ภาคผนวก ก

การควบคุมการเชื่อมให้เป็นไปตามข้อกำหนดตัวแปรในการเชื่อม

(Welding Procedure Specification; WPS)

WPS สำหรับกระบวนการเชื่อมอาร์กลวดหุ้มฟลักซ์ โดยไม่มีการให้ความร้อนหลังการเชื่อม

WELDING PROCEDURE SPECIFICATION (WPS)

JOB NO.:	1	DOC. NO.:	WPS-001
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 1 / 2

Company Name	Advanced Surface Technologies Co.,Ltd.	By:	Mr.Chawanop Muangthong		
WPS No.	WPS-001	Date	June 19, 2012	Supporting PQR No.	N/A
Revision No.	0	Date	N/A		
Welding Process(es)	SMAW	Type	Manual (Automatic, Manual, Machine, or Semi-Auto)		

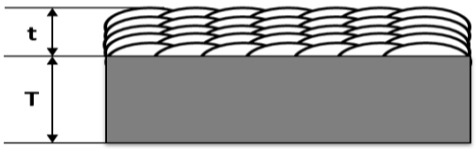
JOINTS (QW-402)

Joint Design	Bead on Plate (Hardfacing)
Backing	N/A
Backing Material (type)	N/A

☐ Metal ☐ Nonfusingmetal

☐ Nonmetallic ☐ Other

Skethes, Production drawing, Weld symbols or Written description should show the general arrangement of the parts to be weld. Where applicable, the root spacing and the details of groove may be specified



BASE METALS (QW-403)

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 Grade	-

OR

Chem. Analysis and Mech. Prop.	-
to Chem. Analysis and Mech. Prop.	-
Thickness Range:	
Base Metal (T):	10 – 25 mm
Other:	N/A

FILLER METALS (QW-404)

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 - filler metal combination should be recorded individually.

WELDING PROCEDURE SPECIFICATION (WPS)

(Section IX, ASME Pressure Vessel Code 2007)

JOB NO.:	1	DOC. NO.:	WPS-001
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 2/2

WPS No. WPS-001 Rev. 0

POSITION (QW-405)

Position(s) of Groove	All			
Welding Progression	Up	Uphill	Down	-
Position(s) of fillet	All			

POST WELD HEAT TREATMENT (QW-407)

Temperature range	N/A
Time Range	N/A
Other	N/A

PREHEAT (QW-406)

Preheat Temperature, Minimum	25 °C
Interpass Temperature, Maximum	180 °C Max
Preheat Maintenance	N/A

(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Percent Composition		
	Gas(es)	Mixture	Flow Rate
Shielding	N/A	N/A	N/A
Trailing	N/A	N/A	N/A
Backing	N/A	N/A	N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current DC or AC	DC	Polarity	DCEP
Amps (Range)	65 – 75 Amps	Volts (Range)	22 – 24 Volts

(Amps and volts range should be recorded for each electrical size. Position, and thickness, etc. This information maybe listed in a tabular form similar to that shown below)

Tungsten Electrode Size and Type	N/A	(Pure Tungsten, 2% Thoriated, etc.)
Mode Metal Transfer for GMAW	N/A	(Spray Arc, Short Circuit Arc, etc.)
Electrode Wire feed Speed Range	N/A	

TECHNIQUE (QW-410)

Stringer or Weave Bead	Stringer
Orifice or Gas Cup Size	9 – 13 mm
Initial and Interpass Cleaning (Brushing, Grinding, etc.)	Grinding and Brushing by stainless steel tool
Edge Preparation for Base Metal	N/A
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	N/A
Multiple or Single Pass (Per Side)	Multiple pass
Multiple or Single Electrodes	Single
Travel Speed (Range)	14 – 20 cm/min
Peening	N/A
Other	N/A

Weld Layer(s)	Process	Filler Metal		Current		Volt Range (V)	Travel Speed Range (cm/min)	Other (e.g. remarks, Comment, Hot Wire Addition, etc)
		Class	Diameter (mm)	Type / Polar	Amp Range (A)			
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	

