

GPI Greenman-Pedersen, Inc.

Engineering and Construction Services

October 16, 2018

Jean H. Laird, P.E.
Senior Project Engineer, Structures Design
New Jersey Turnpike Authority
1 Turnpike Plaza
P.O. Box 5042
Woodbridge, New Jersey 07095-5042

Re: NJTA OPS A3575
2016-2019 New Jersey Turnpike Authority Major Bridge Inspection Program
Turnpike Structure E109.83 - Cracked Floorbeam Webs at Main River Unit Intermediate Deck Joints - 2018 Biennial / 4th Interim Inspection Findings

Dear Ms. Laird:

During the 2016 Biennial Inspection at Turnpike Structure E109.83, GPI identified newly developed cracks in the floorbeam upper webs and associated cracks or breaks in the floorbeam web stiffener-to-top flange welds beneath Stringers 2 & 3 (West 1971 Widening section) and Stringers 14 & 15 (East 1971 Widening section) at all seven (7) intermediate deck joints within the Main River Unit (Span S1, River Span-S, River Span-N, and Span N1 (Piers S2 thru N2)). These findings were reviewed with the Authority, HNTB, Dewberry, and Jacobs in the Fall of 2016 to determine the proper course of action, which entailed designing repair / crack arresting measures (HNTB with Dewberry) and performing 3-month and subsequent 6-month Interim Inspections to monitor the propagation rate of the existing cracks and to check for development of new cracks (GPI).

The following list chronicles the inspection history of the conditions presented herein:

1. Initial finding: October 18, 2016 by GPI. Notification made via email dated October 20, 2016; detailed summary of findings presented via letter (final dated August 14, 2017).
2. 1st BI Look-See (field review with NJTA and Contract T100.137 design personnel to review the findings in-person): October 31, 2016 by the NJTA, HNTB, Dewberry, and GPI. Summary of discussions and action items presented via Minutes of Meeting dated October 31, 2016 (prepared by Dewberry).
3. 1st Interim Inspection (3-month): February 8, 2017 by GPI. Summary of findings presented via letter (final dated February 14, 2017).
4. 2nd Interim Inspection (6-month): August 15, 2017 by GPI. Summary of findings presented via letter (final dated September 4, 2017).
5. 3rd Interim Inspection (6-month): April 20, 2018 by GPI. Summary of findings presented via letter (final dated April 25, 2018).
6. 2018 Biennial Inspection / 4th Interim Inspection (6-month): August 27 thru August 31, 2018 by GPI. Summary of findings presented herein.

The following generally summarizes the changes identified during the 2018 Biennial / 4th Interim Inspection performed at all seven (7) intermediate deck joints within the Main River Unit by GPI from August 27 thru August 31, 2018 - see **Photos 1 thru 14** and **Attachment A** for further details:

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1. There are floorbeam web stiffener-to-upper flange weld deficiencies at 49 locations:
 - a. Two (2) of the cracks have grown in length since the 3rd Interim Inspection (April 2018) (**See Photos 1 and 2**);
 - b. The weld is completely broken at 35 locations (**See Photos 3 and 5 thru 12**); and
 - c. Three (3) welds are newly cracked (**See Photo 4**).
2. There is a total of 30 floorbeam upper web cracks (**See Photos 3 and 5 thru 13**) - five (5) are newly developed and five (5) have grown in length since the 3rd Interim Inspection (April 2018):
 - a. North face of Floorbeam 8S at Stringer 14N in Span S1: 1/8" growth.
 - b. North face of Floorbeam 18S at Stringer 14N in River Span-S: 3/8" growth. **See Photo 10.**
 - c. South face of Floorbeam 18S at Stringer 14S in River Span-S: 1/8" growth.
 - d. South face of Floorbeam 18S at Stringer 15S in River Span-S: 1/2" growth. **See Photo 11.**
 - e. North face of Floorbeam 14N at Stringer 14N in River Span-N: 3/4" growth. **See Photo 12.**
3. The previously noted distressed paint along the north face of the upper web at Floorbeam 18S beneath Stringer 3N in the River Span-S has now developed into a 5'L crack. **See Photo 3.**
4. The previously noted distressed paint along the web stiffener top weld on the north face of Floorbeam 14N beneath Stringer 2N in the River Span-N has developed into a 7/8'L crack with extended distressed paint along the upper and lower toes of the weld. **See Photo 4.**
5. Previously, Floorbeam 4S beneath Stringers 14S & 14N in Span S1 exhibited distressed paint on both the north and south faces of the upper web with a partially cracked top weld on the north face of the web stiffener. The stiffener top weld is now completely broken and includes a small, thin portion of the underside of the upper flange along the apparent heat affected zone. Additionally, the floorbeam upper web now exhibits a 2-1/2'L crack on the north face and a 1'L crack with a 4" length of distressed paint on the south face. **See Photos 5 thru 7.**
6. The previously noted distressed paint along the south face of the upper web of Floorbeam 4S beneath Stringer 15S in Span S1 has developed into a 2-3/8'L crack with distressed paint extending along the lower toe of the web-to-upper flange weld. **See Photo 8.**
7. The previously noted distressed paint along the south face of the Floorbeam 14S upper web beneath Stringer 15S in the River Span-S has now developed into a 1-1/2'L crack. **See Photo 9.**
8. There is a 2-5/8'L paint crack along the lower toe of the web-to-upper flange weld, with light rust staining at the web stiffener (possible developing web crack); and a crack at the upper end of the web stiffener-to-web weld which extends horizontally to the west for 1-11/16" along the web and vertically for 1-1/8" down the upper toe of the east-side web stiffener-to-web weld on the south face of Floorbeam 8N beneath Stringer 15S in Span N1. The web cracks have apparently not changed since the last interim inspection; however, the paint crack appears to be growing. **See Photos 13 and 14.**

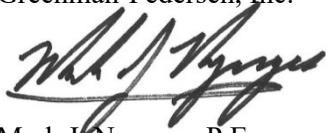
In addition to the floorbeam cracks summarized above, the 2018 Biennial / 4th Interim Inspection efforts also identified six (6) newly developed / located cracks in the upper webs and/or upper flanges of the original construction floorbeams beneath Stringers 4 & 13, immediately adjacent to the floorbeam extension splices at three (3) of the seven (7) intermediate deck joints within the Main River Unit (three (3) cracks each within the West and East 1971 Widening sections). The floorbeams at these two (2) locations are robust, built-up members that do not exhibit the severe upper flange twisting under heavy live load that the rest of the Widening section stringers do and had not developed cracks through the 2nd Interim Inspection visit; therefore, they were considered to be low-risk locations and were omitted from the 3rd Interim Inspection. Furthermore, newly formed cracks in the paint for the full or partial length of the lower flange-to-bearing sole plate welds down one or both edges of the lower flange were discovered at seven (7) Stringer 5 and three (3) Stringer 11 locations scattered throughout the seven (7) intermediate deck joints. These latest findings were introduced to the NJTA via a telephone call on September 17, 2018 and a detailed letter summarizing the conditions was presented to the Authority (Design and Construction), HNTB, and Dewberry on September 20, 2018, at the Authority's request. An impromptu follow-up meeting was held with the NJTA on September 25, 2018 and an email summarizing the discussions was prepared and delivered on September 26, 2018. **See Attachment B** for further details.

Repairs to the previously documented 2016 Biennial Inspection cracks in the floorbeam upper webs and associated cracks or breaks in the floorbeam vertical web stiffener-to-upper flange welds beneath Stringers 2, 3, 14, and 15 at all seven (7) intermediate deck joints within the Main River Unit are scheduled for installation in the coming weeks by Contract A100.196, Work Order S2. In light of the newly discovered cracks in the upper webs and/or upper flanges of the original construction floorbeam extensions beneath Stringers 4 & 13 at three (3) of the seven (7) intermediate deck joints, we recommend the following:

1. As agreed to by the NJTA and the original Contract T100.137 design team (Team), the scheduled repair work should be postponed pending further investigation of the affected members' behavior by the Team; and
2. All 16 stringers at the seven (7) intermediate deck joints within the Main River Unit should be monitored on a 6-month basis until a plan-of-action is developed - as such, the next Interim Inspection would be conducted in February / March 2019.

Please do not hesitate to contact the undersigned should you have any questions or need additional information.

Sincerely,
Greenman-Pedersen, Inc.



