

**Design and Fabrication of Orthotropic Deck Details**

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Submitted by

Sougata Roy, Ph.D.  
Former Principal Research Scientist  
ATLSS Center  
Lehigh University

Soham Mukherjee  
Former Research  
Assistant  
ATLSS Center  
Lehigh University



NJDOT Research Project Manager  
Ms. Priscilla Ukpah

In cooperation with

New Jersey  
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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.					
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## APPENDICES

## **APPENDIX A: STATIC TEST RESULTS OF MOCKUP SPECIMENS**

Table 45 – Static Test Data Sheet for Mockup Specimens

Location	Instrument ID	MU1								MU2			MU3		
		Before Crack	10-17	10-19	10-24		10-26		11-07	11-13	11-15	11-19	11-21		
		FEA	Measured	Measured	FEA	Measured	FEA	Measured	Measured	Measured	Measured	Measured			
LOAD CELL	LC 101_Avg	28.4	28.2	28.4	28.4	28.6	28.4	0.0	28.9	0.0	28.5	0.0	0.0		
	LC 103_Avg	58.1	60.0	58.1	58.1	58.6	58.1	59.3	59.3	58.7	58.4	58.3	58.4		
	LC 105_Avg	27.9	28.9	27.9	27.9	28.0	27.9	0.0	28.5	0.0	27.9	0.0	0.0		
East-FB	N-60 Deg	NEFB R1_Avg	19.9	16.8	17.0	23.9	19.0	7.8	16.7	15.3	5.5	14.9	17.2	13.6	
		NEFB R2_Avg	14.2	11.9	11.7	16.0	12.2	12.6	15.7	11.6	-3.6	9.9	7.4	6.9	
		NEFB R3_Avg	16.5	10.6	10.7	16.9	10.5	17.2	9.0	12.6	6.0	10.7	6.3	8.5	
		NEFB S1_Avg	9.6	4.3	4.1	10.9	4.2	9.0	7.7	9.2	4.1	8.0	5.8	5.4	
		NEFB S2_Avg	8.9	4.2	4.0	10.2	4.2	8.3	7.7	9.2	4.8	7.2	5.3	4.9	
		NEFB S3_Avg	8.7	4.1	4.0	10.0	4.3	8.0	7.7	8.7	4.9	6.8	5.2	4.6	
		NEFB S4_Avg	8.8	4.2	4.1	10.2	4.4	7.9	7.8	8.3	4.8	6.7	5.1	4.5	
		NEFB S5_Avg	8.7	4.2	4.1	10.1	4.5	7.4	7.7	7.8	4.6	6.3	4.8	4.3	
		NEFB 60_1_Avg	8.3	3.9	3.8	9.7	4.3	6.3	6.5	7.1	4.3	3.7	2.6	2.3	
	NEFB 60_2_Avg	6.1	1.5	1.4	7.8	1.6	4.1	-0.3	3.5	1.3	2.9	1.6	0.9		
	30 Deg	NEFB 30_1_Avg	8.8	7.4	7.2	10.4	4.8	3.0	-0.8	7.1	NAN	5.7	3.4	2.5	
		NEFB 30_2_Avg	7.1	5.3	5.9	9.5	4.8	0.9	-1.4	4.9	17.8	2.0	0.8	-0.3	
		EFB 0_1_Avg	2.4	4.0	4.3	8.0	5.4	4.7	4.6	6.5	5.3	5.4	3.4	2.7	
	30 Deg	SEFB 30_1_Avg	-6.0	4.4	4.3	13.2	6.3	11.5	4.9	1.2	-10.0	1.5	1.3	-1.1	
		SEFB 30_2_Avg	-6.3	-0.4	-0.6	12.4	16.1	9.8	7.6	1.4	0.2	-0.2	2.1	-2.0	
	S-60 Deg	SEFB R1_Avg	-13.9	-3.9	-4.0	7.7	8.3	6.1	9.0	0.1	-0.9	-2.4	NAN	-3.2	
		SEFB R2_Avg	-15.0	-5.9	-6.2	-7.2	-3.5	-8.1	-2.7	-10.3	-25.0	-3.2	NAN	-5.5	
		SEFB R3_Avg	-26.3	-19.7	-20.1	-19.3	-19.8	-19.4	-20.3	-18.9	-20.7	-18.3	NAN	-20.1	
SEFB S1_Avg		-9.7	-1.1	-1.2	-6.8	-0.9	-7.5	-0.2	-0.3	-7.8	-1.4	46.3	-3.1		
SEFB S2_Avg		-9.4	-1.2	-1.3	-7.2	-1.1	-7.8	-0.4	-0.5	-7.4	-1.6	NAN	-3.3		
SEFB S3_Avg		-9.3	-1.6	-1.7	-7.7	-1.5	-8.3	-0.7	-0.6	-6.6	-1.5	NAN	-3.1		
SEFB S4_Avg		-9.5	-1.8	-1.9	-8.2	-1.6	-8.8	-0.9	-0.8	-5.6	-1.4	NAN	-3.0		
SEFB S5_Avg		-9.5	-2.0	-2.1	-8.4	-1.6	-9.2	-0.9	-0.8	-4.9	-1.3	NAN	-2.8		
SEFB 60_1_Avg		-9.2	-1.9	-2.0	-8.6	-1.3	-9.3	-0.7	-0.9	-3.0	-1.0	74.0	-2.4		
SEFB 60_2_Avg	-7.3	-0.8	-0.9	-5.7	2.6	-6.3	2.7	-0.4	-0.7	-0.2	0.8	-1.3			
East-Rib	N-60 Deg	NER 60_1_Avg	17.2	7.6	7.7	20.5	8.8	25.9	11.1	11.0	9.4	10.2	8.7	8.4	
		NER 60_2_Avg	1.3	-1.2	-1.2	2.1	-0.9	10.4	2.3	0.3	0.0	-0.7	-2.4	-1.7	
		NER 60_3_Avg	-7.4	-5.7	-5.8	-8.3	-6.4	-3.3	-4.3	-6.1	-6.0	-6.5	-8.0	-6.6	
		NER 60_4_Avg	-5.6	-3.1	-3.2	-8.0	-4.4	-13.2	-7.1	-2.9	-3.6	-2.9	-4.2	-2.9	
		NER 60_5_Avg	-3.4	-1.2	-1.3	-5.8	-2.3	-8.1	-3.5	-1.1	-1.8	-1.0	-2.6	-1.2	
	30 Deg	NER 30_1_Avg	5.4	0.2	0.1	0.9	-3.4	1.0	0.1	3.1	-2.0	3.0	-0.4	1.2	
		NER 30_2_Avg	-9.4	-9.0	-9.1	-14.5	-11.5		54.3	-7.9	-9.4	-8.5	-12.4	-8.5	
	0 Deg	ER 0_1_Avg	-12.8	-8.3	-8.7	-38.9	-28.3	-28.7	-20.5	-3.4	1.5	-4.8	-14.5	-6.6	
		ER 0_2_Avg	-8.0	-6.9	-7.0	-17.8	-10.8	-13.6	-7.1	-6.8	-7.2	-7.1	-14.0	-7.1	
	30 Deg	SER 30_1_Avg	-32.1	-19.3	-19.5	-8.2	-14.3	-8.0	-14.6	-16.2	NAN	-21.5	-49.5	-23.0	
		SER 30_2_Avg	-5.0	-1.6	-1.6	-4.2	-1.7	-1.8	-2.5	-3.9	-2.7	-3.6	0.6	-3.6	
	S-60 Deg	SER 60_1_Avg	-42.6	-24.3	-24.7	-34.8	-25.4	-36.8	-26.1	-27.1	-21.6	-23.1	-0.1	-24.4	
SER 60_2_Avg		-16.7	-11.2	-11.3	-14.0	-14.9	-25.8	-15.4	-9.4	-5.5	-11.7	-0.1	-12.5		
SER 60_3_Avg		-2.5	-2.8	-2.8	-4.9	-7.0	-13.7	-7.2	-1.9	-0.1	-3.0	-7.5	-3.2		
SER 60_4_Avg		-2.9	-5.0	-5.0	-4.2	-5.0	-3.5	-4.8	-6.6	-7.0	-6.2	-1.6	-6.4		
SER 60_5_Avg		-5.4	-6.4	-6.5		-5.4	-2.7	-5.3	-6.1	-6.3	-7.4	8.9	-7.7		
East Section	Deck	ETDP 1_Avg	14.4	12.3	12.6	13.5	0.0	13.2	61.3	11.7	12.1	-11.9	-13.3	-12.2	
		ETDP 2_Avg	13.6	12.1	12.3	13.2	0.0	12.9	128.5	12.2	11.9	-17.6	-1.3	-17.4	
		ETDP 3_Avg	-19.8	-12.0	NAN	-20.3	-11.6	-20.4	-11.3	-11.3	-13.6	-19.4	-19.1	-19.0	
		EBDP 1_Avg	-10.4	-13.5	-13.6	-9.7	-11.2	-9.4	-11.3	-12.1	-12.4	-14.0	-11.9	-13.0	
		EBDP 2_Avg	-13.2	-9.6	-9.8	-12.4	-7.8	-12.1	-7.7	-8.7	-9.2	-10.5	-9.8	-9.7	
		EBDP 3_Avg	-13.7	-10.5	-10.5	-12.9	-8.6	-12.6	-8.7	-13.0	-12.2	-12.1	-10.0	-11.0	
	Rib	EDSP 1_Avg	-7.2	-5.1	-5.1	-6.7	-3.4	-6.5	-3.4	-5.4	-4.4	-5.6	-3.4	-4.7	
		EDSP 2_Avg	22.4	16.2	16.5	22.7	15.0	22.8	14.6	13.8	14.9	17.2	17.1	17.1	
		EDSP 3_Avg	21.3	16.9	17.4	21.5	16.0	21.6	15.5	17.0	17.7	18.8	18.1	18.4	
		ERIB 1_Avg	11.9	11.1	11.6	12.7	11.2	13.2	11.2	11.3	12.0	12.3	12.9	11.9	
		ERIB 2_Avg	10.8	9.8	10.2	11.6	9.8	12.1	9.9	10.0	10.5	8.8	9.0	8.2	
		ERIB 3_Avg	-23.5	-22.2	-22.5	-24.3	-21.7	-24.9	-22.0	-25.5	-27.1	-21.6	-23.2	-21.5	
East Rib	ERIB E2_Avg	-20.8	-18.7	-17.9	-21.5	-16.9	-22.0	-17.2	-20.8	-22.3	-20.6	-22.1	-20.5		
	ER 0_3_Avg	-6.2	-5.8	-5.9	-5.7	-5.5	-6.2	-6.4	-5.7	-5.5	-6.0	-5.1	-6.2		
Hand Cal.		-8.4	-8.8	-8.4	-8.4	-8.5	-8.4	-8.9	0.0	-8.7	0.0	0.0			
Mid Section	Deck	EDPFB 1_Avg	31.3	-5.0	-4.8	32.2	-5.3	32.4	-4.8	-7.6	-8.9	-7.1	-6.7	-7.4	
		WDPFB 1_Avg	31.3	0.4	0.4	32.3	0.5	32.5	0.2	-6.7	-2.4	3.3	2.4	3.5	
FB	EDPFB 2_Avg	-10.2	-15.0	-15.8	-10.4	-15.1	-10.4	-16.0	-16.6	-25.0	-15.3	4.2	-14.7		
	WDPFB 2_Avg	-10.2	-21.1	-21.4	-10.7	-22.6	-10.7	-22.6	-25.1	-9.1	-25.3	14.7	-25.3		
		TF 2_Avg	1.4	1.5	1.6	1.4	1.7	1.4	1.7	1.6	1.6	1.5	1.6		
		TF 1_Avg	8.7	8.3	8.6	8.6	8.6	8.6	8.7	8.4	8.5	8.5	8.5		
		TDP WEB_Avg	4.7	3.6	3.7	4.0	3.5	3.6	3.5	3.3	3.2	3.4	3.4		
		BF 2_Avg	-5.5	-0.9	-0.8	-5.3	-0.7	-5.5	-0.7	-0.8	-0.9	-0.8	-1.0		
		BF 1_Avg	-4.2	-8.0	-8.2	-4.2	-8.4	-4.3	-8.5	-8.5	-7.8	-7.7	-7.7		
		BDP WEB_Avg	-8.0	-7.3	-7.4	-8.8	-7.8	-9.2	-8.0	-6.5	-6.5	-7.1	-6.4		
		DISPL_Avg	-0.1238	0.2066	0.2107	-0.1281	0.2085	-0.1310	0.2108	0.2150	0.2099	0.2081	0.2086		

Location	Instrument ID	MU1								MU2			MU3		
		Before Crack	10-17	10-19	10-24		10-26		11-07	11-13	11-15	11-19	11-21		
		FEA	Measured	Measured	FEA	Measured	FEA	Measured	Measured	Measured	Measured	Measured			
LOAD CELL	LC 101_Avg	28.4	28.2	28.4	28.4	28.6	28.4	0.0	28.9	0.0	28.5	0.0	0.0		
	LC 103_Avg	58.1	60.0	58.1	58.1	58.6	58.1	59.3	59.3	58.7	58.4	58.3	58.4		
	LC 105_Avg	27.9	28.9	27.9	27.9	28.0	27.9	0.0	28.5	0.0	27.9	0.0	0.0		
West-FB	N-60 Deg	NWFB R1_Avg	16.2	9.9	10.5	20.4	13.0	3.0	11.3	8.4	4.8	8.1	13.9	9.9	
		NWFB R2_Avg	8.6	0.7	1.5	10.3	2.4	5.4	6.2	-3.1	-5.3	-1.9	3.5	1.4	
		NWFB R3_Avg	12.0	2.4	2.8	11.9	2.3	11.9	0.7	3.5	2.2	4.6	6.8	6.6	
		NWFB S1_Avg	4.6	-2.1	-1.5	5.8	-1.1	2.5	2.6	-3.2	-0.9	-1.8	3.2	1.0	
		NWFB S2_Avg	4.3	-1.9	-1.3	5.5	-0.8	2.3	3.0	-3.0	-1.0	-1.5	2.9	1.0	
		NWFB S3_Avg	4.2	-1.7	-1.1	5.5	-0.6	2.2	3.2	-2.8	-1.2	-1.3	3.1	1.0	
		NWFB S4_Avg	4.3	-1.5	-1.0	5.7	-0.3	2.2	3.2	-2.6	-1.4	-1.0	3.2	1.3	
		NWFB S5_Avg	4.3	-1.4	-0.8	5.7	-0.2	2.0	2.5	-2.5	-1.6	-1.0	3.1	1.1	
		NWFB 60_1_Avg	4.1	-1.8	-1.3	5.6	-0.5	1.3	2.2	-1.7	-1.9	-1.3	2.9	0.7	
	NWFB 60_2_Avg	2.7	-2.4	-2.1	4.4	-1.6	0.5	-3.2	-2.7	-3.3	-2.2	-3.4	-0.8		
	30 Deg	NWFB 30_1_Avg	1.5	-3.4	-2.7	4.3	-2.7	-2.0	0.4	-11.5	-9.1	-8.2	-2.7	-4.7	
		NWFB 30_2_Avg	1.0	-2.9	-2.5	4.1	-2.3	-4.0	-2.5	-8.9	85.2	-6.3	NAN	-4.0	
	0 Deg	WFB 0_1_Avg	-5.3	-6.8	-6.4	-0.3	-3.9	-4.6	-5.1	-11.5	-6.8	-6.0	9.3	-3.3	
		SWFB 30_1_Avg	-11.9	-13.8	-13.6	5.3	-2.2	2.9	4.8</						