WPS สำหรับกระบวนการเชื่อมอาร์กลวดหุ้มฟลักซ์ โดยมีการให้ความร้อนหลังการเชื่อมภายหลังการเชื่อมชั้นรองพื้น

WELDING PROCEDURE SPECIFICATION (WPS)

JOB NO.:	2	DOC. NO.:	WPS-002
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 1 / 2

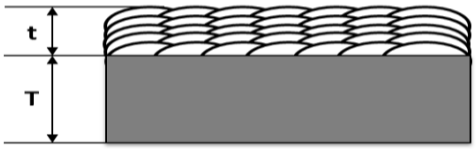
Company Name	Advanced Surface Technologies Co.,Ltd.	By:	Mr.Chawanop Muangthong		
WPS No.	WPS-002	Date	June 19, 2012	Supporting PQR No.	N/A
Revision No.	0	Date	N/A		
Welding Process(es)	SMAW	Type	Manual (Automatic, Manual, Machine, or Semi-Auto)		

JOINTS (QW-402)

Joint Design	Bead on Plate (Hardfacing)
Backing	N/A
Backing Material (type)	N/A

☐ Metal ☐ Nonfusingmetal
☐ Nonmetallic ☐ Other

Skethes, Production drawing, Weld symbols or Written description should show the general arrangement of the parts to be weld. Where applicable, the root spacing and the details of groove may be specified



BASE METALS (QW-403)

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 Grade	-

OR

Chem. Analysis and Mech. Prop.	-
to Chem. Analysis and Mech. Prop.	-
Thickness Range:	
Base Metal (T):	10 – 25 mm
Other:	N/A

FILLER METALS (QW-404)

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 - filler metal combination should be recorded individually.

WELDING PROCEDURE SPECIFICATION (WPS)

(Section IX, ASME Pressure Vessel Code 2007)

JOB NO.:	2	DOC. NO.:	WPS-002
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 2/2

WPS No. WPS-002 Rev. 0

POSITION (QW-405)

Position(s) of Groove	All			
Welding Progression	Up	Uphill	Down	-
Position(s) of fillet	All			

POST WELD HEAT TREATMENT (QW-407)

Temperature range	> 595 °C
Time Range	30 min
Other	N/A

PREHEAT (QW-406)

Preheat Temperature, Minimum	25 °C
Interpass Temperature, Maximum	180 °C Max
Preheat Maintenance	N/A

(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Gas(es)	Mixture	Flow Rate
	Percent Composition		
Shielding	N/A	N/A	N/A
Trailing	N/A	N/A	N/A
Backing	N/A	N/A	N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current DC or AC	DC	Polarity	DCEP
Amps (Range)	65 – 75 Amps	Volts (Range)	22 – 24 Volts

(Amps and volts range should be recorded for each electrical size. Position, and thickness, etc. This information maybe listed in a tabular form similar to that shown below)

Tungsten Electrode Size and Type	N/A	(Pure Tungsten, 2% Thoriated, etc.)
Mode Metal Transfer for GMAW	N/A	(Spray Arc, Short Circuit Arc, etc.)
Electrode Wire feed Speed Range	N/A	

TECHNIQUE (QW-410)

Stringer or Weave Bead	Stringer
Orifice or Gas Cup Size	9 – 13 mm
Initial and Interpass Cleaning (Brushing, Grinding, etc.)	Grinding and Brushing by stainless steel tool
Edge Preparation for Base Metal	N/A
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	N/A
Multiple or Single Pass (Per Side)	Multiple pass
Multiple or Single Electrodes	Single
Travel Speed (Range)	14 – 20 cm/min
Peening	N/A
Other	N/A

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Diameter (mm)	Current Type / Polar	Current Amp Range (A)	Volt Range (V)	Travel Speed Range (cm/min)	Other (e.g. remarks, Comment, 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	PWHT
3 to All	SMAW	ECoCr-A	3.2	DCEP	65 – 75	22 – 24	16 – 18	

WPS สำหรับกระบวนการเชื่อมอาร์กลวดหุ้มฟลักซ์ โดยมีการให้ความร้อนหลังการเชื่อมภายหลังการเชื่อมชั้นต้านทานการสึกหรอที่ผิวหน้า