Mark J. Nyerges, P.E.
Project Manager

Copy: Sean Reichl, P.E., Deputy Project Manager (GPI)

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West 1971 Widening Section (Consists of Stringers 1 thru 4)



Photo 1: Span S1, Floorbeam 8S at Stringer 2S - The previously cracked top weld on the south face floorbeam web stiffener has grown 1/4" in length on the west side of the stiffener, looking northeast.



Photo 2: River Span-S, Floorbeam 18S at Stringer 2S - The previously cracked top weld on the south face floorbeam web stiffener has grown 3/8" in length on the east side of the stiffener, looking northwest.

West 1971 Widening Section (Consists of Stringers 1 thru 4)



Photo 3: River Span-S, Floorbeam 18S at Stringer 3N - Previously noted distressed paint along the north face of the floorbeam upper web has now developed into a 5'L crack, looking southwest. Note the completely severed web stiffener top weld (previously noted condition).



Photo 4: River Span-N, Floorbeam 14N at Stringer 2N - Previously noted distressed paint along the web stiffener top weld on the north face of the floorbeam has developed into a 7/8"L crack at the end of the weld with extended distressed paint along the upper and lower toes of the weld, looking southwest.

East 1971 Widening Section (Consists of Stringers 13 thru 16)



Photo 5: Span S1, Floorbeam 4S at Stringer 14N - Previously noted partially cracked web stiffener top weld and distressed paint along the lower toe of the web-to-upper flange weld on the north face of the floorbeam now exhibits a completely broken weld and a 2-1/2" L crack on the web, west side of the stiffener, looking southeast. Note the broken weld includes a small, thin portion of the underside of the flange along the apparent heat affected zone.

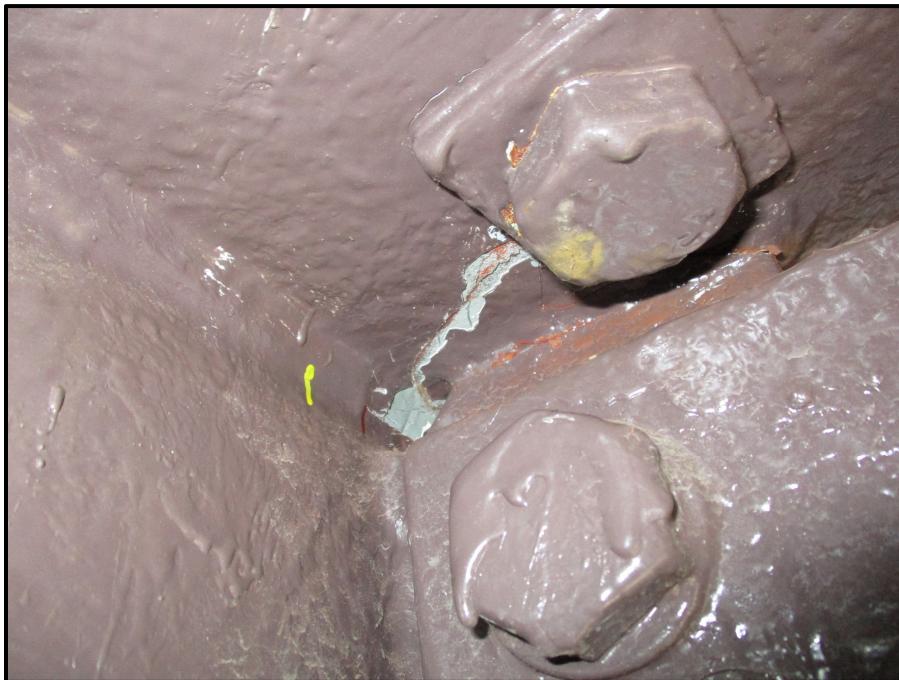


Photo 6: Span S1, Floorbeam 4S at Stringer 14N - Previously noted partially cracked web stiffener top weld and distressed paint along the lower toe of the web-to-upper flange weld on the north face of the floorbeam now exhibits a completely broken weld and a 2-1/2" L crack on the web, east side of the stiffener, looking southwest. Note the broken weld includes a small, thin portion of the underside of the flange along the apparent heat affected zone.

East 1971 Widening Section (Consists of Stringers 13 thru 16)



Photo 7: Span S1, Floorbeam 4S at Stringer 14S - Previously noted distressed paint along the lower toe of the web-to-upper flange weld on the south face of the floorbeam has developed into a 1'L crack with extended distressed paint, looking northeast. Note the completely severed stiffener top weld (previously noted condition).

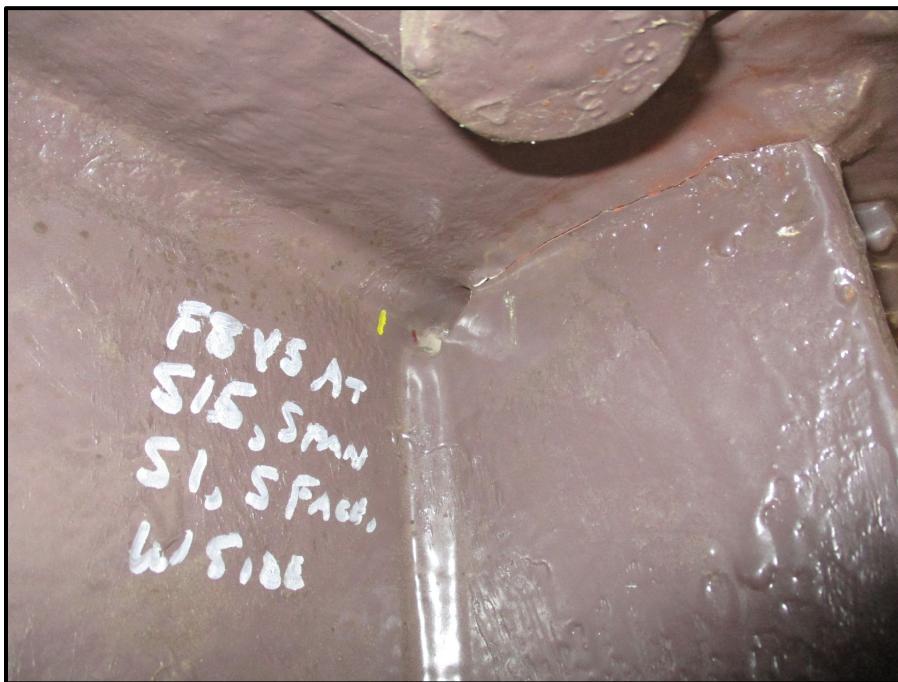


Photo 8: Span S1, Floorbeam 4S at Stringer 15S - Previously noted distressed paint along the lower toe of the web-to-upper flange weld on the south face of the floorbeam has developed into a 2-3/8'L crack with extended distressed paint, looking northeast. Note the completely severed stiffener top weld (previously noted condition).

East 1971 Widening Section (Consists of Stringers 13 thru 16)

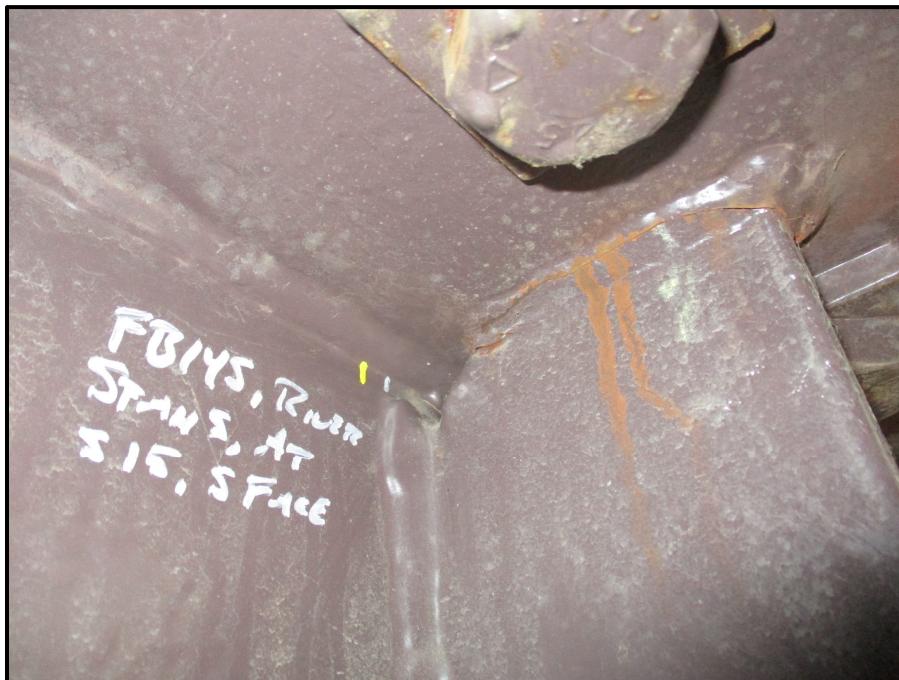


Photo 9: River Span-S, Floorbeam 14S at Stringer 15S - Previously noted distressed paint along the south face of the upper web has now developed into a 1-1/2" L crack, looking northeast. Note the completely severed stiffener top weld (previously noted condition).



