

# Ohio Department of Transportation



## Fracture Critical Member and Fatigue Prone Connection Identification Plan

*Reference: ODOT Manual of Bridge Inspection Chapter 4 and Appendix E*

District: 12  
County-Route-SLM: CUY-010-1613  
Structural File Number: 1801503

Fatigue Life Study: Year of Study N/A Remaining Fatigue Life N/A

Load Path Redundant: No, structure is fracture critical, inspect FCM's every 24 months

Structurally Redundant: No, acts as simple spans

Internally Redundant: Yes/No, some built up riveted members present

System Redundant: Analysis has not been performed to determine

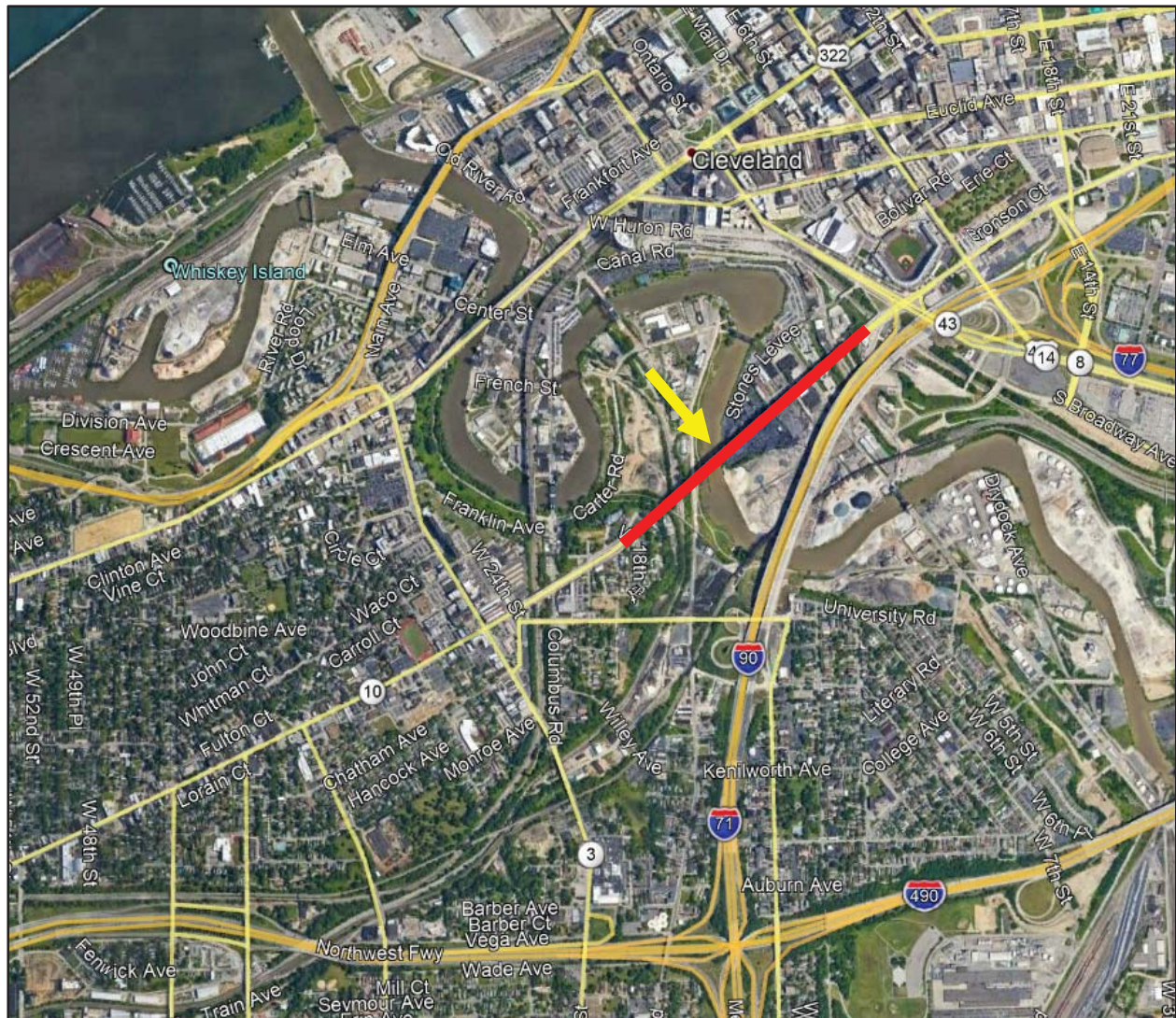