**APPENDIX B: MACRO-ETCHED SECTIONS OF RIB-TO-FLOOR BEAM WELDS IN  
MU1, MU2 AND MU3**

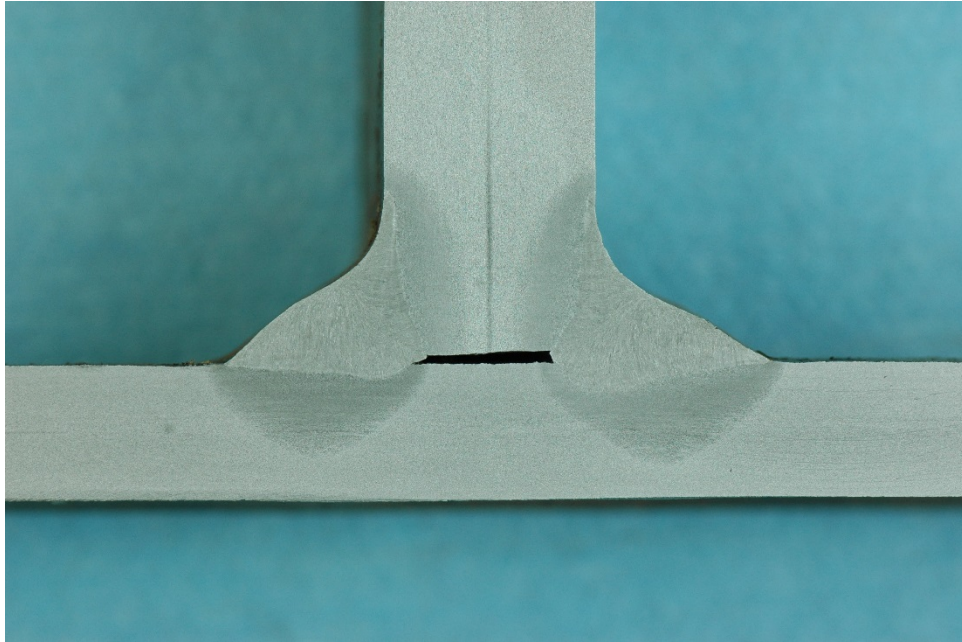


Figure 455. Macro-etched section MU1\_N\_60

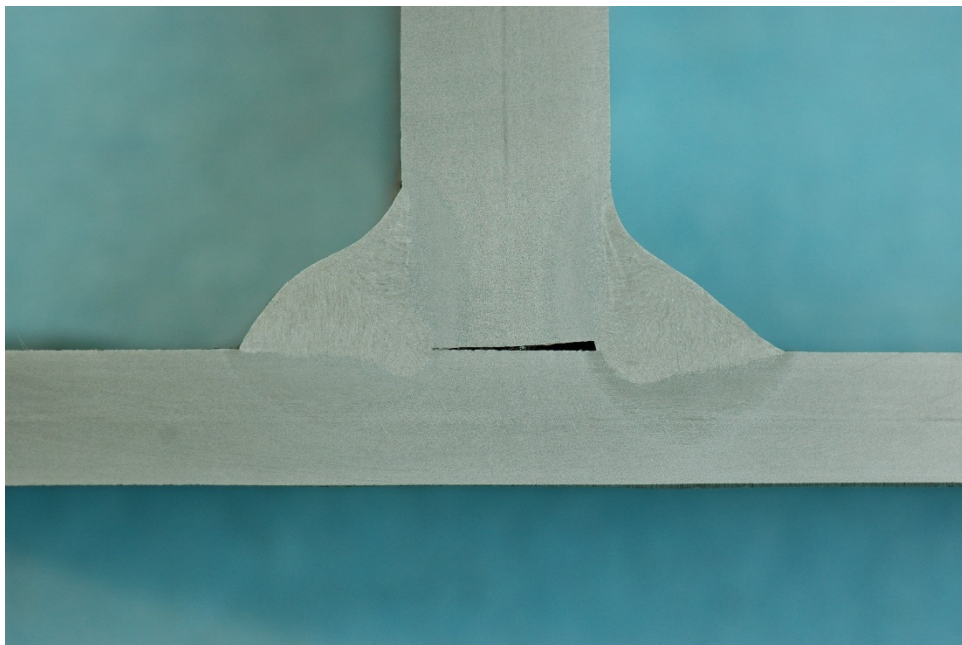


Figure 456. Macro-etched section MU1\_N\_70

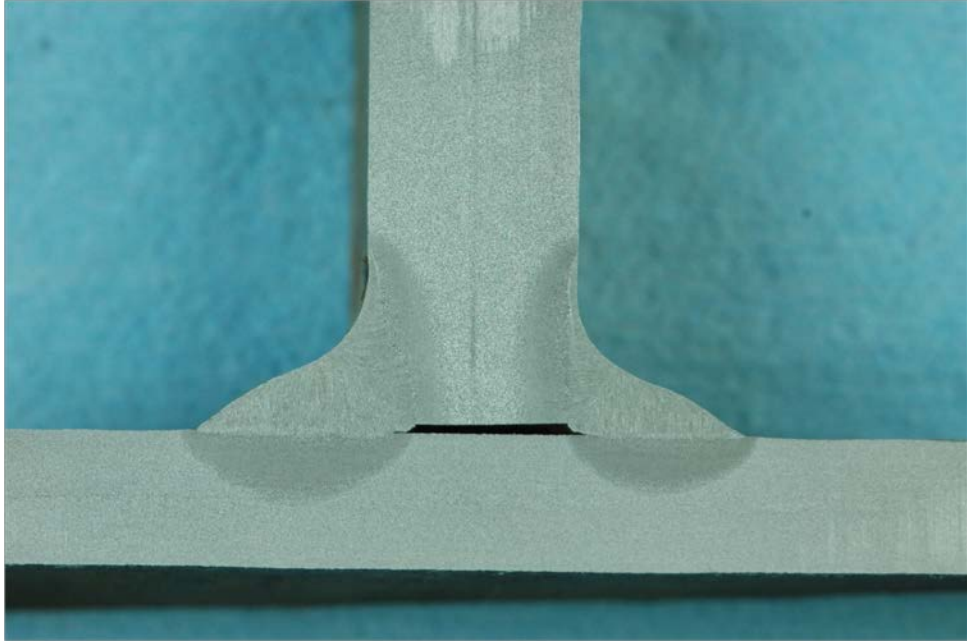


Figure 457. Macro-etched section MU1\_S\_60

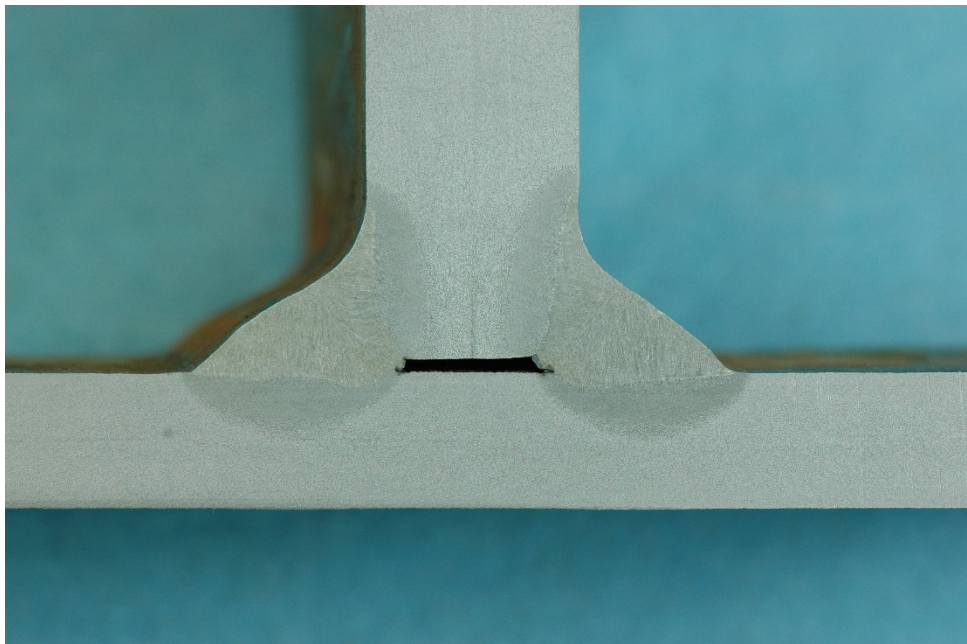


Figure 458. Macro-etched section MU1\_S\_75

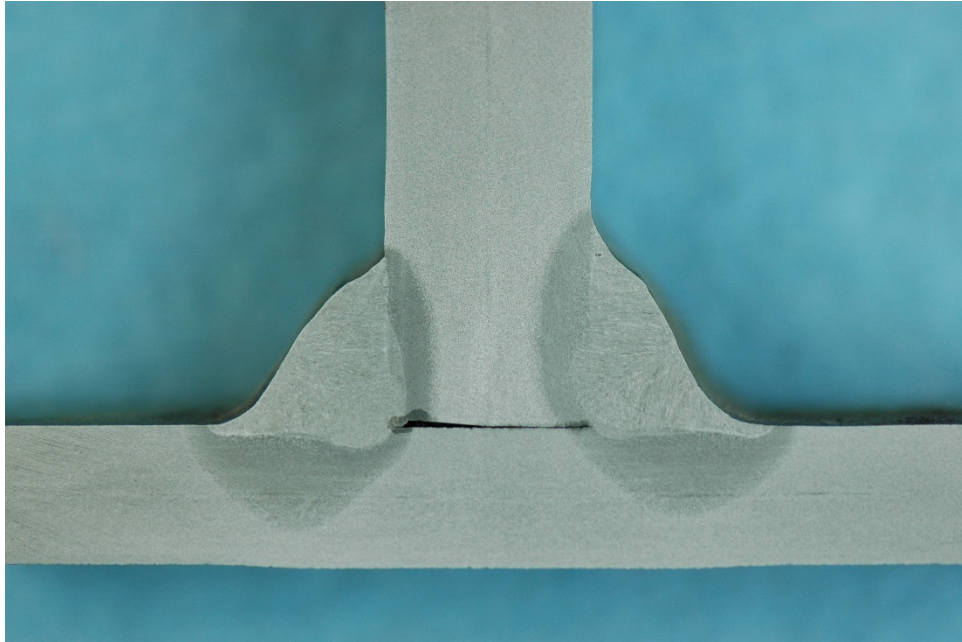


Figure 459. Macro-etched section MU2\_N\_30

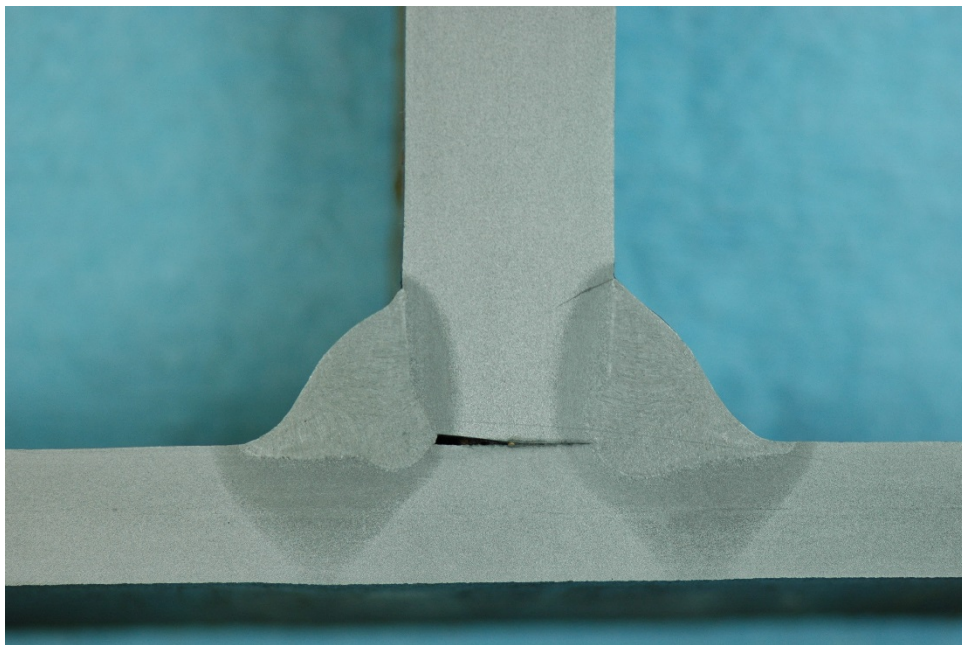


Figure 460. Macro-etched section MU2\_N\_60

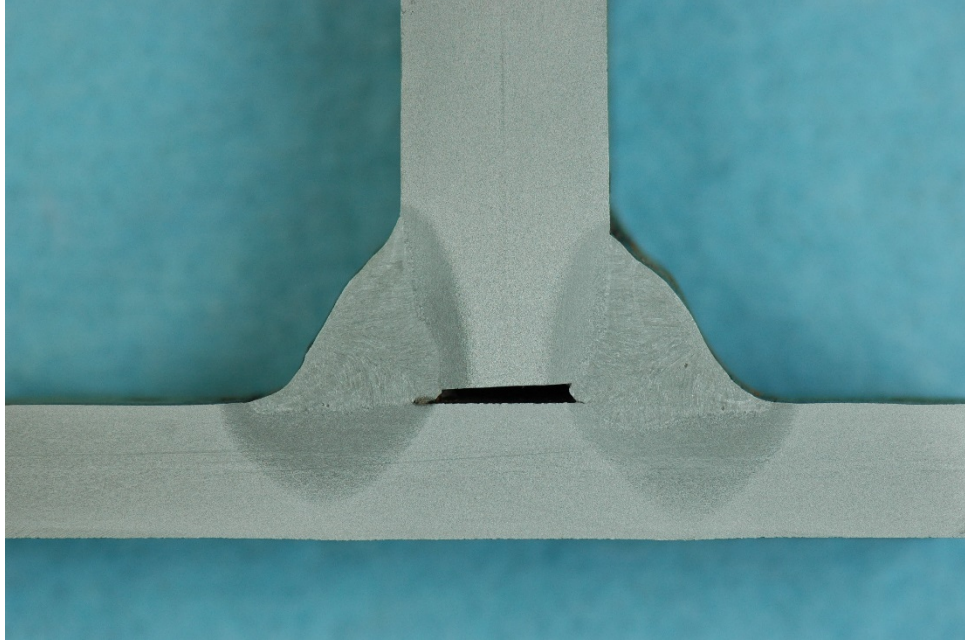


Figure 461. Macro-etched section MU2\_S\_60

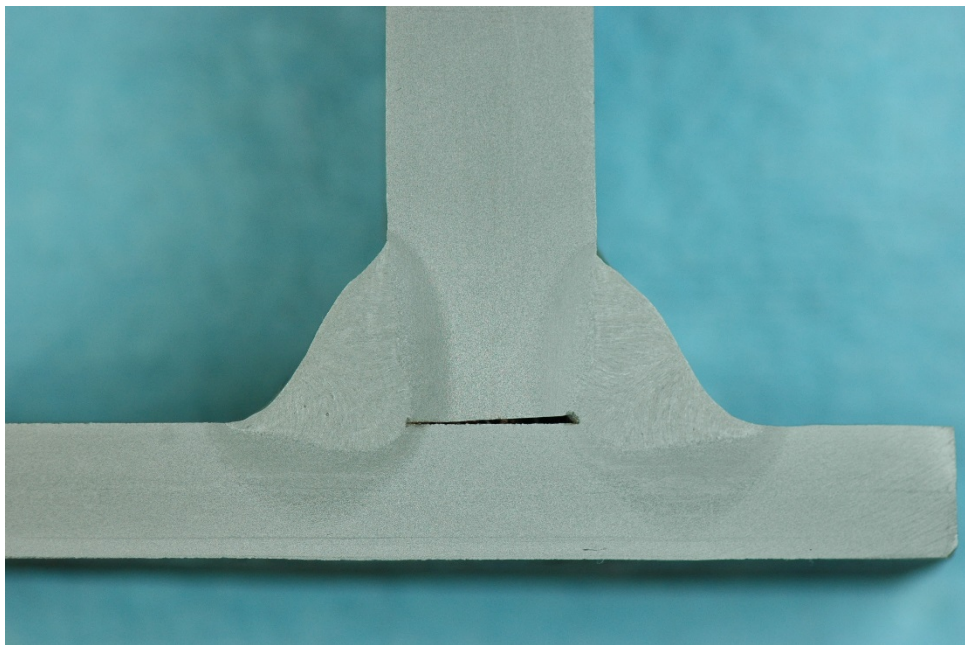


Figure 462. Macro-etched section MU2\_S\_70

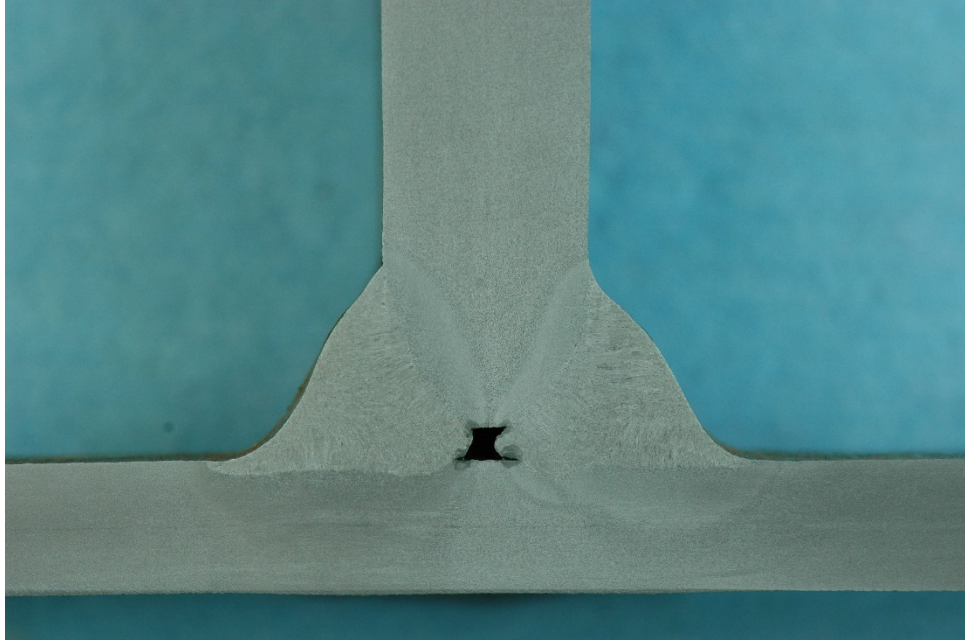


Figure 463. Macro-etched section MU3\_0

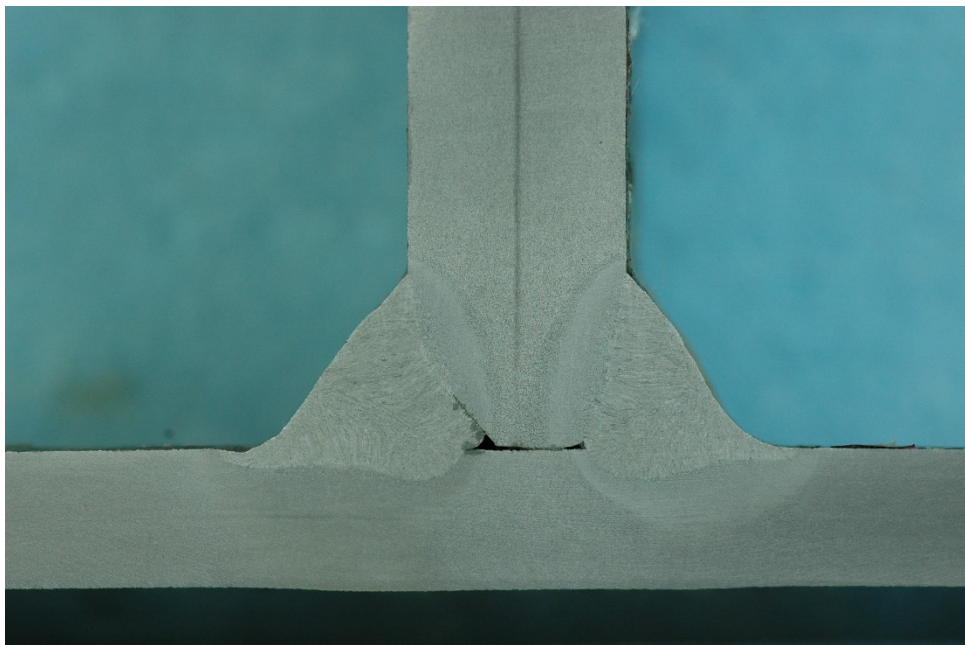


Figure 464. Macro-etched section MU3\_N\_60

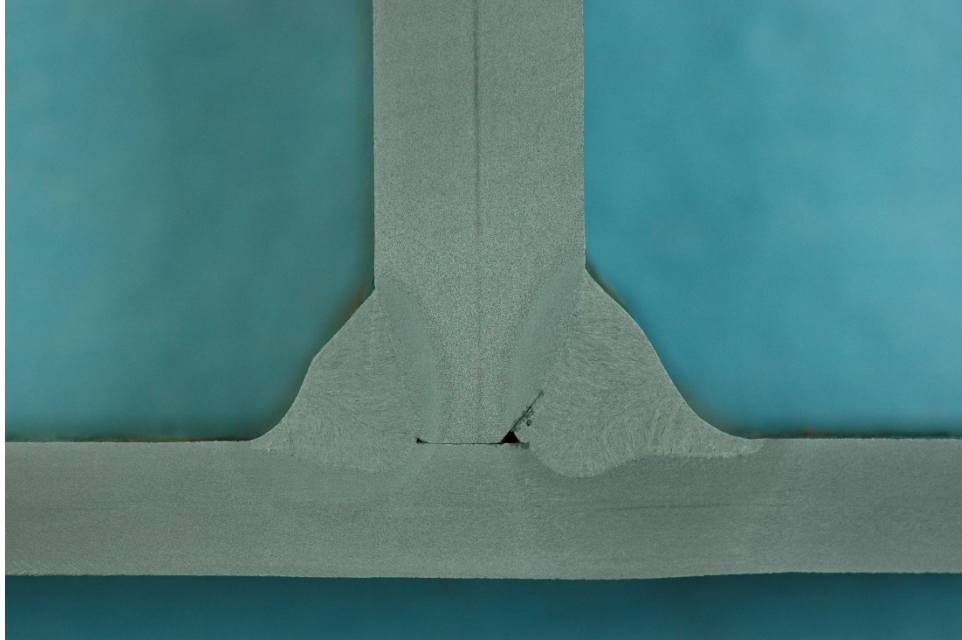


Figure 465. Macro-etched section MU3\_N\_75

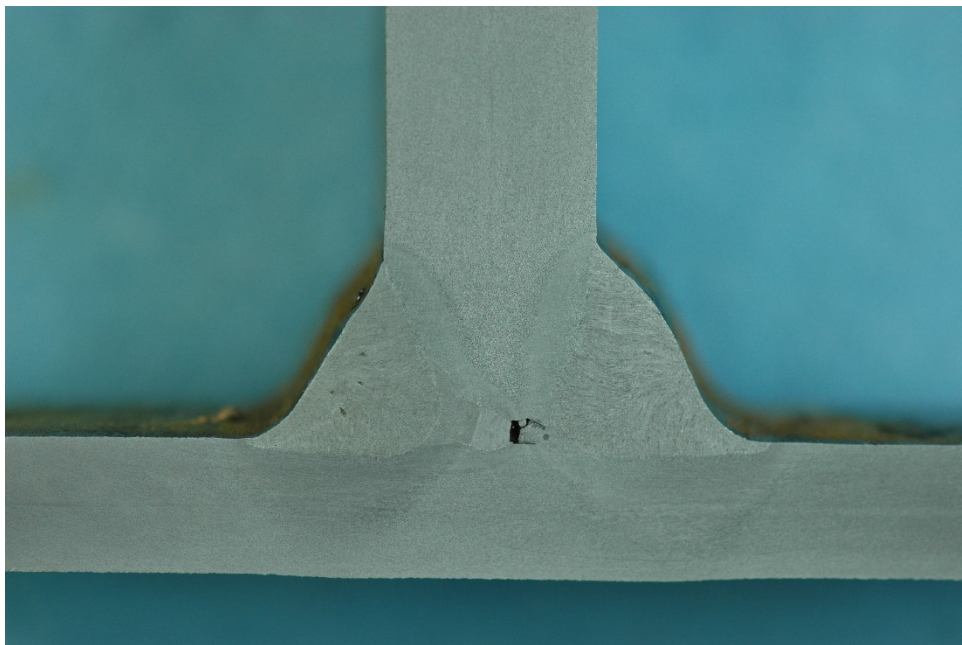


Figure 466. Macro-etched section MU3\_S\_10

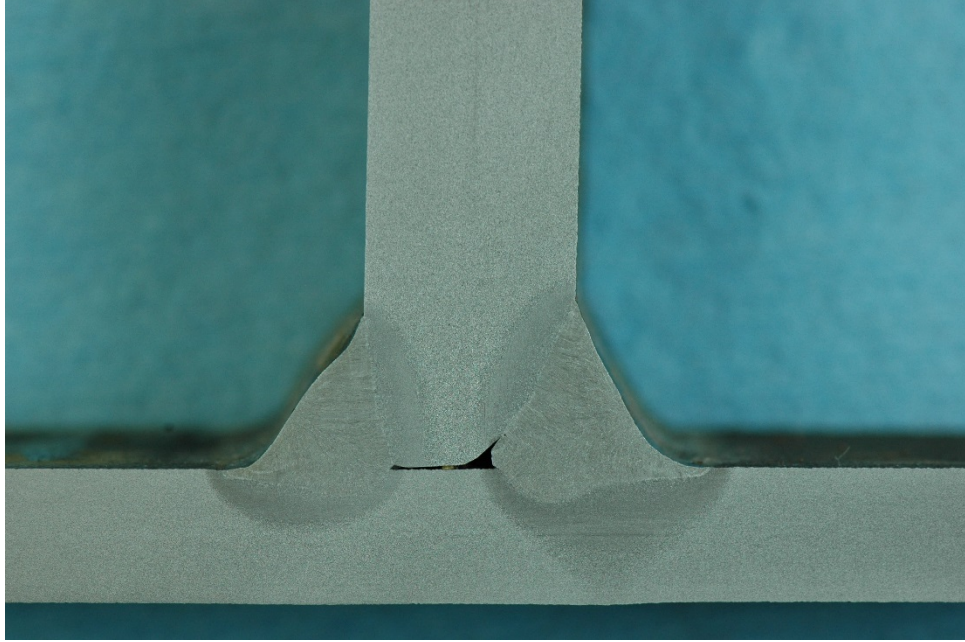
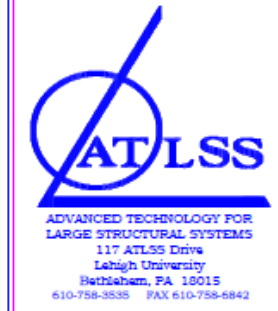
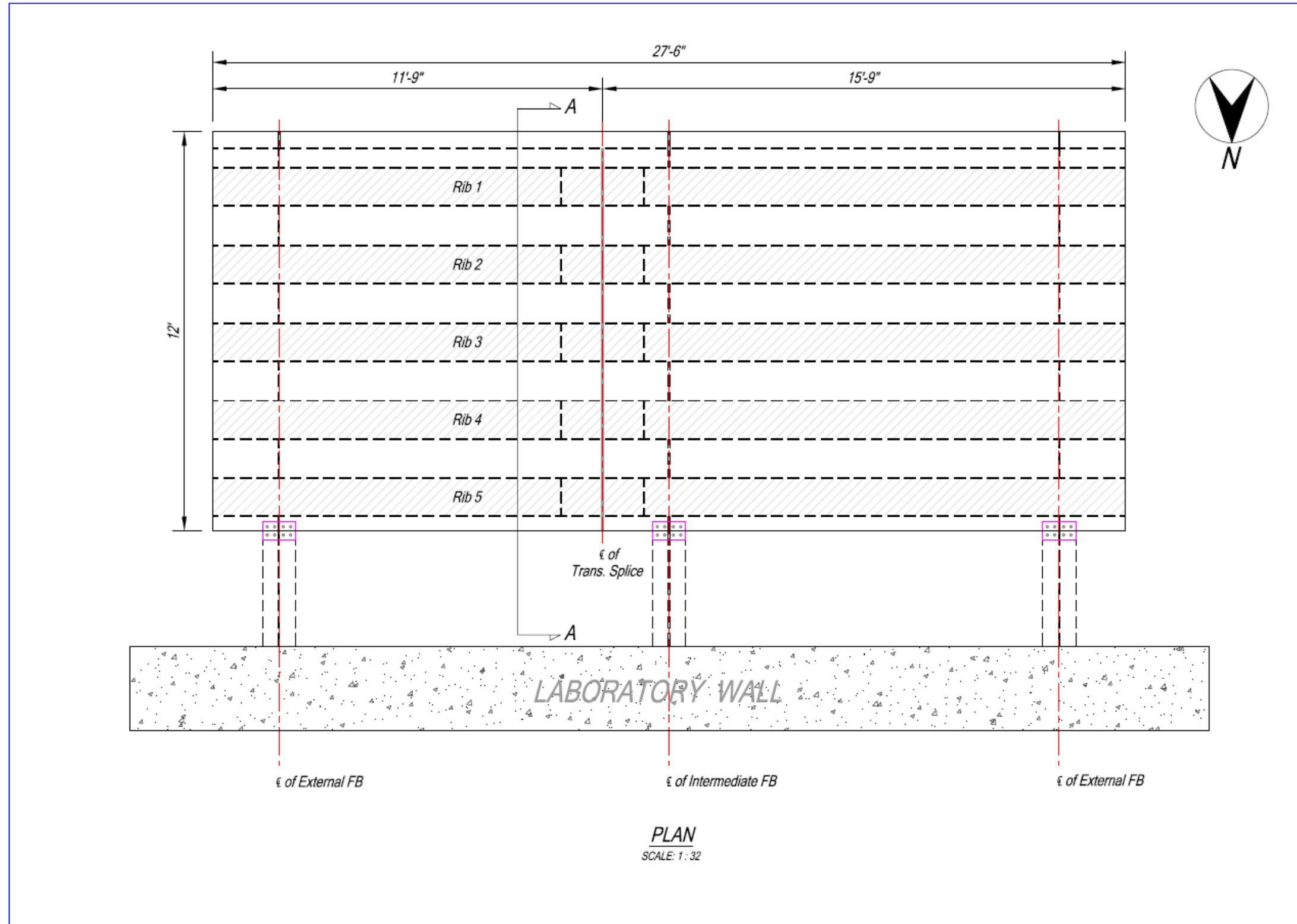


Figure 467. Macro-etched section MU3\_S\_75

## APPENDIX C: SPECIMEN DRAWINGS FOR FULL-SIZE TEST



PROJECT:  
**NJDOT PROJECT  
 2011-14**

- SHEET NOTES:  
 1. Refer attached Specification  
 2. All fillet welds are single pass, 3/16" unless noted otherwise.

NO.	DATE	BY
A	4/19/13	XZ

DESIGNED BY:  
 DRAWN BY: XZ  
 CHECKED BY: SR  
 SCALE: AS SHOWN  
 DATE: 04/10/13  
 PROJECT NO.: 2011-14  
 SHEET TITLE:

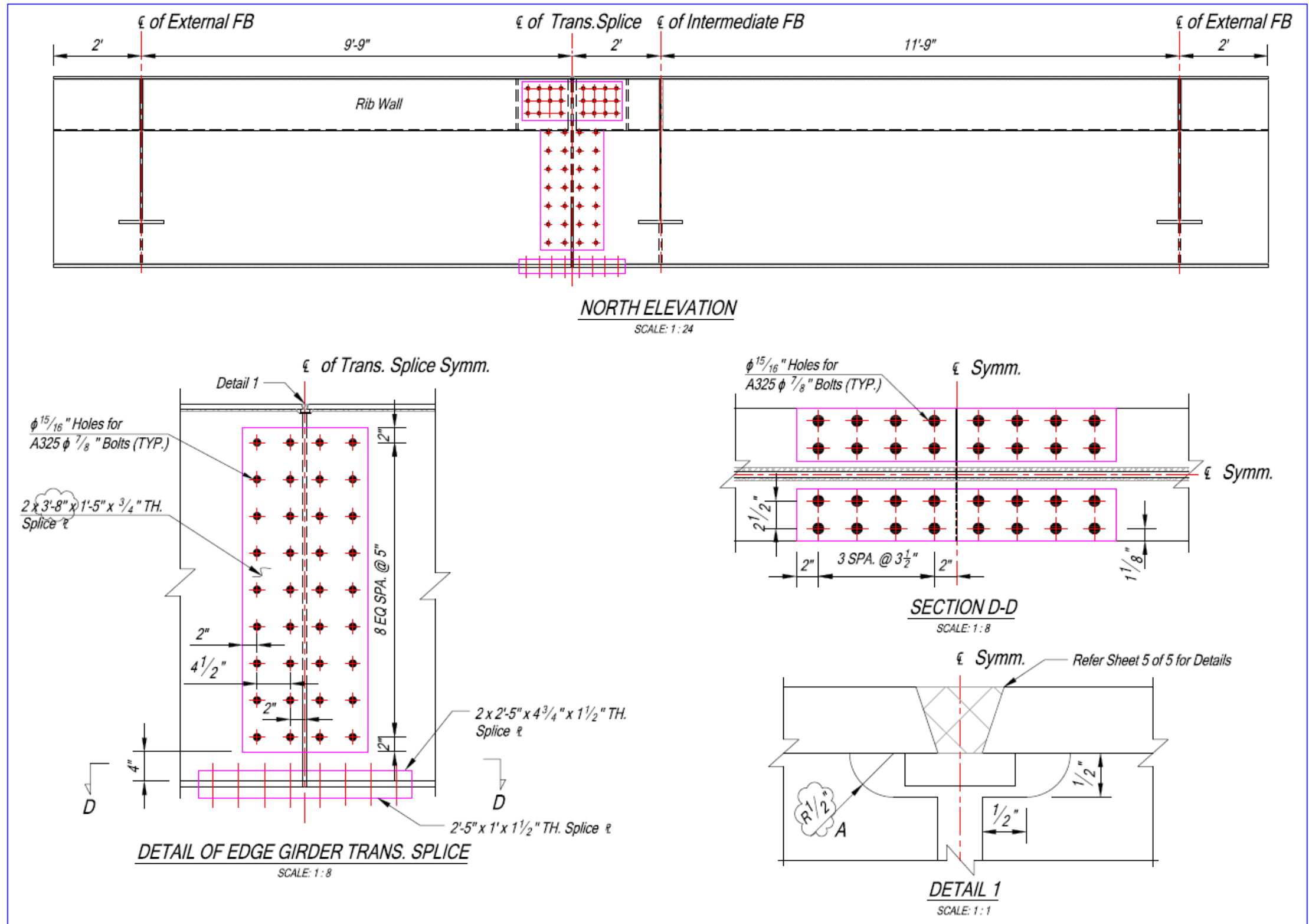
PLAN VIEW

SHEET NO.:

**1 of 5**

Figure 468. Specimen drawing for full-size specimen (sheet 1)





SHEET NOTES:  
1. Refer attached Specification  
2. All fillet welds shall be single pass,  $5/16"$  unless noted otherwise.

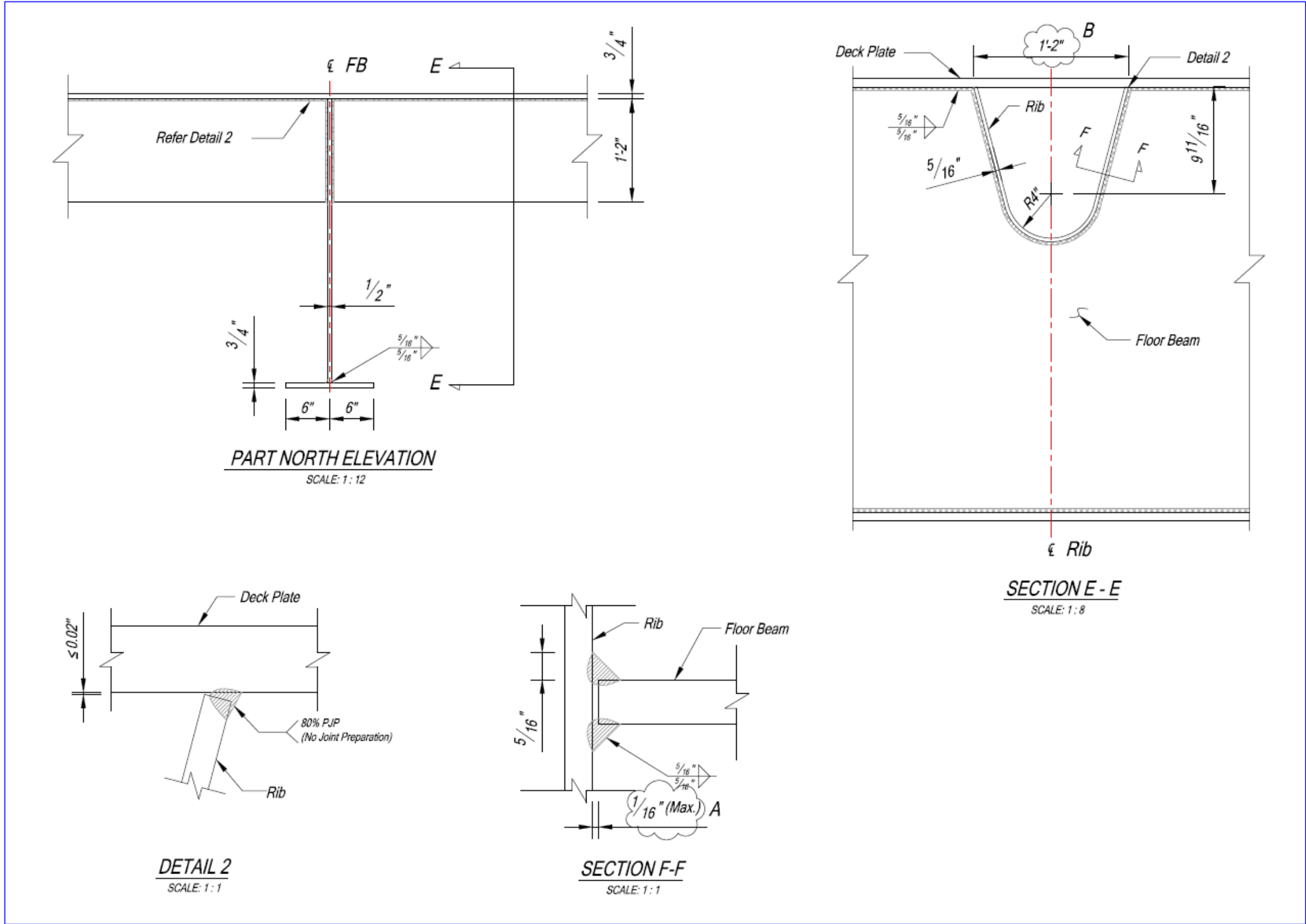
NO.	DESCRIPTION	DATE	BY
A	Revised as marked	4/19/13	XZ

DESIGNED BY:  
DRAWN BY: XZ  
CHECKED BY: SR  
SCALE: AS SHOWN  
DATE: 04/10/13  
PROJECT NO.: 2011-14  
SHEET TITLE:

**ELEVATION AND  
DETAILS**

SHEET NO.:

Figure 470. Specimen drawing for full-size specimen (sheet 3)



PROJECT:  
**NJDOT PROJECT  
 2011-14**

- SHEET NOTES:**
1. Refer attached Specification
  2. All fillet welds are single pass,  $\frac{5}{16}$ " unless noted otherwise.

