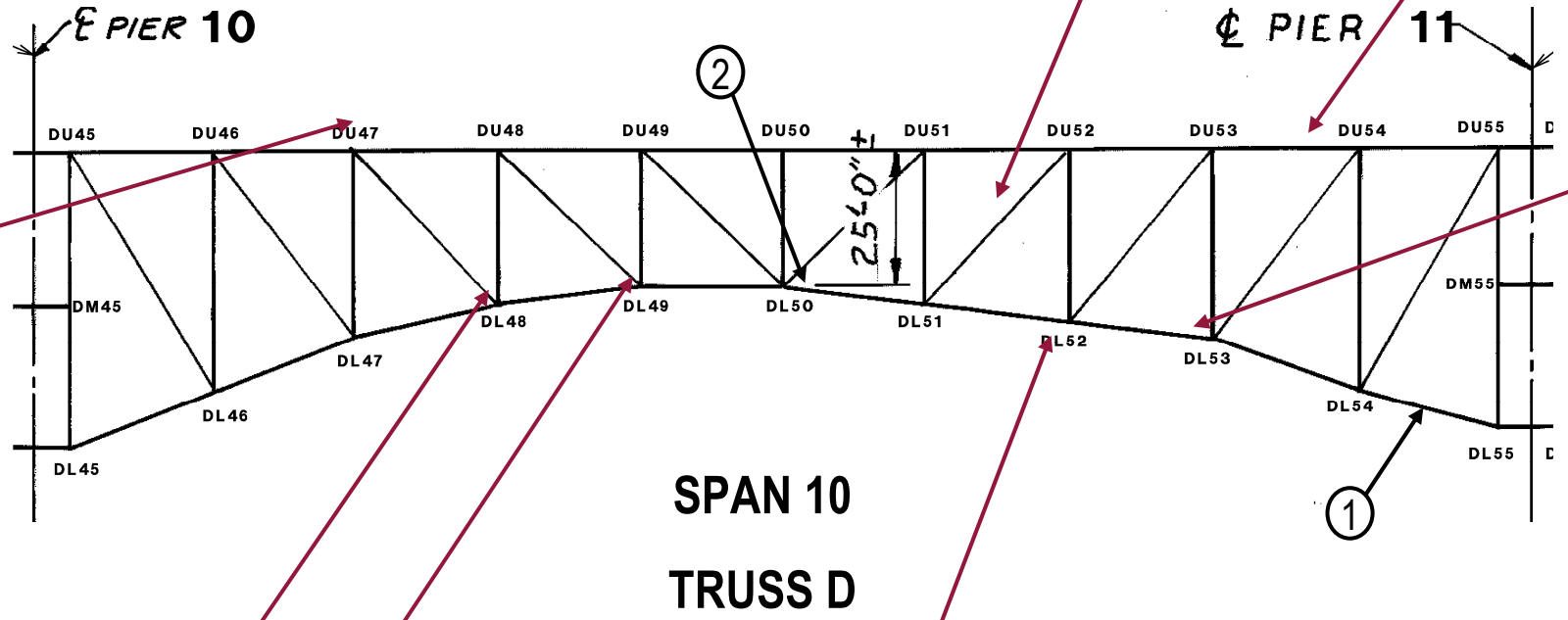
The south web plate of AL54-AU55 exhibits isolated areas of loss up to 3/8" deep by 6" diameter.

The top flange splice at AL53 exhibits minor distortion due to impacted rust formation. Active rusting was noted adjacent to this location on the north gusset plate.

① Similar to other spans throughout the structure, the lower chord north web plates exhibit loss 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.

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.



Deck subdrain location on the west side of Floorbeam 47 with 1/16" pitting and active corrosion to the top chord cover plate, lacing bars and flange angles. Note stalactite formation.

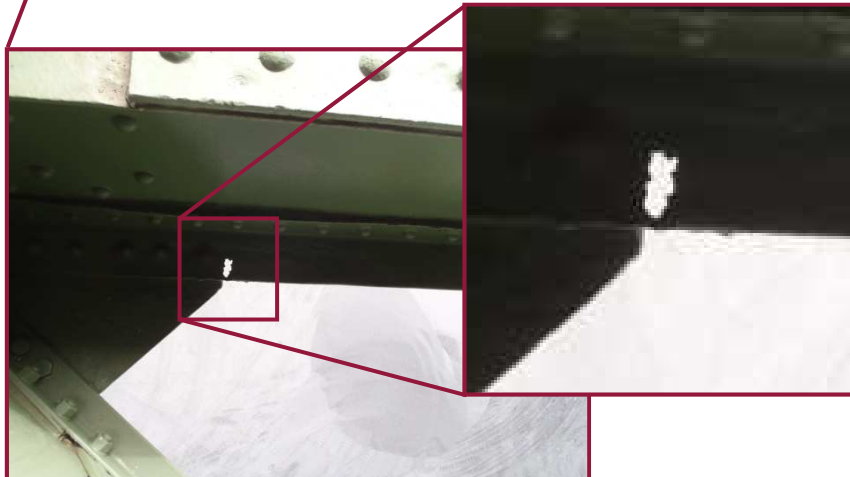


The DL52-DL53 north web plate exhibits an area of 1/4" deep pitting 5" tall (cleaned and painted) along gusset plate DL53N.

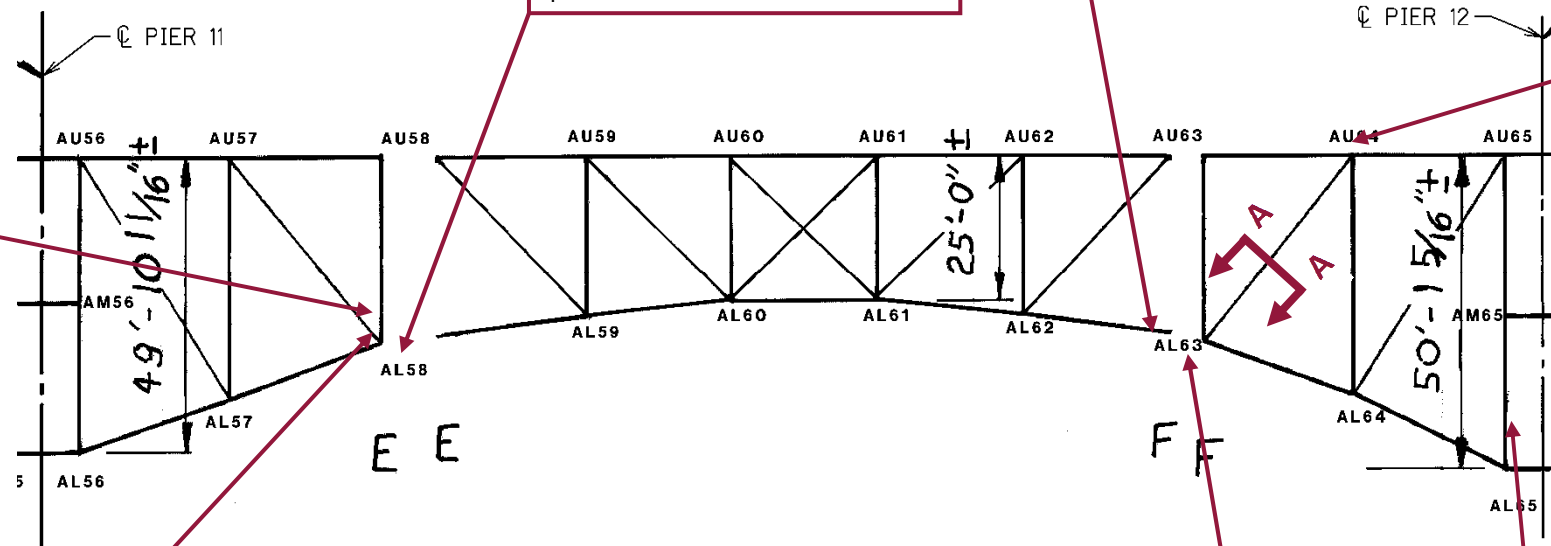
At the flange splice plate at Panel Point DL49, 1/2" thick pack rust has developed and is deforming the flange angles. Reactivating pack rust at this detail is typical of lower chord splices throughout Span 10.

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.

② DL50-DL51 exhibits up to 1/4" deep pitting over the full height of the north web at the interface with gusset plate DL50N. 1/8" pitting is typically found at similar locations throughout the lower panels in Span 10.



Member DL51-DL52 exhibits a 2" by 1" hole in the north bottom flange outstanding leg with 1/16" pitting on the vertical leg adjacent to Panel Point DL52.



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.

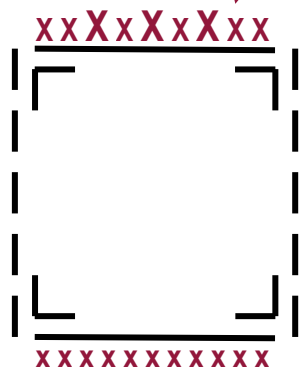
The lower sliding pin at AL63 is heavily corroded with rust scaling at the pin to pin plate interface. Rust is reactivating throughout these components.

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



Top chord member AU63-AU64 exhibits 100% section loss to the north top flange angle within the bounds of the gusset plate at AU64.

1/4" pitting x full web height, with 3 small areas with up to 5/16" loss



Section A-A

1/8" pitting x full web height

SPAN 11 TRUSS A



The web members at lower chord Panel Point AL58 exhibit active minor surface corrosion throughout.

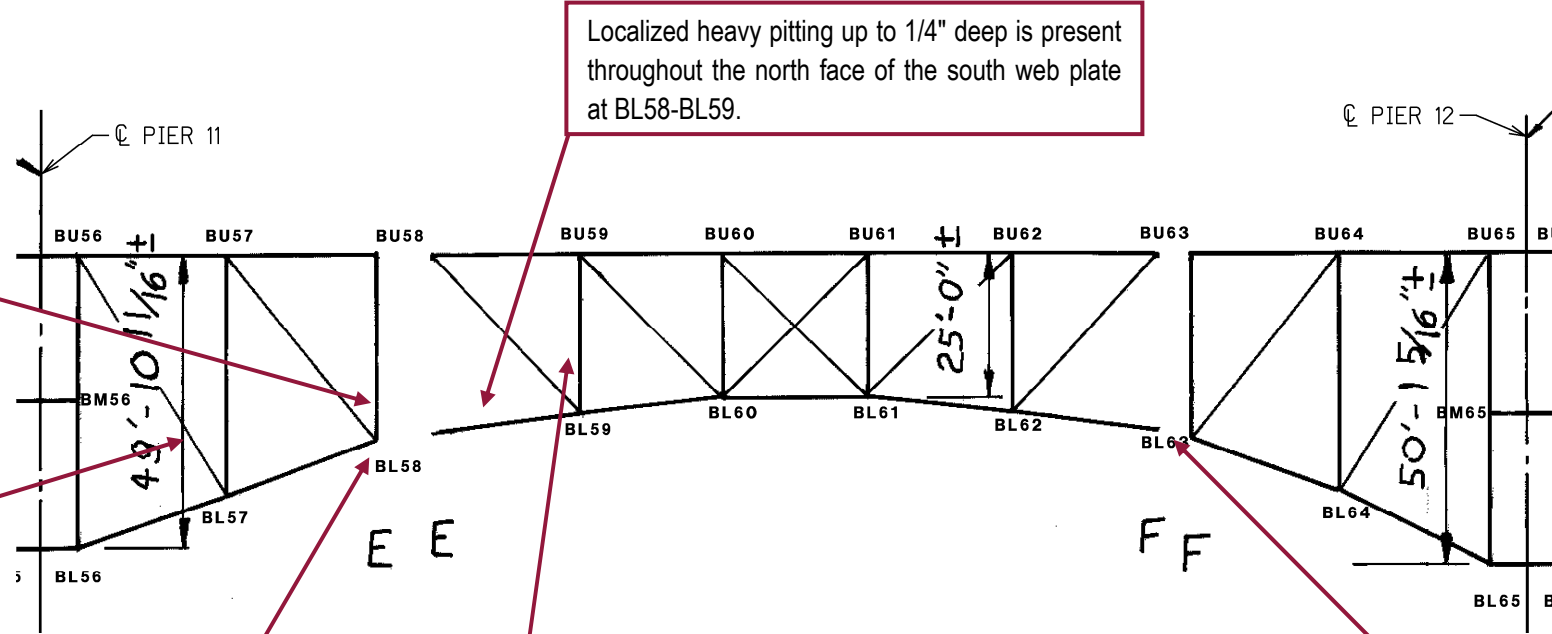


The west face of members at Panel Point AL63 exhibit isolated paint peeling of the top coat, leaving only primer at these locations.



Vertical member AL65-AU65 exhibits pitting up to 3/16" on the south web plate adjacent to the lower chord gusset plate.

Pack rust up to 1-1/4" has formed between the north gusset plate and the vertical member near the lower vertical pin at BL58.



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



Diagonal member BL57-BU56 exhibits 1/4" section loss on the north web plate with associated pack rust at the lower chord gusset plate BL57N interface.

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. Swelling of the pin plates between rivets on the lower chord member was also noted at this location.

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

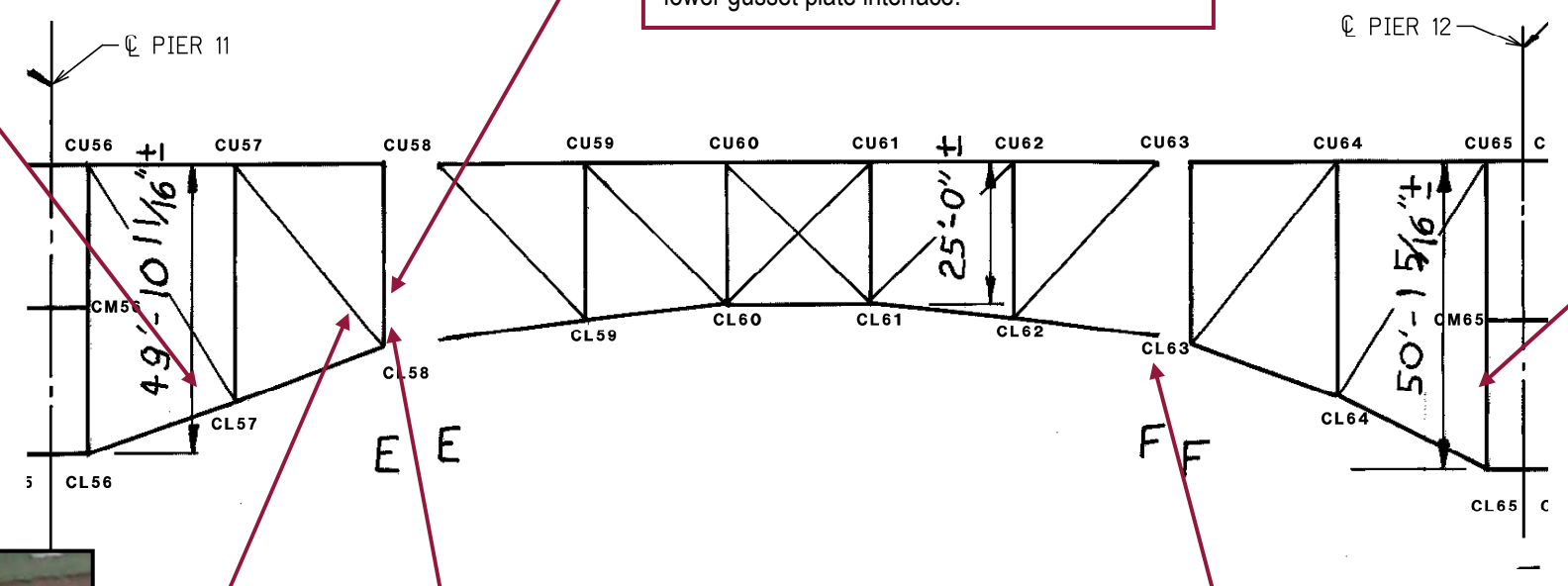


The sliding pin for member BL62-BL63 exhibits typical impacted rust at the north end of the pin at Panel Point BL63.

**SPAN 11
TRUSS B**

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.

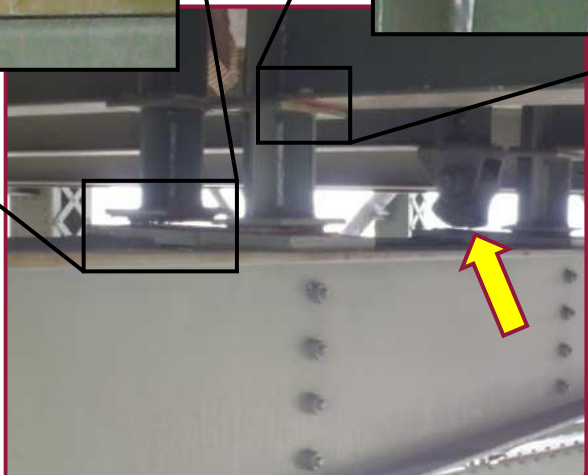
1/8" deep pitting is typical (isolated locations up to 1/4" deep) along the full width of both the north and south web plates of CL58-CU58 above the lower gusset plate interface.



**SPAN 11
TRUSS C**



Pack rust up to 3/4" is present between the web plates and flange angles of vertical member CL65-CU65.



Isolated stringer bearings at utility deck Floorbeam 58 are not in 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 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.



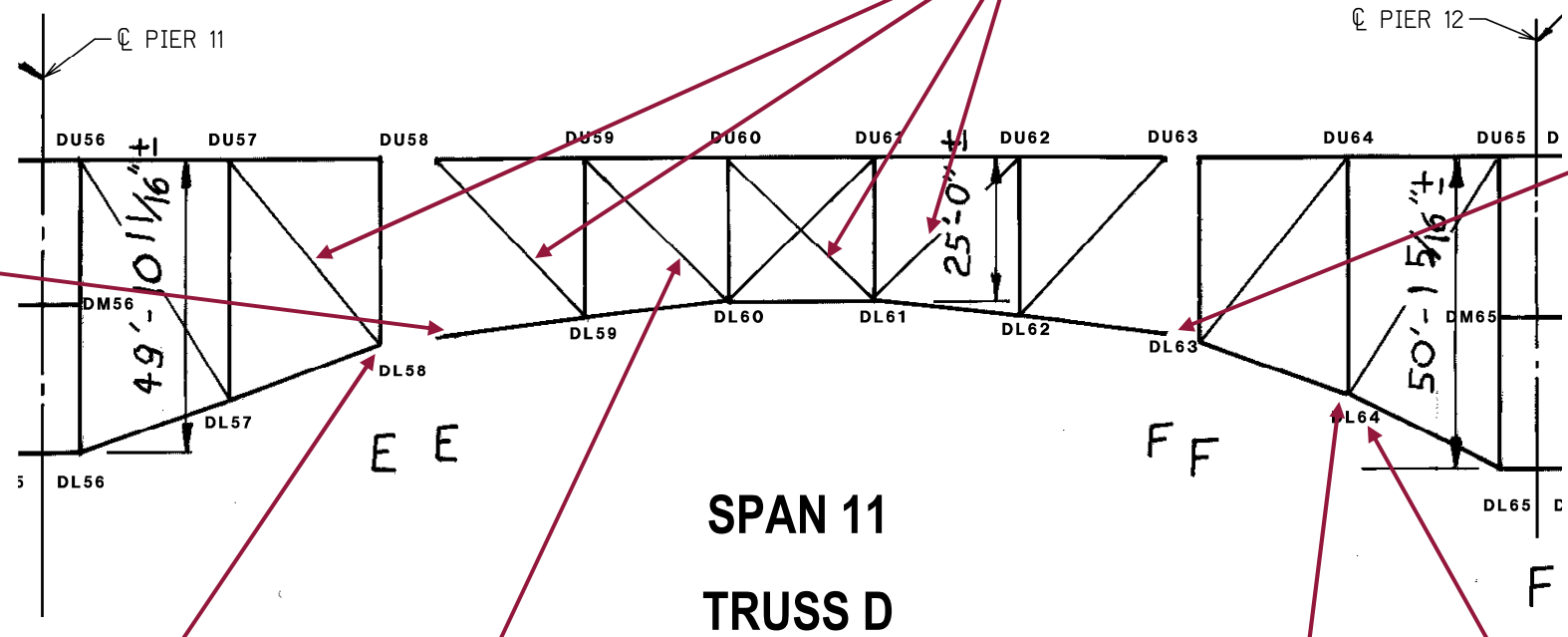
Impacted rust up to 2" thick is present between the vertical web plate and gusset plate CL58S. The pin at this location exhibits a protruding washer.

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 corrosion.

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.



**SPAN 11
TRUSS D**

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

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.