WELDING PROCEDURE SPECIFICATION (WPS)

(Section IX, ASME Pressure Vessel Code 2007)

JOB NO.:	3	DOC. NO.:	WPS-003
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 1 / 2

Company Name	Advanced Surface Technologies Co.,Ltd.	By:	Mr.Chawanop Muangthong		
WPS No.	WPS-003	Date	June 19, 2012	Supporting PQR No.	N/A
Revision No.	0	Date	N/A		
Welding Process(es)	SMAW	Type	Manual (Automatic, Manual, Machine, or Semi-Auto)		

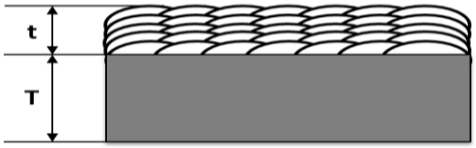
JOINTS (QW-402)

Joint Design	Bead on Plate (Hardfacing)
Backing	N/A
Backing Material (type)	N/A

☐ Metal ☐ Nonfusingmetal

☐ Nonmetallic ☐ Other

Skethes, Production drawing, Weld symbols or Written description should show the general arrangement of the parts to be weld. Where applicable, the root spacing and the details of groove may be specified



BASE METALS (QW-403)

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 Grade	-
OR	
Chem. Analysis and Mech. Prop.	-
to Chem. Analysis and Mech. Prop.	-
Thickness Range:	
Base Metal (T):	10 – 25 mm
Other:	N/A

FILLER METALS (QW-404)

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 - filler metal combination should be recorded individually.

WELDING PROCEDURE SPECIFICATION (WPS)

JOB NO.: 3	DOC. NO.: WPS-003
Project NAME: Effect of Surface Coating Processes on Abrasive Wear	DATE: June 19, 2012 Page 2/2

WPS No. WPS-003 Rev. 0

POSITION (QW-405)

Position(s) of Groove	All			
Welding Progression	Up	Uphill	Down	-
Position(s) of fillet	All			

POST WELD HEAT TREATMENT (QW-407)

Temperature range	> 595 °C
Time Range	30 min
Other	N/A

PREHEAT (QW-406)

Preheat Temperature, Minimum	25 °C
Interpass Temperature, Maximum	180 °C Max
Preheat Maintenance	N/A

(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Percent Composition		
	Gas(es)	Mixture	Flow Rate
Shielding	N/A	N/A	N/A
Trailing	N/A	N/A	N/A
Backing	N/A	N/A	N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current DC or AC	DC	Polarity	DCEP
Amps (Range)	65 – 75 Amps	Volts (Range)	22 – 24 Volts

(Amps and volts range should be recorded for each electrical size. Position, and thickness, etc. This information maybe listed in a tabular form similar to that shown below)

Tungsten Electrode Size and Type	N/A	(Pure Tungsten, 2% Thoriated, etc.)
Mode Metal Transfer for GMAW	N/A	(Spray Arc, Short Circuit Arc, etc.)
Electrode Wire feed Speed Range	N/A	

TECHNIQUE (QW-410)

Stringer or Weave Bead	Stringer
Orifice or Gas Cup Size	9 – 13 mm
Initial and Interpass Cleaning (Brushing, Grinding, etc.)	Grinding and Brushing by stainless steel tool
Edge Preparation for Base Metal	N/A
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	N/A
Multiple or Single Pass (Per Side)	Multiple pass
Multiple or Single Electrodes	Single
Travel Speed (Range)	14 – 20 cm/min
Peening	N/A
Other	N/A

Weld Layer(s)	Process	Filler Metal		Current		Volt Range (V)	Travel Speed Range (cm/min)	Other (e.g. remarks, Comment, Hot Wire Addition, etc)
		Class	Diameter (mm)	Type / Polar	Amp Range (A)			
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 สำหรับกระบวนการเชื่อมอาร์กทังสเตนแก๊สคลุม โดยไม่มีการให้ความร้อนหลังการเชื่อม

