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Design and Fabrication of Orthotropic Deck Details

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16. Abstract
The objectives of the research were to verify the design and fabrication of the orthotropic deck details proposed for the lift bridge, for infinite fatigue life. Multi-level 3D finite element analyses (FEA) of the proposed deck were performed to determine the critical stresses at the connections, the corresponding load position, and the deck specimen. To develop cost-effective connection details, three variations of rib-to-floor beam and rib-to-deck plate connection details, including the influence of different fabrication parameters, were explored in full-scale small size mockups. Subsequently, the infinite life fatigue performance of the connection details were evaluated by laboratory testing of a full-scale prototype. The fatigue testing was conducted under simulated rear tandem axle loading of the AASHTO fatigue truck with adequate boundary condition. The prototype testing was runout after 8 million cycles, verifying the infinite life fatigue performance of the deck design.

17. Key Words	18. Distribution Statement
Lift Span, Orthotropic Deck, Rounded Bottom Ribs, Infinite Fatigue Life, Full-Scale Prototype, Fatigue Testing, AASHTO, Run-Out, Cost-Effective, Fabrication.	

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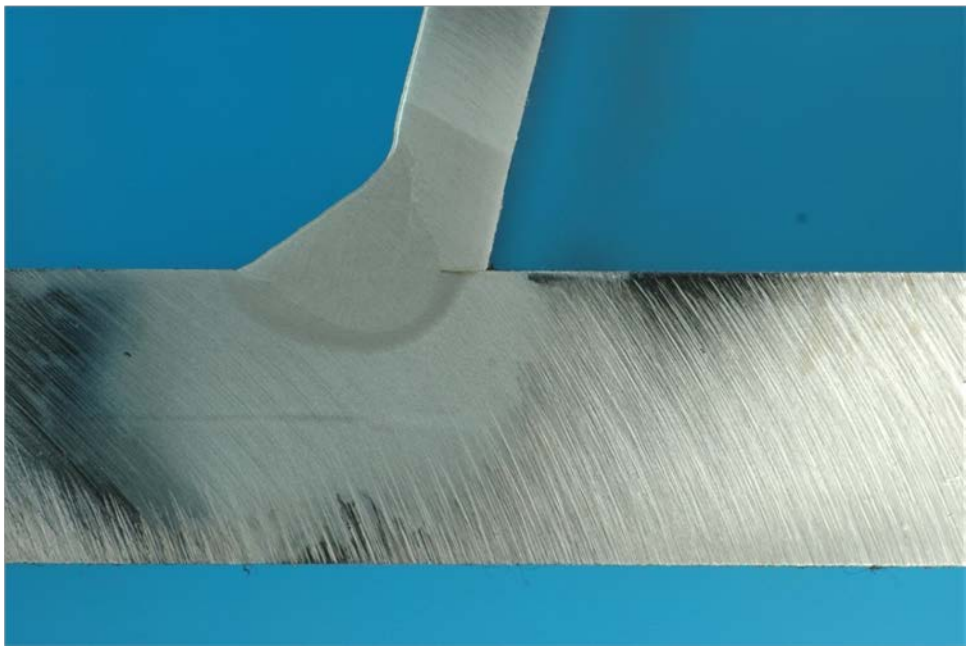

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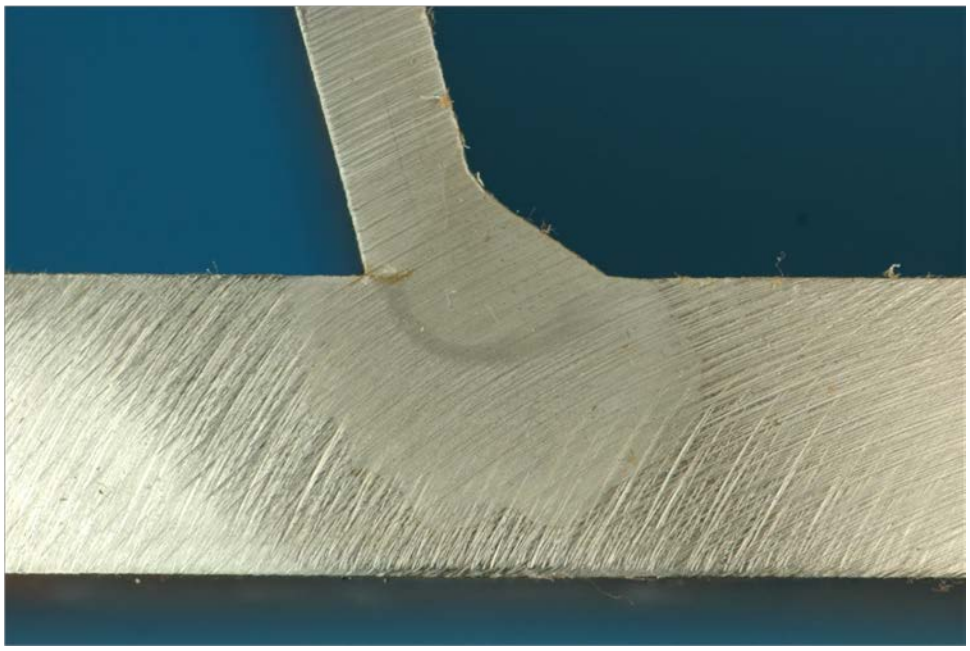

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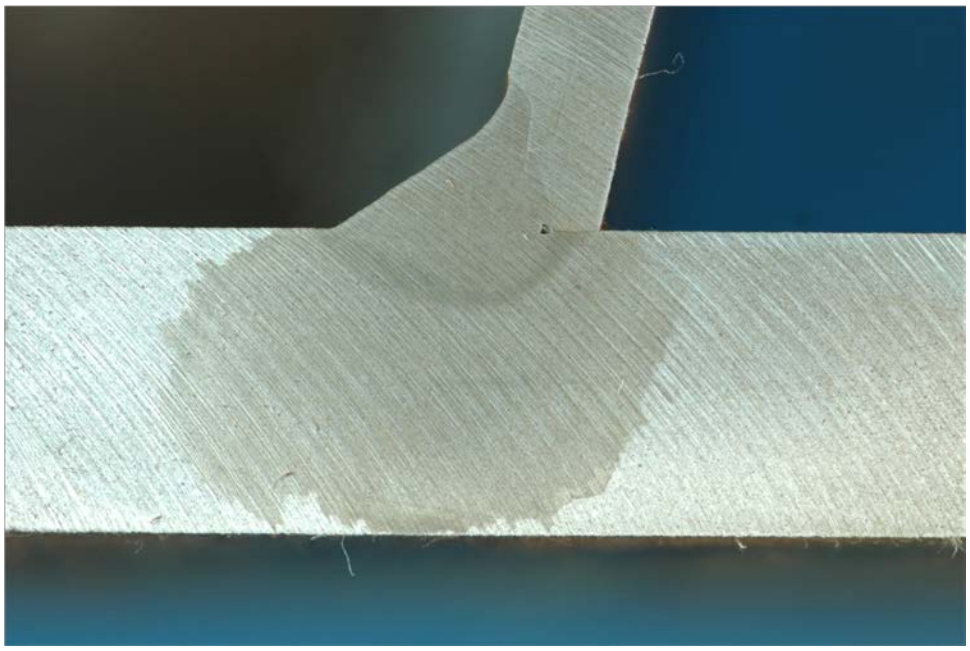

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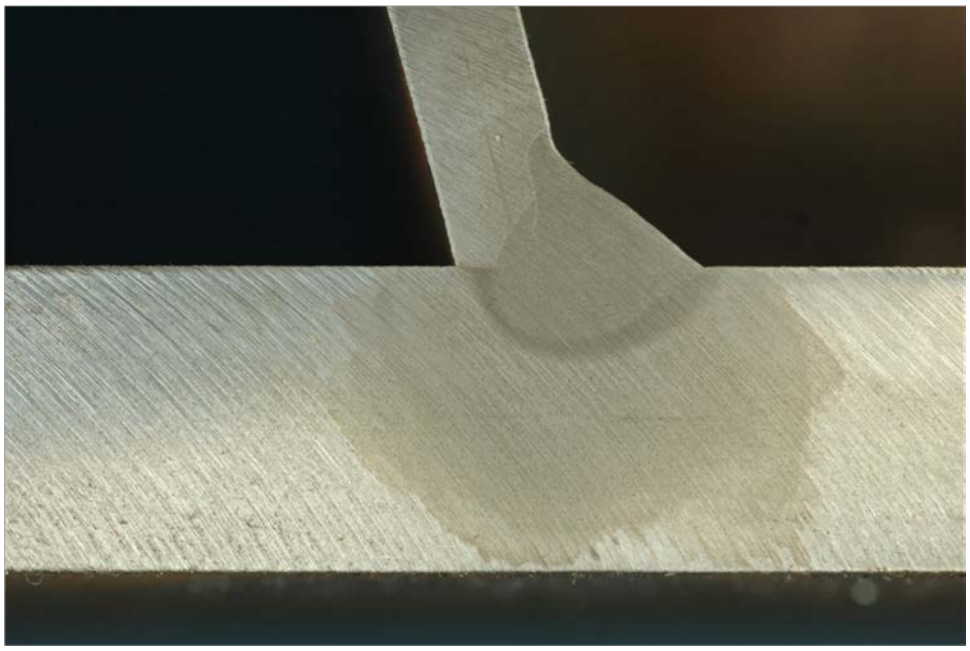

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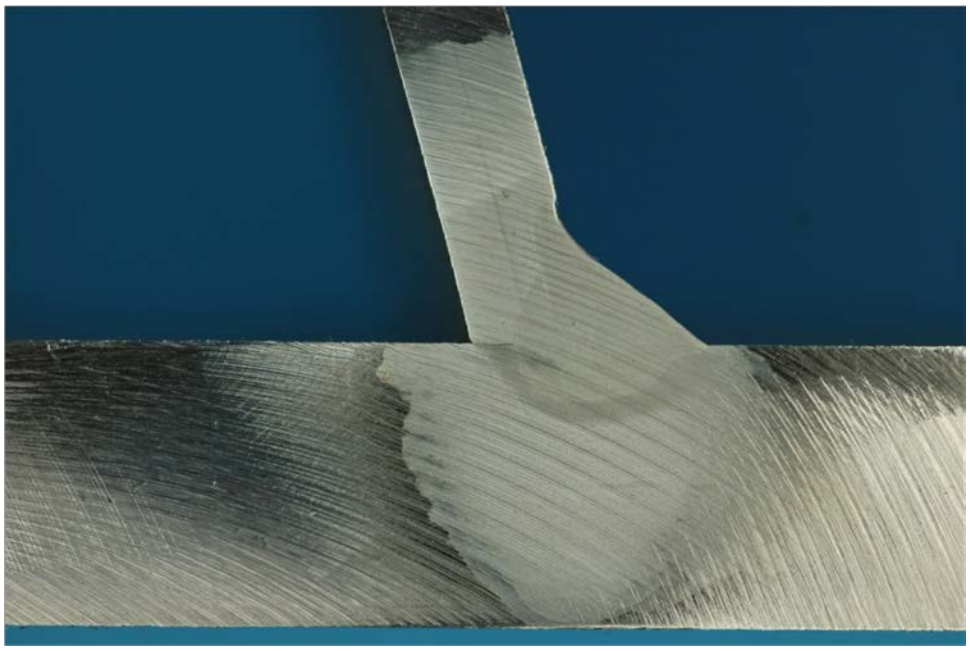

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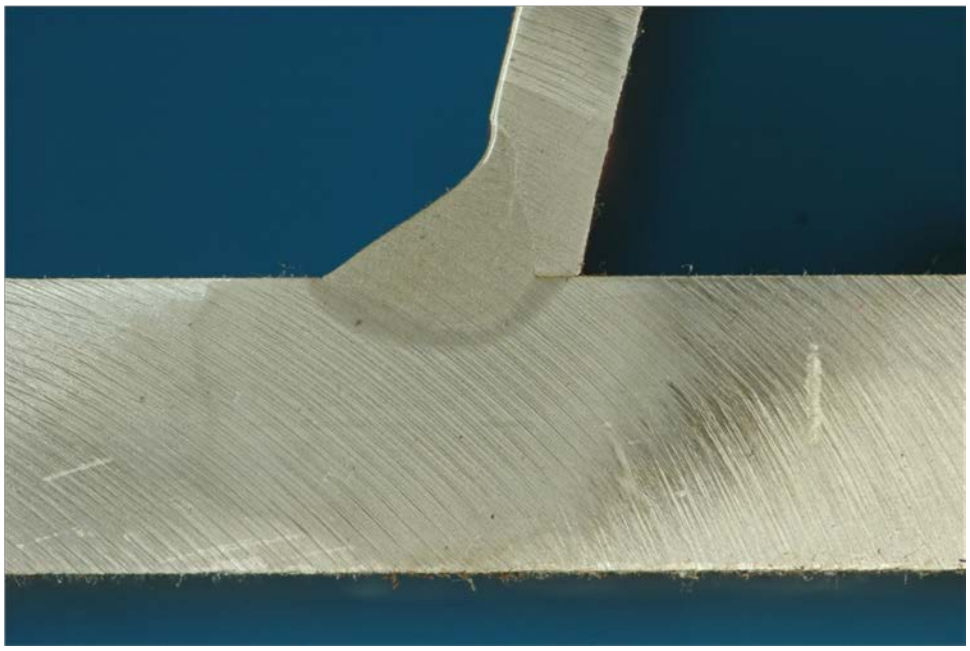

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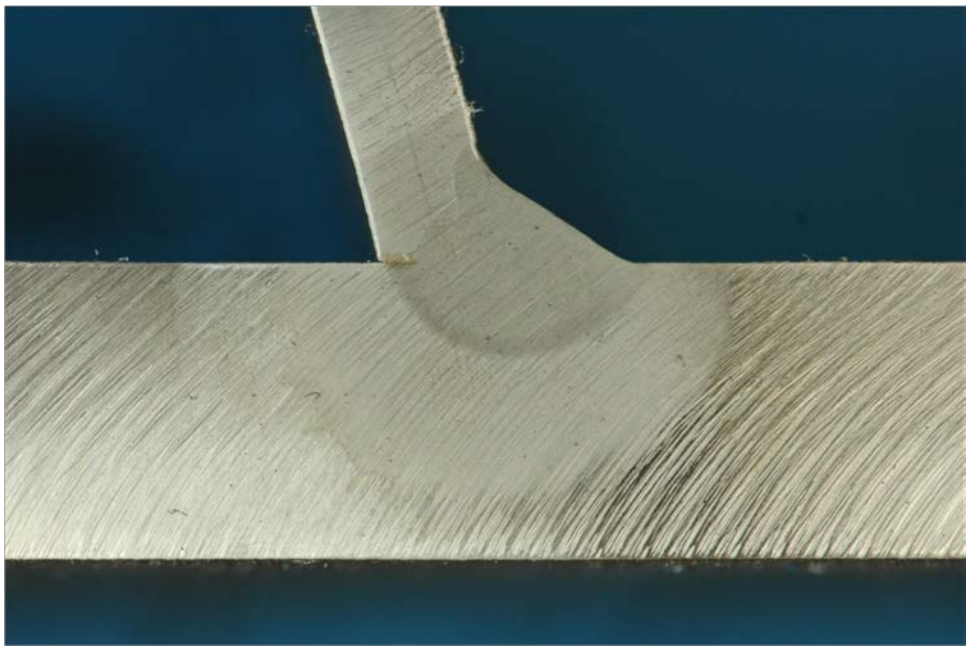

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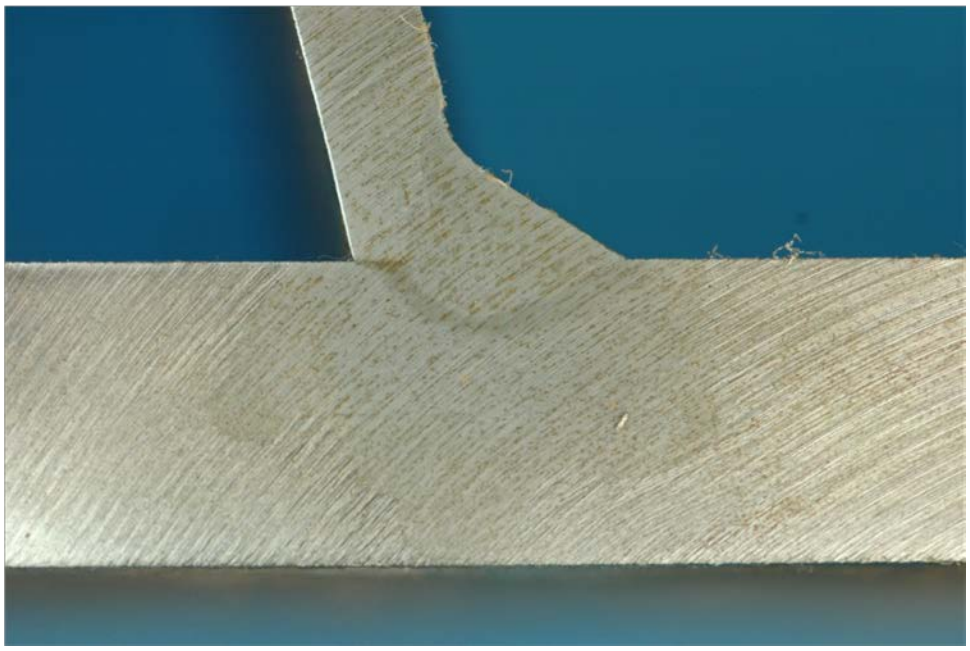

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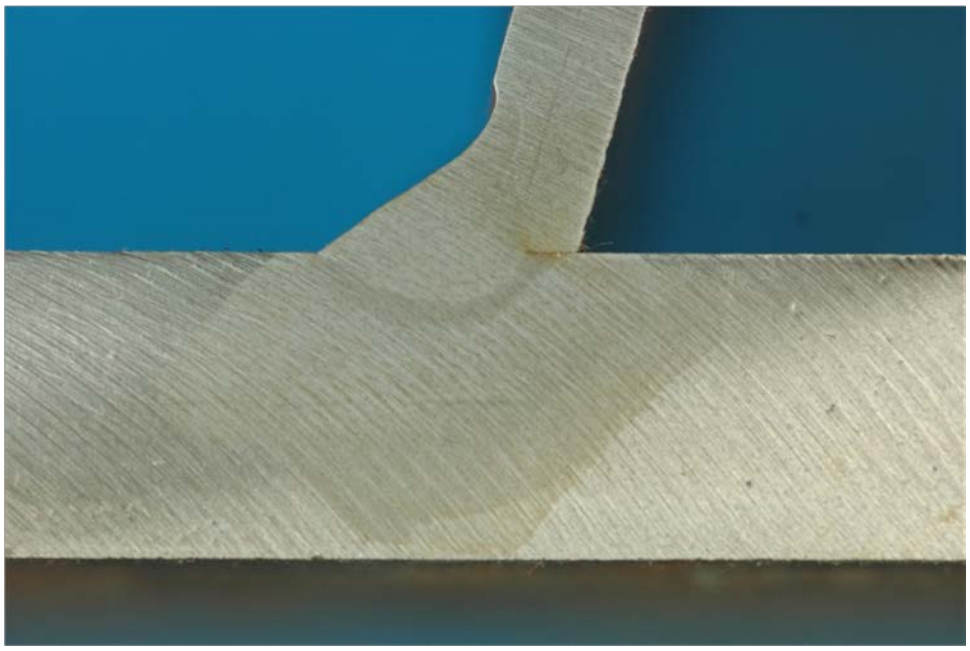

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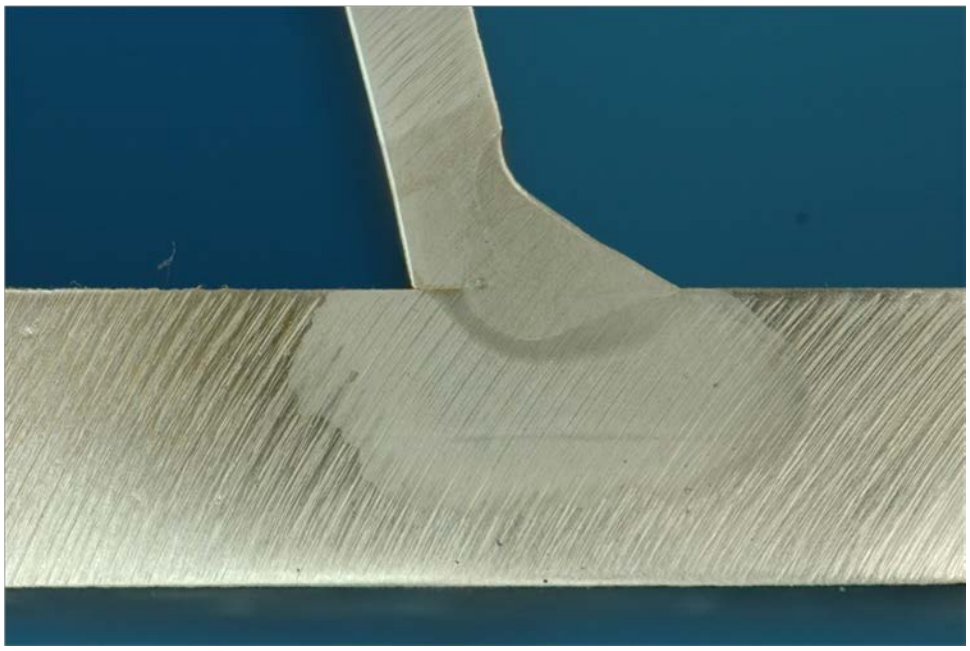

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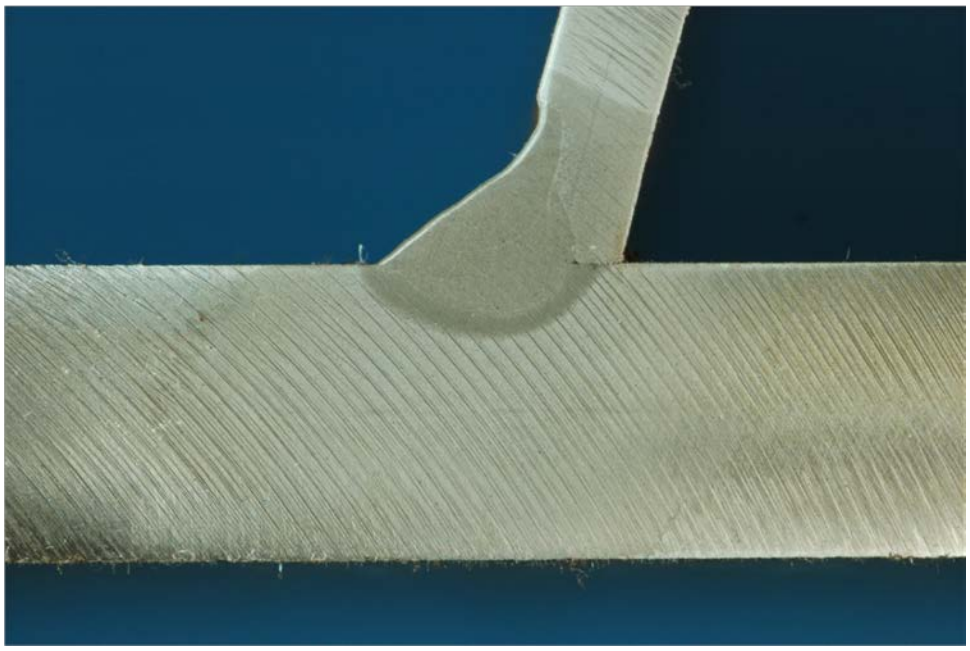

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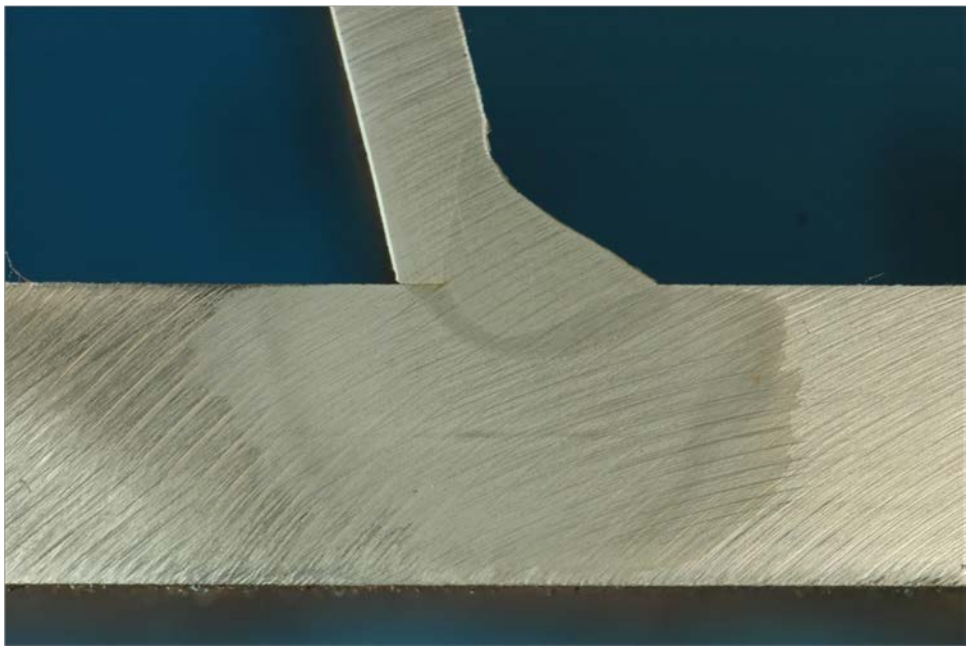

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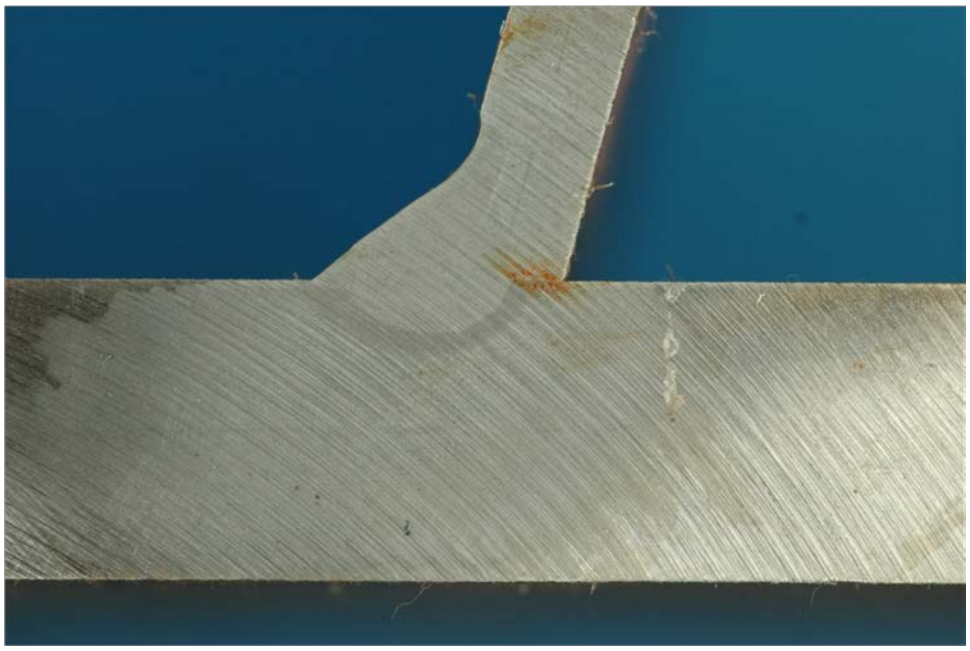

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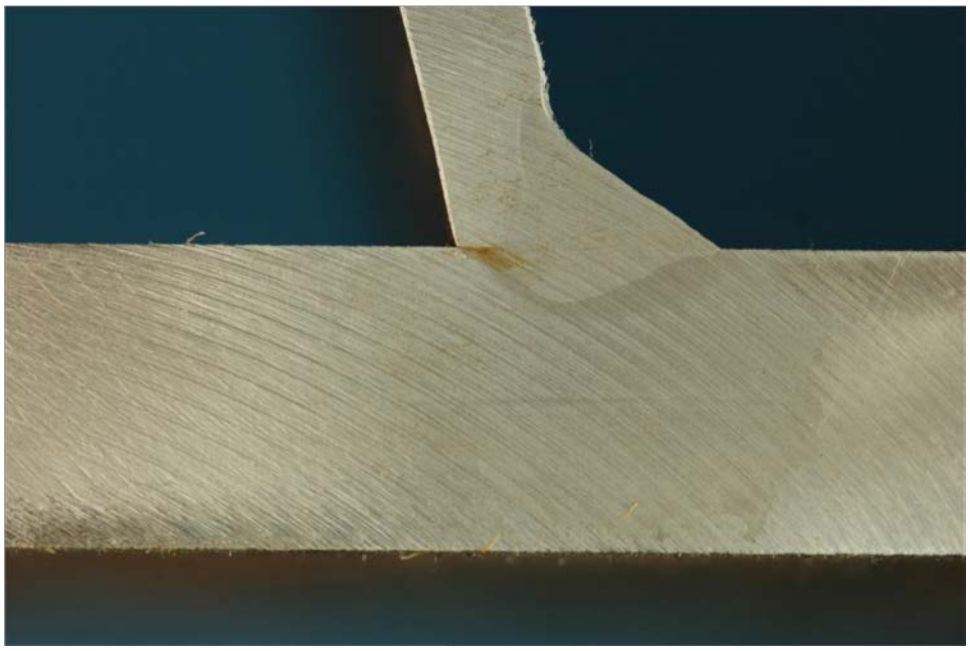

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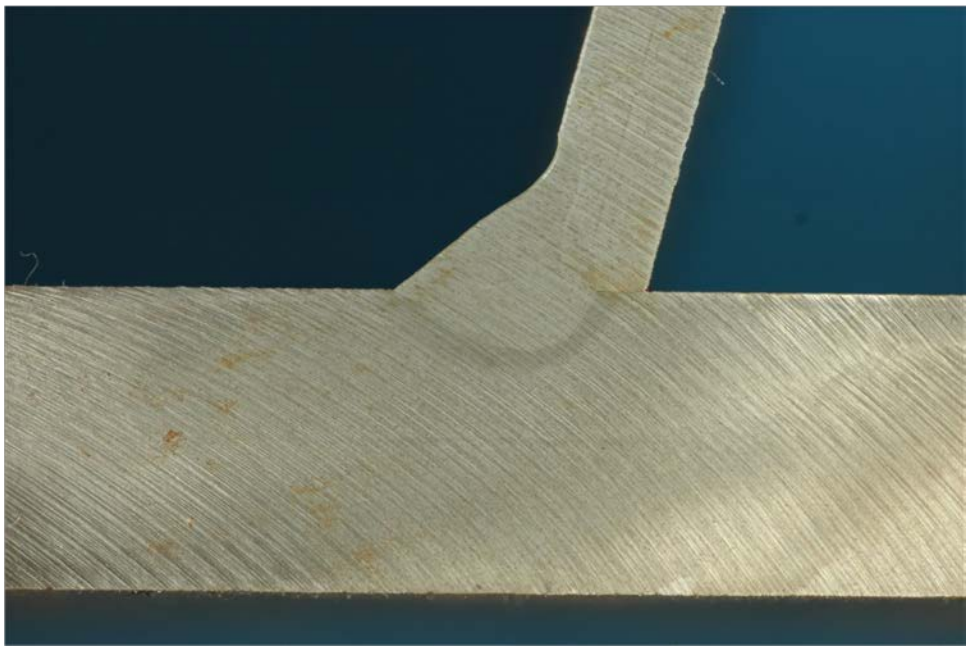

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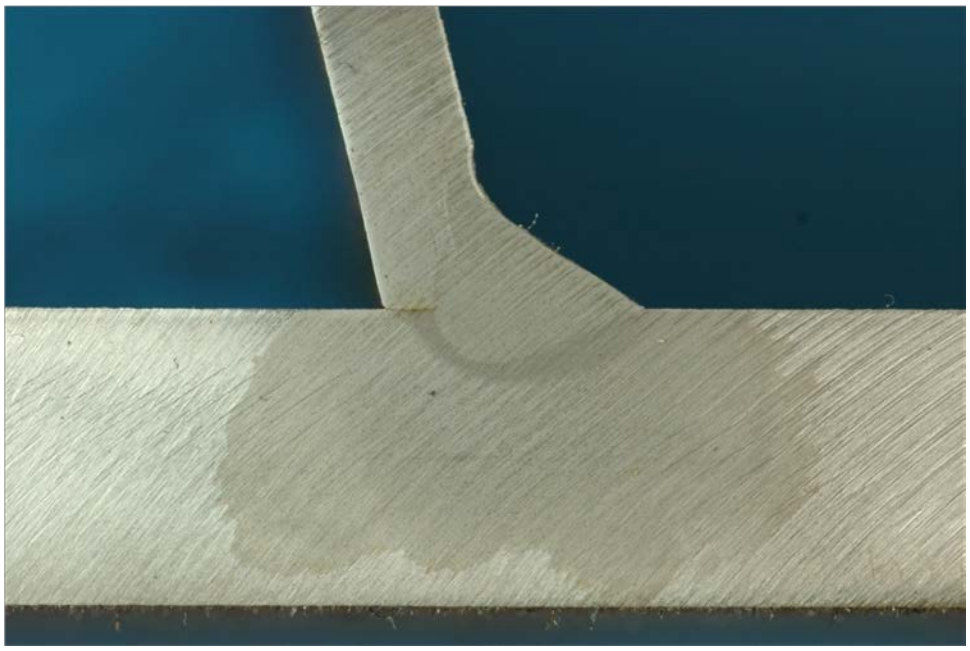

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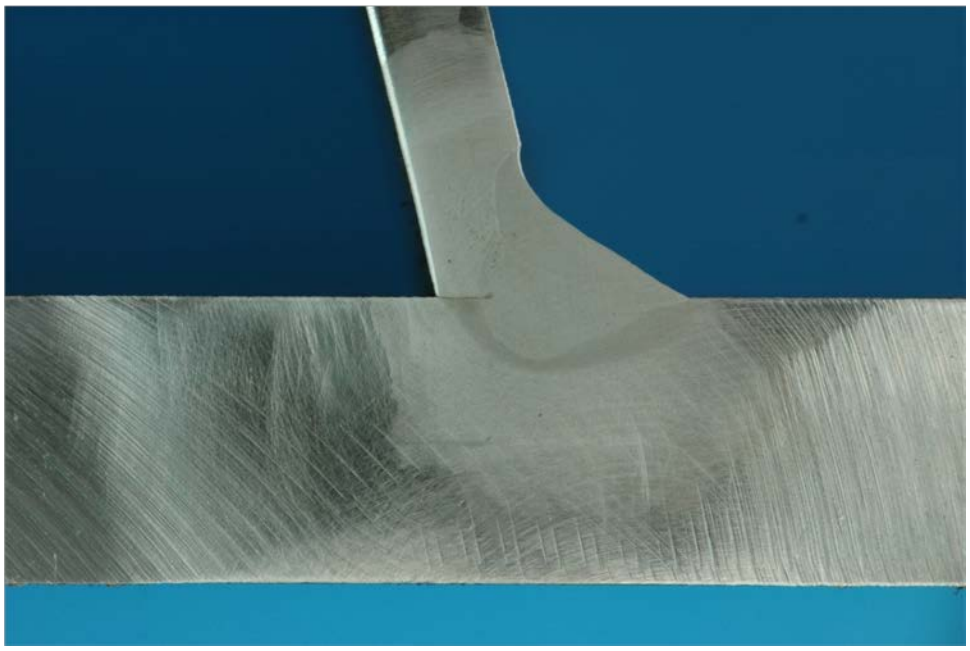

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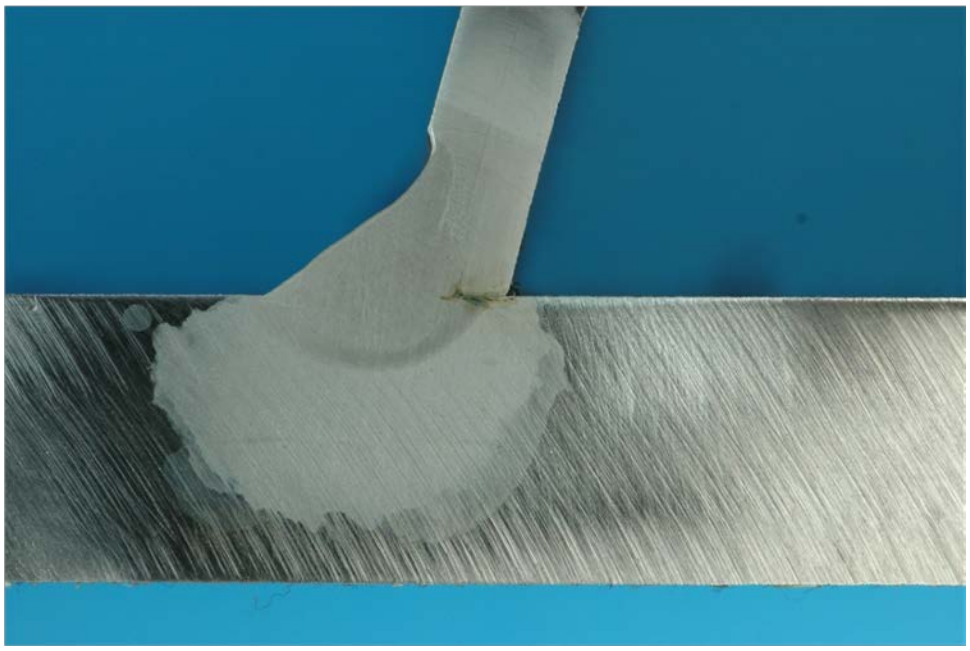

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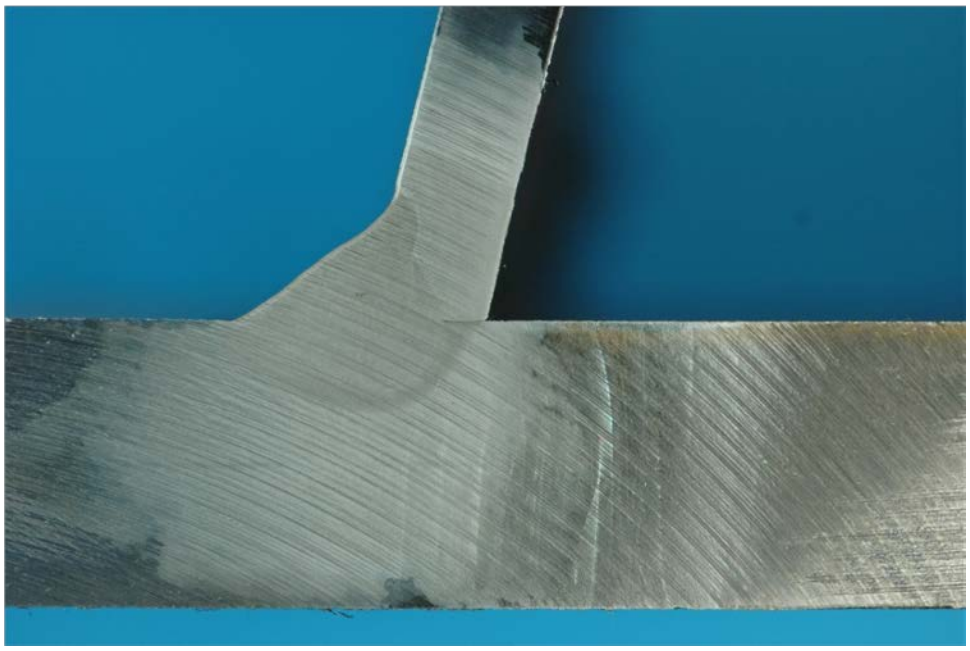

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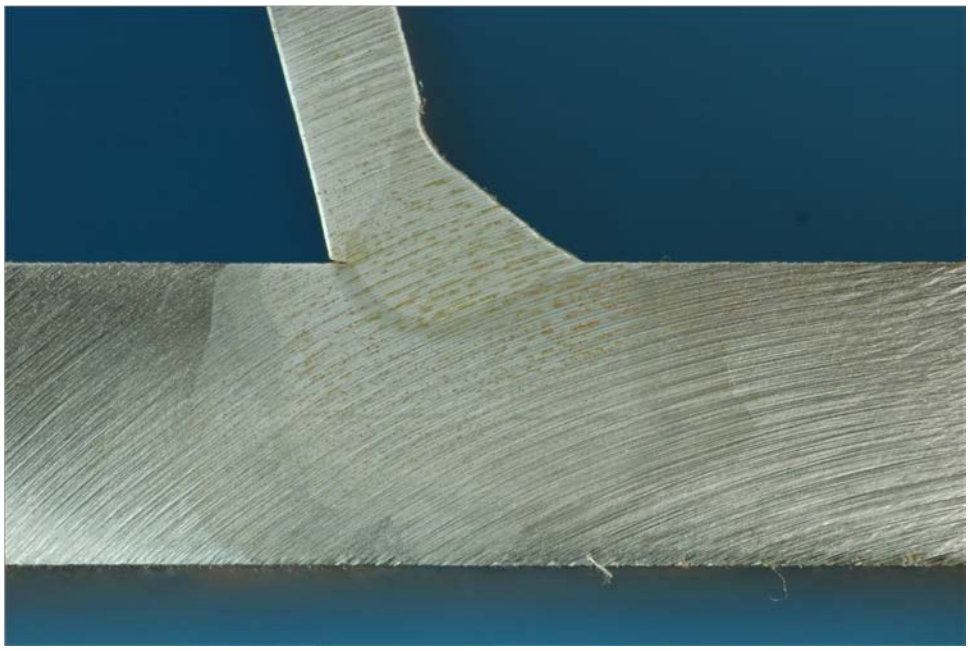

