ภาคผนวก ก

การควบคุมการเชื่อมให้เป็นไปตามข้อกำหนดตัวแปรในการเชื่อม (Welding Procedure Specification; WPS)

WPS สำหรับกระบวนการเชื่อมอาร์กลวดหุ้มฟลักซ์ โดยไม่มีการให้ความร้อนหลังการเชื่อม

ord A sales	WELDING	PROC	EDURE SPEC	IFICATION (WP	S)
MEL A					
JOB NO.:			DOC. NO.:	WPS-001	
Project NAME: Effect of Surfa	ace Coating Processes on Abrasive We	ear	DATE:	June 19, 2012	Page 1 / 2
Company Name Adva WPS No. Revision No.	nced Surface Technologies Co.,Ltd. WPS-001	By: Date Date	June 19, 2012 N/A	Mr.Chawanop Muangth Supporting PQR No.	nong N/A
Welding Process(es)	SMAW	Type	IN/A	— Manual	
weiding Flocess(es)	SIVIAW	_ Type	(Autom	atic, Manual, Machine, o	r Semi-Auto)
		-	(Autom	itie, manuai, maenine, o	r Seini Auto)
JOINTS (QW-402) Joint Design Backing Backing Material (type)	Bead on Plate (Hardfacing) N/A N/A				
Metal Nonmetallic	Nonfusingmetal Other		t 🕽		
should show the general	wing, Weld symbols or Written descri arrangement of the parts to be weld. ing and the details of groove may be	Where	<u> </u>		
BASE METALS (QW-403)	1				
P-No. 1	Group No. 1	to P-No). N/A	Group No.	N/A
OR					
Specification Type or Grade			SA-36		
to Specification Type or Grad	е		-		
OR					
Chem. Analysis and Mech. Pr			-		
to Chem. Analysis and Mech.	Prop.		-		
Thickness Range:	10 – 25 mm				
Base Metal (T): Other:	N/A				
Other.	11//11				
FILLER METALS (QW-4	04)				
Spec No. (SFA)	SFA 5.4			SFA 5.13	
AWS No. (Class)	E309L-16			ECoCr-A	
F-No.	5			71	
A-No.	N/A			N/A	
Size of Filler Metal:	3.2 mm			3.2 mm	
Thickness Range:					-
Weld Metal (t):	> 3.5 mm			> 4.4 mm	
Electrode-Flux (Class)	N/A			N/A	
Flux Trade Name	N/A			N/A	
Consumable Insert					
	N/A			N/A	
Other	N/A			N/A	
* Each base metal - fi	ller metal combination should be recor	rded indivi	dually.		

E	Jalua	l we	LDING PRO	CEDURE S	PECIFICA	TION (WP	(2)	
ding	A					•	5,	
N N	9		(Section IX, A	SME Pressu	ire Vessel Co	ode 2007)		
**W	/EL							
Oleso	Lab Buill'							
	de i							
JOB NO.:		1			DOC. NO.:	W	/PS-001	
Project NAME	E: Effect of S	urface Coating	Processes on Abra	asive Wear	DATE:	Jun	e 19, 2012	Page 2/2
			WI	PS No. W	/PS-001 F	Rev. 0		
POSITION	(OW-405)				POST W	ELD HEAT	TREATME	NT (OW-407)
Position(s)	/		All			ture range	11(1)	N/A
Welding Pro		Jp Uphill		-	Time Ra			N/A
Position(s)	•	·	All		Other	_		N/A
PREHEAT	(OW-406)				GAS (QV	V-408)	Percent Co	omnosition
	nperature, Min	imum	25 °C		UAD (Q	Gas(es		ture Flow Rate
	emperature, Ma		180 °C Ma	ax	Shielding		N/	
Preheat Ma			N/A	in.	Trailing	N/A	N/	
		ting where app	licable should be r	ecorded)	Backing	N/A	N/	/A N/A
FI FCTRIC	'AL CHARA	CTFRISTIC	CS (QW-409)					
Current DC		DC		olarity		DCEP		
Amps (Ran		65 – 75 A		olts (Range)		- 24 Volts		
				_			kness, etc. This	s information maybe
			rm similar to that			•		•
Tungsten El	ectrode Size a	nd Type		N/A			n, 2% Thoriated	
	l Transfer for C			N/A		(Spray Arc, S	hort Circuit Are	c, etc.)
Electrode V	Vire feed Speed	d Range		N/A				
TECHNIOU	UE (QW-410)						
~	Weave Bead	,		Stringer				
_	Gas Cup Size			9 – 13 n	nm			
Initial and I	Interpass Clean	ing (Brushing,	Grinding, etc.)	Grinding	g and Brushing b	y stainless stee	el tool	
Edge Prepar	ration for Base	Metal		N/A				
	Back Gouging			N/A				
Oscillation				N/A				
	be to Work Dis			N/A				
•	Single Pass (P			Multiple	pass			
	Single Electron	iles	_	Single	, .			
Travel Spee	ed (Range)			14 – 20 0	cm/min			
Peening Other				N/A N/A				
	_	_	_					
Weld			r Metal	Cur		Volt	Travel Speed	Other
Layer(s)	Process	Class	Diameter (mm)	Type /	Amp	Range	Range	(e.g. remarks, Comment,
	GN 64 777	F2007 16	2.2	Polar	Range (A)	(V)	(cm/min)	Hot Wire Addition, etc)
2	SMAW SMAW	E309L-16 E309L-16	3.2 3.2	DCEP	65 – 75	22 – 24	15 – 16 18 – 19	
3 to All	SMAW	ECoCr-A	3.2	DCEP DCEP	65 – 75 65 – 75	22 - 24 22 - 24	16 – 19	
3 to All	SIVIAW	ECOCI-A	3,2	DCEF	03 – 73	22 – 24	10 - 18	