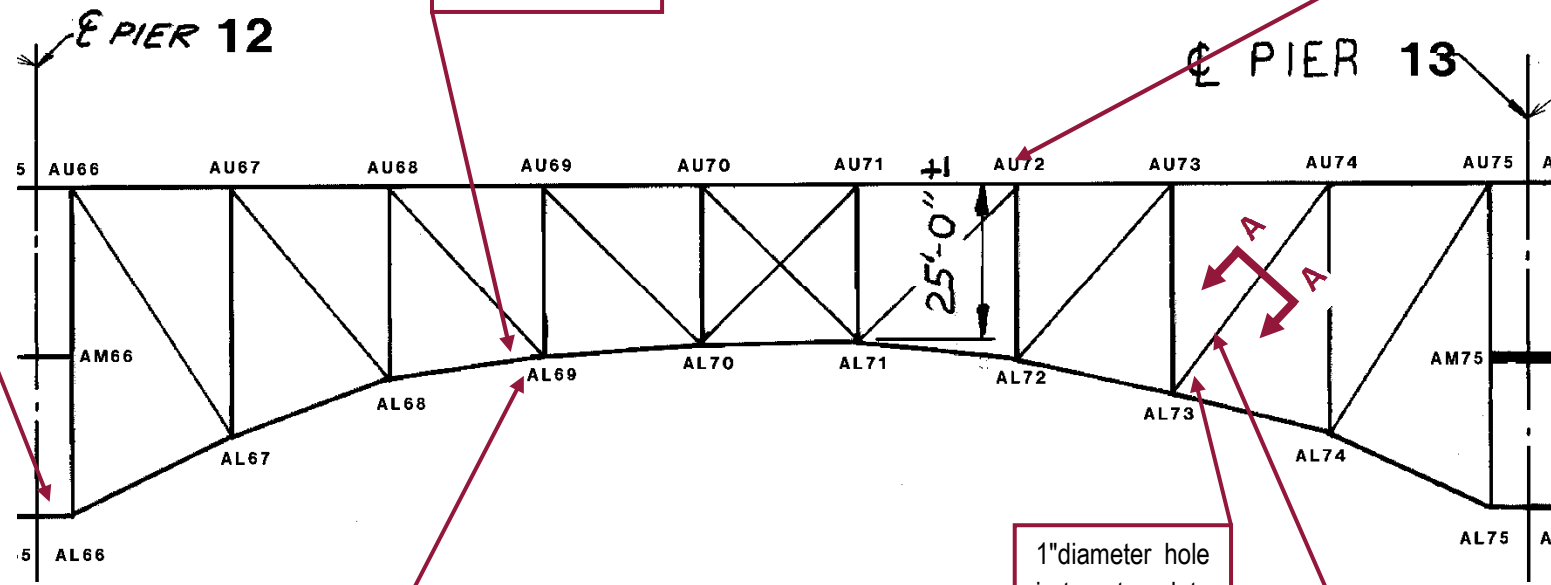
The north gusset plate at DL58 exhibits up to 3/16" pitting, a condition typically found at the expansion locations throughout the structure (Photo taken 2010).



The north web plate of member DL60-DU59 exhibits 1/8" pitting (cleaned and painted) for the full height of the section along the interface with gusset plate DL60N.



Lower chord member AL65-AL66 exhibits pitting on the flange angles up to 1/8" with a 2" by 1/2" hole and up to 2" of impacted rust between the web and bottom flange angles.



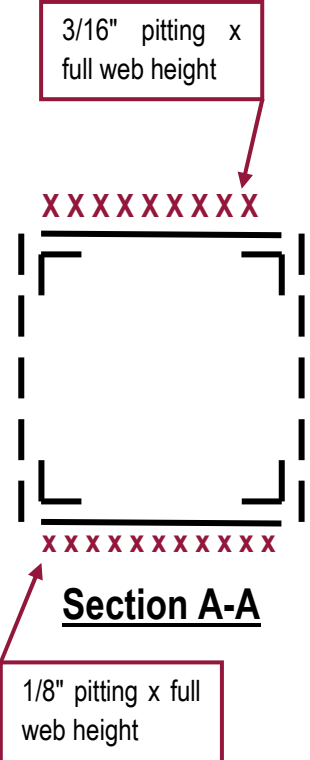
**SPAN 12
TRUSS A**

The south face of the south gusset plate at AL69 exhibits heavy pitting along the lower chord interface and adjacent to isolated rivet heads.

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

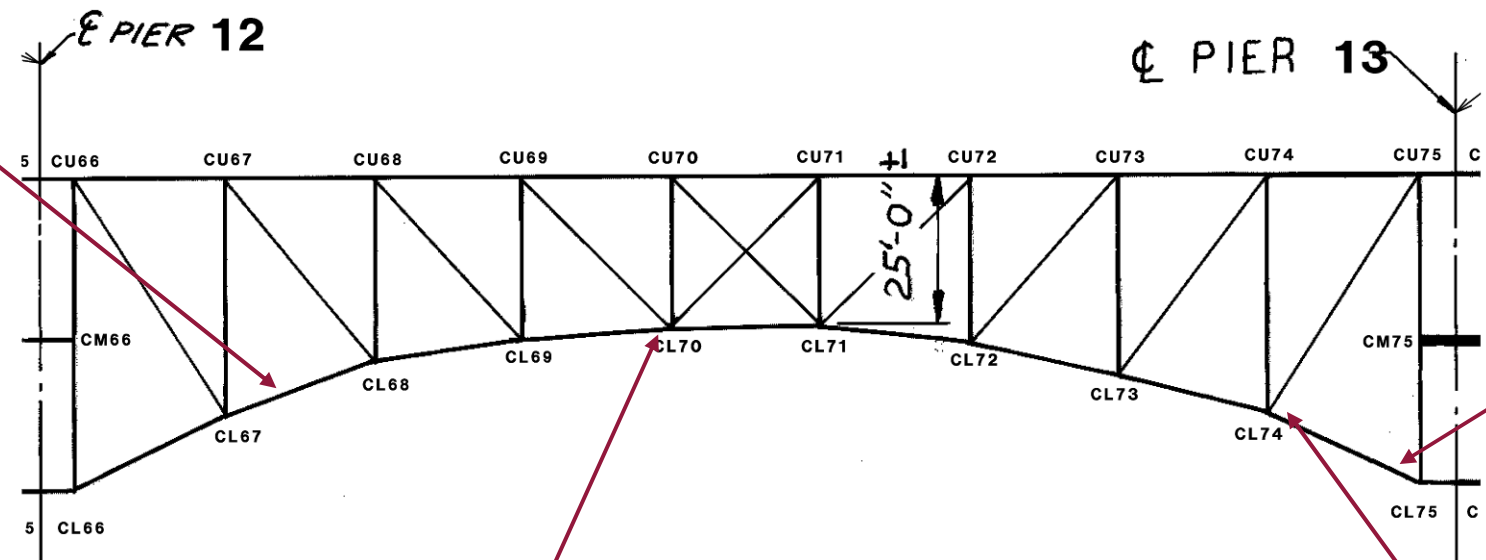


The top chord cover plate just east of Floorbeam 72 exhibits active corrosion due to the presence of a deck subdrain.





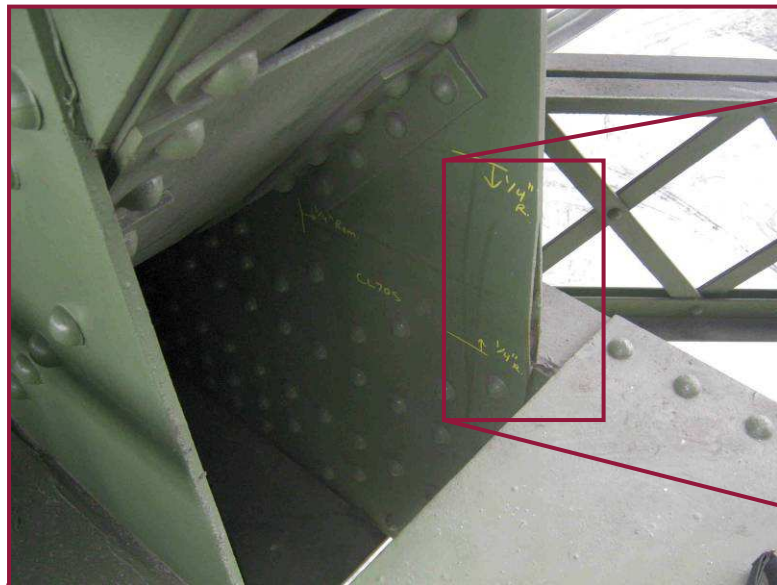
Pack rust is showing signs of reactivation between lower chord web plates and flange angles.



**SPAN 12
TRUSS C**

Isolated 3/16" pitting on the top stay plate

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



The south gusset plate at CL70 exhibits lamellar separation along the west free edge, with an effective remaining plate thickness of approximately 1/4" (Photo taken 2010). Limits of the separation have no increased since the 2010 inspection.



Detail view of lamellar tear taken in 2011.

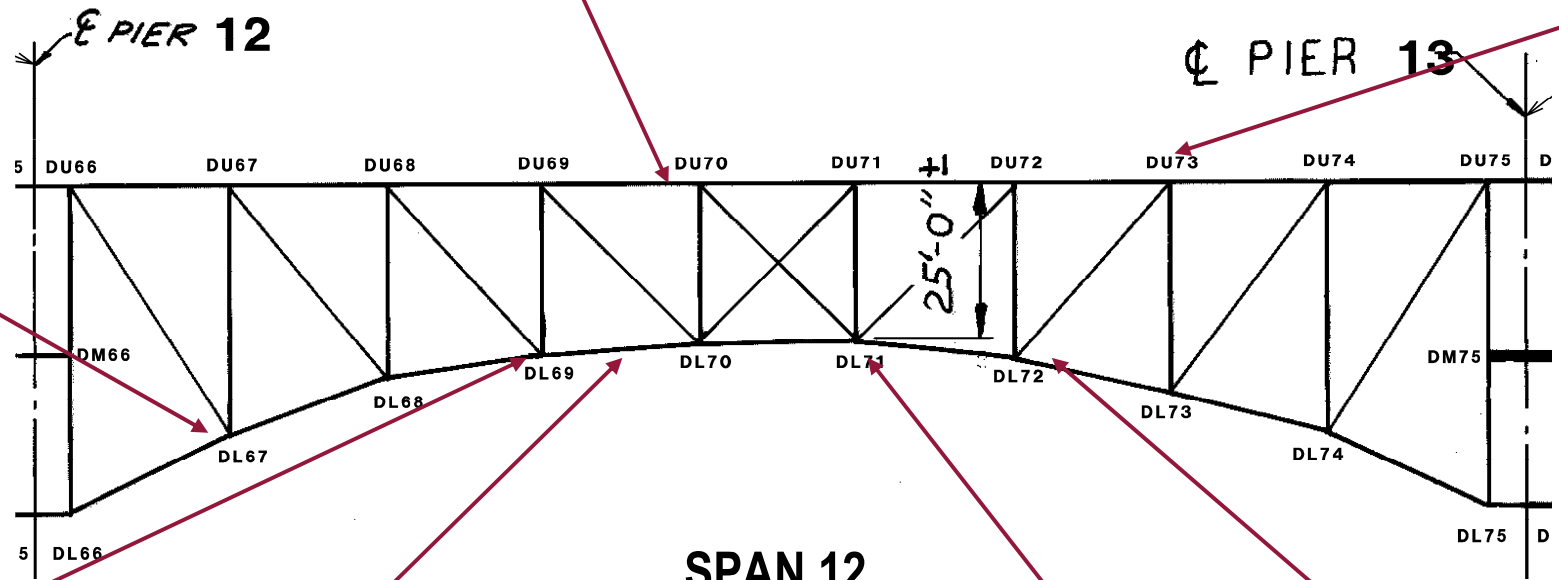
Stringer 1 exhibits up to 1/4" pitting in the bottom half of the south face of the beam near the connection to Floorbeam 70.

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.

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



The south fascia stringer just east of Floorbeam 73 has a weld retrofit along the bottom flange cope.



**SPAN 12
TRUSS D**

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.

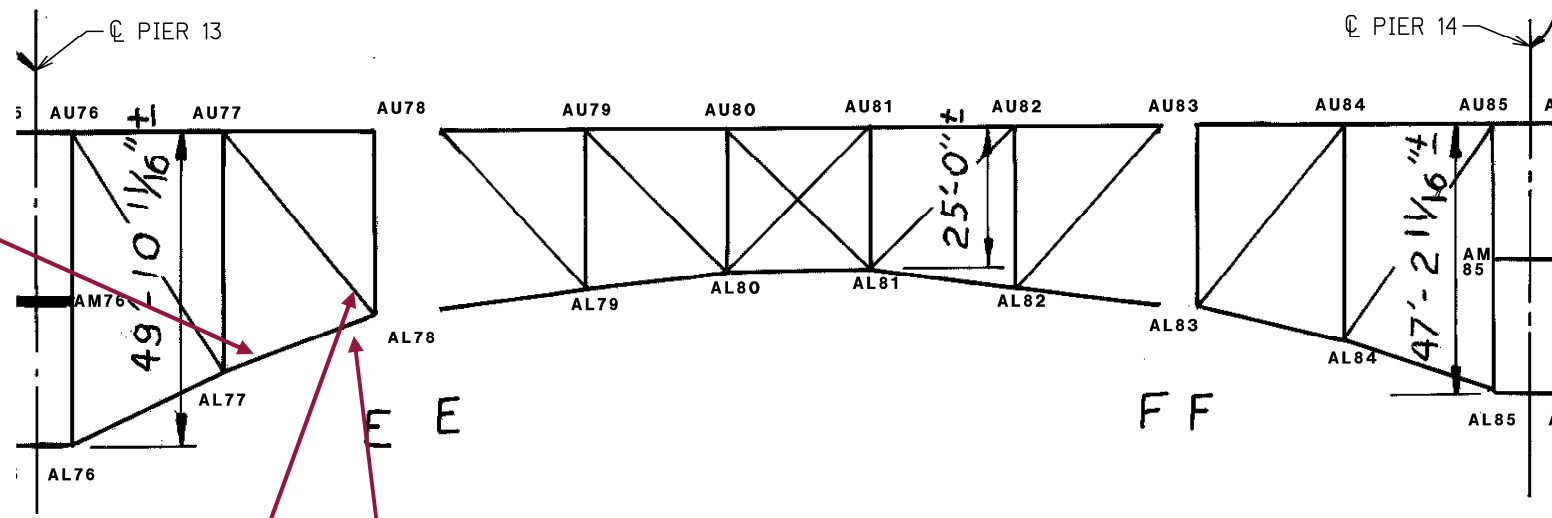


The lower chord member DL69-DL70 exhibits pack rust up to 2" thick between the north web plate and the lower flange angle. Pitting up to 3/16" was noted on the north web plate along the flange angle.

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.

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

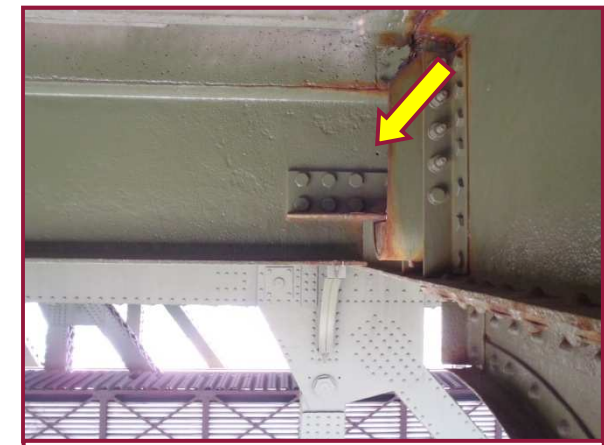
Similar to other spans throughout the structure, the lower chord north web plates exhibit losses along the lower flange angles. Losses in Span 11 are typified by 1/16"-1/8" deep pitting occurring within the lower 2" of the web and most of the length of each bay. The adjacent flange angles exhibit similar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



**SPAN 13
TRUSS A**



The south web plate of member AL77-AL78 exhibits 1/4" pitting approximately 2" high along the bottom flange angle.



The Stringer 2 web just east of Floorbeam 83 exhibits pitting up to 1/8" throughout with isolated holed through sections.



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.



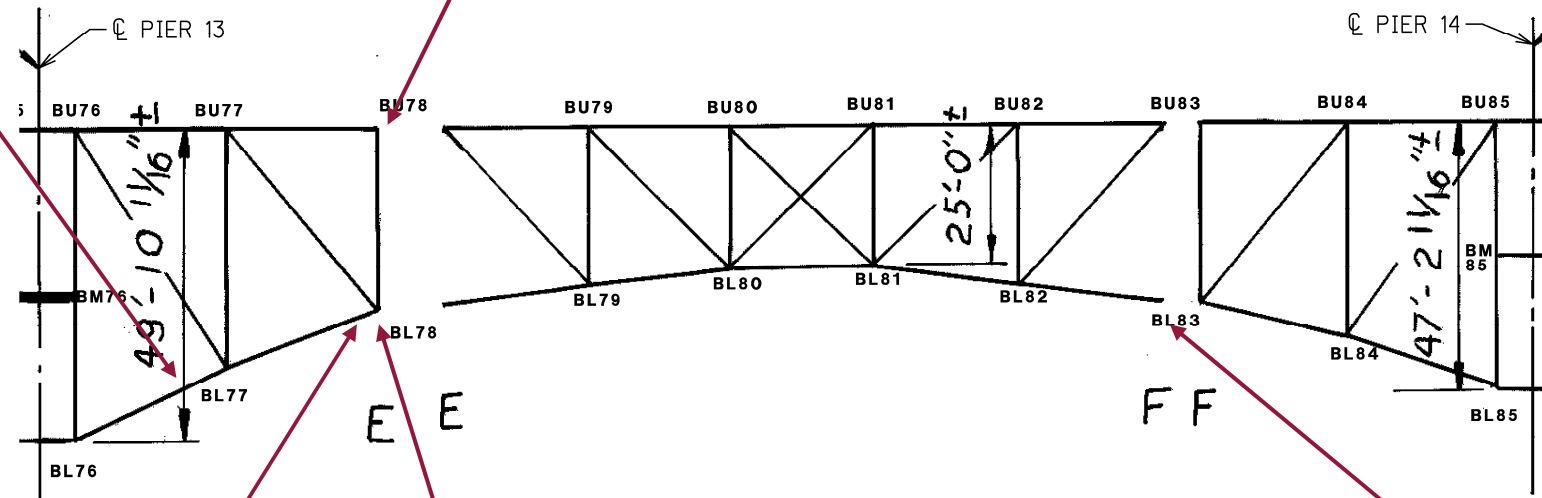
The AL77-AL78 south web adjacent to gusset plate AL78S exhibits isolated pitting. Note the retrofit plates on the web and bottom flange.



The south web plate of member AL83-AU84 exhibits 1/8" pitting along the lower chord gusset plate and in isolated locations along the member.



Pack rust between the web plates and top flange angles exhibits signs of reactivation.



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.

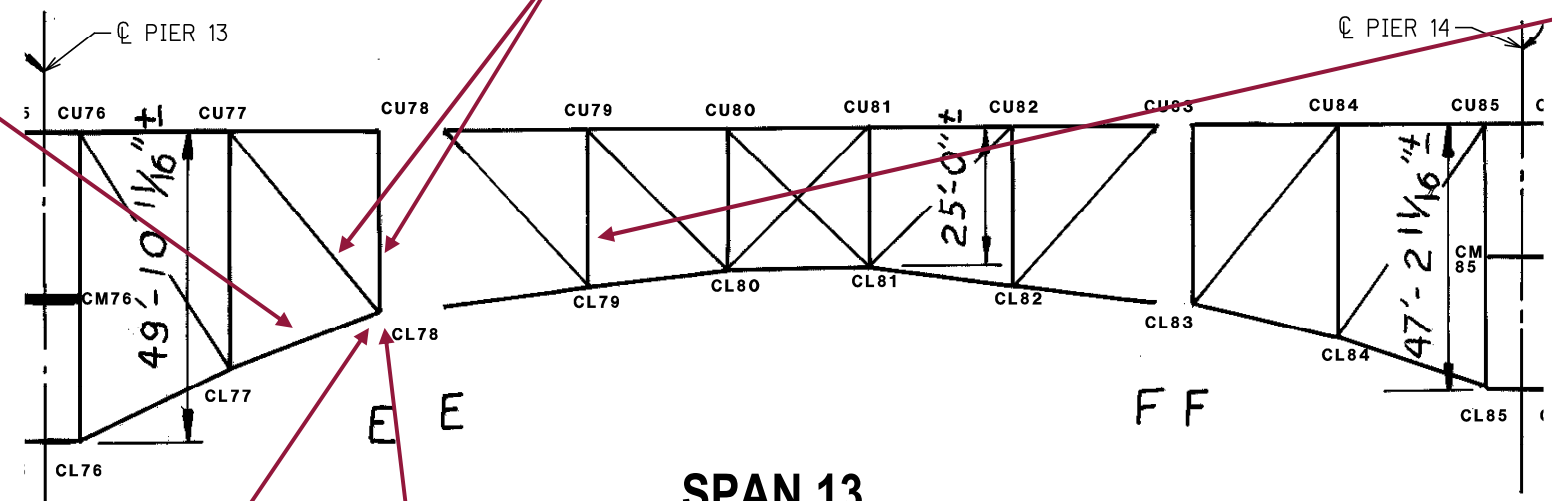
The internal pin plates at BL78 exhibit pack rust up to 1-1/2" thick at the plate corners with localized distortion.



Pack rust at BL83 has pushed the sliding pin plates outward such that 5/16" of the pin is no longer bearing.

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.



**SPAN 13
TRUSS C**



The south web plate of member CL79-CU79 exhibits 1/8" pitting around the sway brace connection.