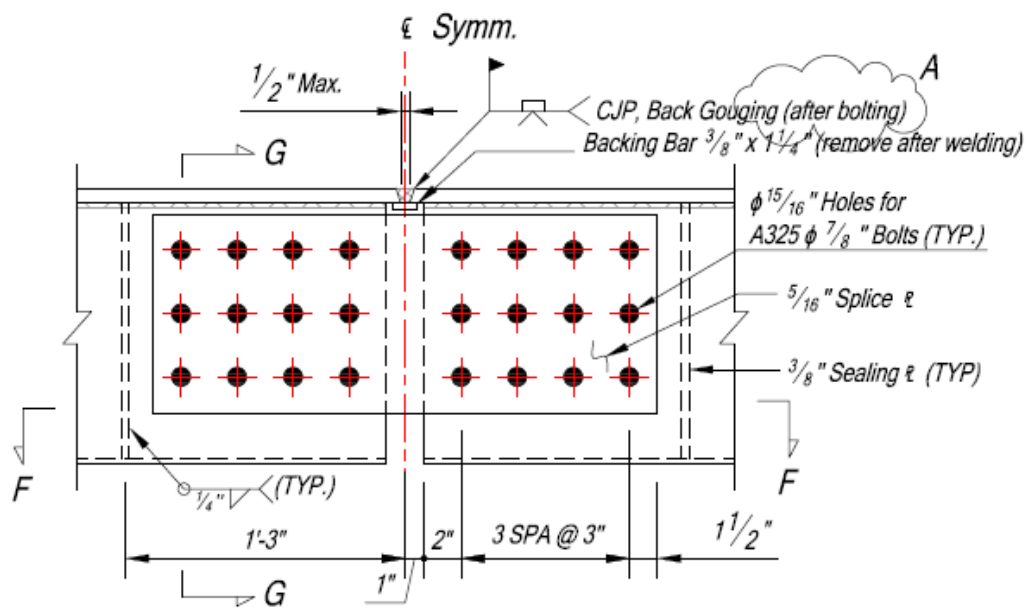
NO.	DATE	BY
B	5/16/13	XZ
A	4/19/13	XZ

DESIGNED BY:  
 DRAWN BY: XZ  
 CHECKED BY: SR  
 SCALE: AS SHOWN  
 DATE: 04/10/13  
 PROJECT NO.: 2011-14  
 SHEET TITLE:

**DETAILS OF RIB TO FB  
 AND RIB TO DECK  
 CONNECTIONS**

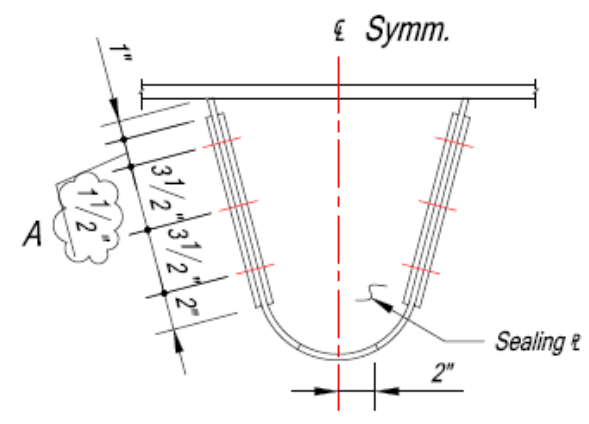
SHEET NO.:

Figure 471. Specimen drawing for full-size specimen (sheet 4)



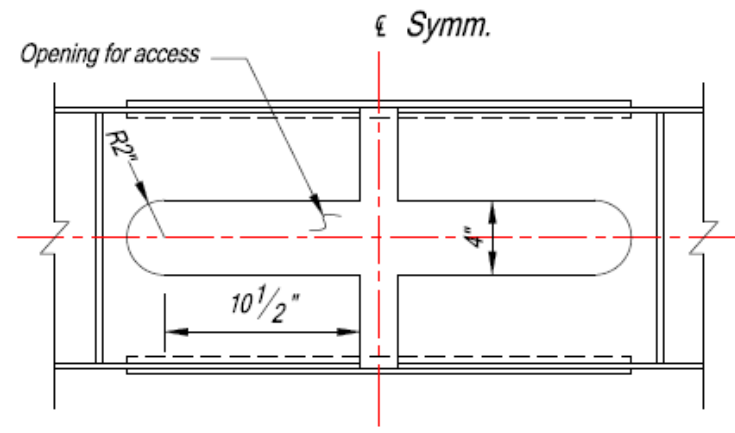
**DETAIL OF TRANSVERSE RIB SPLICE**

SCALE: 1:8



**SECTION G-G**

SCALE: 1:8



**SECTION F-F**

SCALE: 1:8

- SHEET NOTES:
1. Refer attached Specification
  2. All fillet welds are single pass, 3/16" unless noted otherwise.

NO.	DATE	BY
A	4/19/13	XZ
A	4/19/13	XZ

DESIGNED BY:  
DRAWN BY: XZ  
CHECKED BY: SR  
SCALE: AS SHOWN  
DATE: 04/10/13  
PROJECT NO.: 2011-14  
SHEET TITLE:

**DETAILS OF RIB  
SPLICE**

SHEET NO.:

Figure 472. Specimen drawing for full-size specimen (sheet 5)