**Figure 1:** CUY-10-1613 over the Cuyahoga River

**Location:** CUY-10-1613 (SFN 1801503), commonly known as the Lorain-Carnegie Bridge and later renamed the Hope Memorial Bridge, carries four lanes of vehicular traffic and two pedestrian walkways over the



Cuyahoga River Valley, local streets, parking lots, Flat Industrial Railroad and a Norfolk Southern Railroad spur line.



**Figure 2:** CUY-10-1613 in Cleveland over the Cuyahoga River

**Description:** The bridge is approximately 3,515 feet long, which includes 230 feet of subway tunnel on the east end leading up to Bridge No. CUY-10-1685. The bridge is comprised of three sections referred to as Main Spans, West Approach and East Approach:

Main Spans: Thirteen (13) spans of four (4) lines of cantilever Pratt deck style trusses totaling 2,916'-1". Truss spans vary from 161'-2" to 299'-0". A maintenance deck is in place in the center bay, below the vehicular upper deck.

West Approach: Five (5) multi-beam spans bearing on concrete piers and steel bents. Total length of the approach spans total length 157'-8".

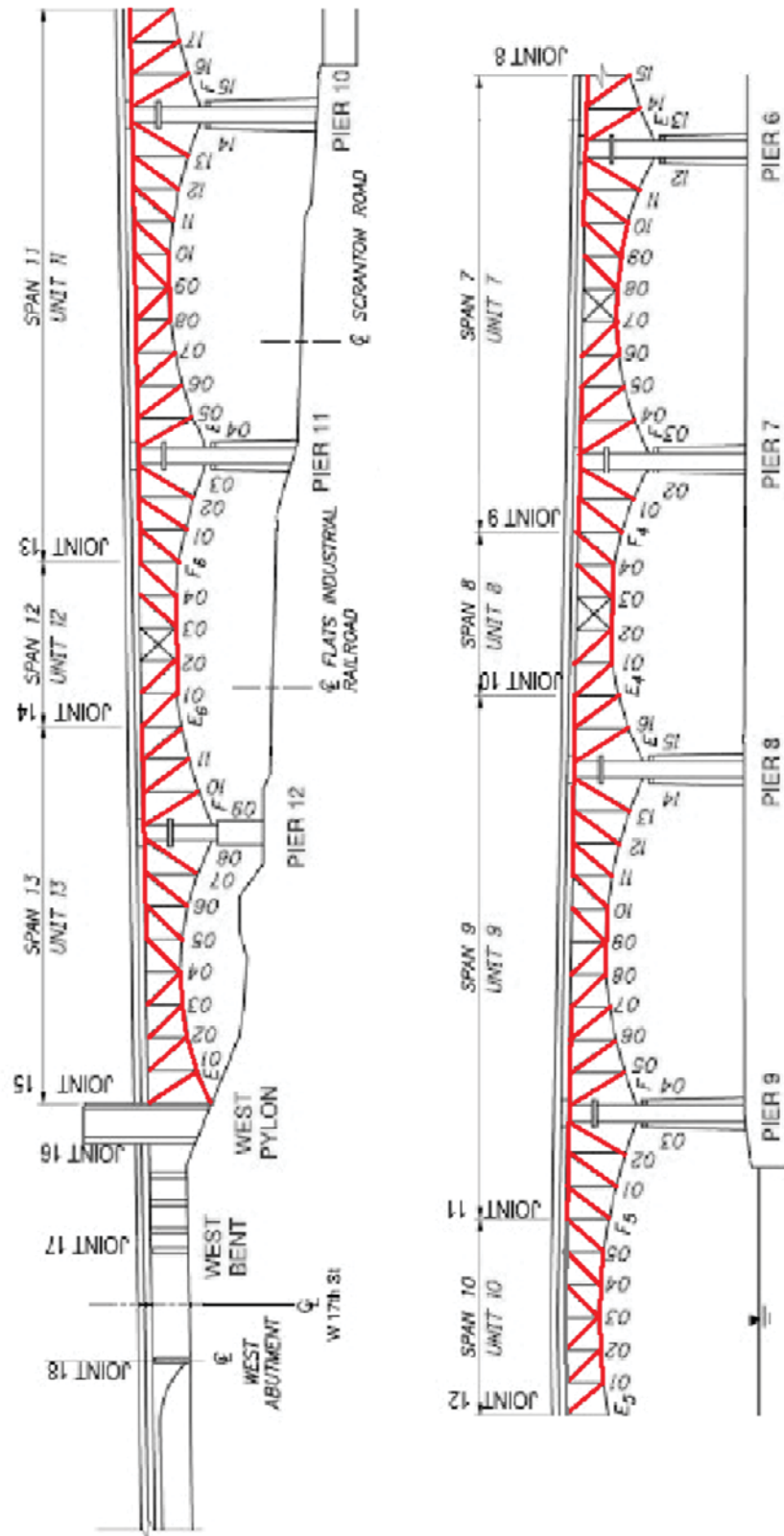
East Approach: Concrete cellular construction approximately 307'-0" long with one 131'-0" long span, consisting of three lines of Pratt deck trusses