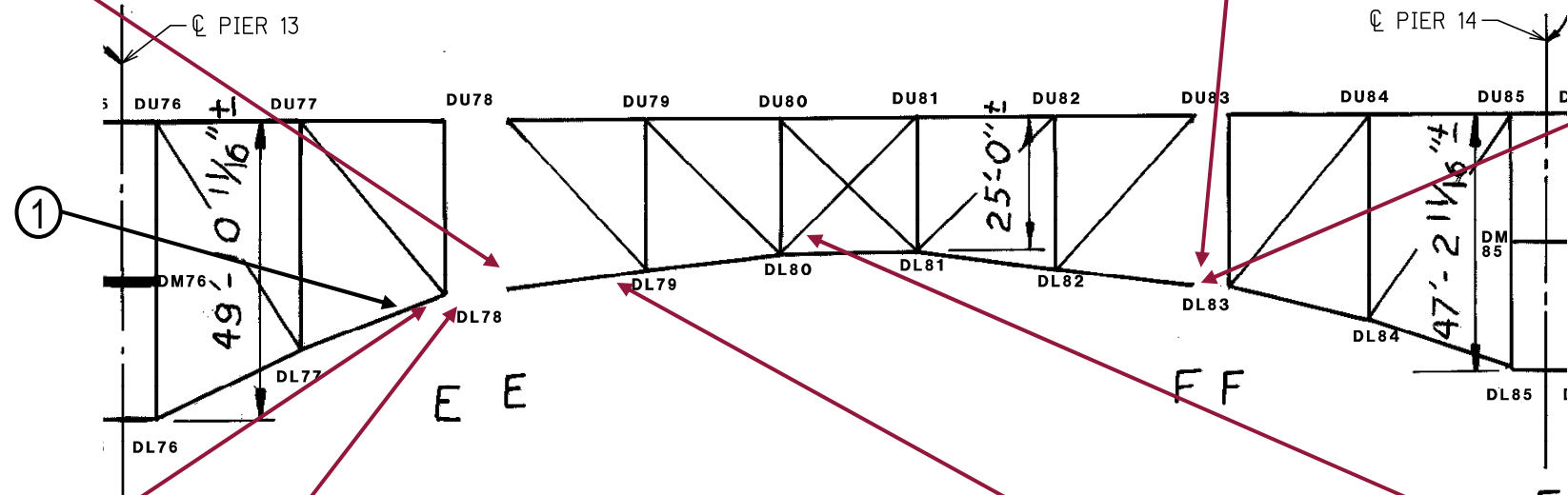
Impacted rust has accumulated between gusset plate CL78S and the vertical member web plate. The rubber washer around the pin is protruding at this location.



Several utility deck stringer bearings exhibit excessive rotation at Panel Point 78. Note the extensive retrofitting of the web and bottom flange of utility deck Floorbeam 78.



Both ends of the lower sliding pin in member DL78-DL79 exhibit section loss in the upper half of the circumference. Losses of 1/16"-1/8" are typical for the full circumference of the pin ends; however, an area exhibiting approximately 1/2" is shown at the north end of the pin.



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".

① 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.

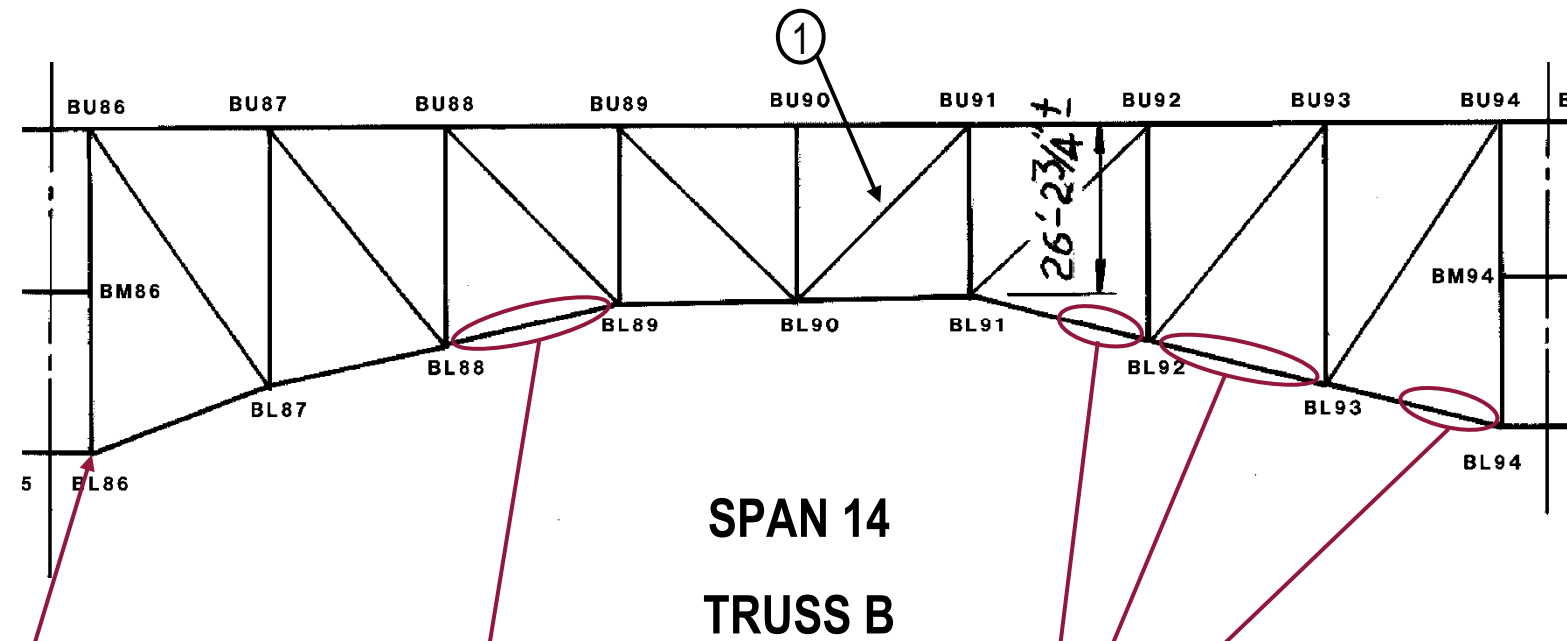
The lower batten plate on the underside of diagonal member DL80-UL81 exhibits advanced corrosion with a 2" diameter hole and adjacent 1/4" pitting near the lacing connection.

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 (Photo taken 2010).

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.



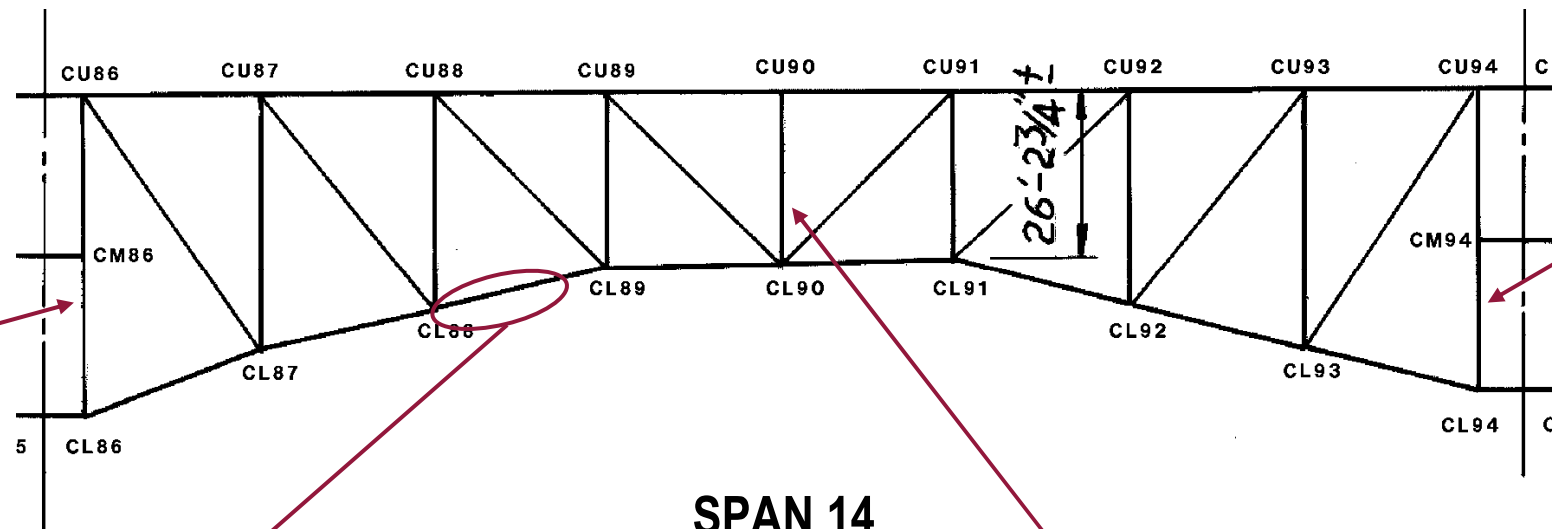
The south exterior lower chord splice plate is pushed out approximately 1" due to pack rust.



1/8" pitting of the north lower chord web plate along the length of the members at isolated locations (BL91-BL92 shown).



Member BL90-BU91 exhibits pack rust up to 1/2" thick between web plates and flange angles.



Vertical member CL86-CU86 exhibits pack rust up to 3/8" between the web plates and flange angles.

Vertical member CL94-CU94 exhibits pack rust up to 1/2" between the web plates and flange angles. Pack rust in this location shows signs of reactivation.

**SPAN 14
TRUSS C**

Vertical member CL90-CU90 exhibits 1/4" pitting around the top sway brace connection.



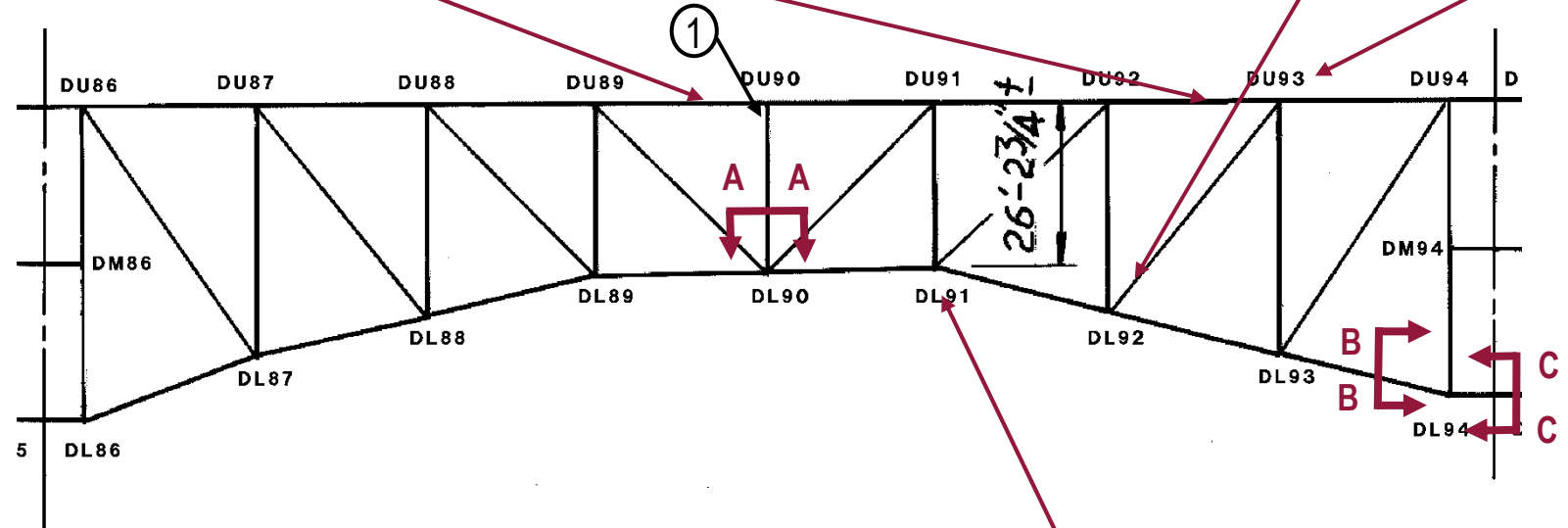
The lower chord south web plate exhibits pitting up to 3/16" deep pitting along the bottom flange angle in the lower half of the plate. The pitting extends approximately 3/4 of the length of CL88-CL89.

Between Floorbeams 89 and 90, the south face of Stringer 7 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.

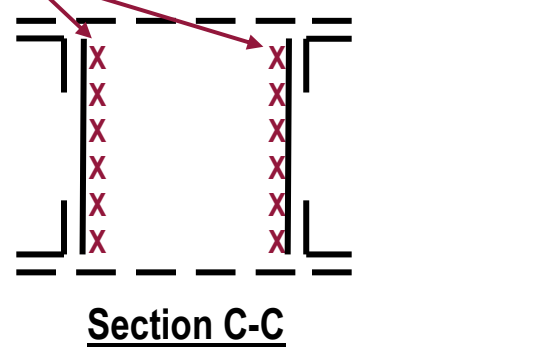
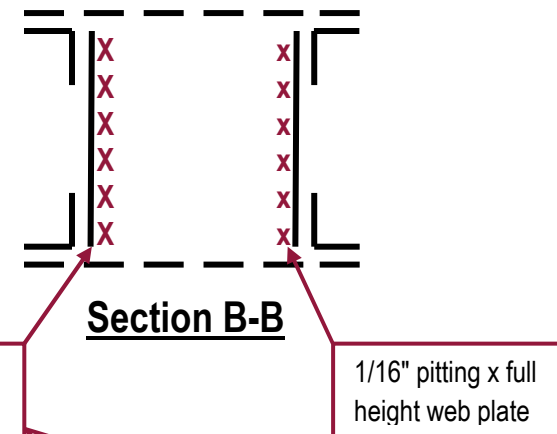
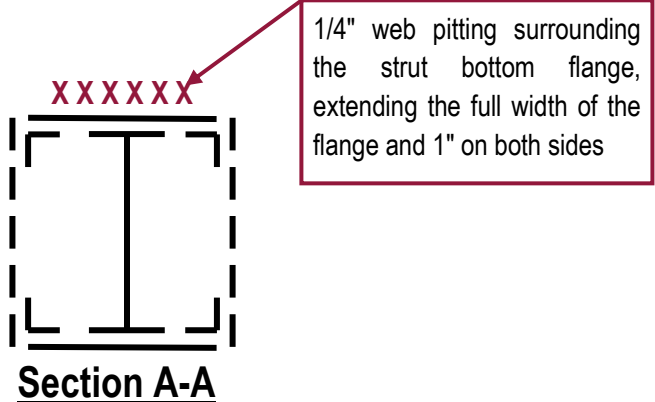
The upper batten plate at the base of the diagonal member exhibits 1/4" pitting throughout, with a 2" diameter perforation.

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 7.

The upper chord of Truss D in Span 14 is in good condition overall with no significant deficiencies noted.



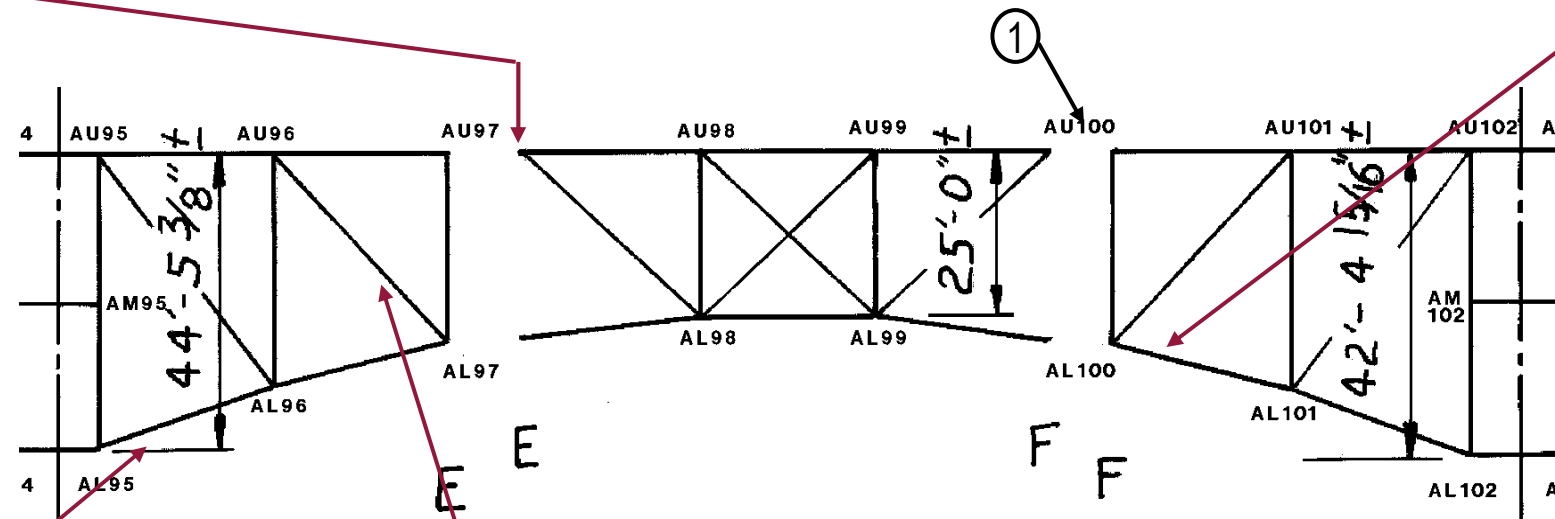
**SPAN 14
TRUSS D**



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 (Photo taken 2010).



The west bottom flange of Floorbeam 97' at AU97 exhibits active laminate rust with 1/16" section loss.



**SPAN 15
TRUSS A**



The south bottom flange angle of member AL100-AL101 exhibits isolated holes with sections cut out of the outstanding legs.

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 pin holes measuring approximately 1/4" diameter.



The interior web plates of AU96-AL97 exhibit laminate rust with 1/8" loss on the interior, as well as isolated areas of 3/16" pitting on the interior and exterior faces of this member.



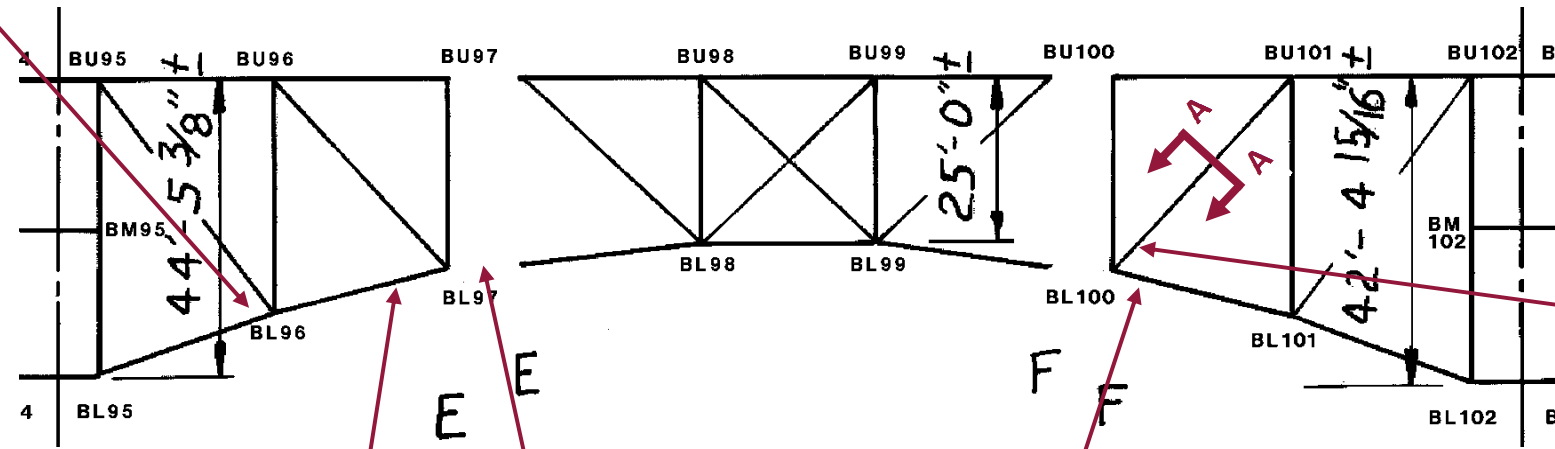
The exterior south web plate of AU96-AL97 exhibits areas of 3/16" pitting (cleaned and painted).



The bearing stiffeners on the east face of Floorbeam 100 adjacent to Truss A exhibit isolated locations of 100% section loss.



The north web plate of BL95-BL96 exhibits 3/16" deep pitting for the full height of the plate adjacent to BL96N. This location was covered by a thin fill plate which has since completely corroded outside the bounds of the gusset plate.

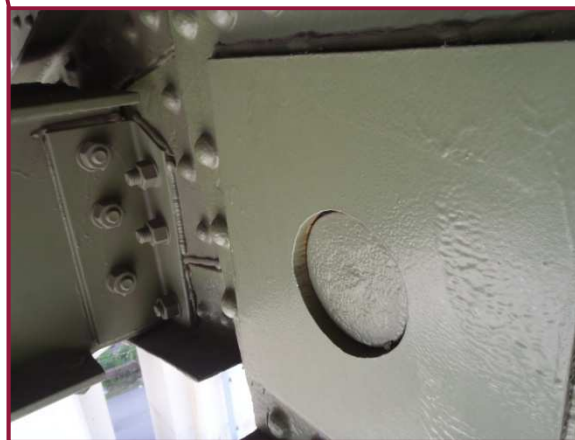


**SPAN 15
TRUSS B**

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.

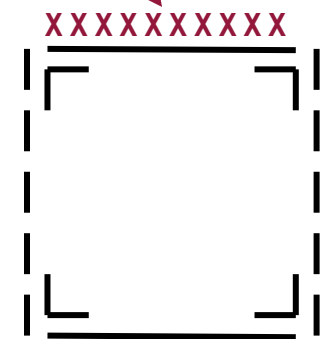
1" diameter hole in outstanding leg of bottom flange angle

Isolated 1/16" pitting on the interior south web plate and similar pitting with pack rust up to 1/2" on the north web plates



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 a reduced pin bearing area.