Photo 10: River Span-S, Floorbeam 18S at Stringer 14N - The upper web crack on the north face of the floorbeam has increased by 3/8" in length (total length measures 8-5/8"), looking southeast. Note the completely severed web stiffener top weld (previously noted condition).

East 1971 Widening Section (Consists of Stringers 13 thru 16)



Photo 11: River Span-S, Floorbeam 18S at Stringer 15S - The upper web crack on the south face of the floorbeam has increased by 1/2" in length (total length measures 2-1/2"), looking northeast. Note the completely severed stiffener top weld (previously noted condition).



Photo 12: River Span-N, Floorbeam 14N at Stringer 14N - The upper web crack on the north face of the floorbeam has increased by 3/4" in length (total length measures 1-1/2"), looking southeast. Note the completely severed web stiffener top weld (previously noted condition).

East 1971 Widening Section (Consists of Stringers 13 thru 16)



Photo 13: Span N1, Floorbeam 8N at Stringer 15S - Close-up view of the east projection of the 2-5/8" L (total) paint crack along the lower toe of the web-to-upper flange weld with light rust staining at the web stiffener (possible developing web crack) on the south face, looking north. Note the crack at the upper end of the web stiffener-to-web weld extending vertically down the upper toe of the east-side web stiffener-to-web weld for 1-1/8", looking north.

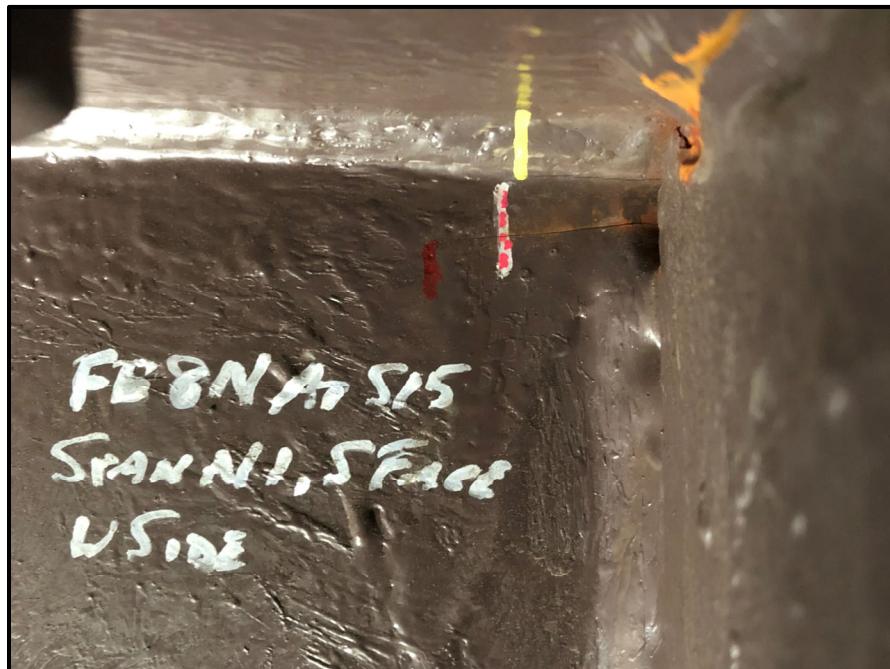


Photo 14: Span N1, Floorbeam 8N at Stringer 15S - Close-up view of the west projection of the 2-5/8" L (total) paint crack along the lower toe of the web-to-upper flange weld on the south face, looking north. Note the cracked web at the upper end of the web stiffener-to-web weld which extends horizontally to the west for 1-11/16" (continuation of the vertical crack depicted in Photo 13).

ATTACHMENT A

FLOORBEAM DEFECT SUMMARY TABLES

Turnpike Structure E109.83 - Floorbeam Defect Summary Table (West 1971 Widening)

Defect (If Applicable)	Inspectio n Date	Span N1				River Span-N		River Span-S				Span S1					
		FB 4N		FB 8N		FB 14N		FB 18S		FB 14S		FB 8S		FB 4S			
		N	S	N	S	N	S	N	S	N	S	N	S	N	S		
West Widening	S2	Cracked Floorbeam Web Stiffener Top Weld	4/2018			3/8" E. 1/4" W.		*		*	1-1/4" E. 7/8" W.	*		*	7/8" E. 3/8" W.	*	1/4" E. 1/8" W.
			8/2018			NC		7/8" ^(F)		NC	1-5/8" E. 7/8" W.	NC		NC	7/8" E. 5/8" W.	NC	NC
		Broken Floorbeam Web Stiffener Top Weld	4/2018	X	X				X								
			8/2018	NC	NC				NC								
	S3	Cracked Floorbeam Upper Web (length)	4/2018	**													
			8/2018	NC													
		Cracked Floorbeam Web Stiffener Top Weld	4/2018				X										
			8/2018				NC										
		Broken Floorbeam Web Stiffener Top Weld	4/2018			X		X	X	X	X	X	X	X	X	X	X
			8/2018			NC		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	S4	Cracked Floorbeam Upper Web (length)	4/2018			4-7/8"	3-3/4"	4-3/8" ^(D)	4-3/8"	**		3/16" ^(D)	4"	3-3/8"	3-7/8"	9-1/2"	8-1/4"
			8/2018			NC	NC	NC	NC	5" ^(G)		NC	NC	NC	NC	NC	NC
		Cracked Floorbeam Web Stiffener Top Weld	8/1/2017 (I)														
			4/1/2018 (J)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			8/2018			*											
		Broken Floorbeam Web Stiffener Top Weld	8/1/2017 (I)														
			4/1/2018 (J)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			8/2018								4"						
		Cracked Floorbeam Upper Web (length)	8/1/2017 (I)														
			4/1/2018 (J)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			8/2018						9-3/4"								
	Cracked Floorbeam Upper Flange (length)	8/1/2017 (I)															
			4/1/2018 (J)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			8/2018						(H)			5-1/2"					

Turnpike Structure E109.83 - Floorbeam Defect Summary Table (East 1971 Widening)

Defect (If Applicable)	Inspectio n Date	Span N1				River Span-N		River Span-S				Span S1			
		FB 4N		FB 8N		FB 14N		FB 18S		FB 14S		FB 8S		FB 4S	
		N	S	N	S	N	S	N	S	N	S	N	S	N	S
East Widening	Cracked Floorbeam Web Stiffener Top Weld	8/1/2017 (I)													
		4/1/2018 (J)	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/2018		1-3/4" W. 1-1/4" E.											
	Broken Floorbeam Web Stiffener Top Weld	8/1/2017 (I)													
		4/1/2018 (J)	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/2018					X (75%)								
	Cracked Floorbeam Upper Web (length)	8/1/2017 (I)													
		4/1/2018 (J)	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/2018													
	Cracked Floorbeam Upper Flange (length)	8/1/2017 (I)													
		4/1/2018 (J)	-	-	-	-	-	-	-	-	-	-	-	-	-
		8/2018					4"		FW						
S13	Cracked Floorbeam Web Stiffener Top Weld	4/2018		7/8" W. 3/8" E.											
		8/2018		NC											
	Broken Floorbeam Web Stiffener Top Weld	4/2018			X	X	X	X	X	X	X	X	X	X (75%)	X
		8/2018			NC	NC	NC	NC	NC	NC	NC	NC	NC	X ^(E)	NC
	Cracked Floorbeam Upper Web (length)	4/2018		5-3/8"	3-3/4" ^(A)	3/4"	4-1/4"	8-1/4"	8-5/8"	2-1/4" ^(D)	4-1/2" ^(C)	6-1/8"	5-1/4" ^(D)	**	**
		8/2018			NC	NC	1-1/2"	NC	8-5/8"	8-3/4"	NC	NC	6-1/4"	NC	2-1/2"
S14	Cracked Floorbeam Web Stiffener Top Weld	4/2018	7/8" W. 5/16" E.									7/8" W. 1/2" E.	1" W. 3/4" E.		
		8/2018	NC									NC	NC		
	Broken Floorbeam Web Stiffener Top Weld	4/2018			X	X		X	X	X	X				X
		8/2018			NC	NC		NC	NC	NC	NC				NC
	Cracked Floorbeam Upper Web (length)	4/2018													
		8/2018			NC	NC	1-1/2"	NC	8-5/8"	8-3/4"	NC	NC	6-1/4"	NC	2-1/2"
S15	Cracked Floorbeam Web Stiffener Top Weld	4/2018													
		8/2018	NC												
	Broken Floorbeam Web Stiffener Top Weld	4/2018			X	X		X	X	X	X				X
		8/2018			NC	NC		NC	NC	NC	NC				NC
	Cracked Floorbeam Upper Web (length)	4/2018				(B)		**(2-3/8")	2-9/16"	2"		**			
		8/2018				NC		NC	NC	2-1/2"		1-1/2"			