**APPENDIX D: MACRO-ETCHED SECTIONS FOR RIB-TO-DECK PLATE WELDS IN  
MU4**

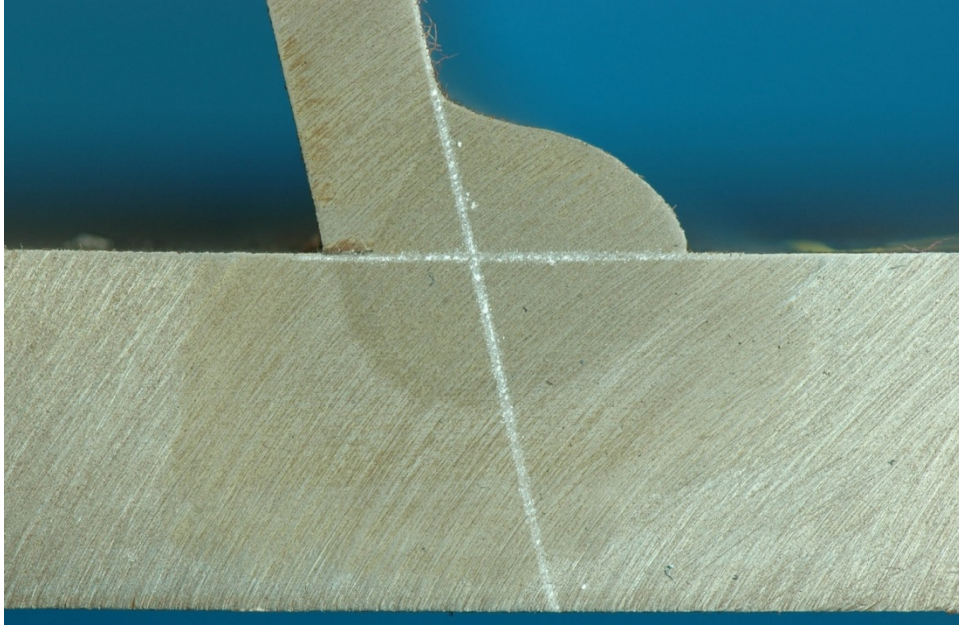


Figure 473. Macro-etched section S12\_1

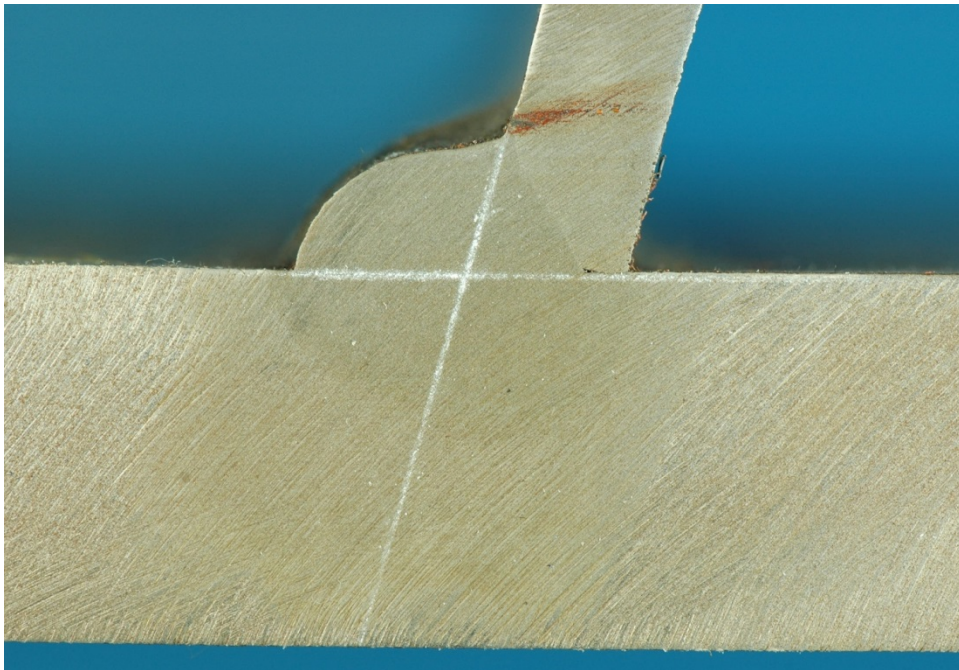


Figure 474. Macro-etched section S34\_1



Figure 475. Macro-etched section S12\_2



Figure 476. Macro-etched section S34\_2

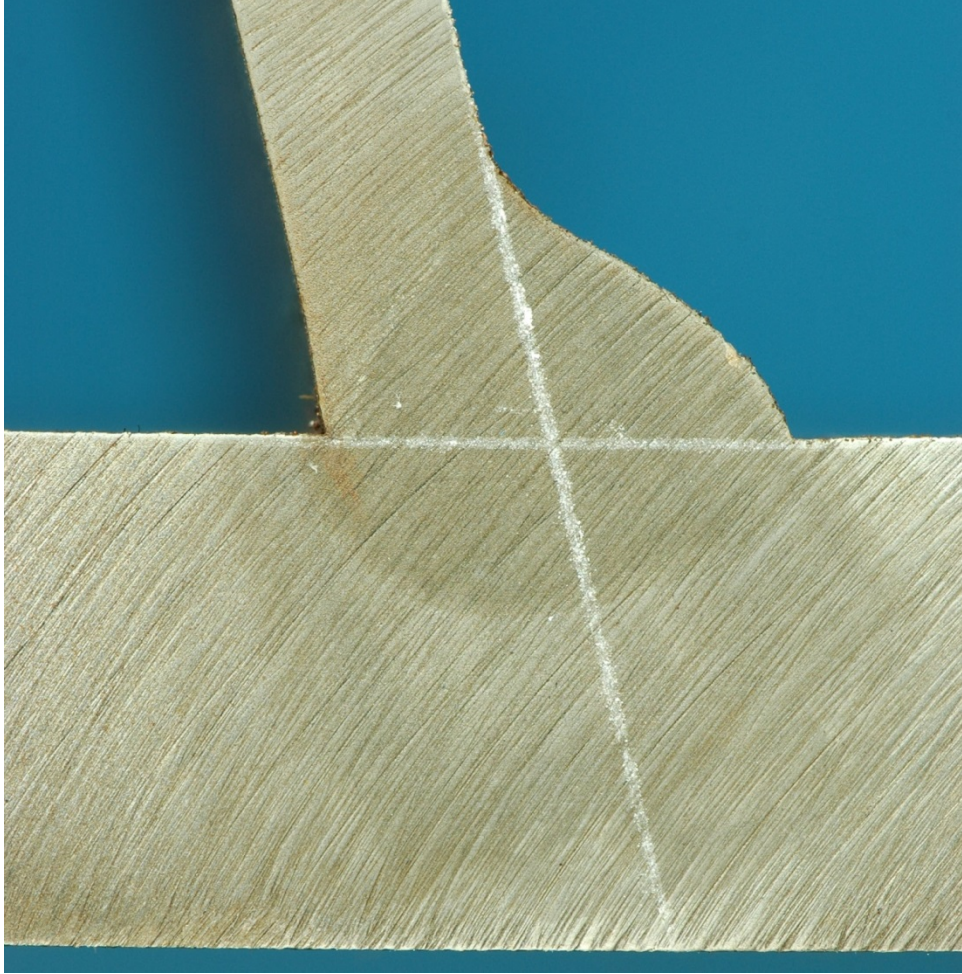


Figure 477. Macro-etched section S12\_3

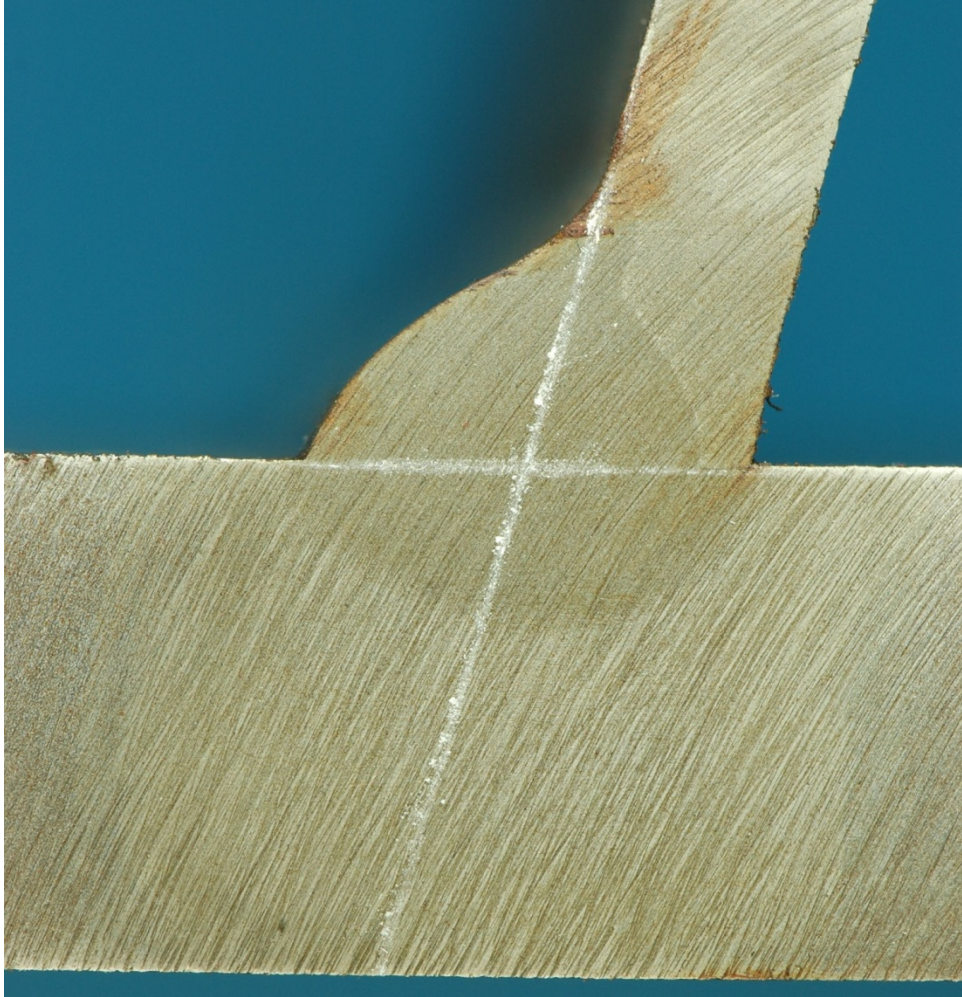


Figure 478. Macro-etched section S34\_3



Figure 479. Macro-etched section S12\_4



Figure 480. Macro-etched section S34\_4

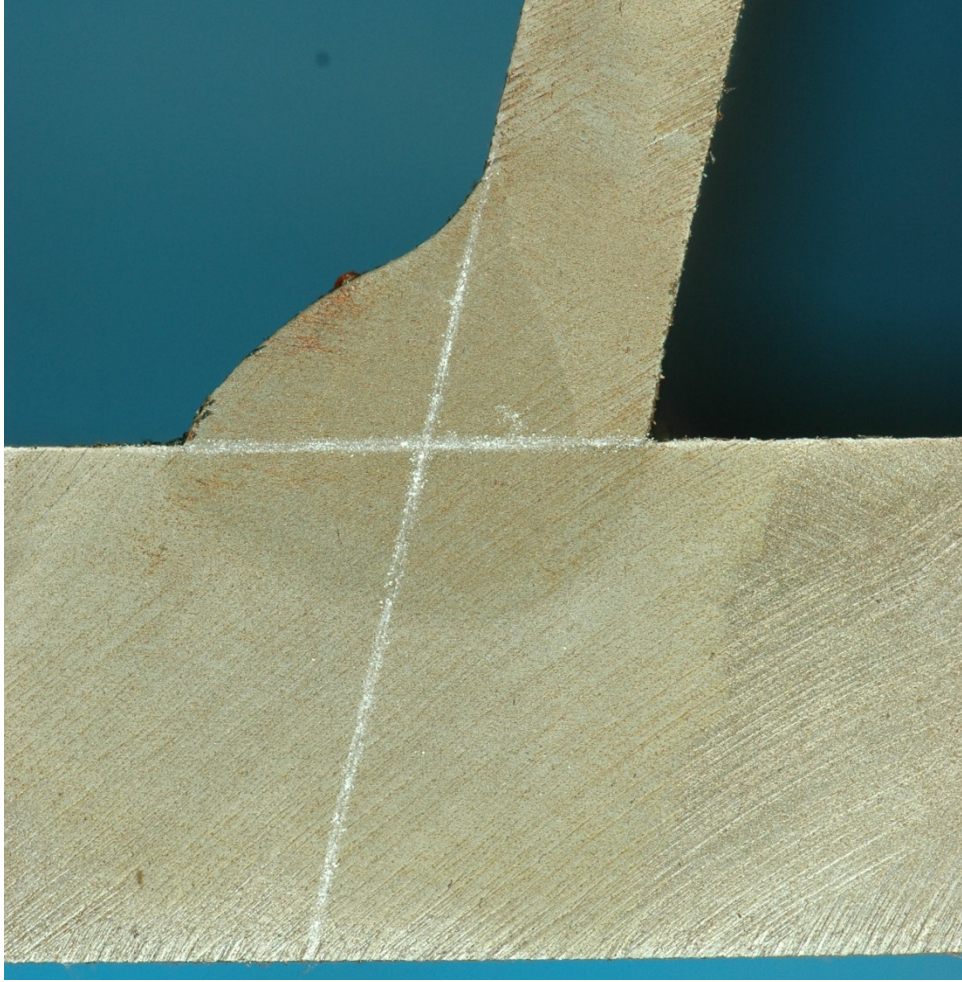


Figure 481. Macro-etched section S12\_5



Figure 482. Macro-etched section S34\_5

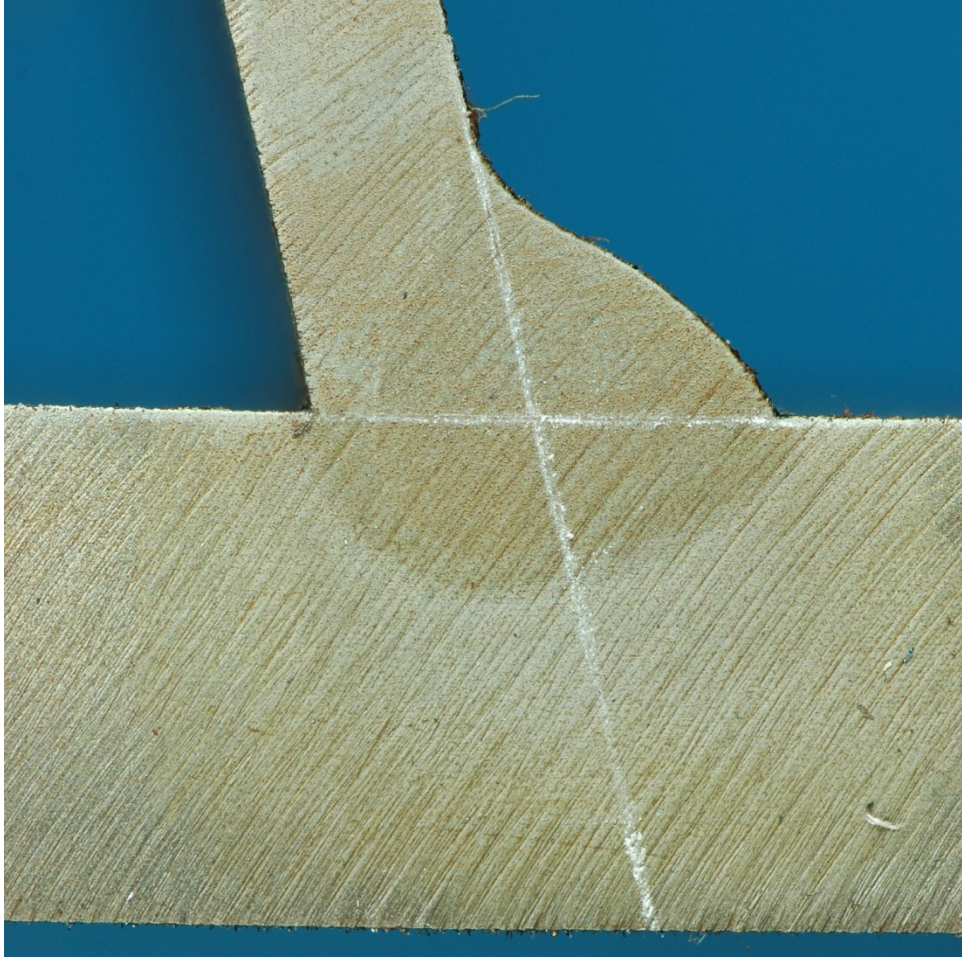


Figure 483. Macro-etched section S12\_6

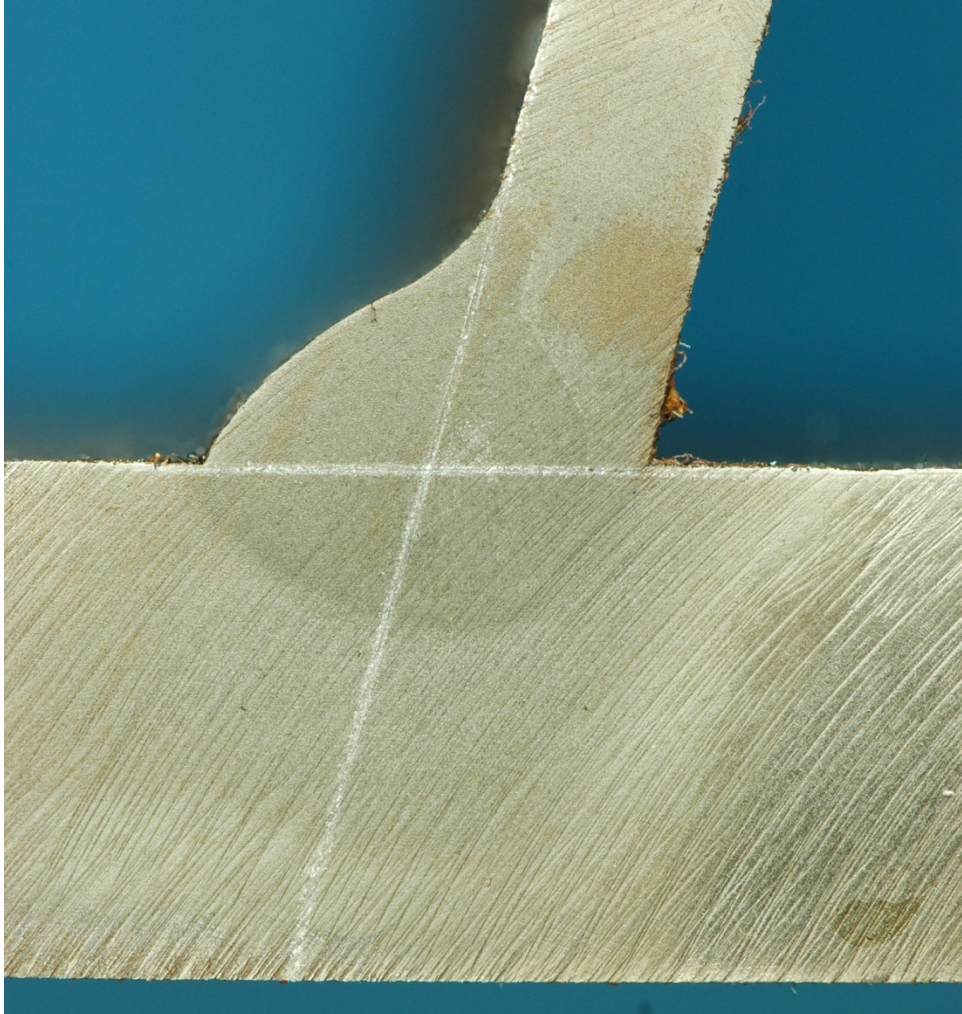


Figure 484. Macro-etched section S34\_6

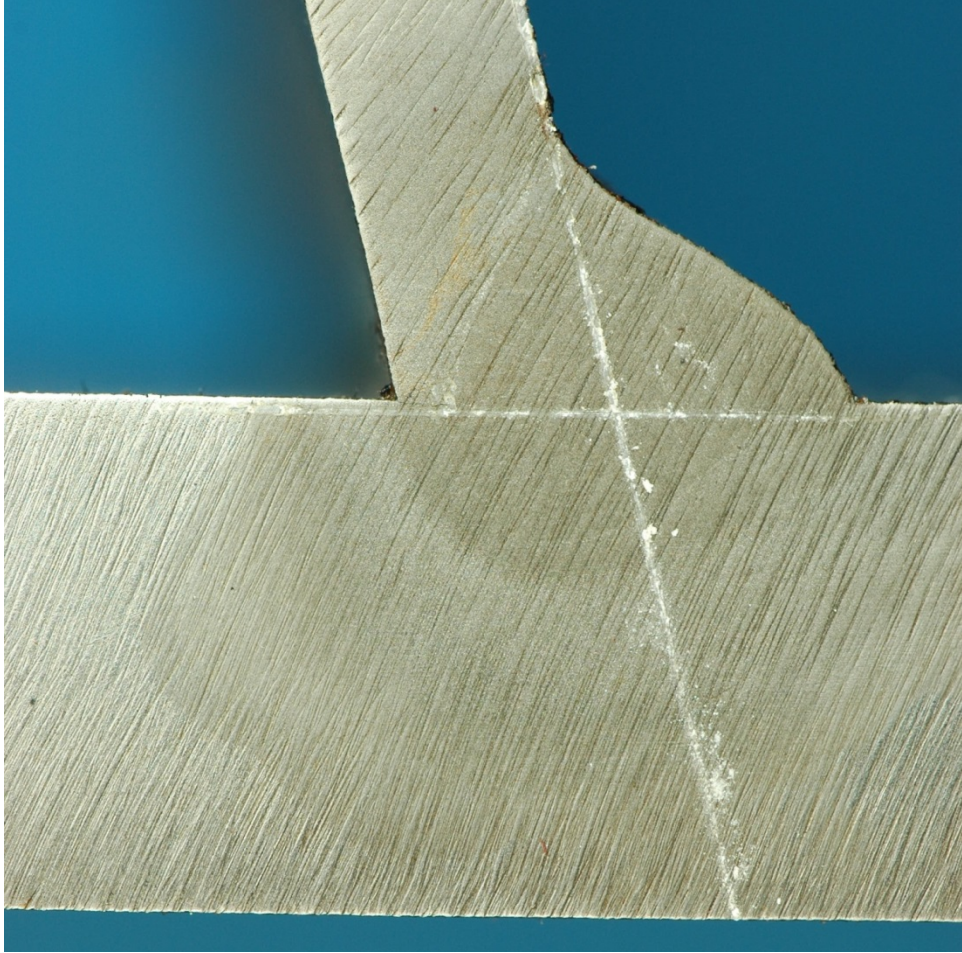


Figure 485. Macro-etched section S12\_7



Figure 486. Macro-etched section S34\_7

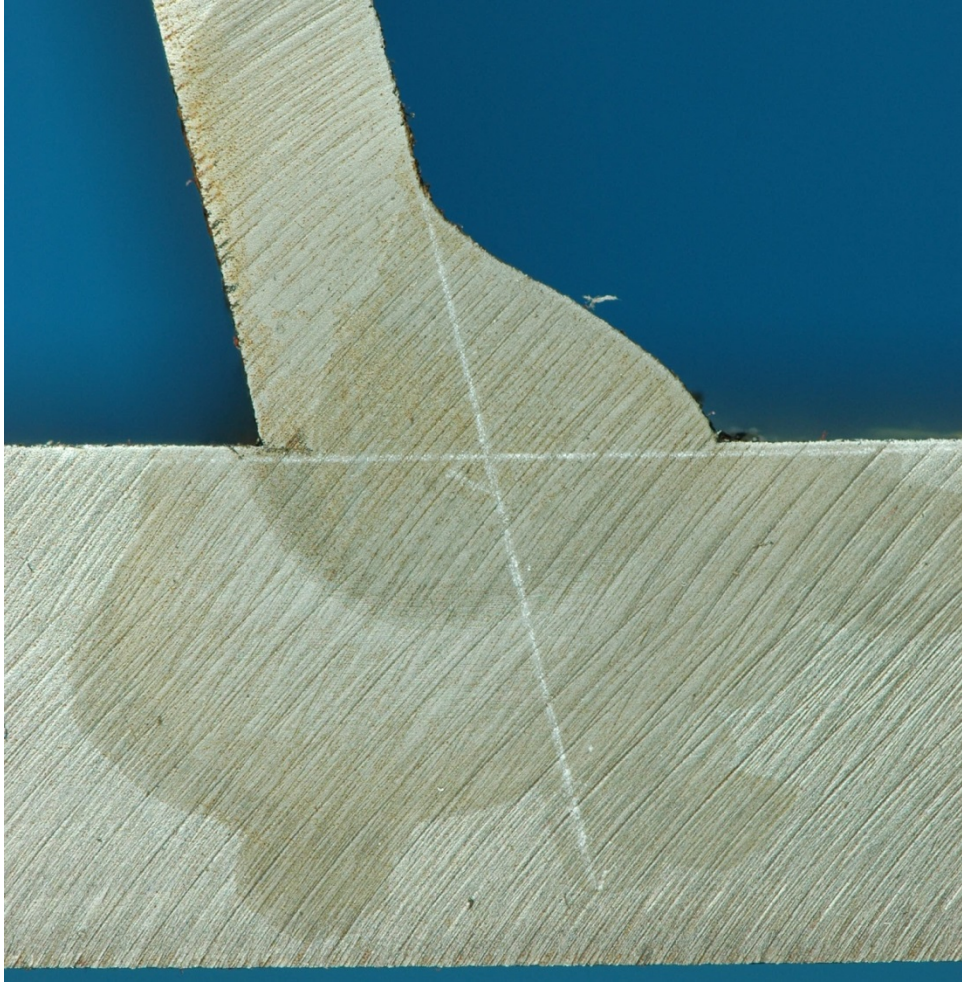


Figure 487. Macro-etched section S12\_8

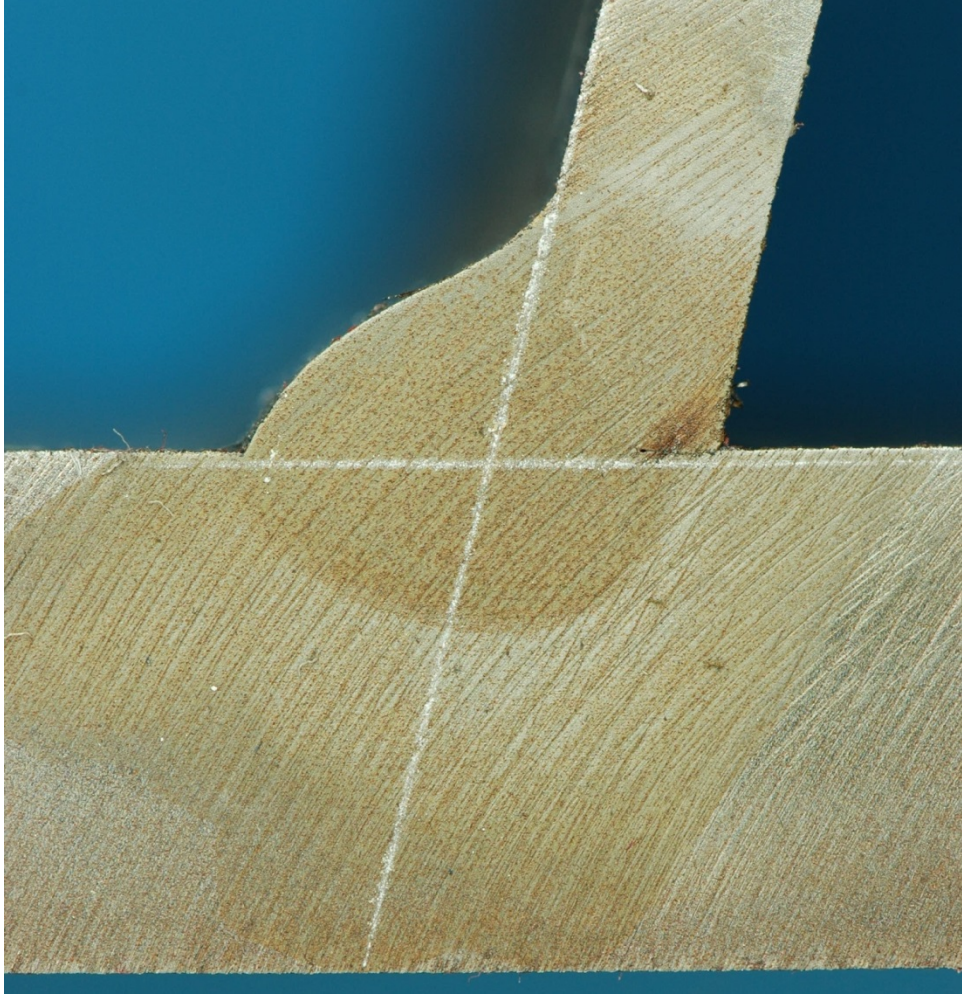


Figure 488. Macro-etched section S34\_8

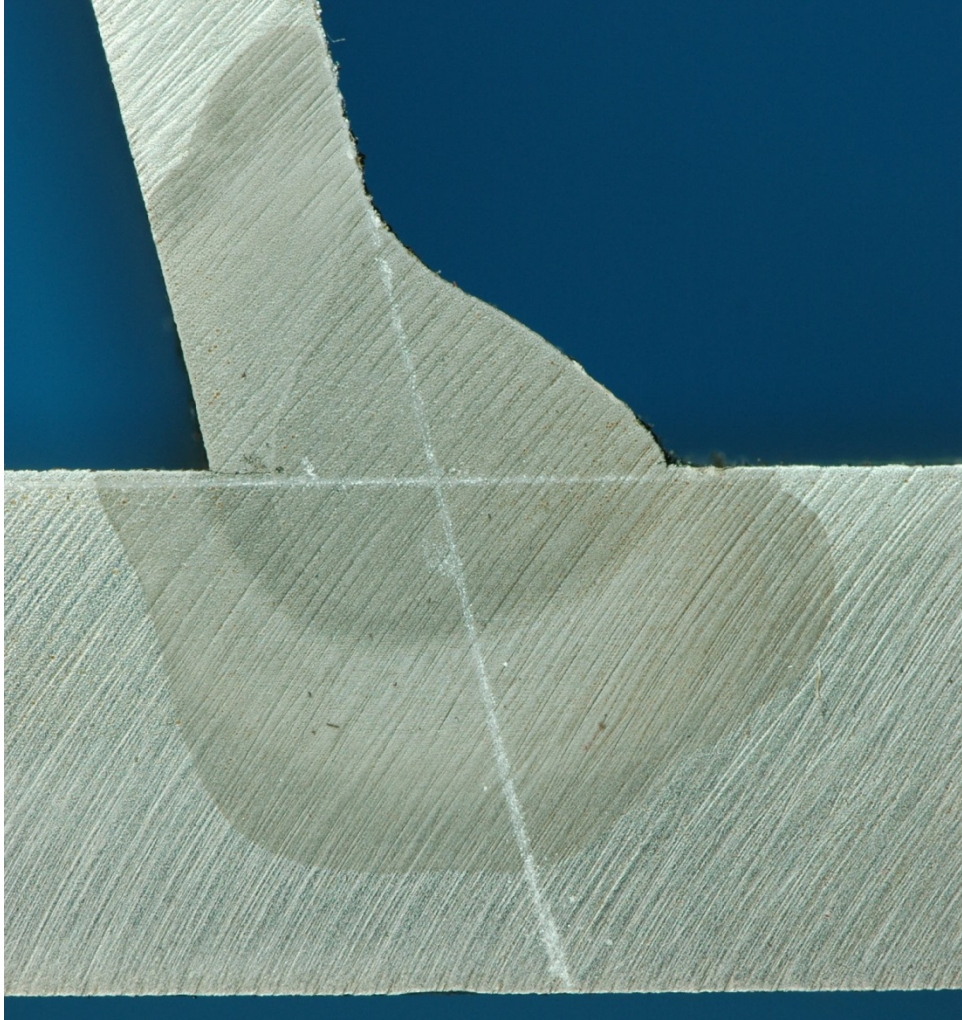


Figure 489. Macro-etched section S12\_9

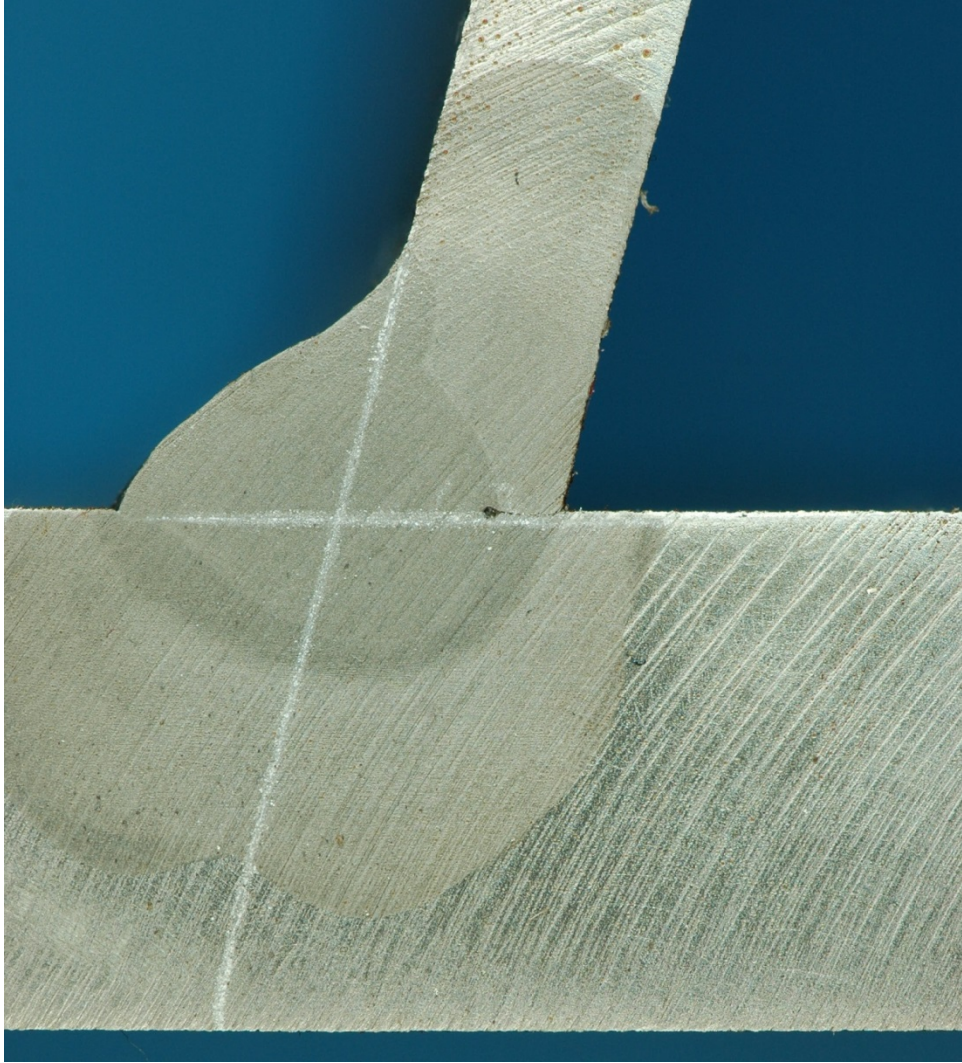


Figure 490. Macro-etched section S34\_9

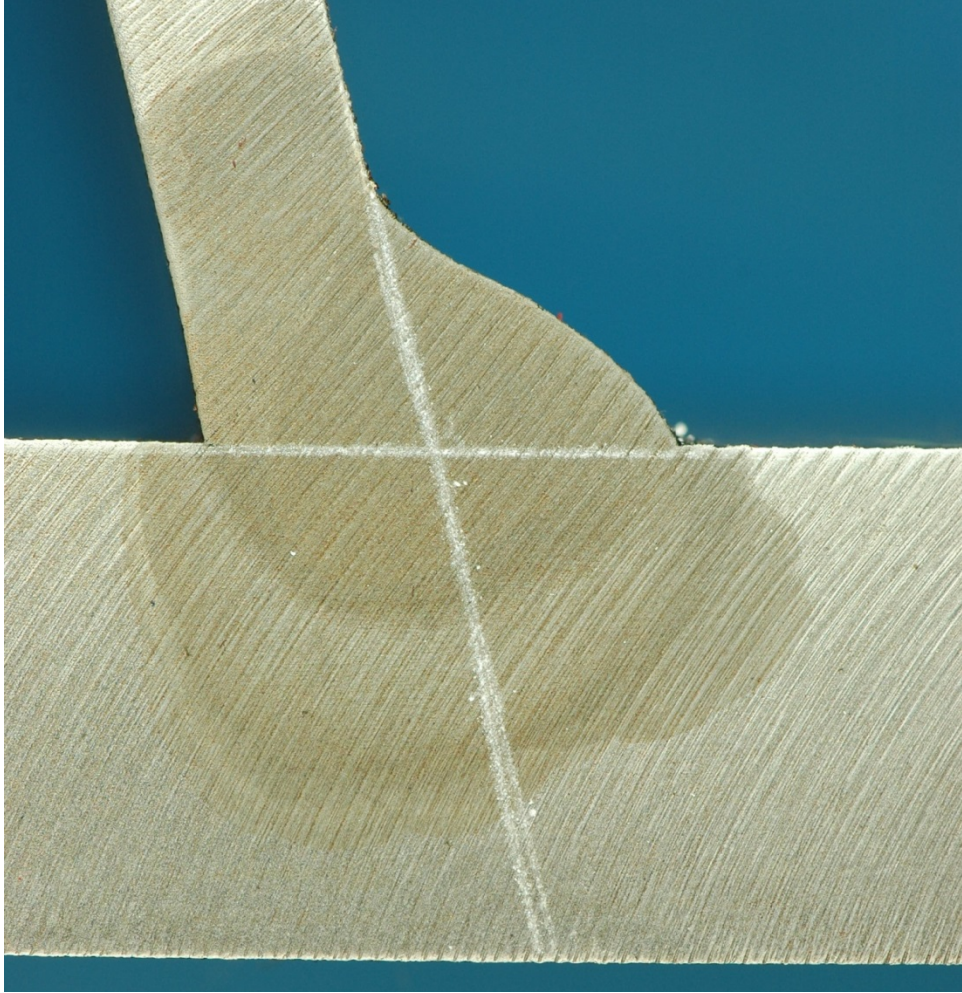


Figure 491. Macro-etched section S12\_10

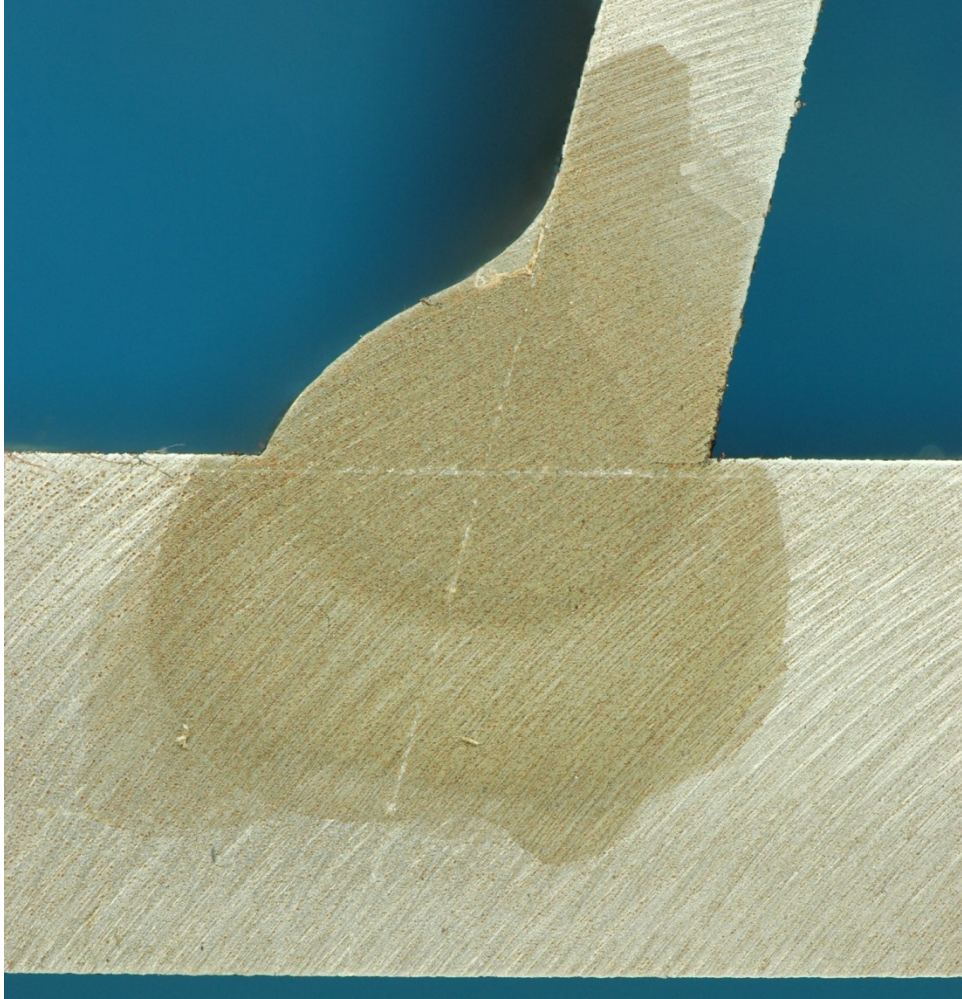


Figure 492. Macro-etched section S34\_10

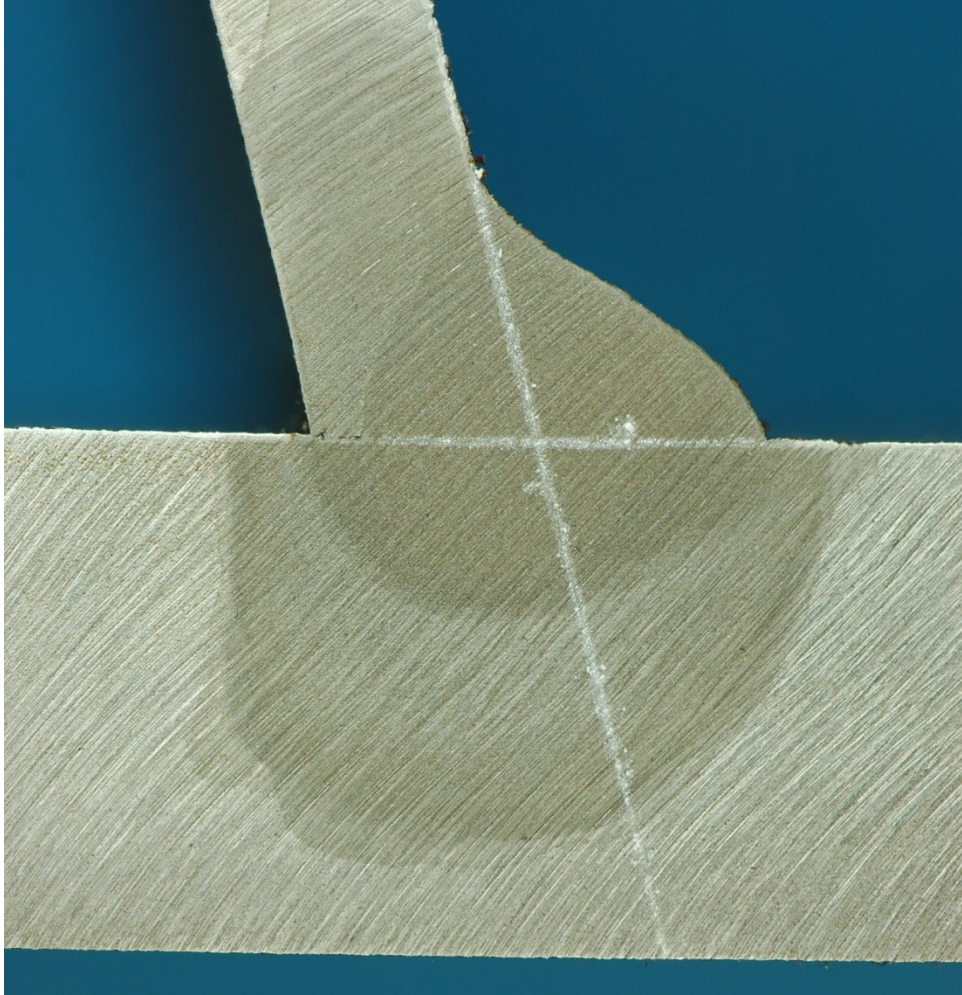


Figure 493. Macro-etched section S12\_11

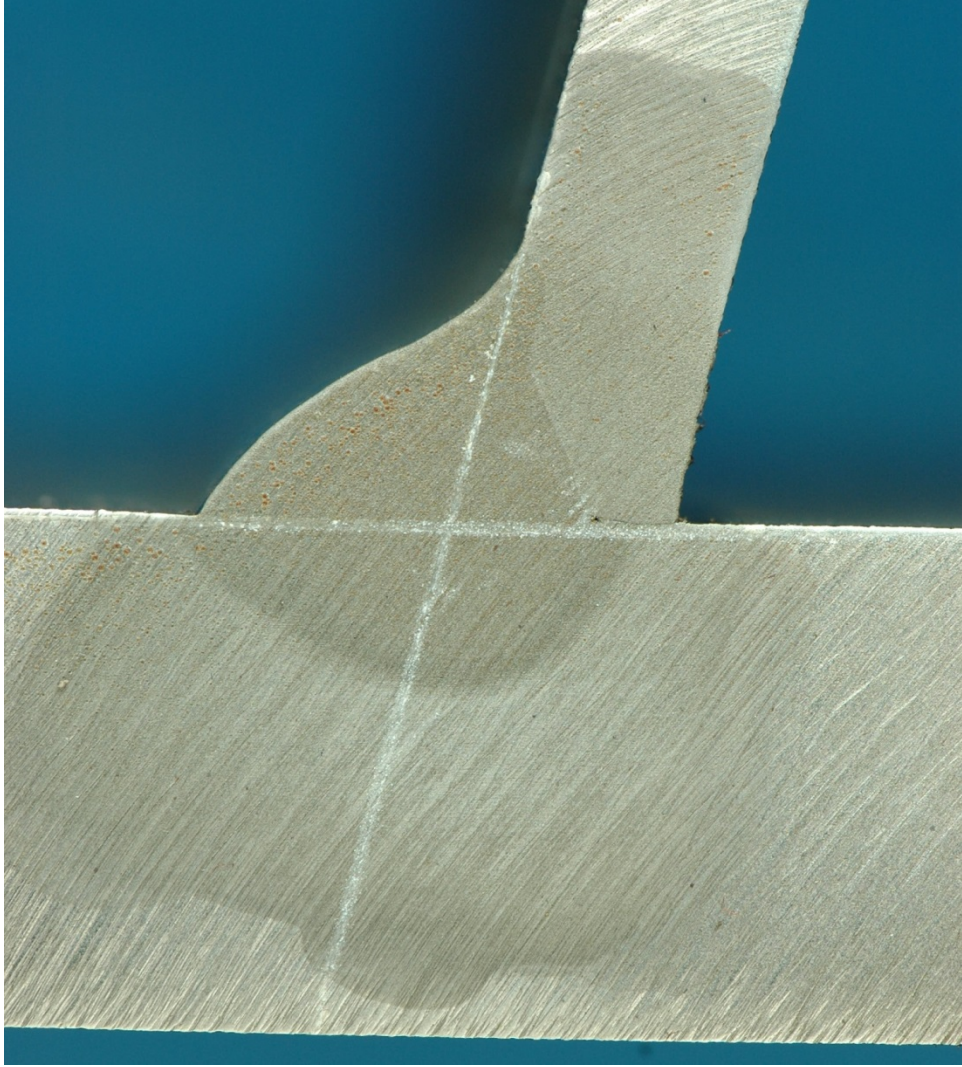