WPS สำหรับกระบวนการเชื่อมอาร์กลวดหุ้มฟลักซ์ โดยมีการให้ความร้อนหลังการเชื่อมภายหลังการ เชื่อมชั้นรองพื้น

ord Evaluation	WELDING PROCEDURE SPECIFICATION (WPS)								
NEL A Lab Lule									
JOB NO.: 2			DOC. NO.:	WPS-002					
	ace Coating Processes on Abrasive W		DATE:	June 19, 2012	Page 1 / 2				
	-			,					
Company Name Adva	nced Surface Technologies Co.,Ltd.	By:		Mr.Chawanop Muangth	ong				
WPS No.	WPS-002	Date	June 19, 2012	Supporting PQR No.	N/A				
Revision No.	0	Date	N/A	_					
Welding Process(es)	SMAW	Туре		Manual					
			(Automa	tic, Manual, Machine, or	Semi-Auto)				
JOINTS (QW-402)									
· -	Dand on Plata (Handfasina)								
Joint Design	Bead on Plate (Hardfacing)								
Backing	N/A								
Backing Material (type)	N/A								
Metal	Nonfusingmetal		1	333	33				
Nonmetallic	Other		t]						
			- 						
	wing, Weld symbols or Written descri	-	T						
_	arrangement of the parts to be weld.		· · ·						
applicable, the root space	eing and the details of groove may be	specified							
BASE METALS (QW-403)									
P-No1	Group No. 1	to P-No	. N/A	Group No.	N/A				
OR	·								
Specification Type or Grade			SA-36						
to Specification Type or Grad	le		-						
OR					_				
Chem. Analysis and Mech. Pr	op.		-						
to Chem. Analysis and Mech.									
Thickness Range:	-								
	10 – 25 mm								
Other:	N/A								
FILLER METALS (QW-4									
Spec No. (SFA)	SFA 5.4			SFA 5.13					
AWS No. (Class)	E309L-16			ECoCr-A					
F-No.	5			71					
A-No.	N/A		·	N/A	<u></u>				
Size of Filler Metal:	3.2 mm			3.2 mm					
Thickness Range:									
Weld Metal (t):	> 3.5 mm			> 4.4 mm					
Electrode-Flux (Class)	N/A			N/A					
Flux Trade Name	N/A			N/A					
Consumable Insert	N/A			N/A					
Other	N/A			N/A					
•									
* Each base metal - fi	ller metal combination should be reco	orded individ	dually.						