Turnpike Structure E109.83 - Floorbeam Defect Summary Table (Notes)

- (1) "X" denotes that the defect is present; cracked floorbeam upper webs are denoted by their respective crack length.
- (2) "NC" indicates there was no change in the previously reported defect.
- (3) All broken welds are pumping under heavy live load.
- (4) All floorbeam upper web cracks are generally centered about the intermediate stiffener beneath each respective stringer.
- (5) The floorbeam top flange is visibly twisting under heavy live load beneath all S2-S4 and S13-S15 stringer locations within the Main River Unit.
- (6) Chronical of intial finding and Interim Inspection history is as follows: Initial Finding (10/18/16); ^f Interim (2/8/17); 2nd Interim (8/15/17); 3rd Interim (4/20/18); 4th Interim / 2018 Biennial (8/27-8/31/18).
- (7) "FW" denotes the full width of an upper flange angle horizontal leg on the original built-up floorbeam.
- ^A (8) The floorbeam upper web has paint cracking extending 7-1/4" centered about the web stiffener beneath S14 at FB8N.
- ^B (9) 2-5/8" L paint crack along the lower toe of the web-to-upper flange weld, with light rust staining at the web stiffener (possible developing web crack). Web is cracked at the top of the web stiffener-to-web weld - extends horizontally to the west for 1-11/16" along the web and vertically for 1-1/8" down the upper toe of the east-side web stiffener-to-web weld.
- ^C (10) The floorbeam upper web has distressed paint extending an additional 2" in length from the west end of the web crack beneath S14 at FB14S.
- ^D (11) Length was corrected from previous erroneously reported measurement - all demarcated limits were verified during the 4/20/18 Interim Inspection.
- ^E (12) Broken weld includes a small portion of the BUF along the apparent heat affected zone.
- ^F (13) There is also distressed paint extending along the upper toe and lower toe of the web stiffener top weld at this location.
- ^G (14) The crack runs along the upper toe of the web-to-upper flange weld at this location.
- ^H (15) Crack begins at leading edge of angle leg then travels around SE bearing anchor bolt and terminates in a ±2-1/2" dia. asterisk-shaped crack at mid-width of leg.
- ^I (16) The floorbeam areas beneath S4 & S13 were inspected during the 2nd Interim Inspection and no defects were noted. The 8/1/2017 findings are presented for these two (2) locations only to represent the clear conditions.
- ^J (17) The floorbeams at S4 & S13 are robust, built-up members that do not exhibit the severe upper flange twisting under heavy live load that the rest of the Widening section stringers do and had not developed cracks through the 2nd Interim Inspection visit; therefore, they were considered to be low-risk locations and were omitted from the 3rd Interim Inspection (4/1/2018).
- * (18) Distressed / cracked paint present at one or more locations along both sides of the weld (indicating an overstressed condition).
- ** (19) Distressed / cracked paint present on floorbeam web on one or both sides of the vertical web stiffener (indicating an overstressed condition).

ATTACHMENT B

**TURNPIKE STRUCTURE E109.83 - NEWLY DISCOVERED
FLOORBEAM AND STRINGER CRACKS AT THE MAIN RIVER
UNIT INTERMEDIATE DECK JOINTS LETTER
(SEPTEMBER 20, 2018)**

AND

**OPS A3575 - SUMMARY OF RECENT DISCUSSIONS REGARDING
N2.01 AND E109.83 EMAIL
(SEPTEMBER 26, 2018)**

GPI Greenman-Pedersen, Inc.

Engineering and Construction Services

September 20, 2018

Jean H. Laird, P.E.
Senior Project Engineer, Structures Design
New Jersey Turnpike Authority
1 Turnpike Plaza
P.O. Box 5042
Woodbridge, New Jersey 07095-5042

Re: NJTA OPS A3575
2016-2019 New Jersey Turnpike Authority Major Bridge Inspection Program
Turnpike Structure E109.83 - Newly Discovered Floorbeam and Stringer Cracks at the Main River Unit Intermediate Deck Joints

Dear Ms. Laird:

During the 2016 Biennial Inspection at Turnpike Structure E109.83, GPI identified newly developed cracks in the floorbeam upper webs and associated cracks or breaks in the floorbeam vertical web stiffener-to-upper flange welds beneath Stringers 2 & 3 (West 1971 Widening section) and Stringers 14 & 15 (East 1971 Widening section) at all seven (7) intermediate deck joints within the Main River Unit. These findings have been periodically monitored since their original discovery and were recently checked as part of the 2018 Biennial Inspection efforts. No significant changes to the conditions at those four (4) stringers since the April 2018 monitoring inspection were noted.

However, during the on-going 2018 Biennial Inspection, six (6) newly developed / located cracks were identified on the upper web and upper flanges of the original construction floorbeam extensions beneath Stringer 4 (West 1971 Widening section) and Stringer 13 (East 1971 Widening section) at three (3) of the seven (7) intermediate deck joints. Three (3) new cracks each were found within the West and East 1971 Widening sections and are summarized below - reference attached Photos 1 through 15 and Attachment 1 for further details. In addition to the newly developed floorbeam upper web and upper flange cracks, stringer lower flange-to-bearing sole plate weld cracks appear to be developing at various locations within the original center section of the bridge (Stringers 5 thru 12 between Girders 2 & 3) - reference attached Photo 16.

West 1971 Widening section (consists of Stringers 1 thru 4)

1W. Floorbeam 14S at Stringer 4N in River Span-S:

The upper flange repair plate is cracked-through extending along the west side of the vertical web stiffener-to-upper flange repair plate weld for 4". From that point, the crack turns toward the southwest to extend an additional 1-1/2" diagonally across the plate. There is also a 1" long crack in the paint that continues along the vertical web stiffener-to-upper flange repair plate weld from where the repair plate crack branches off. There is significant RMS along the break due to the flange and repair plate visibly pumping under heavy live load. For reference, the north horizontal leg of the original upper flange angle was reinforced with a bolted repair plate installed along its underside, and the upper end of the vertical web stiffener was repaired by removing the deteriorated section and then installing a welded repair plate to restore the detail. The stiffener repair plate is fillet welded along both edges to the underside of the upper flange repair plate and overlap welded to the faces of the original stiffener. The web stiffener repair

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plate is not welded to the vertical leg of the upper flange angle or to the floorbeam web. Additionally, the gap between the upper flange angle repair plate and underside of the Stringer 4N bearing bolster is filled with steel putty which hides the leading edge of the original upper flange horizontal angle leg. There is, however, notable RMS emanating from the lower edge of the putty (source undeterminable). **See Photos 1 thru 4.** Note - there were no floorbeam web and/or upper flange defects below Stringer 4S noted at the time of inspection. The upper end of the original vertical web stiffener at this location was field-coped to clear the bolted repair plate installed along the underside of the south horizontal leg of the floorbeam upper flange and is not welded to it.

2W. Floorbeam 14N at Stringer 4S in River Span-N:

The base of the horizontal leg of the upper flange angle is cracked for 3-3/4" long on the east side and 5-5/8" long on the west side of the vertical web stiffener (total length of 9-3/4", including the length behind the web stiffener). The horizontal leg of the upper flange angle is also cracked - the crack begins at the leading edge of the angle and then travels around the southeast bearing anchor bolt where it terminates in a ±2-1/2" diameter asterisk-shaped crack located at mid-width of the angle leg, beneath the east edge of the stringer bearing bolster. The web stiffener-to-upper flange interface is of original construction (tight-fit clearance, no repair plate, not welded). **See Photos 5 thru 8.** Note - there were no floorbeam web and/or upper flange defects below Stringer 4N noted at the time of inspection. The upper end of the vertical web stiffener at this location was repaired by removing the deteriorated section and then installing a welded repair plate to restore the detail. The stiffener repair plate is fillet welded along both edges to the underside of the upper flange horizontal angle leg and overlap welded to the faces of the original stiffener. The web stiffener repair plate is not welded to the vertical leg of the upper flange angle or to the floorbeam web.

