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**TABLES**

**Analyzing girth welds**

*Tests on X80 and X100 line pipe offer instruction for successful welding for demanding environments*

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**Table 1**  
**Weld identification and consumables for X80 welds.**

Weld	Torch	Consumable	Nominal Chemistry
S1	Single	ESAB XTi 0.9 mm dia.	C-Mn-Si-Ti
D1	Dual		
S2	Single	Thyssen - K Nova-Ni 1.0 mm dia.	C-Mn-Si-Ni-Ti
D2	Dual		
S3	Single	Bohler NiMo1-IG 1.0 mm dia.	C-Mn-Si-Ni-Mo-Ti
D3	Dual		

**Table 2**  
**Chemical compositions of X80 single and dual-torch girth welds.**

Weld Metal	Element wt%													ppm		CE (IIW)
	C	Mn	Si	S	P	Ni	Cr	Mo	Cu	Nb	V	Ti	B	O	N	
S1	0.082	1.3	0.40	0.004	0.009	0.02	0.01	0.02	0.09	0.002	0.010	0.016	0.0008	556	34	0.31
D1	0.088	1.3	0.44	0.004	0.009	0.02	0.01	0.02	0.08	<0.001	0.008	0.018	0.0008	558	31	0.31
S2	0.069	1.3	0.42	0.006	0.008	0.65	0.02	0.03	0.10	0.002	0.009	0.032	<0.0005	545	90	0.34
D2	0.063	1.3	0.45	0.006	0.008	0.71	0.02	0.03	0.10	0.002	0.008	0.033	<0.0005	573	64	0.34
S3	0.075	1.4	0.39	0.009	0.011	0.76	0.01	0.26	0.11	<0.001	0.009	0.037	<0.0005	509	71	0.41
D3	0.076	1.4	0.40	0.004	0.012	0.81	0.01	0.27	0.09	<0.001	0.008	0.038	0.0006	512	94	0.42

Notes: CE<sub>(IIW)</sub> = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15; ppm = parts per million.

**Table 3**  
**Summary of tensile, Charpy, and CTOD properties for X80 girth welds.**

Weld	Tensile Strength, (MPa)		Charpy Impact, (J)		CTOD @ -10°C, (mm)		
	0.5% s <sub>v</sub>	UTS	-40°C	-10°C	Min.	Max.	Avg.
S1	608	669	65	101	0.25	0.38	0.30
D1	546	627	88	131	0.35	0.63	0.45
S2	604	672	61	99	0.24	0.31	0.28
D2	579	643	117	140	0.35	0.51	0.42
S3	704	756	72	98	0.23	0.28	0.25
D3	661	728	93	120	0.23	0.38	0.32

**Table 4**  
**Tensile properties of X100 single -torch girth welds.**

Clock Position	Specimen Type	Westpath				Narrow Offset			
		0.5% s <sub>y</sub> (MPa)	UTS (MPa)	Uniform Strain (%)	Elong %	0.5% s <sub>y</sub> (MPa)	UTS (MPa)	Uniform Strain (%)	Elong %
12:00-1:00	R	701	794	11	27	912	993	5	18
	S	708	805	8	26	890	971	5	16
3:00	R	748	841	10	25	895	972	4-5	18
	S	718	823	9	25	865	960	5	17
5:00-6:00	R	684	812	11	24	891	995	5	18
	S	698	798	10	26	784	874	5	18
6:00-7:00	R	683	814	9	22	881	934	4-6	18-19
	S	686	792	10	26	838	926	5	18
9:00	R	755	839	10	25	889	949	5-6	17
	S	729	839	9	23	869	945	5	17
11:00-12:00	R	701	807	11	26	902	978	4-6	18-19
	S	706	797	10	26	837	932	5	17

Note: Westpath Round Bar = 5 mm dia.; Strip = 5 x 9 mm, Narrow Offset Round Bar = 4 mm dia.; Strip = 4 x 9 mm.