Fracture critical members include select truss chords, diagonals, pins, gusset plates, and upper deck floorbeams (see *Figures 3 & 4*).

**FCM Access:** A combination of climbing techniques, aerial work platform, and ladder were used in previous inspections to achieve arms' length inspection. Alternate techniques to those described below may be employed at the discretion of the inspection team.

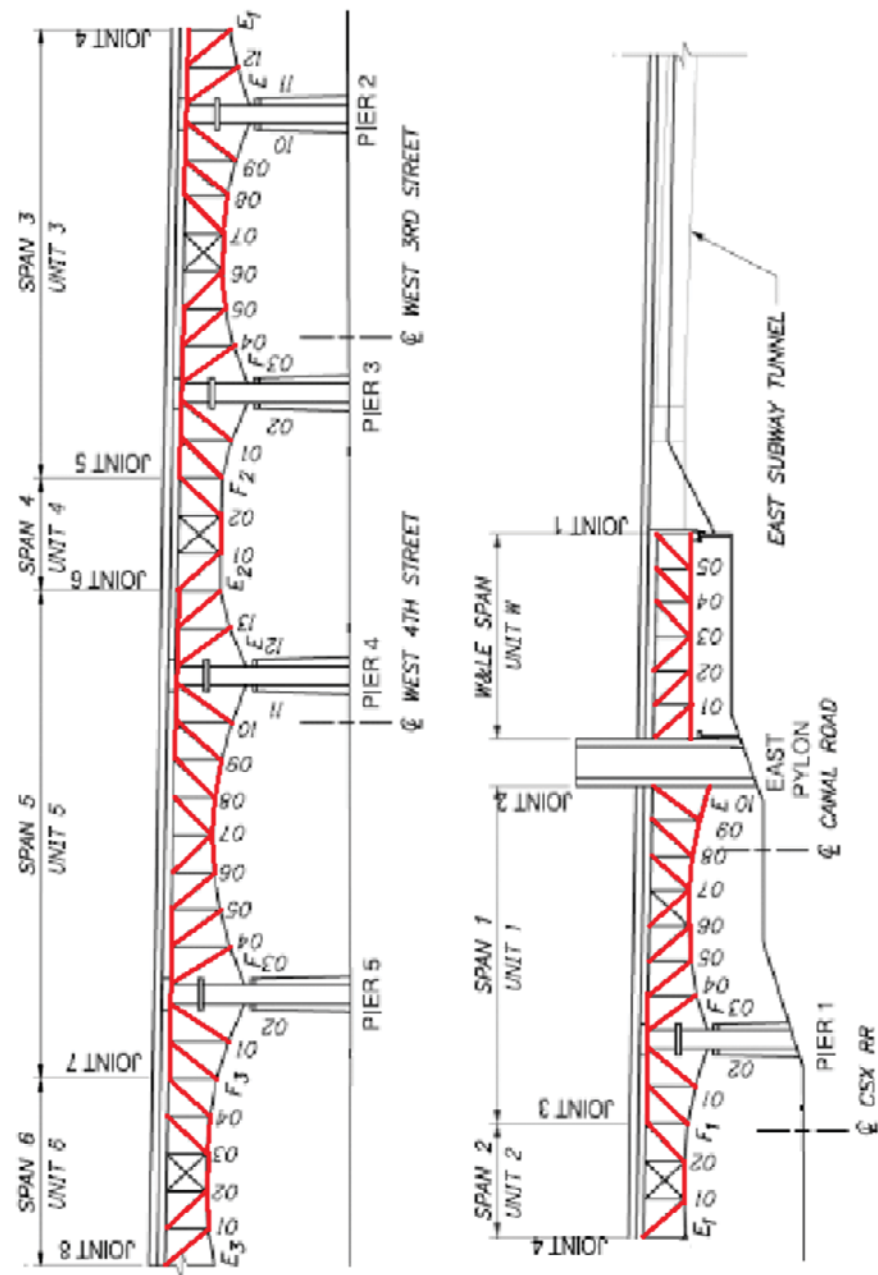
Climbing Techniques / Aerial Work Platform: The truss members, gusset plates, pins and floorbeams are mainly accessed utilizing climbing techniques. This work can be assisted with an aerial work platform operating from the ground below the bridge, in some of the east spans.