E	valua	WE:	LDING PROC	 CEDURE S	PECIFICA	 TION (WI	PS)		
ding	A TON					•			
N N	2		(Section IX, A	SME Pressu	are Vessel Co	ode 2007)			
**************************************	/EL								
DIEJO	Lab Buil'								
JOB NO.:		2			DOC. NO.:	V	VPS-002		
Project NAME	E: Effect of S	urface Coating	Processes on Abra	sive Wear	DATE:	Jun	ne 19, 2012	Page	2/2
			WP	PS No. W	VPS-002 F	Rev. 0			
POSITION	(OW-405)				POST W	ELD HEAT	TREATME	NT (OW-	-407)
Position(s)			All			ture range		595 °C	407)
Welding Pr		Jp Uphill		-	Time Ra			30 min	
Position(s)	-	·	All		Other			N/A	
PREHEAT	(OW-406)				GAS (QV	V-408)	Percent C	omposition	
	mperature, Min	imum	25 °C		UAD (Q	Gas(e:		ture	Flow Rate
	emperature, Ma		180 °C Ma	ıy	Shielding				N/A
Preheat Ma			N/A	i.r.	Trailing	N/A		/A	N/A
(Continuous	s or special hea	ting where appl	licable should be re	ecorded)	Backing	N/A	N.	/A	N/A
EI ECTRIC	TAL CHARA	CTEDISTIC	CS (OW-409)		ļ	-			
Current DC		DC DC	``	larity	1	DCEP			
Amps (Ran		65 – 75 A		olts (Range)		- 24 Volts			
P~ \			ge should be record				ckness, etc. This	s informatio	on maybe
			rm similar to that s			,,	,		
Tungsten El	lectrode Size aı	nd Type		N/A		(Pure Tungste	n, 2% Thoriated	i, etc.)	
	al Transfer for C			N/A		(Spray Arc, S	hort Circuit Ar	c, etc.)	
Electrode V	Wire feed Speed	d Range		N/A					
TECHNIO	UE (QW-410	<u> </u>							
~	Weave Bead	,		Stringer					
_	Gas Cup Size			9 – 13 n					
	Interpass Clean	ing (Brushing,	Grinding, etc.)	Grinding	g and Brushing b	y stainless ste	el tool		
	ration for Base			N/A					
Method of I	Back Gouging		<u> </u>	N/A					
Oscillation			-	N/A					
	be to Work Dis		_	N/A					
-	Single Pass (P			Multiple	pass				
-	Single Electron	des		Single	, .				
Travel Spee	ed (Range)			14 – 20 0	cm/min				
Peening Other				N/A N/A					
Other							-		_
Weld			er Metal		rent	Volt	Travel Speed		Other
Layer(s)	Process	Class	Diameter (mm)	Type /	Amp	Range	Range		arks, Comment,
	0.6144	72007 16		Polar	Range (A)	(V)	(cm/min)	Hot Wire	Addition, etc)
2	SMAW	E309L-16	3.2	DCEP	65 – 75	22 – 24	15 – 16	,	NI TIT
3 to All	SMAW SMAW	E309L-16 ECoCr-A	3.2 3.2	DCEP DCEP	65 – 75 65 – 75	22 - 24 22 - 24	18 – 19 16 – 18	1	PWHT
3 10 AH	SIVIA W	ECOC1-A	3.4	DCEF	03 - 73	22 – 2 4	10 - 10		
		<u> </u>							
	 								

WPS สำหรับกระบวนการเชื่อมอาร์กลวดหุ้มฟลักซ์ โดยมีการให้ความร้อนหลังการเชื่อมภายหลังการ เชื่อมชั้นต้านทานการสึกหรอที่ผิวหน้า