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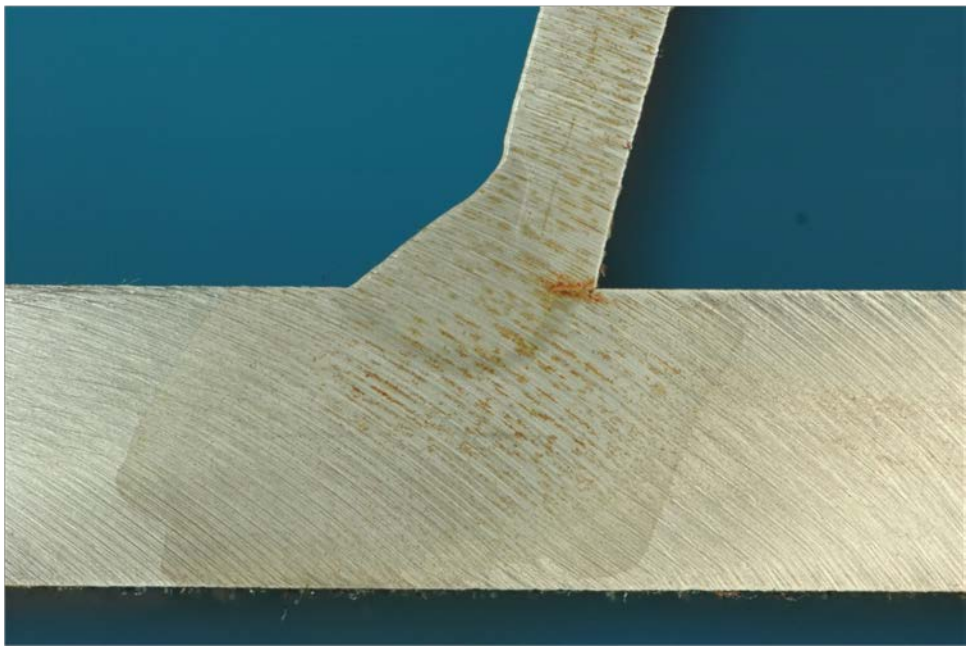

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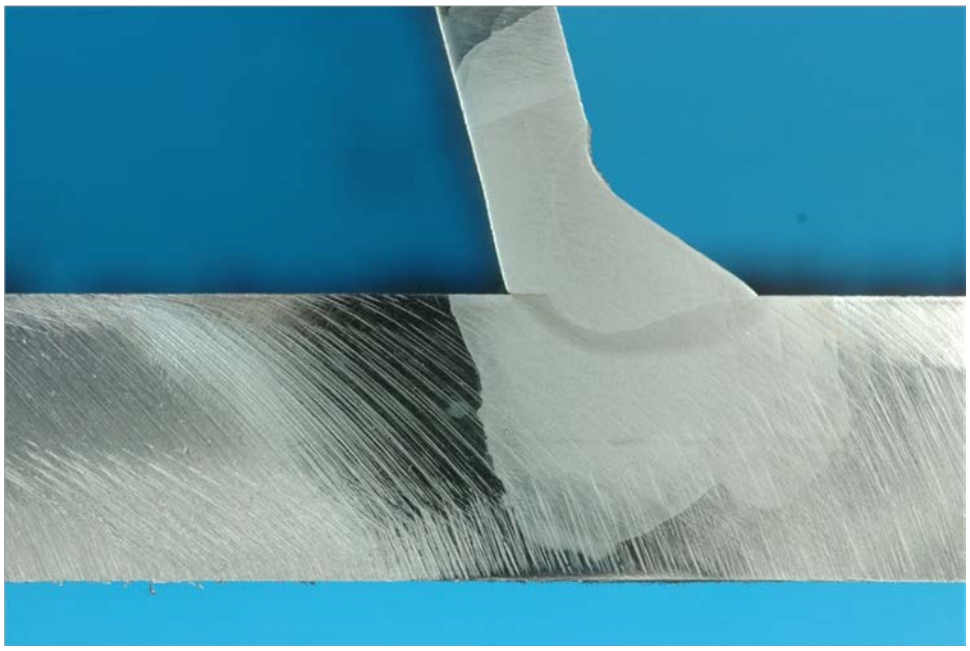

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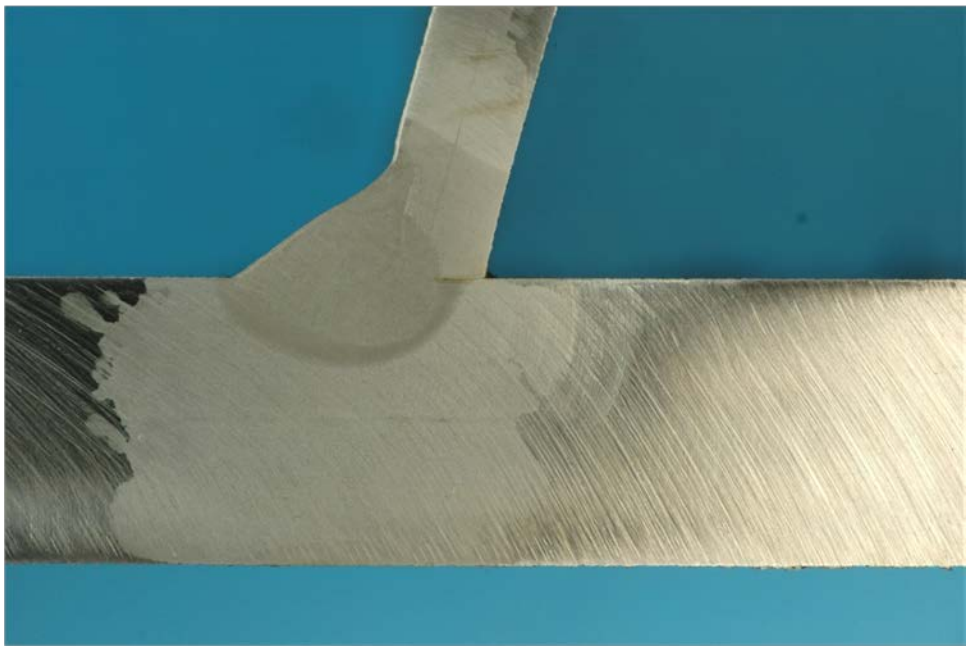

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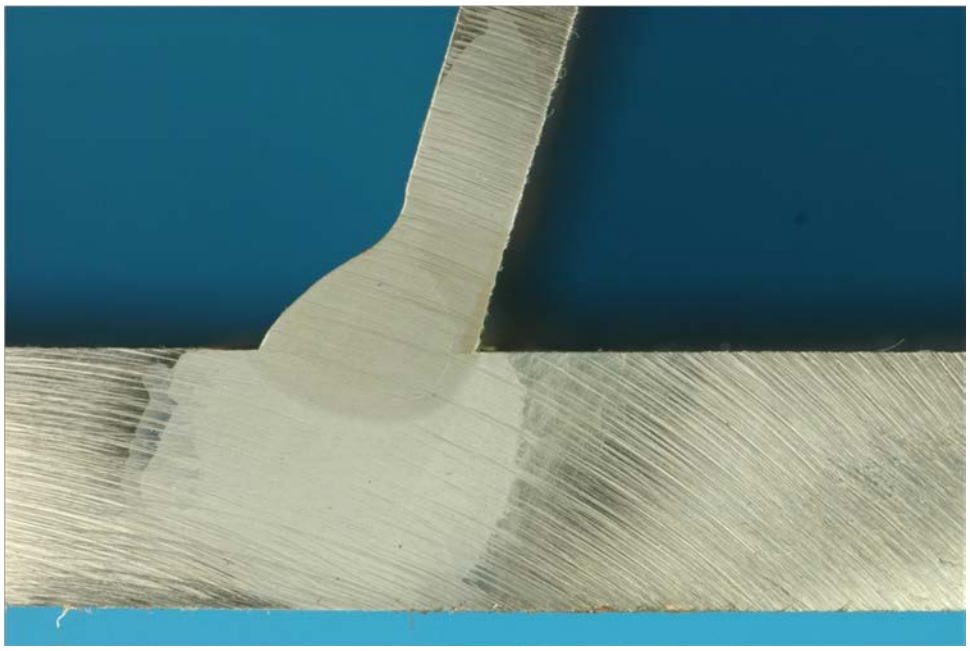

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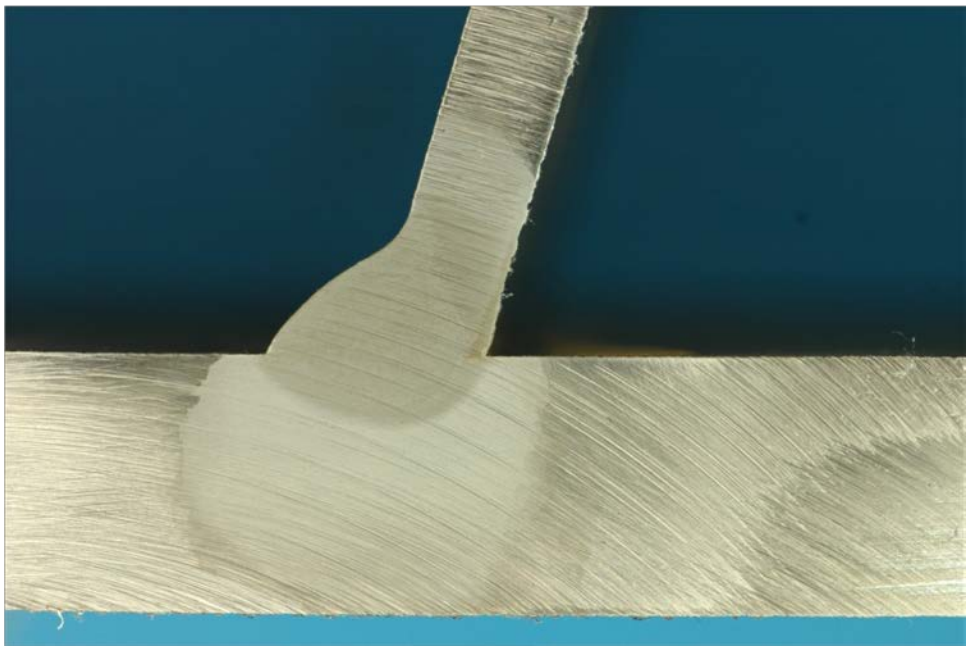

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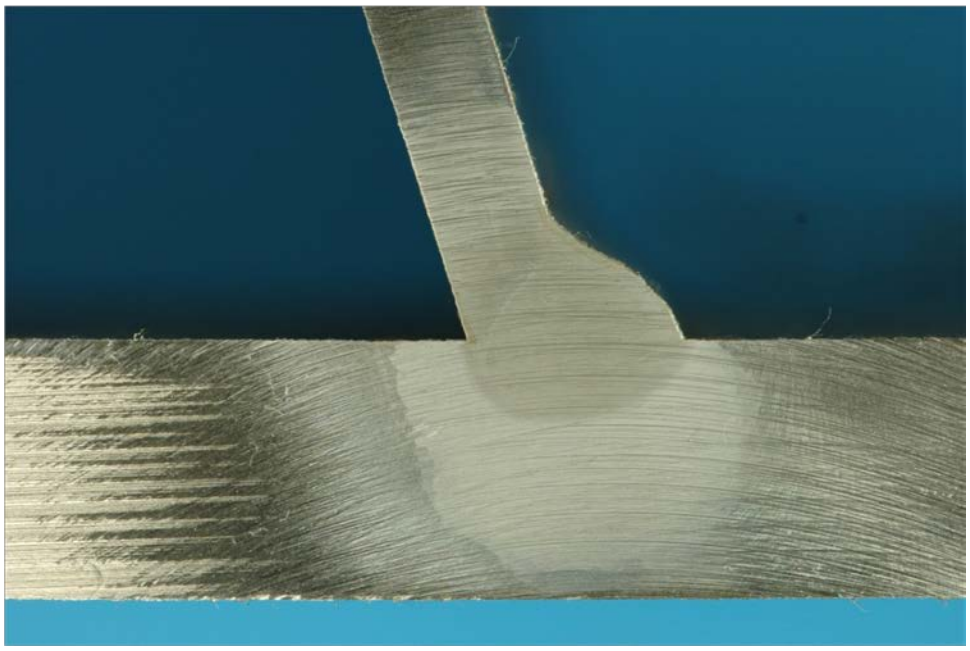

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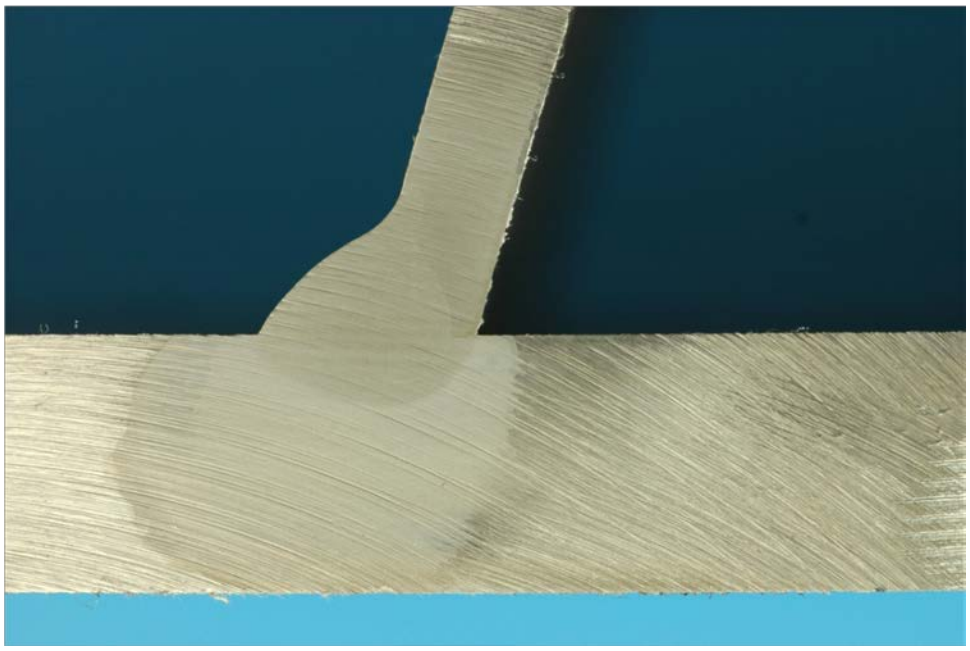

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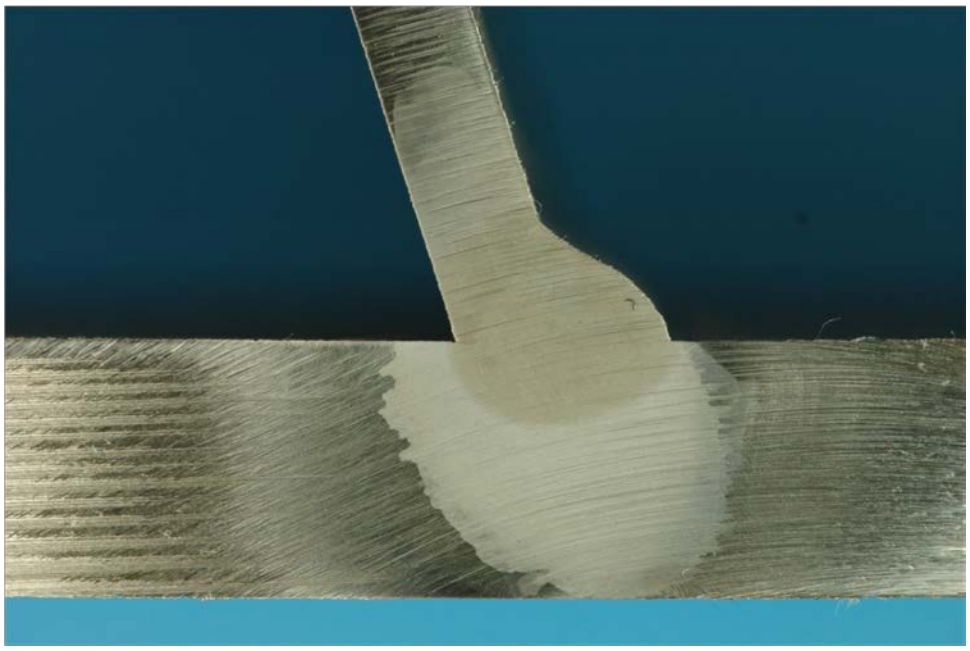

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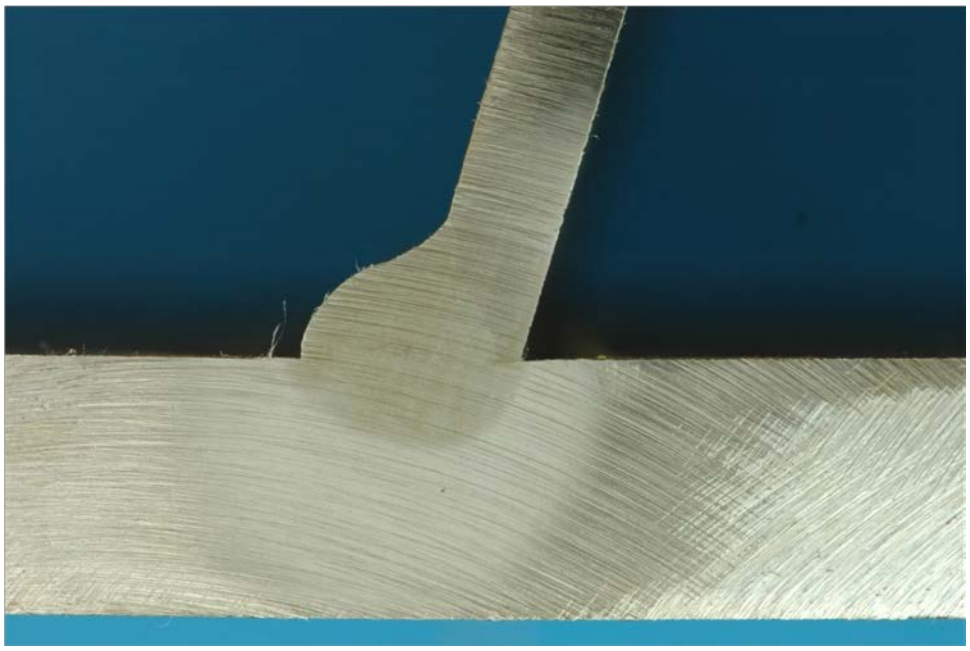

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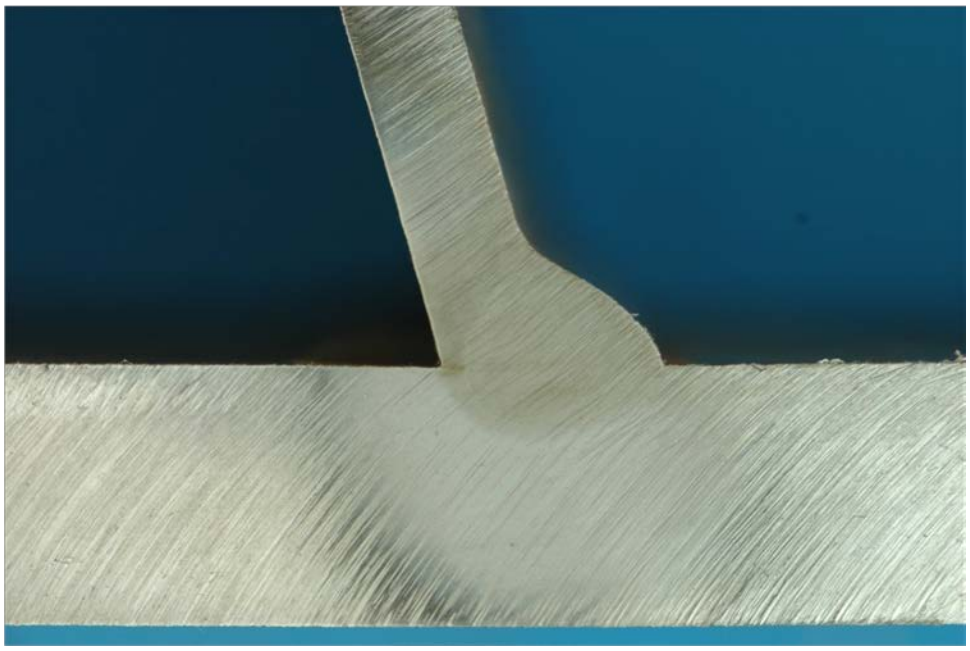

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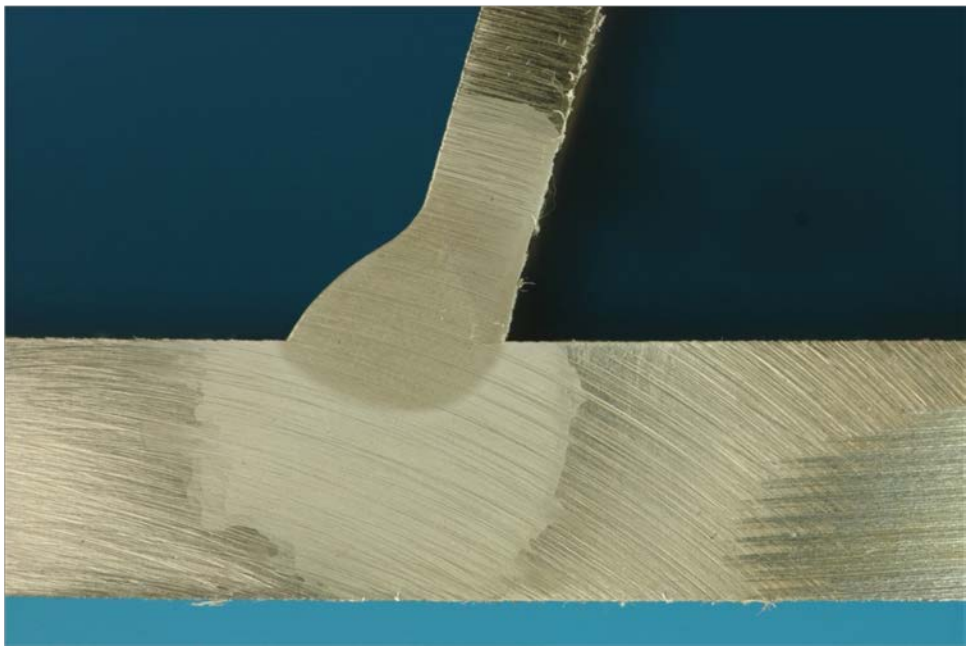

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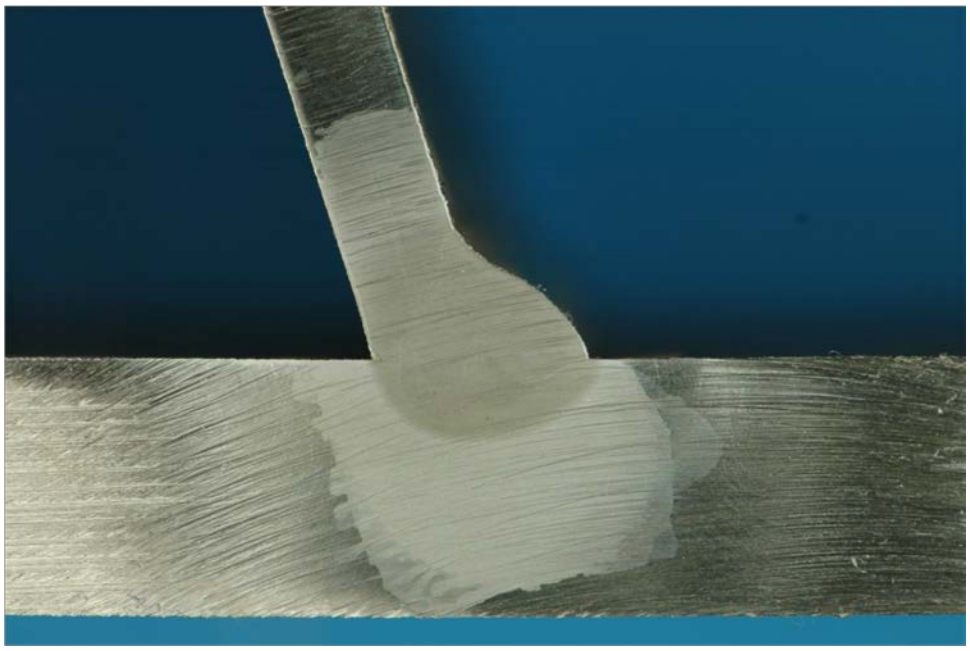

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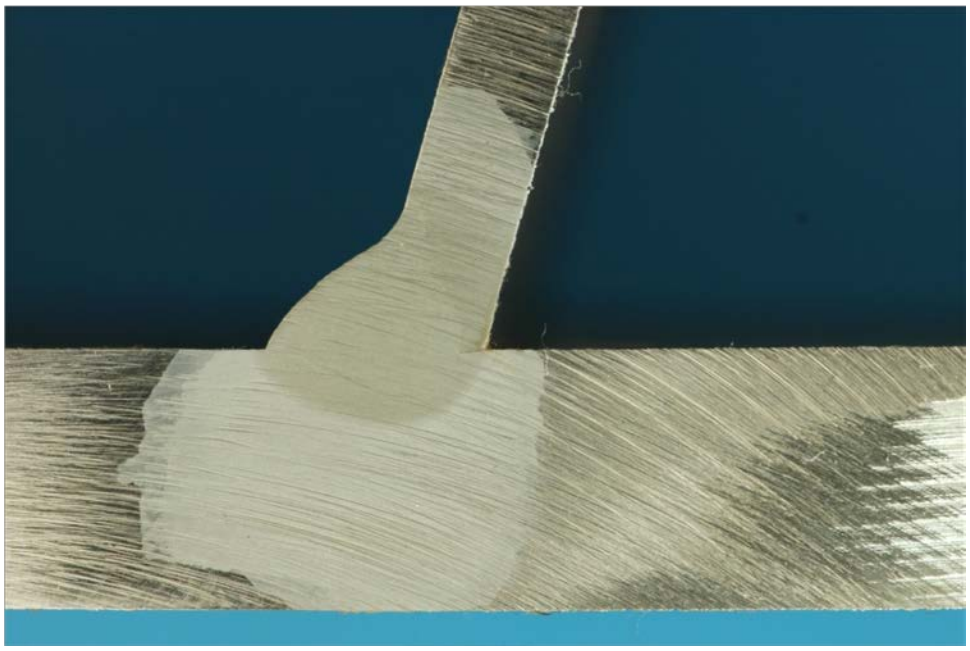

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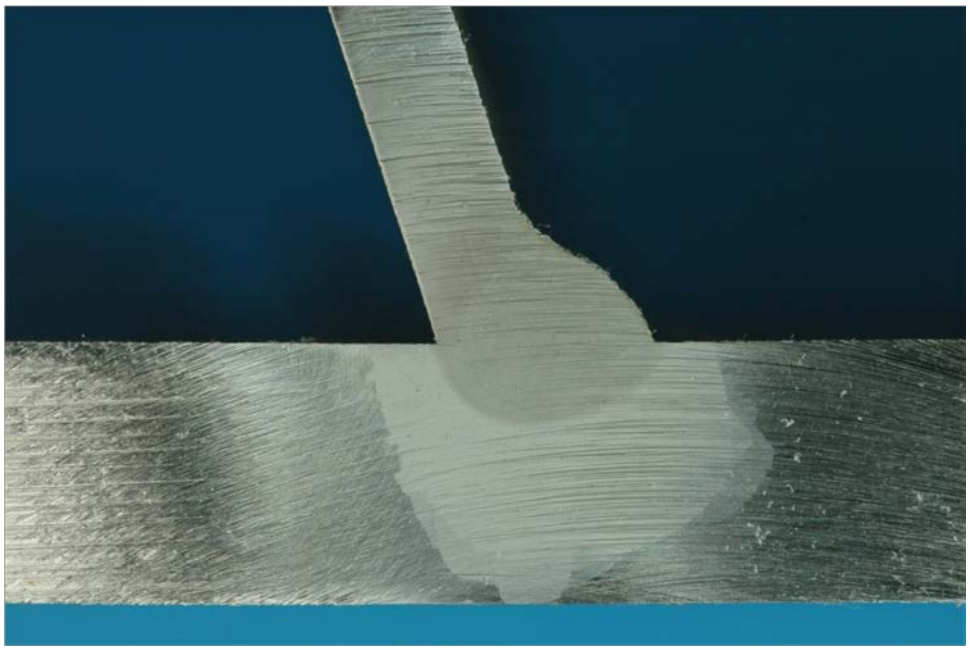

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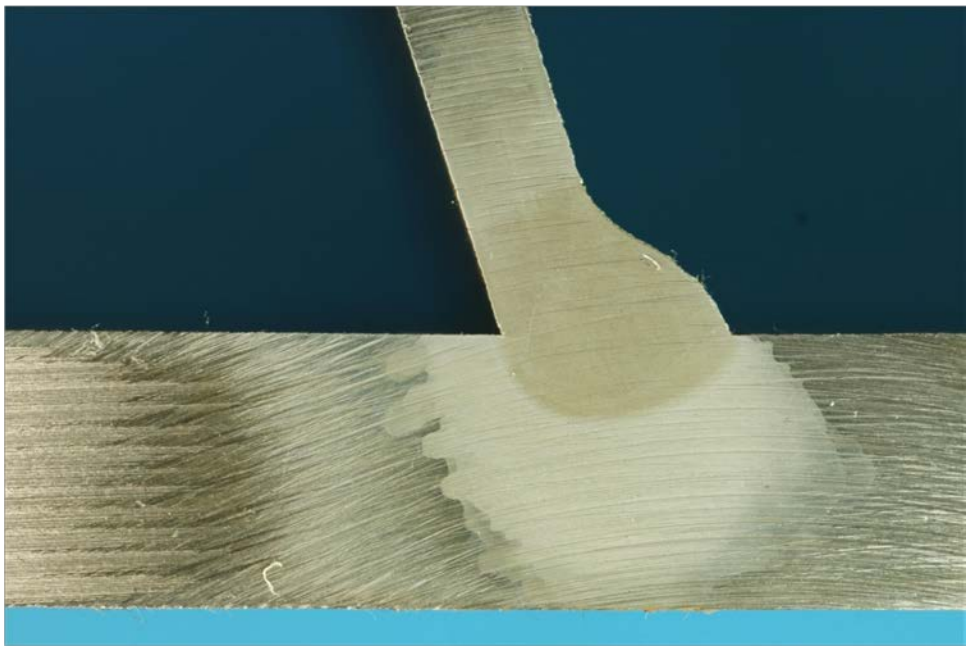

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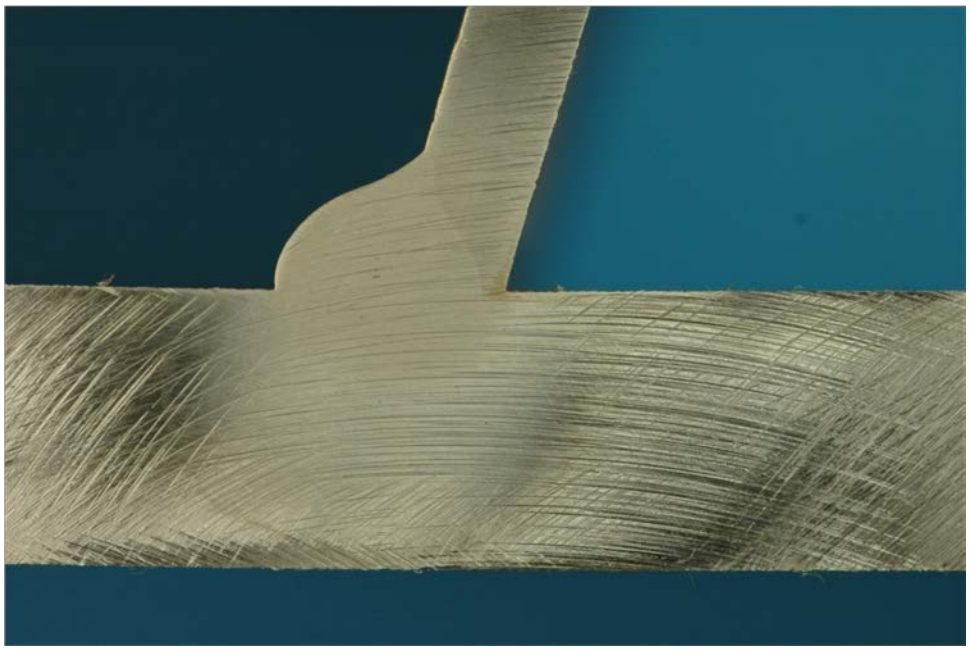

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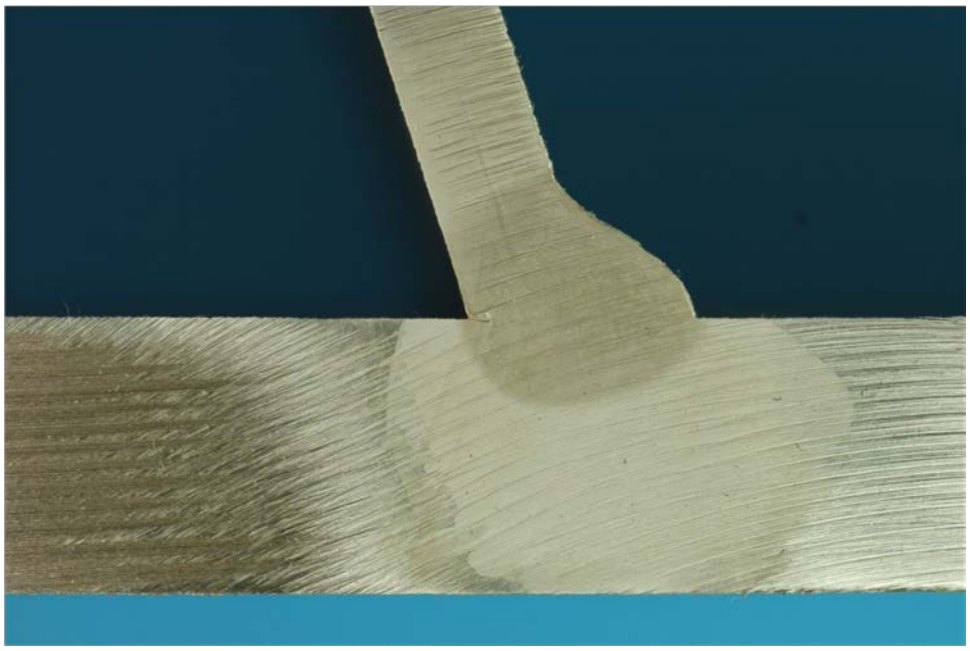

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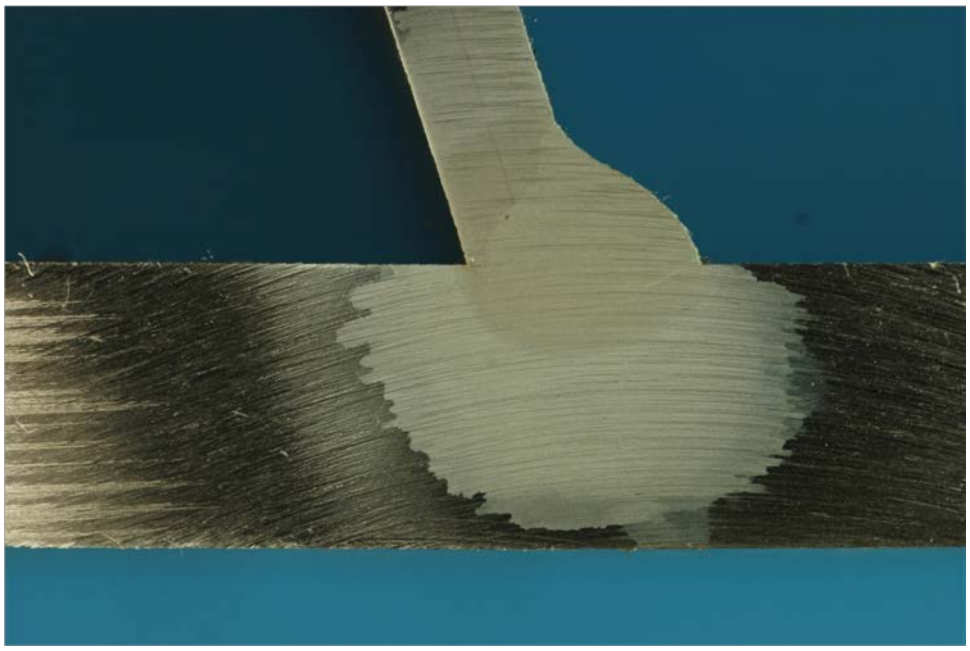

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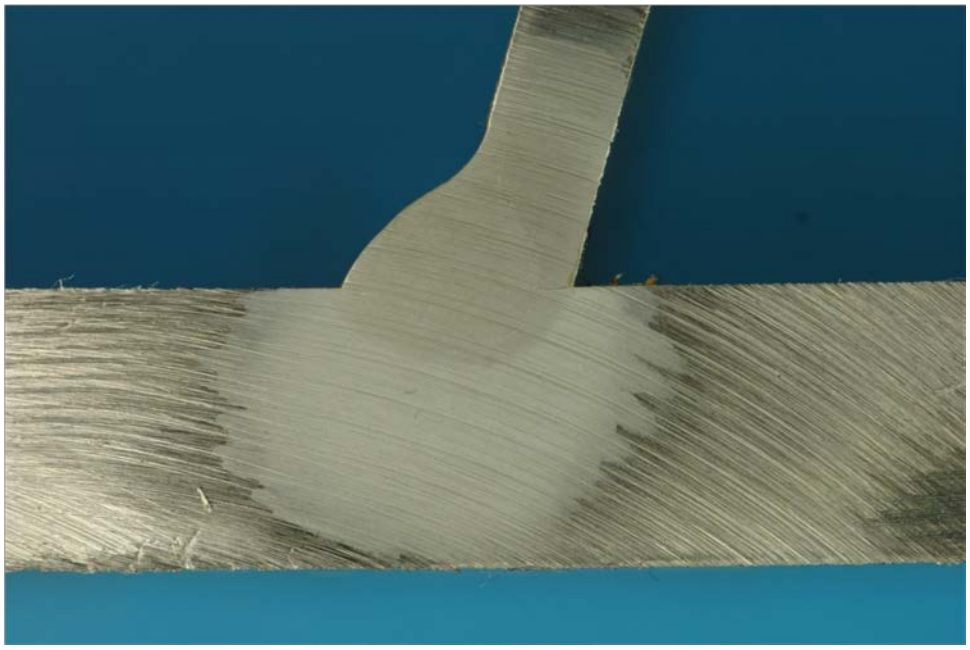

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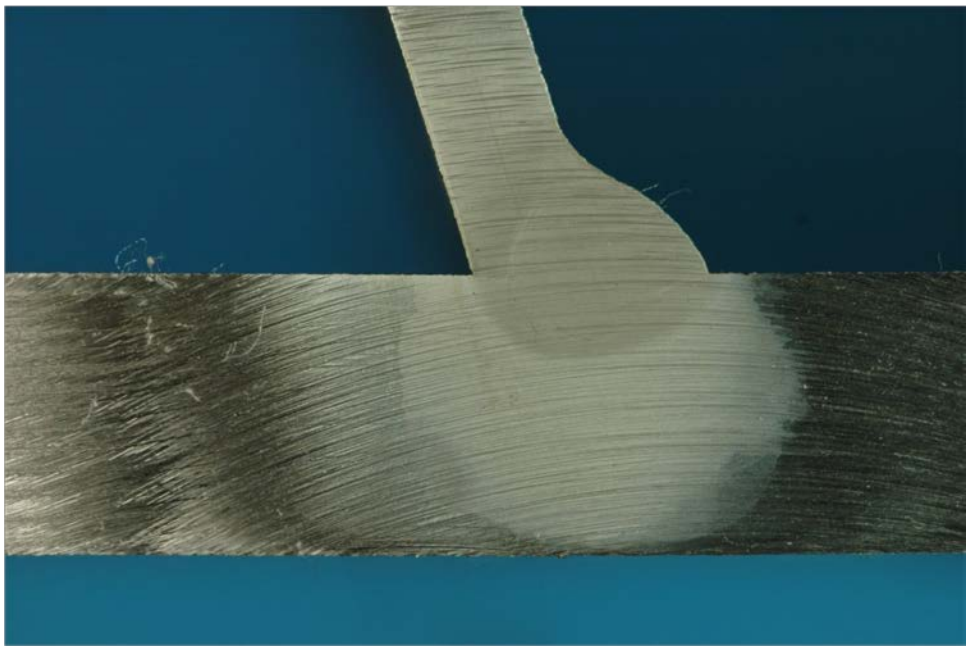