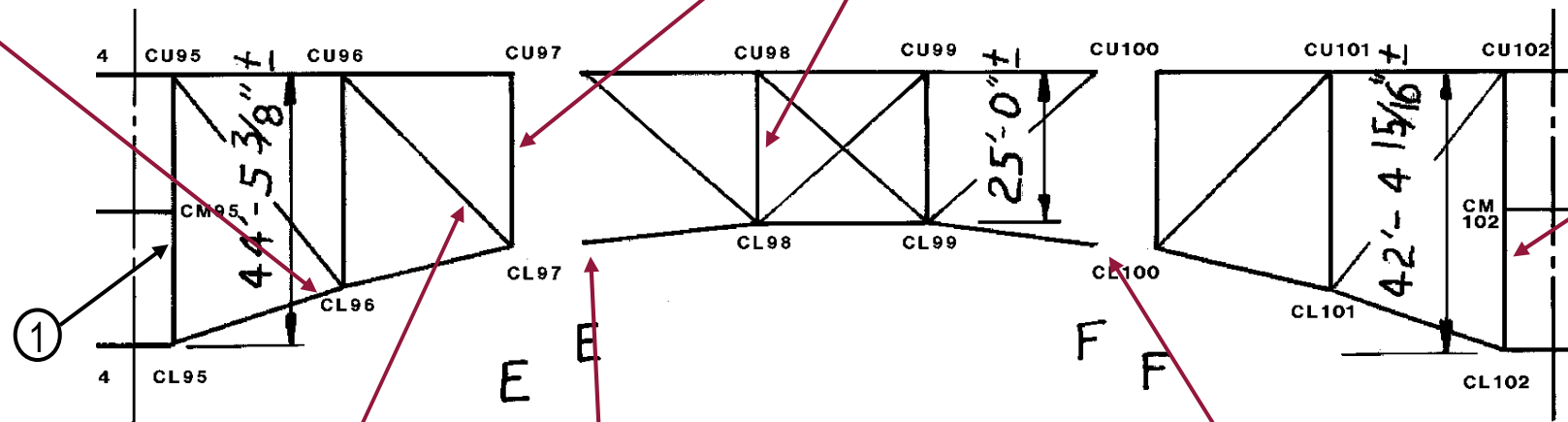
1/4" deep pitting for the full height of the web



Section A-A



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



Surface pitting of lacing bars up to 1/16" throughout vertical member

① Pack rust up to 3/4" between web plates and flange angles

SPAN 15 TRUSS C

Isolated 1/4" pitting on the first and second pin plates in the suspended span

Diagonal member CL97-CU96 exhibits 3/16" pitting to the south web plate for half the height of the section adjacent to the lower chord gusset plate. The north web plate exhibits 1/16" pitting in the same location.



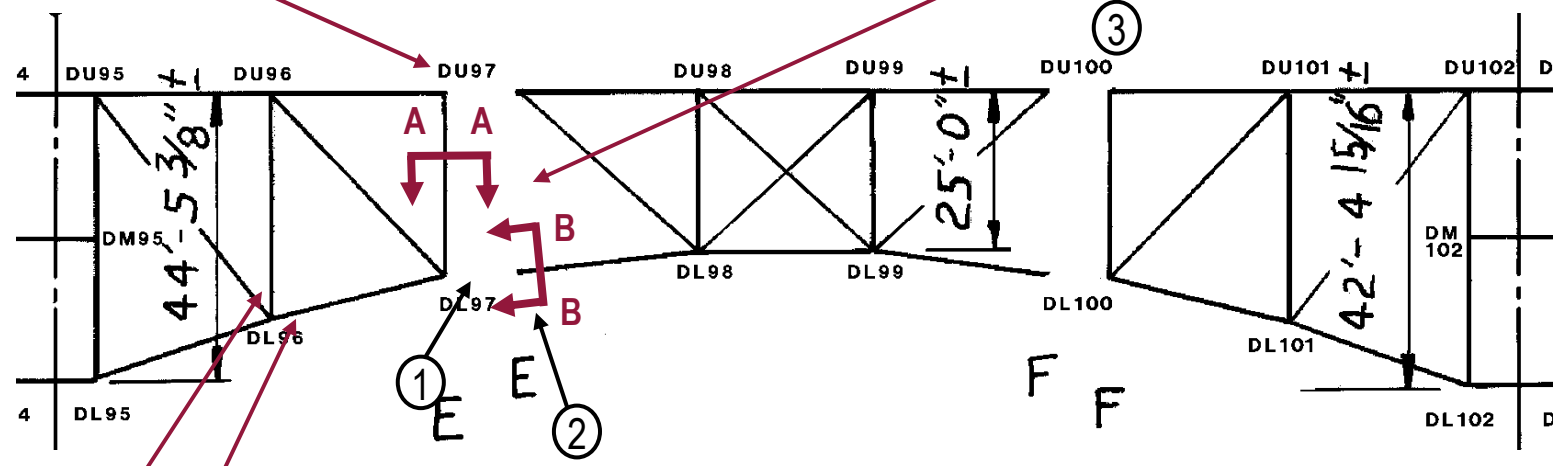
The lower chord sliding pin at CL100 is not bearing fully on the outermost pin plate due to impacted rust between the lower chord and gusset plate. The end of the pin and outer edge of the pin plate are misaligned by 1/4".

The upper vertical pin at DL97 has been retrofitted with a welded plate on the exterior face of the pin. 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.

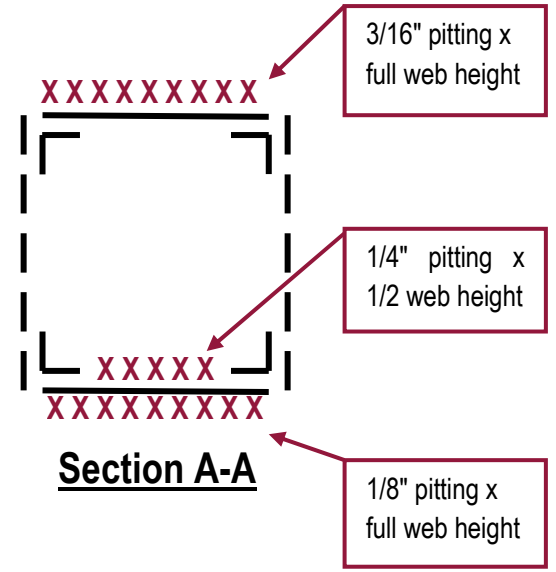
The lower chord at DL97-DL98 exhibits distressed connections due to heavy pack rust, as well as heavy localized pitting up to 5/16" deep.



The lower chord pin and Panel Point DL97 exhibits laminate rust with section loss up to 1/2" at the north end along the top.



**SPAN 15
TRUSS D**

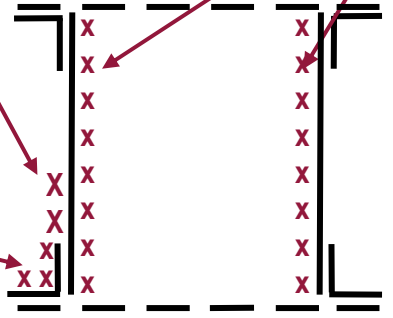


The fill plate between gusset plate DL96 and the north web plate of DL96-DL97 exhibits 100% section loss and the adjacent web plate has 1/4" pitting over the full height. The south web plate exhibits a similar condition with 1/8" pitting.

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

1/4" pitting by 4" high above flange angle

1/8" pitting x full width of both legs of bottom flange angle



Section B-B

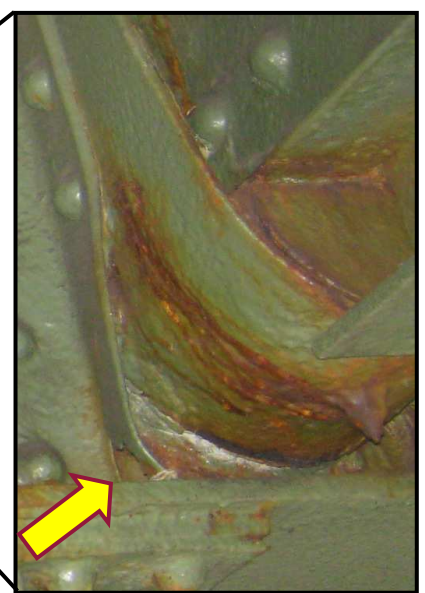
1/8" pitting x full web height



Lower chord member DL97-DL98 exhibits 1/4" deep web pitting 4" high above the north bottom flange, as well as 1/8" on both legs of the flange angle. The interior faces of both web plates also exhibit 1/8" pitting at this location. These losses are depicted in Section B-B.

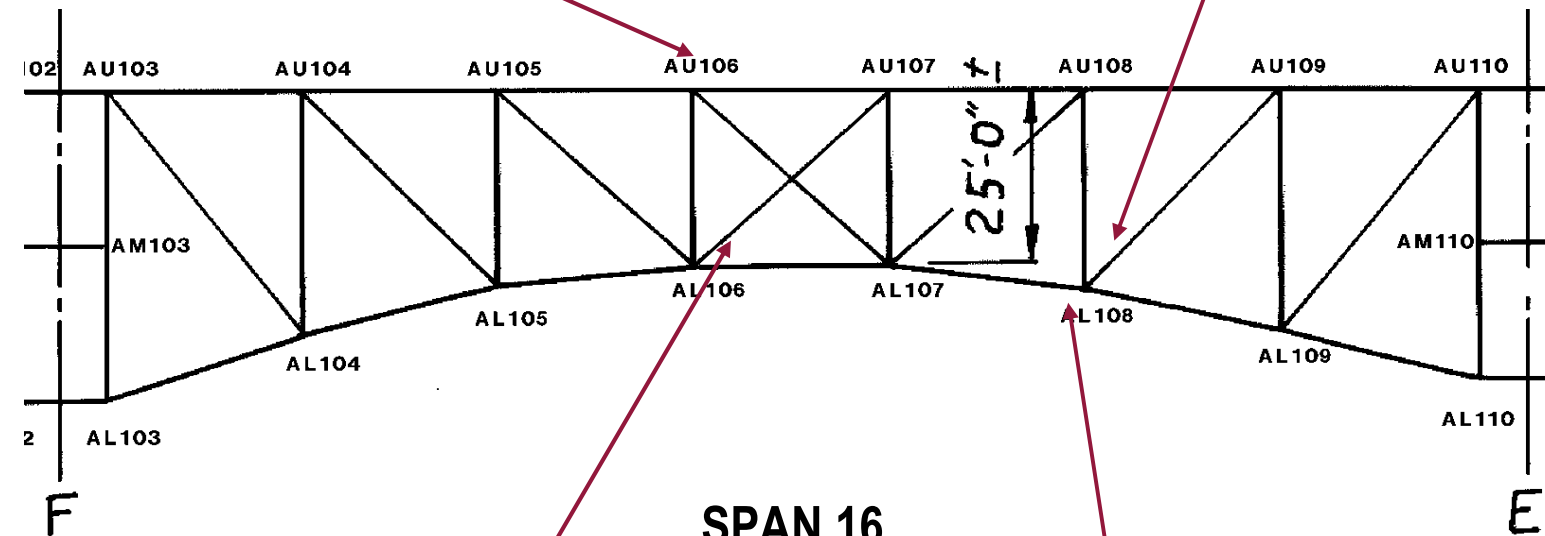


At Floorbeam 100 active rusting of the flanges is typical throughout, with advanced corrosion of the stringer connection angle below the saddle bearing rivets. The connection angle has a 1.5" diameter perforation at this location (right). Additionally, the saddle bearings typically exhibit minor pitting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





Stringer 2 web exhibits a 4" diameter hole approximately 3" from the floorbeam connection with 1/16" pitting for the height of the web at this location.



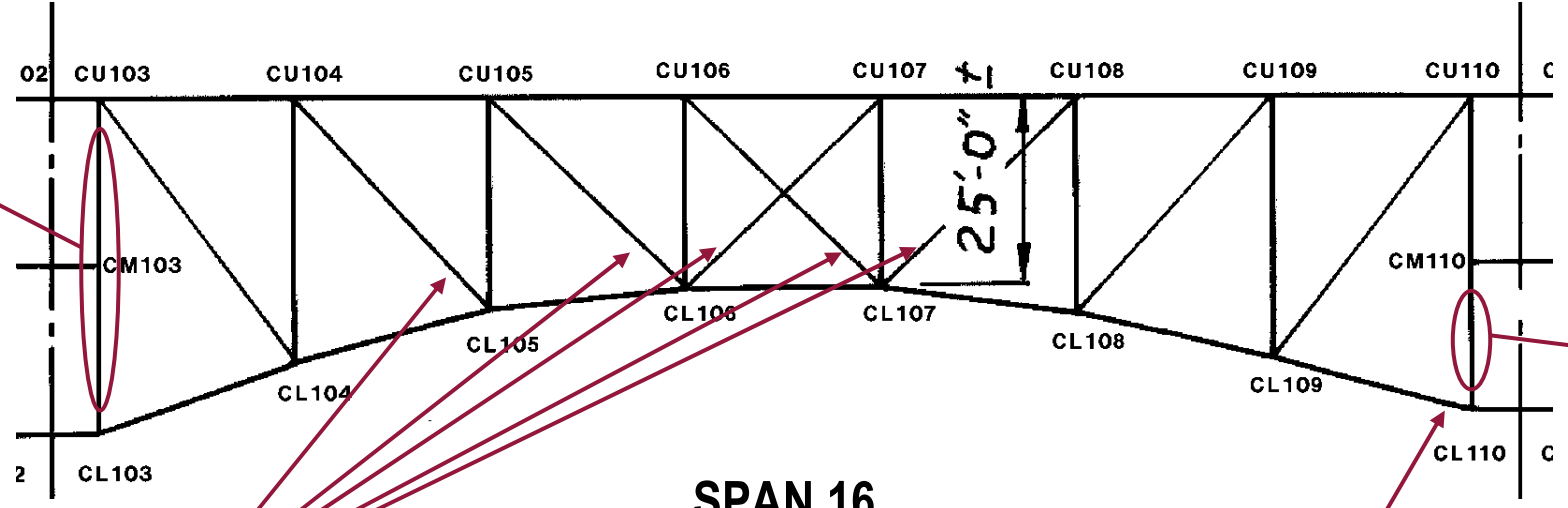
**SPAN 16
TRUSS A**

1/2" diameter hole in diagonal member cover plate near the lower gusset plate

Top flange with isolated pinholes near lower gusset plate

2" diameter hole in outstanding leg of lower chord top flange angle

Pack rust up to 1/4" between web plates and flange angles



Pack rust up to 3/8" between web plates and flange angles

SPAN 16 TRUSS C

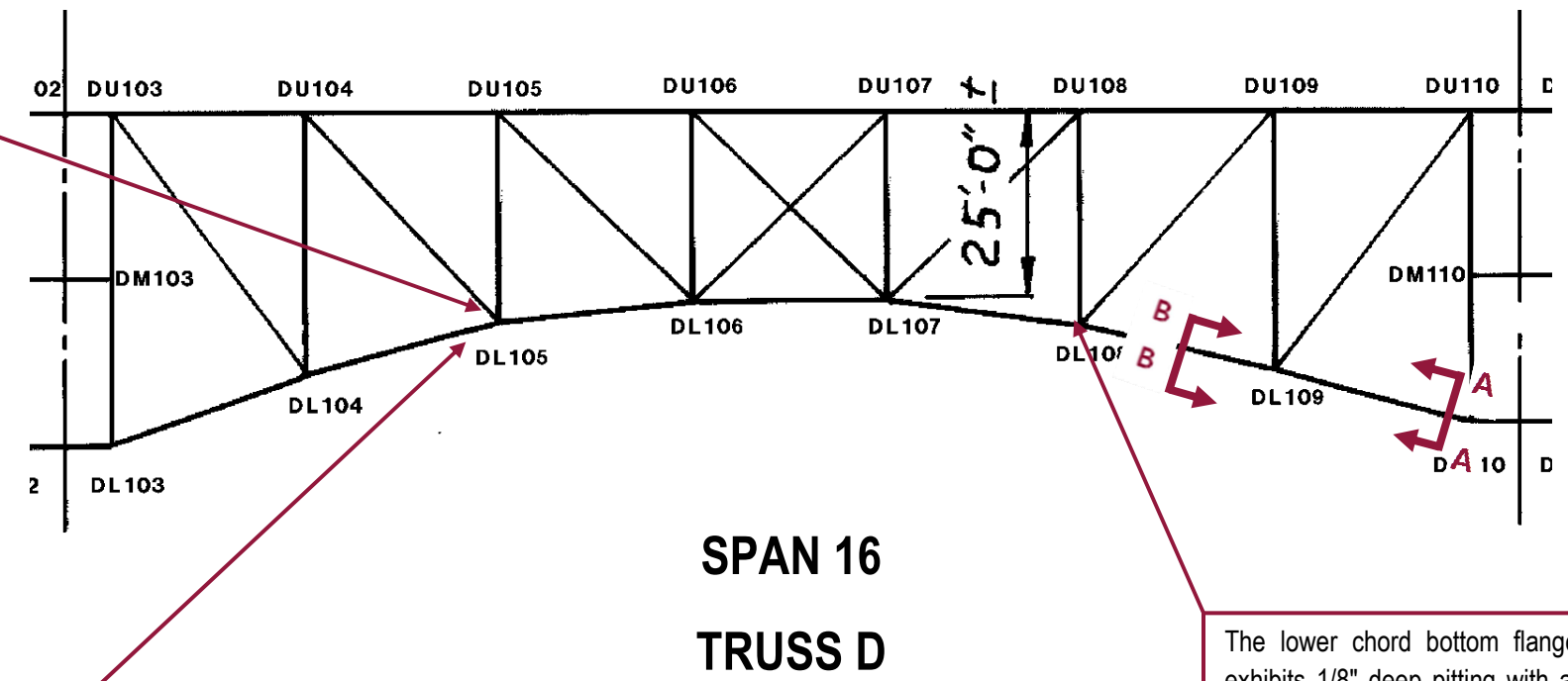
1/8" pitting to top and bottom lateral bracing connection plates



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).

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.

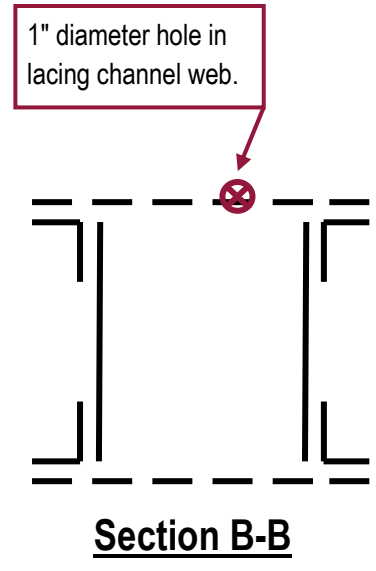
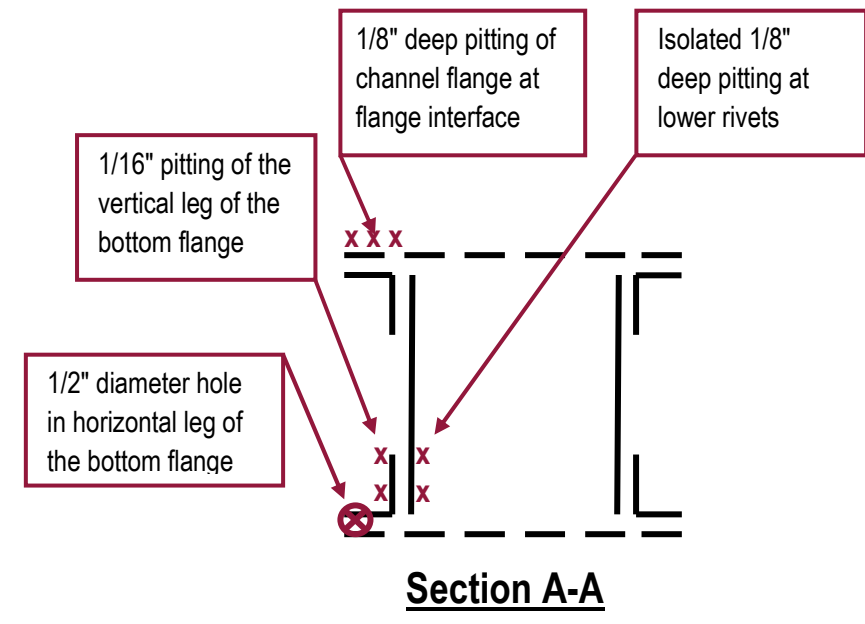
The exterior of the Truss D upper chord is clean with paint intact and no significant deficiencies noted in Span 16.



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



The north interior web plate of DL104-DL105 exhibits 1/16" pitting around the bottom row of rivets for the first 18" from gusset plate DL105N.