Sir A On		KE SI I	ECIFICATION	(WPS)		
	(Section IX, ASME I	ressure	Vessel Code 20	007)		
WEL ab Lab Lab Lab Lab Lab Lab Lab Lab Lab						
JOB NO.: 3			DOC. NO.:	WPS-003		
	ace Coating Processes on Abrasive We	ar	DATE;	June 19, 2012	Page	1 / 2
Troject White. Effect of Surf	ace coating frocesses on frotasive we	uı	DITTE.	June 19, 2012	ruge	1 / 2
Company Name Adva	inced Surface Technologies Co.,Ltd.	By:		Mr.Chawanop Muangti	hong	
WPS No.	WPS-003	Date	June 19, 2012	Supporting PQR No.		N/A
Revision No.	0	Date	N/A	<u> </u>		
Welding Process(es)	SMAW	Type		Manual		
			(Autom	atic, Manual, Machine, o	or Semi-Aut	to)
JOINTS (QW-402)						
Joint Design	Bead on Plate (Hardfacing)					
Backing	N/A					
Backing Material (type)	N/A					
Metal	Nonfusingmetal		+			
			t l			
Nonmetallic	Other		+			
Skethes, Production dra	awing, Weld symbols or Written descrip	otion	т 📗			
should show the genera	l arrangement of the parts to be weld.	Where				
applicable, the root spa	cing and the details of groove may be s	pecified				
DACE METAIC (OW/402)					
BASE METALS (QW-403		to D N	NI/A	Crown No.	N	//A
P-No. 1) Group No1	to P-No	o. <u>N/A</u>	Group No.	N	//A
P-No. 1	Group No. 1			Group No.	N	7/A
P-No. 1 OR Specification Type or Grade	Group No. 1			Group No.	N	//A
P-No. 1	Group No. 1		SA-36	Group No.	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade	Group No. 1		SA-36	Group No.	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR	Group No. 1 de		SA-36	Group No.	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range:	Group No. 1l de rop		SA-36	Group No.	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech.	Group No. 1 de rop. Prop. 10 – 25 mm		SA-36	Group No.	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range:	Group No. 1l de rop		SA-36	Group No.	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other:	Group No. 1 de		SA-36	Group No.	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other:	Group No. 1 de rop. Prop. 10 – 25 mm N/A		SA-36		N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA)	Group No. 1 de		SA-36	SFA 5.13	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA) AWS No. (Class)	Group No. 1 de rop. 10 – 25 mm N/A SFA 5.4 E309L-16		SA-36	SFA 5.13 ECoCr-A	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA) AWS No. (Class) F-No.	Group No. 1 de rop. 10 – 25 mm N/A SFA 5.4 E309L-16 5		SA-36	SFA 5.13 ECoCr-A 71	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA) AWS No. (Class)	Group No. 1 de rop. 10 – 25 mm N/A SFA 5.4 E309L-16		SA-36	SFA 5.13 ECoCr-A 71 N/A	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA) AWS No. (Class) F-No. A-No.	Group No. 1 de rop. Prop. 10 – 25 mm N/A 104) SFA 5.4 E309L-16 5 N/A		SA-36	SFA 5.13 ECoCr-A 71	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA) AWS No. (Class) F-No. A-No. Size of Filler Metal:	Group No. 1 de rop. Prop. 10 – 25 mm N/A 104) SFA 5.4 E309L-16 5 N/A		SA-36	SFA 5.13 ECoCr-A 71 N/A	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA) AWS No. (Class) F-No. A-No. Size of Filler Metal: Thickness Range:	Group No. 1 de rop. Prop. 10 – 25 mm N/A 104) SFA 5.4 E309L-16 5 N/A 3.2 mm		SA-36	SFA 5.13 ECoCr-A 71 N/A 3.2 mm	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA) AWS No. (Class) F-No. A-No. Size of Filler Metal: Thickness Range: Weld Metal (t):	Group No. 1 de rop. Prop. 10 – 25 mm N/A 104) SFA 5.4 E309L-16 5 N/A 3.2 mm > 3.5 mm N/A N/A		SA-36	SFA 5.13 ECoCr-A 71 N/A 3.2 mm > 4.4 mm	N	/A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-2 Spec No. (SFA) AWS No. (Class) F-No. A-No. Size of Filler Metal: Thickness Range: Weld Metal (t): Electrode-Flux (Class) Flux Trade Name Consumable Insert	Group No. 1 de rop. Prop. 10 – 25 mm N/A 104) SFA 5.4 E309L-16 5 N/A 3.2 mm > 3.5 mm N/A N/A N/A N/A		SA-36	SFA 5.13 ECoCr-A 71 N/A 3.2 mm > 4.4 mm N/A	N	//A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-2 Spec No. (SFA) AWS No. (Class) F-No. A-No. Size of Filler Metal: Thickness Range: Weld Metal (t): Electrode-Flux (Class) Flux Trade Name	Group No. 1 de rop. Prop. 10 – 25 mm N/A 104) SFA 5.4 E309L-16 5 N/A 3.2 mm > 3.5 mm N/A N/A		SA-36	SFA 5.13 ECoCr-A 71 N/A 3.2 mm > 4.4 mm N/A N/A	N	//A
P-No. 1 OR Specification Type or Grade to Specification Type or Grade to Specification Type or Grade OR Chem. Analysis and Mech. P to Chem. Analysis and Mech. Thickness Range: Base Metal (T): Other: FILLER METALS (QW-4 Spec No. (SFA) AWS No. (Class) F-No. A-No. Size of Filler Metal: Thickness Range: Weld Metal (t): Electrode-Flux (Class) Flux Trade Name Consumable Insert Other	Group No. 1 de rop. Prop. 10 – 25 mm N/A 104) SFA 5.4 E309L-16 5 N/A 3.2 mm > 3.5 mm N/A N/A N/A N/A		SA-36 - -	SFA 5.13 ECoCr-A 71 N/A 3.2 mm > 4.4 mm N/A N/A N/A	N	/A