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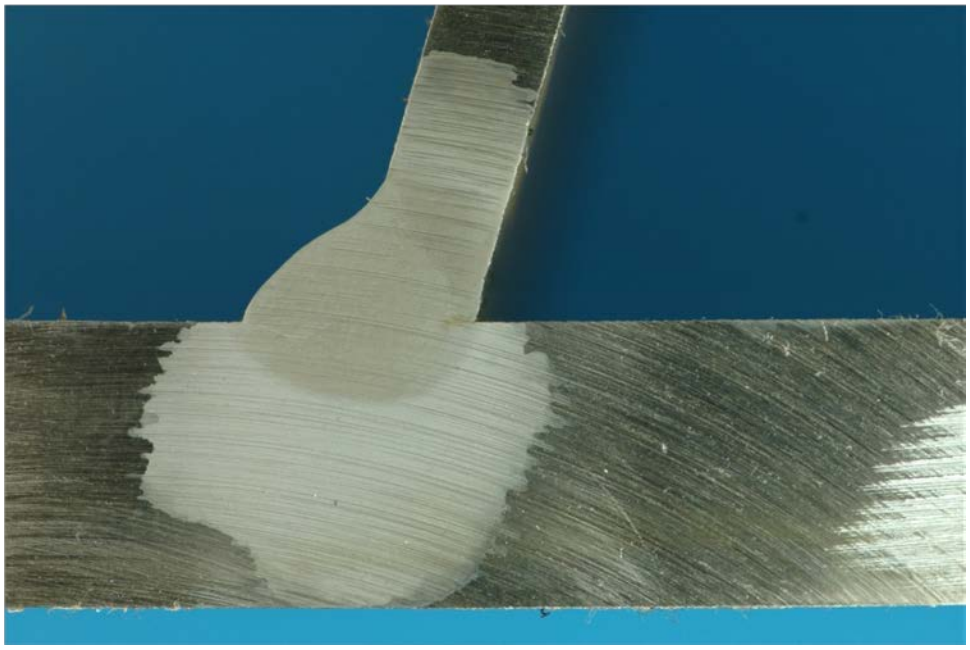

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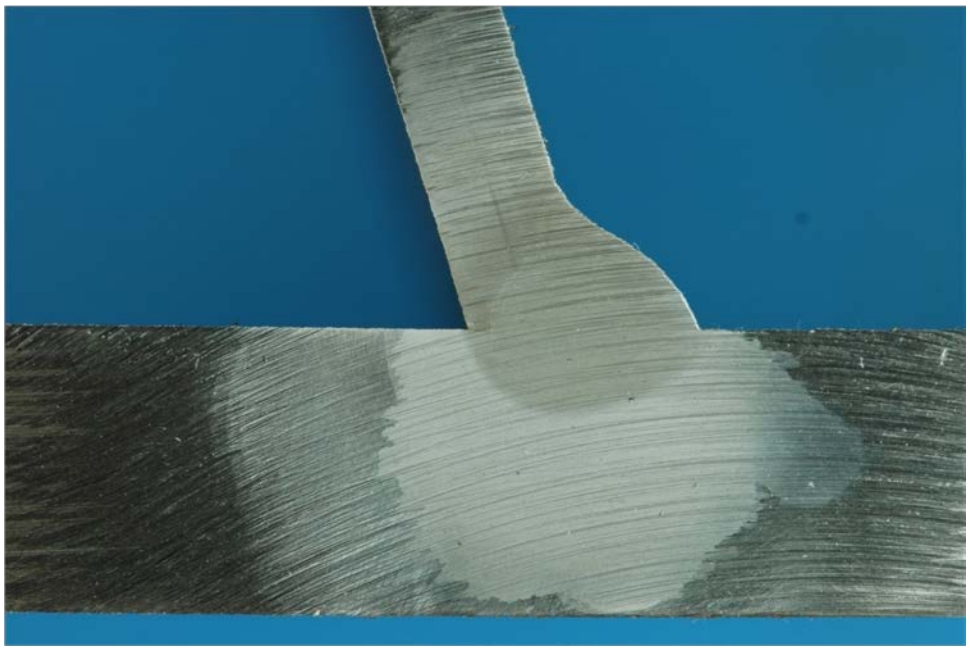

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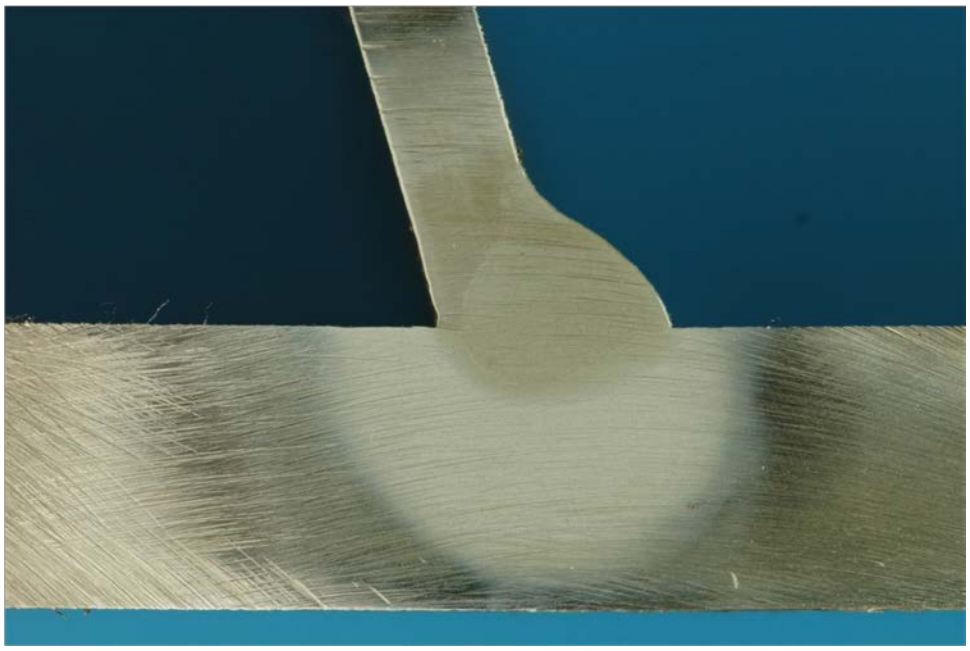

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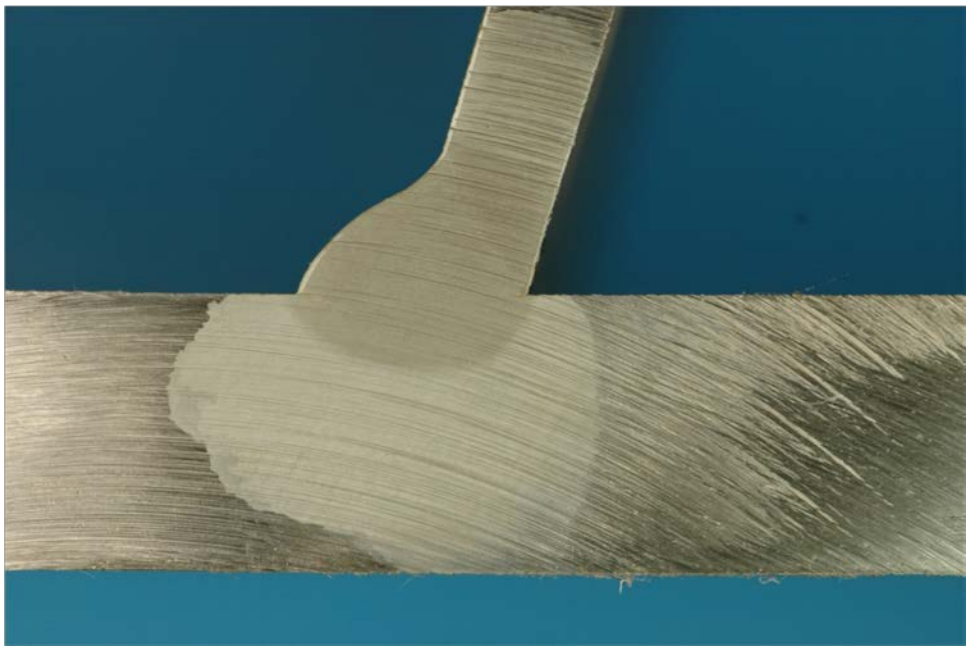

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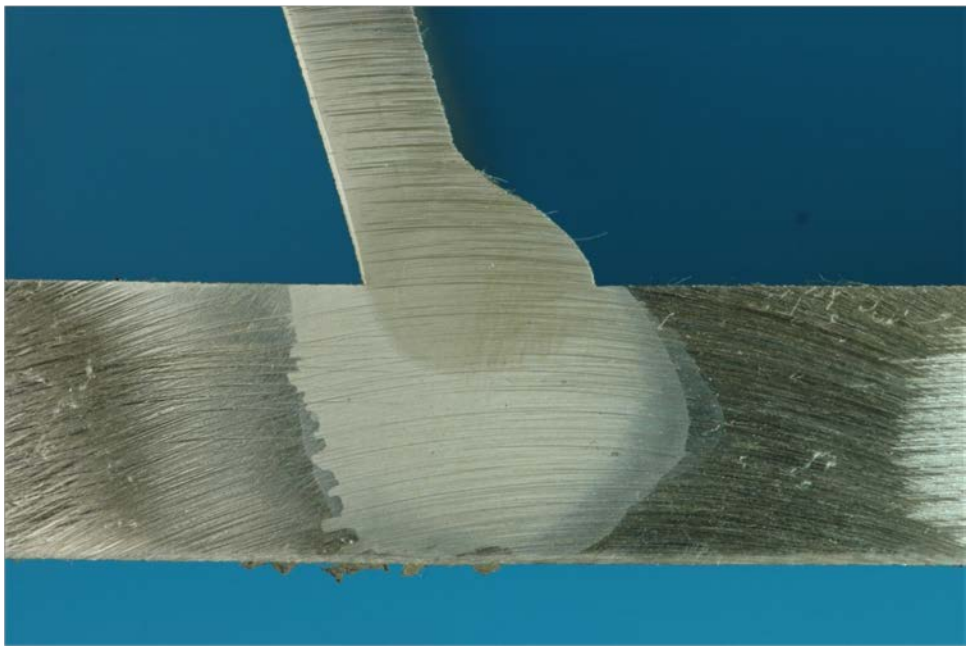

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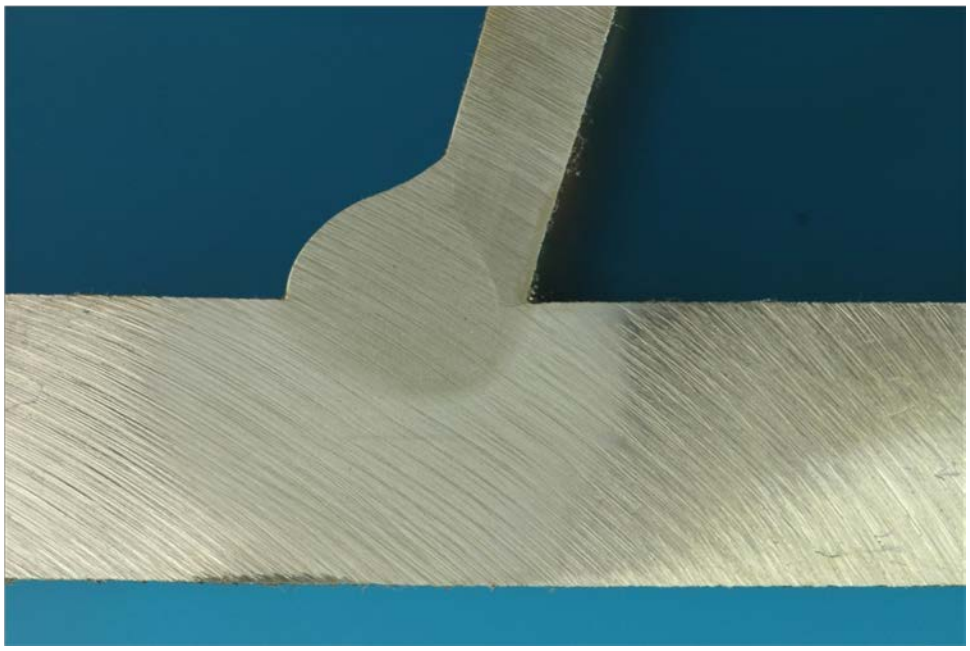

Figure 649. Macro-etched section A_180

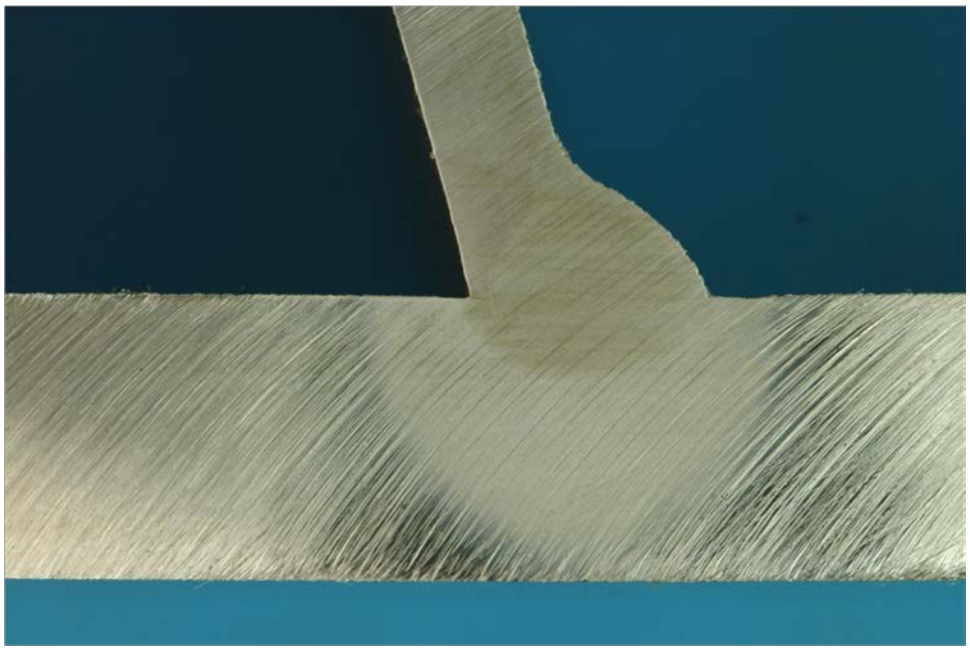

Figure 650. Macro-etched section B_180

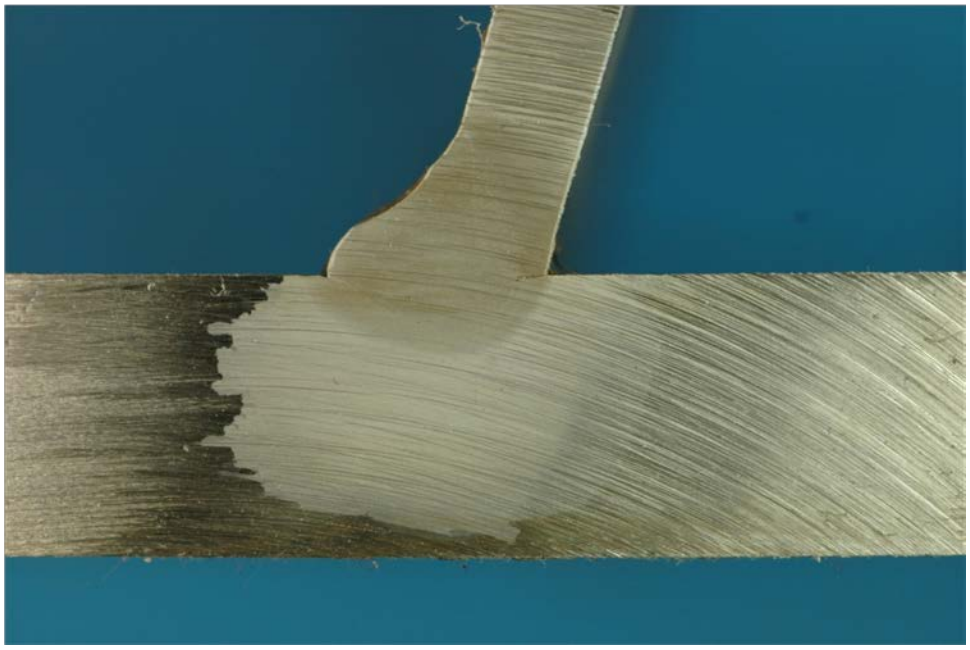

Figure 651. Macro-etched section A_192

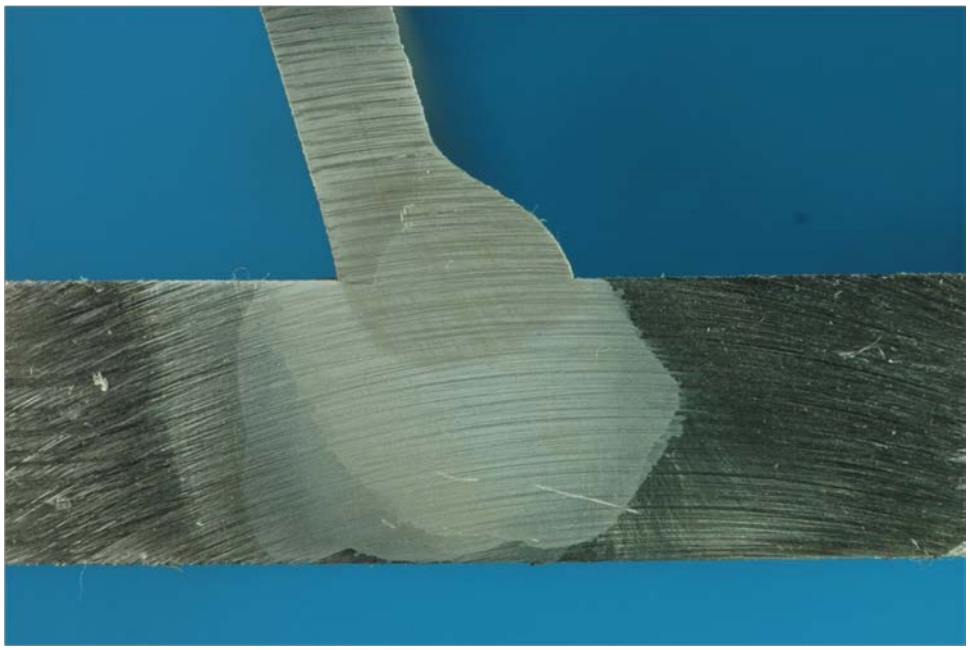

Figure 652. Macro-etched section B_192

APPENDIX I: WPS FOR RIB-TO-DECK PLATE WELDS

WELDING PROCEDURE SPECIFICATION

ORTHOTROPIC DECK SPECIMENS

MATERIAL SPECIFICATION	ASTM A709 GRADE 50
WELDING PROCESS	SUBMERGED ARC WELDING
MANUAL OR MACHINE	MACHINE
POSITION OF WELDING	2G
FILLER METAL SPECIFICATION	AWS A5.17
WELD METAL CLASSIFICATION	F7A2-EM12K-H8
WIRE/FLUX	LINCOLN L-61/960
WIRE DIAMETER	3/32"
SINGLE OR MULTIPLE ARC	SINGLE ARC
POLARITY	AC
ROOT TREATMENT	REMOVE ALL MILL SCALE, RUST AND CONTAMINANTS.
PREHEAT TEMPERATURE	50°F MINIMUM
ELECTRICAL STICK-OUT	3/4"
Electrode angle	60 deg.