Ladder: The steel floorbeams in the west approach span are accessed with an aerial work platform or a 24' ladder, placed on the ground below.

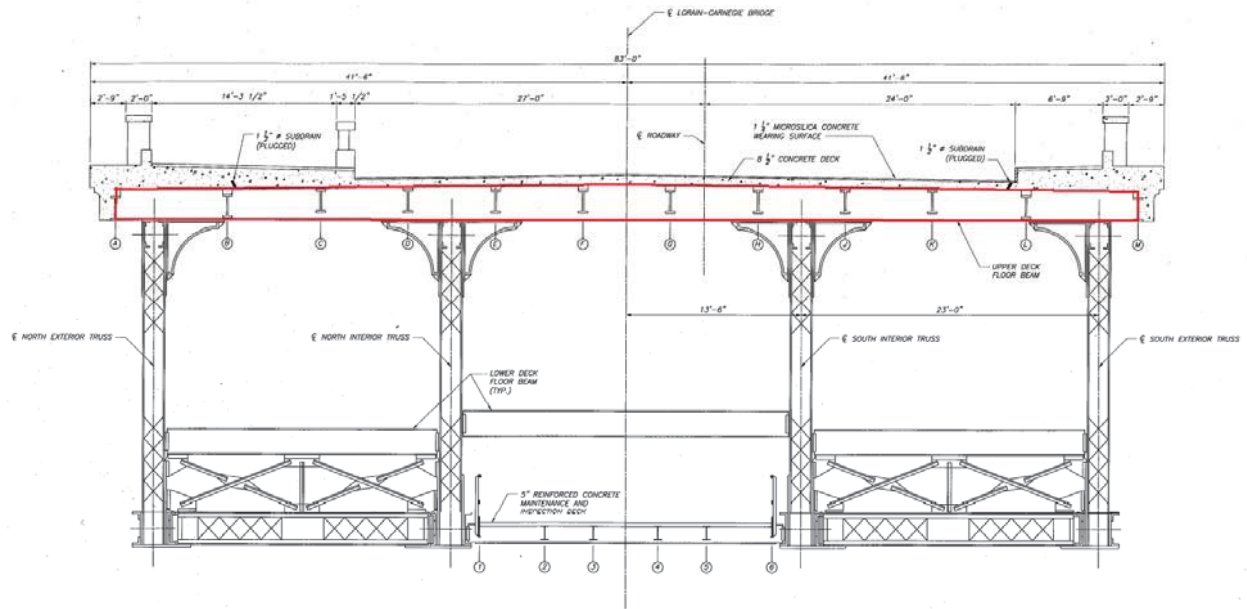


**Figure 3a:** Fracture Critical Member Locations (Highlighted Red)





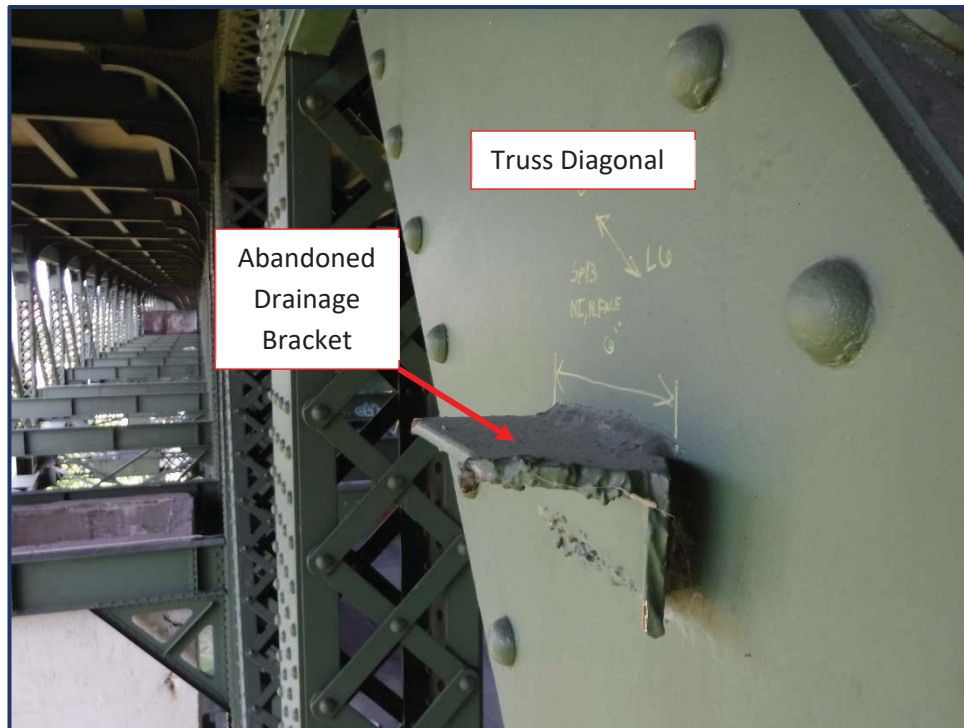
**Figure 3b:** Fracture Critical Member Locations (Highlighted Red)