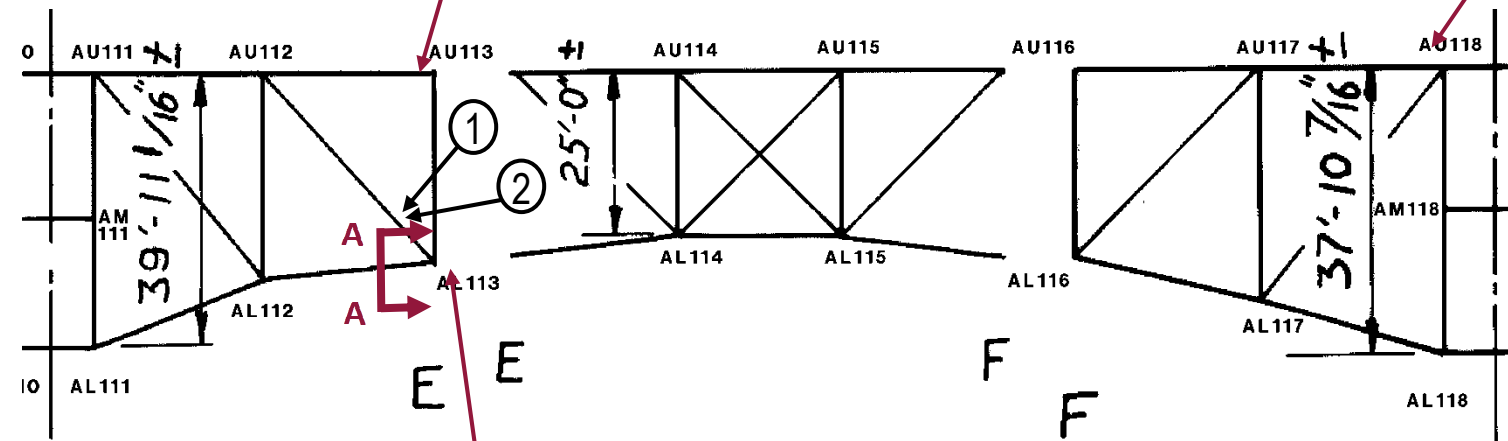




The south exterior web plate of AL113-AU112 exhibits 1/4" deep pitting 1" tall along the interface with the lower chord gusset plate.

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.

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.



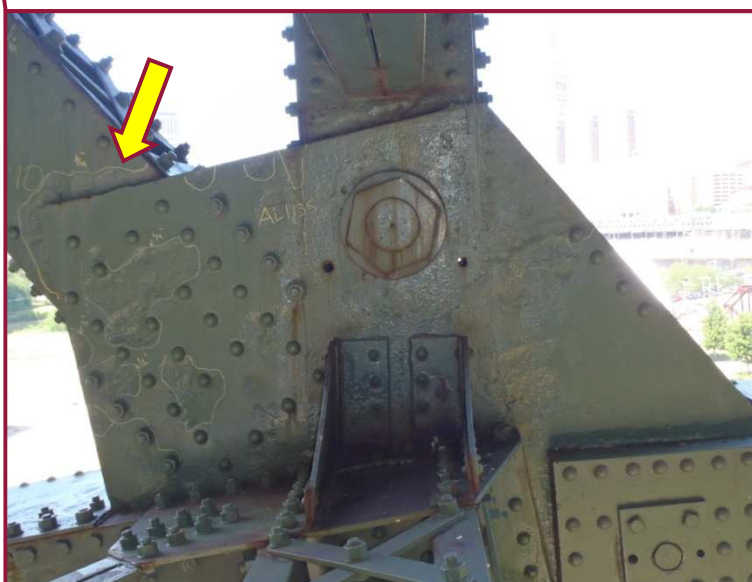
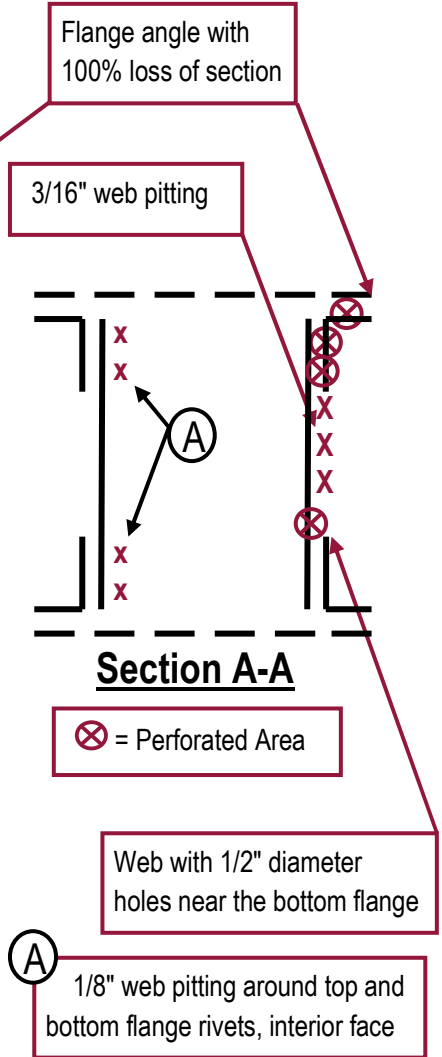
**SPAN 17
TRUSS A**



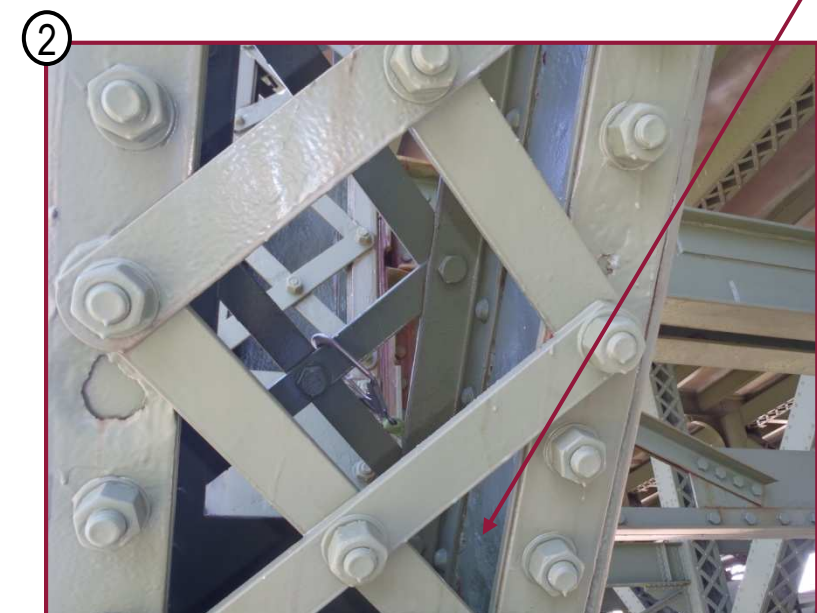
Pitting with active surface rust to the interior south web plate adjacent to gusset plate AL113S



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.



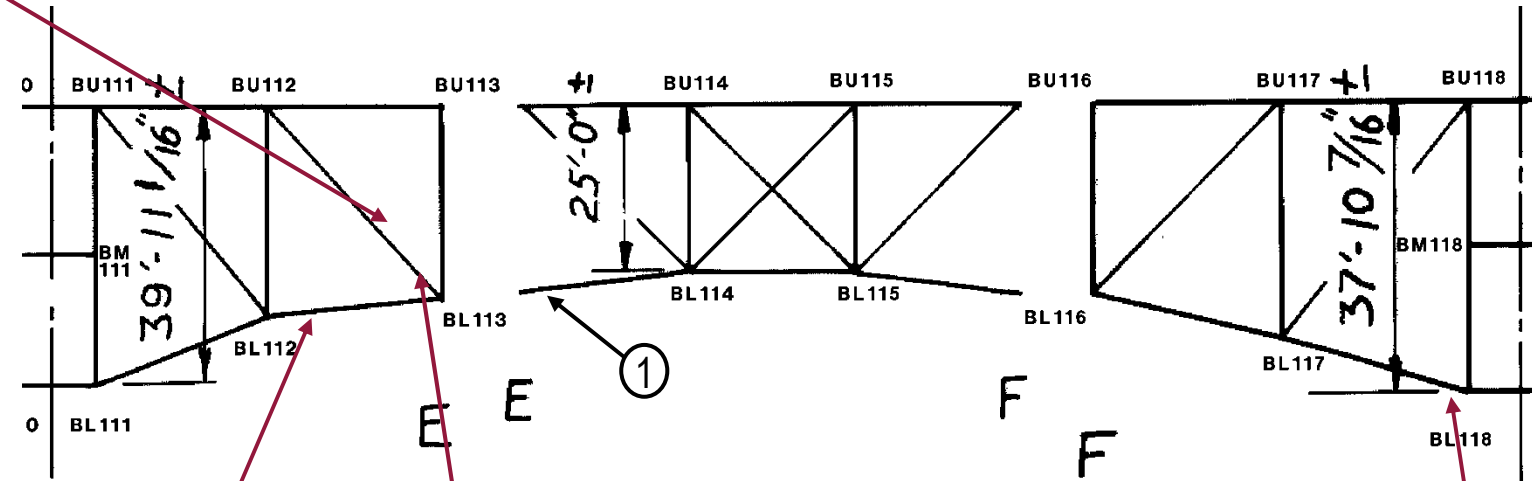
The south face of the south gusset plate at AL113 exhibits widespread heavy loss. The areas highlighted on the plate in yellow exhibit pitting of 1/4" deep or greater. The interior face of the south plate exhibits isolated areas with up to 1/4" loss. Additionally, note the 1/4" deep pitting along the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



The bottom flange angles of member AL113-AU112 exhibit isolated holed through sections up to 2" diameter with new bolted plate retrofits on the inside of the member. The interior faces of both web plates exhibit 1/8" pitting throughout with isolated areas up to 5/16" for the first 3' from the bottom of the member.



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.

Up to 1/4" pitting on the north bottom flange angle near BL112

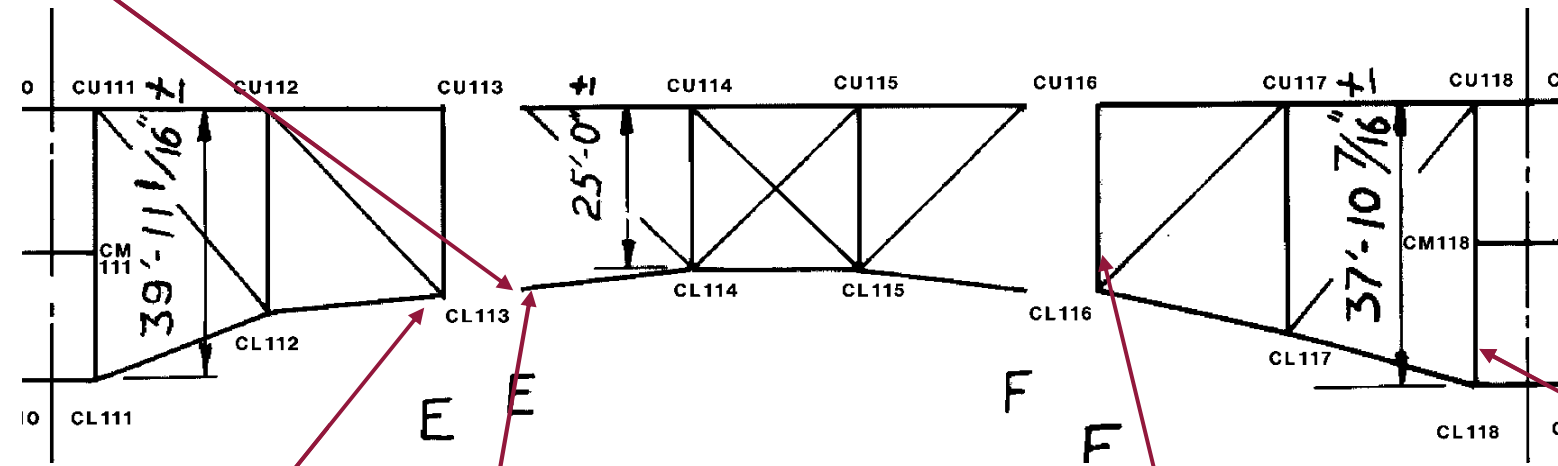


The north gusset plate at BL113 exhibits localized pitting up to 1/4" deep. The areas outlined on the plate are representative of typical losses at pinned gusset plates throughout the structure (Photo taken 2010).

1/4" pitting to top and bottom lower lateral bracing connection plates



hole in the
t the bottom



CL118 is
to pack

al web

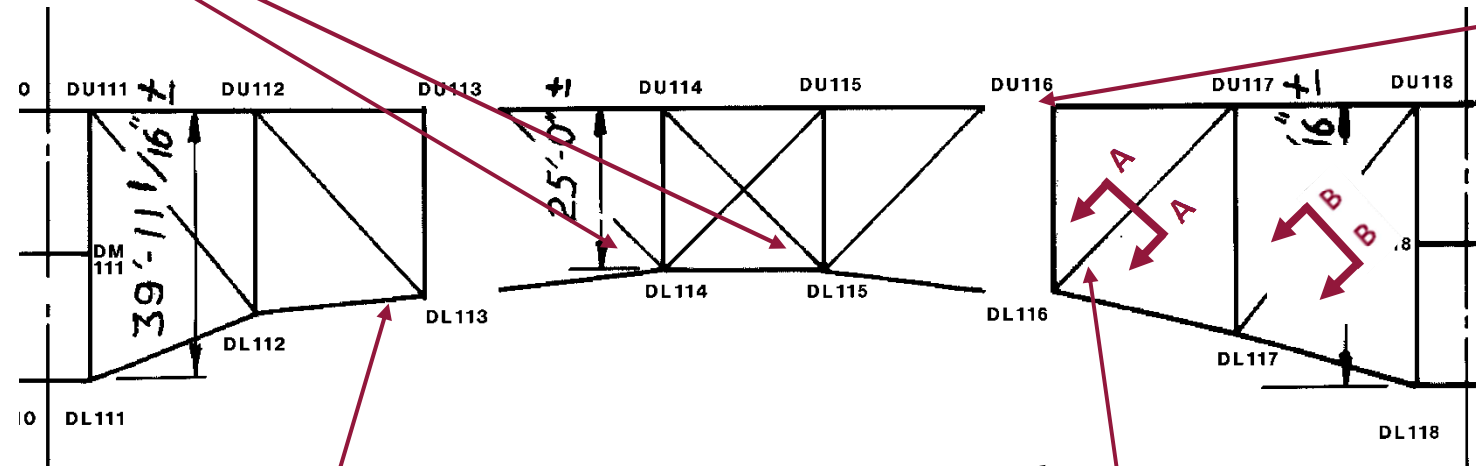
4" diameter holed through section in
bottom cover plate



hibits heavy pitting throughout
reas isolated among the more
deepest pitting is found along
lower chord top flanges and
(Photo taken 2010).

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

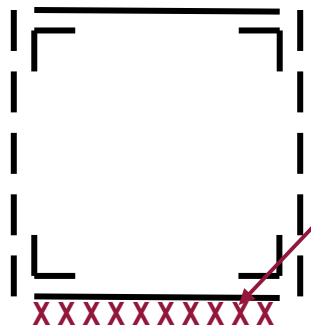
Locations of advanced section loss are isolated throughout Span 17, with isolated flange angles and lacing channels exhibiting small perforations.



**SPAN 17
TRUSS D**

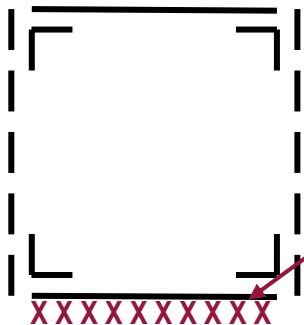


Gusset plate DU116S exhibits 1/4" pitting to the south face around the lower pin. Note the protruding rubber washer at this location.



Section A-A

3/8" pitting x full web height



Section B-B

1/4" pitting x full web height



Member DL112-DL113 exhibits 3/8" pitting for half the height of the north web plate, with 1/8" deep pitting over the remaining height of the section. In addition, the outstanding leg of the bottom flange angle exhibits a 4" diameter hole.

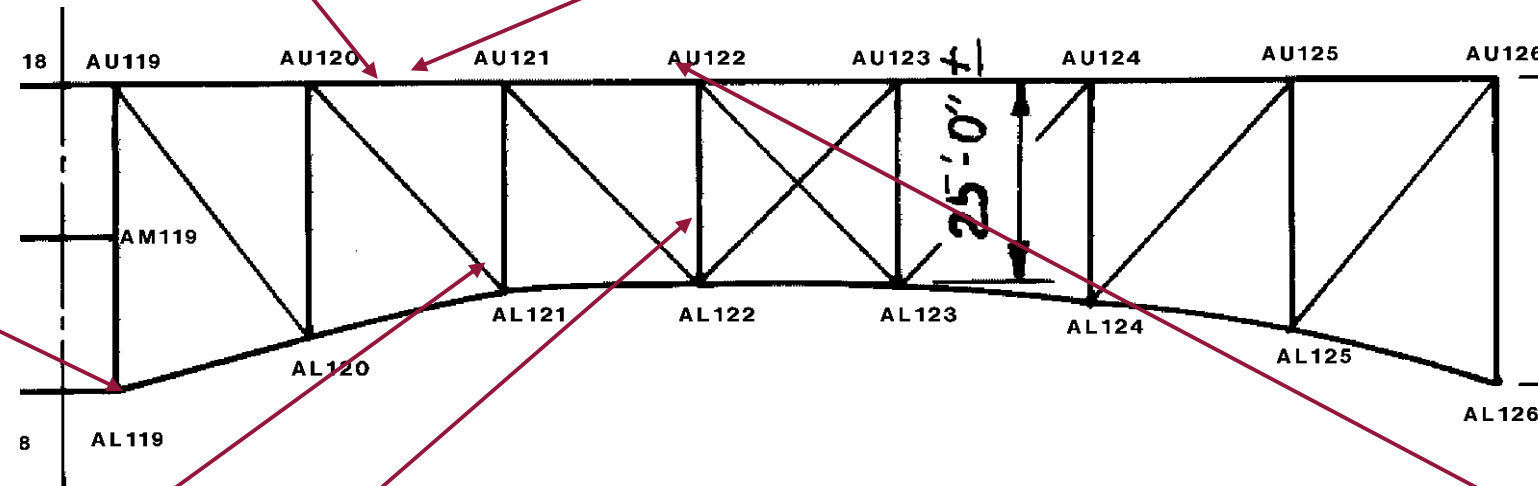


The north web plate of member DL116-DU117 exhibits 3/8" pitting for the full height of the section along the lower chord gusset plate at Panel Point DL116 (see Section A-A).

Abandoned welded appurtenances are present at multiple locations along the north web of AU120-AU121.

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.

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



**SPAN 18
TRUSS A**



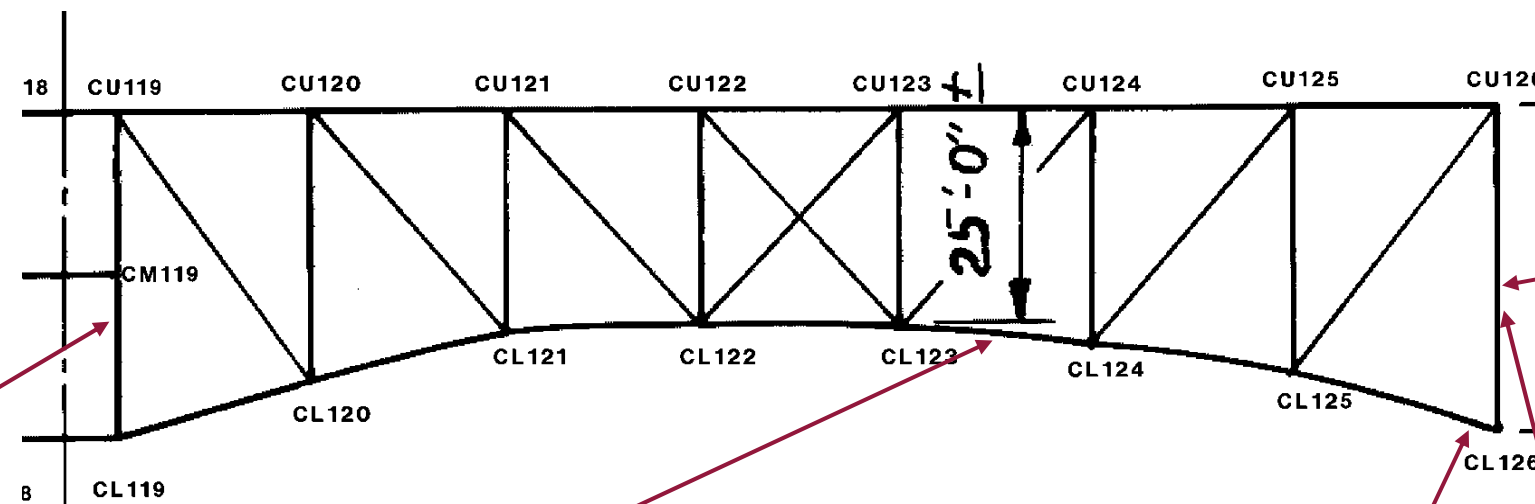
The top batten plate of AL121-AU120 exhibits heavy section loss (cleaned and painted) with isolated locations of paper thin section.



The south web plate of member AL122-AU122 exhibits 1/4" pitting on both sides of the sway brace connection and 3/16" pitting along the bottom of the connection. The north web plate exhibits 1/8" pitting along the full width of the section along the lower chord gusset plate.



The west side of Floorbeam 122 exhibits 1/4" pitting to the top flange and 25% section loss to the bottom flange.