REVISED: 10/7/13
ORIGINAL ISSUE: 6/13/13

PASS NO.	AMPS	VOLTS	TRAVEL SPEED (IPM)	JOINT DETAILS
1	550-650	32-35	17-23	REFER TO LEHIGH UNIVERSITY ATLSS DRAWINGS

USED FOR
RIB TO DECK PLATE

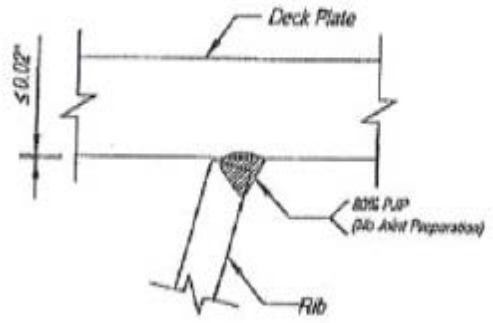

Figure 653. WPS for rib-to-deck plate welds

APPENDIX J: MACRO-ETCHED SECTIONS FOR RIB-TO-FB WELDS IN MU5

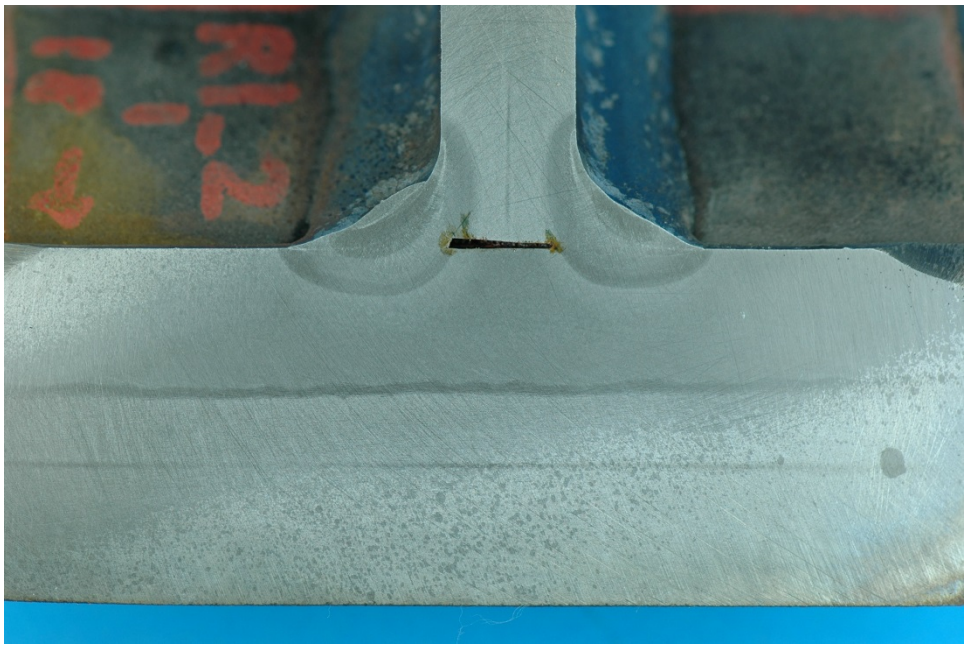

Figure 654. Macro-etched section R1_24_1

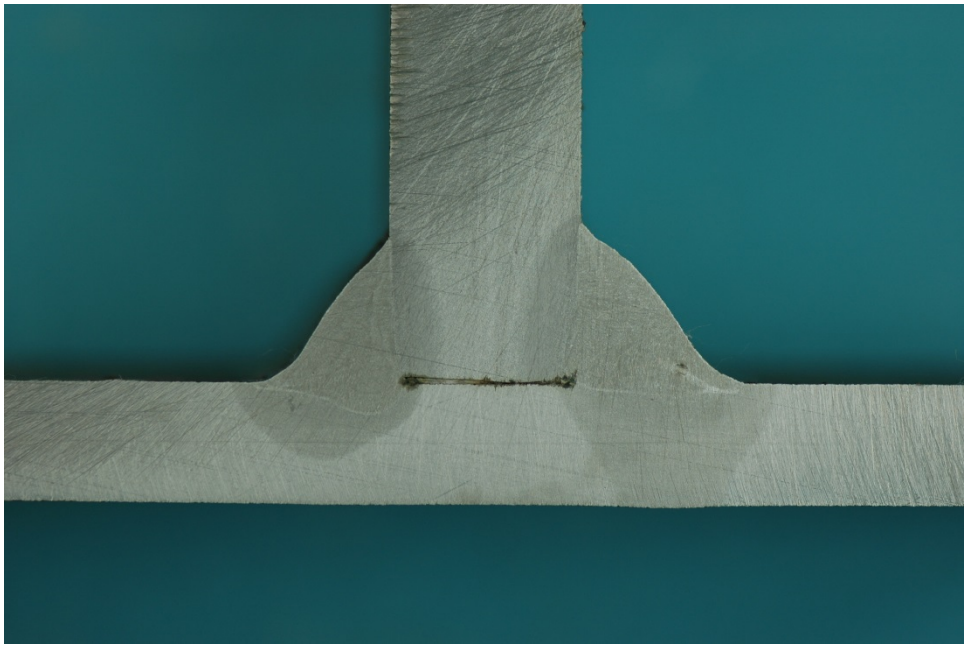

Figure 655. Macro-etched section R1_24_2

Figure 656. Macro-etched section R1_24_3

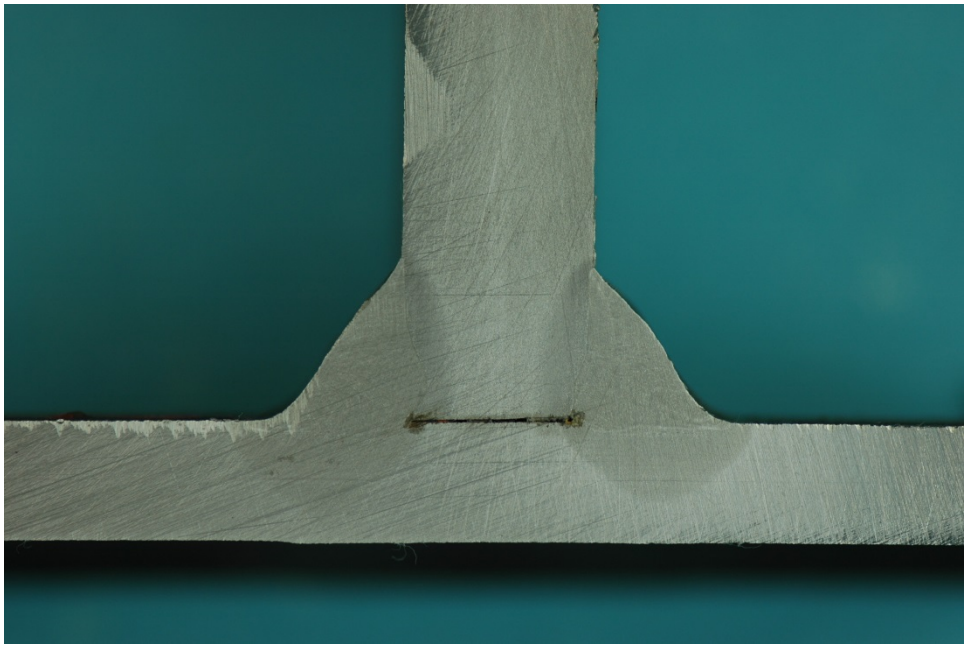

Figure 657. Macro-etched section R1_24_4

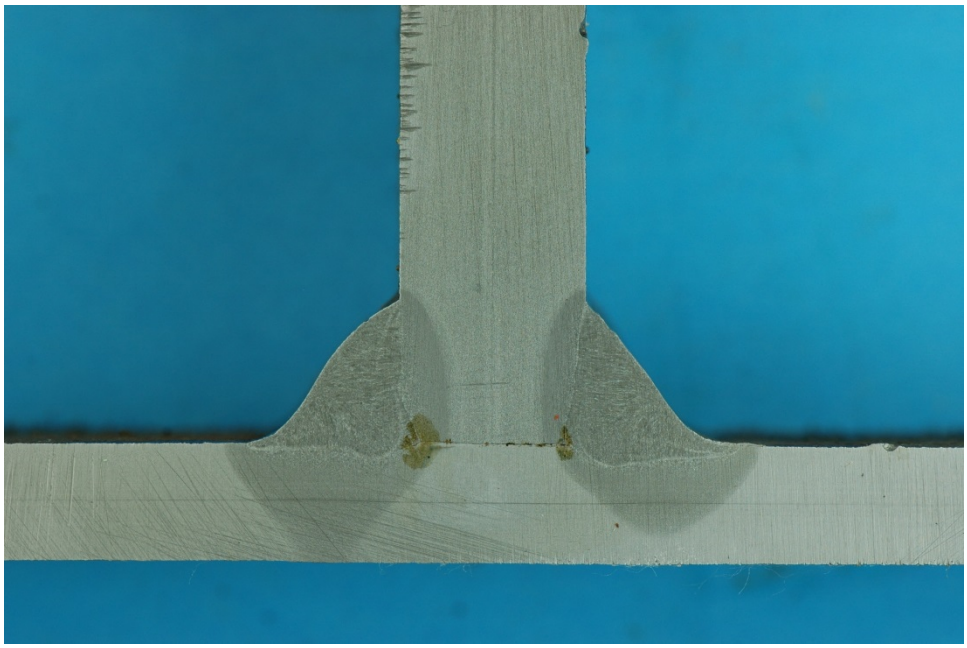

Figure 658. Macro-etched section R1_24_5

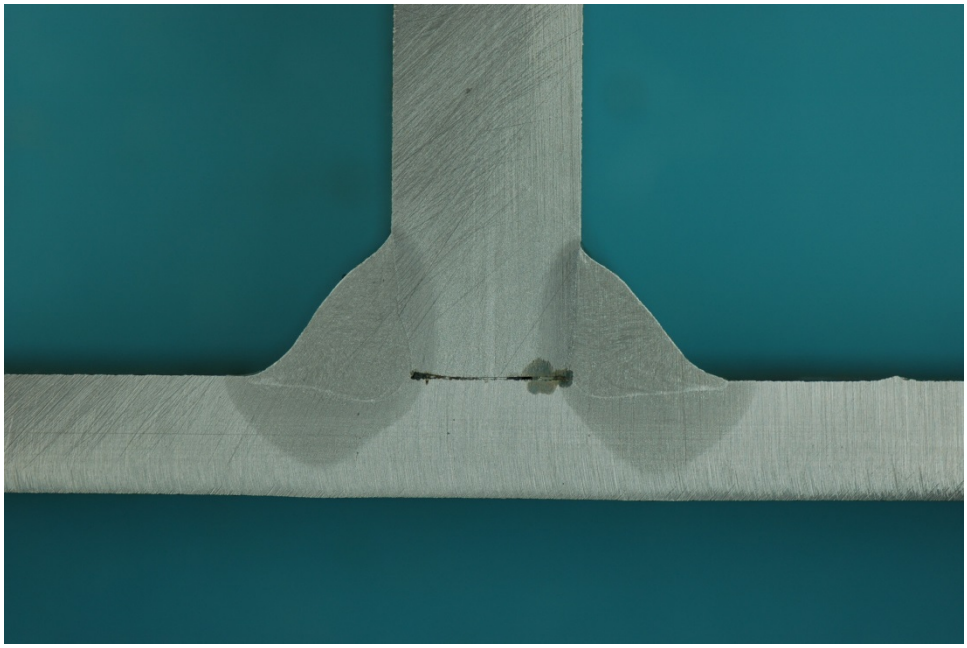

Figure 659. Macro-etched section R1_24_6

Figure 660. Macro-etched section R1_24_7

Figure 661. Macro-etched section R1_90_1

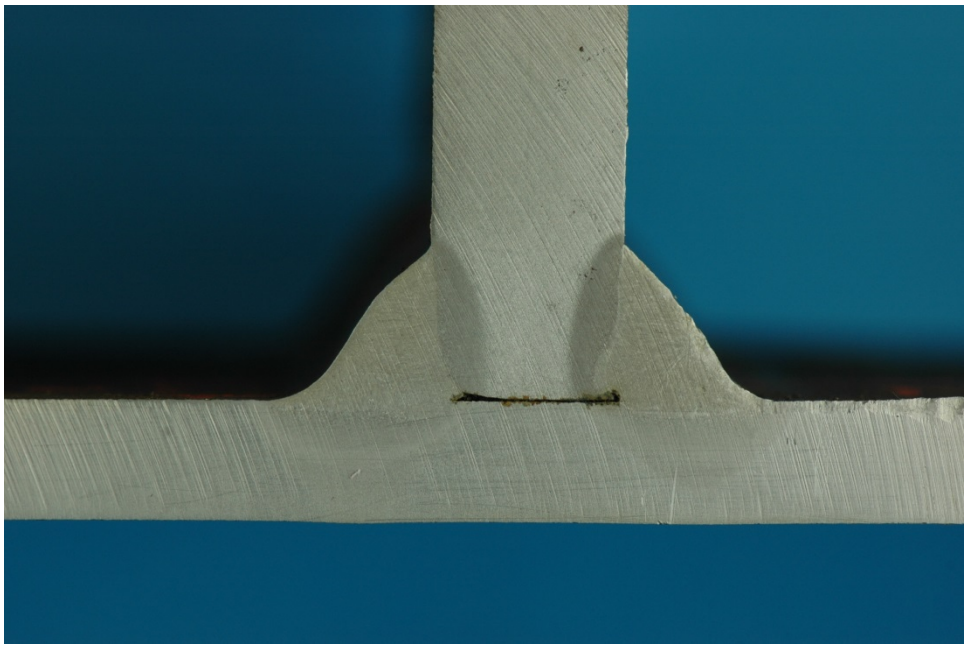

Figure 662. Macro-etched section R1_90_2

Figure 663. Macro-etched section R1_90_3

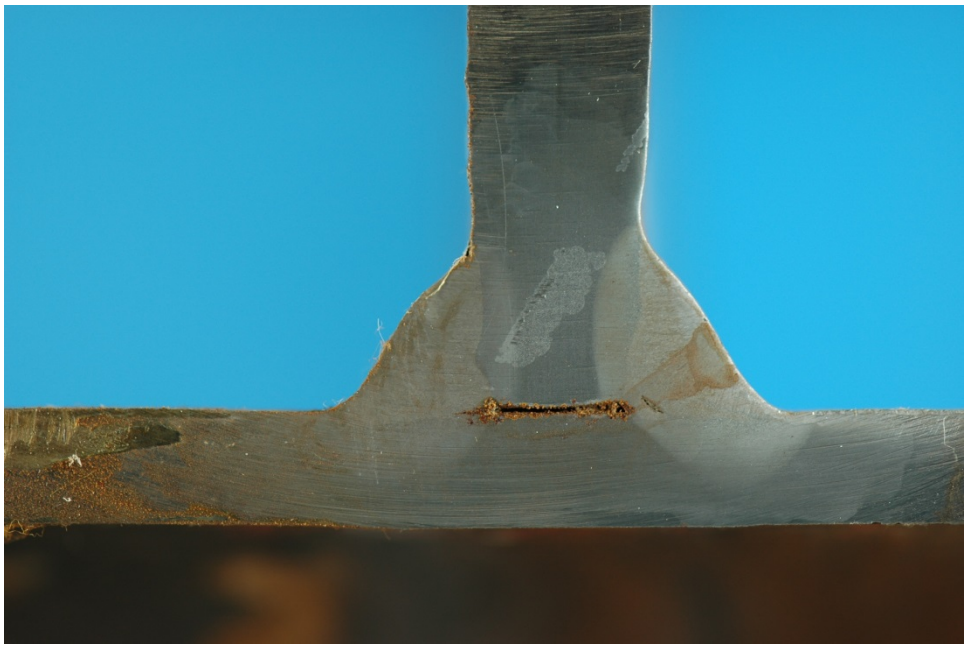

Figure 664. Macro-etched section R1_90_4

Figure 665. Macro-etched section R1_90_5

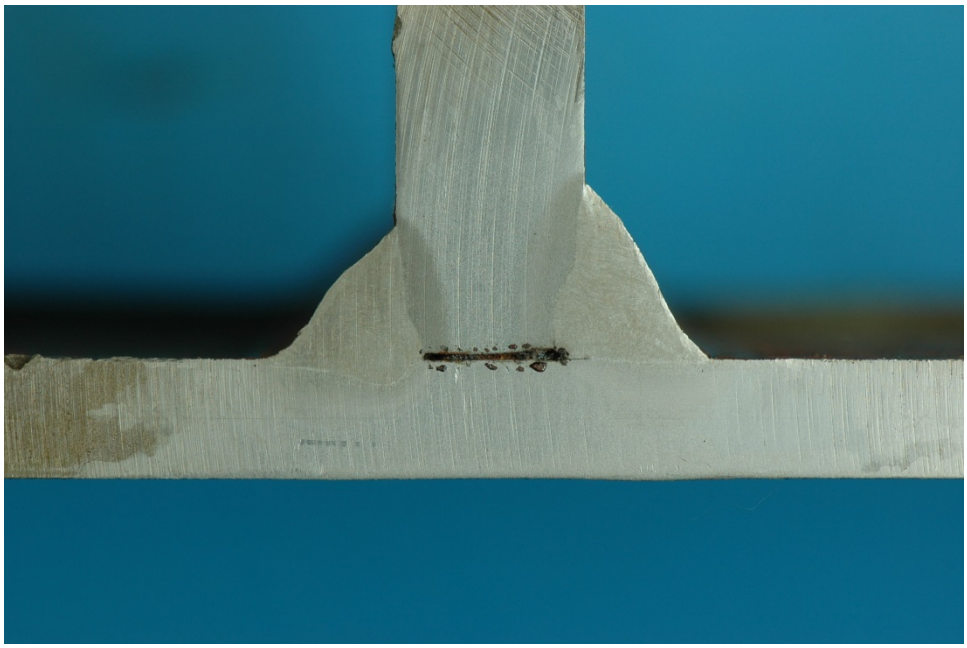

Figure 666. Macro-etched section R1_90_6

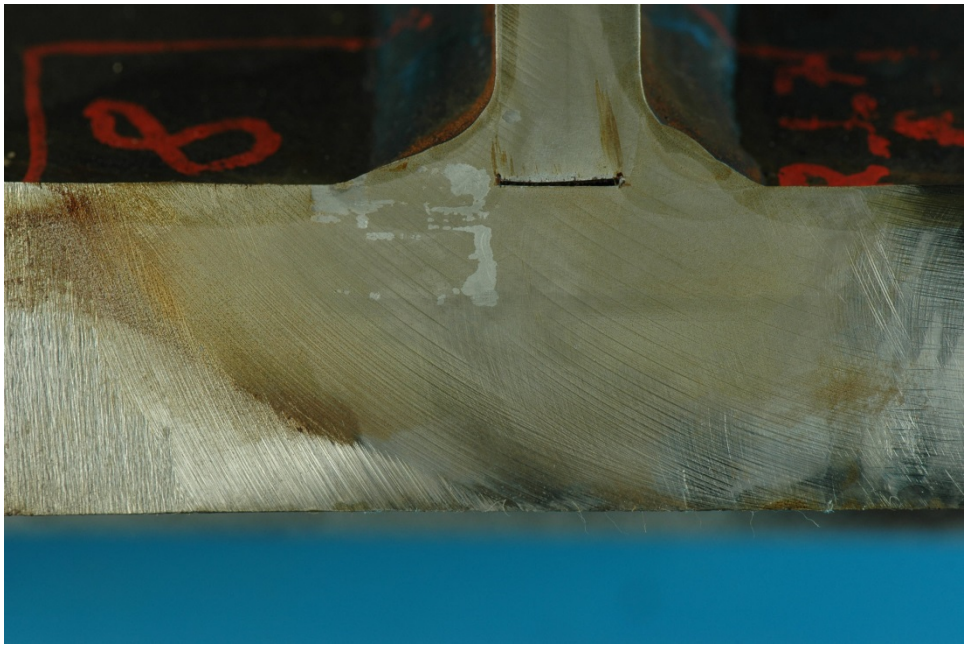

Figure 667. Macro-etched section R1_90_7

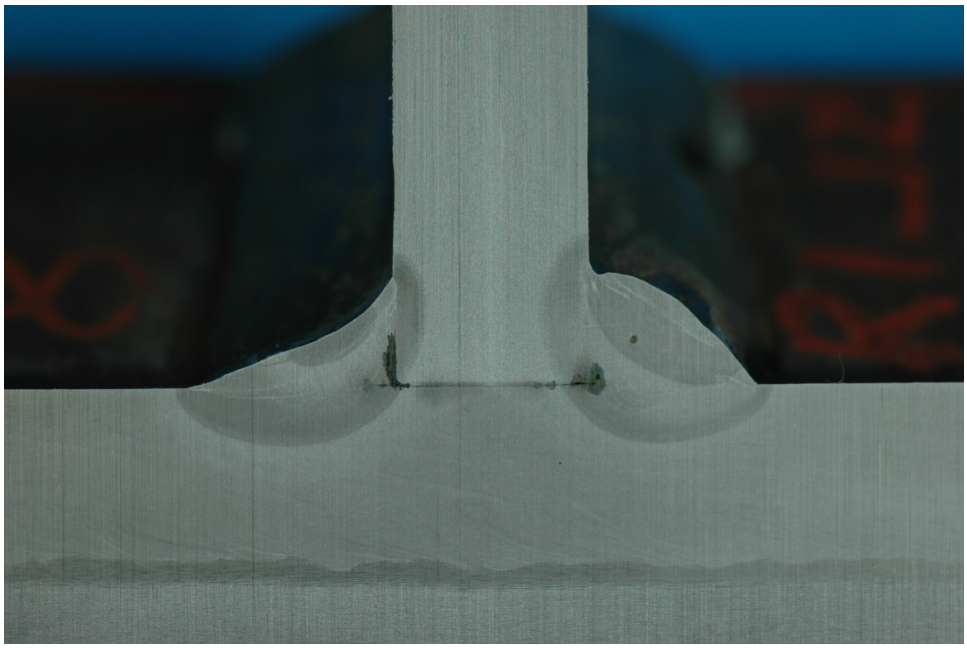

Figure 668. Macro-etched section R1_156_1

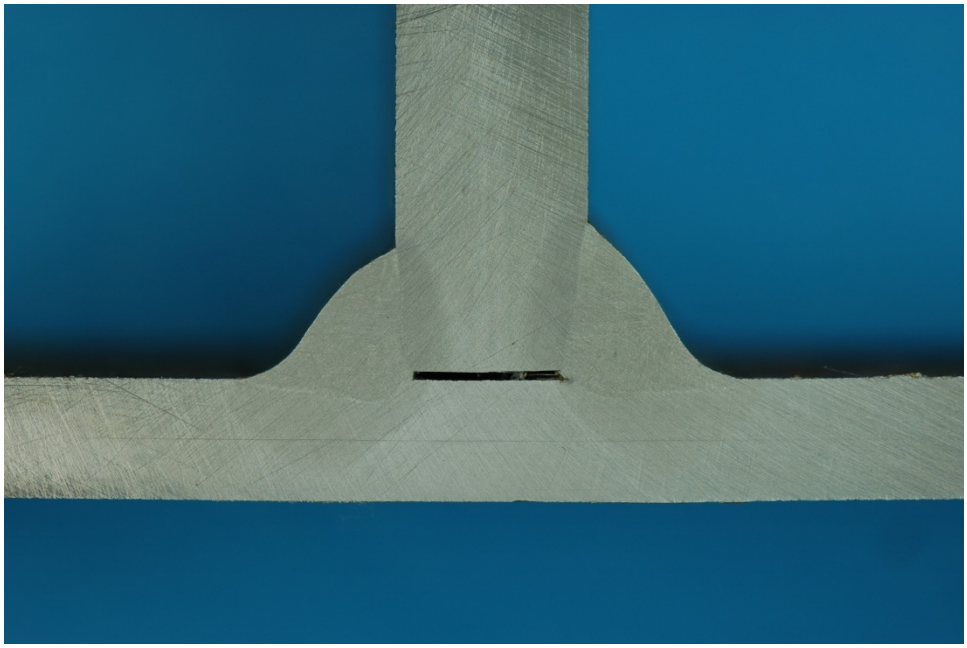

Figure 669. Macro-etched section R1_156_2

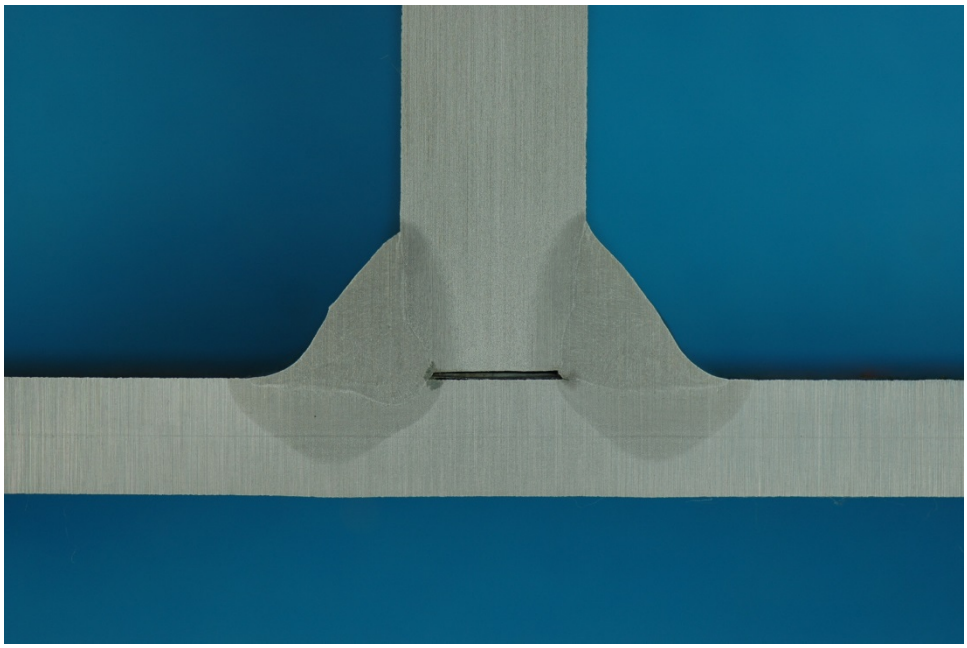

Figure 670. Macro-etched section R1_156_3

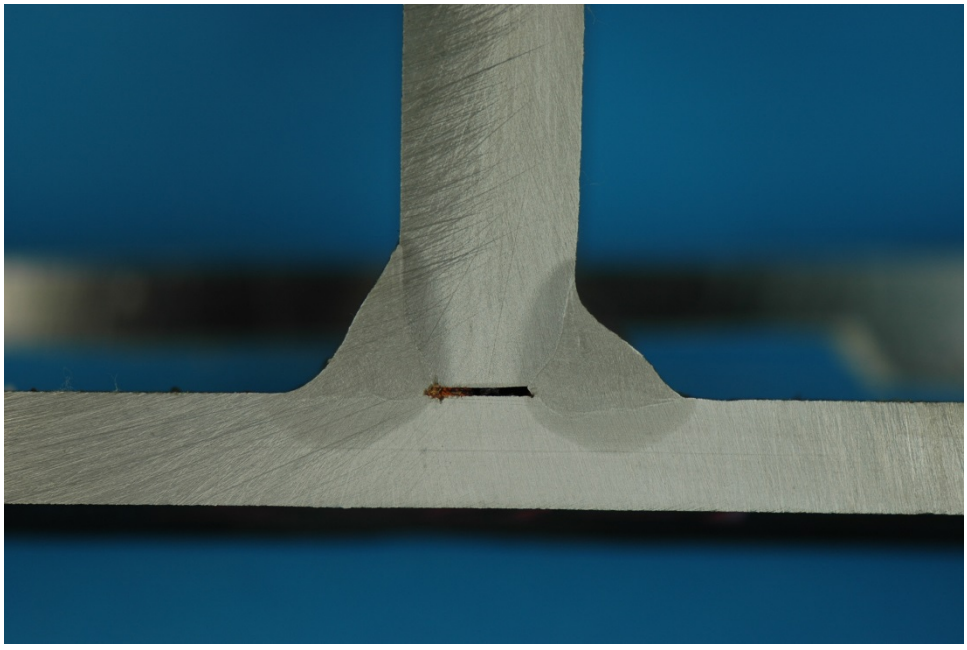

Figure 671. Macro-etched section R1_156_4

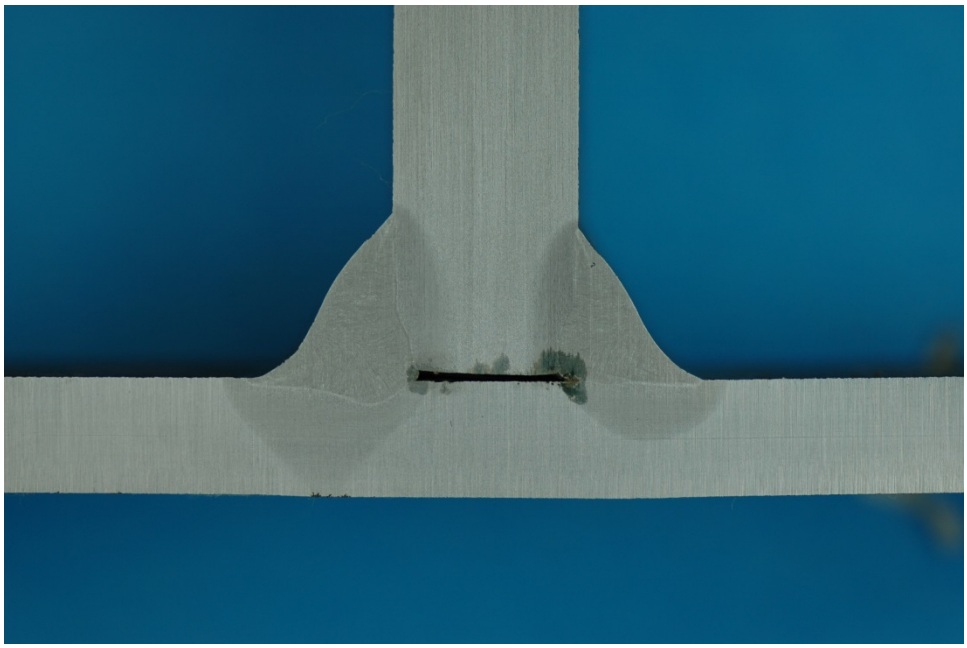

Figure 672. Macro-etched section R1_156_5

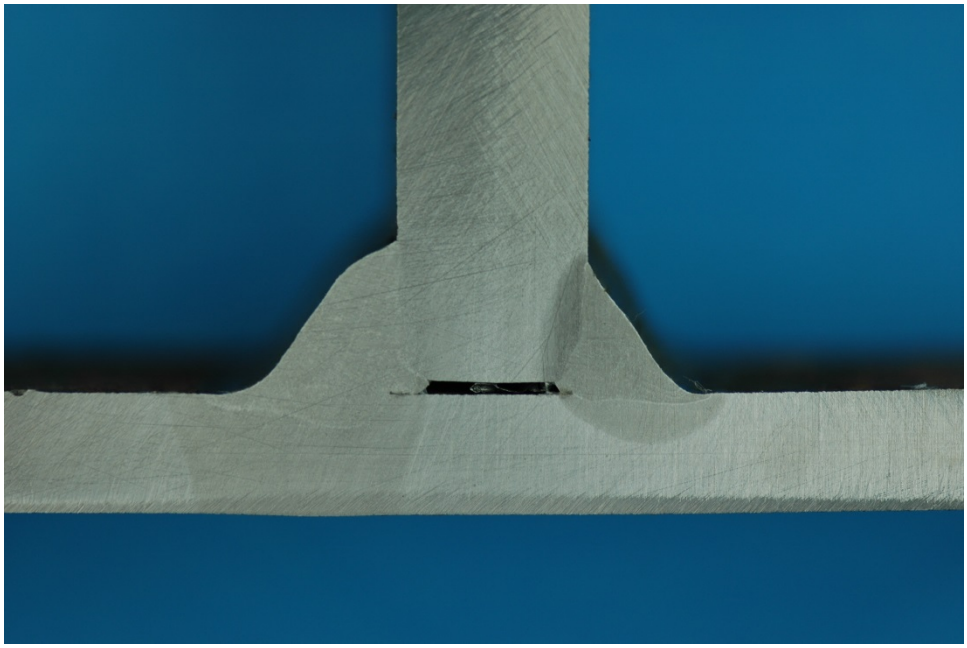

Figure 673. Macro-etched section R1_156_6

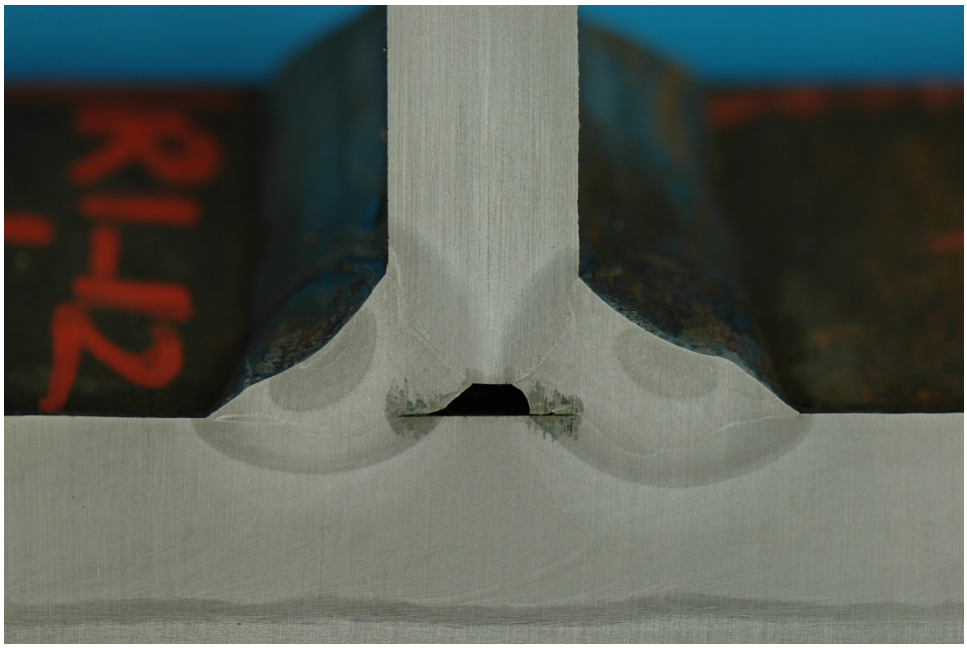

Figure 674. Macro-etched section R1_156_7

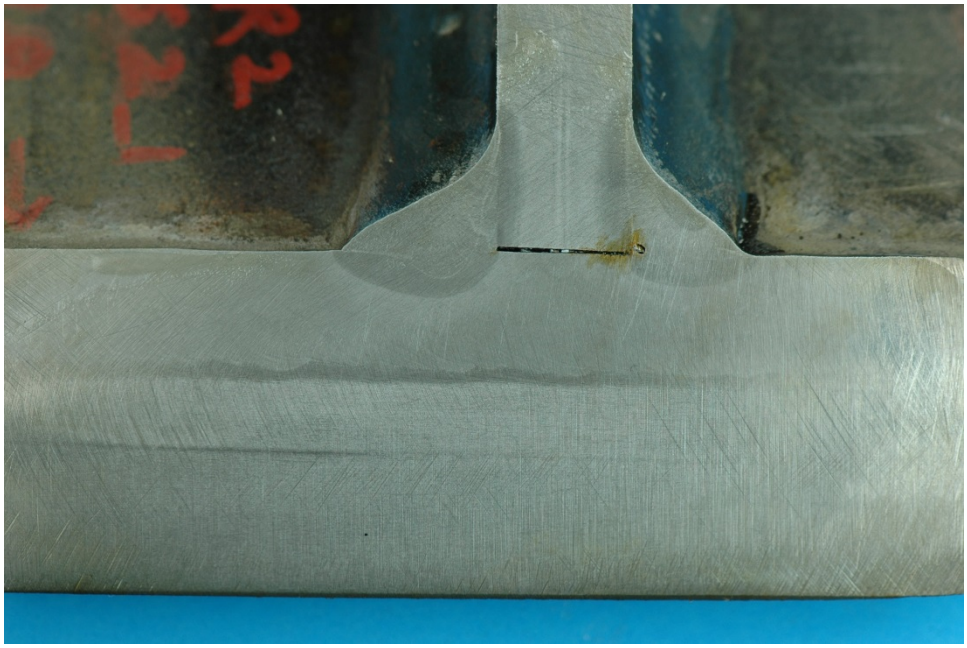

Figure 675. Macro-etched section R2_24_1

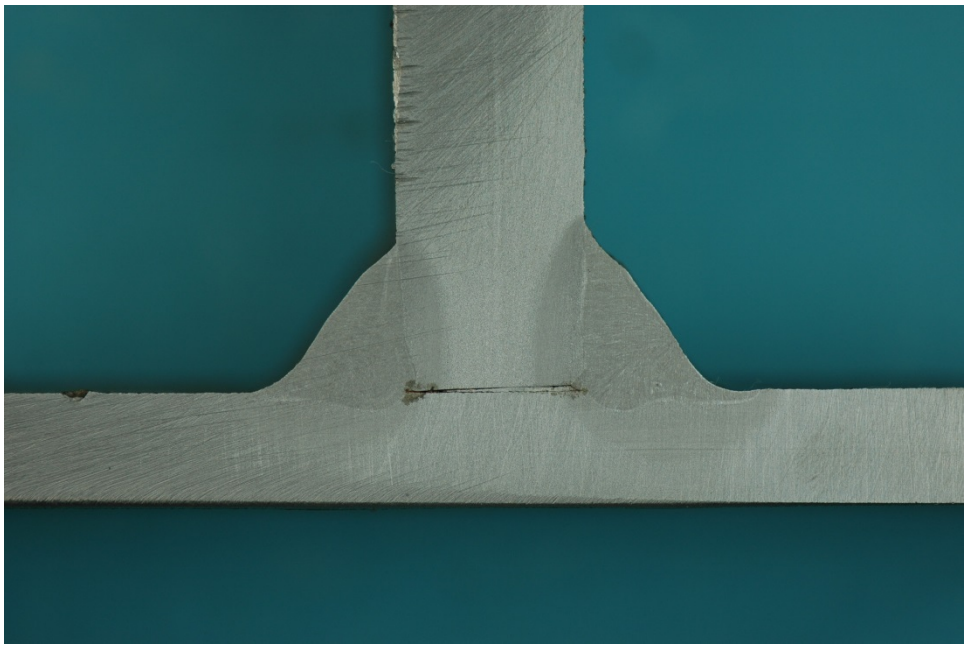

Figure 676. Macro-etched section R2_24_2

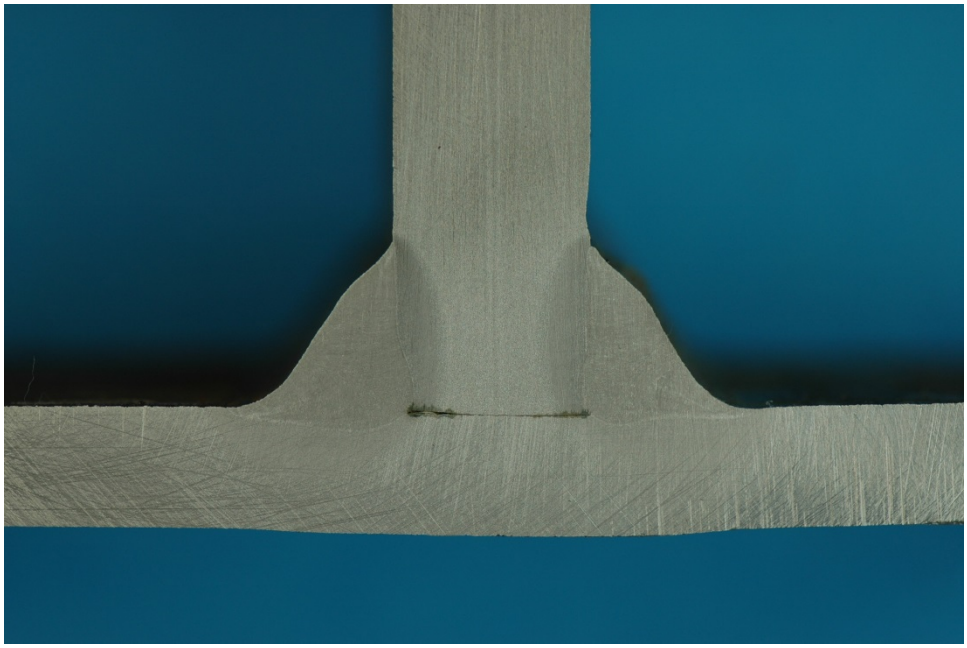

Figure 677. Macro-etched section R2_24_3

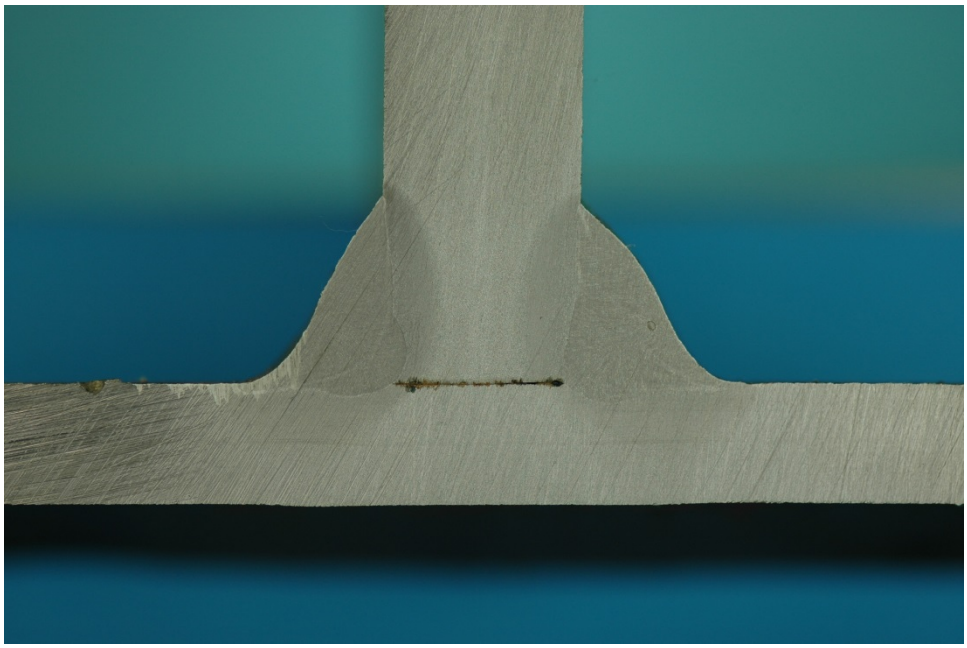

Figure 678. Macro-etched section R2_24_4

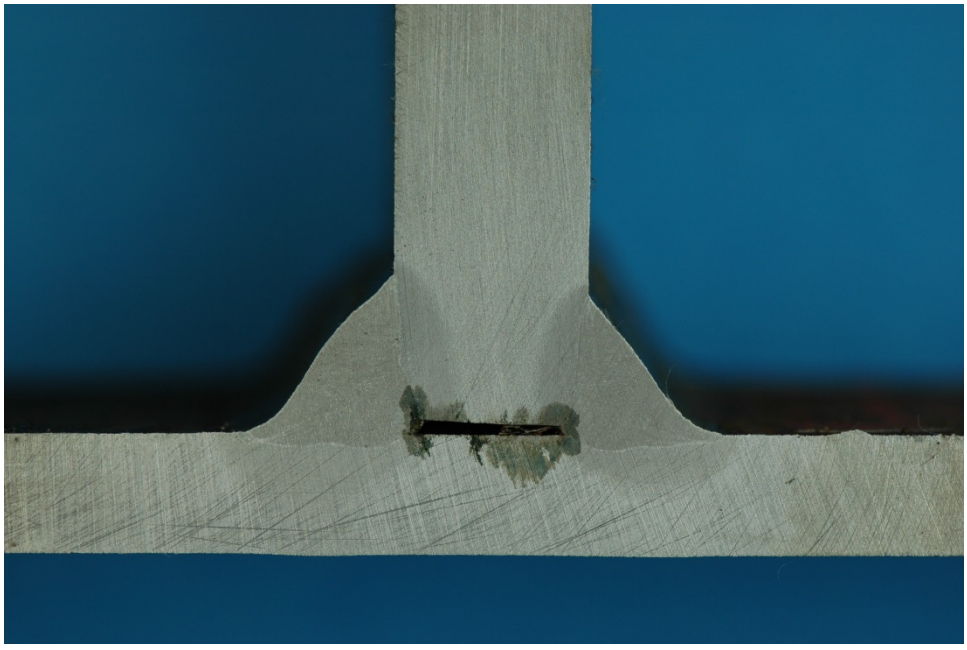

Figure 679. Macro-etched section R2_24_5

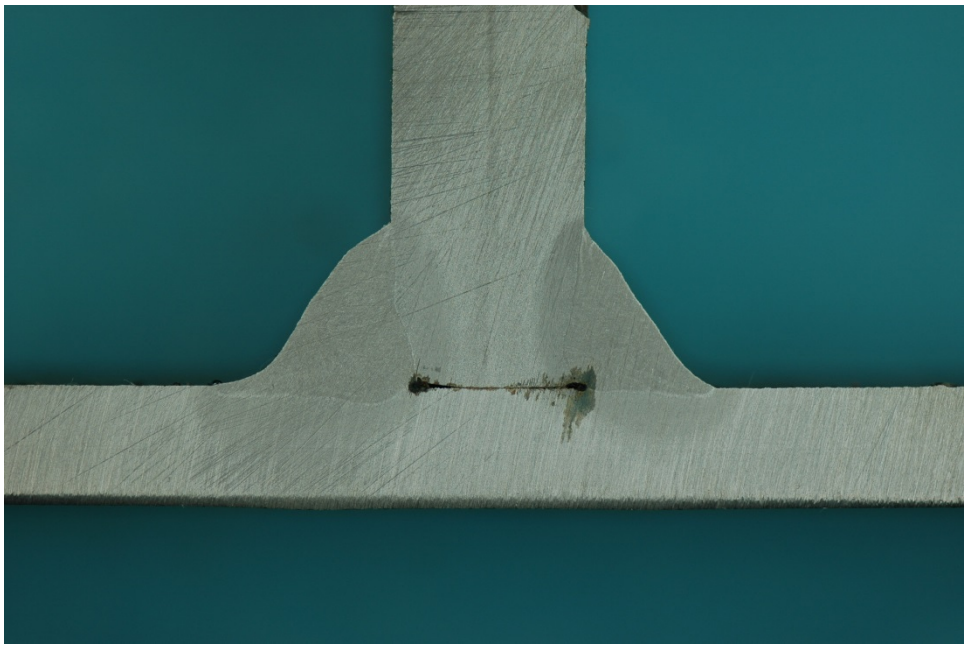

Figure 680. Macro-etched section R2_24_6

Figure 681. Macro-etched section R2_24_7

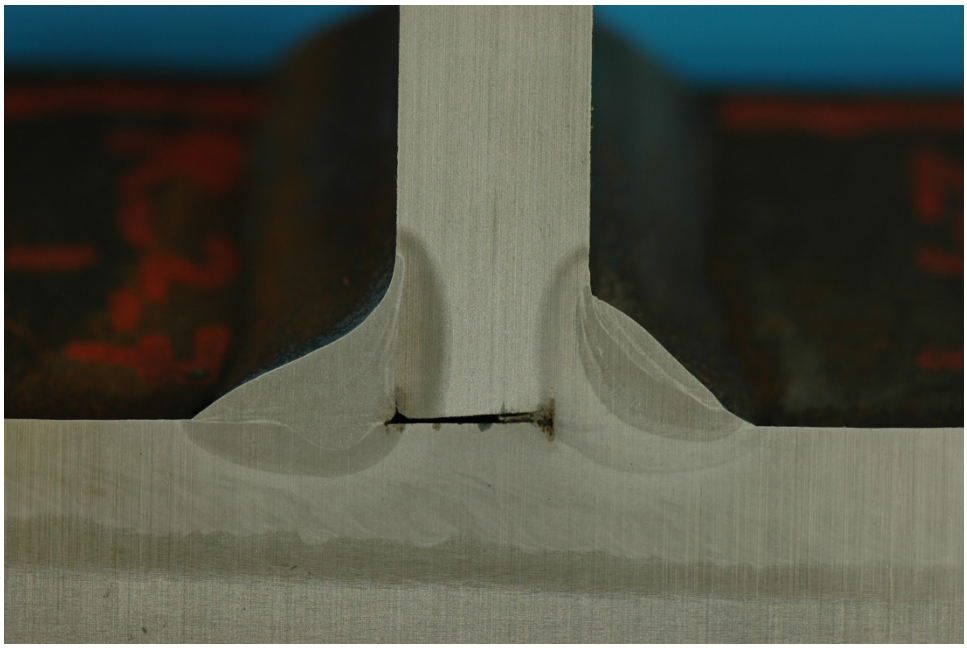

Figure 682. Macro-etched section R2_90_1

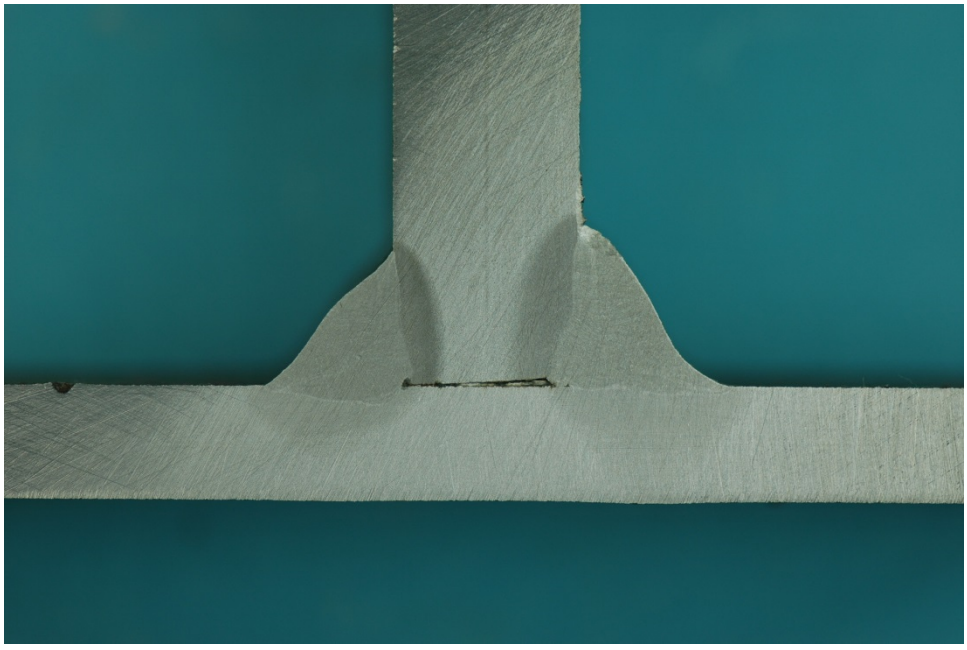

Figure 683. Macro-etched section R2_90_2

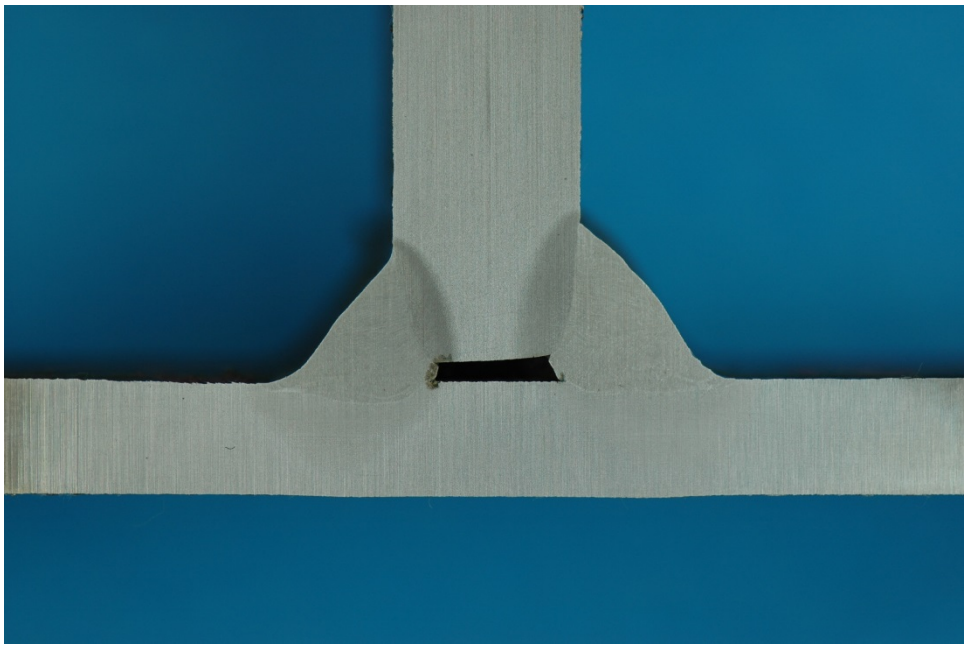

Figure 684. Macro-etched section R2_90_3

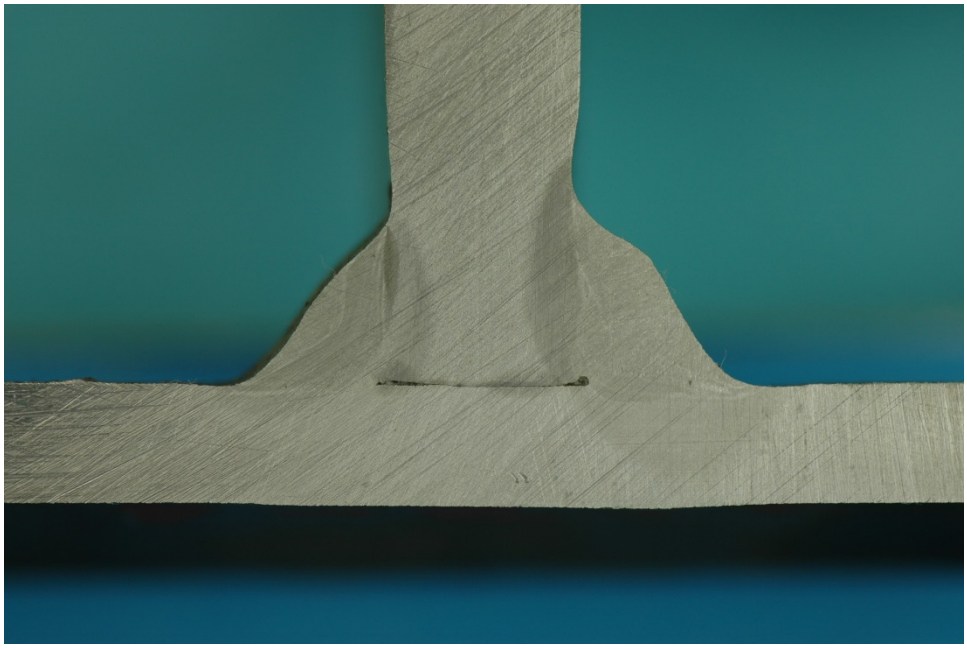

Figure 685. Macro-etched section R2_90_4

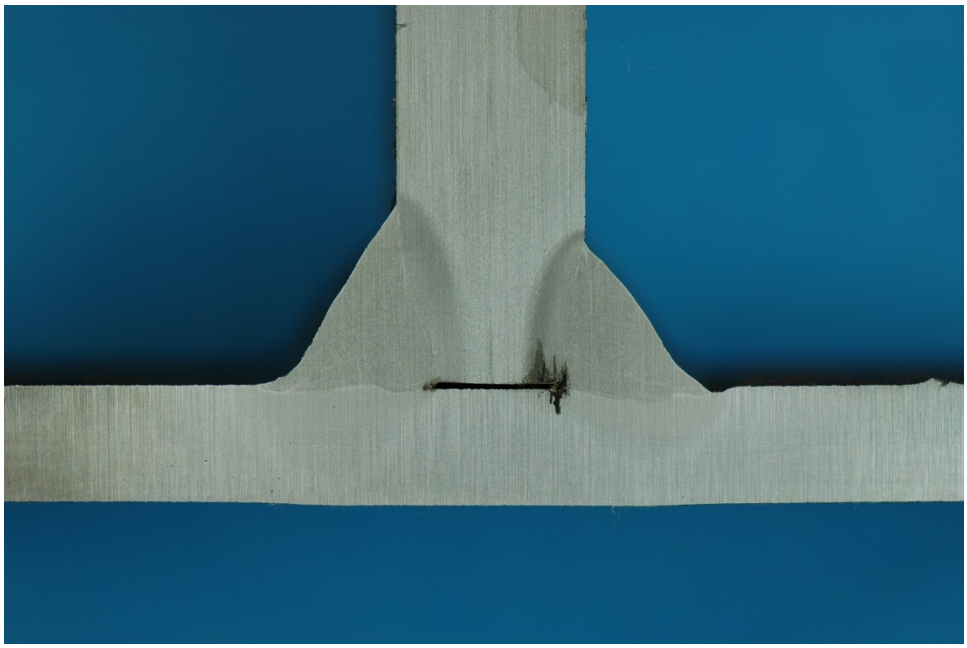

Figure 686. Macro-etched section R2_90_5

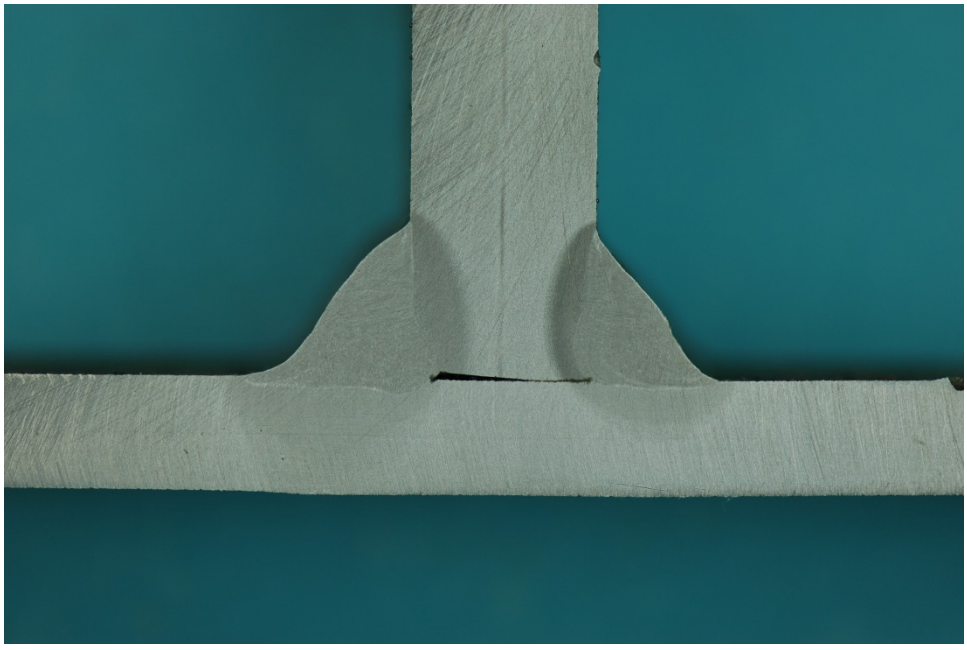

Figure 687. Macro-etched section R2_90_6

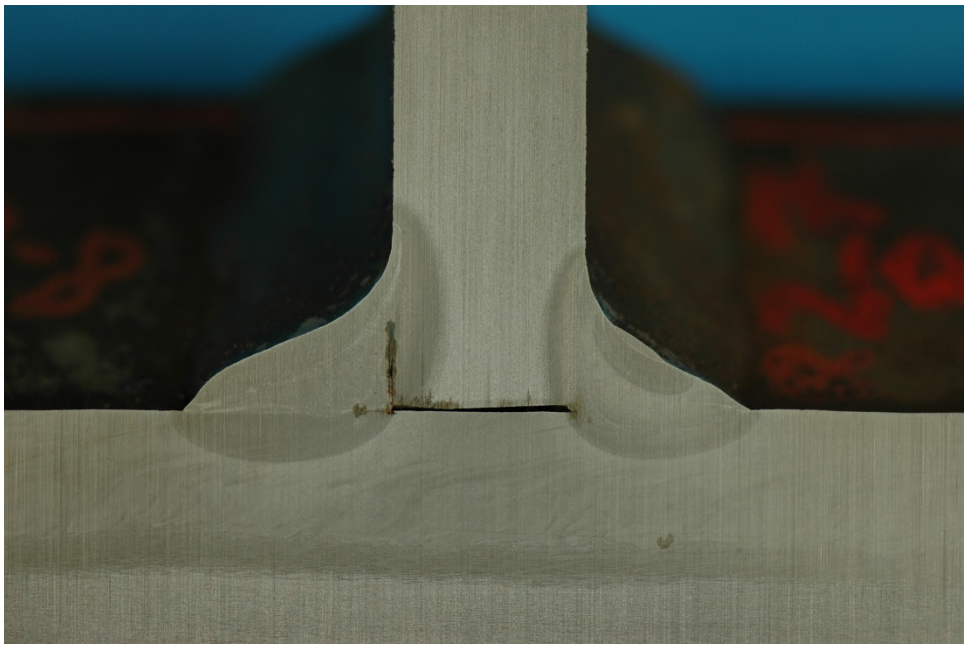

Figure 688. Macro-etched section R2_90_7

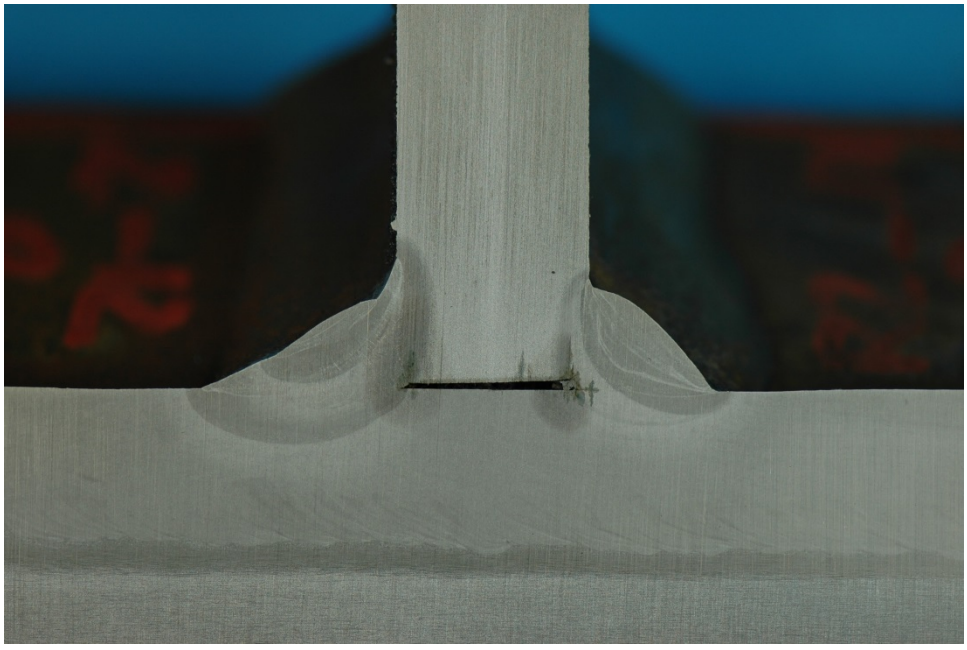

Figure 689. Macro-etched section R2_156_1

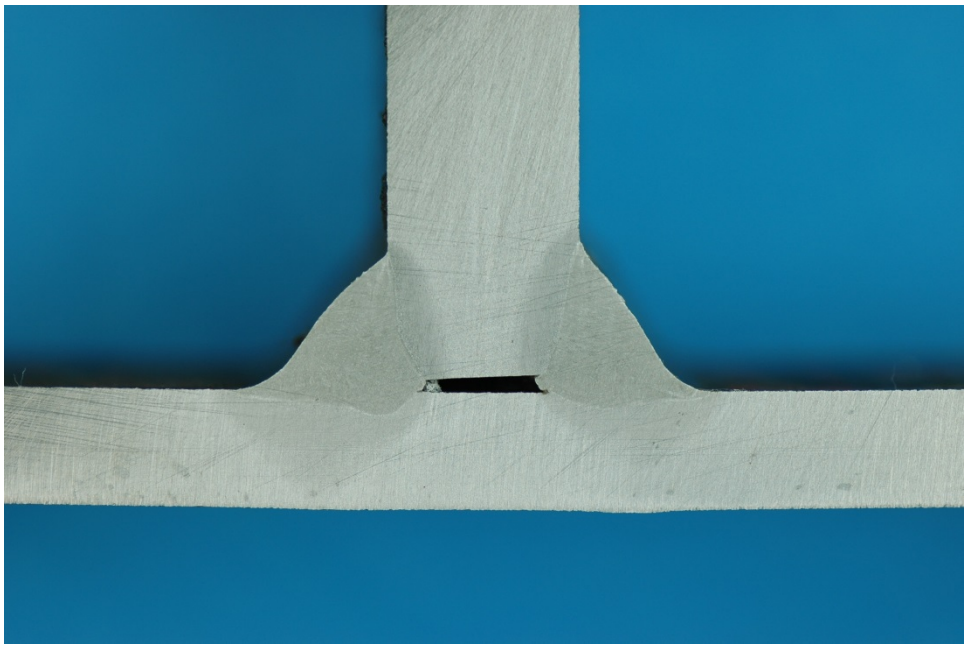

Figure 690. Macro-etched section R2_156_2

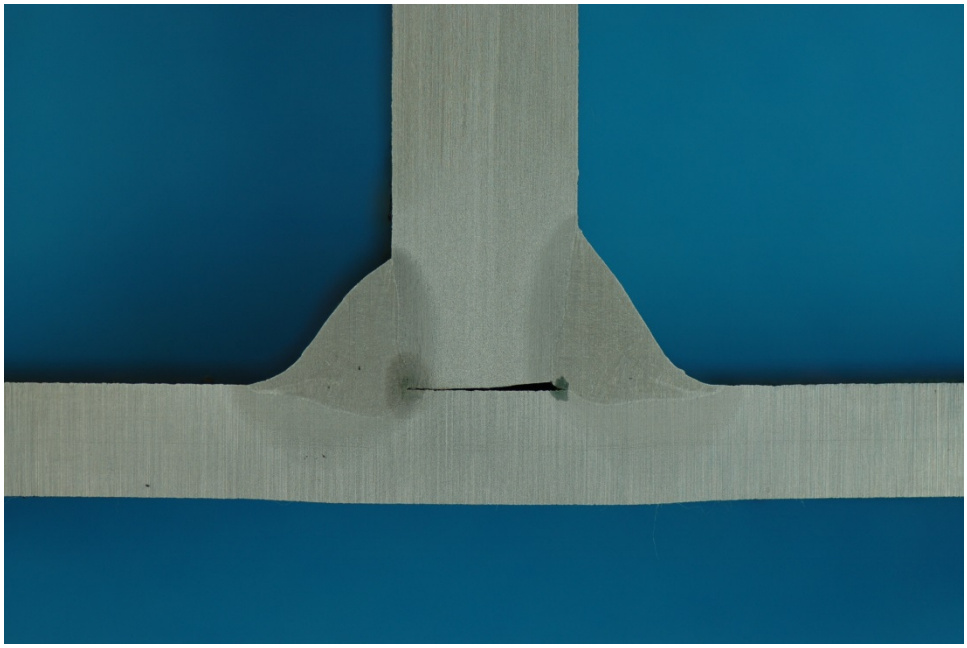

Figure 691. Macro-etched section R2_156_3

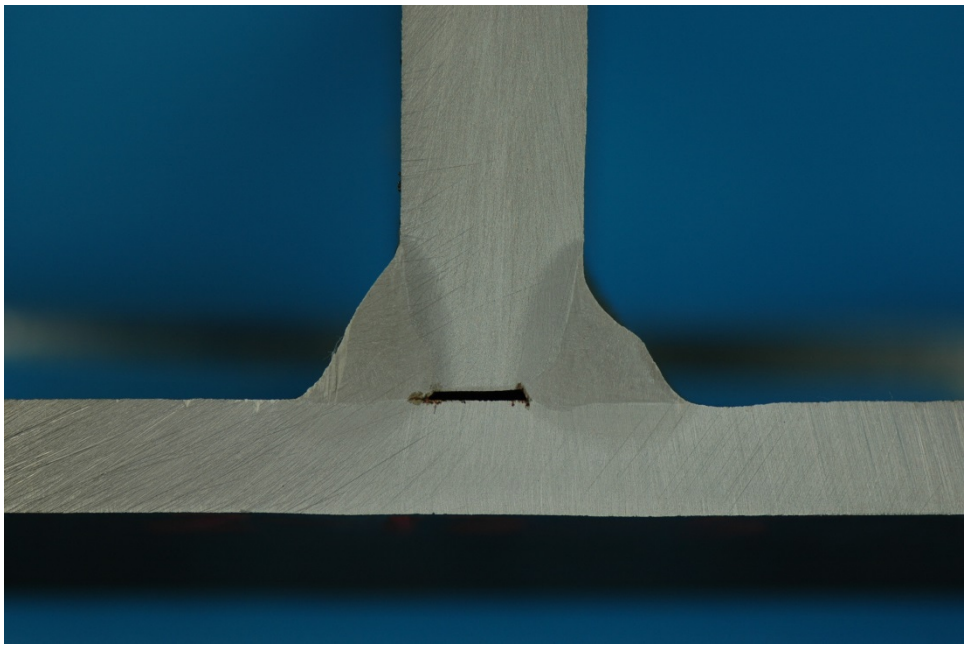

Figure 692. Macro-etched section R2_156_4

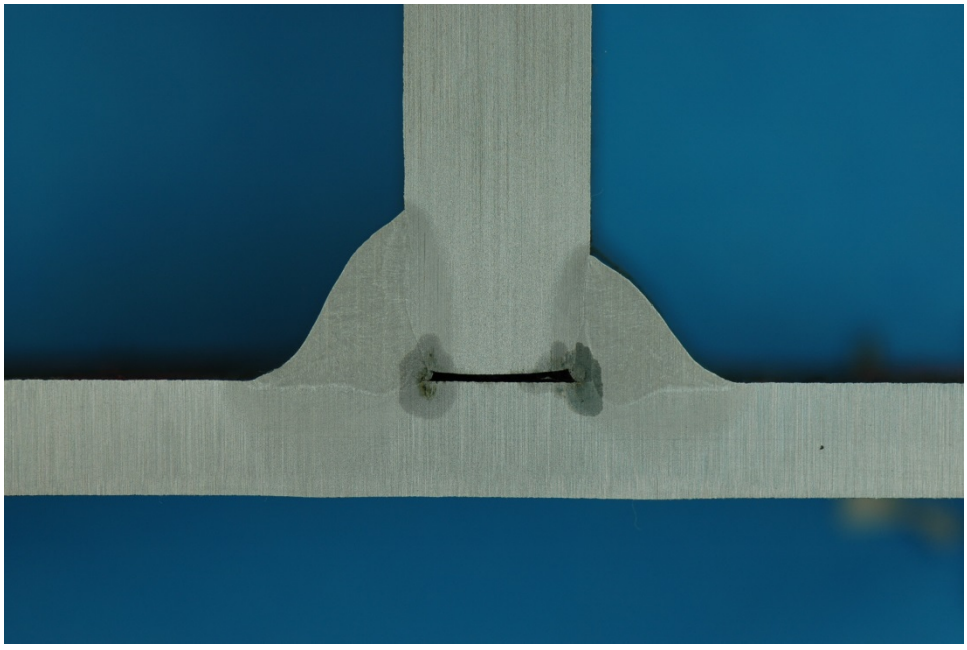

Figure 693. Macro-etched section R2_156_5

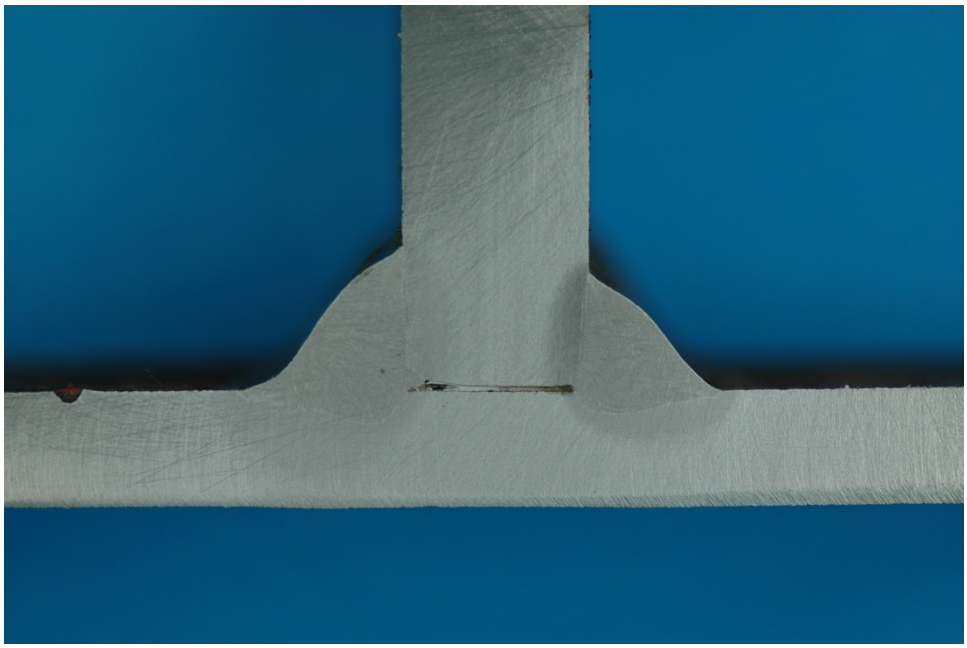

Figure 694. Macro-etched section R2_156_6

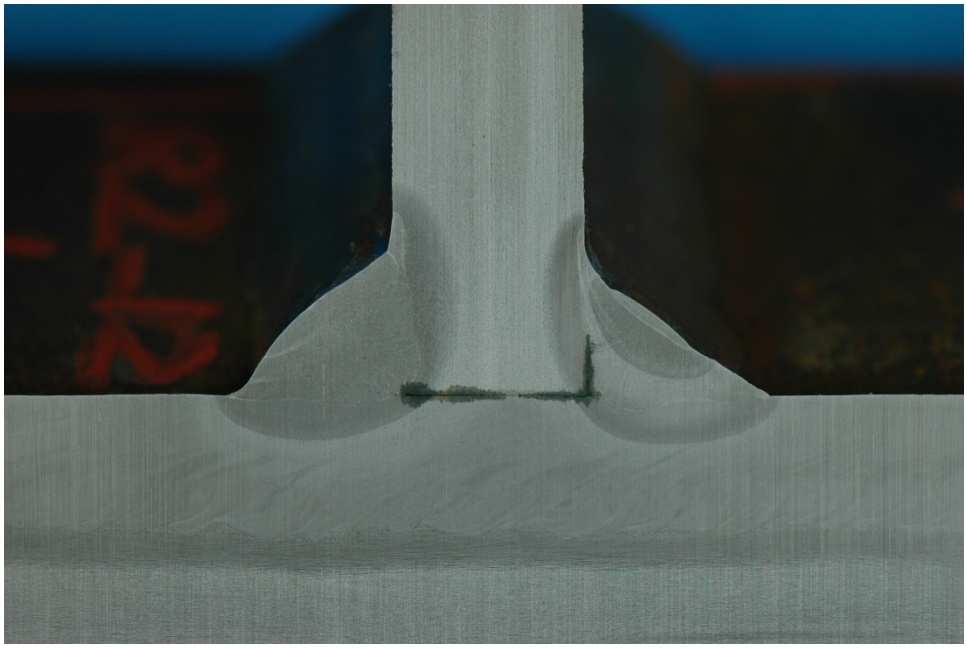

Figure 695. Macro-etched section R2_156_7

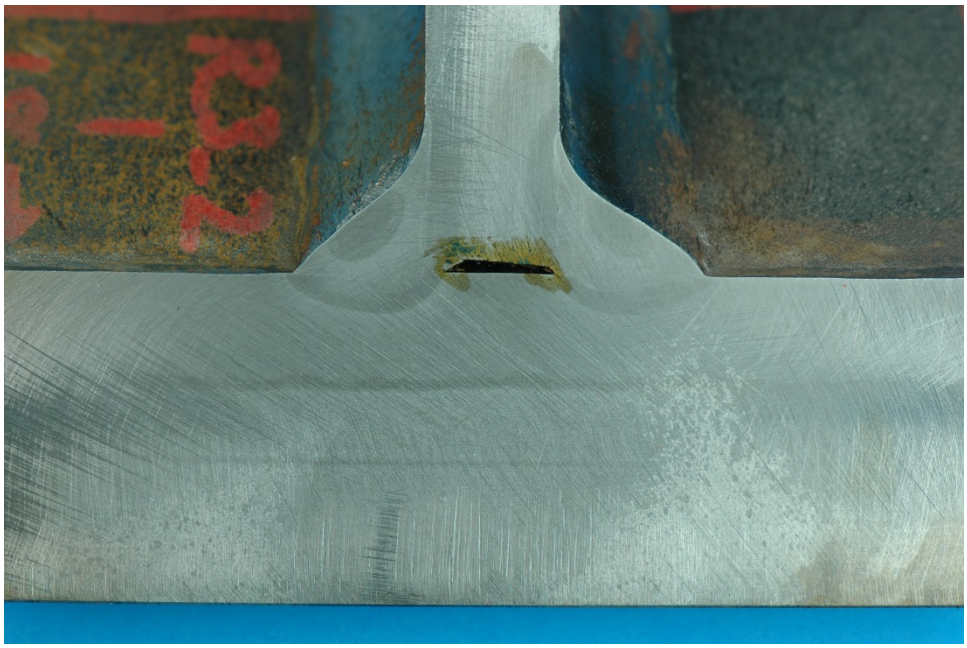

Figure 696. Macro-etched section R3_24_1

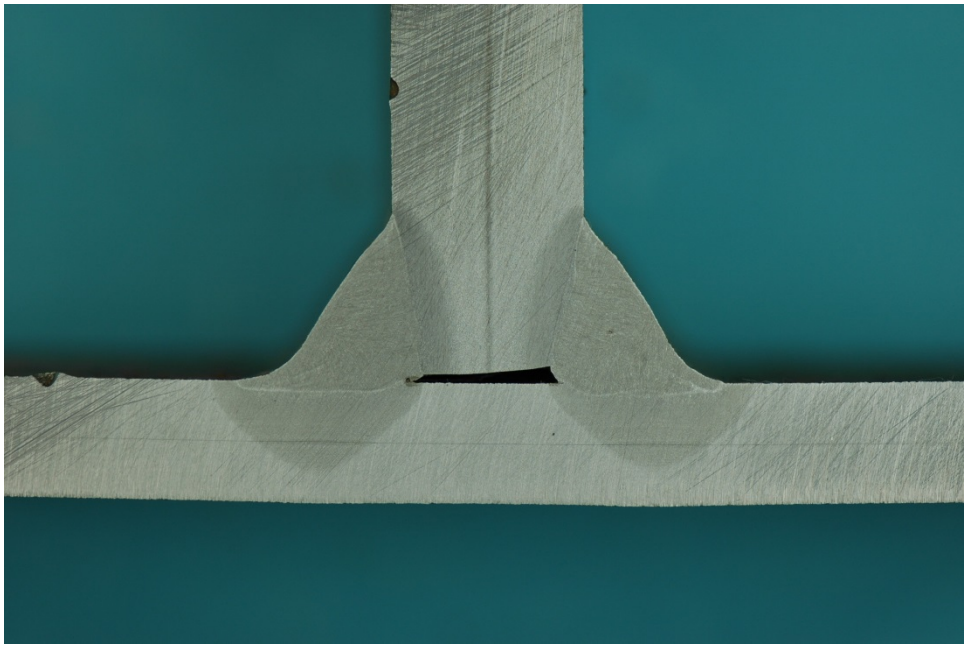

Figure 697. Macro-etched section R3_24_2

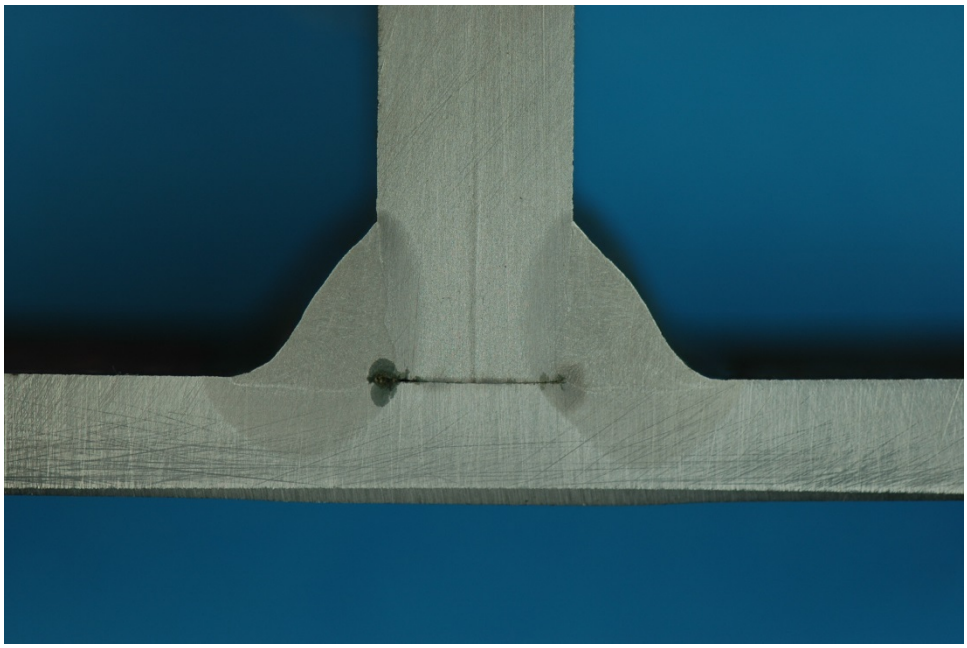

Figure 698. Macro-etched section R3_24_3

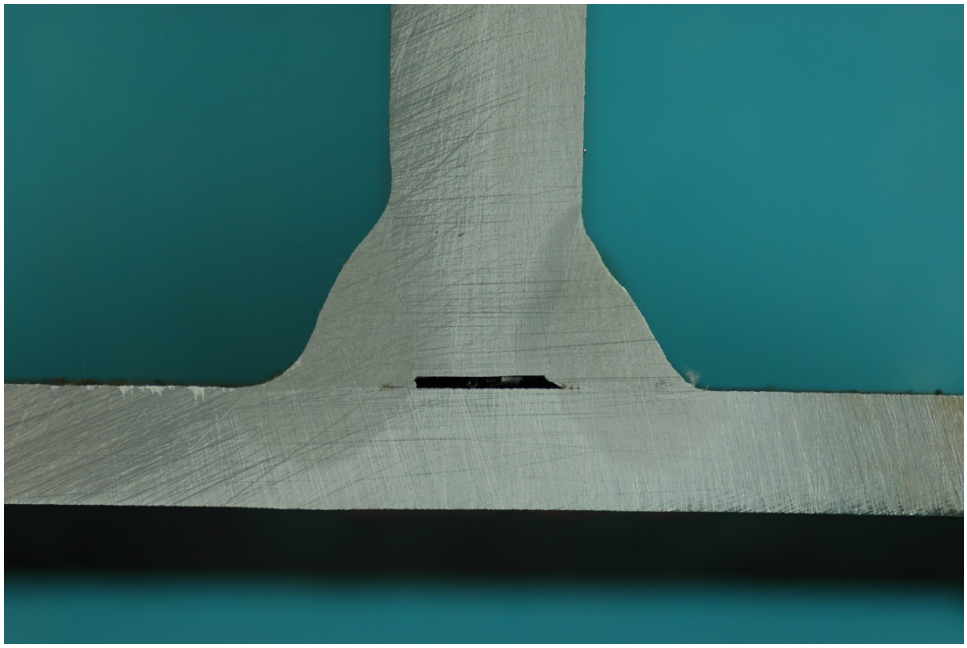

Figure 699. Macro-etched section R3_24_4

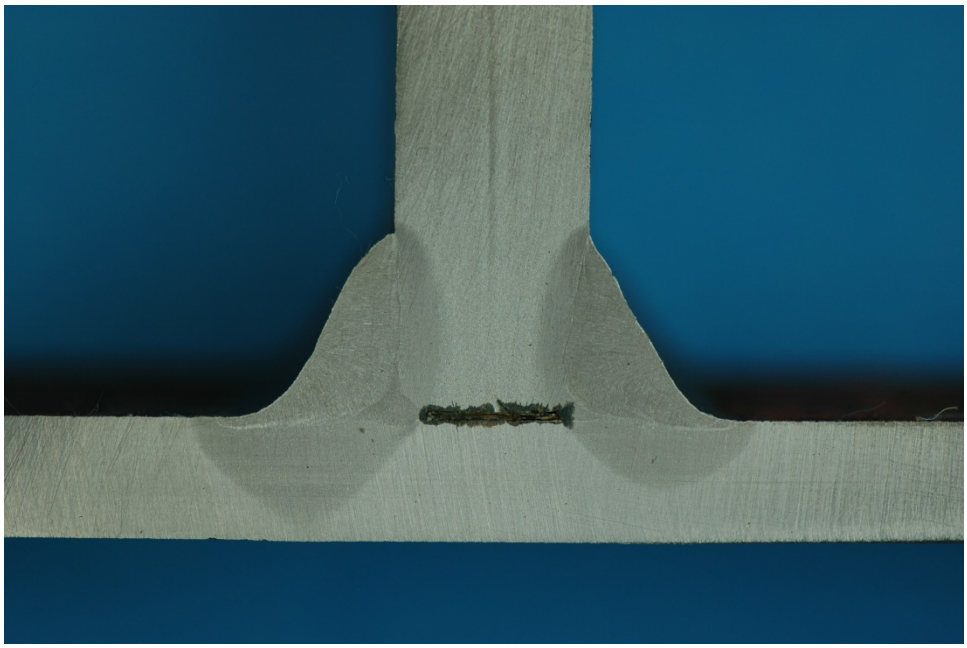

Figure 700. Macro-etched section R3_24_5

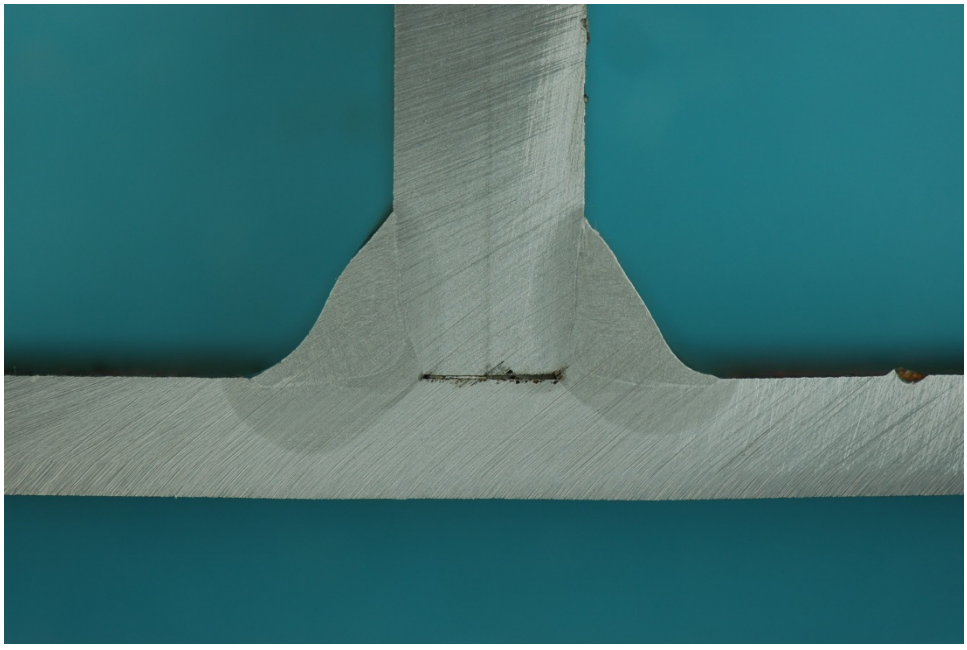

Figure 701. Macro-etched section R3_24_6

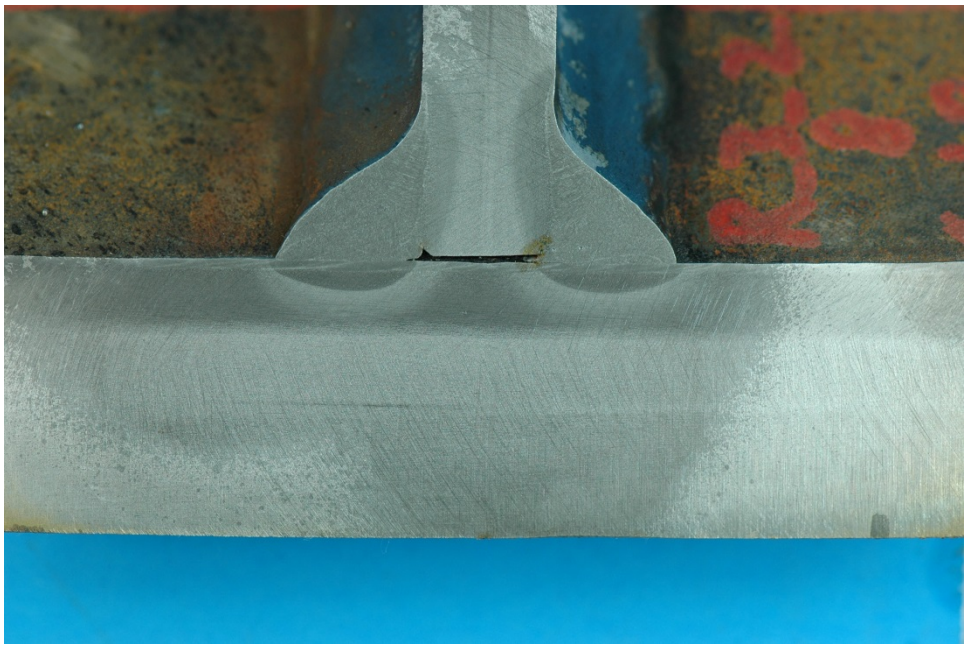

Figure 702. Macro-etched section R3_24_7

Figure 703. Macro-etched section R3_90_1

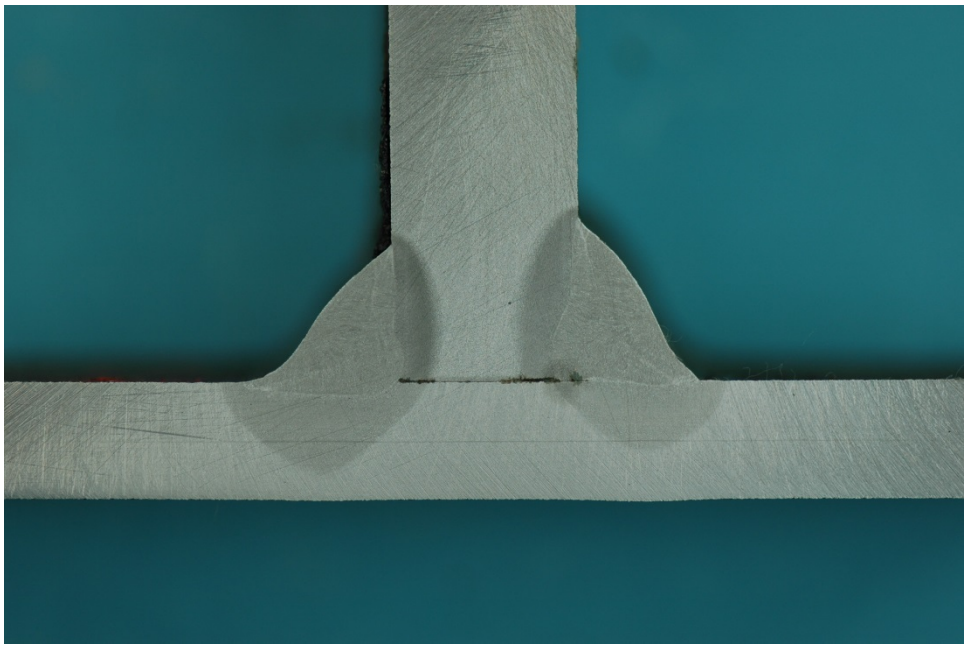

Figure 704. Macro-etched section R3_90_2

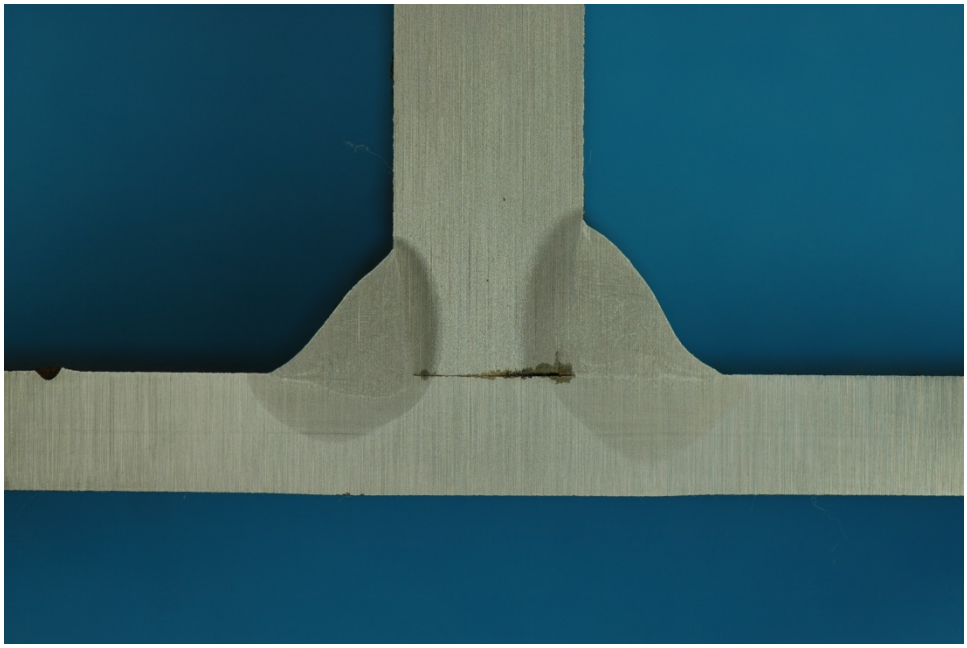

Figure 705. Macro-etched section R3_90_3

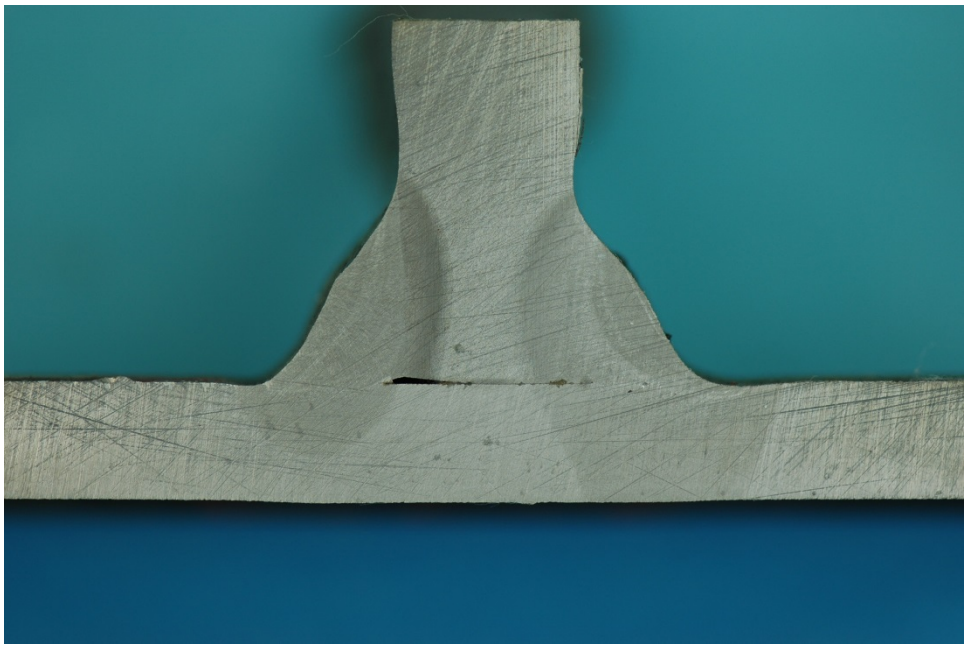

Figure 706. Macro-etched section R3_90_4

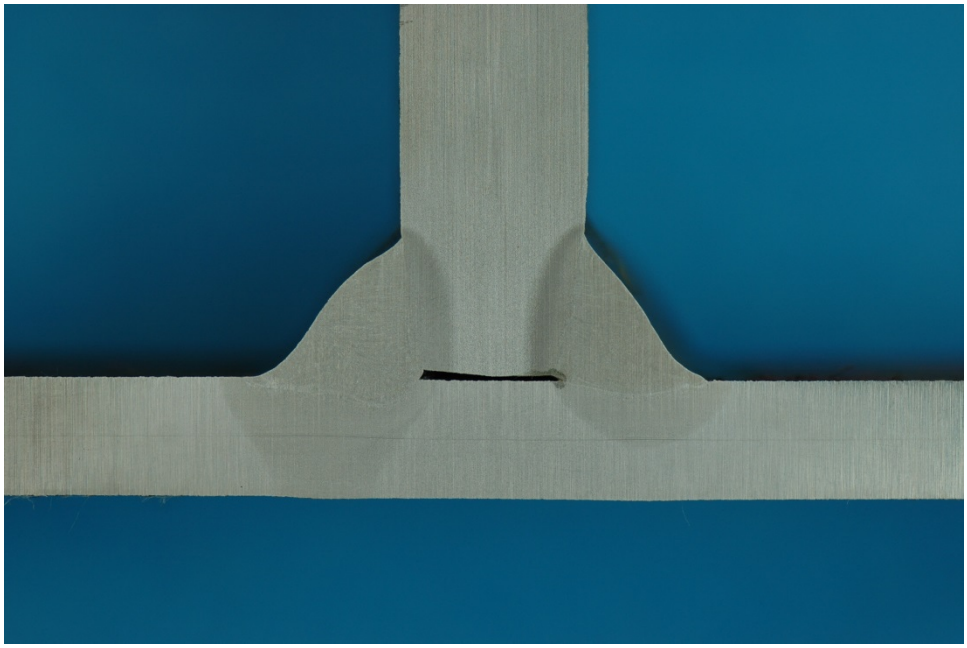

Figure 707. Macro-etched section R3_90_5

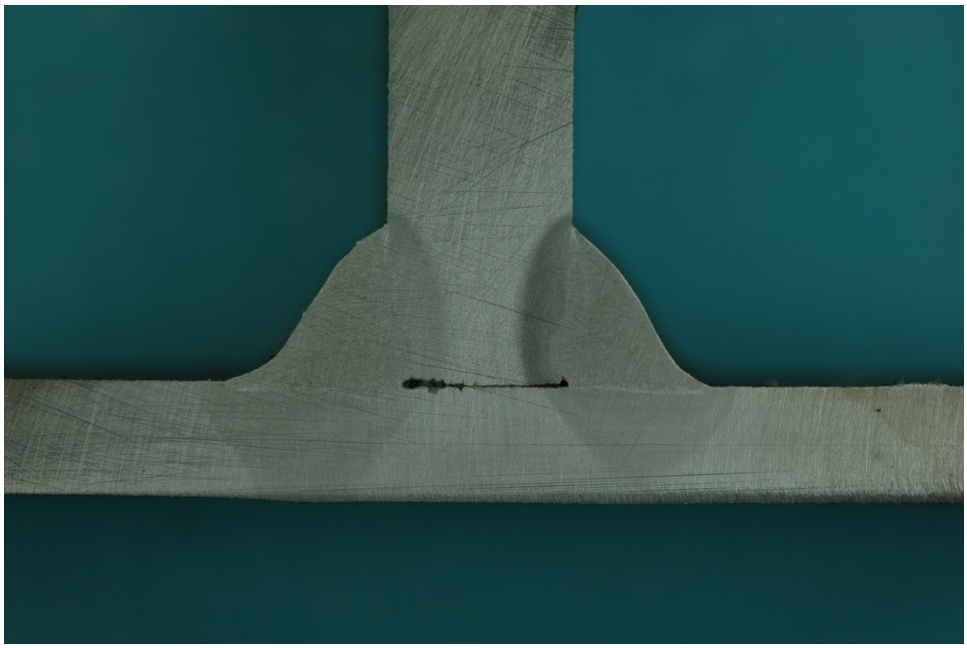

Figure 708. Macro-etched section R3_90_6

Figure 709. Macro-etched section R3_90_7

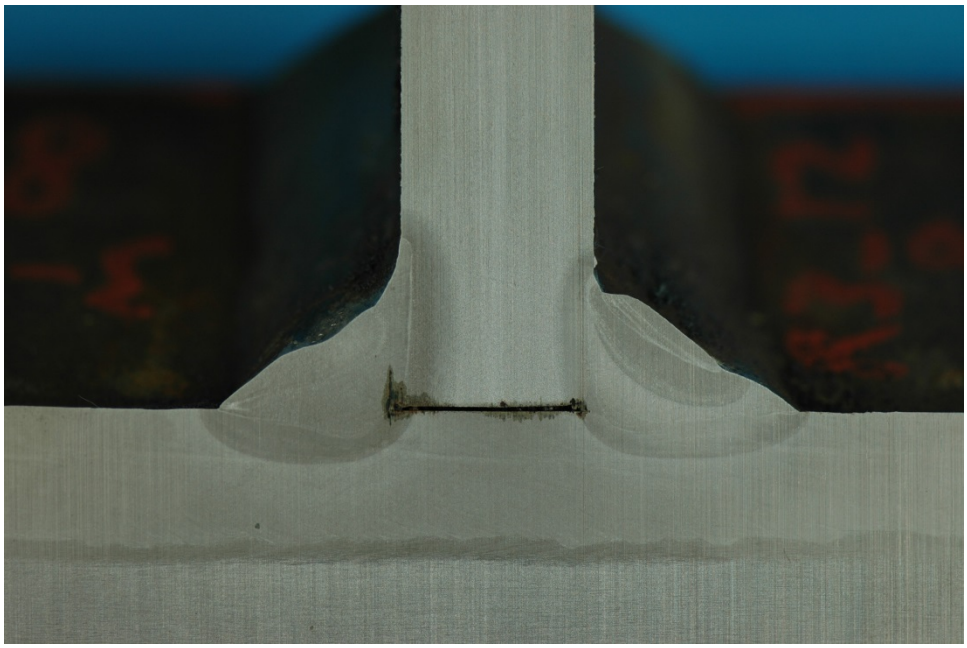

Figure 710. Macro-etched section R3_156_1

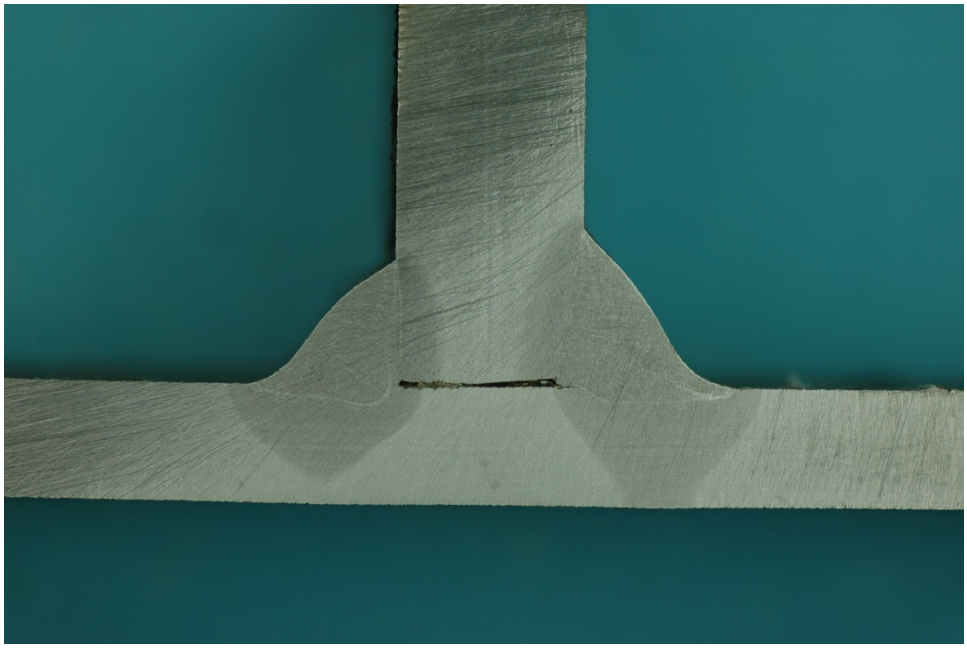

Figure 711. Macro-etched section R3_156_2

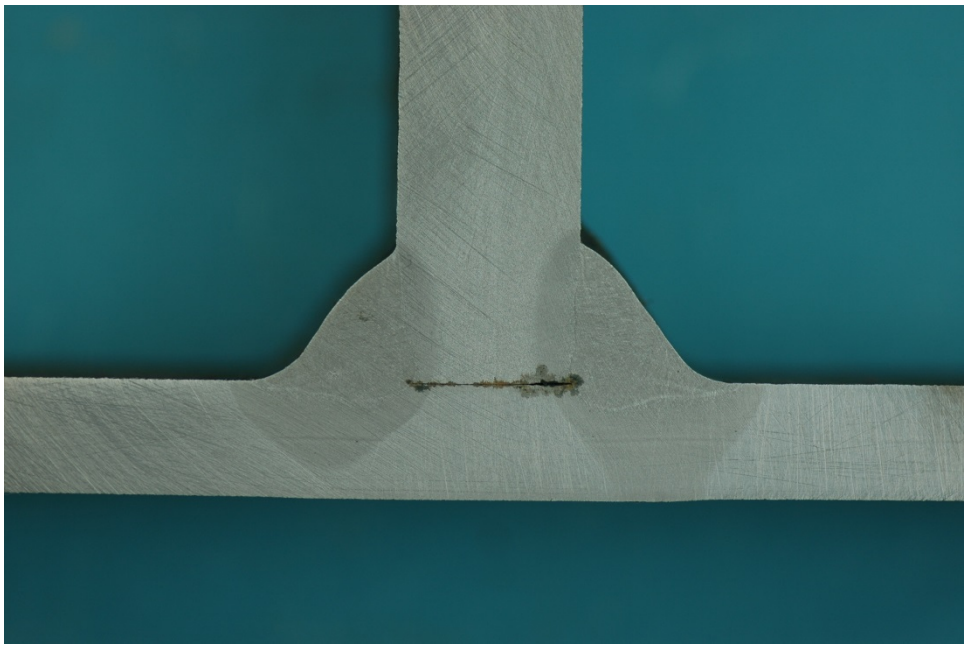

Figure 712. Macro-etched section R3_156_3

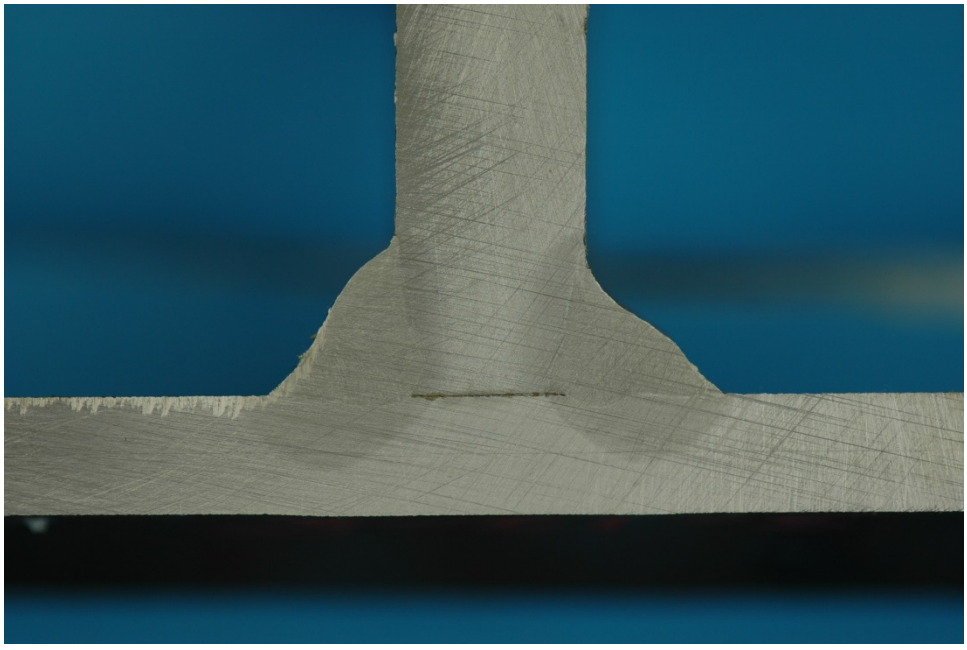

Figure 713. Macro-etched section R3_156_4

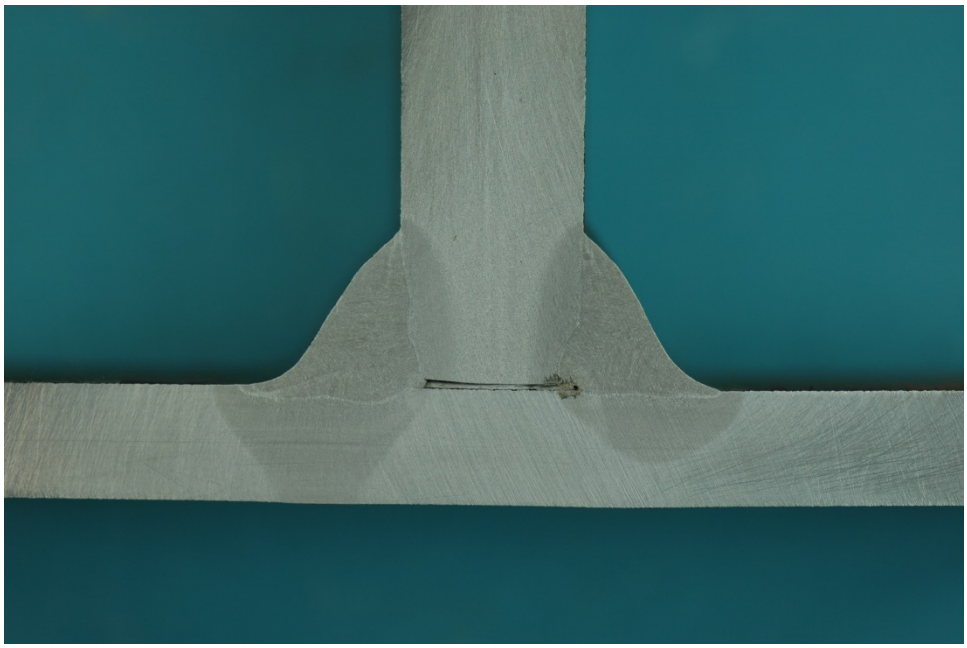

Figure 714. Macro-etched section R3_156_5

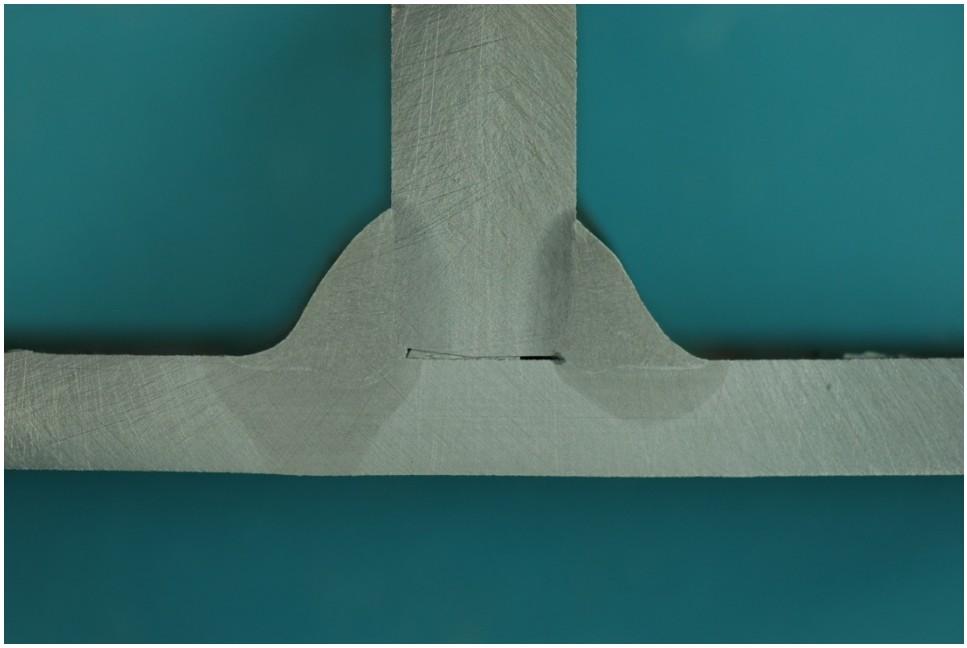

Figure 715. Macro-etched section R3_156_6

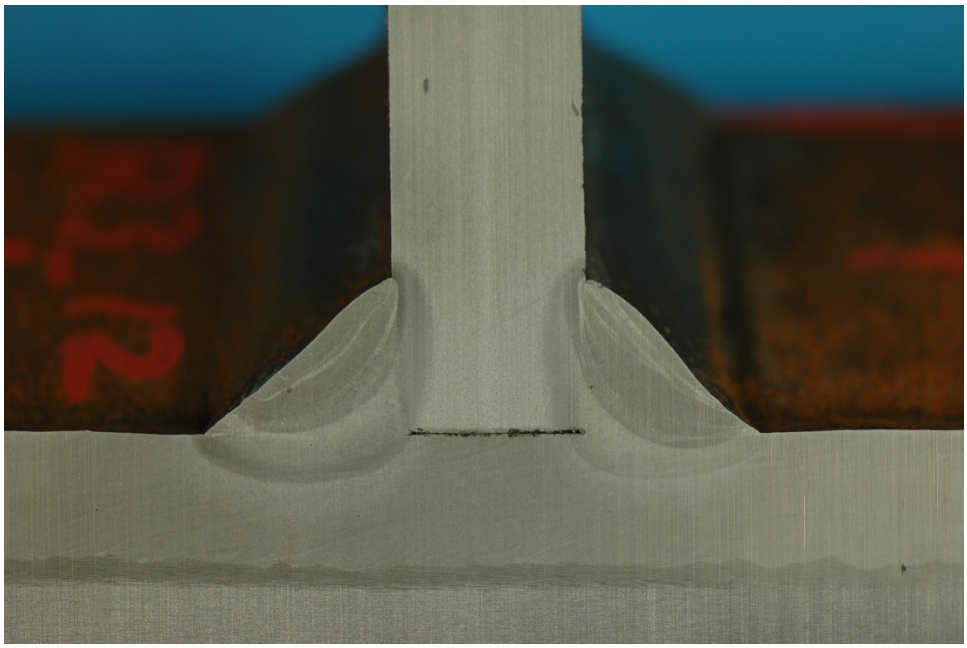

Figure 716. Macro-etched section R3_156_7

APPENDIX K: WPS FOR RIB-TO-FB WELDS

WELDING PROCEDURE SPECIFICATION

ORTHOTROPIC DECK SPECIMENS

MATERIAL SPECIFICATION	ASTM A709 GRADE 50
WELDING PROCESS	PULSED GAS METAL ARC WELDING
MANUAL OR MACHINE	SEMIAUTOMATIC
POSITION OF WELDING	2F
FILLER METAL SPECIFICATION	AWS A5.18
WELD METAL CLASSIFICATION	ER70S-6
WIRE/FLUX	LINCOLN SUPERARC L-56
WIRE DIAMETER	0.052"
POLARITY	DC+
ROOT TREATMENT	REMOVE ALL MILL SCALE, RUST AND CONTAMINANTS.
PREHEAT TEMPERATURE	50°F MINIMUM
ELECTRICAL STICK-OUT	3/4"
SHIELDING GAS	92% AR / 8% CO2
GAS FLOW	32-40 CFH

REVISED: 12/2/13

ORIGINAL ISSUE: 6/13/13

PASS NO.	AMPS	WIRE FEED SPEED (IPM)	VOLTS	TRAVEL SPEED (IPM)	JOINT DETAILS
ALL	225-260	275-325"	25.2-26.5	14-16.5	REFER TO LEHIGH UNIVERSITY ATLSS DRAWINGS

USED FOR

RIB TO FLOORBEAM

REPAIR WELDS

SINGLE-PASS FILLET WELDS

AND TACK WELDS

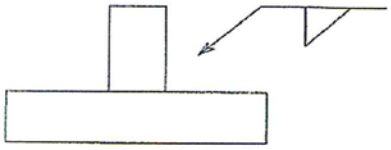

Figure 717. WPS for rib-to-floor beam welds

APPENDIX L: REPAIR PROCEDURE FOR BLOW THROUGH

Project Number: NJ-2011-14
HSSI # 1130820
Piece Mark: deck plate
Date: 11/25/13

REPAIR PROCEDURE

The following procedure is to be used to repair areas of blow-through in rib to deck welds on orthotropic plates:

(1) Using grinding or carbon arc gouging remove the weld metal in the area to be repaired back to within 1/8th inch of the back joint face.

(2) All care shall be taken with both gouging and grinding not to remove or damage base metal unnecessary.

(3) Grind the gouge to bright metal producing a minimum of 10° slope on the edges.

(4) MP testing shall be preformed on the repair area after grinding is complete to insure that the remaining weld material is sound.

(5) The cavity shall be filled using GMAW in conformance with the approved GMAW welding procedure.

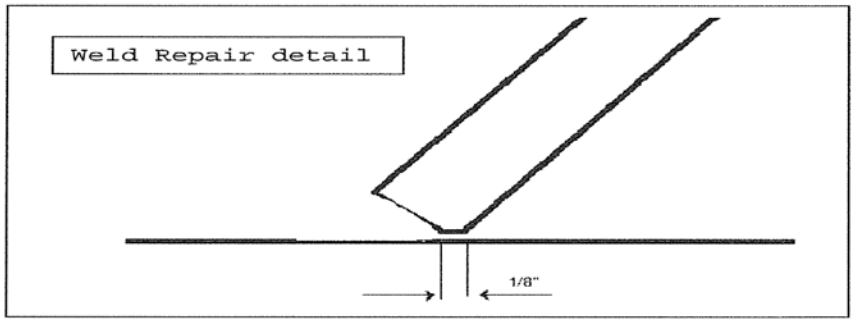

Figure 718. Repair procedure for blow through

APPENDIX M: STATIC TEST RESULTS OF FULL-SIZE SPECIMEN

Table 46 – Static Test Results of Full-Size Specimen

Location			Logger + Slot No. + Card No.	Channel ID	Alias	Static Test Sept 12,2014: Avg (0.1)	Static Test Sept 29,2014: Avg (0.1)	Static Test Oct 9,2014: Avg (0.1)	Static Test Oct 15,2014: Avg (0.1)	Static Test Oct 23,2014: Avg (0.1)	Static Test Nov 11,2014: Avg (0.1)	Static Test Nov 17,2014: Trial 3 (0.1)	Static Test Dec 04,2014: Trial 3 (0.1)	Static Test Dec 10,2014: Trial 4 (0.1)
						Range	Range	Range	Range	Range	Range	Range	Range	Range
Actuator Forces (kip)														
AboveDeck Actuators			1102	1	ACT_1_LOAD_Avg									
			1103	2	ACT_1_DISPL_Avg									
			1104	3	ACT_2_LOAD_Avg									
			1105	4	ACT_2_DISPL_Avg									
Under Deck Actuators			1106	5	ACT_3_LOAD_Avg									
			1107	6	ACT_3_DISPL_Avg									
LVDT Displacments (in)														
Rib 1			3102	7	R1_DISPL_Avg	0.054			0.049		0.049	0.049		0.046
Between Rib 1 and Rib 2			3103	8	R1_2_DISPL_Avg	0.023			0.018		0.019	0.017		0.019
Rib 2			3104	9	R2_DISPL_Avg	0.030			0.027		0.025	0.023		0.021
Between Rib 3 and Rib 4			3105	10	R3_4_DISPL_Avg	0.009			0.009		0.000	0.000		0.000
Rib 4			3106	11	R4_DISPL_Avg	-0.002			-0.002		-0.002	-0.003		-0.002
Between Rib 4 and Rib 5			3107	12	R4_5_DISPL_Avg	-0.003			-0.003		-0.002	-0.007		-0.003
Bottom of Intermediate FB				13	FB_DISPL	0.016	0.017		0.017		0.016	0.016		0.015
Strain GaugeMeasurements (ksi)														