Wey was	A STORY OF THE STO		WEL	DING PRO	CEDURE	SPECIFICA	ATION (W	PS)
N. W.	PEL A							
JOB NO.:		3			DOC. NO.:	. W	VPS-003	
Project NAME	E: Effect of S	urface Coating	Processes on Abra	asive Wear	DATE:	Jun	e 19, 2012	Page 2/2
			WI	PS No. W	/PS-003 F	Rev. 0	-	
POSITION	(OW-405)				POST W	ELD HEAT	TREATME	NT (QW-407)
Position(s)	/		All			ture range		595 °C
Welding Pro		Jp Uphill		-	Time Ra			30 min
Position(s)	•	ор Срии	All		Other			N/A
1 Osition(s)	<u> </u>		All		. Other			14/71
PREHEAT	(QW-406)				GAS (QV	V-408)	Percent Co	omposition
Preheat Ter	mperature, Min	imum	25 °C			Gas(es	s) Mix	ture Flow Rate
	emperature, Ma		180 °C Ma	ıx	Shielding			/A N/A
Preheat Ma		-	N/A		Trailing	N/A	N/	/A N/A
		ting where app	licable should be r	ecorded)	Backing		N/	/A N/A
	•					L	1	L
Current DC Amps (Ran	or AC	DC 65 – 75 A		olarity		DCEP - 24 Volts		
Allips (Ivan							-1an ata Thi	s information maybe
			ge snould be recor rm similar to that :		ectricai size, r	osition, and unc	ekness, etc. 11113	s information maybe
Tomoston El			rm similar to that :			(Down Townsets	20/ Thomisto	1 \
_	ectrode Size a			N/A			n, 2% Thoriated	
	1 Transfer for C	_		N/A		(Spray Arc, 5	hort Circuit Are	c, etc.)
Electrode v	Vire feed Speed	Range		N/A				
TECHNIOL	UE (QW-410	n .						
~	Weave Bead	,		Stringer				
_	Gas Cup Size		_	9 – 13 n	am			
	•	ing (Brushing,	Crinding etc.)		and Brushing t	ar etainlace etae	al +ool	
	ration for Base		Grinding, etc.)	N/A	g aliu Di usiiing u	by stanness stee	21 1001	
		Metai	_	N/A N/A				
Oscillation	Back Gouging			N/A N/A				
0.001111111011	- + - Worls Die		_	N/A N/A				
	be to Work Dis							
•	Single Pass (Po			Multiple Single	pass			
	Single Electron	ies	_	- 6 -	1			
Travel Spee	ed (Range)		_	14 – 20 0	cm/min			
Peening			_	N/A				
Other			_	N/A				
Weld		Fille	r Metal	Cur	rent	Volt	Travel Speed	Other
Layer(s)	Process	Class	Diameter (mm)	Type /	Amp	Range	Range	(e.g. remarks, Comment,
•				Polar	Range (A)	(V)	(cm/min)	Hot Wire Addition, etc)
1	SMAW	E309L-16	3.2	DCEP	65 – 75	22 – 24	15 – 16	
2	SMAW	E309L-16	3.2	DCEP	65 – 75	22 – 24	18 – 19	
3 to All	SMAW	ECoCr-A	3.2	DCEP	65 – 75	22 – 24	16 – 18	PWHT
	-		-	-			-	

WPS สำหรับกระบวนการเชื่อมอาร์กทั้งสเตนแก๊สคลุม โดยไม่มีการให้ความร้อนหลังการเชื่อม

and Evaluation and	WELDING	PROC	EEDURE SPEC	IFICATION (WPS)	
To De Joge 1 Europe						
JOB NO.: 4			DOC. NO.:	WPS-004		
Project NAME: Effect of Surfa	ace Coating Processes on Abrasive We	ar	DATE:	June 19, 2012	Page	1 / 2
	nced Surface Technologies Co.,Ltd.	By:		Mr.Chawanop Muangtho	_	
WPS No.	WPS-004	Date	June 19, 2012	Supporting PQR No.	N	I/A
Revision No.	0	Date	N/A	_		
Welding Process(es)	GTAW	Type		Manual		`
			(Automa	atic, Manual, Machine, or	Semi-Auto))
JOINTS (QW-402)						
Joint Design	Bead on Plate (Hardfacing)					
Backing	N/A					
Backing Material (type)	N/A					
Backing Material (type)	N/A					
Metal	Nonfusingmetal		1 1		33	
Nonmetallic	Other			777	\prec	
should show the general	wing, Weld symbols or Written descrip arrangement of the parts to be weld.	Where	т			
applicable, the root space	eing and the details of groove may be s	pecified				
BASE METALS (QW-403)						
P-No. 1	Group No. 1	to P-N	o. N/A	Group No.	N/	Α
OR						
Specification Type or Grade			SA-36			
to Specification Type or Grad	le		-			
OR						
Chem. Analysis and Mech. Pr	-		-			
to Chem. Analysis and Mech.	Prop.		-			
Thickness Range:						
Base Metal (T):	10 – 25 mm					
Other:	N/A					
FILLER METALS (QW-4	04)					
Spec No. (SFA)	SFA 5.9			SFA 5.21		
AWS No. (Class)	ER309L			ERCoCr-A		
F-No.	6			72		
A-No.	8			N/A		
Size of Filler Metal:	2.4 mm			3.2 mm		
Thickness Range:	•					
Weld Metal (t):	> 2.3 mm			> 2.7 mm		
Electrode-Flux (Class)	N/A			N/A		
Flux Trade Name	N/A			N/A		
Consumable Insert	N/A			N/A		
Other	N/A N/A			N/A		-
VIIIVI	14/11			11/11		
* Each base metal - fi	ller metal combination should be recor	ded indiv	idually.			

