DNV·GL

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

WPS No:
DNVGL-Pipe-03-04
Revision No:
0

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-03-04**

Welding process (ISO 4063):	**111-SMAW Manual/ 136-FCAW Semi Automatic**	Number of electrodes:	**1**	Tungsten electrode designation and Ø:	**N/A**
Welding position(s) (ISO/ASME): **All ex. 3G down**		Joint type:	**Pipe and Flange/socket Butt, T, K, Y CJP, PJP Groove, Fillet weld**	Stringer/weave	**Stringer and slight weave**
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**	Max. interpass temperature:	**149 °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**
Thickness range Butt: Fillet Troat: Leg size:	 **3 – 22 mm** **3 – 22 mm** **4.2 – 31 mm**	Thickness range Butt: Fillet Throat: Leg size:	 **3 – 22 mm** **3 – 22 mm** **4.2 – 31 mm**
Outside diameter range:	**> 76 mm**	Outside diameter range:	**> 76 mm**

Welding consumables

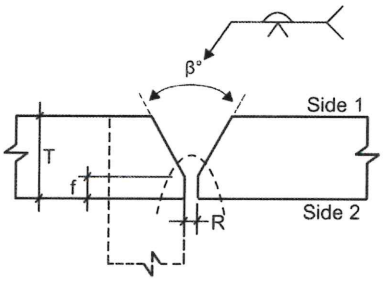
No.	Filler metal and flux				Shielding gas		Nozzle diameter (mm)	DNV GL grade(s)
	Type	Manufacturer	Brand Name/ Designation	ISO or AWS classification	Type	Purity		
1	**Rod**	**Lincoln**	**Fleetweld 5P+**	**AWS A5.1 E6010**	**N/A**	**N/A**	**N/A**	**-**
2	**Wire**	**Nippon Steel & Engineering Co. Ltd.**	**SF-3A/ M21**	**AWS A5.36 E71T1-M21A4-CS1**	**Mixed**	**75%Ar/ 25%CO2**	**16**	**IV Y42MS(H5)**

Effective from April 1st, 2019 manufacturer name changed to Nippon Steel Welding & Engineering Co. Ltd.

WPS No: **DNVGL-Pipe-03-04**
Revision No: **0**

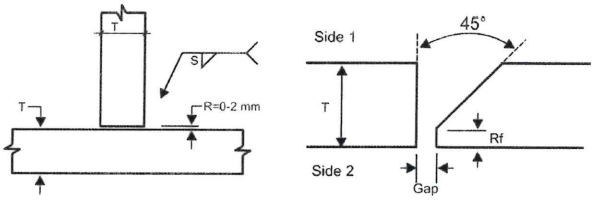
Joint preparation (sketch) and welding details

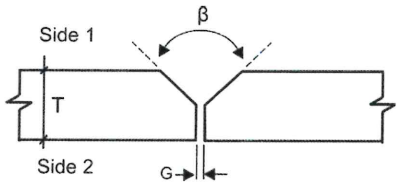
Joint design	Welding sequences
State rolling direction, if applicable	For multiple welding process qualification, the deposited weld metal thickness shall be recorded for each filler metal and process used.



Thickness T = 3 - 22 mm
Groove angle (β) = 70 - 90°
Root face Rf= 0 - 3 mm
Butt Root gap G = 1.5 – 3.5 mm
Fillet Root gap G = 0 - 3 mm

All position except 3G down
Single or Double Vee groove/ Bevel
T, K, Y Complete/ Partial Joint Penetration



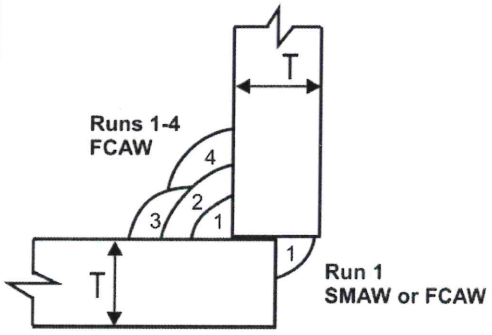


Note:
* Branch connections shall be qualified separately
* This procedure is applicable for welding from one side with/ without backing (gas purging) and both side with/ without gouging
* Grind weld joint preparation edges and adjacent surfaces to bright metal prior to welding to remove all traces of paint, primer, scale, rust, moisture and any other contaminants. Wire brush, grinding to be used for interpass cleaning.
* 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

As required

Example of Weld sequences for slip-on flange



WPS No: **DNVGL-Pipe-03-04**
Revision No: **0**

Run[1]	Process[2]	C[3]	Ø[4] (mm)	Gas flow (l/min)	Current (A)	Voltage (V)	C&P[5]	v[6] (in/min)	s[7] (in/min)	F/B[8]	HI[9] (kJ/cm)
Root & Hot	**111-SMAW**	**1**	**3.2 & 2.4**	**N/A**	**70 – 110**	**25 – 38**	**DC+**	**2.6 - 3.6**	**N/A**	**B**	**11.4 – 23.7**
Fill & Cap	**136-FCAW**	**2**	**1.2 & 1.4**	**17-25**	**140 – 220**	**18– 25**	**DC+**	**7.3 - 9.9**	**150 - 240**	**B**	**7.9 – 13.2**

(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), Wire Feed Speed (S) and Travel speed (V) are ±15% based on the PQR DNVGL-Pipe-03-04.
* Range of the Heat Inputs are ± 25% based on the actual values in the PQR DNVGL-Pipe-03-04.
* Amps and Volts are off the amp/ volt meter.
* Selection of Current (A), Voltage (V), Wire Feed Speed (S) 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**

Place: **Vancouver, BC, Canada**
Date : **September-06-2019**

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA M. TALEIE #143951

Sep 9, 2019

Mehdi Taleie

Seaspan Vancouver Shipyards Co. Ltd

Place: **Vancouver, BC, Canada**
Date : **September-06-2019**

DNV·GL 18 64 SAFEGUARDING LIFE, PROPERTY AND THE ENVIRONMENT

Yuksel Ozdemir

Surveyor - DNV GL Maritime Vancouver