Deck Component	Location	Gage Type	Logger + Slot No. + Card No.	Channel ID	Alias	Static Test Sept 12,2014: Avg (0.1)			Static Test Sept 29,2014: Avg (0.1)			Static Test Oct 9,2014: Avg (0.1)			Static Test Oct 15,2014: Avg (0.1)			Static Test Oct 23,2014: Avg (0.1)			Static Test Nov 11,2014: Avg (0.1)			Static Test Nov 17,2014: Trial 3 (0.1)			Static Test Dec 04,2014: Trial 3 (0.1)			Static Test Dec 10,2014: Trial 4 (0.1)		
						Range			Range			Range			Range			Range			Range			Range			Range			Range		
						Axial	Principal		Axial	Principal		Axial	Principal		Axial	Principal		Axial	Principal		Axial	Principal		Axial	Principal		Axial	Principal		Axial	Principal	
							Max	Min		Max	Min		Max	Min		Max	Min		Max	Min		Max	Min		Max	Min		Max	Min		Max	Min
Intermediate Floor Beam	Rib 1	1 mm Rosette	2110	14	SE_FB_S0_T_Avg	6.63			6.48			6.11			6.14			6.03			6.12			6.13			6.04			6.11		
		1 mm Rosette	2111	15	SE_FB_S0_D_Avg	3.55			3.47			3.31			3.31			3.25			3.31			3.32			3.27			3.30		
		1 mm Rosette	2112	16	SE_FB_S0_A_Avg	3.60	7.29	2.94	3.53	7.12	2.88	3.34	6.71	2.74	3.35	6.75	2.74	3.28	6.62	2.69	3.33	6.72	2.74	3.38	6.75	2.77	3.30	6.64	2.71	3.33	6.70	2.73
		1 mm Uniaxial	2113	17	SE_FB_S0_1_Avg	1.19			1.16			1.12			1.12			1.09			1.09			1.14			1.10			1.11		
		1 mm Uniaxial	2114	18	SE_FB_S0_2_Avg	1.13			1.09			1.04			1.05			1.01			1.03			1.06			1.02			1.03		
		1 mm Rosette	2201	19	SE_FB_25_T_Avg	5.18			5.04			4.76			4.81			4.68			4.75			4.76			4.68			4.72		
		1 mm Rosette	2202	20	SE_FB_25_D_Avg	-2.93			-2.91			-2.70			-2.72			-2.72			-2.72			-2.70			-2.71			-2.71		
		1 mm Rosette	2203	21	SE_FB_25_A_Avg	0.39	8.98	-3.41	0.37	8.79	-3.38	0.37	8.27	-3.14	0.36	8.34	-3.17	0.31	8.14	-3.15	0.33	8.25	-3.17	0.39	8.29	-3.13	0.32	8.15	-3.15	0.33	8.21	-3.15
		1 mm Uniaxial	2204	22	SE_FB_25_1_Avg	-1.87			-1.83			-1.72			-1.72			-1.71			-1.73			-1.69			-1.71			-1.73		
		1 mm Uniaxial	2205	23	SE_FB_25_2_Avg	-1.32			-1.31			-1.23			-1.22			-1.22			-1.24			-1.19			-1.22			-1.23		
		1 mm Uniaxial	2206	24	E_FB_O_Avg	0.43			0.40			0.40			0.43			0.39			0.39			0.39			0.38			0.40		
		1 mm Rosette	2207	25	NE_FB_S0_T_Avg	-7.39			-7.21			-6.88			-6.98			-6.93			-7.04			-6.98			-6.98			-7.03		
		1 mm Rosette	2208	26	NE_FB_S0_D_Avg	-3.06			-2.97			-2.77			-2.83			-2.78			-2.87			-2.80			-2.84			-2.84		
		1 mm Rosette	2209	27	NE_FB_S0_A_Avg	-6.31	-3.02	-10.67	-6.15	-2.94	-10.42	-5.85	-2.74	-9.99	-5.91	-2.79	-10.11	-5.87	-2.75	-10.05	-5.90	-2.83	-10.11	-5.80	-2.76	-10.02	-5.86	-2.80	-10.04	-5.88	-2.80	-10.11
		1 mm Uniaxial	2210	28	NE_FB_S0_1_Avg	-2.52			-2.42			-2.33			-2.35			-2.33			-2.33			-2.27			-2.32			-2.33		
		1 mm Uniaxial	2211	29	NE_FB_S0_2_Avg	-2.54			-2.45			-2.36			-2.36			-2.35			-2.36			-2.30			-2.34			-2.36		
		1 mm Rosette	2212	30	NE_FB_25_T_Avg	-7.23			-7.09			-6.64			-6.72			-6.60			-6.66			-6.61			-6.60			-6.65		
		1 mm Rosette	2213	31	NE_FB_25_D_Avg	2.01			1.97			1.91			1.92			1.88			1.86			1.90			1.85			1.88		
		1 mm Rosette	2214	32	NE_FB_25_A_Avg	-2.95	2.33	-12.51	-2.89	2.28	-12.26	-2.71	2.20	-11.54	-2.74	2.21	-11.67	-2.71	2.16	-11.48	-2.74	2.15	-11.55	-2.65	2.19	-11.46	-2.72	2.13	-11.45	-2.73	2.16	-11.54
		1 mm Uniaxial	2301	33	NE_FB_25_1_Avg	-1.40			-1.35			-1.31			-1.31			-1.31			-1.29			-1.24			-1.30			-1.30		
		1 mm Uniaxial	2302	34	NE_FB_25_2_Avg	-1.99			-1.93			-1.85			-1.86			-1.86			-1.85			-1.79			-1.84			-1.85		
		1 mm Rosette	2303	35	SW_FB_S0_T_Avg	4.84			4.73			4.43			4.48			4.36			4.51			4.44			4.41			4.44		
		1 mm Rosette	2304	36	SW_FB_S0_D_Avg	0.29			0.23			0.24			0.25			0.20			0.34			0.24			0.27			0.27		
		1 mm Rosette	2305	37	SW_FB_S0_A_Avg	0.13	5.70	-0.74	0.09	5.59	-0.77	0.09	5.23	-0.71	0.09	5.28	-0.71	0.05	5.15	-0.74	0.17	5.30	-0.61	0.08	5.24	-0.71	0.10	5.18	-0.67	0.11	5.23	-0.68
		1 mm Uniaxial	2306	38	SW_FB_S0_1_Avg	-1.66			-1.63			-1.54			-1.55			-1.55			-1.47			-1.53			-1.50			-1.51		
		1 mm Uniaxial	2307	39	SW_FB_S0_2_Avg	-1.51			-1.50			-1.41			-1.42			-1.43			-1.35			-1.40			-1.38			-1.39		
		1 mm Rosette	2308	40	SW_FB_25_T_Avg	5.21			5.07			4.78			4.85			4.71			4.84			4.79			4.74			4.79		
		1 mm Rosette	2309	41	SW_FB_25_D_Avg	-3.01			-3.03			-2.79			-2.83			-2.81			-2.73			-2.79			-2.75			-2.77		
		1 mm Rosette	2310	42	SW_FB_25_A_Avg	-1.82	7.57	-4.18	-1.85	7.40	-4.18	-1.70	6.94	-3.87	-1.71	7.06	-3.92	-1.72	6.87	-3.88	-1.63	7.01	-3.81	-1.71	6.95	-3.87	-1.66	6.89	-3.81	-1.68	6.96	-3.85
		1 mm Uniaxial	2311	43	SW_FB_25_1_Avg	-3.25			-3.20			-3.00			-3.04			-3.00			-2.94			-3.00			-2.95			-2.98		
		1 mm Uniaxial	2312	44	SW_FB_25_2_Avg	-2.17			-2.13			-2.00			-2.03			-2.01			-1.97			-2.00			-1.98			-1.99		
		1 mm Uniaxial	2313	45	W_FB_O_Avg	-0.66			-0.66			-0.59			-0.61			-0.61			-0.59			-0.60			-0.60			-0.60		
		1 mm Rosette	2314	46	NW_FB_S0_T_Avg	-7.84			-7.73			-7.21			-7.32			-7.18			-7.24			-7.23			-7.17			-7.22		
		1 mm Rosette	2401	47	NW_FB_S0_D_Avg	-1.75			-1.77			-1.55			-1.61			-1.55			-1.60			-1.66			-1.58			-1.59		
		1 mm Rosette	2402	48	NW_FB_S0_A_Avg	-2.36	-0.77	-9.48	-2.37	-0.81	-9.29	-2.18	-0.66	-8.72	-2.21	-0.71	-8.82	-2.18	-0.68	-8.69	-2.16	-0.69	-8.70	-2.22	-0.76	-8.69	-2.16	-0.69	-8.64	-2.18	-0.70	-8.71
		1 mm Uniaxial	2403	49	NW_FB_S0_1_Avg	-0.21			-0.23			-0.20			-0.20			-0.20			-0.17			-0.22			-0.20			-0.20		
		1 mm Uniaxial	2404	50	NW_FB_S0_2_Avg	-0.17			-0.19			-0.16			-0.16			-0.18			-0.13			-0.18			-0.16			-0.16		
		1 mm Rosette	2405	51	NW_FB_25_T_Avg	-6.79			-6.69			-6.25			-6.32			-6.22			-6.25			-6.25			-6.21			-6.25		
		1 mm Rosette	2406	52	NW_FB_25_D_Avg	2.58			2.48			2.41			2.43			2.37			2.41			2.35			2.36			2.39		
		1 mm Rosette	2407	53	NW_FB_25_A_Avg	0.10	3.50	-10.19	0.06	3.39	-10.02	0.09	3.26	-9.41	0.10	3.30	-9.52	0.08	3.22	-9.35	0.13	3.27	-9.39	0.07	3.21	-9.39	0.08	3.21	-9.33	0.10	3.24	-9.39
		1 mm Uniaxial	2408	54	NW_FB_25_1_Avg	1.10			1.07			1.01			1.03			1.00			1.05			1.01			1.01			1.01		
		1 mm Uniaxial	2409	55	NW_FB_25_2_Avg	-0.50			-0.49			-0.47			-0.46			-0.49			-0.43			-0.47			-0.47			-0.47		
	Edge-Girder Connection	1 mm Uniaxial	1314	56	FB_BF_EB1_Avg	-1.86			-1.72			-1.93			-1.98			-1.85			-2.02			-1.99			-1.93			-1.96		
		1 mm Uniaxial	1401	57	FB_BF_1_Avg	-0.72			-0.68			-0.96			-0.98			-0.89			-1.04			-1.02			-0.98			-0.99		
		1 mm Uniaxial	1402	58	FB_BF_WB1_Avg	-1.37			-1.32			-1.56			-1.62			-1.48			-1.64			-1.62			-1.57			-1.57		
		1 mm Uniaxial	1403	59	FB_BF_ET1_Avg	3.15			2.99			2.90			2.97			2.85			2.95			2.90			2.86			2.90		
		1 mm Uniaxial	1404	60	FB_BF_WT1_Avg	2.23			2.14			2.05			2.12			2.02			2.10			2.06			2.02			2.07		
		1/4" Uniaxial	1405	61	FB_BF_EB2_Avg	0.24			0.27			0.06			0.05			0.09			0.02			0.03			0.03			0.05		
		1/4" Uniaxial	1406	62	FB_BF_2_Avg	0.16			0.19			-0.01			-0.06			0.01			-0.06			-0.05			-0.05			-0.03		
		1/4" Uniaxial	1407	63	FB_BF_WB2_Avg	0.19			0.23			0.02			-0.01			0.04			-0.03			-0.01			-0.01			0.00		
		1/4" Uniaxial	1408	64	FB_BF_ET2_Avg	-0.64			-0.61			-0.67			-0.71			-0.65			-0.70			-0.69			-0.67			-0.67		
		1/4" Uniaxial	1409	65	FB_BF_WT2_Avg	-0.80			-0.75			-0.84			-0.87			-0.80			-0.86			-0.85			-0.83			-0.83		
	Bottom Flange (Global)	1/4" Uniaxial	1714	66	B_FB_1_Avg	2.94			2.89			2.82			2.86			2.81			2.84			2.82			2.80			2.81		
		1/4" Uniaxial	1910	67	B_FB_2_Avg	4.59			4.44			4.29			4.42			4.24			4.37			4.30			4.24			4.30		

Location			Logger + Slot No. + Card No.	Channel ID	Alias	Static Test Sept 12,2014: Avg (0.1)			Static Test Sept 29,2014: Avg (0.1)			Static Test Oct 9,2014: Avg (0.1)			Static Test Oct 15,2014: Avg (0.1)			Static Test Oct 23,2014: Avg (0.1)			Static Test Nov 11,2014: Avg (0.1)			Static Test Nov 17,2014: Trial 3 (0.1)			Static Test Dec 04,2014: Trial 3 (0.1)			Static Test Dec 10,2014: Trial 4 (0.1)		
							Range			Range			Range			Range			Range			Range			Range			Range			Range		
Rib 1	Intermediate Floor Beam	1 mm Rosette	2512	68	R1_SE_50_T_Avg	6.28			6.12			5.77			5.84			5.68			5.84			5.83			5.73			5.77		
		1 mm Rosette	2513	69	R1_SE_50_D_Avg	7.56			7.36			6.92			7.00			6.80			7.00			7.06			6.87			6.91		
		1 mm Rosette	2514	70	R1_SE_50_A_Avg	3.90	7.83	2.35	3.74	7.64	2.23	3.53	7.18	2.13	3.59	7.26	2.18	3.45	7.06	2.07	3.63	7.25	2.21	3.70	7.29	2.23	3.54	7.12	2.15	3.54	7.16	2.14
		1 mm Uniaxial	2601	71	R1_SE_50_1_Avg	-3.25			-3.19			-3.01			-3.02			-2.99			-2.95			-2.93			-2.97			-3.01		
		1/4" Uniaxial	2602	72	R1_SE_50_2_Avg	-4.69			-4.54			-4.46			-4.57			-4.45			-4.49			-4.45			-4.39			-4.45		
		1/4" Uniaxial	2603	73	R1_SE_50_3_Avg	-3.15			-3.04			-3.01			-3.08			-2.98			-3.00			-2.97			-2.94			-2.98		
		1/4" Uniaxial	2604	74	R1_SE_50_4_Avg	-2.48			-2.39			-2.38			-2.41			-2.36			-2.35			-2.35			-2.33			-2.36		
		1 mm Rosette	2508	75	R1_SE_25_T_Avg	0.27			0.24			0.24			0.25			0.20			0.30			0.29			0.25			0.25		