Figure 494. Macro-etched section S34\_11

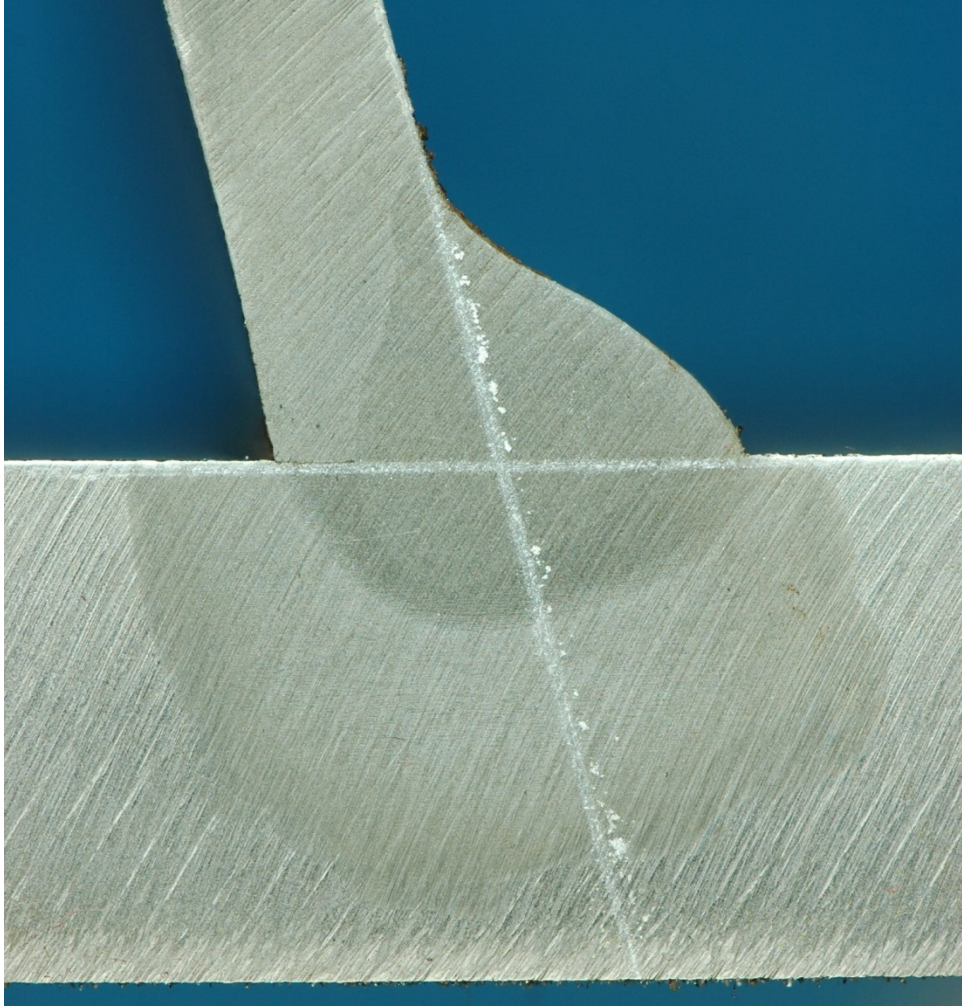


Figure 495. Macro-etched section S12\_12

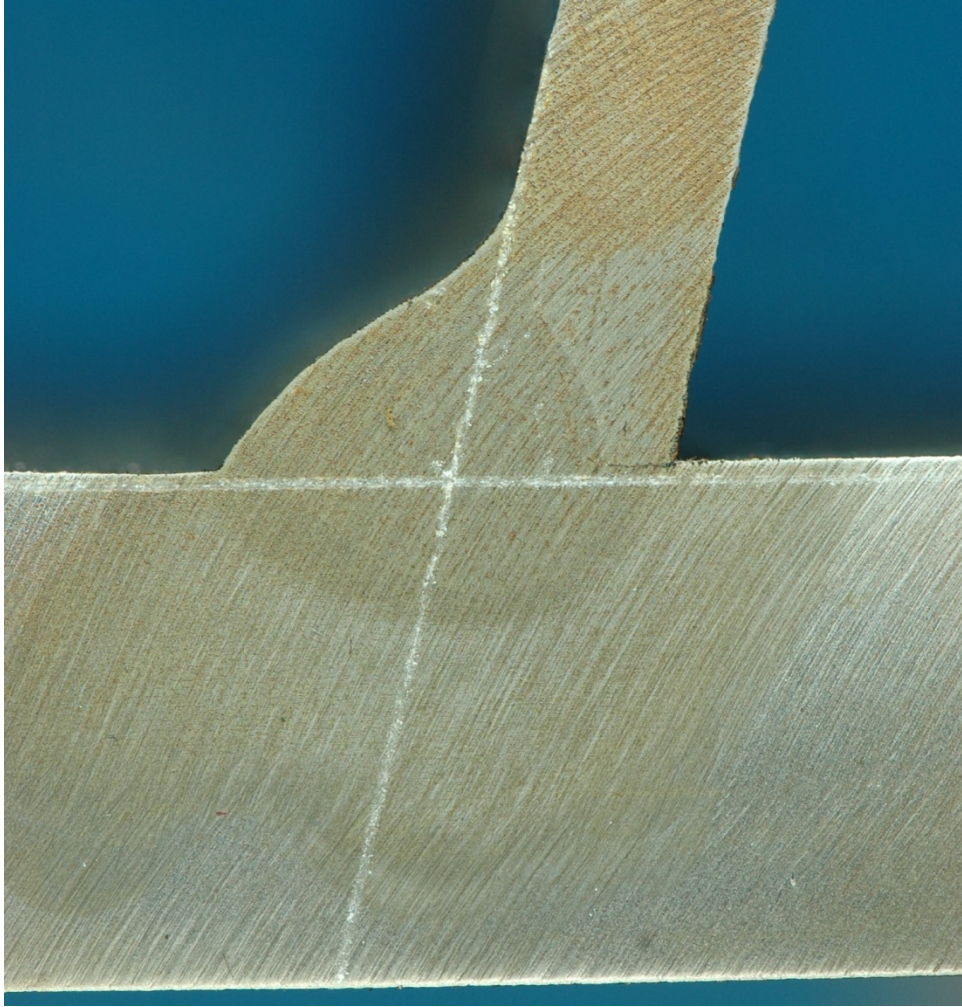


Figure 496. Macro-etched section S34\_12



Figure 497. Macro-etched section S12\_13

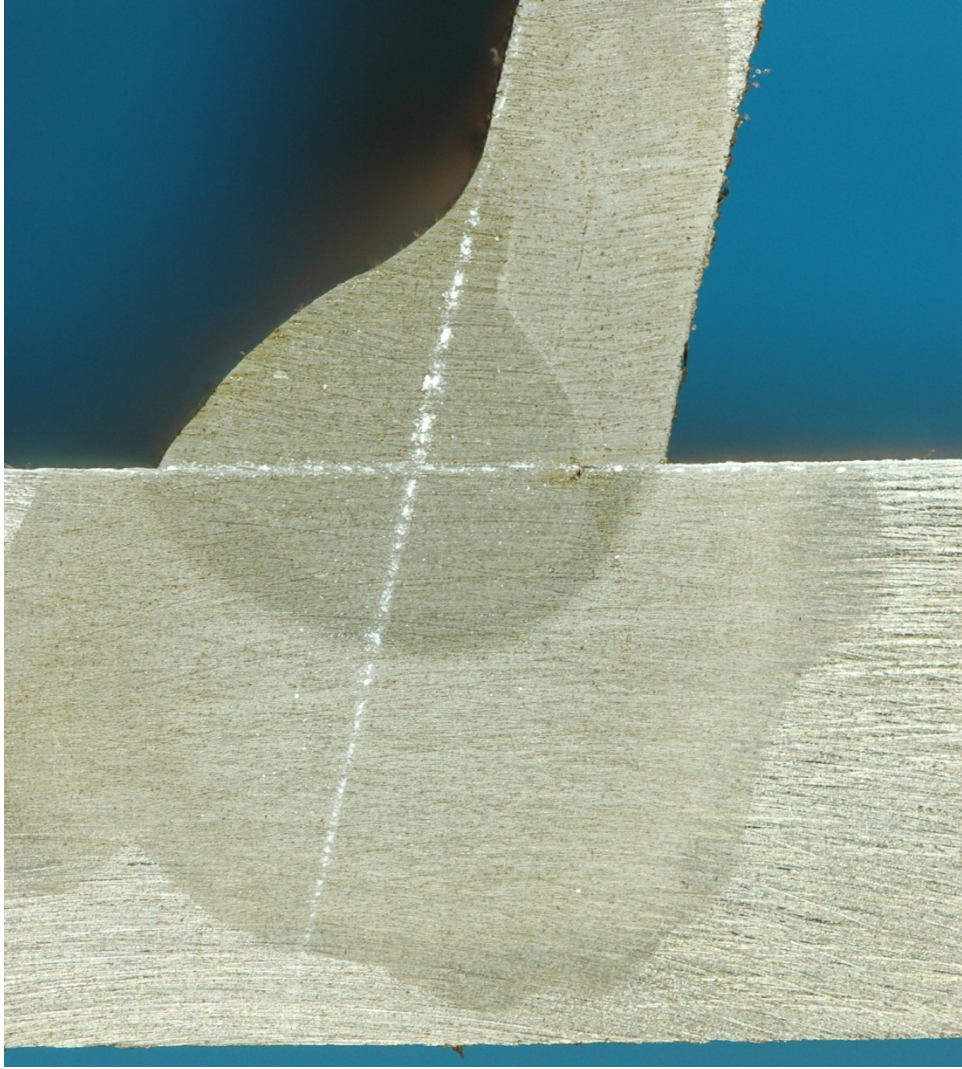


Figure 498. Macro-etched section S34\_13

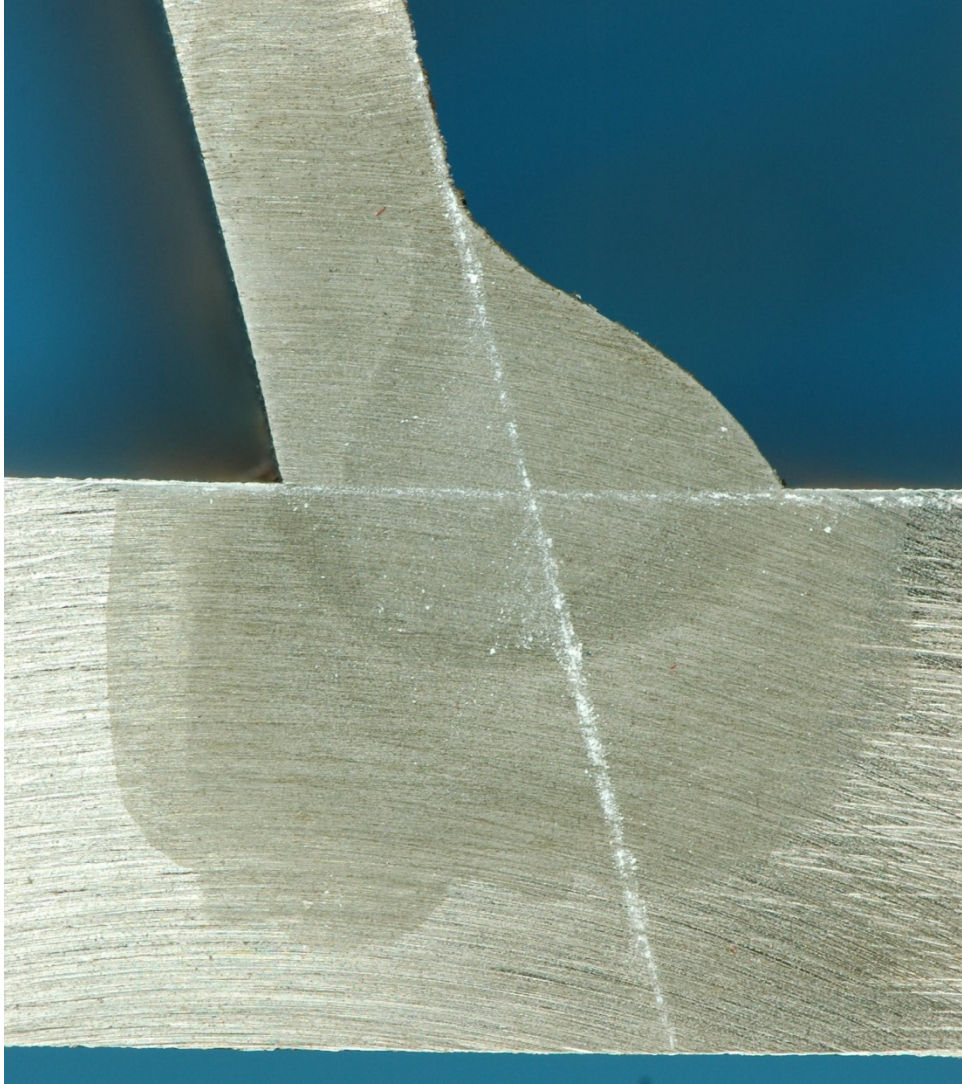


Figure 499. Macro-etched section S12\_14

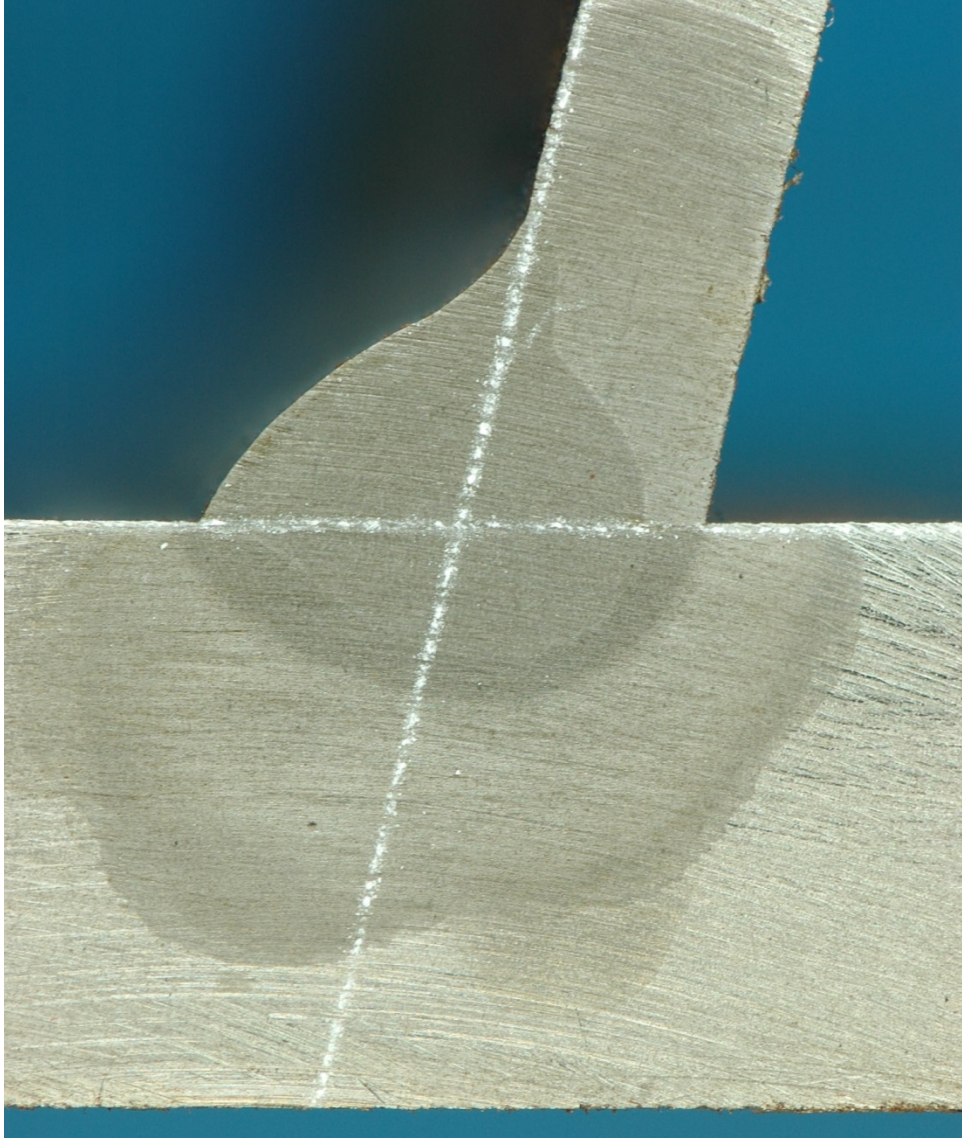


Figure 500. Macro-etched section S34\_14



Figure 501. Macro-etched section S12\_15

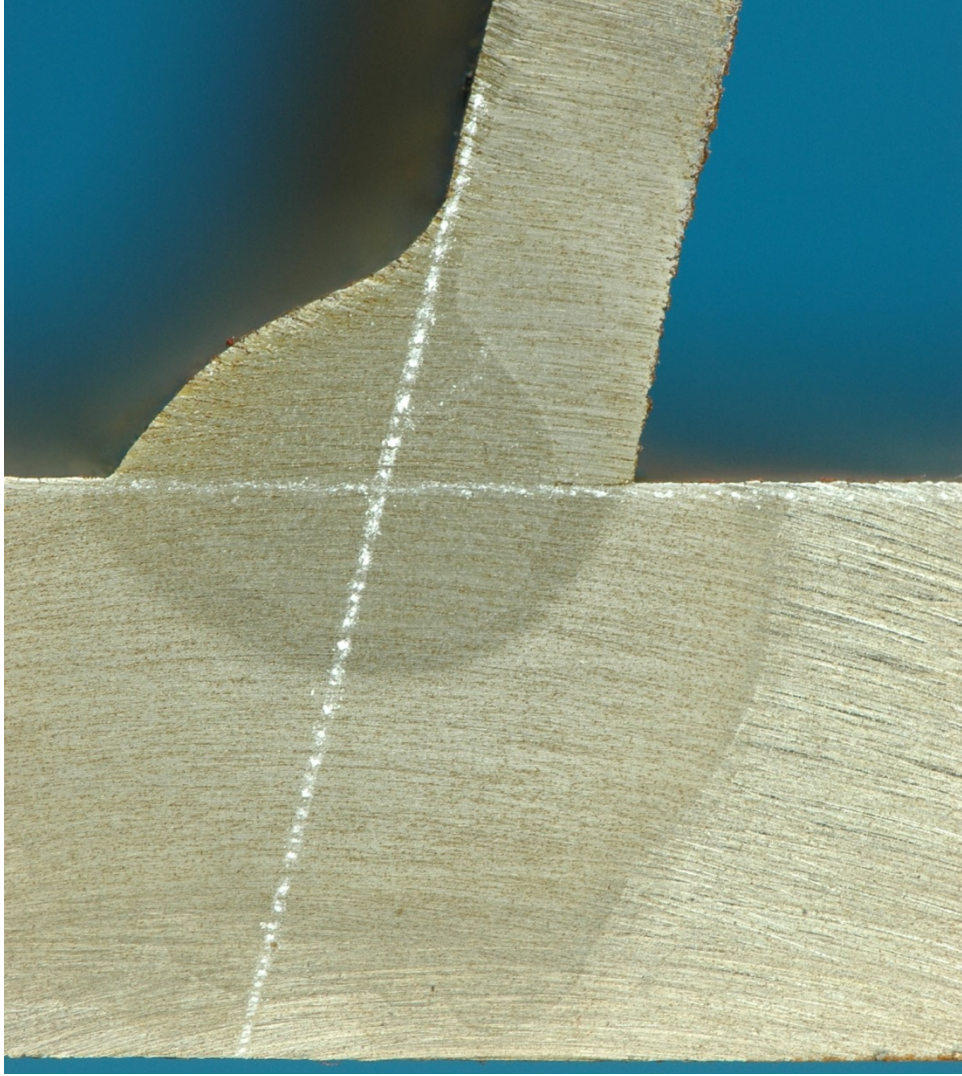


Figure 502. Macro-etched section S34\_15

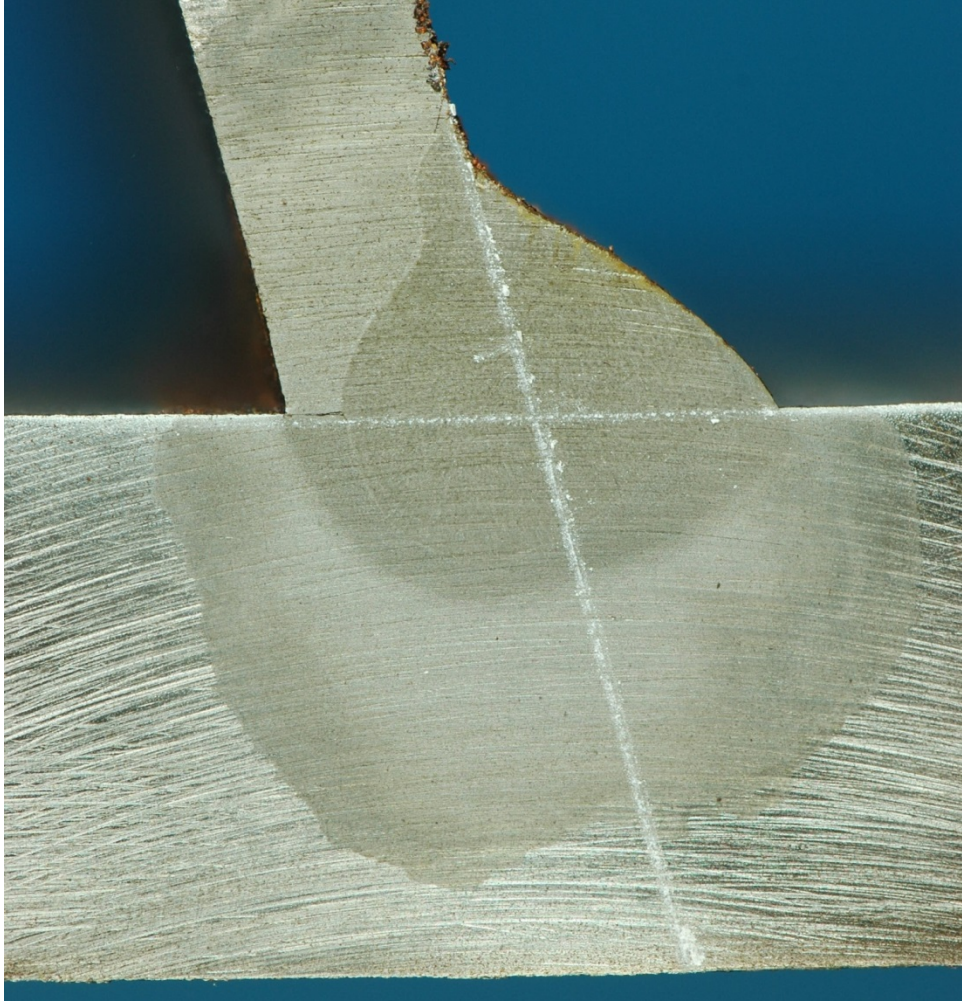


Figure 503. Macro-etched section S12\_16



Figure 504. Macro-etched section S34\_16



Figure 505. Macro-etched section S12\_17

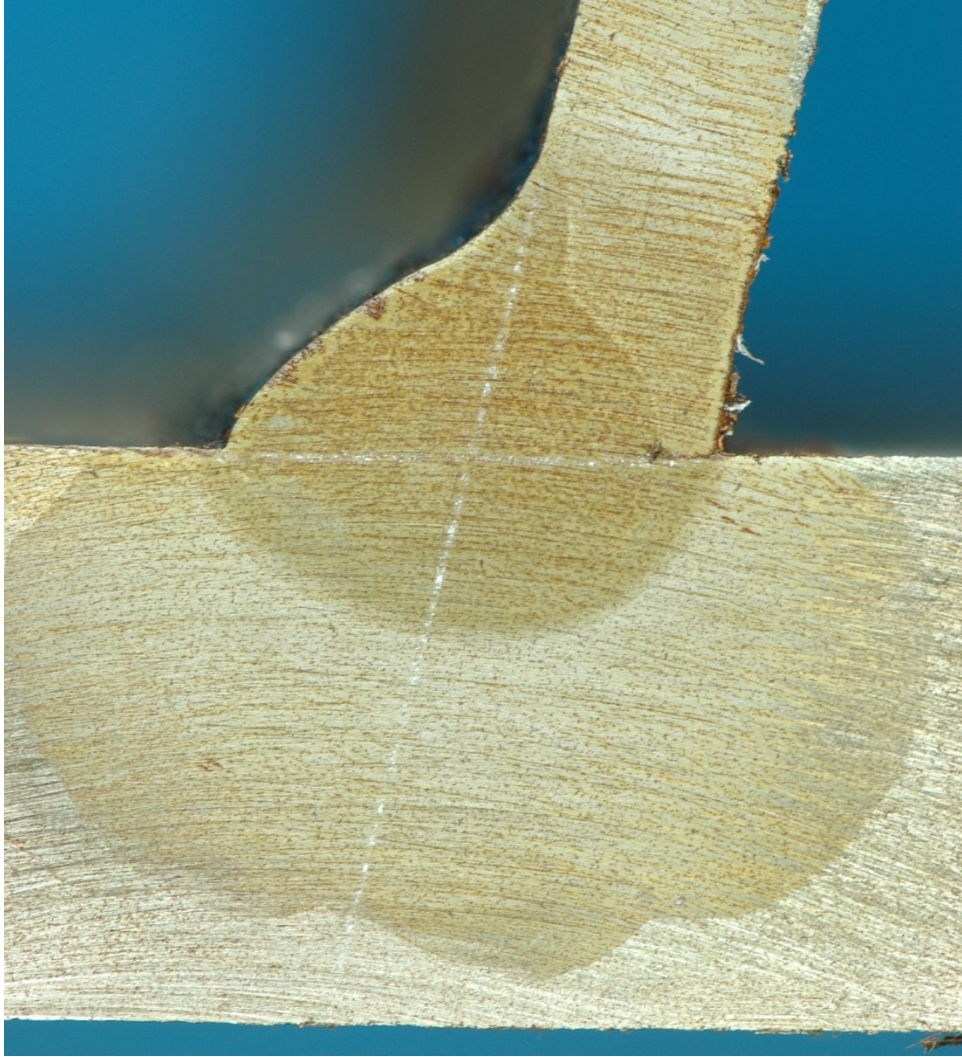


Figure 506. Macro-etched section S34\_17



Figure 507. Macro-etched section S12\_18



Figure 508. Macro-etched section S34\_18



Figure 509. Macro-etched section S12\_19



Figure 510. Macro-etched section S34\_19



Figure 511. Macro-etched section S12\_20



Figure 512. Macro-etched section S34\_20



Figure 513. Macro-etched section S12\_21



Figure 514. Macro-etched section S34\_21



Figure 515. Macro-etched section S12\_22



Figure 516. Macro-etched section S34\_22



Figure 517. Macro-etched section S12\_23



Figure 518. Macro-etched section S34\_23

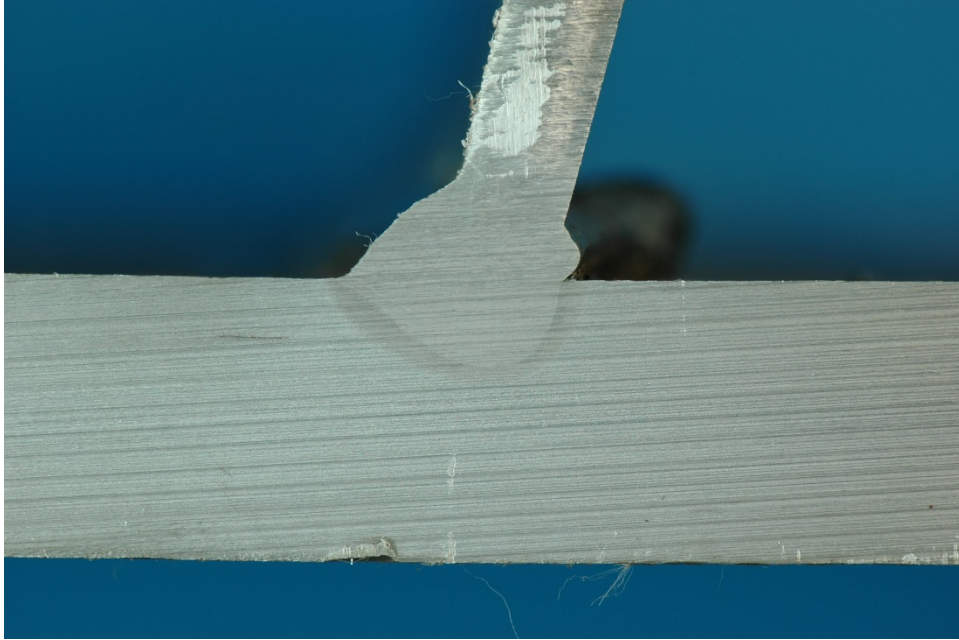


Figure 519. Macro-etched section S12\_24

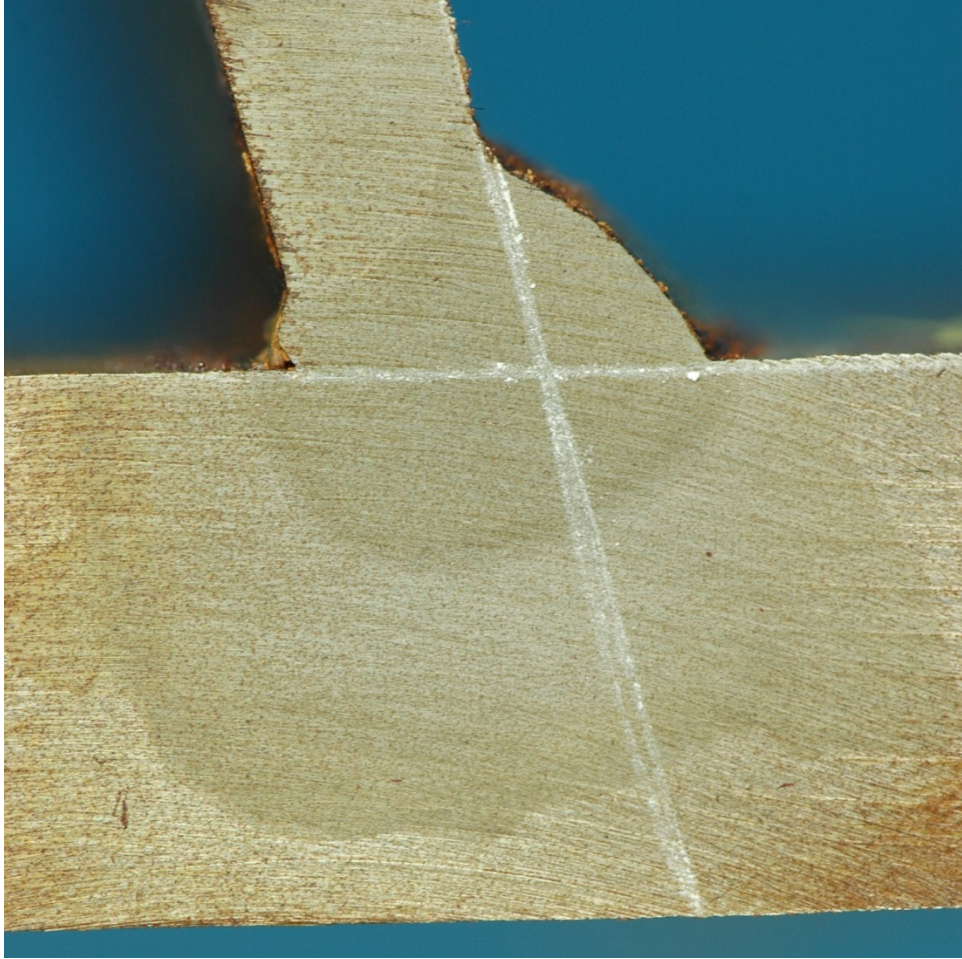


Figure 520. Macro-etched section S12\_24 in specimen 24

