DNV·GL

Seaspan Vancouver Shipyards Co. Ltd.
Seaspan Victoria Shipyards Co. Ltd.
Seaspan Vancouver Drydock Co. Ltd.

WELDING PROCEDURE SPECIFICATION (WPS)

WPS No:
DNVGL-Pipe-04-01 (SS TIG TIG)
Revision No:
1

General information ☐ pWPS

Manufacturer: **Seaspan Vancouver Shipyards Co. Ltd.**

Manufacturer address: **50 Pemberton Ave., North Vancouver, B.C. V7P 2R2**

Welding procedure qualification test records: **PQR DNVGL-Pipe-04-01 (SS TIG TIG)**

Welding process (ISO 4063):	**141-GTAW Manual**	Number of electrodes:	**1**	Tungsten electrode designation and Ø:	**2 % Thoriated 3.2 mm**
Welding position(s) (ISO/ASME): **All ex. 3G down**		Joint type:	**Pipe and Plate Butt, T, K, Y CJP, PJP Groove, Fillet weld**	Stringer/weave, max. bead width:	**Stringer N/A mm**
Welding layer:	**Multi-layer One/ Two side**	Backing Gas: Flow rate:	**With 8 – 15 (l/min)**	Method of preparation:	**Plasma / Oxy fuel cut**
Min. preheating tempertaure:	**Ambient (15°C)**	Max. interpass temperature:	**114 °C**	PWHT details:	**None**

Material specification

Base material 1 group:	**ASTM A312 Gr. 316L and all P-No 8, Group No. 1 materials**	Base material 2 group:	**ASTM A312 Gr. 316L and all P-No 8, Group No. 1 materials**
Delivery condition(s):	**Solution treated Seamless pipe**	Delivery condition(s):	**Solution treated Seamless pipe**
Max. C_{eq}:	**N/A**	Max. C_{eq}:	**N/A**
Thickness range Butt: Fillet Throat: Leg size:	 **3 – 12 mm** **3 – 12 mm** **4.2 – 17 mm**	Thickness range Butt: Fillet Throat: Leg size:	 **3 – 12 mm** **3 – 12 mm** **4.2 – 17 mm**
Outside diameter range:	**> 57 mm**	Outside diameter range:	**> 57 mm**

Welding consumables

No.	Filler metal and flux				Shielding gas		Nozzle diameter (mm)	DNV GL grade(s)
	Type	Manufacturer	Brand Name/ Designation	ISO or AWS classification	Type	Purity		
1	**Rod**	**Exocor**	**Executive 316L**	**A5.9 ER316L**	**Argon**	**100%**	**8**	

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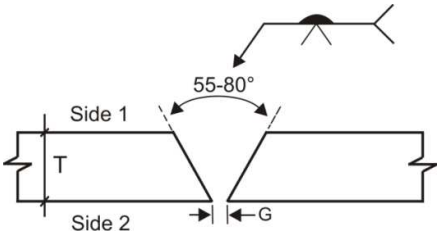
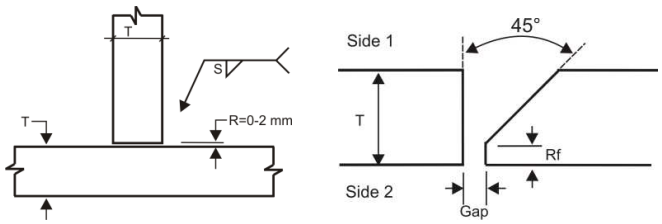
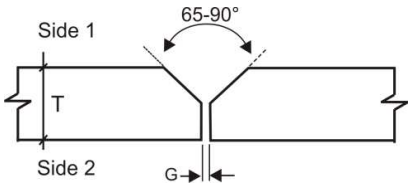
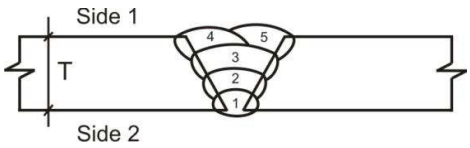
Joint preparation (sketch) and welding details

Joint design	Welding sequences
State rolling direction, if applicable	For multiple welding process qualification, the deposited weld metal thickness shall be recorded for each filler metal and process used.
 Thickness T = 3 - 12 mm Groove angle = 55 - 80° Root face Rf= 0 - 2 mm Root gap G = 1 - 5 mm All position except 3G down Single or Double Vee groove, Butt, T, K, Y Complete/ Partial Joint Penetration   Note: * Pipes rolling direction transverse to the weld. * Branch connections shall be qualified separately * This procedure is applicable for welding from one side with backing (gas purging) and both side with gouging. * Backing Gas is not applicable to Fillets welds. * Grind weld joint preparation edges and adjacent surfaces to bright metal prior to welding to remove all traces of paint, primer, scale, rust, moisture and any other contaminants. Wire brush, grinding to be used for interpass cleaning. * This procedure is also applicable for other double side and single side welded preparation. Also this procedure covers single bevel joint design. Any change in wire brand name/designation is permitted as long as AWS/ISO consumable classification remains the same as PQR.	 Multi Runs/ Multi layers For Thickness T = 6 mm Typically 5 runs & 4 layers

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Run[1]	Process[2]	C[3]	Ø[4] (mm)	Gas flow (l/min)	Current (A)	Voltage (V)	C&P[5]	v[6] (cm/min)	s[7] (mm/s)	F/B[8]	HI[9] (kJ/cm)
Root	**141-GTAW**	**1**	**2.4, 3.2**	**10 - 18**	**65 - 109**	**9 – 14.5**	**DC-**	**2.01 – 2.73**	**N/A**	**B**	**7.5 – 12.5**
Hot, Fill & Cap	**141-GTAW**	**1**	**2.4, 3.2**	**10 - 18**	**74 - 124**	**9 – 14.5**	**DC-**	**2.39 – 3.23**	**N/A**	**B**	**7.3 – 12.2**

(1) Root, fill or cap. (2) Ref. ISO4063. (3) Welding consumable, see previous table. (4) Filler metal diameter. (5) Current and polarity, /P for pulse welding. Details to be specified below. (6) Travel speed. (7) Wire feed speed. (8) Forehand "F" or backhand "B" progression. (9) Heat input not compensated for process efficiency (arc energy).

Note:
* The values for the Current (A), Voltage (V) are ±25% and ±15% for the Travel speed (V) based on the PQR DNVGL-Pipe-04-01 (SS TIG TIG).
* Range of the Heat Inputs are ± 25% based on the actual values in the PQR DNVGL-Pipe-04-01 (SS TIG TIG).

Further information

Shop primer for fillet weld					
Manufacturer:	**N/A**	Brand name:	**N/A**	Max. dry film thickness:	**N/A µm**

Place: **Vancouver, BC, Canada**
Date : **December 2019**

Prepared by: **Mathew Smith P.Eng.**

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA Dr. M. J. SMITH # 43744
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SKC ENGINEERING
WELDING • MATERIALS • MECHANICAL • INSPECTION • TESTING
SKC ENGINEERING 19165 94th AVENUE, SURREY, BC, V4N 3S4
P (604) 882 1889 • F (604) 882 1811 • www.skcsiu.com

Place: **Vancouver, BC, Canada**
Date : **December 2019**

for **DNV GL**
Volodymyr Chumak
Surveyor - DNV GL Maritime Vancouver

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