		1 mm Rosette	2509	76	R1_SE_25_D_Avg	3.74			3.64			3.43			3.47			3.35			3.50			3.51			3.42			3.43		
		1 mm Rosette	2510	77	R1_SE_25_A_Avg	-0.39	3.76	-3.88	-0.40	3.65	-3.82	-0.39	3.45	-3.59	-0.38	3.48	-3.61	-0.42	3.36	-3.59	-0.29	3.51	-3.50	-0.25	3.52	-3.48	-0.33	3.43	-3.51	-0.36	3.45	-3.55
		1 mm Uniaxial	2511	78	R1_SE_25_1_Avg	-4.47			-4.38			-4.13			-4.17			-4.12			-4.05			-4.04			-4.04			-4.09		
		1/4" Uniaxial	2608	79	R1_SE_25_2_Avg	-4.50			-4.34			-4.29			-4.39			-4.28			-4.27			-4.25			-4.19			-4.25		
		1/4" Uniaxial	2609	80	R1_SE_25_3_Avg	-3.04			-2.93			-2.91			-2.96			-2.90			-2.87			-2.87			-2.82			-2.86		
		1/4" Uniaxial	2610	81	R1_SE_25_4_Avg	-2.62			-2.52			-2.51			-2.55			-2.50			-2.45			-2.46			-2.42			-2.46		
		1 mm Rosette	2410	82	R1_E_0_T_Avg	-2.14			-2.09			-1.95			-1.97			-1.98			-1.91			-1.90			-1.93			-1.96		
		1 mm Rosette	2411	83	R1_E_0_D_Avg	-7.97			-7.80			-7.37			-7.42			-7.36			-7.29			-7.25			-7.27			-7.33		
		1 mm Rosette	2412	84	R1_E_0_A_Avg	-6.47	-0.04	-8.56	-6.31	-0.03	-8.37	-6.02	-0.04	-7.93	-6.04	-0.03	-7.98	-6.02	-0.08	-7.92	-5.85	0.06	-7.82	-5.82	0.06	-7.78	-5.88	-0.01	-7.80	-5.94	-0.02	-7.88
		1 mm Uniaxial	2413	85	R1_E_0_1_Avg	-2.79			-2.72			-2.63			-2.62			-2.63			-2.50			-2.49			-2.52			-2.55		
		1/4" Uniaxial	2605	86	R1_E_0_2_Avg	-2.43			-2.33			-2.37			-2.40			-2.36			-2.27			-2.28			-2.27			-2.29		
		1/4" Uniaxial	2606	87	R1_E_0_3_Avg	-2.57			-2.46			-2.48			-2.51			-2.48			-2.39			-2.41			-2.38			-2.41		
		1/4" Uniaxial	2607	88	R1_E_0_4_Avg	-2.52			-2.42			-2.42			-2.46			-2.42			-2.34			-2.36			-2.32			-2.35		
		1 mm Rosette	2414	89	R1_NE_25_T_Avg	-11.47			-11.25			-10.60			-10.69			-10.56			-10.55			-10.47			-10.48			-10.57		
		1 mm Rosette	2501	90	R1_NE_25_D_Avg	-22.71			-22.16			-21.09			-21.17			-21.00			-20.88			-20.73			-20.78			-20.97		
		1 mm Rosette	2502	91	R1_NE_25_A_Avg	-18.51	-6.50	-23.47	-18.06	-6.41	-22.89	-17.26	-6.04	-21.83	-17.27	-6.08	-21.88	-17.21	-6.03	-21.74	-17.00	-5.97	-21.58	-16.86	-5.91	-21.42	-16.95	-5.95	-21.48	-17.08	-5.97	-21.68
		1 mm Uniaxial	2503	92	R1_NE_25_1_Avg	-3.78			-3.68			-3.61			-3.58			-3.63			-3.43			-3.41			-3.47			-3.50		
		1/4" Uniaxial	2611	93	R1_NE_25_2_Avg	-0.15			-0.12			-0.23			-0.19			-0.24			-0.08			-0.10			-0.14			-0.14		
		1/4" Uniaxial	2612	94	R1_NE_25_3_Avg	-1.75			-1.68			-1.73			-1.75			-1.74			-1.61			-1.62			-1.62			-1.63		
		1/4" Uniaxial	2613	95	R1_NE_25_4_Avg	-2.03			-1.95			-1.98			-2.00			-1.99			-1.88			-1.89			-1.87			-1.90		
		1 mm Rosette	2504	96	R1_NE_50_T_Avg	-9.86			-9.66			-9.11			-9.19			-9.08			-9.09			-9.04			-9.03			-9.12		
		1 mm Rosette	2505	97	R1_NE_50_D_Avg	-14.01			-13.68			-13.04			-13.10			-13.02			-12.93			-12.82			-12.89			-12.99		
		1 mm Rosette	2506	98	R1_NE_50_A_Avg	-11.96	-7.63	-14.19	-11.66	-7.47	-13.84	-11.19	-7.07	-13.22	-11.20	-7.12	-13.27	-11.19	-7.06	-13.20	-10.98	-6.99	-13.08	-10.88	-6.96	-12.96	-10.99	-6.97	-13.05	-11.08	-7.04	-13.15
		1 mm Uniaxial	2507	99	R1_NE_50_1_Avg	-3.03			-2.94			-2.92			-2.88			-2.96			-2.74			-2.70			-2.80			-2.82		
		1/4" Uniaxial	2614	100	R1_NE_50_2_Avg	1.86			1.82			1.69			1.77			1.65			1.85			1.84			1.74			1.77		
		1/4" Uniaxial	2701	101	R1_NE_50_3_Avg	-0.29			-0.27			-0.35			-0.32			-0.39			-0.21			-0.22			-0.27			-0.27		
		1/4" Uniaxial	2702	102	R1_NE_50_4_Avg	-0.95			-0.91			-0.98			-0.96			-1.00			-0.85			-0.86			-0.88			-0.89		
		1 mm Rosette	2805	103	R1_SW_50_T_Avg	3.03			2.91			2.74			2.77			2.67			2.86			2.81			2.76			2.77		
		1 mm Rosette	2806	104	R1_SW_50_D_Avg	4.91			4.78			4.47			4.53			4.40			4.55			4.52			4.44			4.46		
		1 mm Rosette	2807	105	R1_SW_50_A_Avg	0.39	5.17	-1.75	0.34	5.03	-1.78	0.31	4.72	-1.66	0.33	4.77	-1.67	0.26	4.64	-1.71	0.44	4.79	-1.49	0.40	4.76	-1.54	0.35	4.68	-1.57	0.33	4.71	-1.61
		1 mm Uniaxial	2808	106	R1_SW_50_1_Avg	-3.87			-3.81			-3.58			-3.61			-3.56			-3.53			-3.52			-3.52			-3.56		
		1/4" Uniaxial	2809	107	R1_SW_50_2_Avg	-3.06			-2.88			-2.84			-2.90			-2.83			-2.88			-2.84			-2.82			-2.86		
		1/4" Uniaxial	2810	108	R1_SW_50_3_Avg	-2.07			-1.98			-1.94			-1.98			-1.92			-1.97			-1.91			-1.92			-1.94		
		1/4" Uniaxial	2811	109	R1_SW_50_4_Avg	-0.94			-0.88			-0.86			-0.87			-0.83			-0.88			-0.82			-0.85			-0.86		
		1 mm Rosette	2801	110	R1_SW_25_T_Avg	1.50			1.45			1.35			1.37			1.30			1.44			1.41			1.35			1.35		
		1 mm Rosette	2802	111	R1_SW_25_D_Avg	3.30			3.26			3.02			3.06			2.97			3.10			3.07			2.99			3.00		
		1 mm Rosette	2803	112	R1_SW_25_A_Avg	-2.54	3.80	-4.84	-2.49	3.74	-4.78	-2.37	3.48	-4.50	-2.39	3.52	-4.54	-2.39	3.43	-4.52	-2.22	3.55	-4.33	-2.25	3.52	-4.36	-2.30	3.44	-4.39	-2.34	3.46	-4.45
		1 mm Uniaxial	2804	113	R1_SW_25_1_Avg	-4.06			-3.97			-3.77			-3.80			-3.75			-3.68			-3.67			-3.68			-3.72		
		1/4" Uniaxial	2907	114	R1_SW_25_2_Avg	-3.62			-3.48			-3.45			-3.52			-3.43			-3.44			-3.40			-3.37			-3.42		
		1/4" Uniaxial	2908	115	R1_SW_25_3_Avg	-2.03			-1.94			-1.93			-1.96			-1.92			-1.91			-1.87			-1.87			-1.90		
		1/4" Uniaxial	2909	116	R1_SW_25_4_Avg	-1.19			-1.12			-1.12			-1.13			-1.11			-1.10			-1.06			-1.08			-1.10		
		1 mm Rosette	2703	117	R1_W_0_T_Avg	-6.84			-6.73			-6.40			-6.40			-6.41			-6.17			-6.17			-6.21			-6.29		
		1 mm Rosette	2704	118	R1_W_0_D_Avg	0.75			0.75			0.65			0.73			0.61			0.77			0.77			0.70			0.69		
		1 mm Rosette	2705	119	R1_W_0_A_Avg	-3.72	0.95	-11.52	-3.71	0.94	-11.37	-3.46	0.84	-10.71	-3.47	0.92	-10.79	-3.48	0.80	-10.69	-3.38	0.95	-10.49	-3.39	0.94	-10.50	-3.40	0.88	-10.49	-3.44	0.87	-10.59
		1 mm Uniaxial	2706	120	R1_W_0_1_Avg	-3.54			-3.45			-3.31			-3.33			-3.34			-3.19			-3.18			-3.21			-3.26		
		1/4" Uniaxial	2904	121	R1_W_0_2_Avg	-1.88			-1.79			-1.83			-1.85			-1.83			-1.75			-1.73			-1.74			-1.76		
		1/4" Uniaxial	2905	122	R1_W_0_3_Avg	-2.28			-2.19			-2.21			-2.24			-2.22			-2.13			-2.11			-2.12			-2.14		
		1/4" Uniaxial	2906	123	R1_W_0_4_Avg	-2.06			-1.97			-1.99			-2.01			-1.99			-1.91			-1.89			-1.89			-1.91		
		1 mm Rosette	2707	124	R1_NW_25_T_Avg	-6.78			-6.63			-6.25			-6.30			-6.25			-6.20			-6.20			-6.19			-6.25		
		1 mm Rosette	2708	125	R1_NW_25_D_Avg	-12.95			-12.71			-12.05			-12.12			-12.03			-11.84			-11.84			-11.83			-11.93		
		1 mm Rosette	2709	126	R1_NW_25_A_Avg	-8.48	-2.26	-13.01	-8.29	-2.15	-12.77	-7.95	-2.08	-12.12	-7.94	-2.05	-12.19	-7.96	-2.11	-12.10	-7.72	-2.02	-11.90	-7.71	-2.00	-11.90	-7.76	-2.06	-11.90	-7.83	-2.08	-11.99
		1 mm Uniaxial	2710	127	R1_NW_25_1_Avg	-2.74			-2.67			-2.62			-2.61			-2.66			-2.45			-2.45			-2.51			-2.54		
		1/4" Uniaxial	2812	128	R1_NW_25_2_Avg	-0.56			-0.52			-0.61			-0.59			-0.64			-0.46			-0.48			-0.52			-0.52		
		1/4" Uniaxial	2813	129	R1_NW_25_3_Avg	-2.33			-2.25			-2.29			-2.32			-2.32			-2.17			-2.16			-2.17			-2.20		
		1/4" Uniaxial	2814	130	R1_NW_25_4_Avg	-3.11			-3.01			-3.03			-3.09			-3.08			-2.91			-2.89			-2.90			-2.93		
		1 mm Rosette	2711	131	R1_NW_50_T_Avg	-8.89			-8.70			-8.21			-8.25			-8.20			-8.15			-8.15			-8.14			-8.21		
		1 mm Rosette	2712	132	R1_NW_50_D_Avg	-15.74			-15.44			-14.67			-14.72			-14.64			-14.44			-14.45			-14.44			-14.57		
		1 mm Rosette	2713	133	R1_NW_50_A_Avg	-13.56	-6.14	-16.31	-13.28	-5.99	-16.00	-12.72	-5.68	-15.24	-12.70	-5.68	-15.27	-12.71	-5.69	-15.21	-12.41	-5.61	-14.95	-12.40	-5.59	-14.96	-12.46	-5.63	-14.97	-12.57	-5.67	-15.11
		1 mm Uniaxial	2714	134	R1_NW_50_1_Avg	-2.20			-2.15			-2.15			-2.11			-2.19			-1.98			-1.98			-2.04			-2.06		
		1/4" Uniaxial	2901	135	R1_NW_50_2_Avg	0.01			0.00			-0.09			-0.05			-0.12			0.06			0.06			-0.01			0.00		
		1/4" Uniaxial	2902	136	R1_NW_50_3_Avg	-2.03			-1.96			-2.03			-2.04			-2.08			-1.89			-1.87			-1.91			-1.93		
		1/4" Uniaxial	2903	137	R1_NW_50_4_Avg	-3.42			-3.31			-3.34			-3.40			-3.40			-3.22			-3.18			-3.20			-3.24		
	Section at Center Line of Load Pad	1 mm Uniaxial	1804	138	R1_S_1_Avg	2.80			2.71			2.63			2.64			2.62			2.63			2.59			2.60			2.61		
		1 mm Uniaxial	1805	139	R1_S_2_Avg	2.51			2.46			2.40			2.40			2.40			2.40			2.34			2.37			2.38		
		1 mm Uniaxial	1806	140	R1_N_1_Avg	-12.49			-12.00			-11.71			-11.65			-11.79			-10.70			-11.59			-11.19			-11.26		
		1 mm Uniaxial	1807	141	R1_N_2_Avg	-12.39			-11.92			-11.60			-11.56			-11.67			-10.63			-11.51			-11.09			-11.15		
	Sealing Plate	1 mm Uniaxial	1613	142	R1_N_INT_1_Avg	-2.71			-2.63			-2.56			-2.56			-2.53			-2.41			-2.37			-2.37			-2.41		
		1 mm Uniaxial	1614	143	R1_N_INT_2_Avg	-3.74			-3.66			-3.54			-3.56			-3.52			-3.38			-3.34			-3.36			-3.39		
		1 mm Uniaxial	1701	144	R1_S_INT_1_Avg	0.27			0.30			0.28			0.29			0.30			0.27			0.33			0.29			0.29		
		1 mm Uniaxial	1702	145	R1_S_INT_2_Avg	1.06			1.02			0.98			0.97			0.97			0.95			1.02			0.97			0.98		

