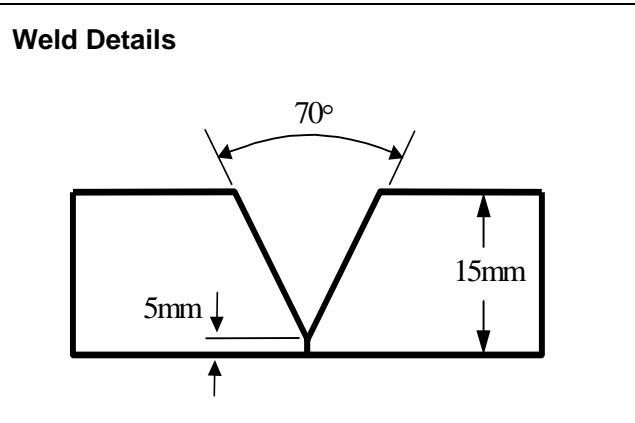


# Weld Procedure Record

Sub-Arc Weld in 304L

Ref: SAW/308L/1

<b>Material</b>	SA240 grade 304L					
<b>Filler Metal</b>	Metrode 308S92					
<b>Classification</b>	AWS A5.9 ER308L					
<b>Process</b>	SAW	<b>Flux</b>	SSB			
<b>Current</b>	DC+	<b>Position</b>	1G			
<b>Preheat / Interpass Temperature</b>	10 / 250°C					



Run No	Ø mm	Current Amp	Arc Volts	Travel Speed mm/min	ROL mm	Heat Input kJ/mm
1	3.2	440	29		-	Approx
2	3.2	450	30	310	-	1.9
3	3.2	470	32	to	-	to
4	3.2	470	29	470	-	2.5
5	3.2	470	31		-	

**Procedural Comments**

Deposit runs 1-3 in groove, turn plate and back-grind, then deposit runs 4 and 5.

Analysis	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	FN (WRC)
Wire	0.016	1.61	0.39	0.004	0.015	19.7	10.3	0.03	0.04	5

<b>Tensile</b> Transverse:  591 MPa 598 MPa	Side Bend:  Pass  X-ray:  Pass	Ferrite (measured):  5 – 8 FN	<b>Charpy Impact</b>	-196°C			
				J	mm		
			Weld	46	0.67		
				47	0.54		
41	0.61						
HAZ	120	1.44					
	94	1.22					
	121	1.50					