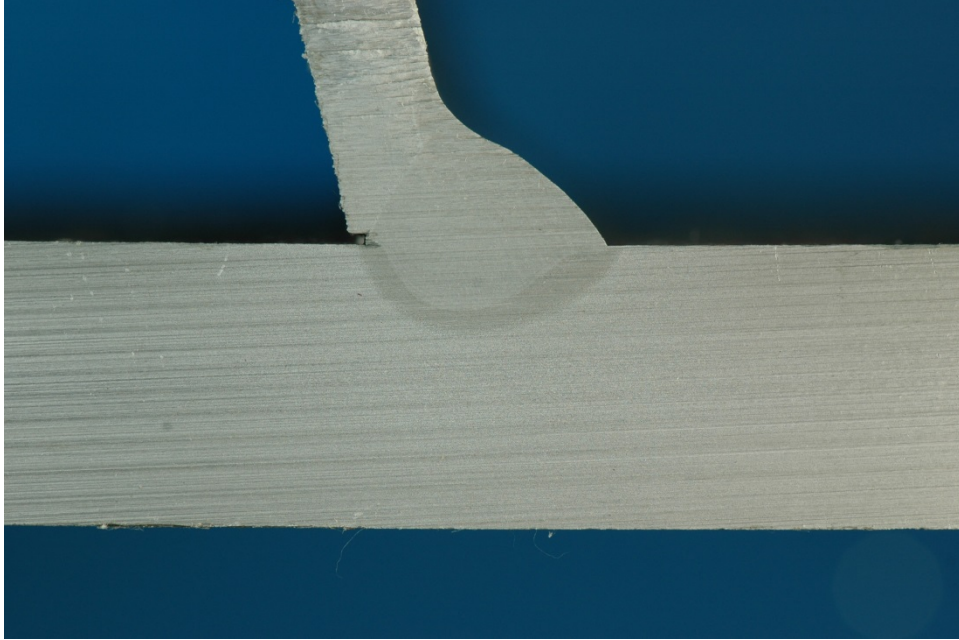


Figure 521. Macro-etched section S34\_24 in specimen 23



Figure 522. Macro-etched section S34\_24 in specimen 24



Figure 523. Macro-etched section S12\_25



Figure 524. Macro-etched section S34\_25

**APPENDIX E: MACRO-ETCHED SECTIONS FOR RIB-TO-DECK PLATE WELDS  
FOR RIB 1 IN MU5**



Figure 525. Macro-etched section R1\_A\_6



Figure 526. Macro-etched section R1\_B\_6

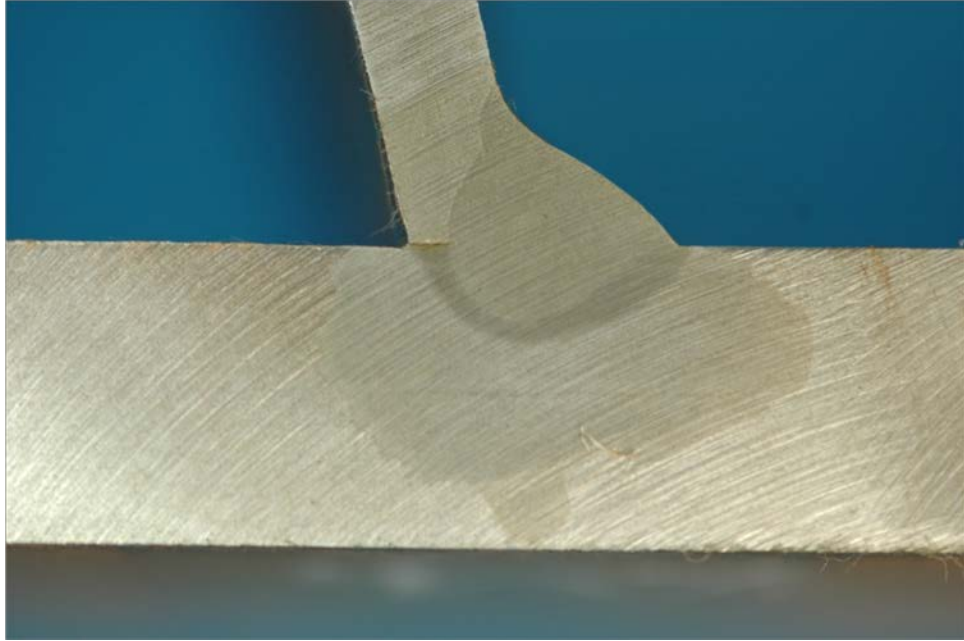


Figure 527. Macro-etched section R1\_A\_18



Figure 528. Macro-etched section R1\_B\_18

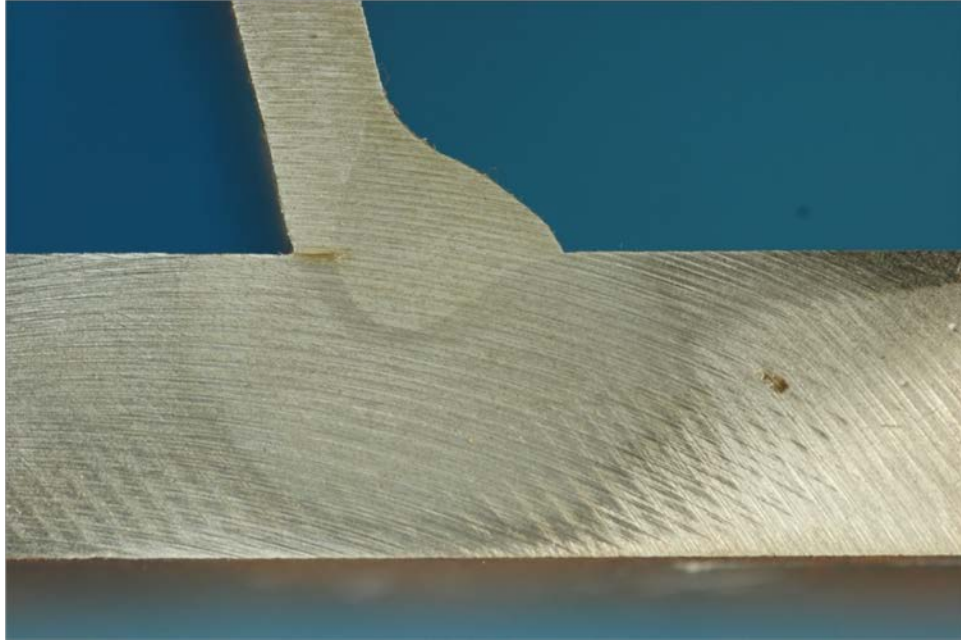


Figure 529. Macro-etched section R1\_A\_30

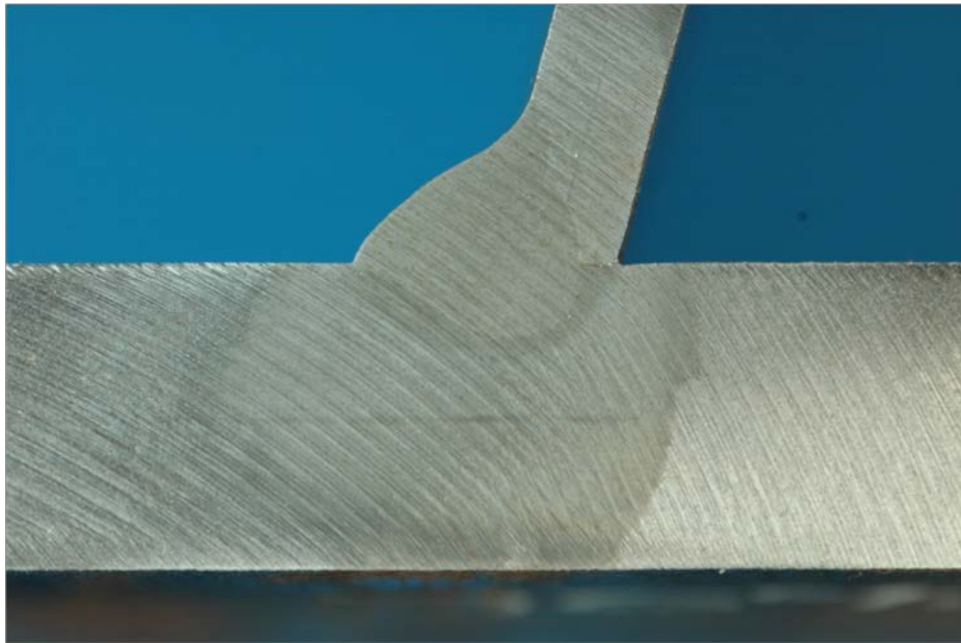


Figure 530. Macro-etched section R1\_B\_30

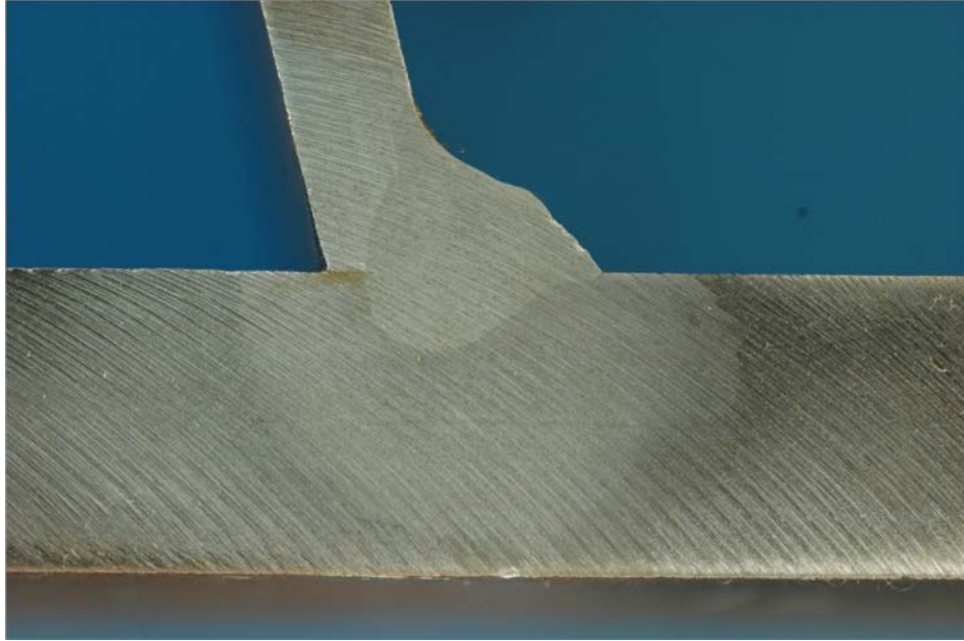


Figure 531. Macro-etched section R1\_A\_42

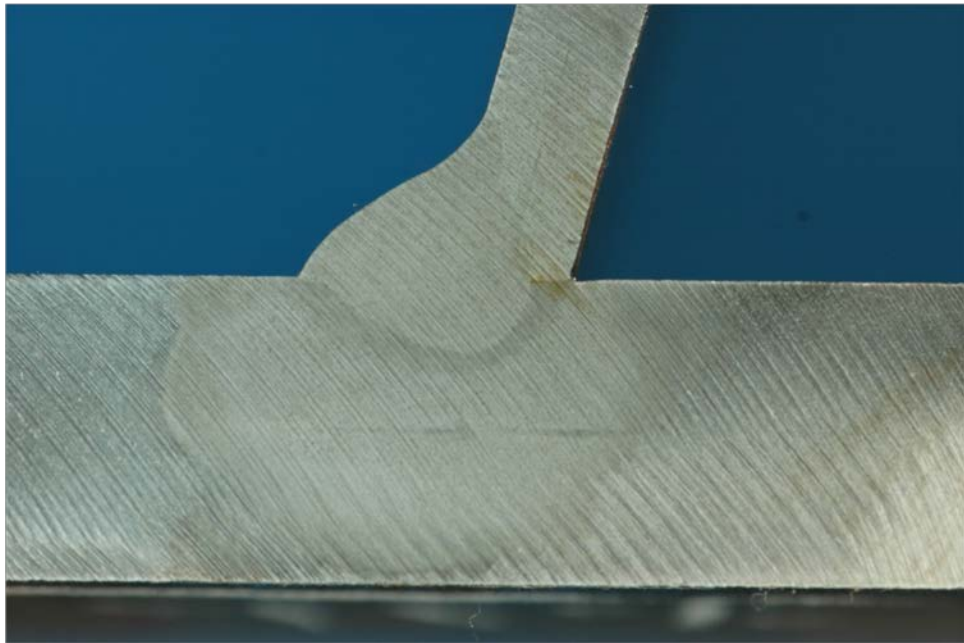


Figure 532. Macro-etched section R1\_B\_42



Figure 533. Macro-etched section R1\_A\_54



Figure 534. Macro-etched section R1\_B\_54

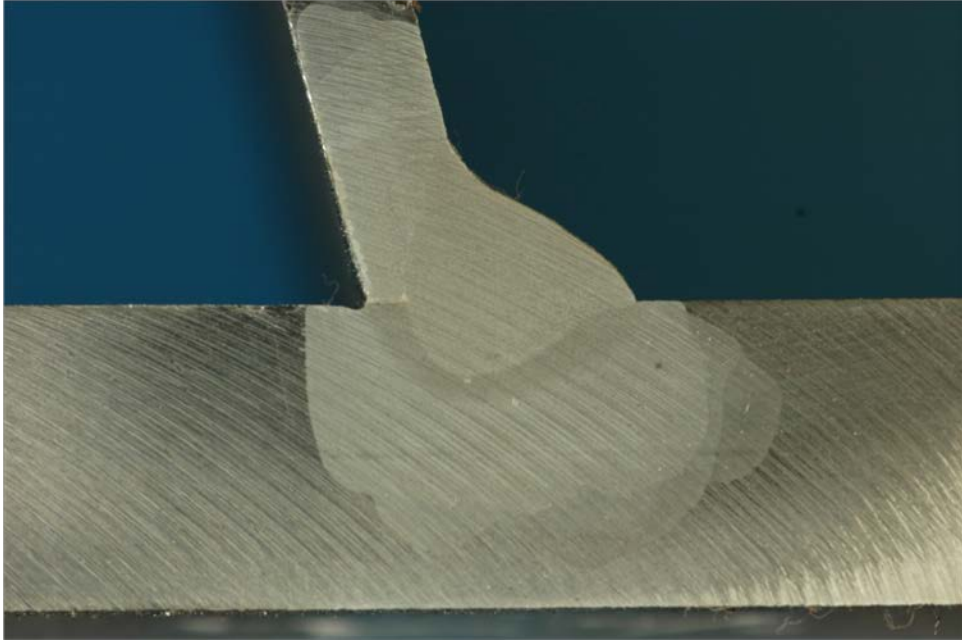


Figure 535. Macro-etched section R1\_A\_66

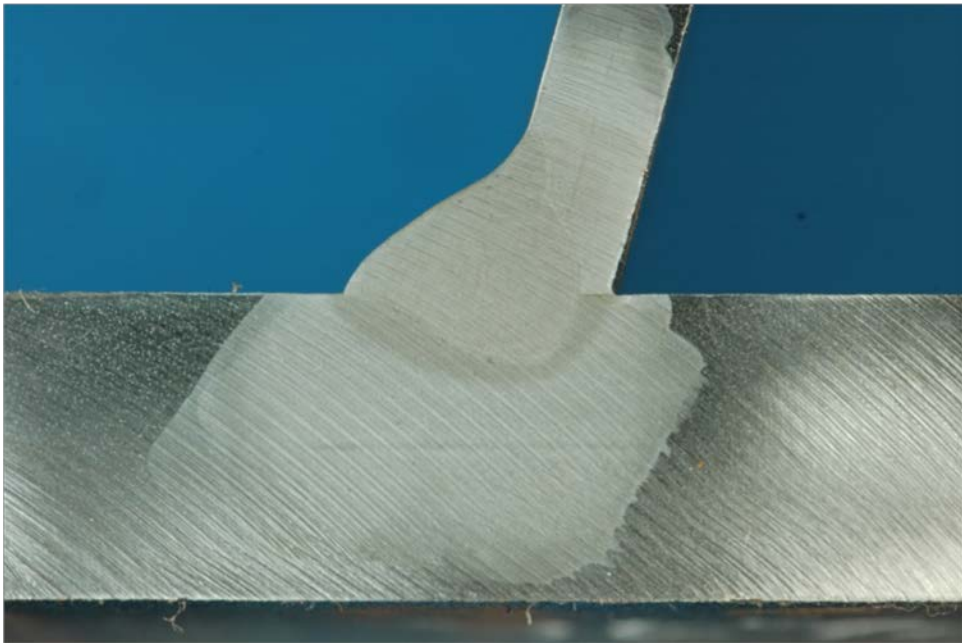


Figure 536. Macro-etched section R1\_B\_66

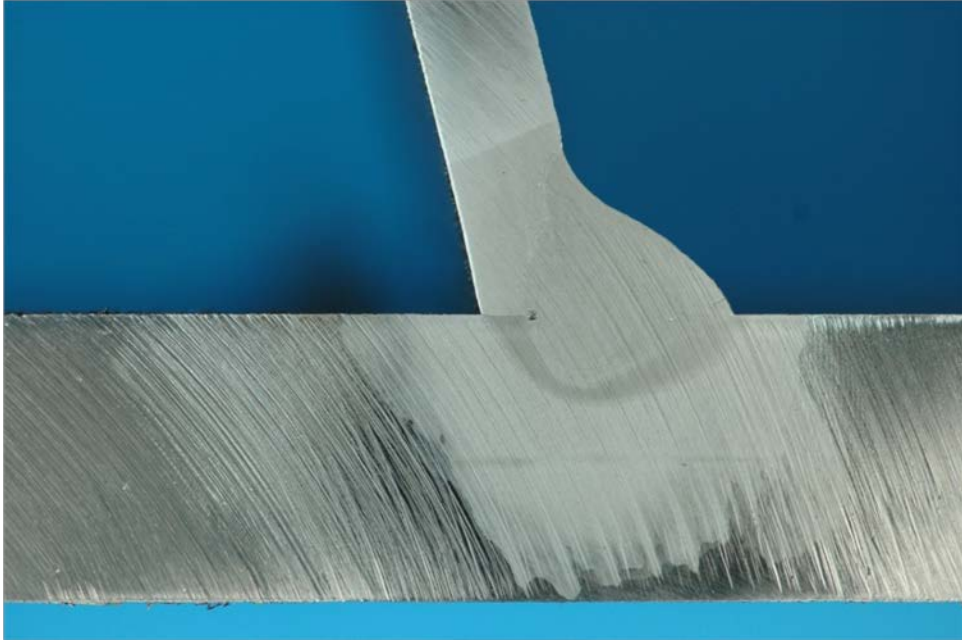


Figure 537. Macro-etched section R1\_A\_78

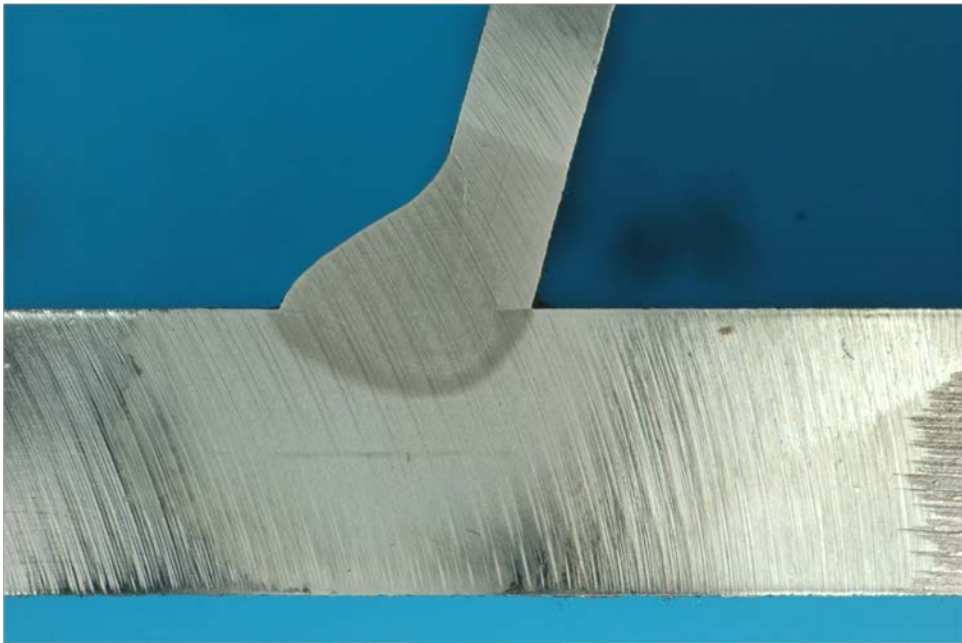


Figure 538. Macro-etched section R1\_B\_78

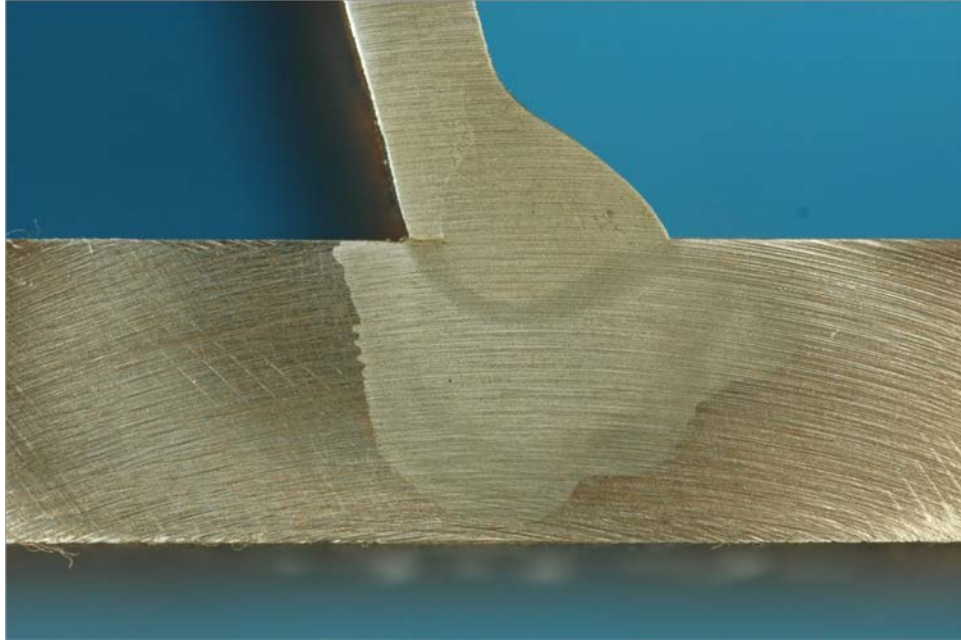


Figure 539. Macro-etched section R1\_A\_84

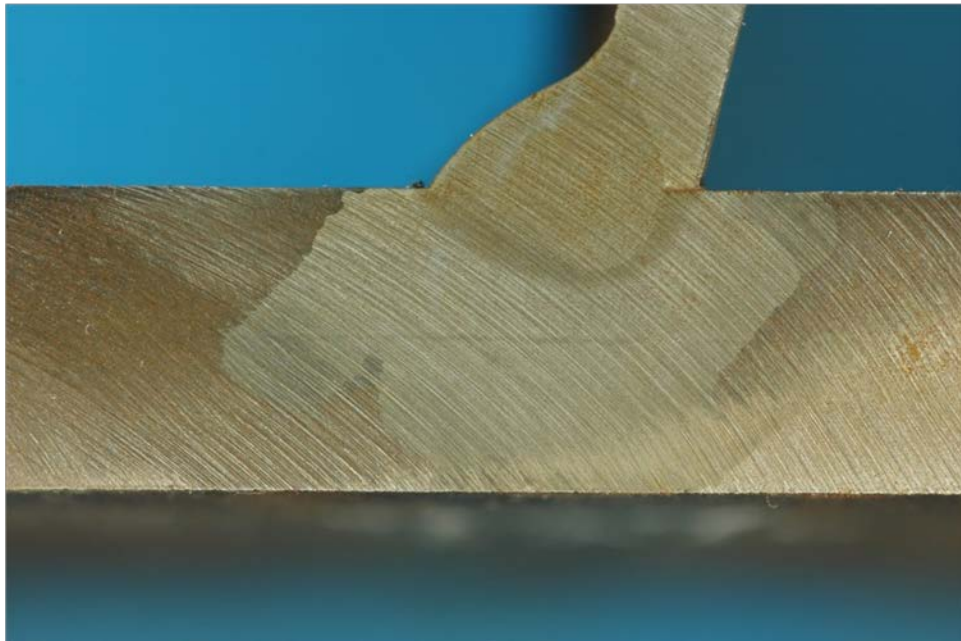


Figure 540. Macro-etched section R1\_B\_84

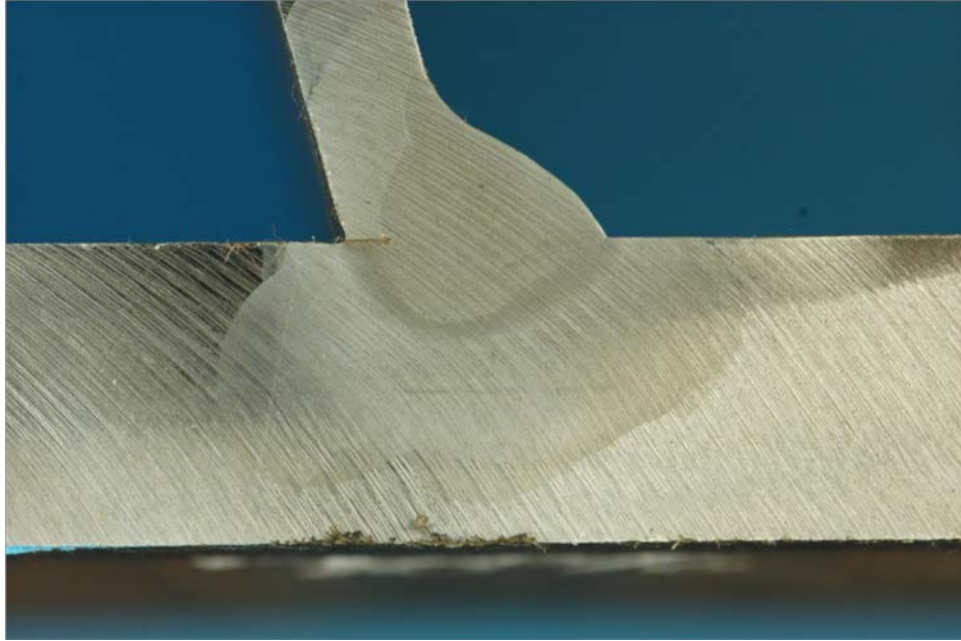


Figure 541. Macro-etched section R1\_A\_96

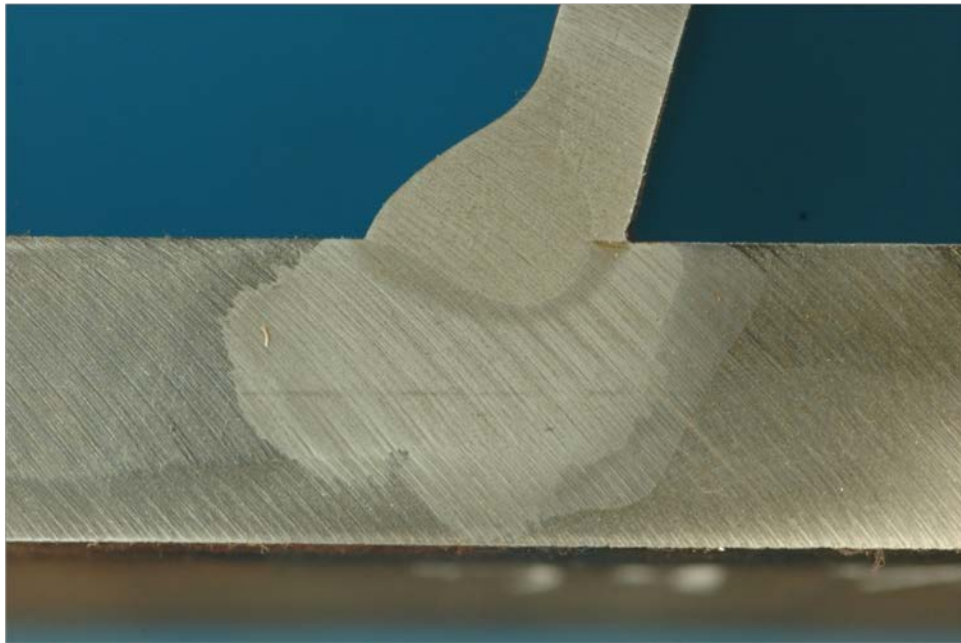