E CONTRACTOR DE LA CONT	Aluarion		LDING PRO			•	S)				
A			(50000000000000000000000000000000000000		1						
Rypleso	PEL A DUNI										
JOB NO.:		4			DOC. NO.:		/PS-004				
Project NAME	E: Effect of S	urface Coating	Processes on Abra	asive Wear	DATE:	Jun	e 19, 2012	Page	2/2		
	WPS No. WPS-004 Rev. 0										
POSITION	(QW-405)				POST W	ELD HEAT	TREATME	NT (QW	-407)		
Position(s)	of Groove		All		Tempera	ture range		N/A			
Welding Pr	ogression L	Ip Uphill	Down	-	Time Ra	nge		N/A			
Position(s)	of fillet		All		Other	_		N/A			
PREHEAT	(QW-406)				GAS (QV	V-408)	Percent Co	omposition	1		
Preheat Ter	mperature, Min	imum	25 °C			Gas(es	s) Mix	ture	Flow Rate		
Interpass To	emperature, Ma	aximum	180 °C Ma	ax	Shielding	g Ar	99.9	99%	15 l/min		
Preheat Ma			N/A		Trailing	N/A	N/		N/A		
(Continuous	s or special hea	ting where app	licable should be r	ecorded)	Backing	N/A	N/	/A	N/A		
ELECTRIC	CAL CHARA	CTERISTIC	CS (QW-409)								
Current DC		DC		olarity		DCEN					
Amps (Ran		100 – 120 z		olts (Range)		- 14 Volts					
	, ,		ge should be recor		ectrical size. Po	osition, and thic	kness, etc. This	s informat	ion maybe		
			rm similar to that			(D	20/ 771				
	lectrode Size at		2.	4 mm, 2% Tho	nated		n, 2% Thoriated				
	1 Transfer for O Vire feed Spee			N/A N/A		(Spray Arc, Si	hort Circuit Are	c, etc.)			
Electrode v	vire feed speed	r Kange		N/A							
TECHNIQU	UE (QW-410)									
Stringer or	Weave Bead			Stringer							
Orifice or 0	Gas Cup Size			9 – 13 n	nm						
Initial and I	Interpass Clean	ing (Brushing,	Grinding, etc.)	Grinding	g and Brushing b	y stainless stee	el tool				
	ration for Base	Metal	_	N/A							
	Back Gouging			N/A							
Oscillation	, W 1 D		_	N/A							
	be to Work Dis		_	N/A							
-	Single Pass (P Single Electro		_	Multiple Single	pass						
Travel Spec	•	ies	_	8 – 10 ci	m/min						
Peening	ed (Range)		_	N/A	17 111111						
Other			_	N/A							
	Г	n:::				** 1:	I	1	0.1		
Weld	D		r Metal		rent	Volt	Travel Speed		Other		
Layer(s)	Process	Class	Diameter (mm)	Type / Polar	Amp Range (A)	Range (V)	Range (cm/min)		narks, Comment, e Addition, etc)		
1	GTAW	E309L	2.4	DCEN	100 – 120	13 – 14	(cm/min) 8 – 9	not wir	e Addition, etc)		
2	GTAW	E309L	2.4	DCEN	100 - 120 100 - 120	13 – 14	9 – 10				
3 to All	GTAW	ERCoCr-A	3,2	DCEN	100 - 120	13 – 14	9 – 10				
2 (3 7111	522111	Liteber 11	,2	D OLLI	100 120	10 11	, 10				

WPS สำหรับกระบวนการเชื่อมอาร์กทั้งสเตนแก๊สคลุม โดยมีการให้ความร้อนหลังการเชื่อมภายหลัง การเชื่อมชั้นรองพื้น

and A saluation	WELDING PRO	OCEDURE SPE	CIFICATION (WPS)
TIGOTOGET BUILD				
JOB NO.: 5		DOC. NO.:	WPS-005	
	ace Coating Processes on Abrasive Wear	DATE:	June 19, 2012	Page 1 / 2
Company Name Adva: WPS No. Revision No. Welding Process(es)	meed Surface Technologies Co.,Ltd. By WPS-005 Da 0 Da GTAW Tyl	June 19, 2012 te N/A	Mr.Chawanop Muangthe Supporting PQR No. Manual Matic, Manual, Machine, or	N/A
IOINTS (OW-402)				
JOINTS (QW-402) Joint Design Backing Backing Material (type)	Bead on Plate (Hardfacing) N/A N/A	- - -		
Metal Nonmetallic	Nonfusingmetal Other	t T		
should show the general	wing, Weld symbols or Written description arrangement of the parts to be weld. Where cing and the details of groove may be specific			
BASE METALS (QW-403)				
P-No. 1	Group No. 1 to F	P-No. N/A	Group No.	N/A
OR				
Specification Type or Grade		SA-36		
to Specification Type or Grad OR	e	-		
Chem. Analysis and Mech. Pr	op.	_		
to Chem. Analysis and Mech.		-		
Thickness Range:	•			
Base Metal (T):	10 - 25 mm			
Other:	N/A			
FILLER METALS (QW-4	04)			
Spec No. (SFA)	SFA 5.9		SFA 5.21	
AWS No. (Class)	ER309L		ERCoCr-A	
F-No.	6		72	
A-No.	8		N/A	
Size of Filler Metal:	2.4 mm		3.2 mm	
Thickness Range:			• -	
Weld Metal (t):	> 2.3 mm		> 2.7 mm	
Electrode-Flux (Class)	N/A		N/A	
Flux Trade Name	N/A		N/A	
Consumable Insert Other	N/A		N/A N/A	
Other	N/A		N/A	
* Each base metal - fi	ller metal combination should be recorded in	dividually.		