Hardness	PM	HAZ	Weld Metal	HAZ	PM
<b>Orig.</b> GBH					
<b>Date</b> 26.8.99					

# Weld Procedure Record

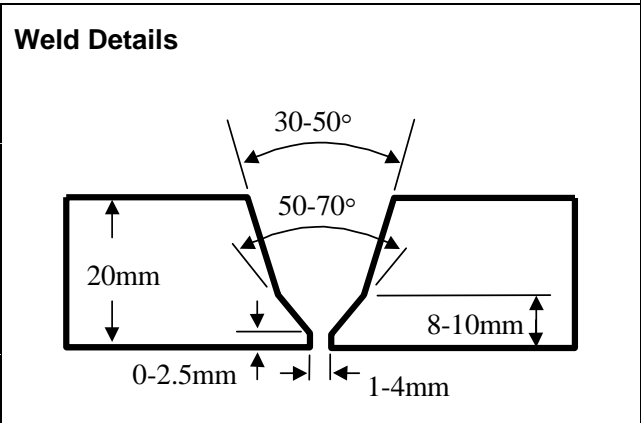
All-Weld Metal Sub-Arc Weld – 316L										Ref: SAW/316L/1							
<b>Material</b> All-Weld Test Buttered CMn					<b>Weld Details</b>												
<b>Filler Metal</b> Metrode 316S92																	
<b>Classification</b> AWS A5.9 ER316L																	
<b>Process</b> SAW		<b>Flux</b> SSB															
<b>Current</b> DC+		<b>Position</b> 1G															
<b>Preheat / Interpass Temperature</b> 10 / 250°C					<b>Procedural Comments</b>												
<b>Run No</b>	<b>ø mm</b>	<b>Current Amp</b>	<b>Arc Volts</b>	<b>Travel Speed mm/min</b>	<b>ROL mm</b>	<b>Heat Input kJ/mm</b>								Bead sequence – 3 beads per layer Wire extension – 20mm Flux depth – 25mm			
All	2.4	350	29	280	-	~2.2											
<b>Analysis</b>		<b>C</b>	<b>Mn</b>	<b>Si</b>	<b>S</b>	<b>P</b>	<b>Cr</b>	<b>Ni</b>	<b>Mo</b>	<b>Cu</b>	<b>FN (WRC)</b>						
Wire		0.013	1.54	0.34	0.012	0.011	18.6	11.7	2.59	0.10	9						
Deposit		0.011	1.17	0.51	0.013	0.021	18.5	11.6	2.48	0.14	9						
<b>Tensile</b>						<b>Charpy Impact</b>		<b>-50°C</b>		<b>-130°C</b>		<b>-196°C</b>					
(All-Weld):		Ferrite:				Weld C/L		J	mm	J	mm	J	mm				
UTS 574 MPa		Measured						86	1.35	46	0.67	36	0.45				
proof 498 MPa		= 9 FN						82	1.29	51	0.69	23	0.30				
El (4d) 41%		Calculated (WRC)						83	1.08	41	0.60	30	0.34				
El (5d) 39%		= 9 FN															
RoA 55%																	
<b>Hardness</b>	<b>PM</b>	<b>HAZ</b>	<b>Weld Metal</b>	<b>HAZ</b>	<b>PM</b>												
						<b>Orig.</b>		GBH				<b>Date</b>		26.8.99			

# Weld Procedure Record

**Sub-Arc Weld – 316L**

**Ref: SAW/316L/2**

<b>Material</b>	SA240 316L		
<b>Filler Metal</b>	Metrode 316S92		
<b>Classification</b>	AWS A5.9 ER316L BS 2901 pt 2 316S92		
<b>Process</b>	TIG/MIG/SAW	<b>Gas/Flux</b>	Note 1
<b>Current</b>	DC-/DC+/DC+	<b>Position</b>	1G
<b>Preheat / Interpass Temperature</b>	5 / 150°C		



Run No	Process	Ø mm	Current Amp	Arc Volts	Travel Speed mm/min	Heat Input kJ/mm
1-2	TIG	1.6	80-100	12-14	60	~1.4
3-7	MIG	0.9	135	23	300	~1.2
Fill	SAW (2)	2.4	315	31	400	~1.5
Cap	SAW (2)	2.4	310	30	430	~1.3

**Procedural Comments & Notes**

Note 1: TIG – Ar; MIG – Helishield 101;  
SAW – SSB flux.

Note 2: Wire extension – 20mm;  
Flux depth – 25mm.

Bead sequence: Split runs started run 4 & 5.

Analysis	C	Mn	Si	S	P	Cr	Ni	Mo	Cu				
Base metal	0.01	1.20	0.33	0.003	0.030	17.8	11.4	2.28	0.43				
Weld (SAW)	0.01	1.36	0.58	0.009	0.020	18.9	11.9	2.69	0.13				

<b>Tensile</b>	<b>Ferrite:</b>	
	<b>WRC</b>	<b>Measured</b>
	Base:	
	6 FN	0 FN *
	Weld:	
	10 FN	7 FN **
	* Mid-thickness = 4 FN	
	** Cap = 9 FN	

<b>Charpy Impact</b>									

<b>Hardness</b>	<b>PM</b>	<b>HAZ</b>	<b>Weld Metal</b>	<b>HAZ</b>	<b>PM</b>

**Orig.** GBH **Date** 26.8.99