Figure 542. Macro-etched section R1\_B\_96

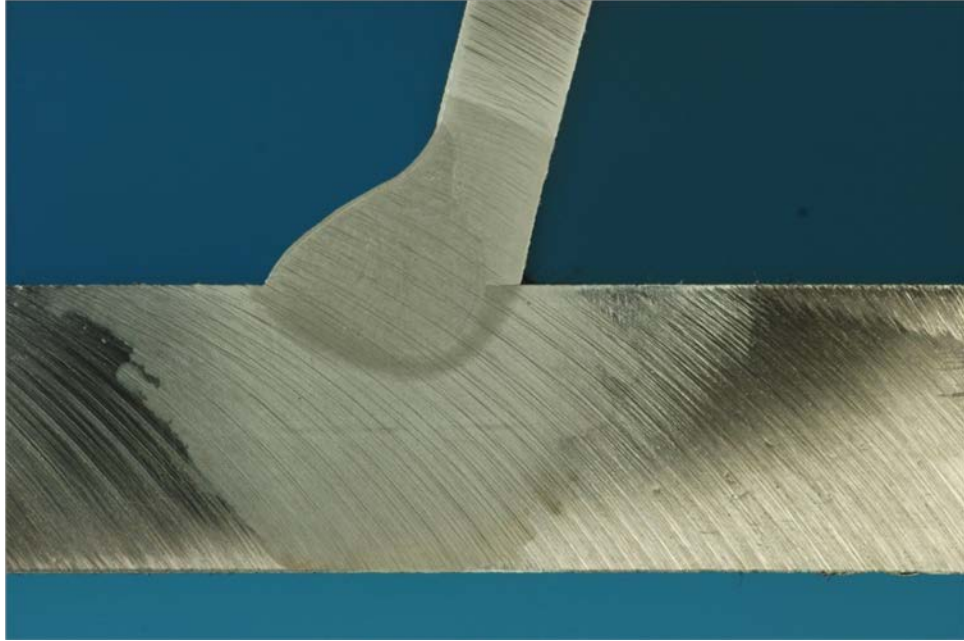


Figure 543. Macro-etched section R1\_A\_108

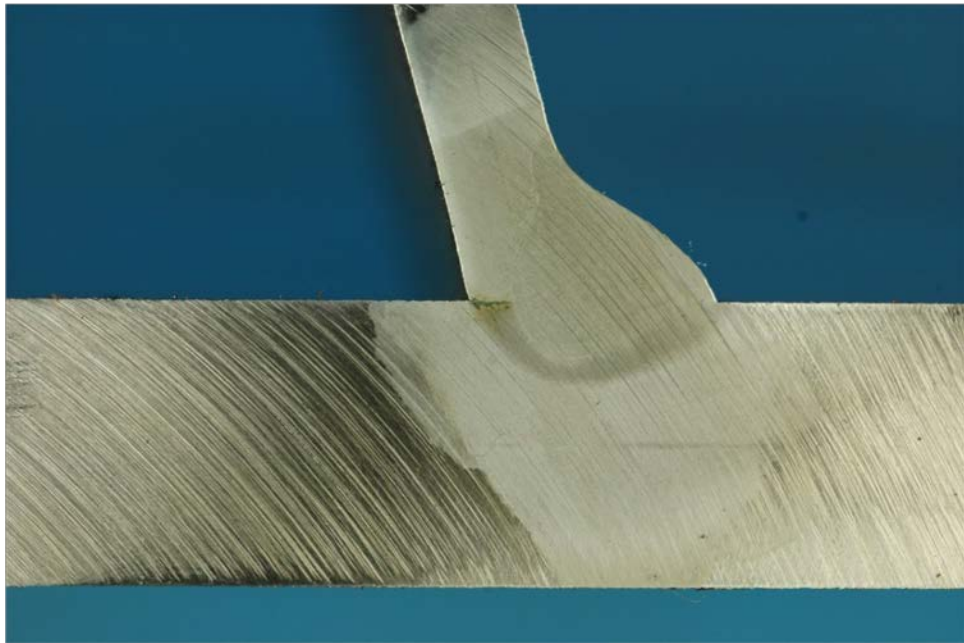


Figure 544. Macro-etched section R1\_B\_108



Figure 545. Macro-etched section R1\_A\_120

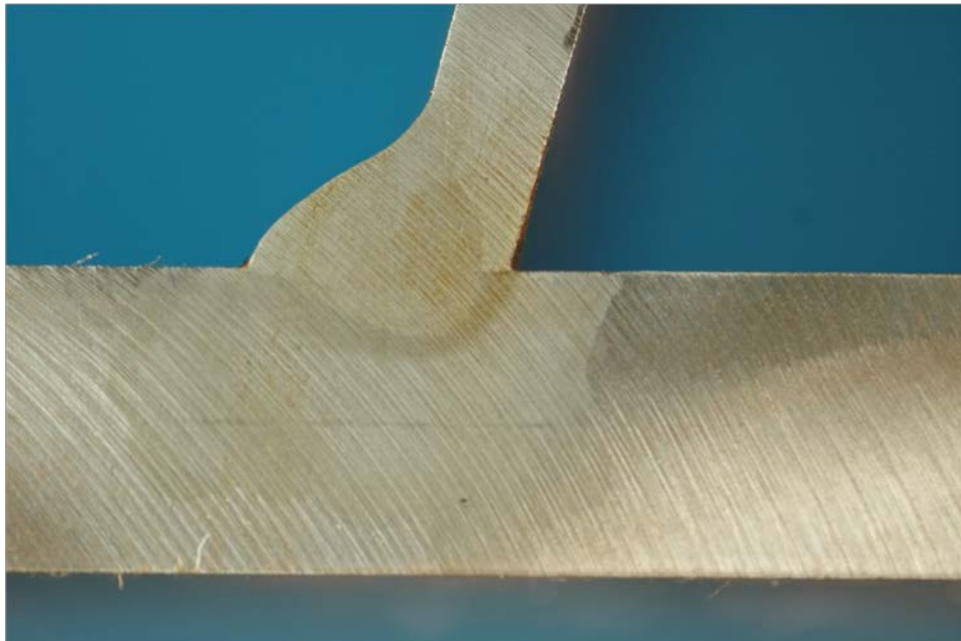


Figure 546. Macro-etched section R1\_B\_120

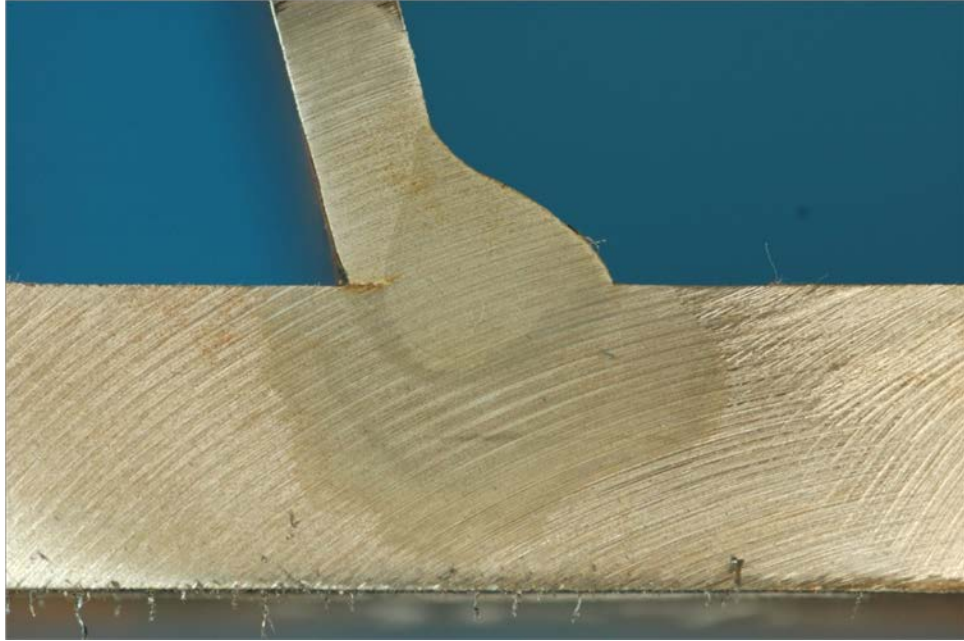


Figure 547. Macro-etched section R1\_A\_132



Figure 548. Macro-etched section R1\_B\_132

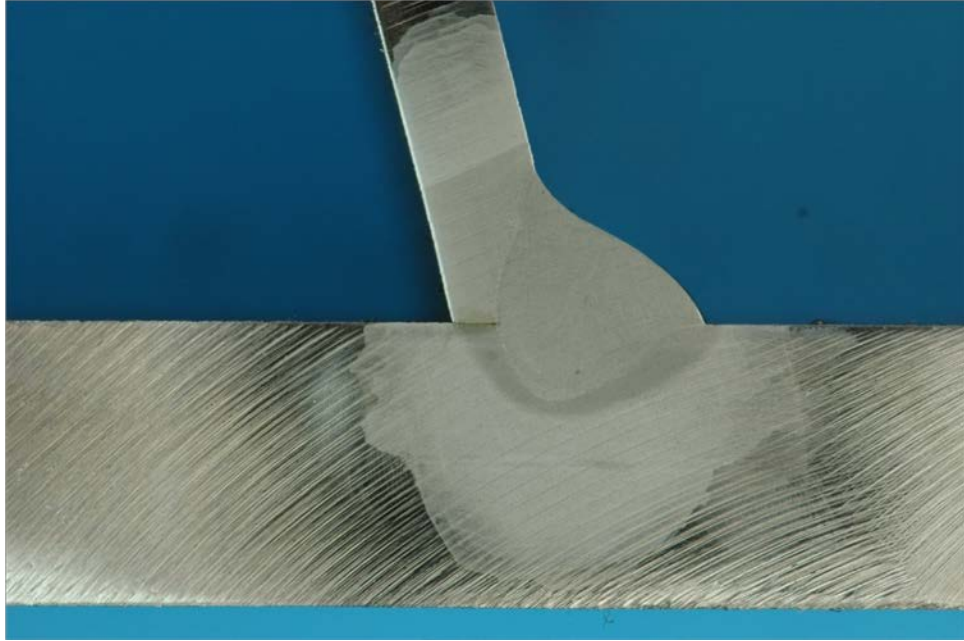


Figure 549. Macro-etched section R1\_A\_144

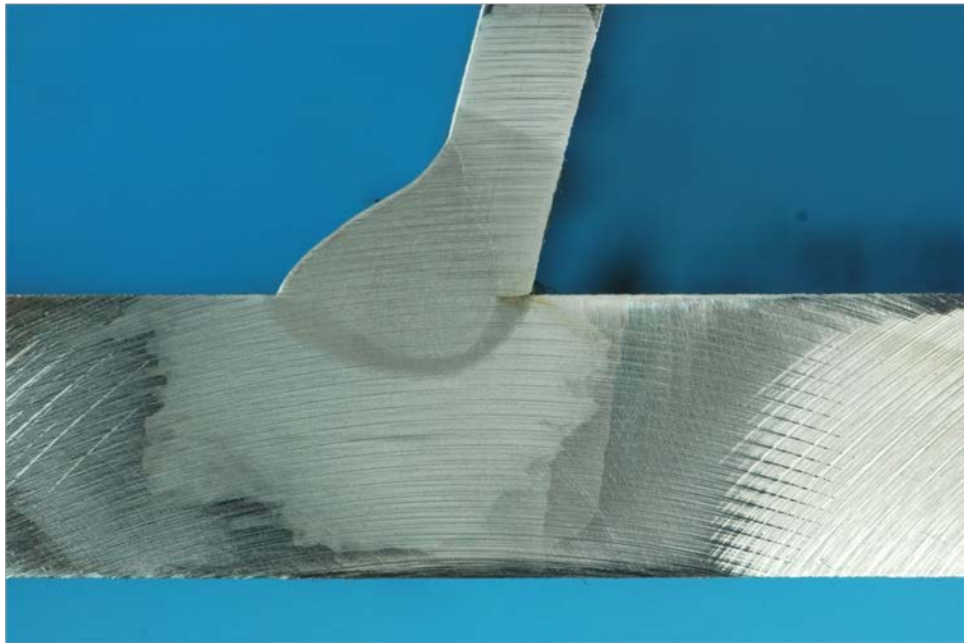


Figure 550. Macro-etched section R1\_B\_144



Figure 551. Macro-etched section R1\_A\_150

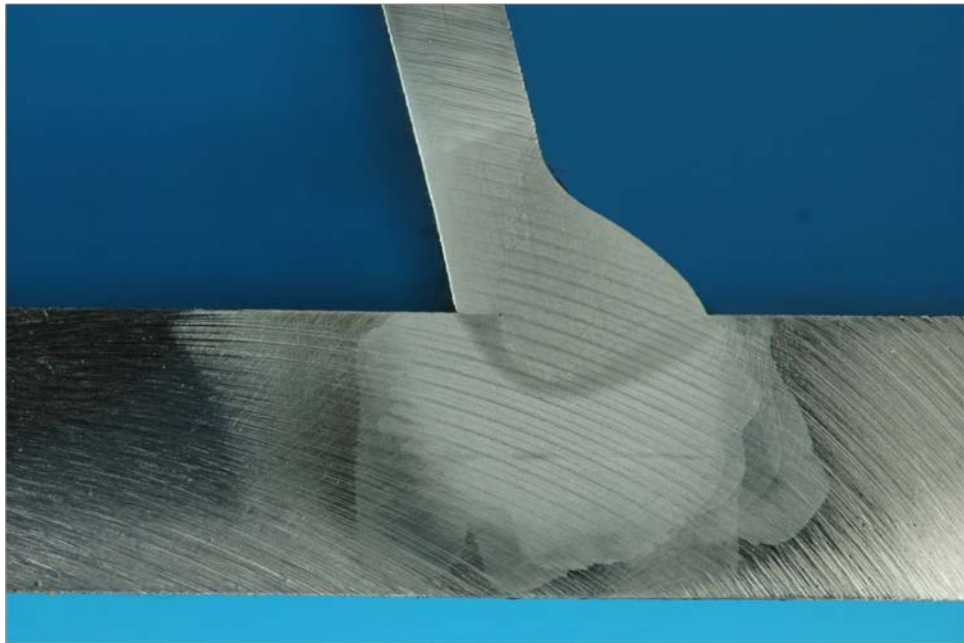


Figure 552. Macro-etched section R1\_B\_150

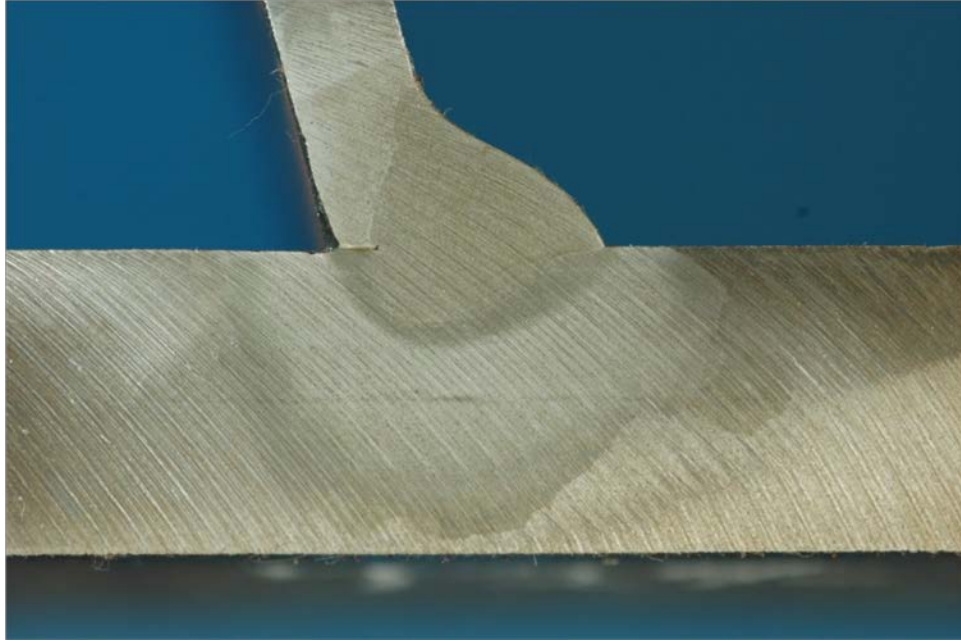


Figure 553. Macro-etched section R1\_A\_162

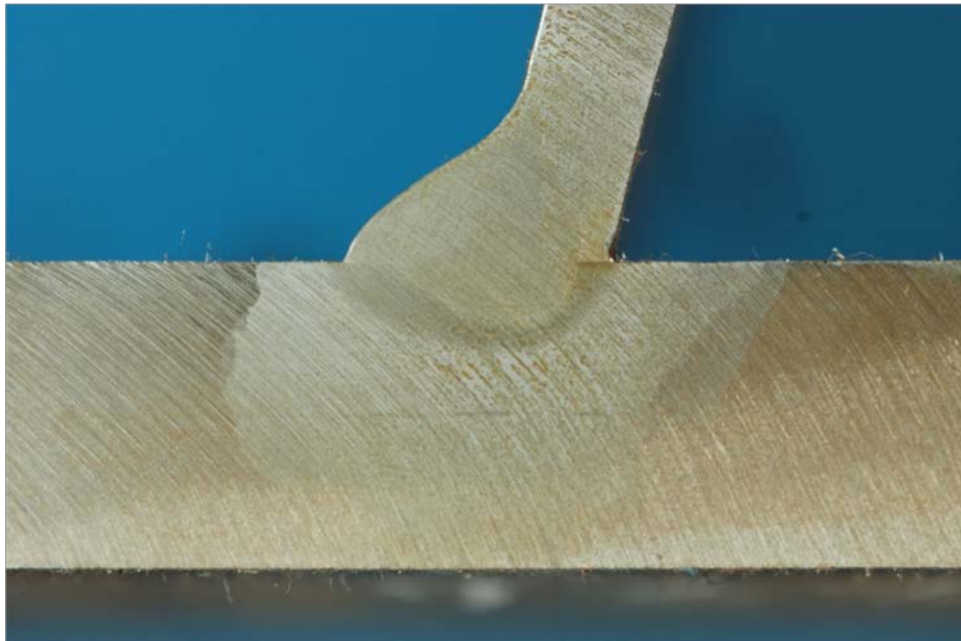


Figure 554. Macro-etched section R1\_A\_6



Figure 555. Macro-etched section R1\_A\_174



Figure 556. Macro-etched section R1\_B\_174

**APPENDIX F: MACRO-ETCHED SECTIONS FOR RIB-TO-DECK PLATE WELDS  
FOR RIB 2 IN MU5**

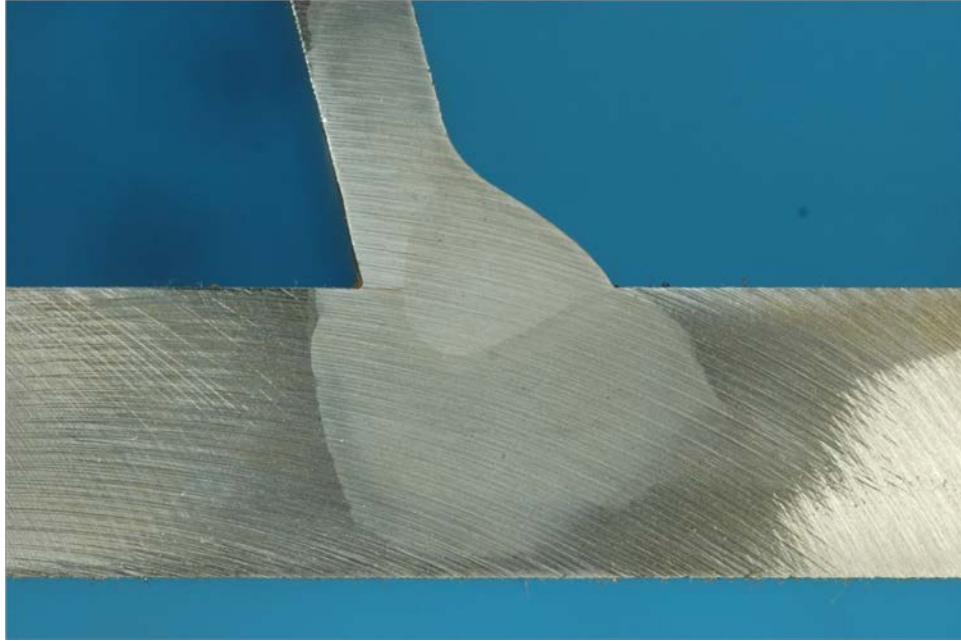


Figure 557. Macro-etched section R2\_A\_6



Figure 558. Macro-etched section R2\_B\_6

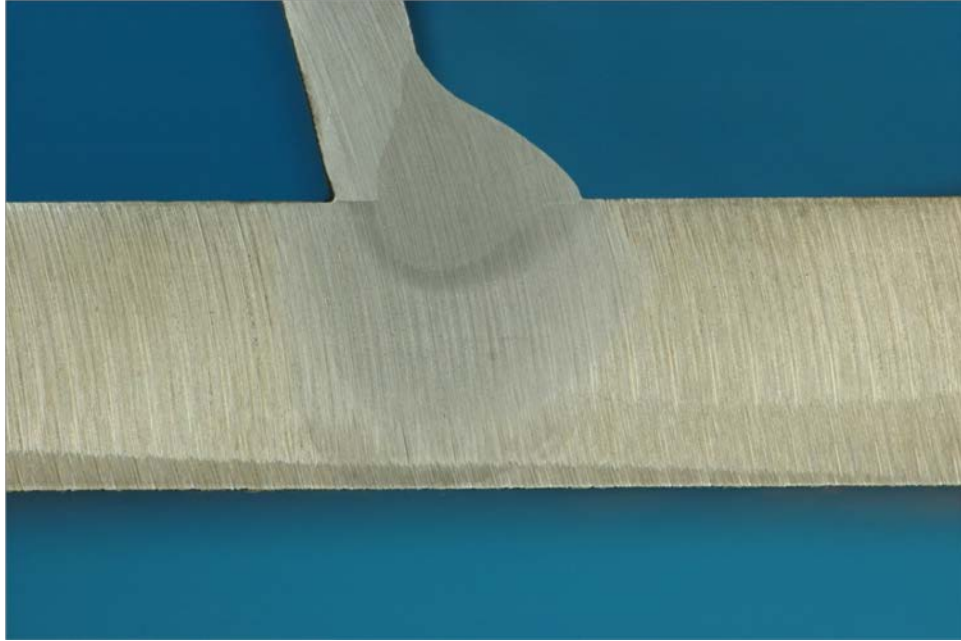


Figure 559. Macro-etched section R2\_A\_18



Figure 560. Macro-etched section R2\_B\_18

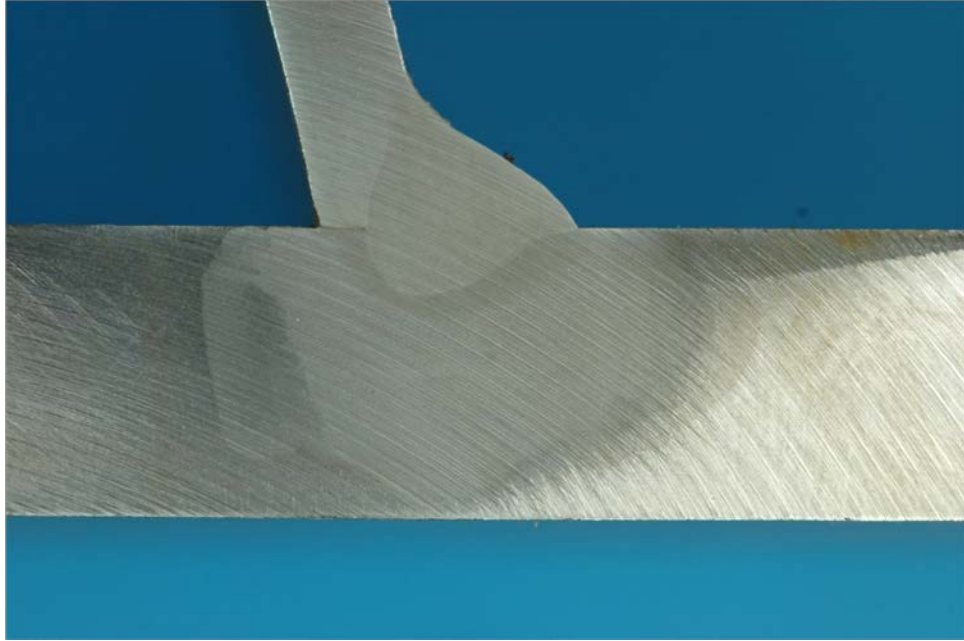


Figure 561. Macro-etched section R2\_A\_30



Figure 562. Macro-etched section R2\_B\_30



Figure 563. Macro-etched section R2\_A\_42