3W. Floorbeam 8N at Stringer 4N in Span N1:

There is distressed paint along the upper and lower toes of the west-side weld between the vertical web stiffener repair plate and upper flange horizontal angle leg repair plate. **See Photo 9.** Note - there were no floorbeam web and/or upper flange defects below Stringer 4S noted at the time of inspection. The web stiffener-to-upper flange interface at this location is of original construction (tight-fit clearance, no repair plate, not welded).

East 1971 Widening section (consists of Stringers 13 thru 16)

1E. Floorbeam 18S at Stringer 13N in River Span-S:

The north horizontal leg of the upper flange angle is cracked-thru for nearly its full width directly above the vertical web stiffener. The web stiffener-to-upper flange interface is of original construction (tight-fit clearance, no repair plate, not welded), and the angle leg visibly pumps under heavy live load (a slight banging noise is heard). **See Photos 10 and 11.** Note - there is RMS along the seam between the floorbeam web stiffener and upper flange angle leg below Stringer 13S; however, no visible cracks in the web and/or angle leg were observed. The web stiffener-to-upper flange interface at this location is of original construction (tight-fit clearance, no repair plate, not welded).

2E. Floorbeam 14N at Stringer 13N in River Span-N:

There is a 4" long thru-crack in the north horizontal leg of the upper flange angle beginning at the leading edge and extending along the upper toe of the floorbeam web stiffener repair plate-to-upper flange weld, west side. The crack visibly pumps under heavy live load and exhibits RMS as a result. For reference, the upper end of the vertical web stiffener was repaired by removing the deteriorated section (3" high) and then installing a welded repair plate to restore the detail. The stiffener repair plate was cut to fit the removed portion and is fillet welded along both edges

to the underside of the horizontal angle leg and face of the vertical angle leg of the original upper flange, and butt welded to the trimmed end of the original stiffener. **See Photo 12.**

3E. Floorbeam 4N at Stringer 13S in Span N1:

There is a crack along the vertical web stiffener-to-upper flange weld for 1-1/4" long on the east face and 1-3/4" long on the west face. For reference, the upper end of the vertical web stiffener was repaired by removing the deteriorated section (4" high) and then installing a welded repair plate to restore the detail. The stiffener repair plate was cut to fit the removed portion and is fillet welded along both edges to the underside of the horizontal angle leg and face of the vertical angle leg of the original upper flange, and butt welded to the trimmed end of the original stiffener. **See Photos 13 thru 15.**

Original Center section (consists of Stringers 5 thru 12)

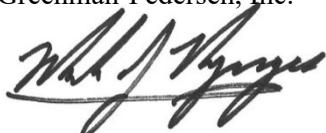
1C. Cracks in the paint are evident for the full or partial length of the welds down one or both edges of the lower flange at the following ten (10) locations: Span S1 - Stringer 5S & 5N at Floorbeam 8S; River Span-S - Stringers 11S & 11N at Floorbeam 14S and Stringer 5S at Floorbeam 18S; River Span-N - Stringer 5S at Floorbeam 14N; and Span N1 - Stringers 5S, 5N, and 11N at Floorbeam 4N and Stringer 5S at Floorbeam 8N. **See Photo 16.**

Repairs to the previously documented 2016 Biennial Inspection cracks in the floorbeam upper webs and associated cracks or breaks in the floorbeam vertical web stiffener-to-upper flange welds beneath Stringers 2, 3, 14, and 15 at all seven (7) intermediate deck joints within the Main River Unit are scheduled for installation in the coming weeks by Contract A100.196, Work Order S2. Considering that there were no significant changes to those conditions since the April 2018 monitoring inspection and in light of the newly discovered cracks, we recommend the following:

1. The scheduled repair work be postponed until all of the newly discovered findings and their relationship to the previously documented cracks can be further investigated and assessed by the original Contract T100.137 design team; and
2. All 16 stringers at the seven (7) intermediate deck joints within the Main River Unit be monitored on a 6-month basis until a plan-of-action is developed - as such, the next interim inspection would be conducted in March 2019.

Please do not hesitate to contact the undersigned should you have any questions or need additional information.

Sincerely,
Greenman-Pedersen, Inc.



Mark J. Nyerges, P.E.
Project Manager

Copy: Sean Reichl, P.E., Deputy Project Manager (GPI)

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West 1971 Widening Section (Consists of Stringers 1 thru 4)



Photo 1: River Span-S, Floorbeam 14S at Stringer 4N - General view of the vertical web stiffener-to-upper flange interface, looking southeast. Note the repair plates welded to the upper end of the stiffener and bolted to the underside of the upper flange horizontal angle leg; the stiffener repair plate is welded to the underside of the flange repair plate which is where a thru-crack has developed along the west side as evidenced by the RMS.



Photo 2: River Span-S, Floorbeam 14S at Stringer 4N - General view of the vertical web stiffener-to-upper flange interface, looking southwest. Note the repair plates welded to the upper end of the stiffener and bolted to the underside of the upper flange horizontal angle leg. Also note the RMS emanating from the thru-crack along the west side of the stiffener repair plate-to-upper flange repair plate weld as depicted in Photo 1.

West 1971 Widening Section (Consists of Stringers 1 thru 4)

Photo 3: River Span-S, Floorbeam 14S at Stringer 4N - Close-up view of the 4" long thru-crack along the web stiffener repair plate-to-upper flange repair plate weld, looking up facing southeast. Note the end of the crack branches off and extends 1-1/2" toward the southwest. Also note the paint is cracked along the upper toe of the weld for an additional 1" from the end of the thru-crack; and the RMS resulting from pumping of the flange under heavy live load.



Photo 4: River Span-S, Floorbeam 14S at Stringer 4N - Close-up view of the thru-cracked upper flange repair plate along the west edge of web stiffener repair plate-to-upper flange repair plate weld, looking south.

West 1971 Widening Section (Consists of Stringers 1 thru 4)



Photo 5: River Span-N, Floorbeam 14N at Stringer 4S - General view of the 9-3/4" long crack along the base of the original upper flange horizontal angle leg, and of the cracked upper flange horizontal angle leg at the southeast stringer bearing anchor bolt, looking up, facing north.



Photo 6: River Span-N, Floorbeam 14N at Stringer 4S - Close-up view of the 3-3/4" long crack along the base of the original upper flange horizontal angle leg on the east side of the vertical web stiffener, looking up, facing north.

West 1971 Widening Section (Consists of Stringers 1 thru 4)



Photo 7: River Span-N, Floorbeam 14N at Stringer 4S - Close-up view of the 5-5/8" long crack along the base of the original upper flange horizontal angle leg on the west side of the vertical web stiffener, looking up, facing north.



Photo 8: River Span-N, Floorbeam 14N at Stringer 4S - Close-up view of the cracked horizontal leg of the upper flange angle leg, looking up, facing north. The crack begins at the leading edge of the angle (arrow) and then travels around the southeast bearing anchor bolt where it terminates in a ±2-1/2" diameter asterisk-shaped crack located at mid-width of the angle leg, beneath the east edge of the stringer bearing bolster.

West 1971 Widening Section (Consists of Stringers 1 thru 4)



Photo 9: Span N1, Floorbeam 8N at Stringer 4N - Distressed paint along the west-side weld between the vertical web stiffener repair plate and upper flange horizontal angle leg repair plate, looking southeast.

East 1971 Widening Section (Consists of Stringers 13 thru 16)



Photo 10: River Span-S, Floorbeam 18S at Stringer 13N - The north horizontal leg of the original upper flange angle is cracked-thru for nearly its full width directly above the original vertical web stiffener (tight fit clearance, not welded), looking up, facing southeast. Note the light RMS emanating from the crack indicating the angle leg pumps under heavy live load (interface bangs lightly under passage).



Photo 11: River Span-S, Floorbeam 18S at Stringer 13N - Close up-view of the thru-cracked original upper flange angle leg directly above the original vertical web stiffener, looking south.

East 1971 Widening Section (Consists of Stringers 13 thru 16)



Photo 12: River Span-N, Floorbeam 14N at Stringer 13N - 4" long thru-crack in the north horizontal leg of the upper flange angle beginning at the leading edge and extending along the upper toe of the floorbeam web stiffener repair plate-to-upper flange weld, west side, looking up, facing southeast. Note the RMS emanating from the crack due to pumping under heavy live load.