Location			Logger + Slot No. + Card No.	Channel ID	Alias	Static Test Sept 12,2014: Avg (0.1)			Static Test Sept 29,2014: Avg (0.1)			Static Test Oct 9,2014: Avg (0.1)			Static Test Oct 15,2014: Avg (0.1)			Static Test Oct 23,2014: Avg (0.1)			Static Test Nov 11,2014: Avg (0.1)			Static Test Nov 17,2014: Trial 3 (0.1)			Static Test Dec 04,2014: Trial 3 (0.1)			Static Test Dec 10,2014: Trial 4 (0.1)		
						Range			Range			Range			Range			Range			Range			Range			Range			Range		
Rib 2	Section at Center Line of Load Pad	1 mm Uniaxial	18012	146	R2_S_1_Avg	-9.45			-9.33			-8.76			-8.93			-8.89			-8.04			-8.29			-7.63			-7.67		
		1 mm Uniaxial	1813	147	R2_S_2_Avg	-9.70			-9.62			-9.04			-9.20			-9.15			-8.32			-8.57			-7.93			-7.97		
		1 mm Uniaxial	1814	148	R2_N_1_Avg	0.04			0.02			0.00			0.04			0.12			0.09			0.11			0.06			0.05		
		1 mm Uniaxial	1901	149	R2_N_2_Avg	0.07			0.11			0.10			0.08			0.13			0.13			0.23			0.19			0.17		
Rib 4	Section at Center Line of Load Pad	1 mm Uniaxial	1904	150	R4_S_1_Avg	0.27			0.34			0.29			0.31			0.32			0.30			-0.15			-0.03			0.04		
		1 mm Uniaxial	1905	151	R4_S_2_Avg	0.85			0.89			0.80			0.86			0.85			0.84			0.17			0.37			0.44		
		1 mm Uniaxial	1906	152	R4_N_1_Avg	-2.97			-2.98			-2.70			-2.71			-2.66			-2.57			-2.98			-2.84			-2.79		
		1 mm Uniaxial	1907	153	R4_N_2_Avg	-3.26			-3.21			-2.92			-2.92			-2.85			-2.75			-3.23			-3.04			-2.98		
		1/4" Uniaxial	1608	154	R4_INT_Avg	0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00		
Rib 5	Section at Center Line of Load Pad	1 mm Uniaxial	2106	155	R5_S_1_Avg	-0.74			-0.74			-0.76			-0.76			-0.76			-0.77			-1.90			-1.60			-1.58		
		1 mm Uniaxial	2107	156	R5_S_2_Avg	-0.67			-0.68			-0.69			-0.68			-0.70			-0.68			-1.72			-1.44			-1.42		
		1 mm Uniaxial	2108	157	R5_N_1_Avg	0.50			0.54			0.52			0.50			0.54			0.45			0.47			0.58			0.57		
		1 mm Uniaxial	2109	158	R5_N_2_Avg	0.50			0.54			0.52			0.51			0.53			0.44			0.46			0.59			0.59		
	Sealing Plate	1 mm Uniaxial	1705	159	R5_N_INT_1_Avg	-0.10			-0.03			0.00			-0.06			0.00			0.01			0.00			0.01			-0.01		
		1 mm Uniaxial	1706	160	R5_N_INT_2_Avg	0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00		
		1 mm Uniaxial	1707	161	R5_S_INT_1_Avg	0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00		
		1 mm Uniaxial	1708	162	R5_S_INT_2_Avg	-0.55			-0.60			-0.54			-0.60			-0.57			-0.63			-0.68			-0.64			-0.66		
Top of Deck	Rib 1	1/4" Uniaxial	1108	163	R1_TDP_1_Avg	-1.12			-1.04			-0.99			-1.05			-1.02			-0.89			-1.32			-1.02			-1.03		
		1/4" Uniaxial	1109	164	R1_TDP_2_Avg	-0.52			-0.47			-0.43			-0.49			-0.40			-0.33			-0.68			-0.42			-0.49		
		1/4" Uniaxial	1110	165	R1_TDP_3_Avg	6.22			5.90			0.00			0.00			0.00			0.00			0.00			0.00			0.00		
		1/4" Uniaxial	1111	166	R1_TDP_4_Avg	3.27			3.21			3.14			3.25			3.17			2.39			0.0023			0.0033			-0.0034		
	Between Rib 1 and Rib 2	1/4" Uniaxial	1112	167	R1_TDP_5_Avg	-9.66			-9.27			-9.14			-9.47			-9.28			-7.12			-7.74			-6.35			-6.53		
	Rib 2	1/4" Uniaxial	1113	168	R2_TDP_1_Avg	4.49			4.61			4.58			4.66			4.59			3.70			4.06			3.40			3.44		
		1/4" Uniaxial	1114	169	R2_TDP_2_Avg	5.95			5.74			5.53			0.00			-0.01			0.00			0.00			0.00			0.00		
		1/4" Uniaxial	1201	170	R2_TDP_3_Avg	-0.81			-0.72			-0.72			-0.77			-0.77			-0.56			-0.51			-0.41			-0.44		
		1/4" Uniaxial	1202	171	R2_TDP_4_Avg	-0.85			-0.79			-0.78			-0.82			-0.84			-0.64			-0.61			-0.51			-0.54		
	Rib 4	1/4" Uniaxial	1204	172	R4_TDP_1_Avg	5.63			0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00		
		1/4" Uniaxial	1205	173	R4_TDP_2_Avg	2.97			3.03			3.12			3.11			3.11			3.02			0.27			1.71			1.99		
		1/4" Uniaxial	1206	174	R4_TDP_3_Avg	-7.65			-7.52			-7.19			-7.28			-7.23			-7.11			-3.89			-4.01			-4.12		
		1/4" Uniaxial	1207	175	R4_TDP_4_Avg	0.01			0.00			0.00			0.00			0.00			3.81			8.64			118.74			50.00		
		1/4" Uniaxial	1208	176	R4_TDP_5_Avg	0.01			0.00			0.00			0.00			0.00			8.47			10.40			#DIV/0!			7.18		
	Rib 5	1/4" Uniaxial	1209	177	R5_TDP_1_Avg	0.01			0.01			0.06			0.06			0.07			0.10			1.14			0.88			0.84		
		1/4" Uniaxial	1210	178	R5_TDP_2_Avg	-0.20			-0.18			-0.18			-0.10			-0.09			-0.09			1.00			0.56			0.77		
		1/4" Uniaxial	1211	179	R5_TDP_3_Avg	0.24			0.00			0.00			0.00			0.01			0.00			0.00			0.00			0.00		
		1/4" Uniaxial	1212	180	R5_TDP_4_Avg	0.13			0.00			0.00			0.00			0.00			0.01			0.00			0.00			0.00		
	Deck Splice - Between Rib 1 & Rib 2	1/4" Uniaxial	1508	181	R1_TDSP_1_Avg	-3.87			-3.72			-3.44			-3.45			-3.52			-1.46			-1.67			-1.40			-1.33		
		1/4" Uniaxial	1509	182	R1_TDSP_2_Avg	0.01			0.00			0.00			0.00			0.00			-1.17			-1.63			-1.73			-1.62		
		1/4" Uniaxial	1510	183	R1_TDSP_3_Avg	0.00			0.00			0.00			0.00			0.01			-1.07			-0.63			-0.98			-0.95		
		1/4" Uniaxial	1511	184	R1_TDSP_4_Avg	-1.95			-1.71			-1.68			-1.33			-1.13			-0.40			-0.07			-0.42			-0.39		
	Deck Splice - Rib 4	1/4" Uniaxial	1512	185	R4_TDSP_1_Avg	-3.90			-3.68			-3.61			-3.27			-3.43			-2.27			-2.17			-2.27			-2.27		
		1/4" Uniaxial	1513	186	R4_TDSP_2_Avg	-8.65			-7.41			-6.43			-6.20			-5.87			-2.63			-2.68			-2.65			-2.64		
		1/4" Uniaxial	1514	187	R4_TDSP_3_Avg	0.01			-0.01			0.00			0.01			0.00			-2.21			-2.40			-2.37			-2.37		
		1/4" Uniaxial	1601	188	R4_TDSP_4_Avg	0.00			0.01			-0.01			0.01			-0.01			-1.61			-2.03			-1.95			-1.97		
	At Midspan - Global Gauges	1/4" Uniaxial	1203	189	T_FB_1_Avg	-0.32			-0.30			-0.29			-0.34			-0.26			-0.29			-0.30			-0.29			-0.29		
		1/4" Uniaxial	1213	190	T_FB_2_Avg	-0.53			-0.55			-0.53			-0.52			-0.49			-0.52			-0.56			-0.53			-0.52		
Underside of Deck	Rib 1	1 mm Uniaxial	1802	191	R1_BDP_1_Avg	-0.40			-0.41			-0.36			-0.37			-0.33			-0.45			-0.13			-0.32			-0.32		
		1/4" Uniaxial	1711	192	R1_BDP_2_Avg	-0.64			-0.64			-0.62			-0.64			-0.58			-0.70			-0.41			-0.56			-0.57		
		1 mm Uniaxial	1803	193	R1_BDP_3_Avg	-5.95			-5.81			-5.51			-5.64			-5.51			-4.52			-5.07			-4.30			-4.34		
		1/4" Uniaxial	1712	194	R1_BDP_4_Avg	-1.97			-1.97			-1.79			-1.97			-1.83			-1.17			-0.97			-0.41			-0.41		
		1/4" Uniaxial	1713	195	R1_BDP_5_Avg	8.24			7.84			7.76			8.04			7.90			5.82			6.49			5.05			5.11		
	Rib 2	1 mm Uniaxial	1810	196	R2_BDP_1_Avg	-5.07			-4.97			-4.80			-4.88			-4.81			-3.97			-4.26			-3.90			-3.90		
		1/4" Uniaxial	1808	197	R2_BDP_2_Avg	-1.19			-1.09			-1.19			-1.15			-1.12			-0.60			-0.74			-0.72			-0.71		
		1 mm Uniaxial	1811	198	R2_BDP_3_Avg	-0.01			-0.08			-0.06			-0.02			-0.01			-0.18			-0.23			-0.33			-0.33		
		1/4" Uniaxial	1809	199	R2_BDP_4_Avg	-0.03			-0.10			-0.07			-0.05			-0.02			-0.18			-0.23			-0.33			-0.31		
	Rib 4	1 mm Uniaxial	1902	200	R4_BDP_1_Avg	-6.48			-6.53			-6.31			-6.29			-6.39			-6.19			-5.43			-5.67			-5.75		
		1/4" Uniaxial	1908	201	R4_BDP_2_Avg	-5.42			-5.46			-5.52			-5.51			-5.59			-5.41			-4.75			-4.94			-5.03		
		1 mm Uniaxial	1903	202	R4_BDP_3_Avg	-7.04			-7.05			-6.69			-6.78			-6.80			-6.51			-6.82			-6.34			-6.35		
		1/4" Uniaxial	1909	203	R4_BDP_4_Avg	-3.92			-4.01			-4.01			-4.10			-4.11			-3.78			-3.71			-3.26			-3.28		
	Rib 5	1 mm Uniaxial	2104	204	R5_BDP_1_Avg	-0.51			-0.53			-0.56			-0.57			-0.54			-0.53			-1.55			-1.35			-1.33		
		1/4" Uniaxial	2102	205	R5_BDP_2_Avg	-0.61			-0.63			-0.66			-0.66			-0.66			-0.63			-1.30			-1.17			-1.16		
		1 mm Uniaxial	2105	206	R5_BDP_3_Avg	-0.01			0.02			0.02			0.04			0.04			-0.10			-0.05			0.09			0.08		
		1/4" Uniaxial	2103	207	R5_BDP_4_Avg	0.01			0.04			0.03			0.06			0.04			-0.07			-0.03			0.08			0.08		
	Deck Splice - Between Rib 1 & Rib 2	1/4" Uniaxial	1414	208	R1_BDSP_1_Avg	4.52			4.33			4.29			4.45			4.43			3.15			3.91			3.48			3.44		
		1/4" Uniaxial	1501	209	R1_BDSP_2_Avg	6.22			5.70			5.49			5.58			5.41			3.51			3.96			3.78			3.75		
		1/4" Uniaxial	1502	210	R1_BDSP_3_Avg	6.52			5.86			5.46			5.36			5.03			3.71			3.29			3.56			3.60		
		1/4" Uniaxial	1503	211	R1_BDSP_4_Avg	4.56			4.12			3.82			3.70			3.43			3.25			2.57			2.88			2.93		
	Deck Splice - Rib 4	1/4" Uniaxial	1604	212	R4_BDSP_1_Avg	3.40			3.28			3.15			2.78			2.68			1.63			1.50			1.45			1.46		
		1/4" Uniaxial	1605	213	R4_BDSP_2_Avg	4.74			4.35			4.11			3.67			3.47			1.87			1.75			1.68			1.70		
		1/4" Uniaxial	1606	214	R4_BDSP_3_Avg	4.02			3.59			3.29			3.18			3.01			1.71			1.89			1.83			1.84		
		1/4" Uniaxial	1607	215	R4_BDSP_4_Avg	2.22			2.00			1.84			1.89			1.85			1.35			1.68			1.62			1.62		
Rib Splice Plate	Rib 1	1/4" Uniaxial	1410	216	R1_S_SP_Avg	1.06			1.02			0.99			1.02			0.97			1.01			1.02			0.99			1.01		
		1/4" Uniaxial	1411	217	R1_N_SP_Avg	0.14			0.15			0.01			0.02			0.00			0.05			0.10			0.07			0.08		
	Rib 2	1/4" Uniaxial	1412	218	R2_S_SP_Avg	0.67			0.65			0.63			0.63			0.61			0.73			0.61			0.65			0.67		
		1/4" Uniaxial	1413	219	R2_N_SP_Avg	0.09			0.09			0.09			0.08			0.08			0.10			0.08			0.08			0.09		
	Rib 4	1/4" Uniaxial	1602	220	R4_S_SP_Avg	0.89			0.96			0.93			0.95			0.93			0.88			0.92			0.89			0.90		
		1/4" Uniaxial	1603	221	R4_N_SP_Avg	1.15			1.19			1.12			1.11			1.07			0.70			0.79			0.78			0.77		

Location			Logger + Slot No. + Card No.	Channel ID	Alias	Static Test Sept 12,2014: Avg (0.1)			Static Test Sept 29,2014: Avg (0.1)			Static Test Oct 9,2014: Avg (0.1)			Static Test Oct 15,2014: Avg (0.1)			Static Test Oct 23,2014: Avg (0.1)			Static Test Nov 11,2014: Avg (0.1)			Static Test Nov 17,2014: Trial 3 (0.1)			Static Test Dec 04,2014: Trial 3 (0.1)			Static Test Dec 10,2014: Trial 4 (0.1)		
						Range			Range			Range			Range			Range			Range			Range			Range			Range		
Rib Sealing Plate	Rib 1	1 mm Uniaxial	1611	222	R1_N_SP_1_Avg	3.02			2.96			2.78			2.84			2.82			2.78			2.77			2.75			2.78		
		1/4" Uniaxial	1609	223	R1_N_SP_2_Avg	2.33			2.31			2.29			2.34			2.32			2.27			2.25			2.25			2.28		
		1 mm Uniaxial	1612	224	R1_S_SP_1_Avg	-1.84			-1.85			-1.73			-1.76			-1.74			-1.68			-1.70			-1.69			-1.70		
		1/4" Uniaxial	1610	225	R1_S_SP_2_Avg	-1.66			-1.69			-1.66			-1.66			-1.64			-1.59			-1.63			-1.61			-1.61		
	Rib 5	1 mm Uniaxial	1703	226	R5_N_SP_1_Avg	0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00			0.00		
		1/4" Uniaxial	1709	227	R5_N_SP_2_Avg	-0.59			-0.57			-0.58			-0.59			-0.63			-0.69			-0.62			-0.63			-0.65		
		1 mm Uniaxial	1704	228	R5_S_SP_1_Avg	0.71			0.72			0.70			0.66			0.69			0.78			0.78			0.75			0.76		
		1/4" Uniaxial	1710	229	R5_S_SP_2_Avg	0.58			0.60			0.59			0.57			0.58			0.65			0.65			0.66			0.63		
Edge Girder Web	Intermediate Floor Beam	1/4" Uniaxial	1312	230	N_GSTF_1_Avg	-10.13			-9.86			-9.69			-9.61			-9.13			-9.58			-9.46			-9.27			-9.42		
		1/4" Uniaxial	1404	231	N_GSTF_2_Avg	-8.90			-8.72			-8.78			-9.12			-8.63			-8.88			-8.74			-8.56			-8.71		
Edge Girder Web Splice Plate	Edge Girder Splice	1/4" Uniaxial	1504	232	NT_FB_SP_Avg	0.63			0.58			0.59			0.65			0.59			0.63			0.61			0.59			0.61		
		1/4" Uniaxial	1505	233	ST_FB_SP_Avg	0.95			0.90			0.83			0.91			0.84			0.89			0.86			0.84			0.87		
		1/4" Uniaxial	1506	234	NB_FB_SP_Avg	-1.02			-0.96			-0.90			-0.94			-0.88			-0.91			-0.89			-0.87			-0.89		
		1/4" Uniaxial	1507	235	SB_FB_SP_Avg	-1.49			-1.42			-1.36			-1.45			-1.34			-1.40			-1.36			-1.33			-1.36		
Edge Girder Flange Splice Plate	Edge Girder Splice	1/4" Uniaxial	1801	236	B_FB_SPL_Avg	-1.68			-1.58			-1.50			-1.55			-1.44			-1.51			-1.49			-1.43			-1.47		
Edge Girder Stiffener	Intermediate Floor Beam	1/4" Uniaxial	1214	237	E_GSTF_1	-0.44			-0.71			0.28			0.47			0.15			0.59			0.46			0.41			0.41		
		1/4" Uniaxial	1301	238	W_GSTF_1	-0.25			-0.51			0.47			0.64			0.32			0.77			0.66			0.59			0.57		
		1/4" Uniaxial	1302	239	E_GSTF_4	1.52			1.11			2.32			2.50			2.07			2.66			2.51			2.40			2.40		
		1/4" Uniaxial	1303	240	W_GSTF_4	1.26			0.88			1.98			2.30			1.83			2.36			2.21			2.12			2.15		
		1/4" Uniaxial	1304	241	E_GSTF_5	-1.41			-1.58			-0.92			-0.55			-0.79			-0.59			-0.66			-0.66			-0.61		
		1/4" Uniaxial	1305	242	W_GSTF_5	-0.99			-1.17			-0.35			-0.52			-0.58			-0.27			-0.32			-0.37			-0.38		
		1 mm Uniaxial	1306	243	E_GSTF_2	-0.04			-0.35			0.76			0.95			0.59			1.08			0.96			0.89			0.87		
		1 mm Uniaxial	1307	244	W_GSTF_2	0.39			0.10			1.16			1.36			0.98			1.46			1.34			1.27			1.25		
		1 mm Uniaxial	1308	245	E_GSTF_3	1.44			1.02			2.27			2.41			1.97			2.60			2.45			2.36			2.33		
		1 mm Uniaxial	1309	246	W_GSTF_3	1.17			0.69			1.86			2.22			1.70			2.27			2.11			2.03			2.03		
		1 mm Uniaxial	1310	247	E_GSTF_6	-1.55			-1.74			-1.07			-0.67			-0.90			-0.74			-0.80			-0.78			-0.74		
		1 mm Uniaxial	1311	248	W_GSTF_6	-0.91			-1.09			-0.26			-0.51			-0.53			-0.24			-0.28			-0.32			-0.36		

Total Channels	=	251
Gauge Channels	=	248
Trigger Channels	=	3

APPENDIX N: FINITE ELEMNT TRIALS TO DETERMINE TRANSVERSE EXTENT OF PROTOTYPE DECK

Transverse Extent of the Specimen

Figure 720 shows that the curvature of the inner FB was restricted to few ribs locally around the load patches and inclusion of few ribs in the transverse direction was sufficient as the prototype deck specimen, provided the stresses in the global model could be reproduced in the specimen by appropriate boundary condition. Accordingly, the transverse extent of the specimen was determined progressively by trial analyses of FE models of the part bridge deck. The in-plane bending moment and the shear in the inner FB web was compared with the global model analysis results to have the same curvature in the inner FB as the global model and the principal stress contour in the inner FB web was compared with the submodel analysis results to have similar stress state at the fatigue critical rib-to-floor beam connection.

First and Second Trials

Figure 721 shows the 3D view of the first trial FE model. As discussed earlier 3 floor beams were included in the longitudinal direction as the longitudinal extent of the FE model with 2 ft. overhang on both sides. Figure 722 shows the cross sectional elevation of the model at the inner FB section. Five ribs were included in the transverse direction to accommodate the wheel loads in the transverse direction and the deck was extended beyond the fifth rib. The deck included a 7 ft. 4in. deep box girder web with 1 in. thick flange. The transverse width of the specimen was 15 ft. Figure 719 shows that the in-plane bending moment at the box girder edge (right wall of BG-1) was about zero and there was non-zero in-plane moment at 15 ft. from the box girder edge. Accordingly, the box girder flange was given pinned boundary condition aligned with the centerline of the three floor beams and the end of the floor beams on the other side were given fixed boundary conditions to develop moment restraint at that section. Provision of moment restraint was avoided in the second trial FE model, where the deck was extended beyond the fifth rib such that the transverse width of the specimen was 20 ft. 8 in. Figures Figure 723 and Figure 724 shows the 3D view and the sectional elevation of the second trial FE model. It can be seen from Figure 719 that the in-plane bending moment 20 ft. 8 in. from the box girder edge was about zero. Hence, in the second trial FE model the end of the floor beams were given roller boundary condition to develop no moment restraint.

Figure 725 compares the principal stress contour in the inner FB web of the first and second trial FE models with the submodel analysis results. The principal stress contour of second trial FE model matched well with the submodel analysis results. However, the principal stress values in first trial FE model was lower than the submodel analysis. Figures 726 and 727 compares the in-plane bending moment and shear in the inner FB of the two models with the global model respectively. It can be clearly seen that the bending moment in the first trial model was much lower than the global model. However, the moment and shear in the second trial model matched well with the global model results. Thus, the second trial FE model was the chosen alternative. However, the deck specimen was huge for the second model, requiring large volume of steel for fabrication and large laboratory space for testing. Accordingly, adjustments were

incorporated in the next trial FE models to reduce the size of the specimen but simulating the critical stress state at the rib-to-floor beam connection.

Third Trial

It was observed for the first trial FE model that the in-plane moment was lower than the global model. Keeping the transverse width of the specimen model as 15 ft., it was analyzed that an upward displacement of 0.07 in. at the box girder aligned with the centerline of the inner FB was creating a similar curvature in the inner FB. The 3D view and the sectional elevation of the third trial FE model is shown in Figures 728 and 729 respectively. The longitudinal and the transverse extents of this model was same as that of the first trial model, however, the box girder web was trimmed matching the depth of the floor beam. Pinned boundary condition was applied at the box girder flange aligned with centerline of the two outer FB and the end of the floor beams on the other side was given fixed boundary condition. Figure 730 shows the comparison of the principal stress contour in the inner FB web with the submodel analysis. The principal stress contour in the inner floor beam web matched well with the submodel analysis results. This can also be seen from Figure 731, which shows a good correlation of the in-plane bending moment in the inner FB web of the trial model with the global model analysis results.

Fourth Trial

The third trial appeared to be better than the second trial as it restricted the transverse width of the specimen to 15 ft. However, the deck plate and the floor beams were extended beyond the fifth rib for the entire transverse width of 15 ft., which again required huge amount of steel for fabrication. Consequently, in the fourth trial FE model the deck plate was not extended the full transverse width after the fifth rib. The 3D view and the sectional elevation of the fourth trial FE model is shown in Figures 732 and 733 respectively. The floor beams were continued for the full width of the specimen, but the deck plate was cut 1 ft. 6 in. short. A 3 ft. 7 in. deep box girder was used, and similar to third trial an upward displacement of 0.07 in. was applied at the box girder flange aligned with the centerline of the inner FB. An 8 in. x ¾ in. thick plate was used after the fifth rib at a 1 ft. 6 in. from the specimen end, to simulate the stiffening effect of the sixth rib. Pinned boundary condition was applied at the box girder flange aligned with centerline of the two outer floor beams and the end of the floor beams on the other side was given fixed boundary condition. Figure 734 shows principal stress comparison with the submodel analysis. The principal stress contour in the inner FB web matched well with the submodel analysis results. This can also be seen from Figures 735 and 736, which show a good correlation of the in-plane bending moment and shear in the inner FB web of the trial model with the global model analysis results. Hence, the fourth trail was the best option for the full-size model among all the four trials conducted.

Fifth Trial

Fourth trial involved the application of lift-up, and so it was investigated in the fifth trial whether this lift-up can be avoided by increasing the transverse width of the specimen. Recall that the second trial where the transverse width of the specimen was 20 ft. 8 in.

gave a good correlation with the global model and submodel analysis results. The fifth trial FE model was a modified version of the second trial model. The 3D view and the sectional elevation of the fourth trial FE model is shown in Figures 737 and 738 respectively. The applied boundary conditions to the FE model was similar to the second trial model. The inner floor beam was continued to the full width of the specimen, but the outer floor beams and the deck plate were trimmed at 15 ft. from the box girder web. Figure 739 shows the principal stress comparison with the submodel analysis. The principal stress contour in the inner FB web matched well with the submodel analysis results. This can also be seen from Figures 740 and 741 which shows a good correlation of the in-plane bending moment and shear in the inner floor beam web of the trial model with the global model analysis results. Hence, the fifth trail was also an alternative for the full-size specimen.