Figure 564. Macro-etched section R2\_B\_42



Figure 565. Macro-etched section R2\_A\_54



Figure 566. Macro-etched section R2\_B\_54

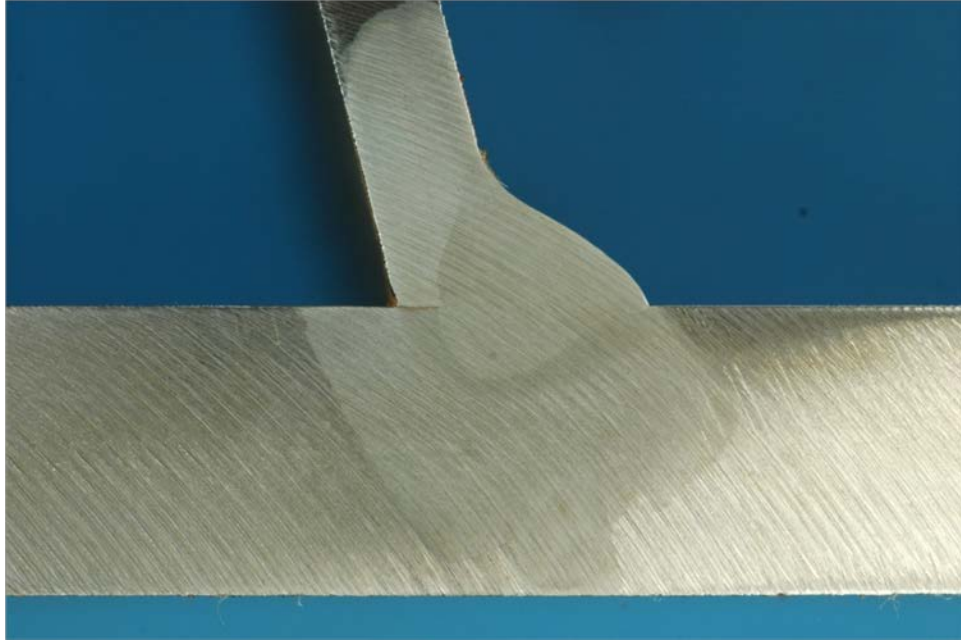


Figure 567. Macro-etched section R2\_A\_66



Figure 568. Macro-etched section R2\_B\_66

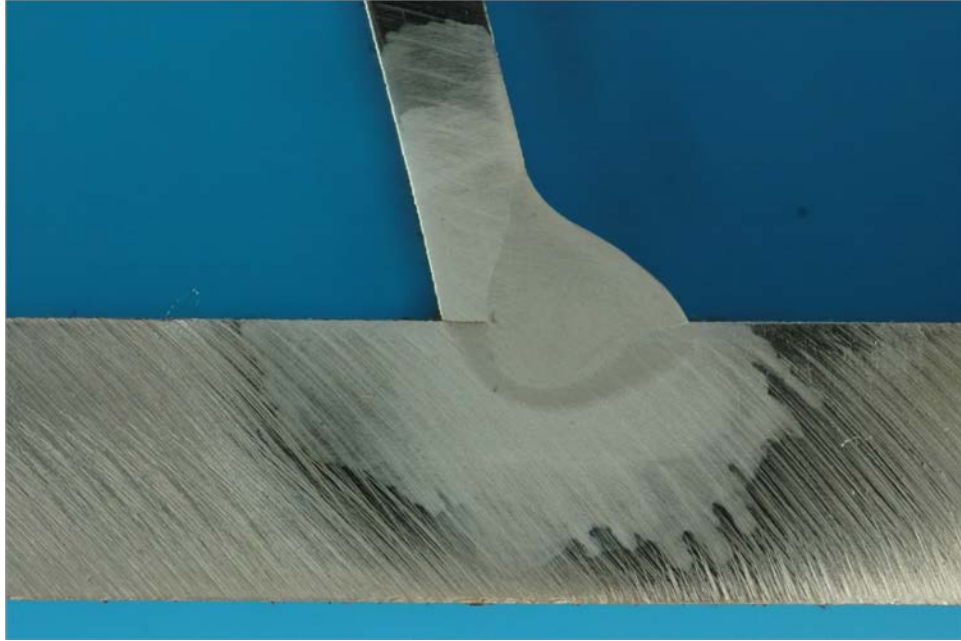


Figure 569. Macro-etched section R2\_A\_78



Figure 570. Macro-etched section R2\_B\_78

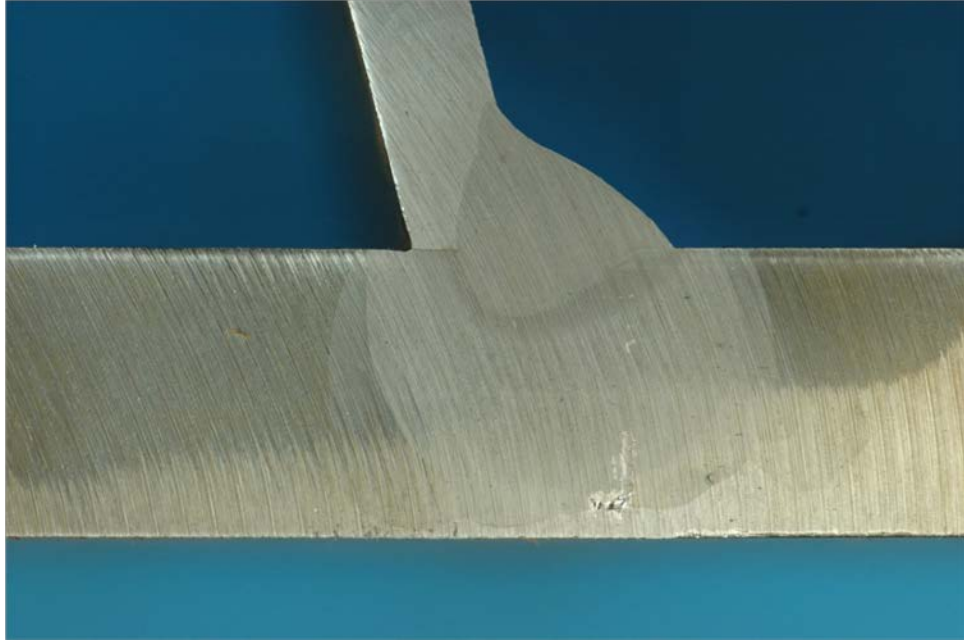


Figure 571. Macro-etched section R2\_A\_84

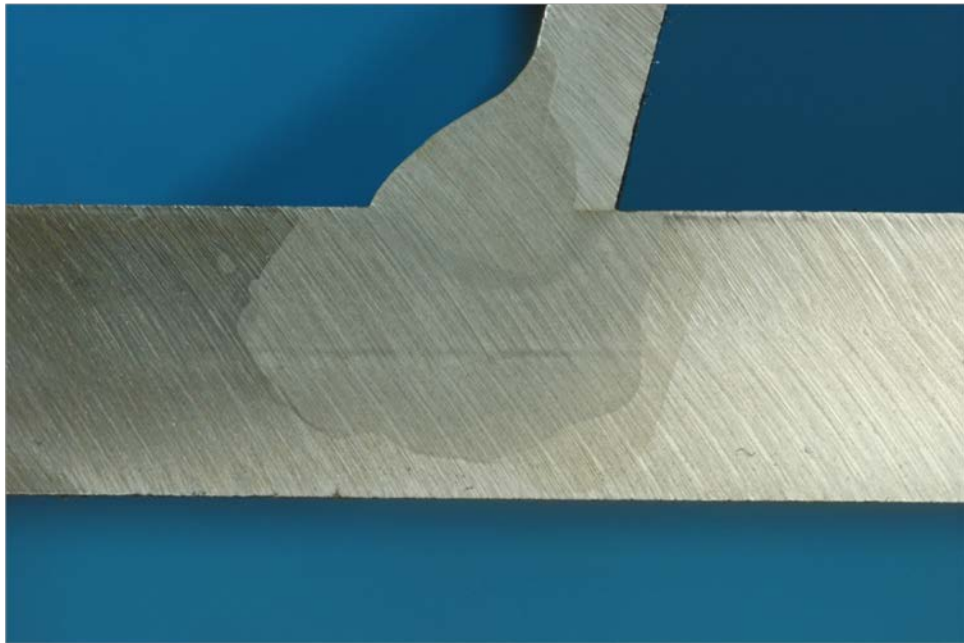


Figure 572. Macro-etched section R2\_B\_84

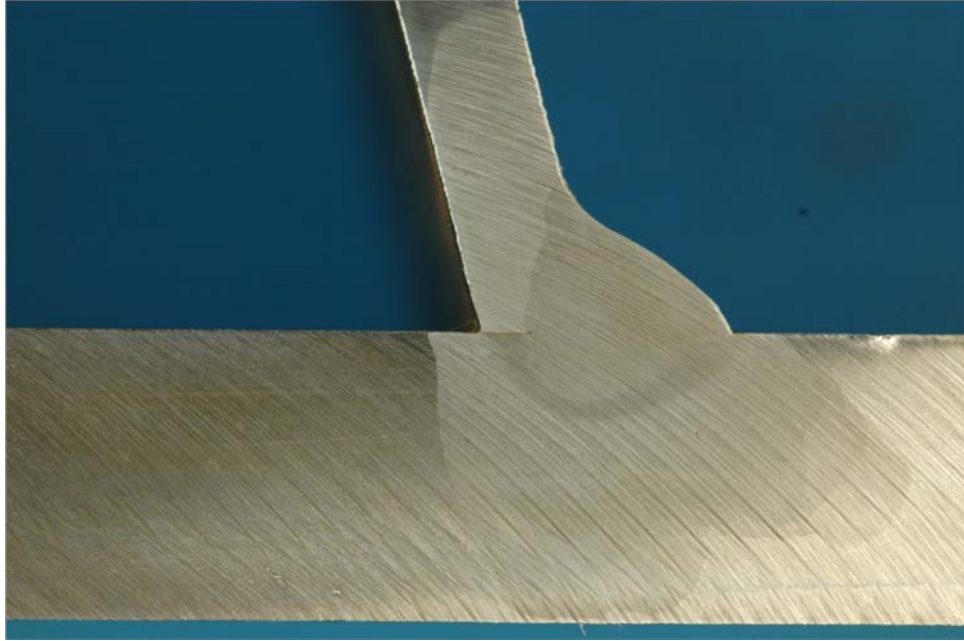


Figure 573. Macro-etched section R2\_A\_96



Figure 574. Macro-etched section R2\_B\_96

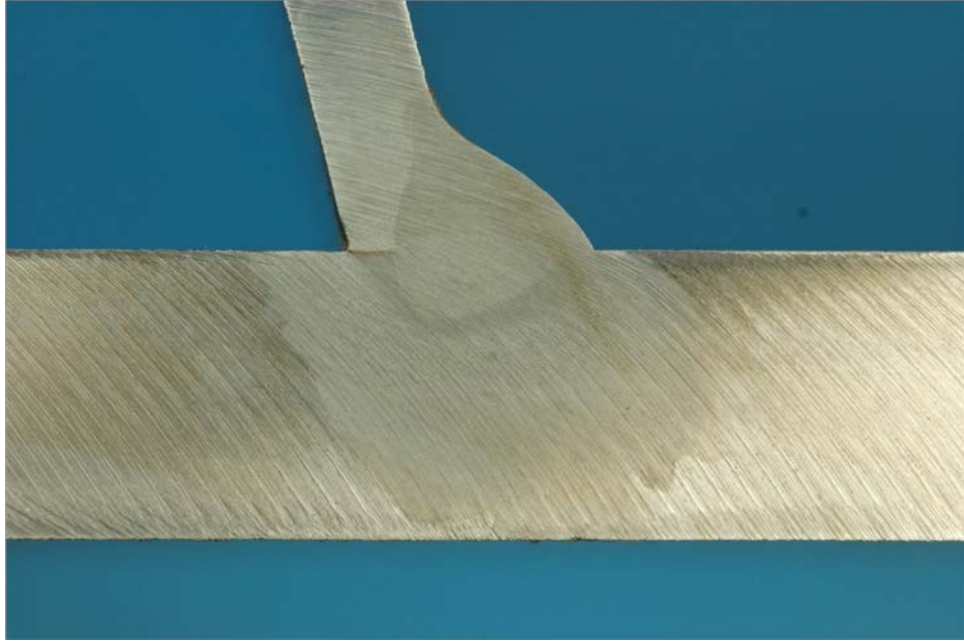


Figure 575. Macro-etched section R2\_A\_108



Figure 576. Macro-etched section R2\_B\_108

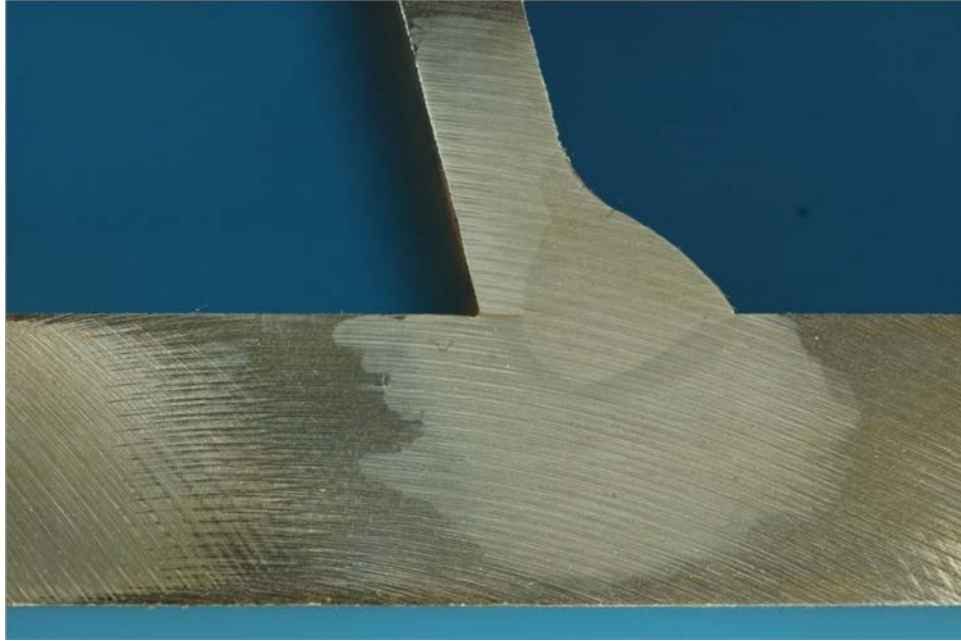


Figure 577. Macro-etched section R2\_A\_120

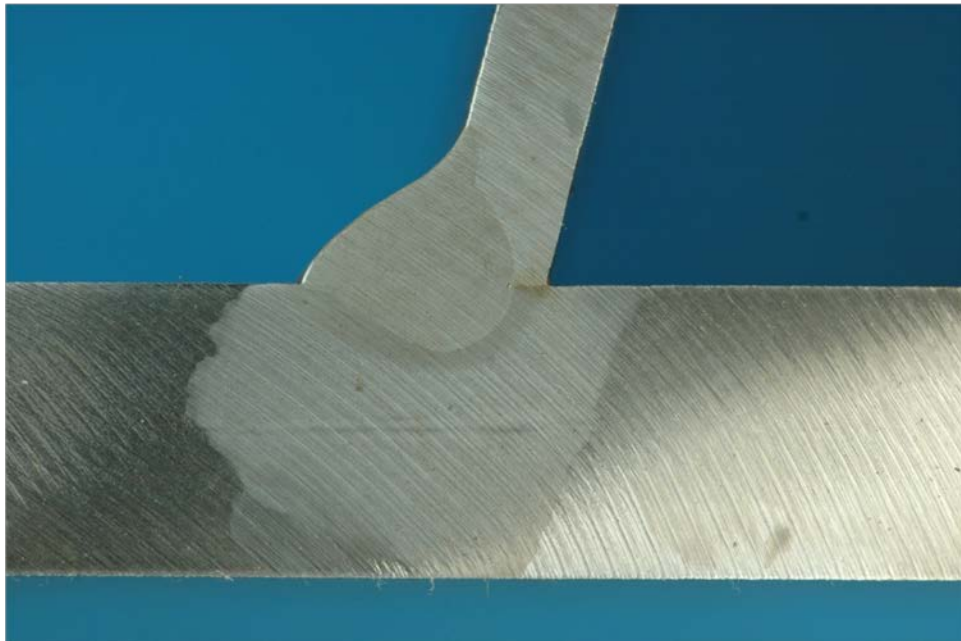


Figure 578. Macro-etched section R2\_B\_120

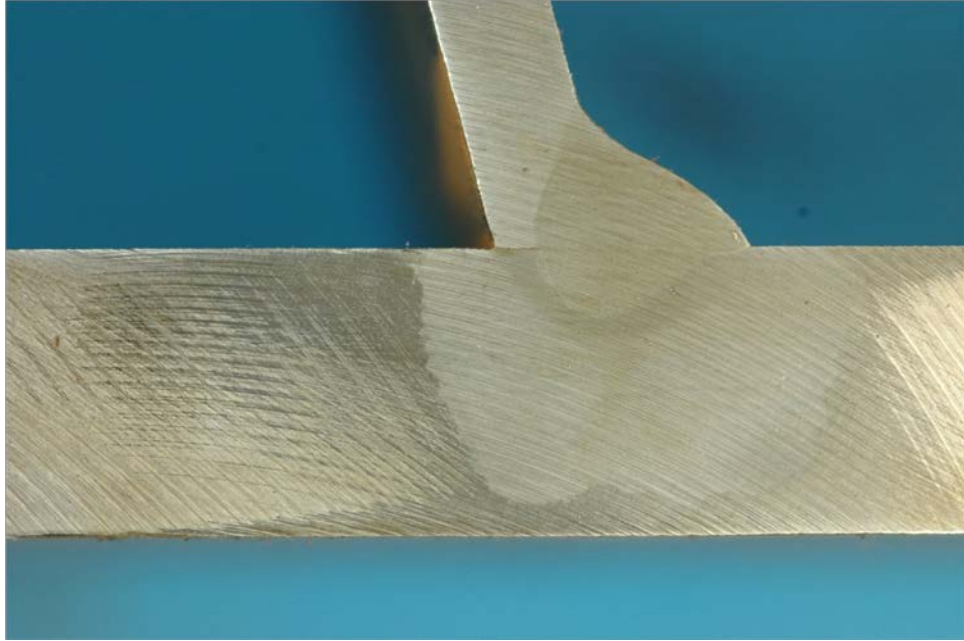


Figure 579. Macro-etched section R2\_A\_132

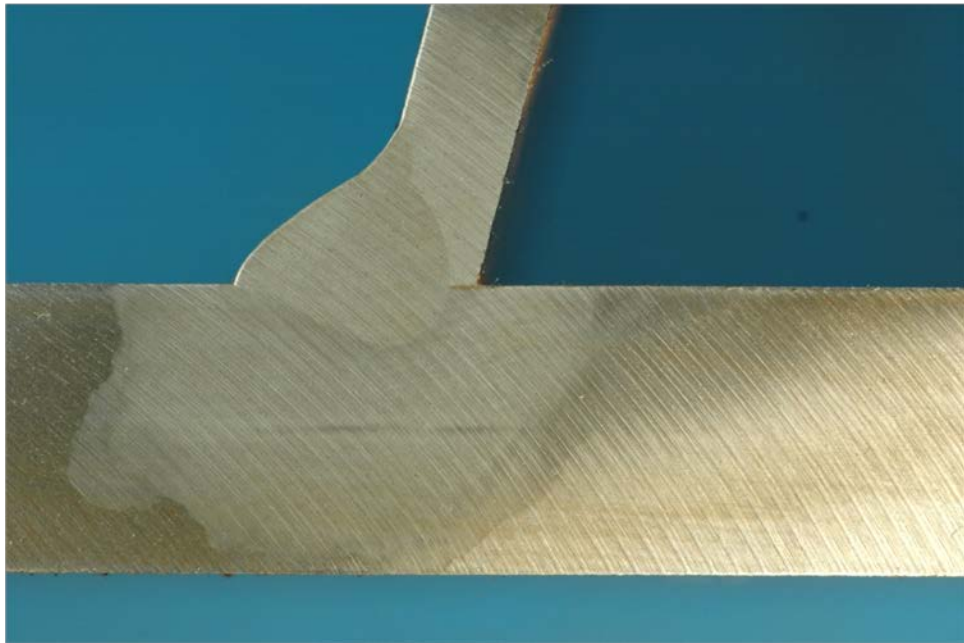


Figure 580. Macro-etched section R2\_B\_132



Figure 581. Macro-etched section R2\_A\_144



Figure 582. Macro-etched section R2\_B\_144



Figure 583. Macro-etched section R2\_A\_150



Figure 584. Macro-etched section R2\_B\_150

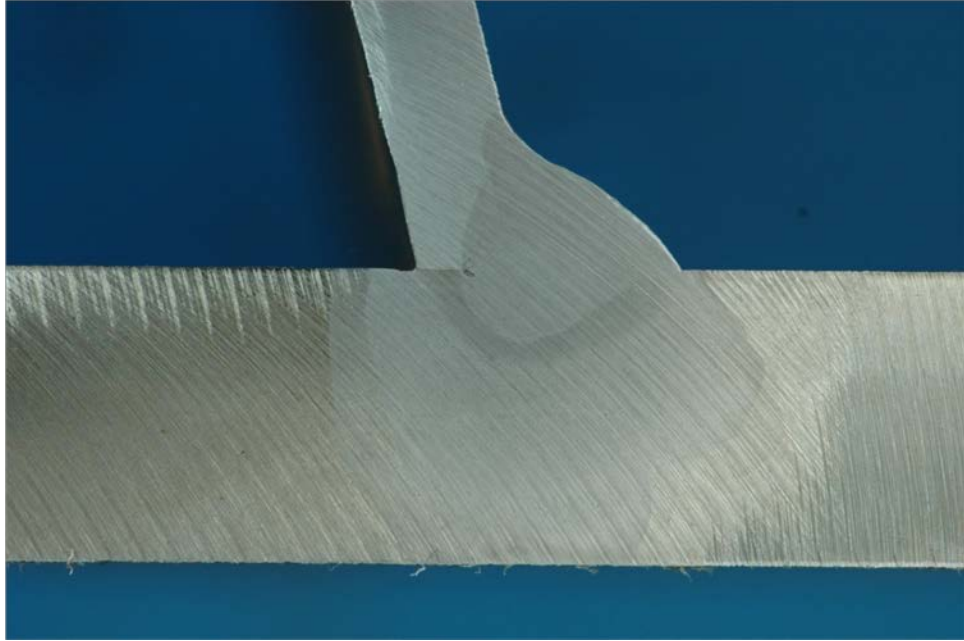


Figure 585. Macro-etched section R2\_A\_162



Figure 586. Macro-etched section R2\_B\_162

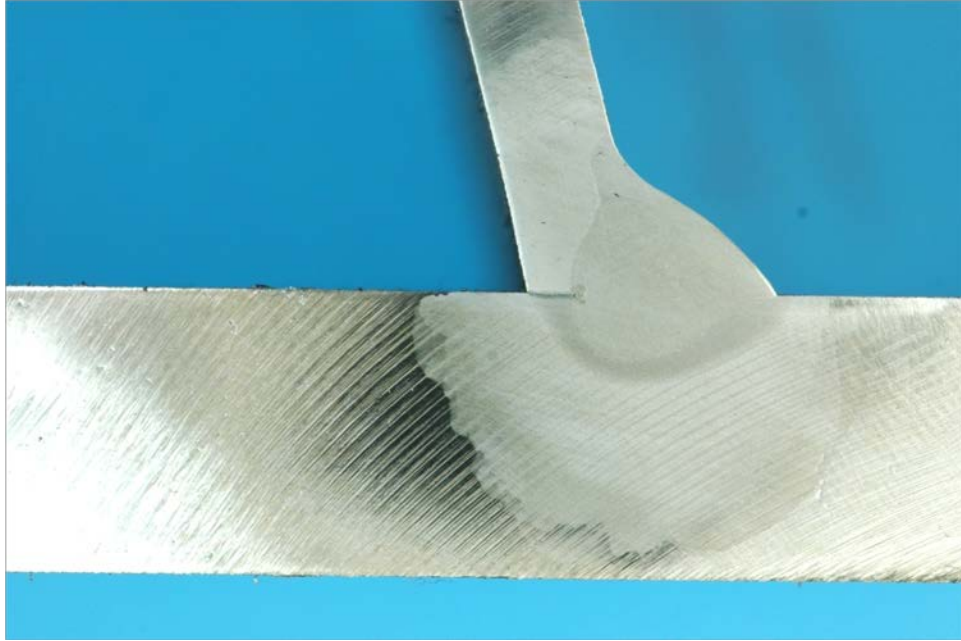


Figure 587. Macro-etched section R2\_A\_174



Figure 588. Macro-etched section R2\_B\_174