Photo 13: Span N1, Floorbeam 4N at Stringer 13S - General view of the cracked vertical web stiffener repair plate-to-upper flange weld, looking northwest.

East 1971 Widening Section (Consists of Stringers 13 thru 16)



Photo 14: Span N1, Floorbeam 4N at Stringer 13S - Close-up view of the 1-1/4" long crack along the east side of the web stiffener repair plate-to-upper flange weld, looking up, facing northwest.

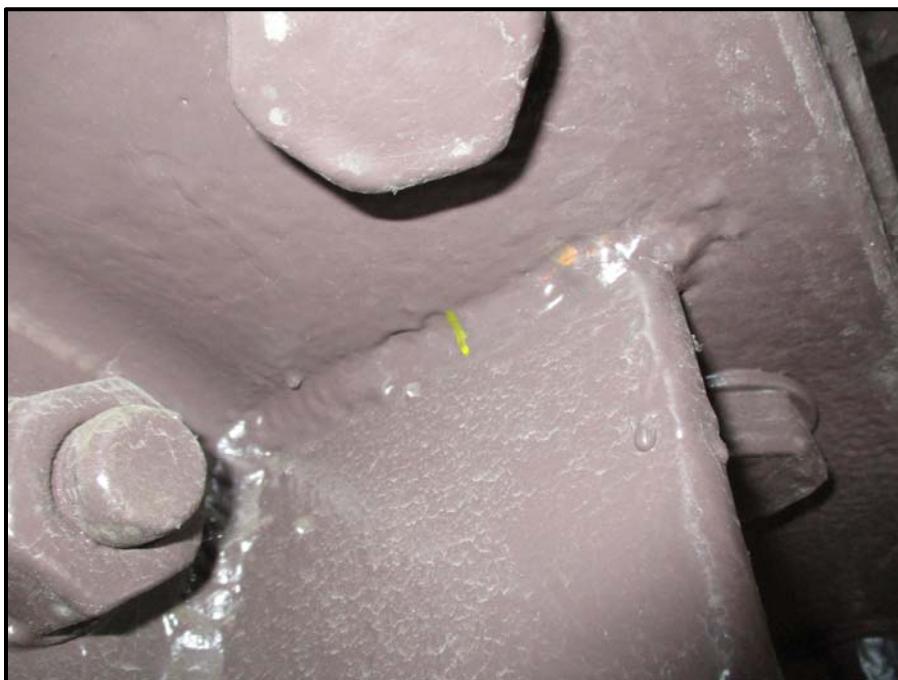


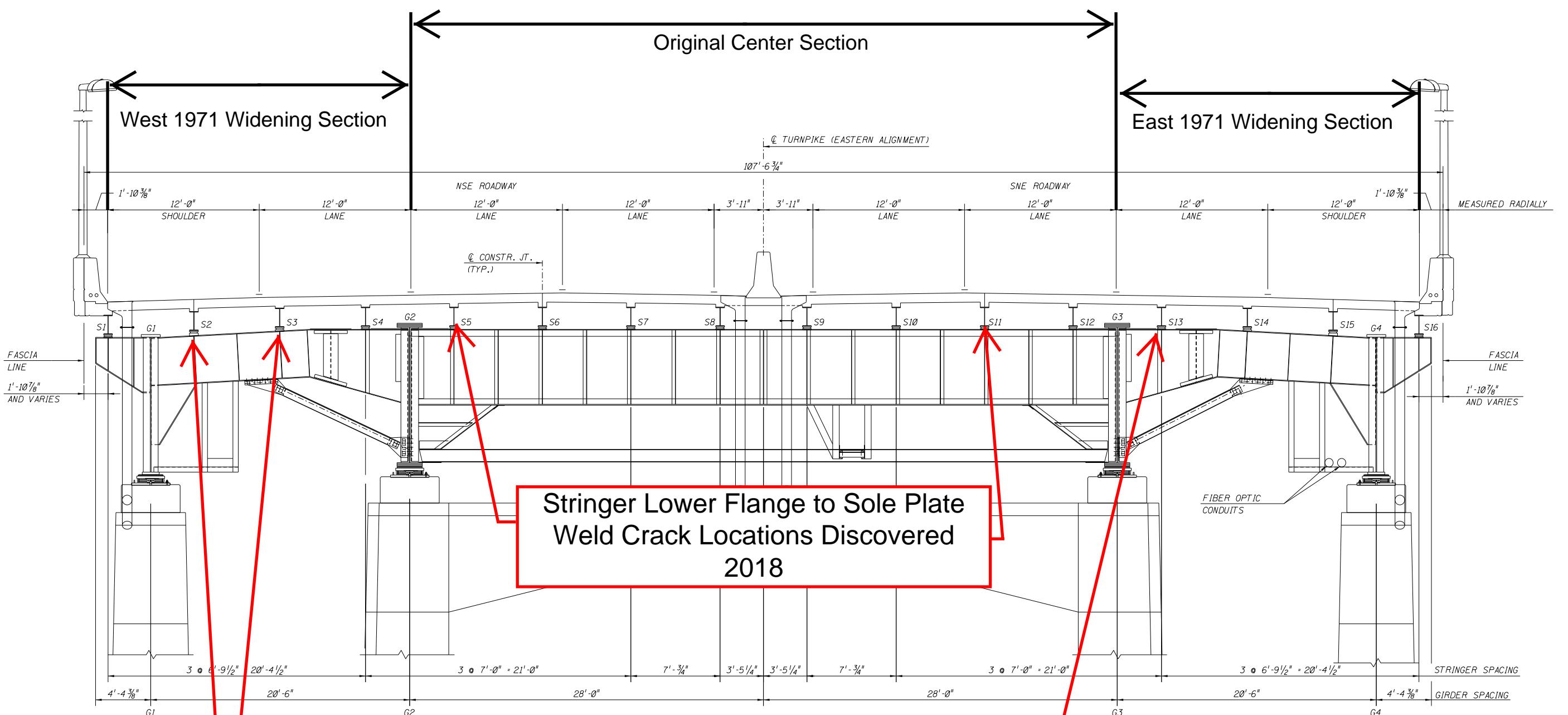
Photo 15: Span N1, Floorbeam 4N at Stringer 13S - Close-up view of the 1-3/4" long crack along the west side of the web stiffener repair plate-to-upper flange weld, looking up, facing northeast.

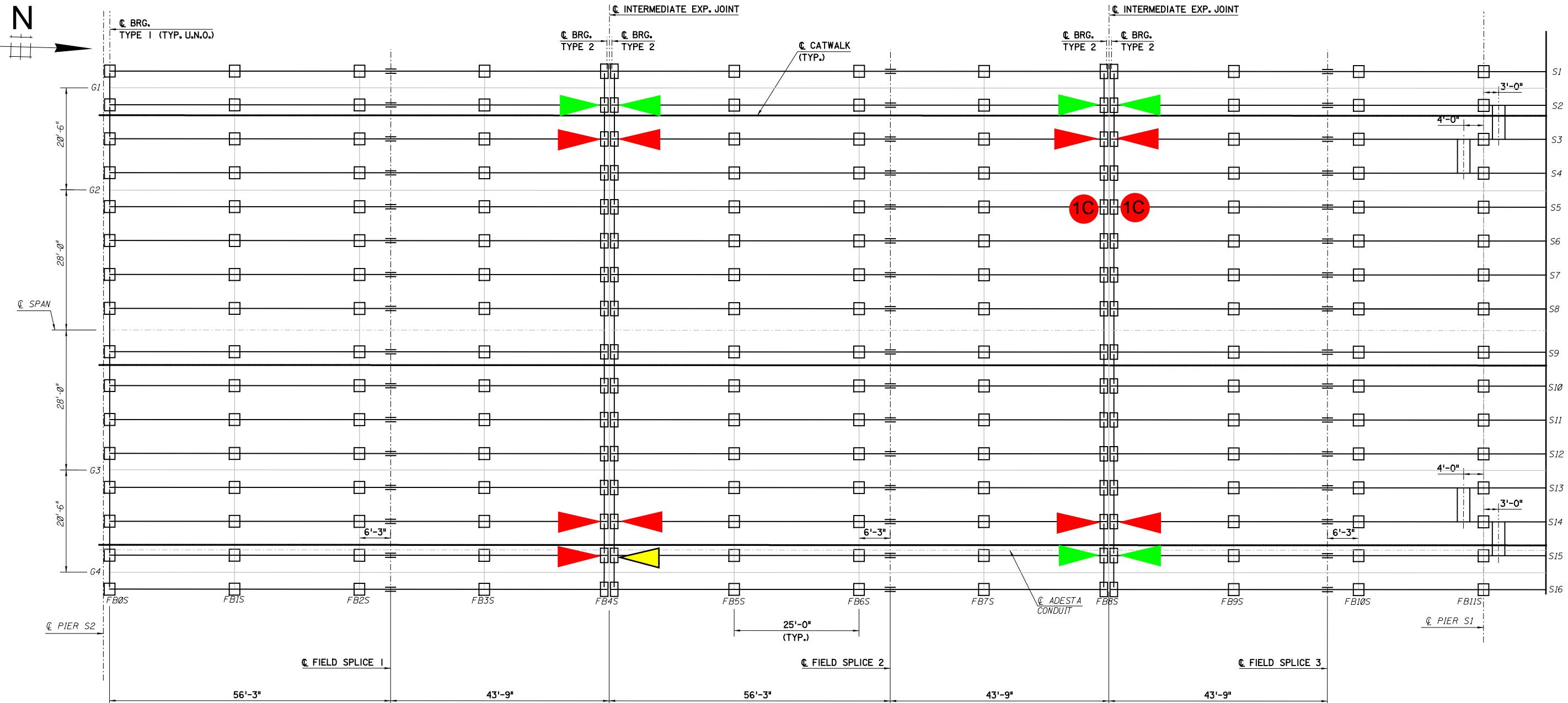
Original Center Section (Stringers 5 thru 12)