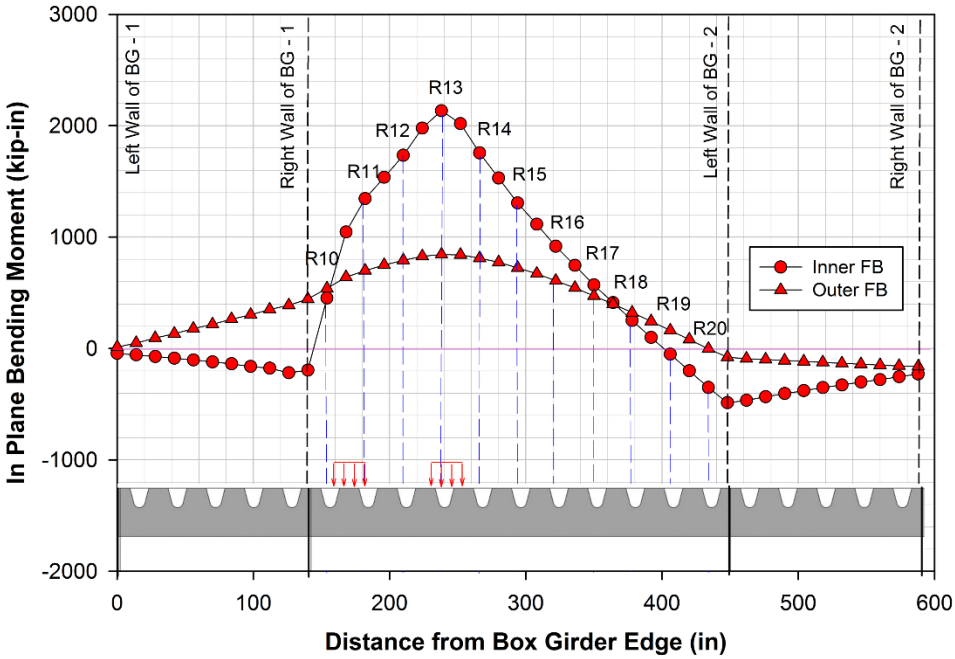

Figure 719. Variation of in-plane bending moment in floor beams

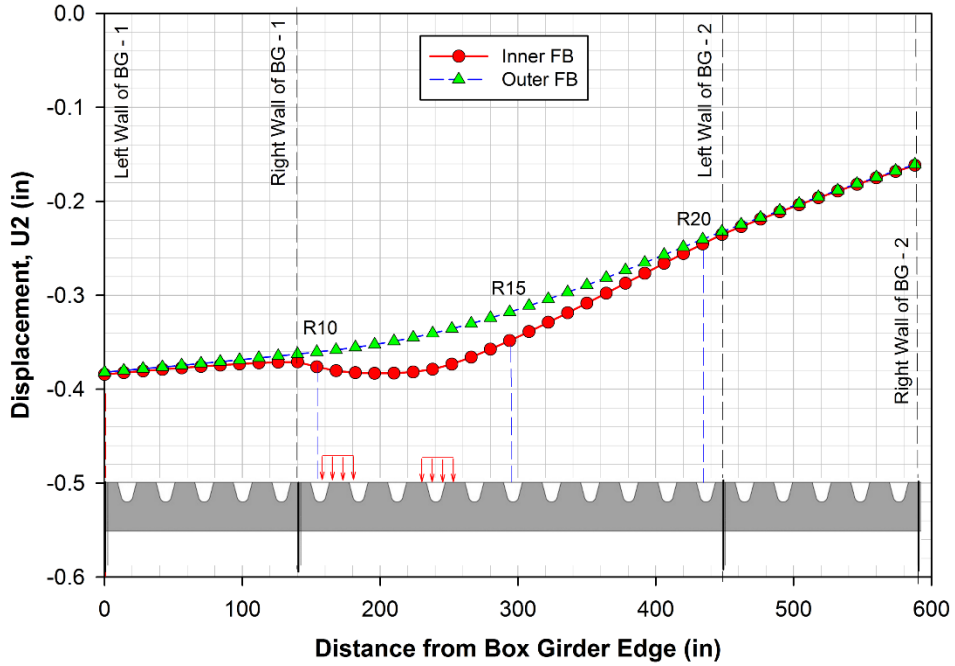

Figure 720. Comparison of deflection of inner and outer floor beam

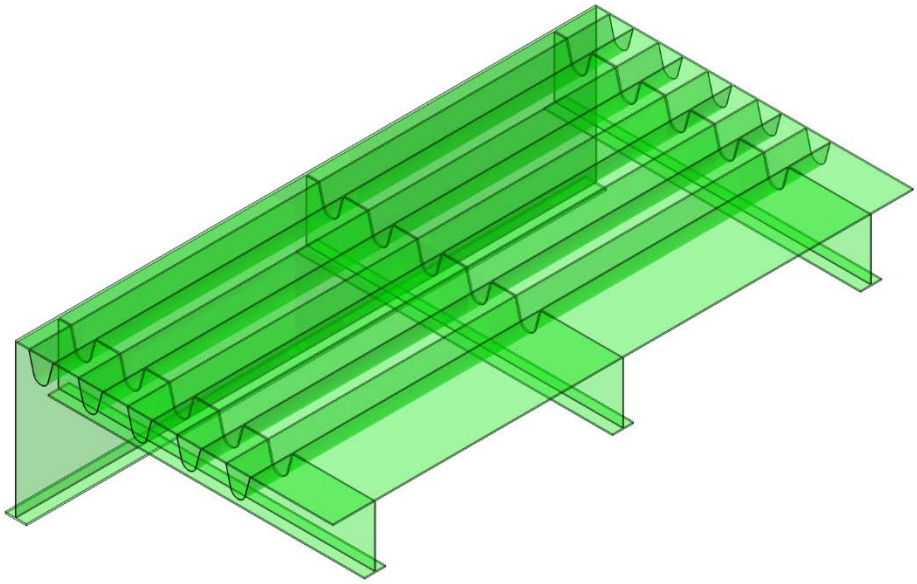

Figure 721. 3D view of the first trial FE model

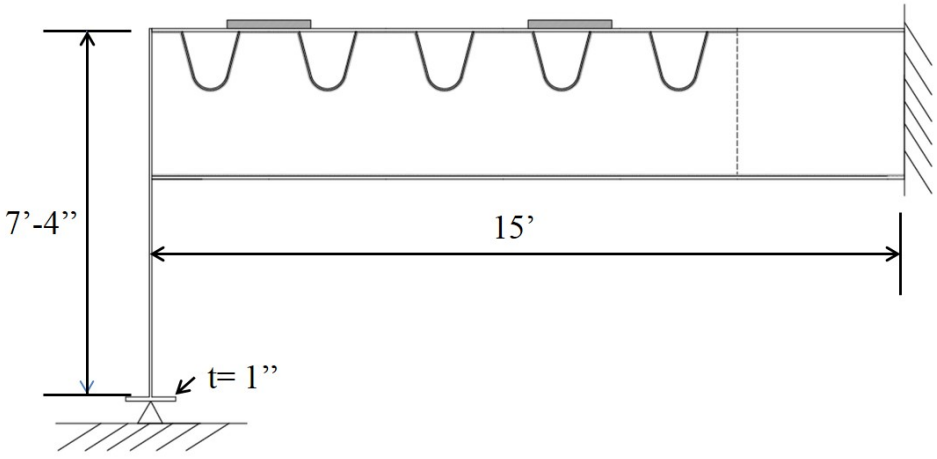

Figure 722. Sectional elevation of first trial FE model

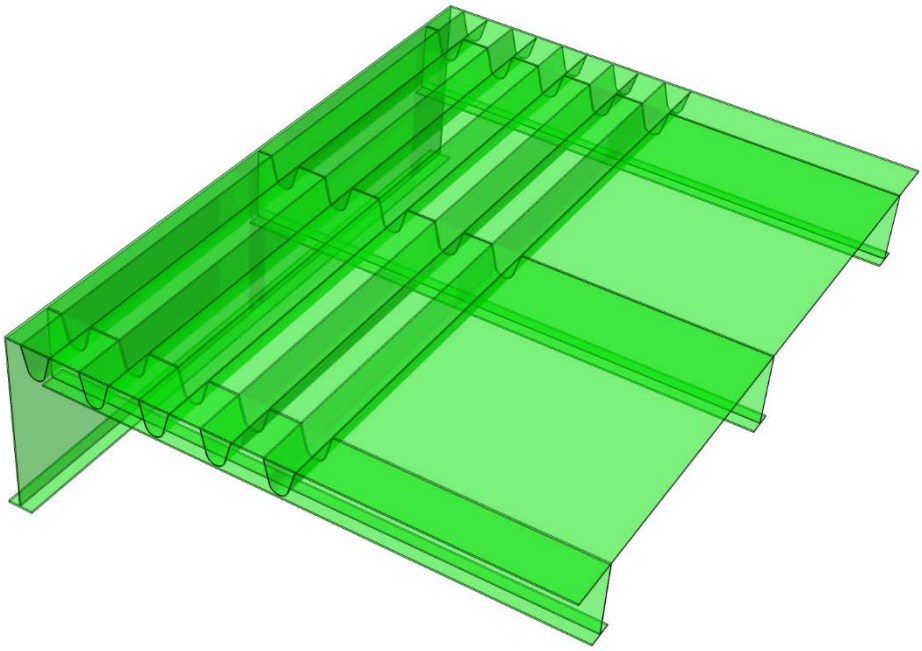

Figure 723. 3D view of the second trial FE model

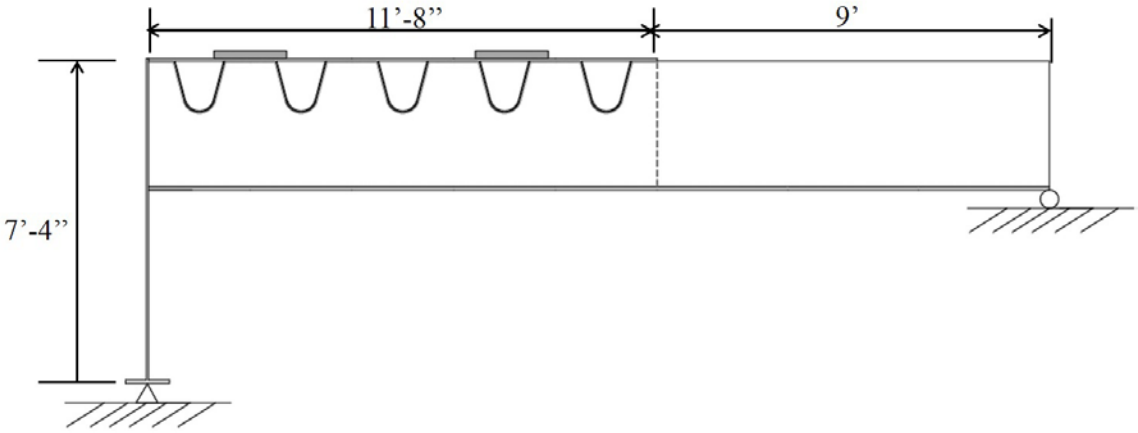

Figure 724. Sectional elevation of second trial FE model

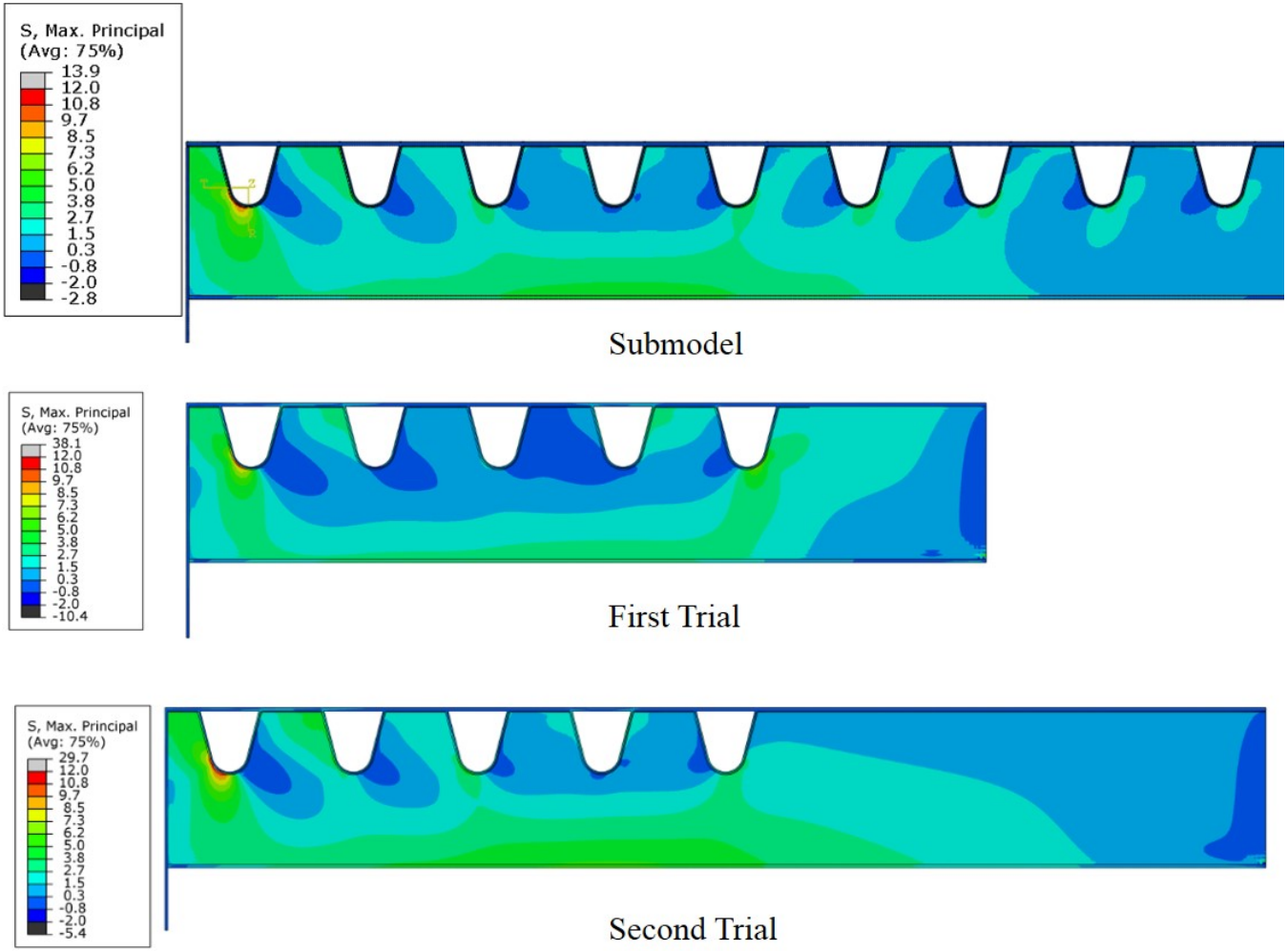

Figure 725. Principal stress comparison for first and second trial FE models

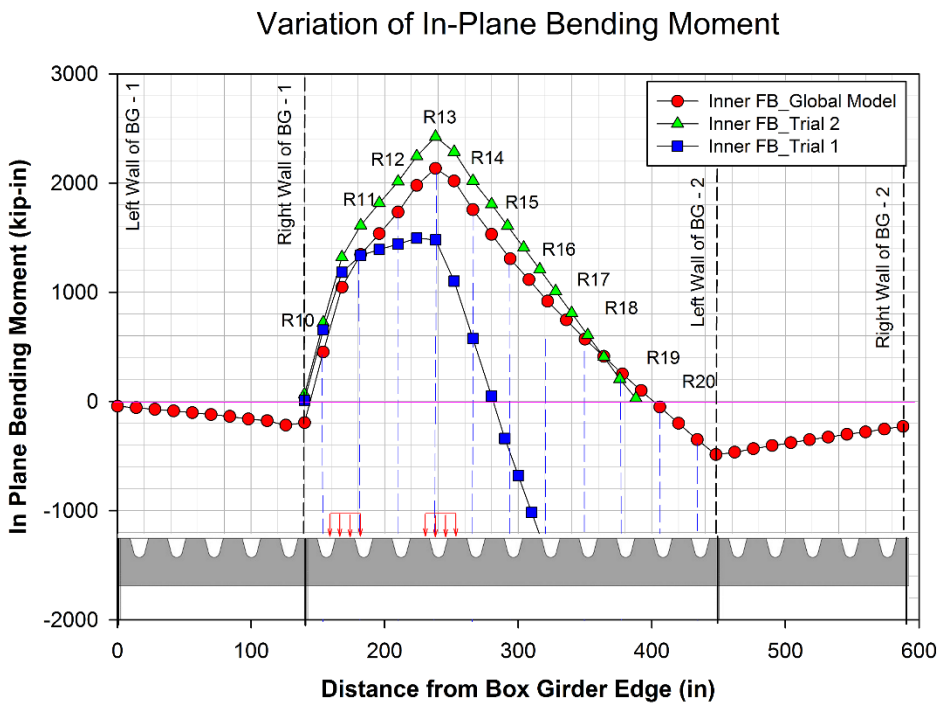

Figure 726. Comparison of in-plane bending moment of inner FB of first and second trial FE analyses with global model

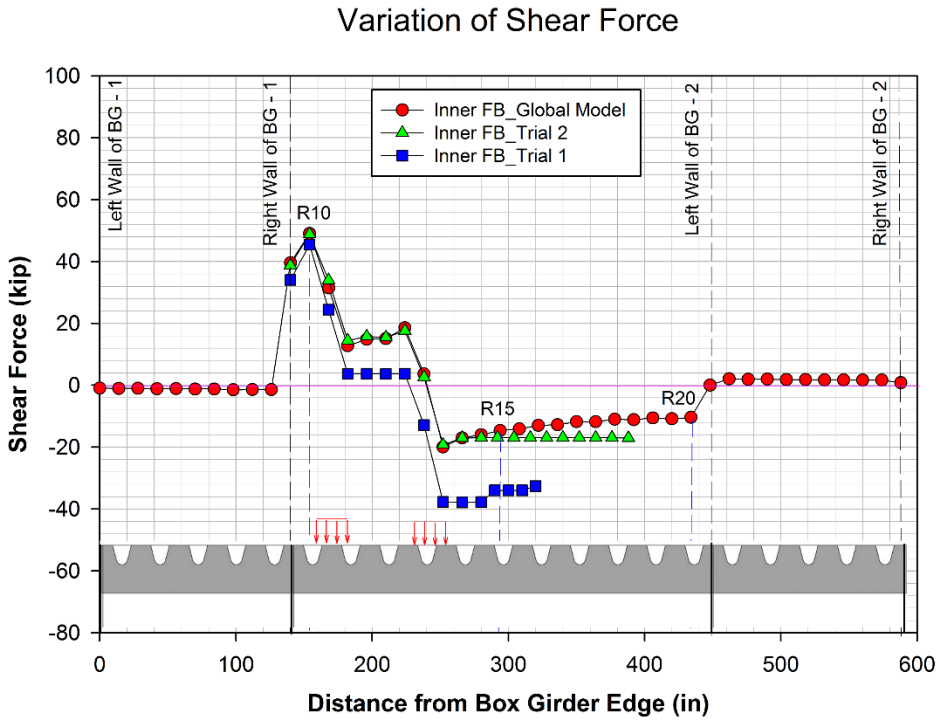

Figure 727. Comparison of shear force in inner FB of first and second trial FE analyses with global model

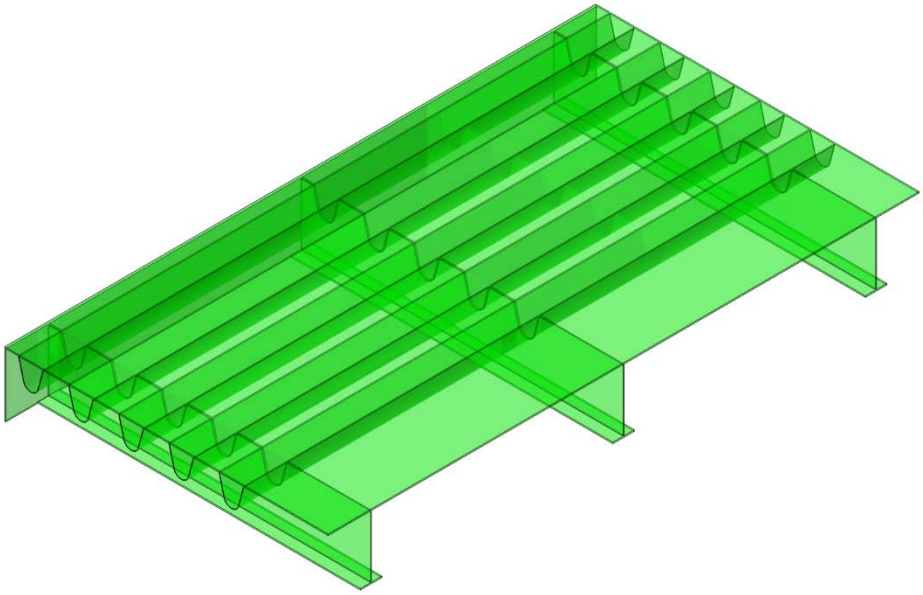

Figure 728. 3D view of the third trial FE model

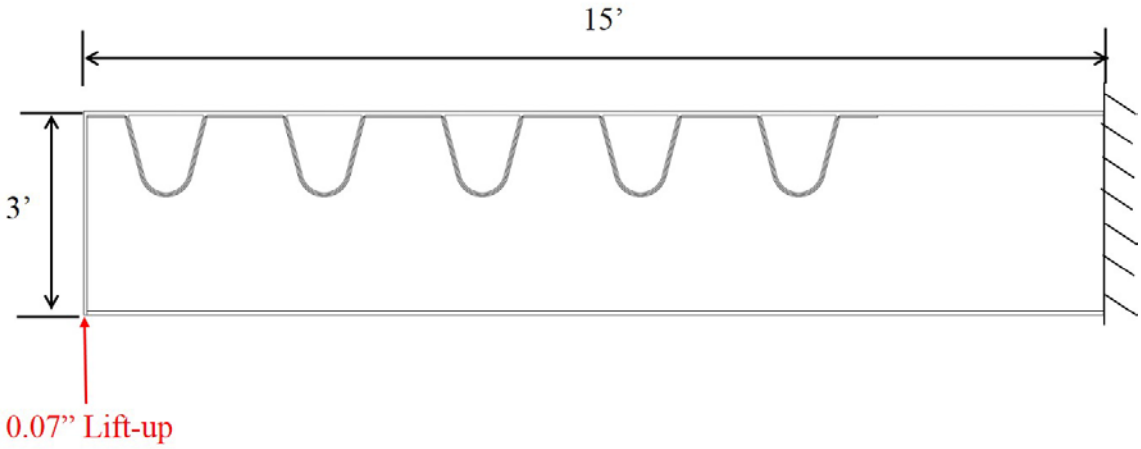

Figure 729. Sectional elevation of third trial FE model

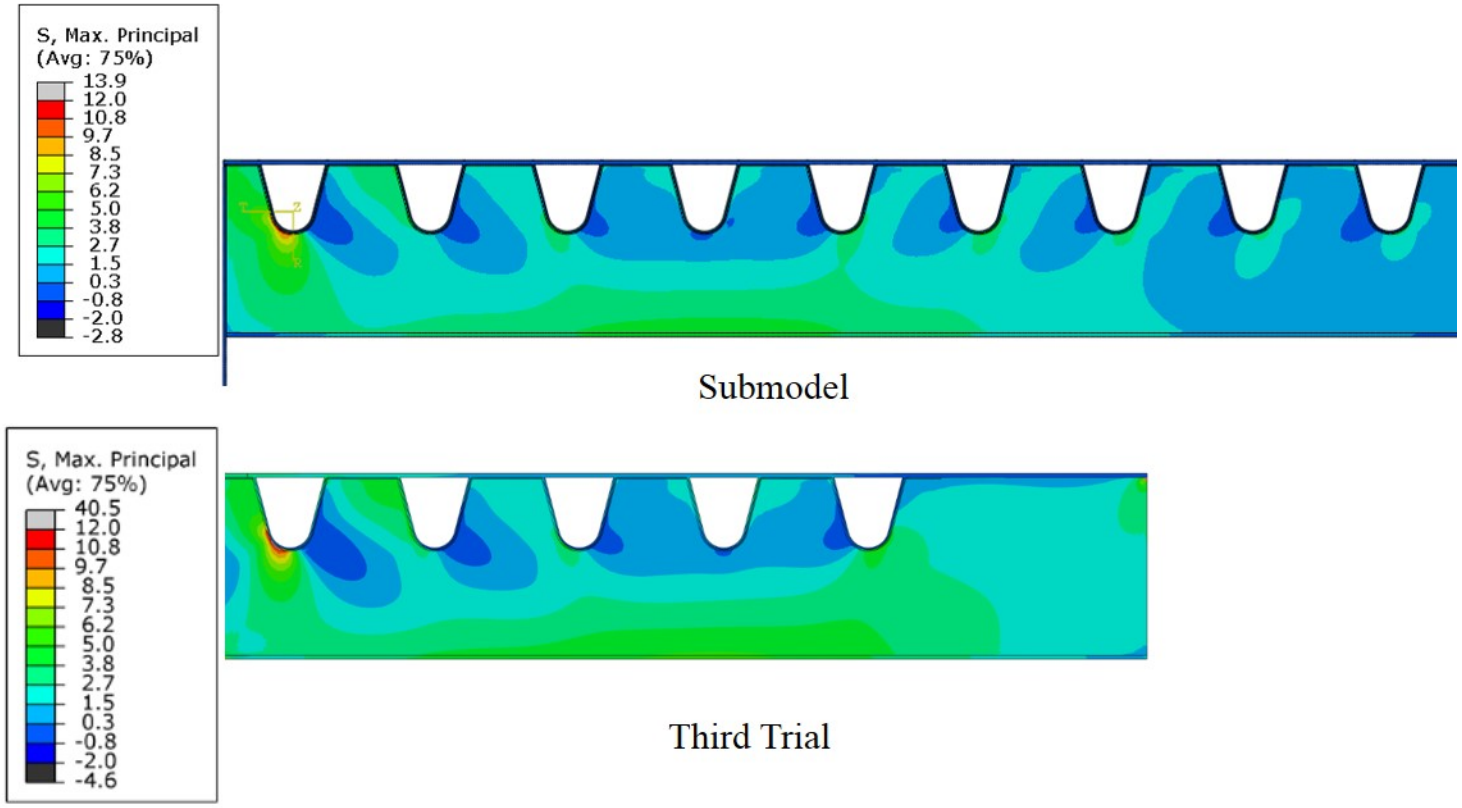

Figure 730. Principal stress comparison for third trial FE model

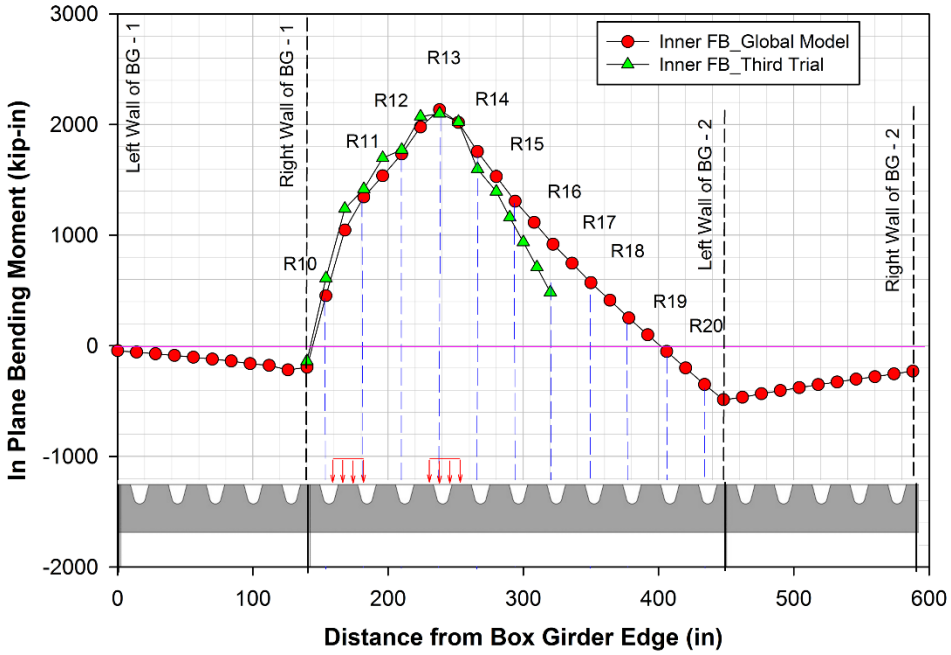

Figure 731. Comparison of in-plane bending moment of inner FB of third trial FE analysis with global model

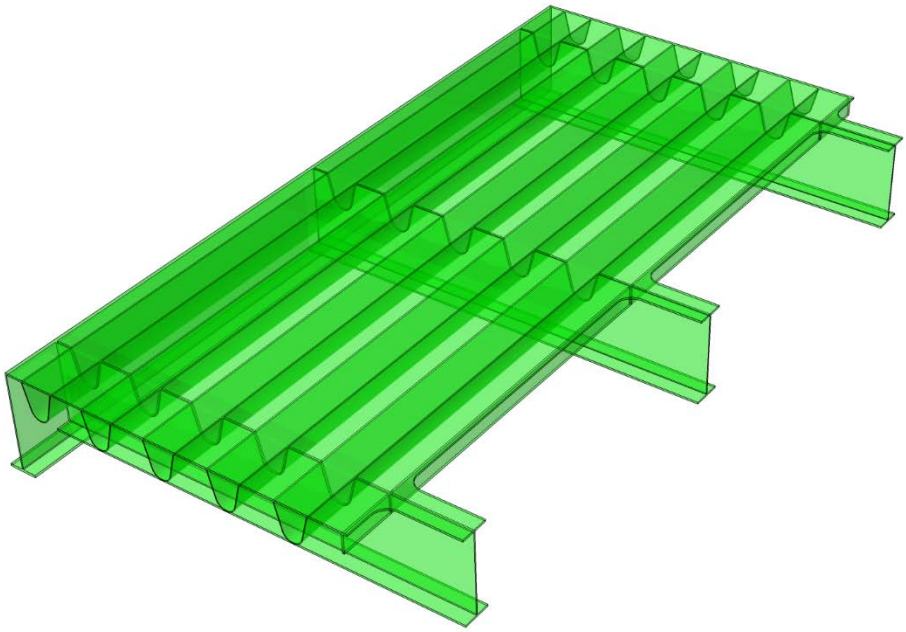

Figure 732. 3D view of the fourth trial FE model

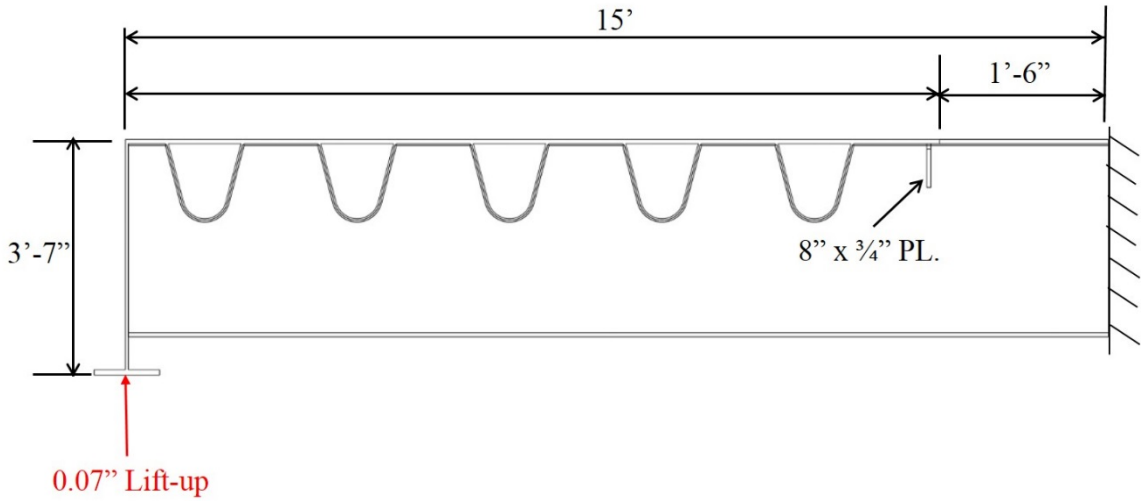

Figure 733. Sectional elevation of fourth trial FE model

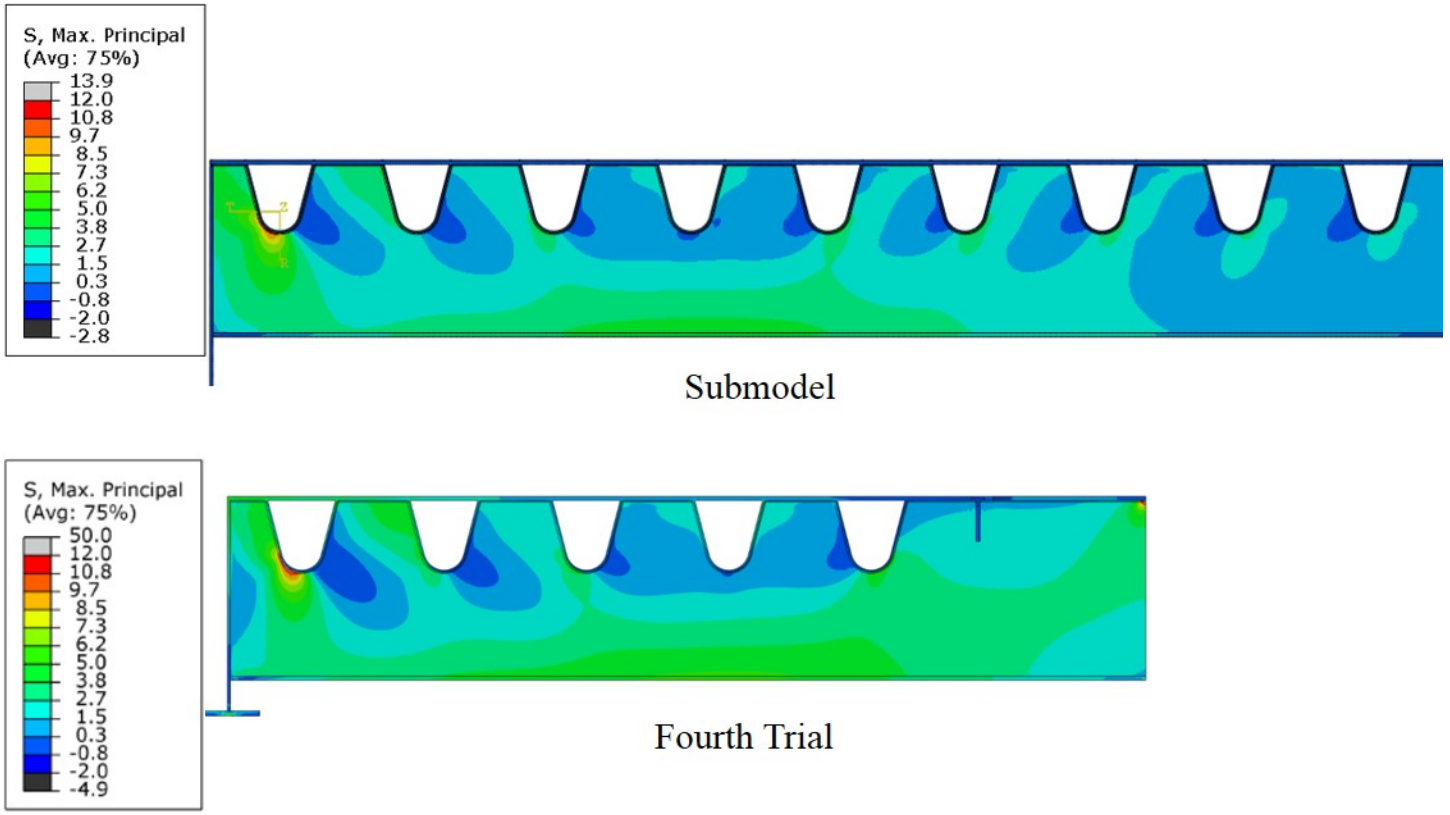

Figure 734. Principal stress comparison for fourth trial FE model

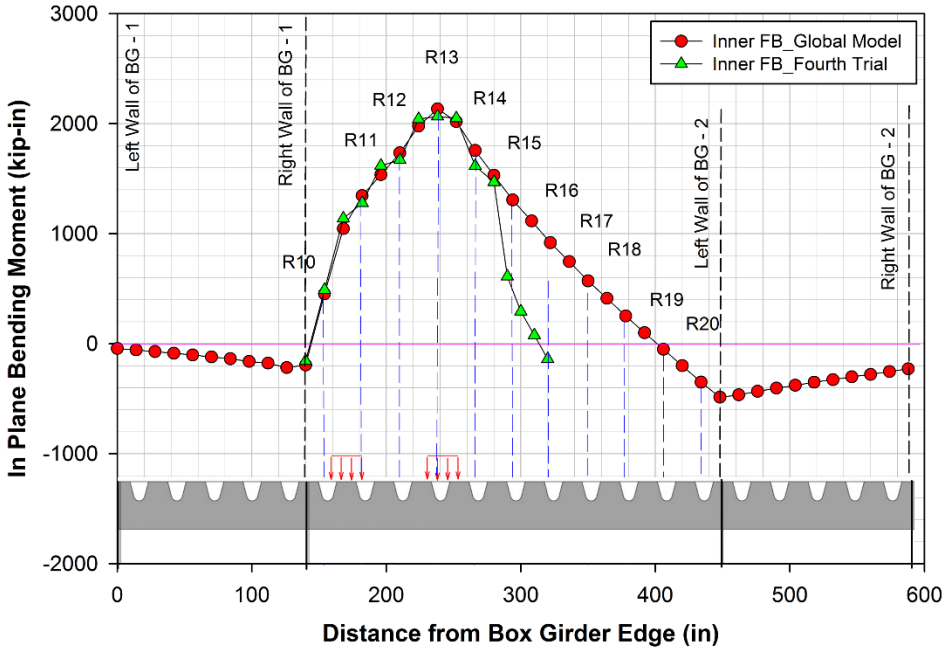

Figure 735. Comparison of in-plane bending moment of inner FB of fourth trial FE analysis with global model

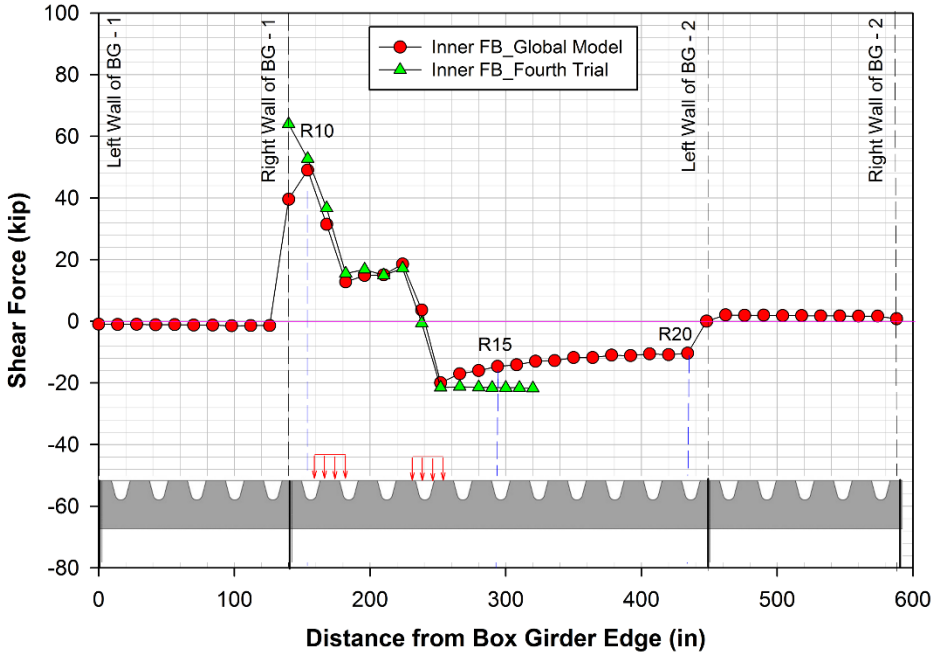

Figure 736. Comparison of shear force in inner FB of fourth trial FE analysis with global model

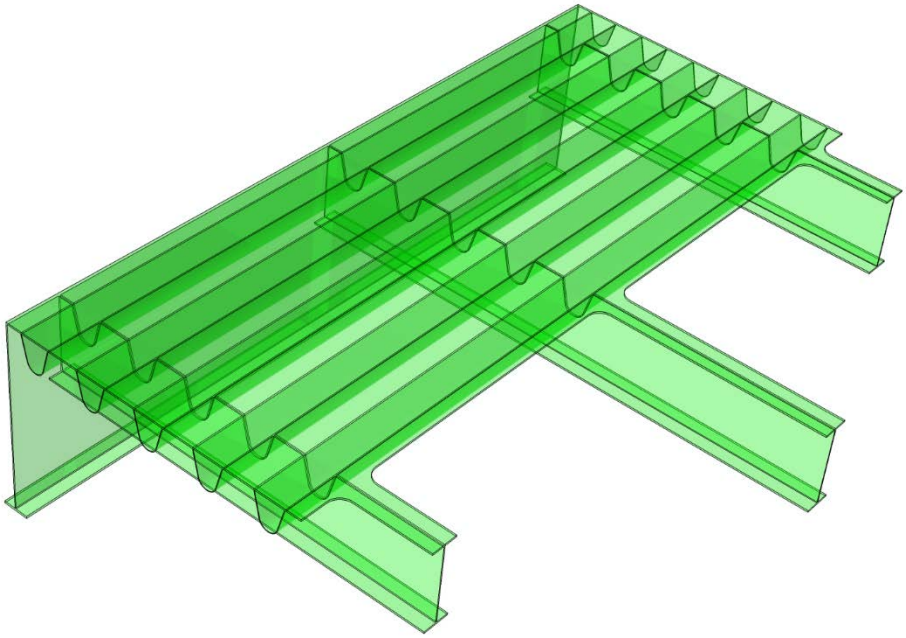

Figure 737. 3D view of the fifth trial FE model

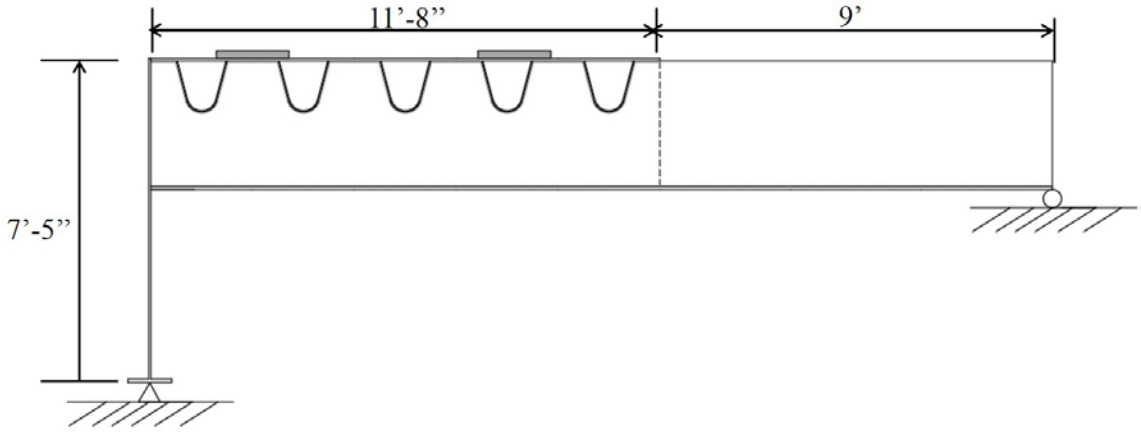

Figure 738. Sectional elevation of fifth trial FE model

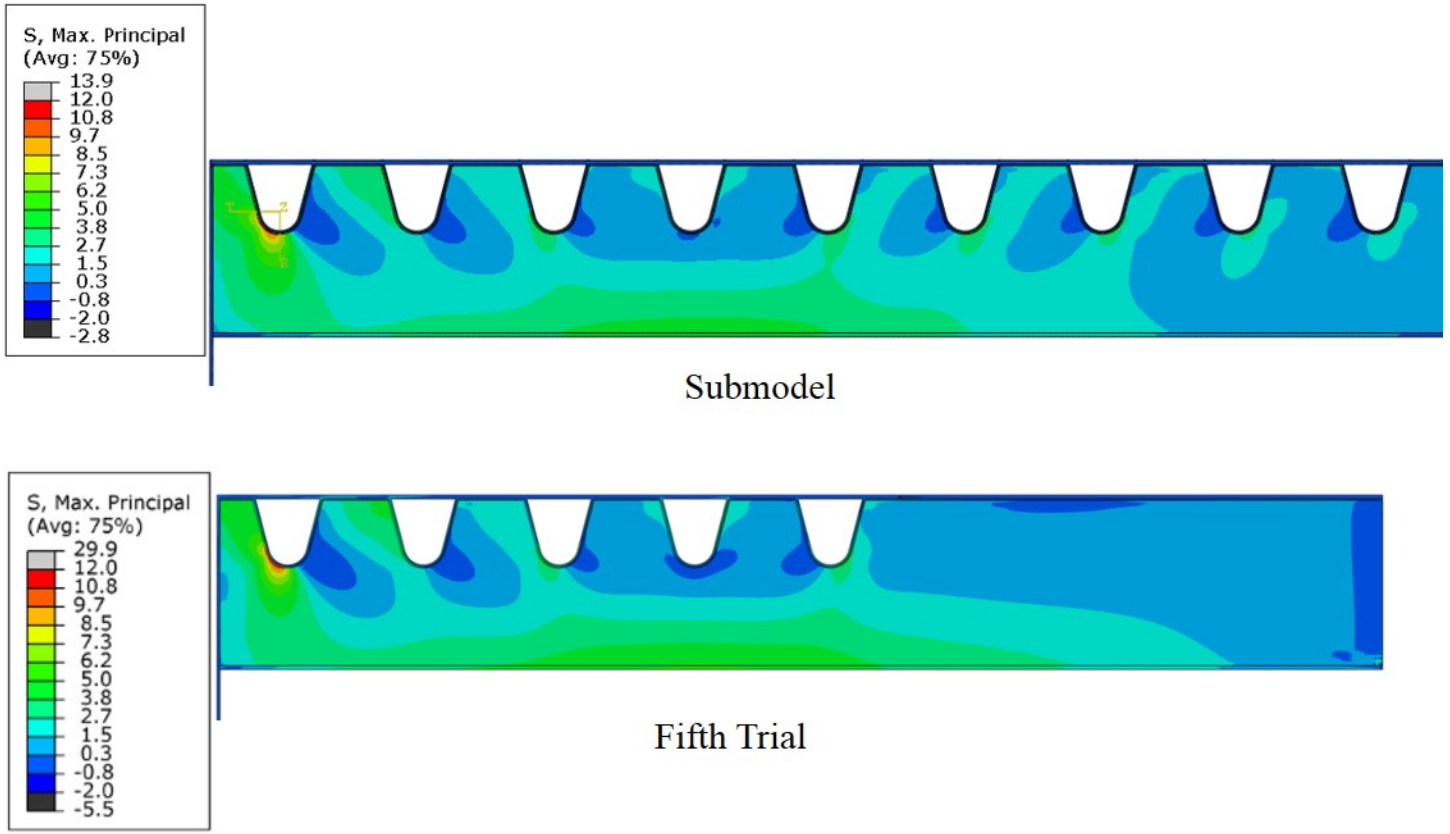

Figure 739. Principal stress comparison for fifth trial FE model

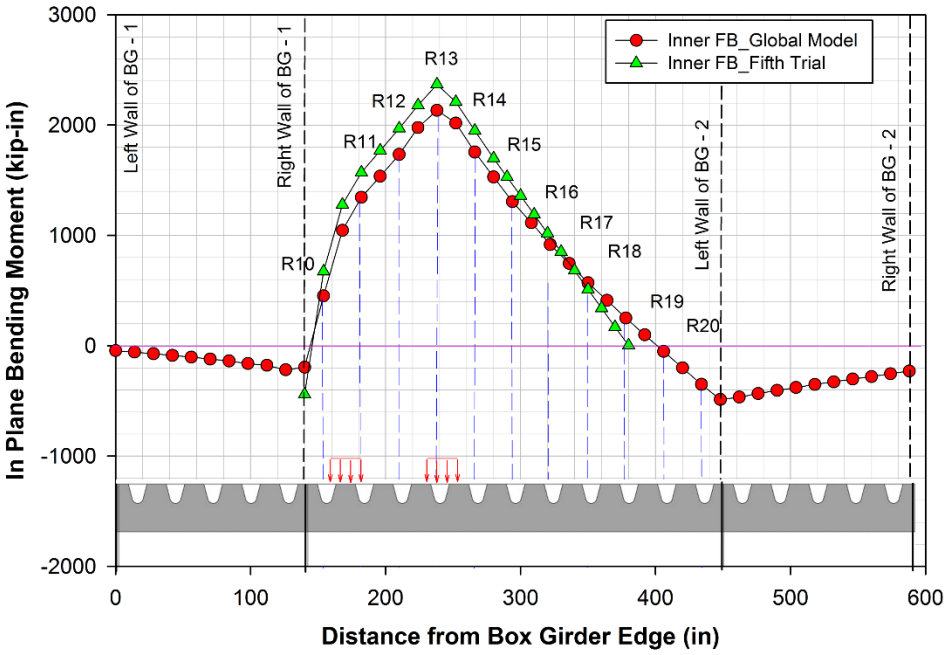

Figure 740. Comparison of in-plane bending moment of inner FB of fifth trial FE analysis with global model

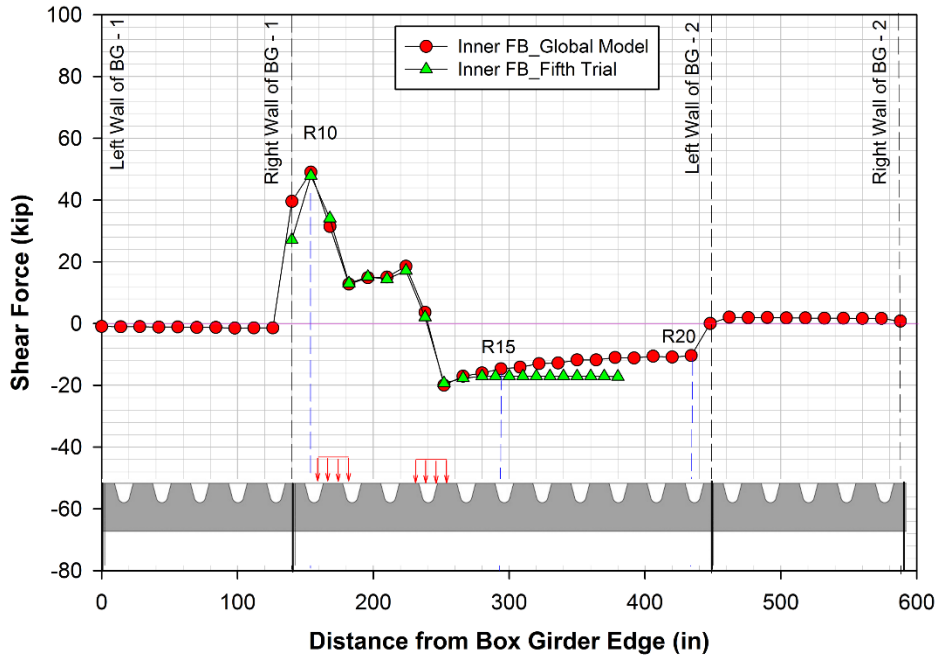

Figure 741. Comparison of shear in inner FB of fifth trial FE analysis with global model