DNV·GL

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

WPS No:
DNVGL-Pipe-03-01 (CS SMAW)
Revision No:
2

WELDING PROCEDURE SPECIFICATION (WPS)

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-03-01 (CS SMAW)**

Welding process (ISO 4063):	**111-SMAW Manual**	Number of electrodes:	**1**	Tungsten electrode designation and Ø:	**N/A**
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:	**Without or With**	Method of preparation:	**Plasma / Oxy fuel cut**
Min. preheating tempertaure:	**Ambient °C**	Max. interpass temperature:	**112 °C**	PWHT details:	**None**

Material specification

Base material 1 group:	**ASTM A106 Gr. B and all P-No 1, Group No. 1 materials**	Base material 2 group:	**ASTM A106 Gr. B and all P-No 1, Group No. 1 materials**
Delivery condition(s):	**AR Hot Rolled Seamless pipe**	Delivery condition(s):	**AR Hot Rolled Seamless pipe**
Max. C_{eq}:	**N/A**	Max. C_{eq}:	**N/A**
Thickness range Butt: Fillet Troat: Leg size:	 **3 – 19 mm** **3 – 19 mm** **4.2 – 26.8 mm**	Thickness range Butt: Fillet Throat: Leg size:	 **3 – 19 mm** **3 – 19 mm** **4.2 – 26.8 mm**
Outside diameter range:	**> 63 mm**	Outside diameter range:	**> 63 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**	**Lincoln**	**Fleetweld 5P+**	**AWS A5.1 E6010**	**N/A**	**N/A**	**N/A**	**-**
2	**Rod**	**Lincoln**	**Lincoln Excalibur E7018-MR**	**AWS A5.1 E7018-1**	**N/A**	**N/A**	**N/A**	**3YH5**

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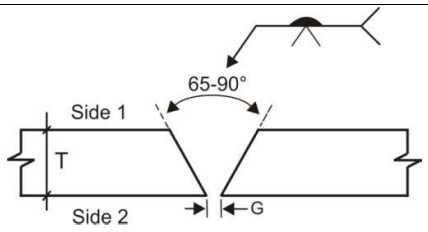
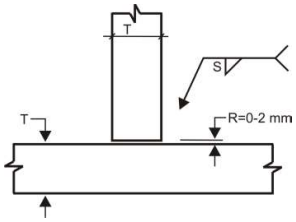
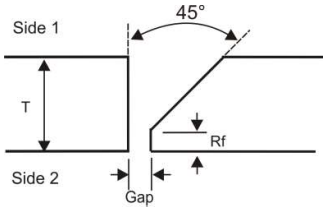
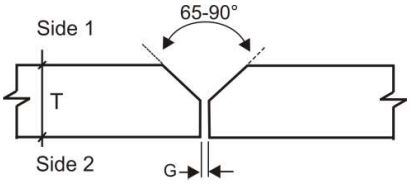
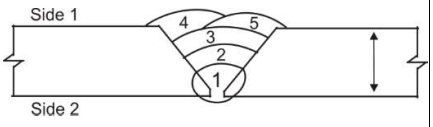
Joint preparation (sketch) and welding details

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 - 19 mm Groove angle = 65 - 90° Root face Rf= 0 - 2 mm Butt Root gap G = 1 - 5 mm Fillet Root gap G = 0 - 2 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/ without backing and both side with/ without gouging * 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 electrode brand name/designation is permitted as long as AWS/ISO consumable classification remains the same as PQR.	 Multi Runs/ Multi layers For Thickness T = 9.5 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	**111-SMAW**	**1**	**3.2**	**N/A**	**58 – 85**	**20.8 – 30.6**	**DC+**	**11 – 14.8**	**N/A**	**B**	**5.8 – 9.7**
Fill & Cap	**111-SMAW**	**2**	**3.2**	**N/A**	**86 – 127**	**20.4 – 30.0**	**DC+**	**13.7 – 18.6**	**N/A**	**B**	**6.9 – 11.5**

(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).

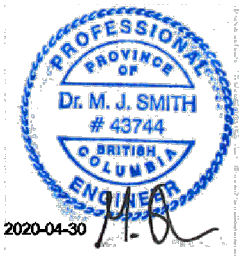
Note:
* The values for the Current (A) and Voltage (V) are -15%, +25% and ±15% for Travel speed (V) based on the PQR DNVGL-Pipe-03-01 (CS SMAW).
* Range of the Heat Inputs are ± 25% based on the actual values in the PQR DNVGL-Pipe-03-01 (CS SMAW).
* Selection of Current (A), Voltage (V) and Travel speed (V) shall be in compliance with approved range of heat input provided above.

Further information

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

****Revision 2: Type of backing and welding consumable was corrected in "Joint Preparation Notes".**

Place: **Vancouver, BC, Canada**
Date : **April-27-2020**



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Place: **Vancouver, BC, Canada**
Date : **April-27-2020**

Volodymyr Chumak
Seniro surveyor - DNV GL Maritime Vancouver