Photo 16: Span S1, Stringer 5S at Floorbeam 8S - Newly cracked paint along the upper toe of the stringer lower flange-to-bearing sole plate weld, looking southeast. This condition is typical at ten (10) locations scattered throughout Stringers 5 thru 12 (original center section of the bridge) along the seven (7) intermediate deck joints within the Main River Unit.

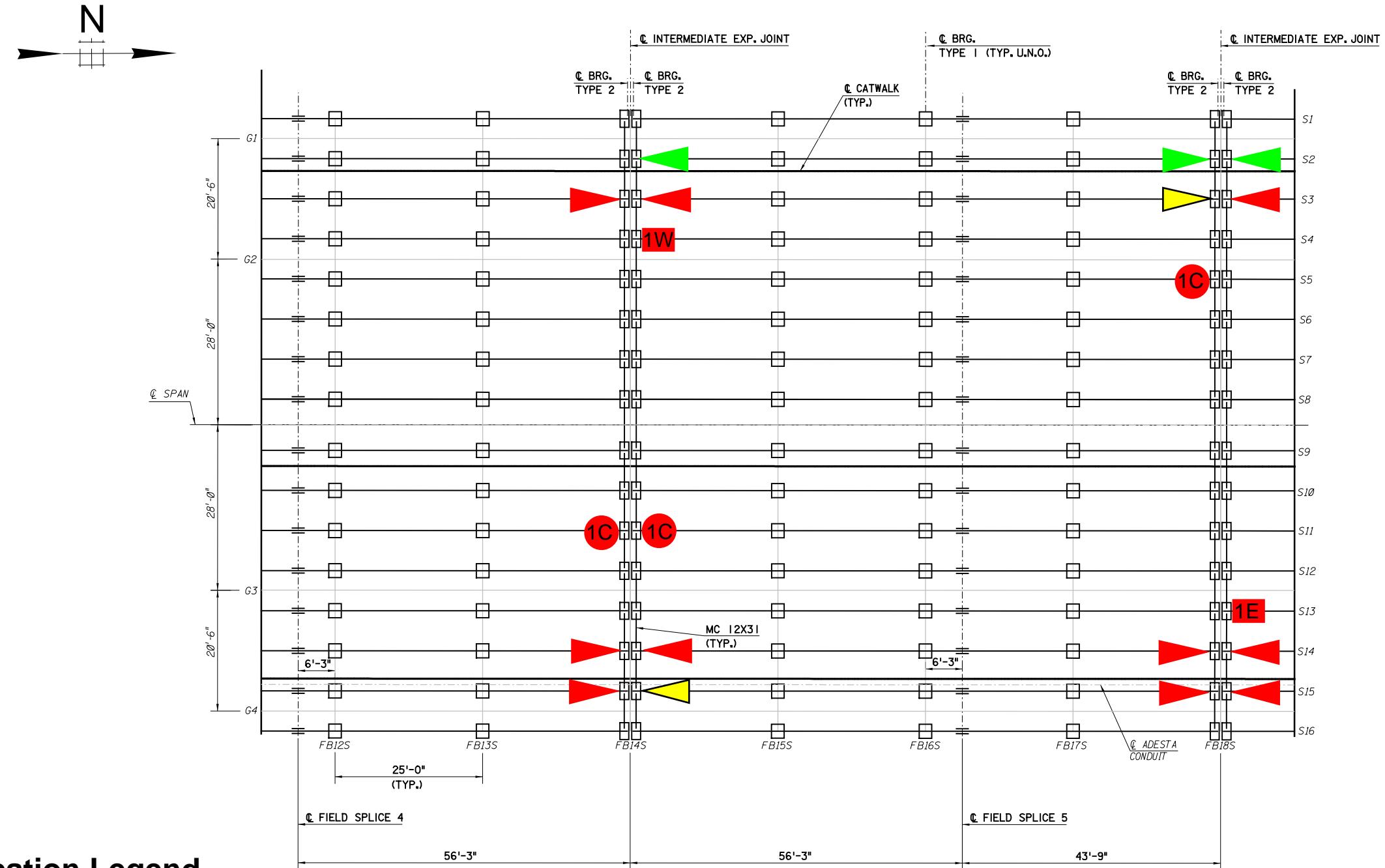
ATTACHMENT 1 - CRACK LOCATION PLANS

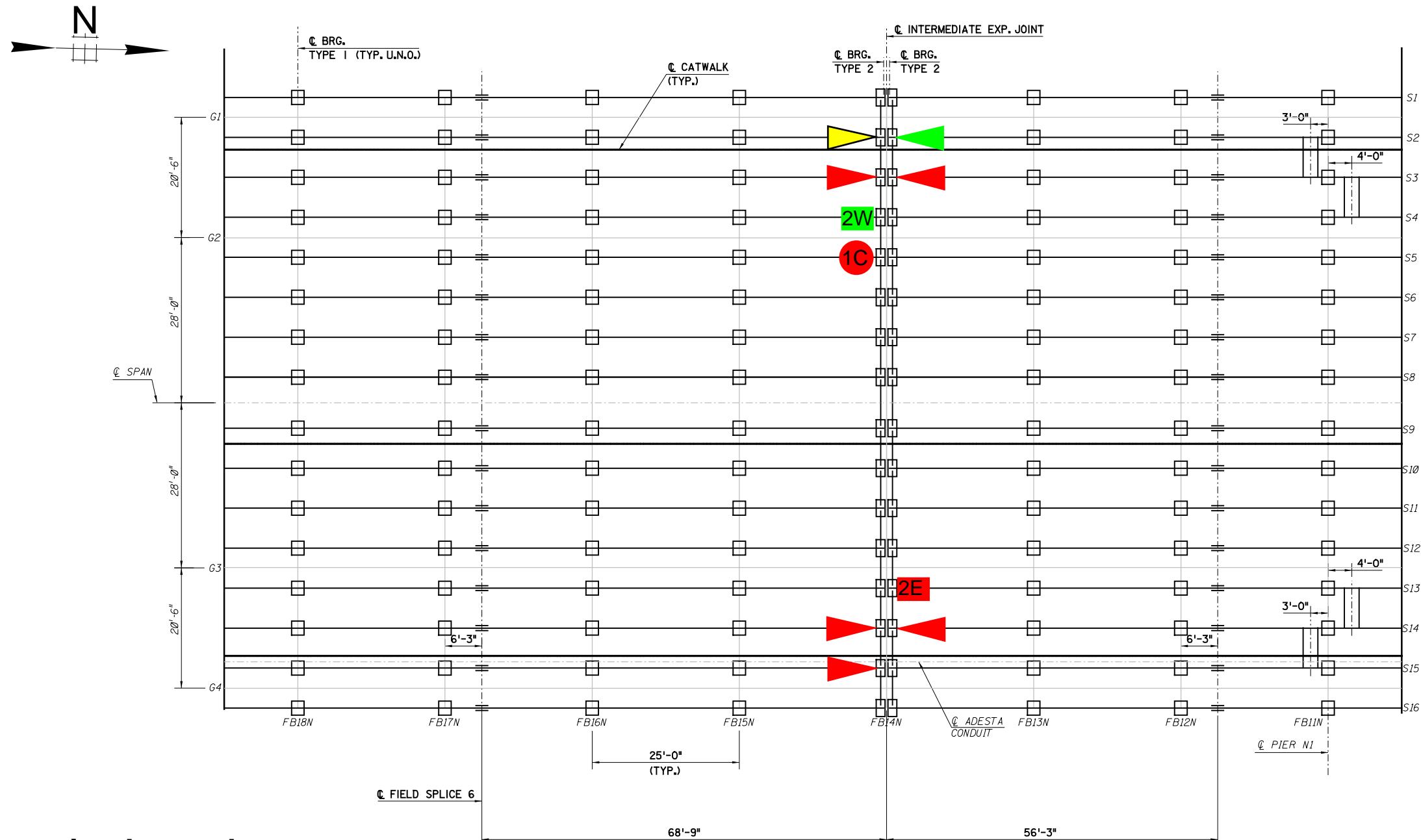


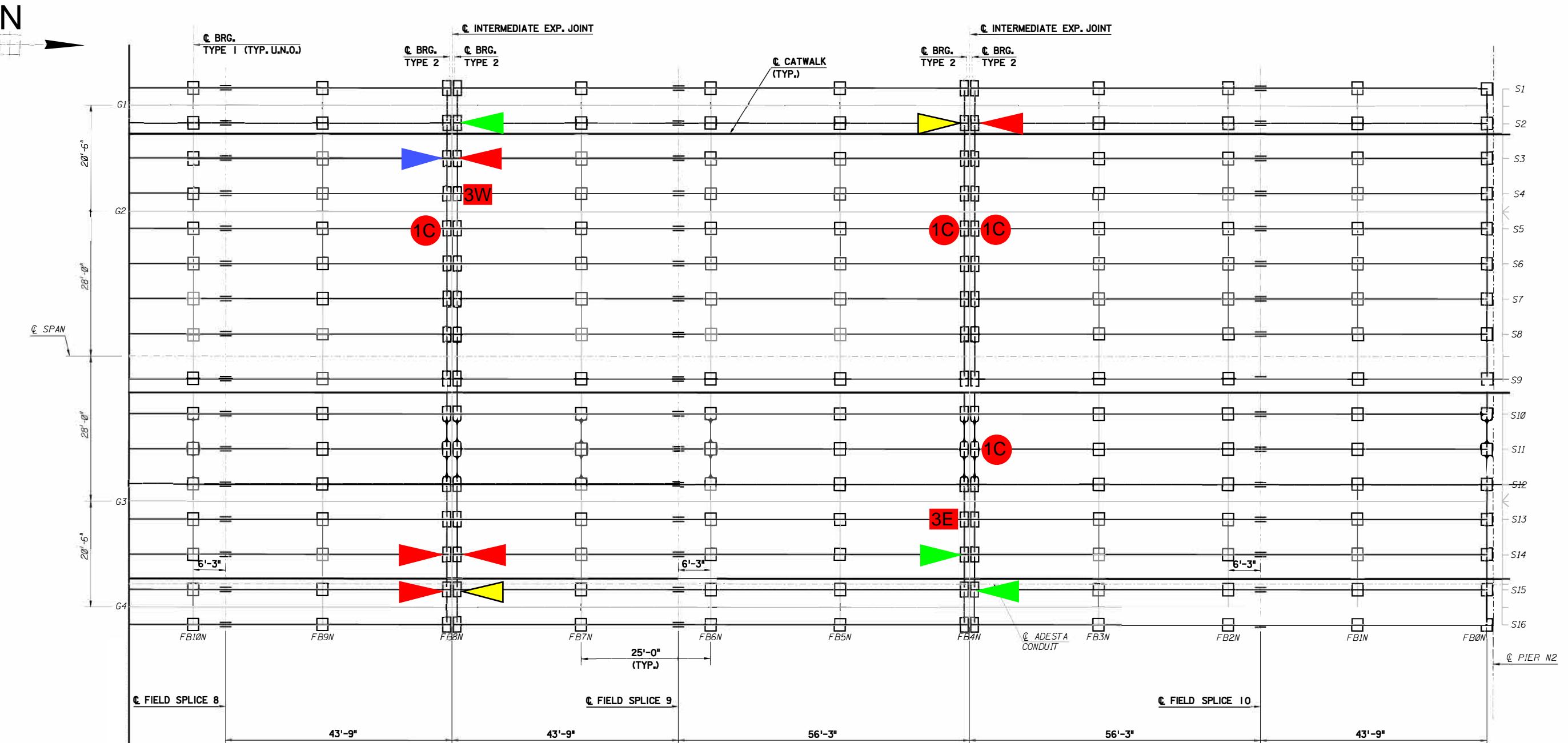


Crack Location Legend

- ▲ Broken Web Stiffener Top Weld & Cracked Floorbeam Upper Web (Location First Identified During 2016 Inspection)
- ▲ Cracked Web Stiffener Top Weld (Location First Identified During 2016 Inspection)
- ▲ Cracked Web Stiffener Top Weld & cracked Floorbeam Upper Web (Location First Identified During 2016 Inspection)
- ▲ Broken Web Stiffener Top Weld (Location First Identified During 2016 Inspection)
- Stringer Lower Flange to Sole Plate Weld Crack (Location First Identified During 2018 Inspection)
- XX Cracked Floorbeam Upper Flange (Location First Identified During 2018 Inspection)







Crack Locations - Span N1

Crack Location Legend

- ▲ Broken Web Stiffener Top Weld & Cracked Floorbeam Upper Web (Location First Identified During 2016 Inspection)
- ▲ Cracked Web Stiffener Top Weld (Location First Identified During 2016 Inspection)
- ▲ Cracked Web Stiffener Top Weld & cracked Floorbeam Upper Web (Location First Identified During 2016 Inspection)
- ▲ Broken Web Stiffener Top Weld (Location First Identified During 2016 Inspection)
- Stringer Lower Flange to Sole Plate Weld Crack (Location First Identified During 2018 Inspection)
- Cracked Floorbeam Upper Flange (Location First Identified During 2018 Inspection)

Nyerges, Mark

From: Nyerges, Mark
Sent: Wednesday, September 26, 2018 8:59 AM
To: Jean H. Laird (laird@turnpike.state.nj.us)
Cc: 'Richard Schaefer'; Reichl, Sean; Johnson, Greg; Hicks, David
Subject: OPS A3575 - Summary of Recent Discussions Regarding N2.01 and E109.83

Morning Jean,

A quick summary of yesterday's impromptu meeting regarding the newly developed structural steel cracks at Turnpike Structure E109.83 and load rating update status for Turnpike Structure N2.01:

E109.83