E	Jalua	l we	LDING PRO	CEDURE S	PECIFICA	TION (WP	(2)	
Aing E	A arion	, V.E.	LDING I KO	CEDURES	Lenica	11011 (111	3)	
Mel	9		(Section IX, A	SME Pressu	ire Vessel Co	ode 2007)		
****	/EL							
Tojess	Lab GUIVI							
30	gen							
JOB NO.:					DOC. NO.:	· V	/PS-005	
			Processes on Abra	sive Wear	DATE:		e 19, 2012	Page 2/2
						Rev. 0	,	- "8" = -
			WI	25 NoW	/PS-005 F	cev. 0		
POSITION	(QW-405)				POST W	ELD HEAT		NT (QW-407)
Position(s)			All			ture range		595 °C
Welding Pr	•	Jp <u>Uphill</u>		-	Time Ra	nge		30 min
Position(s)	of fillet		All		Other			N/A
PREHEAT	(OW-406)				GAS (QV	V-408)	Percent Co	omposition
	mperature, Min	imum	25 °C		(.	Gas(es	s) Mix	ture Flow Rate
Interpass To	emperature, M	aximum	180 °C Ma	ıx	Shielding	g Ar	99.9	99% 15 l/min
Preheat Ma	intenance		N/A		Trailing	N/A	N/	/A N/A
(Continuous	s or special hea	ting where appl	licable should be re	ecorded)	Backing	N/A	N/	/A N/A
FI FCTRIC	TAL CHARA	CTERISTIC	CS (QW-409)					
Current DC		DC DC	/	larity	1	DCEN		
Amps (Ran		100 – 120 A		olts (Range)		- 14 Volts		
							kness, etc. This	s information maybe
			rm similar to that					,,
Tungsten El	lectrode Size a	nd Type	2.	4 mm, 2% Thor	riated	(Pure Tungster	n, 2% Thoriated	l, etc.)
Mode Meta	1 Transfer for 6	GMAW		N/A		(Spray Arc, Sl	hort Circuit Are	c, etc.)
Electrode V	Vire feed Spee	d Range		N/A				
TECHNIOL	UE (OW) 410	<u> </u>						
~	U E (QW-41(Weave Bead	"		Stringer				
_	Gas Cup Size			9 – 13 n	nm			
		ing (Brushing,	Grinding etc.)		and Brushing t	v ctainless stee	al tool	
	ration for Base			N/A	, and Drasning (by stanness stee	21 1001	-
- 1	Back Gouging	11101111		N/A				
Oscillation				N/A				
Contact Tul	be to Work Dis	tance		N/A				-
Multiple or	Single Pass (P	er Side)		Multiple	pass			
Multiple or	Single Electro	des	<u> </u>	Single				
Travel Spec	ed (Range)			8 – 10 cı	n/min			
Peening				N/A				
Other				N/A				
Weld		Fille	r Metal	Cur	rent	Volt	Travel Speed	Other
Layer(s)	Process	Class	Diameter (mm)	Type /	Amp	Range	Range	(e.g. remarks, Comment,
•				Polar	Range (A)	(V)	(cm/min)	Hot Wire Addition, etc)
1	GTAW	E309L	2.4	DCEN	100 - 120	13 – 14	8 – 9	
2	GTAW	E309L	2.4	DCEN	100 – 120	13 – 14	9 – 10	PWHT
3 to All	GTAW	ERCoCr-A	3.2	DCEN	100 - 120	13 – 14	9 – 10	
	1						l	

WPS สำหรับกระบวนการเชื่อมอาร์กทั้งสเตนแก๊สคลุม โดยมีการให้ความร้อนหลังการเชื่อมภายหลัง การเชื่อมชั้นด้านทานการสึกหรอที่ผิวหน้า