Pack rust up to 1/2" between web plates and flange angles

Pack rust reactivating between web plates and flange angles with rust staining present

**SPAN 18
TRUSS C**

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



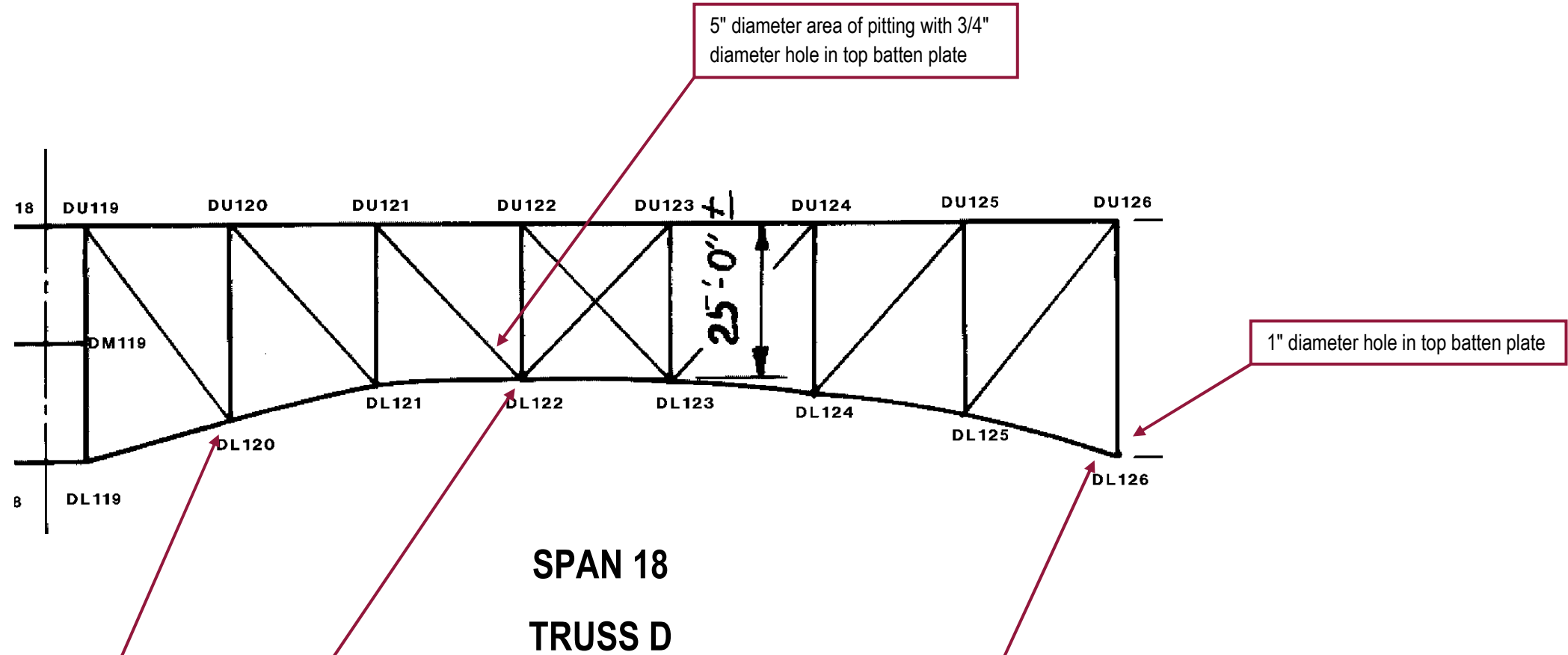
Both web plates of member CL125-CL126 exhibit full height 1/8" pitting along the interface with gusset plates at CL126 (north web plate shown).



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.

Pack rust is reactivating between the web plates and flange angles on all lower chord members east of Panel Point DL121.



The north web plate of member DL119-DL120 exhibits 1/4" pitting over the bottom 1/4 of the height along the gusset plate interface. Pack rust has built up between this web plate and gusset plate DL120N.

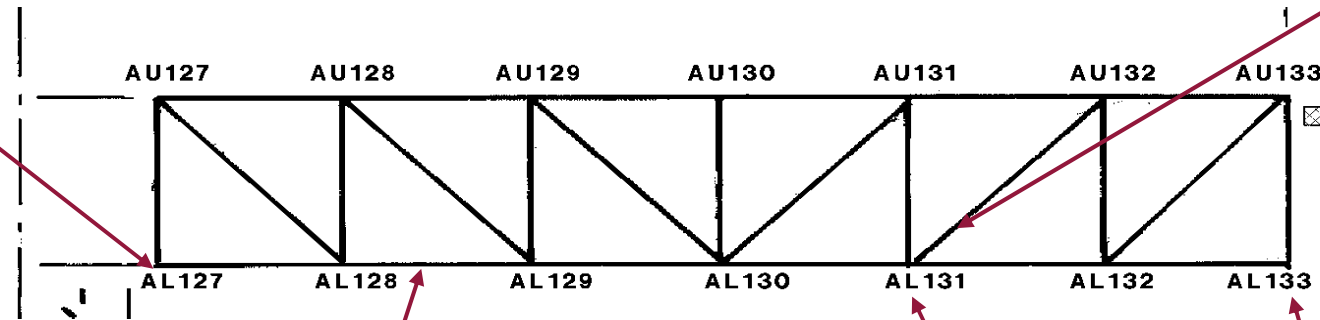
Bottom corner of splice plate bent outward 3/4" due to pack rust



Member DL125-DL126 exhibits 3/16" pitting for the full height of the south web plate along the interface of gusset plate DL126S.



The truss bearing at AL127 exhibits impacted rust up to 5/8" between the gusset plates and bearing casting (north side shown).



**SPAN 20
TRUSS A**



Member AL131-AU132 exhibits 1/4" pitting for the full width of the north top flange horizontal angle leg adjacent to the cover plate.



Abandoned bolted connections to the interior south web plate of AL128-AL129



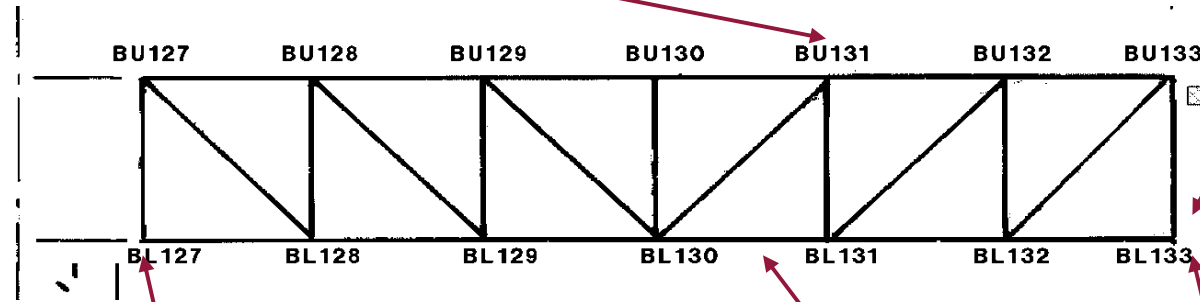
The north face of gusset plate AL113S exhibits 1/4" pitting along the top of the diagonal 24" long by 5" high. This gusset plate also exhibits pitting up to 1/4" between the lower chord rivets. Also note the area of 100% section loss at the base of the diagonal member cover plate.



The bearing components at AL131 exhibit 1/8" pitting and activating surface rust throughout. The east side of the bearing contained standing water at the time of the inspection with moderate to heavy rusting in this area.



Floorbeam 131 bottom flange exhibits 1/16" pitting (cleaned and painted) for the full width.



**SPAN 20
TRUSS B**



The south web plate of member BL133-BU133 exhibits 1/16" pitting for the full width of the section with isolated 1/8" pitting (cleaned and painted) adjacent to the lower gusset plate.



The truss bearing at BL127 exhibits impacted rust between gusset plate BL127N and the bearing casting.



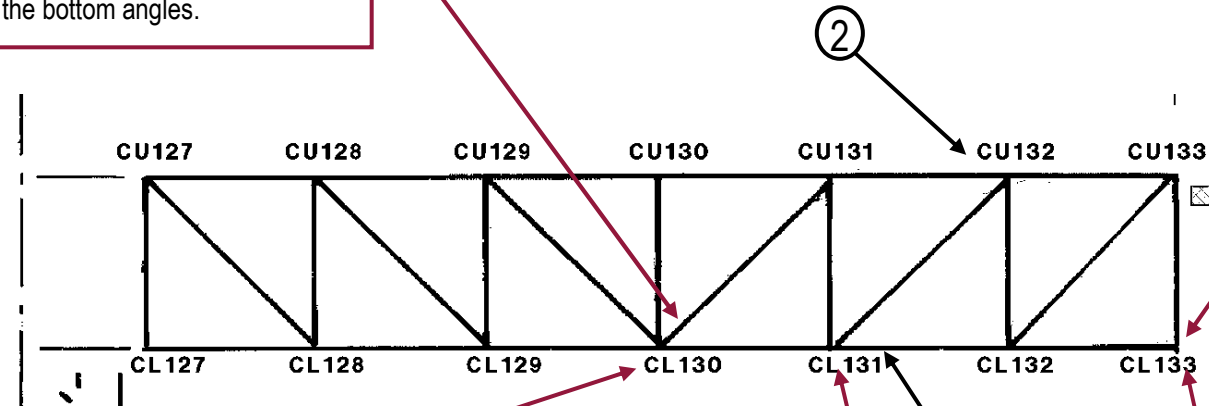
Lower chord BL130-BL131 exhibits extensive areas of peeling paint.

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 north top flange angle of CL131-CL132 exhibits a 3" diameter area of section loss up to 100%, including one 3" diameter hole, in the outstanding leg. Also note the heavy pack rust between the flange angle and lacing bar.

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**

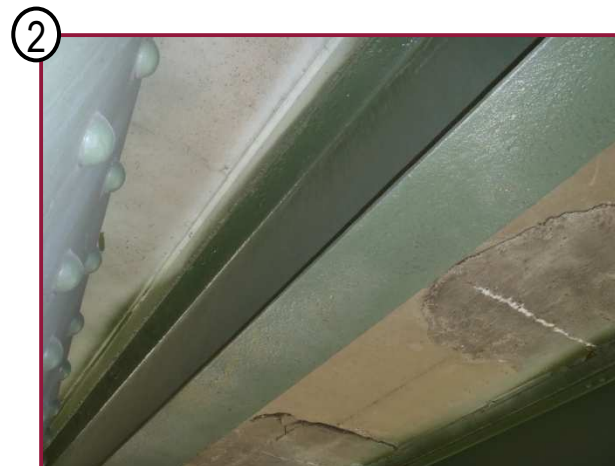
The lateral bracing connection plate/bottom cover plate at CL130 is bowed due to active pack rust up to 1" thick.

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



The bottom cover plate at CL133 exhibits a 12" long by 3" wide area with up to 100% section loss.

The fence support angle weld to the south gusset plate of CL133 is broken with no distress noted in the gusset plate base metal.



The Stringer 11 bottom flange exhibits pitting up to 1/8" between Panel Points CU131 and CU132.

APPENDIX D

Gusset Plate Section Losses



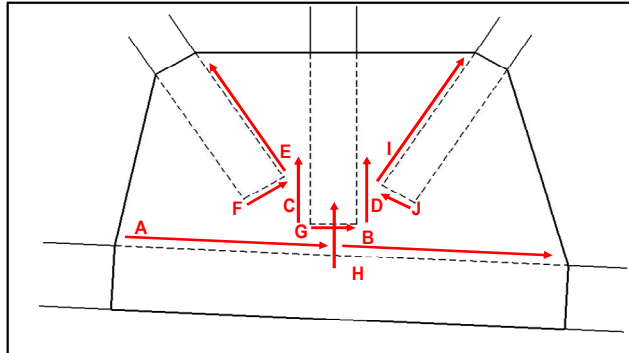
Italic Values are from Visual Inspection

Truss A																	
Measurement (Average % Loss)																	
Gusset Plate	A		B		H		C		D		E		F		G		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
12115N					5.5	10.65											
12116N							17.3	26.75									
12118N	25.0	12.00	25.0	12.00													3/16" pitting along A and B
12119N	20.0	15.00					40.0	12.00	40.0	12.00					40.0	18.00	1/8" pitting along A. 1/4" pitting along G and lower 12" of C and D
12120N	16.8	22.85					15.0	1.10									
11012S							33.3	24.00	33.3	24.00							1/4" pitting along lower half of C and D (surrounding pin)
11097S							33.3	18.00	33.3	18.00							Up to 1/4" pitting along lower half of C and D (surrounding pin)
11100S	8.3	12.00	8.3	48.00	8.3	6.00	16.7	18.00	16.7	18.00	8.3	12.00	8.3	24.00	8.3	6.00	1/16" pitting throughout plate with 1/8" pitting around lower half of C and D (surrounding pin)
11113S							33.3	24.00	33.3	24.00							1/4" pitting lower half of C and D (surrounding pin) and isolated 1/4" pitting on interior of plate
11116S	8.3	50.00	8.3	36.00	8.3	6.00	8.3	36.00	8.3	36.00	8.3	16.00	8.3	32.00	8.3	6.00	1/16" pitting throughout
12001S			40.0	24.00									40.0	12.00			1/4" pitting along B and under diagonal (opposite E). 1/4" pitting along bottom 12" of F.
12002S			40.0	6.00													1/4" pitting along end 6" of B.
12003S							40.0	10.00									1/4" pitting along top 6" of C.
12005S	40.0	42.00	40.0	24.00			40.0	12.00	20.0	12.00					40.0	14.00	1/4" pitting along A, B and G. 1/4" pitting along bottom 12" of C. 1/8" pitting along bottom 12" of D. 1/4" pitting along bottom 24" below diagonal (opposite of E)
12006S	16.7	43.25	21.3	19.50													
12007S	23.8	51.80	17.8	16.80			16.8	35.15									
12009S			16.7	24.00													1/8" pitting along B and opposite of B
12010S	21.0	16.95	15.3	37.60			32.8	9.75							24.7	32.55	
12011S	15.1	59.65	15.1												15.1	20.00	B and G scan data similar to A
12012S	16.7	24.00	16.7	60.00			13.9	48.00	33.3	24.00	25.0	18.00			16.7	6.00	7/16" remaining along C, up to 1/4" pitting along half D, 3/16" pitting isolated along E, 1/8" with 3/16" along G, 1/8" pitting along A and B, 1/4" pitting isolated throughout plate
12013S	10.5	13.70	17.2	45.15													
12014S	22.7	24.05	15.3	22.30													
12015S	12.0	32.10	13.0	19.65													
12016S	19.2	46.35	19.3	26.70			23.4	23.20	27.3	4.95							
12017S	16.7	48.00	16.7	36.00			16.7	12.00	50.0	12.00	16.7	12.00					1/8" pitting along A and B, 1/8" pitting along upper thirds of C, 3/8" pitting along upper third of D, 1/8" pitting along half of E, 1/8" with isolated 1/4" pitting along tension plane of chords
12019S	21.7	58.90	15.5	9.50													
12020S	18.5	45.40	16.2	12.30													J scan 8" east of the west edge has 14.5% loss over 18.5" length, 27.19% loss in 2.5" dip scanned vertically
12022S	11.0	31.10	11.5	32.45													
12023S	13.1	33.80	14.9	46.50					22.7	20.55							
12025S	21.7	13.10	14.6	29.20											21.7	15.00	G scan similar to A scan
12027S	12.0	50.25	19.0	15.15													
12028S			21.7	19.45													
12029S	11.9	55.40	15.0	24.40									26.8	14.80	16.1	24.05	
12030S	13.4	49.10															
12033S	17.7	17.65	13.8	59.95													
12034S	11.2	59.95	11.2	24.00													B scan similar to A scan
12035S	25.0	36.00	16.7	40.00			12.5	24.00	12.5	24.00	16.7	12.00					3/16" with isolated 1/4" pitting along A, 1/8" pitting along B, 3/16" pitting along upper half of C and D, 1/8" with isolated 3/16" pitting along E, 1/8" pitting along tension plane for both chords, 6" diameter 1/4" deep pits throughout left half, isolated 1/8" pitting along both free edges
12036S	10.7	12.70	10.8	59.95													
12037S			13.5	59.95											28.2	1.85	



Italic Values are from Visual Inspection

Truss A																	
Measurement (Average % Loss)																	
Gusset Plate	A		B		H		C		D		E		F		G		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
12107S			20.0	3.00													1/8" pitting along B for first 3"
12108S	10.0	30.00	10.0	20.00	10.0	6.00	10.0	30.00	10.0	30.00	10.0	20.00	10.0	15.00	10.0	6.00	1/16" pitting throughout exterior of plate
12109S	12.0	31.70															7/16" remaining along A at edge of plate (scan accurate)
12112S	17.9	34.30			21.8	4.75											
12113S			16.7	36.00			25.0	36.00	25.0	36.00	66.7	2.00					1/8" pitting along B, 1/2" pitting for 2" near edge along E, 1/4" pitting along upper half and 1/8" pitting for remaining portion of C and D. 1/2" pitting under diagonal (opposite of E)
12114S			17.4	34.40	9.7	13.05											
12115S	14.6	35.95			14.1	4.45									20.0	4.00	1/8" pitting along G over 4"
12116S									33.3	32.00	23.4	15.05					1/4" pitting over 12" along D, 1/4" pitting over 6" along E then 1/8" pitting over 8"
12117S	12.6	35.95											10.0	18.00	10.0	9.00	Scan accurate, 1/8" pitting under half of G, 1/16" pitting along full width of F
12118S									25.0	24.00							3/16" pitting along top 24" of D
12119S	50.0	15.00	33.3	12.00			16.7	14.00	33.3	12.00							3/8" remaining along A and below lower chord opposite of B. 1/8" pitting along C. 1/4" pitting with 1" hole along last 12" of B. 1/4" pitting along top 12" of D.
12120S	20.2	9.80	20.4	26.10						19.9	4.90						
12121S	9.8	4.15	10.1	31.90			15.8	2.80									
12122S	16.5	29.85	24.8	29.90													
12123S	12.4	31.15	16.0	16.70					25.1	3.20							
12125S									9.1	1.45							
12131S											40.0	24.00					1/4" pitting along E for 24"



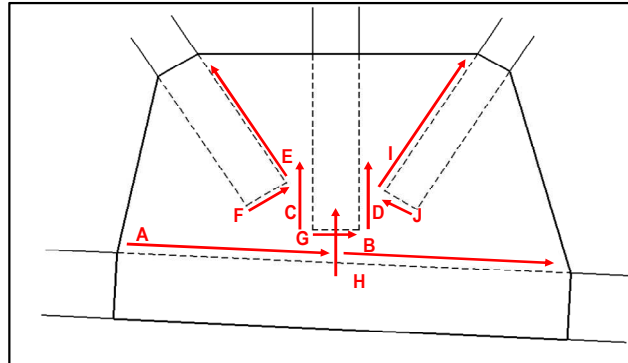
Italic> Values are from Visual Inspection

Truss B																	
Measurement (Average % Loss)																	
Gusset Plate	A		B		H		C		D		E		F		G		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
21012N							16.7	32.00	16.7	32.00							Isolated 1/8" pitting along 2/3 length of C and D (surrounding pin)
21078N							16.7	24.00	16.7	24.00							1/8" pitting along lower half of C and D (surrounding pin)
21113N							8.3	24.00	8.3	24.00							1/16" pitting along lower half of C and D (surrounding pin)
22003N					2.2	23.60											
22004N					3.4	7.55											
22005N	22.9	20.15	14.6	39.30	28.0	4.95					20.0	3.00					1/8" pitting for 3" along E
22006N			11.3	42.95					15.7	1.55							
22012N	25.0	60.00	33.3	30.00			16.7	48.00	16.7	48.00	16.7	54.00	25.0	18.00	25.0	6.00	1/8" and 1/4" pitting along A, 1/4" pitting along B, 1/16" and 1/8" pitting along C and D, 1/8" pitting along E, 3/16" along F, 3/16" and 1/4" pitting along G, isolated 1/8" and 1/4" pitting on vertical free edge
22014N	21.3	28.35	20.7	24.35					13.6	12.10							
22015N	8.1	21.50	6.8	31.90			17.8	2.10									
22016N	12.1	26.85	12.6	41.45													
22017N	25.0	22.00					16.7	48.00	16.7	24.00			8.3	48.00	25.0	6.00	3/16" pitting along a third of A, 1/8" pitting along C, 1/8" pitting along half of D, 1/16" pitting along a third of F, 3/16" pitting along half of G, 1/8" pitting along tension plane left chord
22018N	40.0	40.00	40.0	52.00									40.0	12.00	40.0	20.00	1/4" pitting along A, B, G, and bottom 12" of F
22023N	20.0	52.00	20.0	48.00													1/8" pitting along A and B
22024N	15.9	46.70	6.2	41.60													
22025N	10.2	41.70					7.1	24.45									
22026N	8.6	28.40							8.0	16.60							
22027N	15.7	21.60	23.0	46.55			29.9	8.25	17.4	2.10							
22028N			15.0	12.50													
22035N	16.7	17.00	16.7	15.00			16.7	24.00	16.7	24.00	8.3	27.00			8.3	6.00	1/8" pitting along half of A, B, C, and D, 1/16" pitting along half of E and G, 1/16" pitting along top free edge, isolated 1/16" pitting on vertical free edge, 1/8" pitting on tension plane right chord
22036N	10.0	54.00	10.0	30.00	10.0	6.00	10.0	42.00	10.0	42.00	10.0	40.00	10.0	16.00	10.0	16.00	Isolated 1/8" pitting over entire surface of plate
22037N	16.1	35.20					18.5	1.65							20.0	14.00	1/8" pitting along G
22038N	18.3	21.65	13.0	20.00			12.5	4.35	11.8	2.50					18.3	12.00	1/8" pitting along G same as A
22039N	10.3	26.35	13.7	33.95			9.3	3.95									
22040N			10.1	49.80			16.8	2.20									
22041N	16.7	18.00	16.7	22.00			16.7	27.00	16.7	27.00	16.7	30.00	16.7	9.00	16.7	6.00	1/8" pitting along half of A, B, C, D, E, F and G, isolated 1/8" pitting along vertical free edge