1. Based on the development of the new floorbeam upper flange cracks beneath Stringers 4 and 13 at the intermediate deck joints in the Main River Unit, it was agreed that the repairs / arresting measures for the upper web cracks scheduled for installation by Contract A100.196, Work Order S2 be put on-hold pending further study / investigation by HNTB and DGI.
2. The next monitoring of the intermediate deck joint floorbeams is to be performed in the Winter of 2019 (January / February) rather than the historical 6-month due date.
3. GPI anticipates completing the inspection field work by the end of October / early November and will provide the NJTA with a summary letter of the newly developed / developing Widening stringer web cracks (S1 thru S3 and S14 thru S16) at the end diaphragm connection plates.
4. GPI will also provide a location plan of the intermediate floorbeam bracket tie plate locations upon completion of the inspection field work, annotated with the ones that are cracking.

N2.01

1. Rating updates for the as-inspected conditions are necessary, and any resulting repair / strengthening warrants are to be included in Contract T100.184.
2. The Phase D due date for Contract T100.184 has been delayed and there is an opportunity to get the design plans / details into the documents prior to submission. If not, they can be inserted as a COP afterward.
3. The focus for the rating updates shall be the girder splices in the approach spans due to the significant pack rust build-ups. Analysis of the gusset plates is also warranted.
4. The legal truck types are to be utilized for the analyses.
5. Jean will discuss the update needs with Mark Bernard to determine who will perform them (HNTB, DGI, or GPI) and from what source they will be paid.
6. Bill Farrow (GPI) has been familiarizing himself with the latest conditions of the bridge since the need to perform the updates was first discussed earlier this year and GPI is available to turn the calculations around in a timely manner.

Please advise of any changes and/or additions and we will update accordingly.

Feel free to call Sean or me with any questions.

Thanks,
Mark

Mark Nyerges, P.E.
Manager, Bridge Inspection and Bridge Management

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