drd Evaluation sa	WELDING PROCEDURE SPECIFICATION (WPS)								
Tropologer Bullo									
JOB NO.: 6		DOC. NO.:	WPS-006						
	ace Coating Processes on Abrasive Wear	DATE:	June 19, 2012	Page 1 / 2					
	meed Surface Technologies Co.,Ltd. WPS-006 Dat O Dat GTAW Typ	June 19, 2012 e N/A	Mr.Chawanop Muangthe Supporting PQR No. Manual Matic, Manual, Machine, or	ong N/A					
TOTALES (OVE 402)									
JOINTS (QW-402) Joint Design Backing Backing Material (type)	Bead on Plate (Hardfacing) N/A N/A								
Metal	Nonfusingmetal	+ 1 6							
Nonmetallic	Other	- +	777	77					
should show the general applicable, the root space	wing, Weld symbols or Written description arrangement of the parts to be weld. Where sing and the details of groove may be specifie	d							
BASE METALS (QW-403)									
P-No. 1	Group No. 1 to P	-No. N/A	A Group No.	N/A					
OR		SA 26							
Specification Type or Grade to Specification Type or Grad		SA-36							
OR									
Chem. Analysis and Mech. Pr	op.	-							
to Chem. Analysis and Mech.		-							
Thickness Range:									
Base Metal (T):	10 – 25 mm								
Other:	N/A								
FILLER METALS (QW-4	04)								
Spec No. (SFA)	SFA 5.9		SFA 5.21						
AWS No. (Class)	ER309L		ERCoCr-A						
F-No.	6	· ·	72						
A-No.	8		N/A						
Size of Filler Metal:	2.4 mm		3.2 mm						
Thickness Range: Weld Metal (t):	> 2.3 mm		> 2.7 mm						
Electrode-Flux (Class)	N/A		N/A						
Flux Trade Name	N/A		N/A N/A						
Consumable Insert	N/A		N/A						
Other	N/A		N/A	_					
•									
* Each base metal - fi	ller metal combination should be recorded in	lividually.							

E	Jalua	WE.	LDING PRO	CEDURE S	PECIFICA	TION (WP	(2)	
hind	A drion	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	LDINGTRO	CLDCKLS	Lenien	11011(111	5)	
Mel	9		(Section IX, A	SME Pressu	ire Vessel Co	ode 2007)		
* *	/EL							
Toles	Lab GUIJI							
	gen							
JOB NO.:		6			DOC. NO.:	· W	/PS-006	
		•	Processes on Abra	DATE:		e 19, 2012	Page 2/2	
						Rev. 0	, -	
			VV I	5 NO. W				
POSITION								NT (QW-407)
Position(s)			All			ture range		595 °C
Welding Pr	•	Jp Uphill		-	Time Ra	nge		30 min
Position(s)	of fillet		All		Other			N/A
PREHEAT	(QW-406)				GAS (QV	V-408)	Percent Co	omposition
	mperature, Min	imum	25 °C			Gas(es	s) Mix	ture Flow Rate
Interpass To	emperature, M	aximum	180 °C Ma	ıx	Shielding	g Ar	99.9	99% 15 1/min
Preheat Ma	intenance		N/A		Trailing	N/A	N/	/A N/A
(Continuous	s or special hea	ting where app	licable should be re	ecorded)	Backing	N/A	N,	/A N/A
FLECTRIC	'AL CHARA	CTERISTIC	CS (QW-409)					
Current DC		DC	/	olarity	1	DCEN		
Amps (Ran		100 - 120 A		olts (Range)		- 14 Volts		
P~ \							kness, etc. This	s information maybe
			rm similar to that			,		,,,,
Tungsten El	lectrode Size a	nd Type	2.	4 mm, 2% Thor	riated	(Pure Tungster	n, 2% Thoriated	l, etc.)
Mode Meta	1 Transfer for	GMAW		N/A		(Spray Arc, Sl	hort Circuit Are	c, etc.)
Electrode V	Vire feed Spee	d Range		N/A				
TECHNIOL	UE (OW 410	<u>,, </u>						
~	U E (QW-41(Weave Bead	"		Stringer				
_	Gas Cup Size			9 – 13 n	am			
		ing (Brushing,	Grinding etc.)		and Brushing t	v ctainless stee	al tool	
	ration for Base			N/A	g and Drusning (by stanness stee	21 1001	
- 1	Back Gouging	Wictai	-	N/A				
Oscillation				N/A				
Contact Tul	be to Work Dis	tance		N/A				
Multiple or	Single Pass (P	er Side)		Multiple	pass			
Multiple or	Single Electro	des		Single	•			
Travel Spec	ed (Range)			8 – 10 cı	n/min			
Peening			_	N/A				
Other				N/A				
Weld	I	Fille	r Metal	Cur	rent	Volt	Travel Speed	Other
Layer(s)	Process	Class	Diameter (mm)	Type /	Amp	Range	Range	(e.g. remarks, Comment,
		0.4455		Polar	Range (A)	(V)	(cm/min)	Hot Wire Addition, etc)
1	GTAW	E309L	2.4	DCEN	100 – 120	13 – 14	8 – 9	, ,
2	GTAW	E309L	2,4	DCEN	100 - 120	13 – 14	9 – 10	
3 to All	GTAW	ERCoCr-A	3.2	DCEN	100 - 120	13 – 14	9 – 10	PWHT