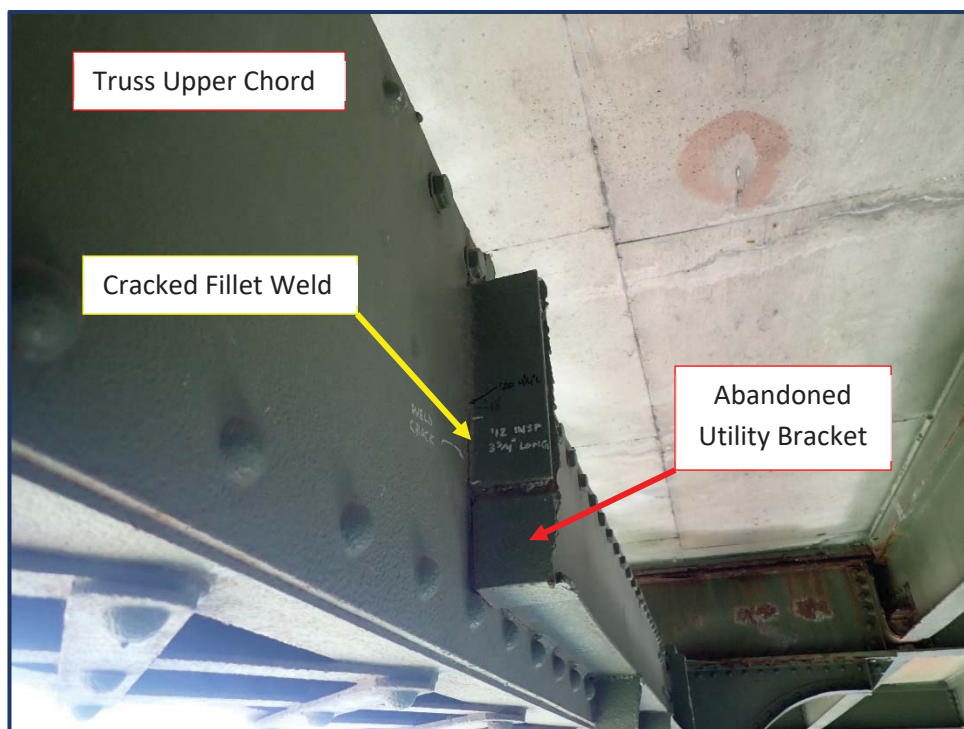
**Figure 4: Fracture Critical Member Locations (Highlighted Red)**

<b>Known Structural Risk Factors &amp; Fatigue Prone Details</b> <i>Category reference: AASHTO LRFD Bridge Design Specs, 9<sup>th</sup> Ed. Table 6.6.1.2.3-1</i>			
Photo Reference	Label / Fatigue Category	Where?	Description
1	Abandoned Drainage Brackets, <b>Fatigue Category E</b>	Span 13 Truss Diagonals	Fillet welds connecting abandoned drainage brackets to truss diagonals (NI L6-U7, SI L6-U7, SE L6-U7)
2	Abandoned Utility Brackets, <b>Fatigue Category E</b>	South Exterior Truss Upper Chords	Fillet welds connecting abandoned utility brackets to truss upper chords (S5 U10-U11, S7 U4-U5, S9 U0-U1, S9 U12-U13, S11 U11-U12, S13 U6-U7). Crack present in vertical fillet weld at S9 U0-U1.
3	Cracks in Flange Angles	Lower Chords	Cracks in fillet of lower flange angles at gusset plates (S6 SI L1-L2, S12 NI L1-L2, S12 NI L2-L3, S12 NI L2-L4, S12 SI L0-L1, S12 SI L2-L3, S12 SI L3-L4, S12 SE L3-L4). Some locations have been arrested with drilled holes.
4	Cracks in Floorbeam Connections	Maintenance Deck Floorbeams	Cracks in floorbeam webs at connection to truss. Some locations have been arrested with drilled holes.