Italic Values are from Visual Inspection

Truss B																	
Measurement (Average % Loss)																	
Gusset Plate	A		B		H		C		D		E		F		G		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
22042N	13.7	17.05	17.9	48.10			22.9	2.05									
22048N	14.8	13.40					9.8	1.65									
22049N			6.9	25.80													
22051N			5.7	34.95			30.0	18.00	40.0	36.00					10.2	2.15	1/4" pitting along D, 3/16" loss to upper half of C
22052N			8.0	43.30													1/16" pitting along B
22053N	10.3	17.95	16.9	45.00			25.0	2.15									1/4" pitting at beginning of B scan for 6", 3/16" shown at end 6" of A and beginning 6" of C
22058N	16.7	18.00	16.7	24.00			16.7	24.00	16.7	24.00	8.3	22.00	8.3	18.00	8.3	6.00	1/8" pitting along half of A, B, C, and D (surrounding pin), 1/16" pitting along half of E, F, and G, 1/8" pitting along half of tension plane both chords
22059N	4.7	34.00									40.0	6.00			40.0	16.00	1/4" pitting along G, 1/4" pitting along 6" of E
22060N	20.0	20.00	20.0	18.00													1/8" pitting along half length of A and B
22061N	20.0	20.00															1/8" pitting along outer half of A
22062N			7.7	36.80											20.0	15.00	1/8" pitting along G, 25.8% loss over 4.80" along B
22063N	16.7	24.00	16.7	15.00			16.7	24.00	16.7	24.00	16.7	22.00	25.0	8.00			1/8" pitting along half of A, B, C, D, E, and G, 3/16" pitting along half of F, 1/16" pitting along tension plane left chord, 1/8" pitting along tension plane right chord
22064N	20.0	16.00	20.0	16.00													1/8" pitting along half of A and B
22068N	20.0	20.00															1/8" pitting along half of A
22069N	20.0	18.00															1/8" pitting along half of A
22070N	30.0	20.00	30.0	22.00											20.0	14.00	Isolated 3/16" pitting along half length A, Isolated 1/8" pitting along half length of B, 1/8" pitting along G
22071N	23.1	2.30					23.1	2.30									C captures 2" diameter 1/4" pit along end of A
22073N			12.3	17.85											20.0	17.00	1/8" pitting along B for 5" and full length of G
22074N			20.0	24.00													1/8" pitting along half the length of B
22077N			20.0	16.00													1/8" pitting along B
22078N	16.7	18.00	16.7	36.00			16.7	48.00	16.7	48.00	16.7	22.00			16.7	6.00	1/8" pitting along half of A, E, and G, 1/8" pitting along B, C, and D
22079N	8.0	43.55	9.0	15.30					15.9	25.05							
22083N	16.7	40.00	16.7	36.00			8.3	20.00	8.3	20.00							1/16" pitting along half of C and D, 1/8" pitting along A and B
22088N	7.8	29.50															
22090N	15.3	33.75	14.9	36.70					17.2	1.35					14.9	14.00	G scan similar to B
22092N	17.2	13.55	29.7	32.40			17.5	1.10							17.2	18.00	G scan similar to A
22096N			11.1	20.90					19.0	2.70	9.0	6.75					
22097N							16.7	36.00	16.7	18.00							1/8" pitting along C, 1/8" pitting along half of D, 1/16" pitting along tension plane both chords
22098N	13.6	23.40															
22100N			16.7	16.00					8.3	18.00					25.0	6.00	1/8" pitting along half of B, 1/16" pitting along half of D, 3/16" pitting along half of G
22101N	8.8	7.90															
22109N	9.7	9.30	14.1	16.50	10.0	6.00	10.0	40.00	10.0	40.00	10.0	24.00	10.0	18.00	10.0	18.00	1/16" pitting throughout north face
22112N	18.4	37.20	11.5	6.95													
22113N	16.7	16.00					16.7	18.00	16.7	18.00	33.3	8.00					1/8" pitting along half of A, C, and D, 1/4" pitting along half of E
22114N	12.8	27.65															
22115N	12.2	12.95													30.0	14.00	3/16" pitting along G
22116N							8.3	18.00	8.3	18.00							1/16" pitting along half of C and D, 1/4" pitting along tension plane right chord
22119N	20.0	20.00					20.0	20.00									1/8" pitting along A and half of C
22120N	20.4	38.10															1/4" pit along A for 18"
22122N	9.2	29.90															
22126N	9.9	8.75															
21017S							16.7	24.00	16.7	24.00							1/8" pitting along bottom 24" of C and D (surrounding pin)
21035S			8.3	32.00			16.7	24.00	16.7	24.00							1/8" pitting along bottom 24" of C and D (surrounding pin). 1/16" pitting along B



Italic Values are from Visual Inspection

Truss C																			
Measurement (Average % Loss)																			
Gusset Plate	A		B		H		C		D		E		F		G		J		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
31017N	8.3	50.00					16.7	24.00	16.7	24.00									1/8" pitting along bottom 24" of C and D (surrounding pin). 1/16" pitting along A
31035N	8.3	50.00	8.3	68.00			16.7	24.00	16.7	24.00					8.3	12.00			1/8" pitting along bottom 24" of C and D (surrounding pin). 1/16" pitting along A, B and G.
31078N	8.3	50.00	8.3	50.00	8.3	6.00	8.3	48.00	8.3	48.00	8.3	45.00	8.3	15.00	8.3	12.00			1/16" pitting throughout plate surface
31097N							8.3	24.00	8.3	24.00									1/16" pitting to bottom 24" of C and D (surrounding pin)
31100N							8.3	24.00	8.3	24.00									1/16" pitting to bottom 24" of C and D (surrounding pin)
31113N							8.3	24.00	8.3	24.00									1/16" pitting to bottom 24" of C and D (surrounding pin)
32002N										50.0	0.75								
32003N							10.6	1.80	9.9	4.20									
32004N			6.9	38.10															
32005N	18.6	18.40							20.0	11.40									
32006N							5.0	11.45											
32010N														10.0	18.00				1/16" pitting along G
32012N	16.7	27.00	25.0	18.00			16.7	24.00	8.3	24.00	50.0	50.00	25.0	18.00					1/8" pitting along half of A and D, 3/16" and 1/4" pitting along half of B and C, 3/8" pitting along E, 3/16" pitting along F, 1/8" along partial vertical free edge
32013N	10.8	43.50					8.0	12.20			8.3	39.95							
32014N																	16.6	21.20	
32015N	9.4	25.25	14.2	30.80					12.7	4.30									
32016N	20.0	32.00					18.6	5.75											1/8" pitting along A
32017N	8.3	36.00																	1/16" pitting along A
32024N									12.1	2.15									
32025N														20.0	16.00				1/8" pitting along G
32027N			11.5	22.10			20.3	5.00						17.2	16.00				B loss similar to loss under vertical not able to be scanned
32028N	7.1	31.40																	
32033N	20.3	39.40																	
32035N	33.3	20.00	16.7	15.00			8.3	24.00	8.3	24.00	8.3	25.00							1/4" pitting along half of A, 1/8" pitting along half of B, D, and E, 1/16" pitting along half of C, 3/16" pitting along tension plane both chords
32036N	20.3	47.30	15.8	7.35			11.2	3.00	9.9	3.45									
32037N			17.1	12.45					12.8	1.80					17.1	14.00			Loss along G similar to loss along B



Italic Values are from Visual Inspection

Truss C																			
Measurement (Average % Loss)																			
Gusset Plate	A		B		H		C		D		E		F		G		J		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
32017S	16.7	54.00					8.3	24.00			8.3	27.00			8.3	6.00			1/8" pitting along A, 1/16" pitting along half of C, E, and G, 3/16" pitting along tension plane right chord, 1/8" pitting along half of tension plane left chord
32027S			17.0	44.15					9.6	17.80									
32033S	11.3	52.70	11.5	39.00															
32035S	16.7	32.00	16.7	23.00			33.3	24.00	16.7	24.00	16.7	24.00	8.3	8.00	16.7	6.00			1/8" pitting along A, 1/8" pitting along half of B, D, E, and F, 1/4" along half of C, 1/16" pitting along G and tension plane left chord, 1/8" pitting along vertical free edge
32036S									14.8	43.50									
32041S	8.3	27.00	16.7	24.00			8.3	24.00	25.0	24.00	16.7	30.00							1/16" pitting along half of A and C, 1/8" pitting along half of B, E and tension plane right chord, 3/16" pitting along half of D
32047S	10.0	36.00	10.0	60.00															1/16" pitting along A and B
32053S	20.0	54.00	20.0	36.00															1/8" pitting along A and B
32058S	8.3	27.00					33.3	24.00	16.7	24.00			8.3	9.00	8.3	6.00			1/16" pitting along half of A, F, and G, 1/4" pitting along half of C, 1/8" pitting along half of D and tension plane left chord
32063S			25.0	48.00			8.3	24.00	8.3	24.00	8.3	27.00			8.3	6.00			3/16" pitting along B, 1/16" pitting along half of C, D, E, and G, 3/16" pitting along tension plane both lower chord members
32070S			53.7	16.25															Lamellar tear on west free edge for 16". 1/4" remaining along B for 16", 1/4" remaining along west free edge, 1/4" remaining opposite of I, T scan has 55.51% loss for 10.3" along west free edge
32072S									14.5	2.25									
32073S			12.0	10.55															
32078S	25.0	48.00					25.0	48.00	16.7	24.00	16.7	42.00			25.0	6.00			3/16" pitting along A and C, 1/8" pitting along half of D, 1/8" pitting along E, 3/16" pitting along half of G, 1/8" pitting along tension plane right chord
32079S			14.7	34.75															
32082S			13.0	10.40											13.0	16.00			A loss continues under vertical both plates
32089S													20.0	16.00					1/8" loss along F
32091S									11.4	0.55									
32092S	20.0	36.00	20.0	30.00															1/8" pitting along A and B
32096S	10.7	27.25	7.2	38.70															
32097S	16.7	42.00	16.7	36.00			16.7	24.00	33.3	24.00	8.3	16.00			16.7	6.00			1/8" pitting along A and B, 1/8" pitting along half of C, 1/4" pitting along half of D, 3/8" pitting along half of E, 3/16" pitting along G, 3/16" pitting along tension plane right chord
32098S			14.7	18.90					18.0	0.95									
32100S									8.3	18.00									
32112S							21.2	0.60											1/16" pitting along half of D
32113S			16.7	36.00			16.7	18.00	33.3	18.00	16.7	16.00	16.7	16.00	16.7	6.00			1/8" pitting along B, F, and top free edge, 1/8" pitting along half of C, E, and G, 1/4" pitting along half of D
32114S			21.6	33.85					26.6	3.10									
32118S	20.0	24.00	10.0	18.00	10.0	6.00	10.0	24.00	10.0	24.00					10.0	20.00			1/8" pitting along A. 1/16" pitting throughout south face



Italic Values are from Visual Inspection

Truss D																			
Measurement (Average % Loss)																			
Gusset Plate	A		B		H		C		D		E		F		G		I		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
42030N	16.4	15.95	24.0	53.90									20.8	8.00					
42033N	23.2	59.95	14.9	18.55			21.3	2.20											
42034N	19.4	19.00	26.1	38.85															
42035N	16.7	45.00	16.7	40.00			16.7	60.00	16.7	30.00			16.7	50.00	16.7	6.00			1/8" pitting along A, B, C, F, and G. 1/8" pitting along lower chord tension planes. 1/8" pitting along top half of D.
42036N	25.3	43.10																	
42037N	10.3	25.10	30.0	48.00			17.5	5.40			20.0	32.00							3/16" pitting along B, 1/8" pitting along E
42038N	16.3	25.80	17.2	18.05					16.8	2.10									
42039N	12.7	11.10	26.1	11.00															
42040N	10.6	19.25																	
42041N	16.7	40.00			16.7	6.00	16.7	12.00	16.7	12.00	16.7	48.00							1/8" pitting along A, B, H, and E. 1/8" pitting along top 12" of C and D. 1/8" pitting along lower chord tension planes.
42042N	15.4	14.05	10.0	50.00	10.0	6.00	10.0	12.00	10.0	12.00	10.0	48.00	10.0	18.00	10.0	18.00			Up to 1/16" pitting throughout plate
42043N			20.7	13.00															
42046N	20.8	26.70					29.6	10.90											
42047N	9.2	29.05	8.4	30.80															
42048N	24.3	18.75	22.1	8.95															
42049N	19.6	35.45	20.7	14.90															
42051N	17.4	13.00																	
42053N	14.6	14.05	25.9	22.60															
42054N	15.2	15.00	19.2	42.40															
42057N	8.5	59.95																	
42058N	13.2	30.35	18.3	23.95			16.7	24.00	16.7	24.00	16.7	45.00	16.7	18.00					1/8" pitting along E, F, and top 24" of C and D. 30.1% loss for 2.90" height along west free edge
42059N	20.0	50.00					40.0	24.00			40.0	6.00	40.0	6.00					Isolated 1/4" pitting along C, E and F for approximately 6". Up to 1/8" pitting along A
42060N	14.1	26.80	17.1	21.50							40.0	3.00							1/4" pitting for 3" along E with isolated 1/16"
42061N	17.3	18.95	15.8	23.75			10.0	6.00											Isolated 1/16" pitting along C
42062N	16.2	12.60	13.9	27.85															
42064N	10.5	43.05	23.8	21.75															
42067N	22.0	48.55	16.2	18.15															
42068N	14.9	24.85																	
42069N	22.1	29.05	21.2	21.90			11.6	17.05	9.7	26.90	20.0	24.00							Up to 5/16" pit along A for 3", last 8" of B scan with 1/4" remaining, up to 1/8" for 24" along
42070N	17.8	18.95	13.4	28.15															Up to 1/4" pitting along A for 4"
42071N	14.4	25.70	14.1	33.10															1" area at end of B with 1/4" remaining
42072N	13.8	22.90																	
42073N			14.0	59.95															
42074N	12.0	14.35																	
42077N	13.0	47.95	18.2	25.55															
42078N	16.7	48.00	8.3	36.00			16.7	24.00	16.7	24.00	16.7	43.00	33.3	18.00					1/8" pitting along A and associated tension plane. 1/16" pitting along B. 1/8" pitting along E and top 24" of C and D. 1/4" pitting along F
42079N	17.6	34.90	11.5	15.75											11.5	16.00			3/8" remaining for 12" long along A, G same as scan B, isolated pitting throughout diagonal rivets
42080N	11.4	22.35	10.5	15.35															3/8" pitting along A for 5"
42081N	16.5	18.00	10.2	26.05															1/4" pitting for first 3" of A



Italic Values are from Visual Inspection

Truss D																			
Measurement (Average % Loss)																			
Gusset Plate	A		B		H		C		D		E		F		G		I		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
42082N	11.3	10.55	10.9	31.65															
42083N	8.3	40.00	13.5	23.00			16.7	24.00	16.7	24.00					13.5	6.00			1/16" pitting along A. 1/8" pitting top 24" along C and D. G scan similar to B
42084N	19.0	12.85	16.0	42.25											19.0	20.00			G scan similar to A
42087N	19.8	41.10	16.1	13.60											16.1	20.00			G scan similar to B
42088N	18.8	16.65	13.6	16.50											13.6	20.00			G scan similar to B
42089N	9.0	22.25	32.8	8.00											32.8	16.00			G scan similar to B
42090N	14.8	19.35	11.4	16.10															
42091N			18.6	29.25															
42092N	11.0	6.60	12.2	29.85											11.0	18.00			G scan similar to A
42093N	21.6	40.55													21.6	20.00			G scan similar to A
42096N			14.0	8.15									18.6	20.20					
42097N	16.7	36.00	16.7	45.00			16.7	45.00	16.7	45.00			16.7	25.00					1/8" pitting along A, B, C, D, F and lower chord tension planes. 1/8" pitting below diagonal (opposite of E)
42098N	11.3	35.15																	
42099N	5.0	12.95																	
42100N	25.0	30.00	17.5	25.80			33.3	36.00											3/16" pitting along A. 1/4" pitting along C
42101N	9.7	7.15	8.5	36.80										9.7	18.00				G scan similar to A
42104N	50.0	24.00	9.6	6.90															5/16" pitting along A
42105N	20.0	30.00	20.0	20.00															1/8" pitting along A and B
42106N	12.5	30.00	12.5	14.15															A scan similar to B
42107N	20.0	36.00	20.0	32.00															1/8" pitting along A and B
42108N	13.0	8.85	14.2	30.95															
42109N							16.4	19.15											
42112N	10.5	36.85	13.0	9.40					13.6	3.65									
42113N	50.0	36.00	41.7	36.00			58.3	36.00	66.7	36.00	50.0	32.00	50.0	16.00					7/16" pitting along C. 3/8" pitting along E and F. 1/2" pitting along D. 7/16" pitting along first 12" of B, 3/16" along remainder of B and 3/8" pitting along A. 1/2" pitting under diagonal, opposite of E.
42114N	16.3	19.15	18.3	20.15			27.3	6.25	36.6	5.10									Two 3" diameter spots of 1/4" pitting in B scan, 5/16" pitting in middle of D scan for 4"
42115N	40.0	32.00	18.5	19.50			23.5	6.85	37.9	3.00									Area of 5/16" pitting in D scan. 1/4" pitting along A and first half under diagonal (opposite of J)
42116N	16.7	40.00	25.0	36.00			33.8	24.00	33.8	24.00	41.7	32.00	25.0	16.00					3/16" pitting along B, 1/8" pitting along A. 1/2" pitting along top 12" of C and D and 3/16" pitting for the 12" below. 5/16" pitting along E. 3/16" pitting along F. 1/8" pitting under diagonal opposite of E.
42117N	9.1	8.10	10.4	27.10															
42118N	40.0	18.00	40.0	18.00			40.0	20.00	40.0	17.00									1/4" pitting along A, B, C, D
42119N			30.0	18.00															3/16" pitting along B
42120N	28.9	32.45	27.3	10.45			24.0	2.15											
42121N			19.4	10.85					21.2	1.60									
42122N	14.7	39.95	17.8	21.45			18.1	1.35	20.0	5.00									
42125N									12.1	2.45									
41012S							33.3	12.00	33.3	12.00									1/4" pitting along bottom 12" of C and D (surrounding pin)
41017S							25.0	12.00	25.0	12.00									3/16" pitting along bottom 12" of C and D (surrounding pin)
41035S							8.3	24.00	8.3	24.00									1/16" pitting to bottom half of C and D (surrounding pin)
41041S							8.3	24.00	8.3	24.00									1/16" pitting to bottom half of C and D (surrounding pin)



Italic Values are from Visual Inspection

Truss D																			
Measurement (Average % Loss)																			
Gusset Plate	A		B		H		C		D		E		F		G		I		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
41078S							<i>33.3</i>	24.00	<i>33.3</i>	24.00									1/4" pitting along lower half of C and D (surrounding pin)
41083S							<i>33.3</i>	24.00	<i>33.3</i>	24.00									1/4" pitting along lower half of C and D (surrounding pin)
41097S							<i>33.3</i>	24.00	<i>33.3</i>	24.00									1/4" pitting along lower half of C and D (surrounding pin)
41100S							<i>33.3</i>	24.00	<i>33.3</i>	24.00									1/4" pitting along lower half of C and D (surrounding pin)
41101S									<i>100.0</i>	1.00									Missing rivet/hole, 1" diameter hole along D
41113S							<i>33.3</i>	24.00	<i>33.3</i>	24.00									1/4" pitting along lower half of C and D (surrounding pin)
41116S							<i>33.3</i>	24.00	<i>33.3</i>	24.00									1/4" pitting along lower half of C and D (surrounding pin)
42001S	<i>40.0</i>	25.00																	1/4" pitting along A
42002S	12.8	29.70			8.6	1.45	18.5	5.90			19.0	17.05							1/8" pitting along A
42003S	<i>20.0</i>	<i>36.00</i>	<i>20.0</i>	32.00			<i>7.7</i>	3.35											1/8" pitting along A and B
42004S	9.9	59.90					10.6	3.00											1/8" pitting along end 14" of A
42005S															<i>20.0</i>	14.00			1/8" pitting along G
42006S	12.0	39.20	<i>20.0</i>	36.00															1/8" pitting along B
42012S	<i>25.0</i>	36.00	<i>41.7</i>	56.00			16.7	12.00	16.7	12.00	16.7	54.00							3/16" pitting along A. 5/16" pitting along B with 1" hole. 1/8" pitting along top 12" of C and D (surrounding pin). Isolated 1/8" pitting along E
42013S															<i>20.0</i>	6.00			1/8" pitting along G
42014S			<i>60.0</i>	36.00							<i>60.0</i>	18.00			<i>60.0</i>	14.00	<i>60.0</i>	20.00	3/8" pitting along B, E, G and I.
42015S	<i>20.0</i>	12.00	<i>20.0</i>	12.00											<i>20.0</i>	14.00			1/8" pitting along G and first 12" of A and B past vertical
42016S	<i>40.0</i>	48.00	<i>40.0</i>	36.00											<i>40.0</i>	16.00			3/8" remaining along A. and G. 1/4" remaining along first half of B, 1/8" pitting along outer half.
42017S	<i>25.0</i>	48.00	<i>33.3</i>	48.00			16.7	12.00	16.7	12.00	<i>33.3</i>	24.00							1/4" pitting along B. 3/16" pitting along A. 1/4" pit along E for 24". 1/8" pitting along top 12" of C and D
42018S	<i>20.0</i>	50.00	<i>20.0</i>	32.00															1/8" pitting along A and B
42023S	6.5	41.95			19.6	2.95					<i>20.2</i>	23.05							
42029S									11.3	1.50									
42038S	13.4	9.95	<i>20.0</i>	36.00											<i>20.0</i>	14.00			1/8" pitting along G, and 1/8" pitting along half of A and B
42039S	12.1	23.60					10.2	1.50			19.0	5.10							
42047S	15.1	34.15	7.1	33.25			11.6	2.45											
42051S											<i>20.0</i>	8.00							1/8" pitting along 1/3 length of E
42054S			17.7	16.60															
42057S			7.3	46.05															
42058S	<i>33.3</i>	50.00	16.7	36.00			16.7	24.00	16.7	24.00	<i>25.0</i>	45.00							1/8" pitting along top 24" of C and D. 1/8" pitting along B. 1/4" pitting along A. 3/16" pitting along E
42067S	11.1	28.60	9.7	59.95	16.6	3.00													
42069S																			3/8" pitting along bottom and end of connection to right lower chord
42070S											<i>20.9</i>	13.10							
42072S											13.0	21.50							1/16" pitting along tension plane, bottom chords full height
42073S							12.8	1.90			18.3	17.65							
42074S			6.1	59.95															
42078S	16.7	40.00	16.7	36.00			16.7	24.00	16.7	24.00	16.7	43.00			<i>25.0</i>	6.00			3/16" pitting along G. 1/8" pitting along A, B, E, and lower chord tension planes. 1/8" top 24" of C and D.
42083S							<i>20.8</i>	24.00	8.3	24.00									1/4" pitting along top 12" of C and 1/16" pit for 12" below. 1/16" for top 24" along D
42084S			10.9	16.55															Up to 5/16" pitting along B for 4"
42087S																			1/8" pitting along lower chord tension planes