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

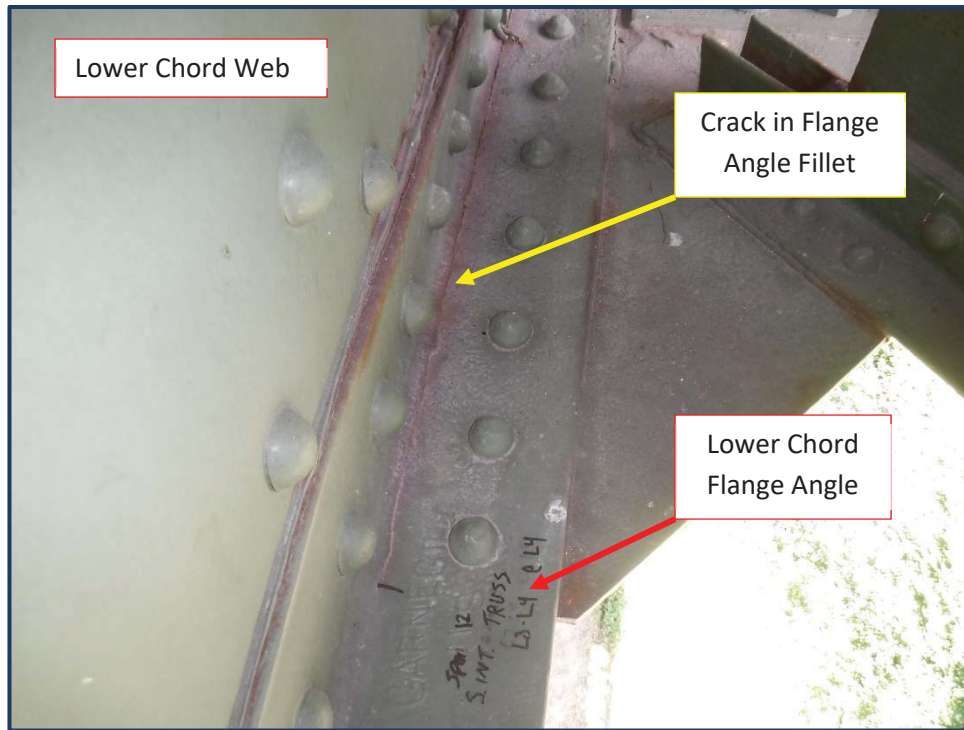


*Photo 1 – Abandoned Drainage Bracket on Truss Diagonal*

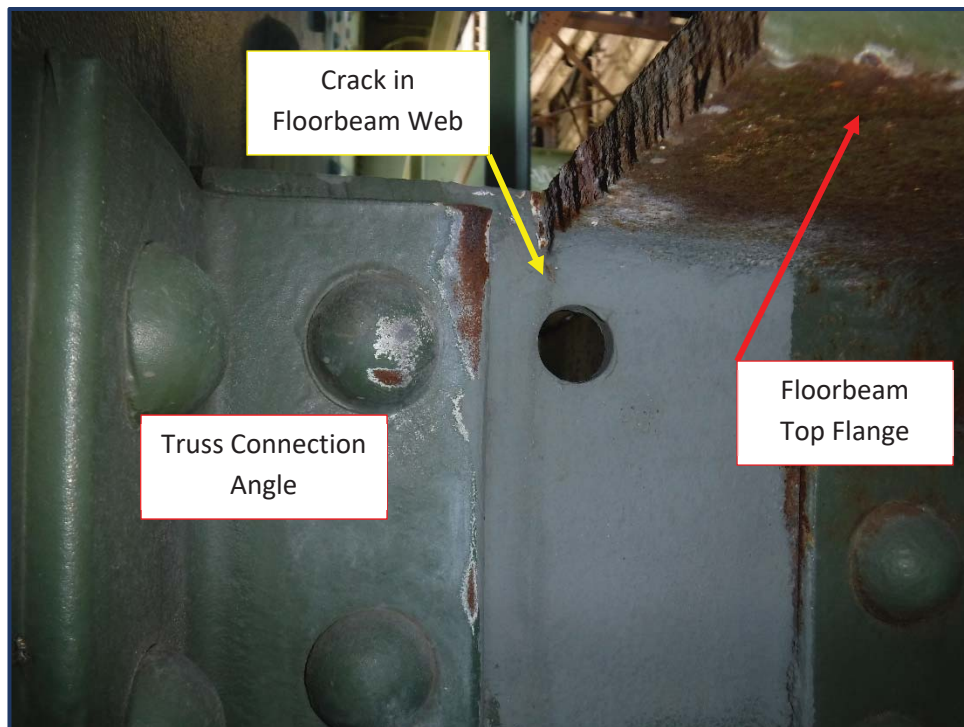


*Photo 2 – Abandoned Utility Bracket on Truss Upper Chord*





*Photo 3 – Cracks in Fillet of Lower Chord Flange Angles*



*Photo 4 – Cracks in Maintenance Deck Floorbeam Web at Truss Connection*