Italic Values are from Visual Inspection

Truss D																			
Measurement (Average % Loss)																			
Gusset Plate	A		B		H		C		D		E		F		G		I		Highlights
	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	Loss %	Length in.	
42091S			8.5	21.05					21.1	1.55									
42097S	16.7	44.00	8.3	36.00			16.7	40.00	16.7	40.00	16.7	24.00							1/8" pitting along A, C, D, E and lower chord tension planes. 1/16" pitting along B
42100S			33.3	30.00					16.7	36.00									1/4" pitting along B. 1/8" pitting along D
42106S			11.1	8.50															
42108S											12.1	8.25							
42113S	58.3	40.00	50.0	36.00			37.5	36.00	35.4	36.00			41.7	16.00					1/2" pitting for top 12" of D, 3/16" pitting along remainder. 7/16" pitting along A. 3/8" pitting along B. 5/16" pitting along F, half width. 3/8" pitting along top 12" of C, 1/4" pitting along remainder. 5/16" pitting under diagonal, opposite of E. 1/8" pitting along lower chord tension planes.
42116S	25.0	40.00					25.0	12.00			41.7	32.00							3/16" pitting along A and top 12" of C. 5/16" pitting along E.
42118S	50.0	18.00							50.0	20.00									5/16" pitting along A and D

APPENDIX E

BR-86 Bridge Inspection Report

OHIO DEPARTMENT OF TRANSPORTATION

BRIDGE INSPECTION REPORT

1 8 0 1 5 0 3

STRUCTURE FILE NUMBER

CUY

CO

00010

ROUTE

1613

UNIT

YEAR BUILT

1932

DIST 12

BRIDGE TYPE

343

TYPE OF SERVICE

5 7

CUY RIVER VALLEY & FI RR

DECK

1. Floor	3	2. Wearing Surface	1
3. Curbs, Sidewalks & Walkways	1	4. Median	
5. Railing	1	6. Drainage	1
7. Expansion Joints	2	8. SUMMARY	5

SUPERSTRUCTURE

9. Alignment of Members	1	10. Beams/Girders/Slab	1
11. Diaphragms or Cross frames	1	12. Joists/Stringers	2
13. Floorbeams	2	14. Floorbeam Connections	1
15. Verticals	2	16. Diagonals	2
17. End posts		18. Upper Chord	1
19. Lower Chord	3	20. Gusset Plates	3
21. Lateral Bracing	1	22. Sway Bracing	1
23. Portals		24. Bearing Devices	2
25. Arch		26. Arch Columns or Hangers	
27. Spandrel Walls		28. Protective Coating System (PCS)	7
29. Pins/Hangers/Hinges	2	30. Fatigue Prone Detail (E & E')	1
31. Live Load Response (E or S)	S	32. SUMMARY	4

SUBSTRUCTURE

33. Abutments	1	34. Abutment Seats	1
35. Piers	2	36. Pier Seats	1
37. Backwalls	1	38. Wingwalls	1
39. Fenders and Dolphins	4	40. Scour (Insp Type - 1, 2, 3)	3 2
41. Slope Protection		42. SUMMARY	6

CULVERT

43. General		44. Alignment	
45. Shape		46. Seams	
47. Headwall or Endwalls		48. Scour (Insp Type - 1,2,3)	
49. Abutments		50. SUMMARY	

CHANNEL

51. Alignment	2	52. Protection	2
53. Hydraulic Opening	1	54. SUMMARY	6

APPROACHES

55. Pavement	1	56. Approach Slabs	1
57. Guardrail	1	58. Relief Joint	
59. Embankment	1	60. SUMMARY	8

GENERAL


61. Navigation Lights	1	62. Warning Signs	
63. Sign Supports		64. Utilities	3
65. Vertical Clearance (1, 2-change, N)	N	66. General Appraisal & Operational Status	4 A

67. Inspected By, First & Last Name

68. Reviewed By, First & Last Name


Anthony D. Koloze

PE Number


Wesley R. Weir, P.E.

P.E.# 69991

PE Number

Date 12/7/2011

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Date 12/7/2011

69. Survey (1, 0, N)

BRIDGE INSPECTION REPORT

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STRUCTURE FILE NUMBER

CUY
CO00010
ROUTE1613
UNIT

YEAR BUILT 1932

DIST 12

BRIDGE TYPE

343

TYPE OF SERVICE

57

CUY RIVER VALLEY & FI RR

Deck

1. The east cellular unit exhibits one 10' diameter spalled area exhibiting 7 consecutive transverse bars with 100% section loss, as well as spalls with exposed rebar exhibiting minor section loss over 10% of the deck area. The main truss spans deck soffit exhibits spalls with exposed rebar in isolated locations over up to 5% of total deck area, and transverse cracking at 10' spacings with efflorescence. The utility deck underside exhibits widespread spalling due to 1" to 2" thick concrete that was poured below the underside of floorbeam top flanges, which are potential falling hazards over the streets and industrial yard below.
7. Isolated expansion joints exhibit areas of torn neoprene glands.

Superstructure

12. The first interior stringers of the main truss spans exhibit isolated holed through sections and minor pitting (cleaned and painted) on the web and bottom flanges.
15. Moderate section loss (cleaned and painted) noted with isolated locations up to 1/4" due to previous corrosion. Pack rust between web plates and flange angles is beginning to reactivate.
16. Moderate section loss with isolated advanced section loss to web up to 1/4" at gusset plate interface (cleaned and painted).
19. Moderate section loss with isolated areas of advanced loss due to previous corrosion of web plates and rivet heads. Pack rust is beginning to reactivate in several locations, mainly between web plates and top flange angles.
20. Typical moderate section loss up to 10% widespread throughout gusset plates with isolated areas of advanced section loss up to 50%. Isolated average section loss of 20% noted on gusset plates along lower chord members. Gusset plate CL70S exhibits a laminar split on the west free edge below the diagonal, reducing the effective gusset plate thickness to 1/4" remaining.
28. Rust staining over the top coat on truss members primarily beneath leaking joints.
29. Pins exhibit pack rust between web plates and gusset plates which have caused bending in chord web plates, preventing sliding pins from fully bearing on chord members. Lower chord sliding pins at panel points AL17 and BL41 appear to be frozen as a result of pack rust. Several pins exhibit advanced wear up to 1/4" along one-third of the pin diameter.
30. Utility deck floorbeams exhibit cracks due to lack of radial coping at truss connections. Isolated cracks in floorbeams have not been arrested, and crack ends without arrest holes have been marked and dated to monitor propagation.

Substructure

35. Large spalls with exposed rebar are typical throughout pier towers above truss bearings, with many spalls now sealed. The exterior walls of the piers exhibit hairline cracks and isolated corner spalls along outside corbels.
39. Severe timber rot and collision damage have caused total failure of the fender system.

Channel

51. Channel has a sharp bend just upstream of the bridge.
52. West bank sheet piling is washed out 200 yards north (downstream) of the bridge.

General

64. Widespread cracking with isolated spalls noted on precast concrete light poles mounted outside bridge railing. Numerous access covers for electrical boxes and hand access hatches on light poles missing. Several damaged or missing decorative lights located on piers.

For additional comments, see report in bridge file.

APPENDIX F

FCM and FPD Identification Plan

Fracture Critical Member and Fatigue Prone Detail Identification Plan

Reference: ODOT Manual of Bridge Inspection, Part 1, Section 2.11

District: 12

County-Route-SLM: CUY-10-1613

Structural File Number: 1801503

Access: In order to achieve the hands-on access required for this type of inspection, a UB-50 under bridge inspection unit, ladders, and modified technical climbing were utilized.

Fatigue Life Study: Year of Study Not Calculated Remaining Fatigue Life Not Calculated

Load Path Redundant: No, structure is fracture critical and should be inspected every 24 months.

Structurally Redundant: No, simply supported suspended spans.

Internally Redundant: No, although main truss members consist of built-up, riveted sections.



Figure 1 – CUY-10-1613 elevation looking northeast

Location: The CUY-10-1613 (Hope Memorial) Bridge (see Figure 1 above) spans the Cuyahoga River on the southwest side of Cleveland, Ohio (see Figure 2 on the next page). The structure carries four lanes of State Route 10 traffic and sidewalks, oriented west-to-east towards downtown Cleveland. The structure passes over the Cuyahoga River, Norfolk Southern/CSX railroad tracks and numerous local streets, as well as through downtown Cleveland.

Structure Description: Constructed in 1932, the bridge was originally designed to carry two rapid transit tracks on a lower deck alongside a utility deck for truck access. The main truss spans include a 13-span cantilevered Pratt deck truss consisting of 4 truss lines and an additional simply supported Pratt deck truss with 3 truss lines at the east end of the bridge (see Figures 1 and 2). The west approach spans consist of steel beam simple spans, supported by both steel bents and concrete piers, while the east approach is a concrete cellular unit.

The Lorain-Carnegie Bridge maintains a straight horizontal alignment for the full length of the structure. The bridge is oriented from west to east with nomenclature following ODOT standards, and the four truss lines are labeled A through D from north to south. Gusset plate nomenclature is based on the shop drawings, with labels consisting of the truss letter (A through D), upper or lower (U or L), panel point number, and north or south plate (N or S).

See Figures 3 and 4 for identification of fracture critical members in the main truss spans.

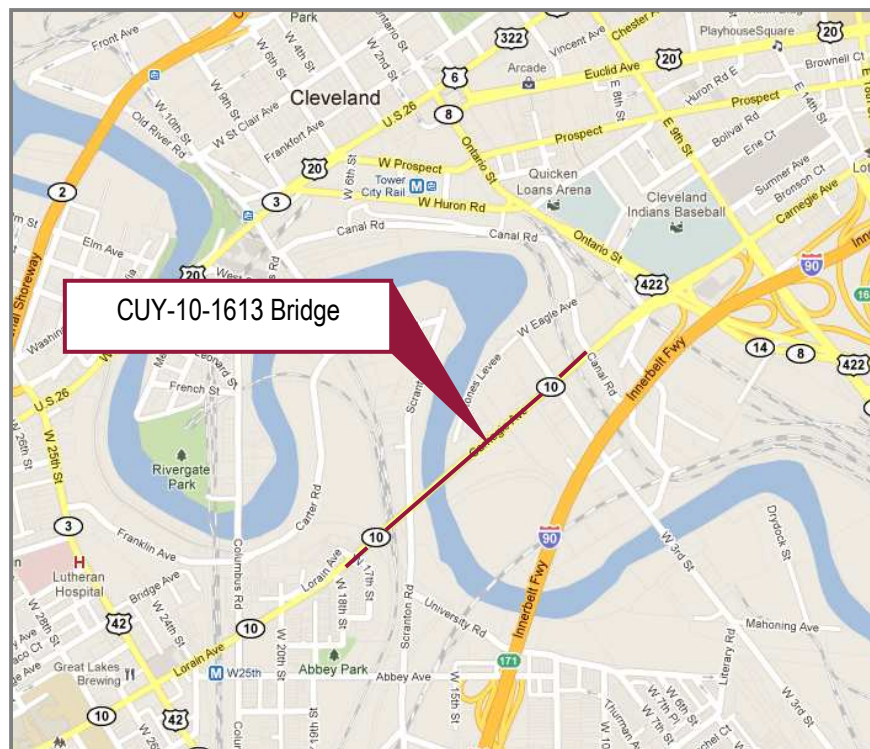
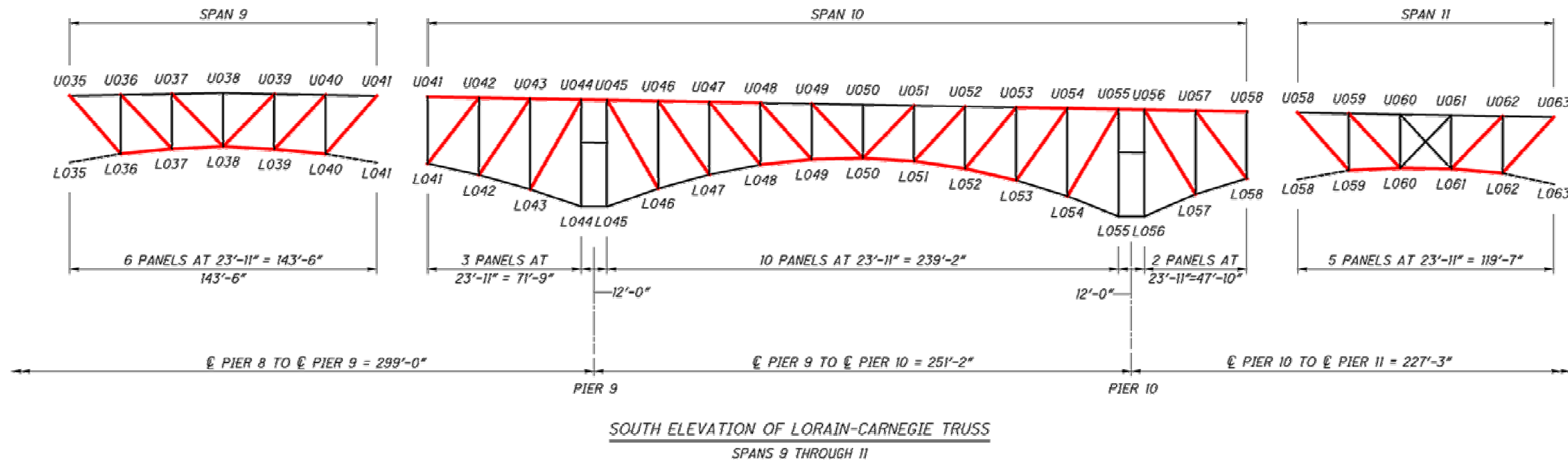
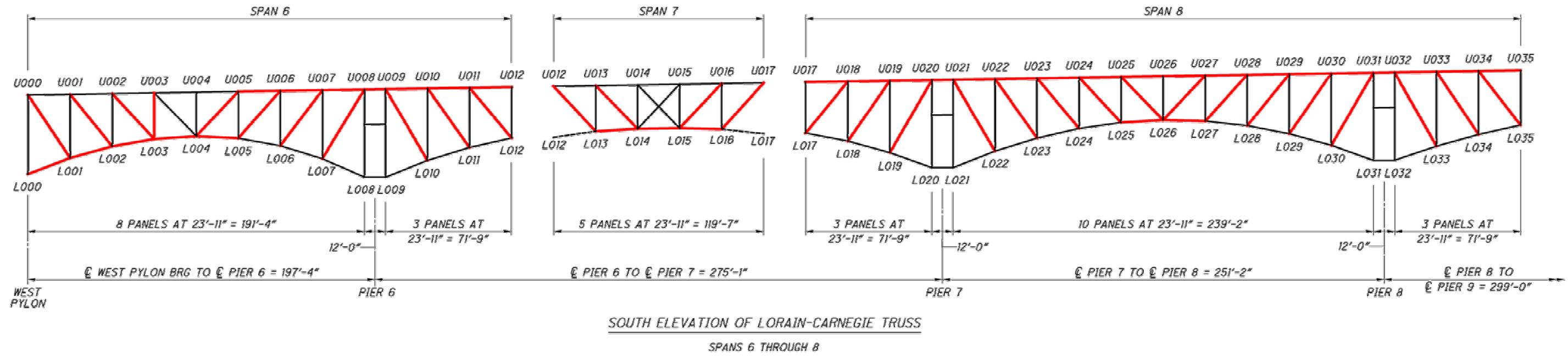


Figure 2 – Location Map

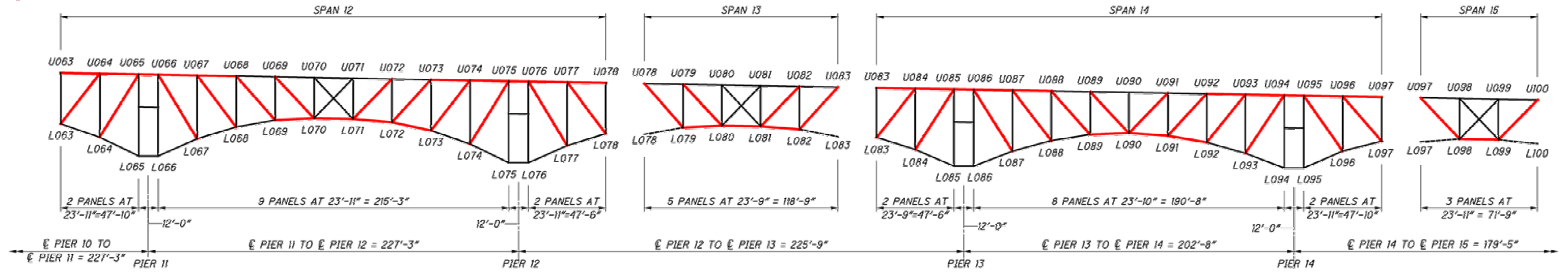


ALL FLOORBEAMS IN THE MAIN TRUSS
SPANS ARE FRACTURE CRITICAL MEMBERS

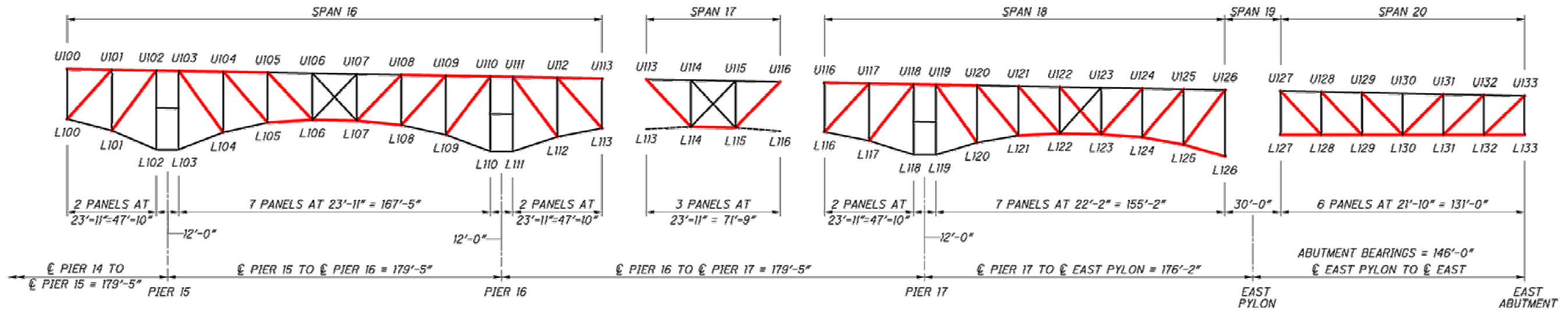
TRUSS LEGEND

- COMPRESSION MEMBERS UNDER COMBINED DEAD LOAD AND LIVE LOAD
- FRACTURE CRITICAL TRUSS MEMBERS
- ZERO FORCE MEMBERS SEE NO LIVE LOAD FORCE

Figure 3 – South Elevation of Spans 6 to 11



SOUTH ELEVATION OF LORAIN-CARNEGIE TRUSS
SPANS 12 THROUGH 15



SOUTH ELEVATION OF LORAIN-CARNEGIE TRUSS
SPANS 16 THROUGH 20

ALL FLOORBEAMS IN THE MAIN TRUSS
SPANS ARE FRACTURE CRITICAL MEMBERS

TRUSS LEGEND

- COMPRESSION MEMBERS UNDER COMBINED DEAD LOAD AND LIVE LOAD
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Figure 4 – South Elevation of Spans 12 to 20

Fatigue Prone Details

Category Reference: AASHTO LRFD Bridge Design Specifications Table 6.6.1.2.3-1

Photo Reference (photos on following pages)	Category (E, E' or R for retrofit)	Distribution	Description
1	E	Isolated lower chord members	Isolated lower chord bottom flange angles have welded retrofit plates less than 0.8" thick, constituting a Category E detail.
2	E	Lower chord members at pin locations	Many pin plates throughout the structure exhibit minor section loss in the net section. This location represents a category E detail.
3	E	Floorbeam webs	Several floorbeam webs have welds greater than 4" long at locations of abandoned connections.
4	E	Top chord members	Several top chord web plates have welded platform connections that include tack welds longer than 4".

* Blank cells are for inspectors to add FPD's, retrofits or crack locations in future inspections