WELDING PROCEDURE SPECIFICATION (WPS)

JOB NO.:	4	DOC. NO.:	WPS-004
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 1 / 2

Company Name	Advanced Surface Technologies Co.,Ltd.	By:	Mr.Chawanop Muangthong		
WPS No.	WPS-004	Date	June 19, 2012	Supporting PQR No.	N/A
Revision No.	0	Date	N/A		
Welding Process(es)	GTAW	Type	Manual (Automatic, Manual, Machine, or Semi-Auto)		

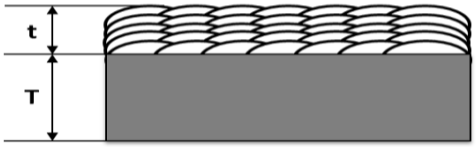
JOINTS (QW-402)

Joint Design	Bead on Plate (Hardfacing)
Backing	N/A
Backing Material (type)	N/A

☐ Metal ☐ Nonfusingmetal

☐ Nonmetallic ☐ Other

Skethes, Production drawing, Weld symbols or Written description should show the general arrangement of the parts to be weld. Where applicable, the root spacing and the details of groove may be specified



BASE METALS (QW-403)

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 Grade	-
OR	
Chem. Analysis and Mech. Prop.	-
to Chem. Analysis and Mech. Prop.	-
Thickness Range:	
Base Metal (T):	10 – 25 mm
Other:	N/A

FILLER METALS (QW-404)

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

* Each base metal - filler metal combination should be recorded individually.

WELDING PROCEDURE SPECIFICATION (WPS)

(Section IX, ASME Pressure Vessel Code 2007)

JOB NO.:	4	DOC. NO.:	WPS-004
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 2/2

WPS No. WPS-004 Rev. 0

POSITION (QW-405)

Position(s) of Groove	All			
Welding Progression	Up	Uphill	Down	-
Position(s) of fillet	All			

POST WELD HEAT TREATMENT (QW-407)

Temperature range	N/A
Time Range	N/A
Other	N/A

PREHEAT (QW-406)

Preheat Temperature, Minimum	25 °C
Interpass Temperature, Maximum	180 °C Max
Preheat Maintenance	N/A

(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

Percent Composition

	Gas(es)	Mixture	Flow Rate
Shielding	Ar	99.99%	15 l/min
Trailing	N/A	N/A	N/A
Backing	N/A	N/A	N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current DC or AC	DC	Polarity	DCEN
Amps (Range)	100 – 120 Amps	Volts (Range)	13 – 14 Volts

(Amps and volts range should be recorded for each electrical size. Position, and thickness, etc. This information maybe listed in a tabular form similar to that shown below)

Tungsten Electrode Size and Type	2.4 mm, 2% Thoriated	(Pure Tungsten, 2% Thoriated, etc.)
Mode Metal Transfer for GMAW	N/A	(Spray Arc, Short Circuit Arc, etc.)
Electrode Wire feed Speed Range	N/A	

TECHNIQUE (QW-410)

Stringer or Weave Bead	Stringer
Orifice or Gas Cup Size	9 – 13 mm
Initial and Interpass Cleaning (Brushing, Grinding, etc.)	Grinding and Brushing by stainless steel tool
Edge Preparation for Base Metal	N/A
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	N/A
Multiple or Single Pass (Per Side)	Multiple pass
Multiple or Single Electrodes	Single
Travel Speed (Range)	8 – 10 cm/min
Peening	N/A
Other	N/A

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Diameter (mm)	Current Type / Polar	Current Amp Range (A)	Volt Range (V)	Travel Speed Range (cm/min)	Other (e.g. remarks, Comment, 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	

WPS สำหรับกระบวนการเชื่อมอาร์กทังสเตนแก๊สคลุม โดยมีการให้ความร้อนหลังการเชื่อมภายหลังการเชื่อมชั้นรองพื้น

WELDING PROCEDURE SPECIFICATION (WPS)

JOB NO.:	5	DOC. NO.:	WPS-005
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 1 / 2

Company Name	Advanced Surface Technologies Co.,Ltd.	By:	Mr.Chawanop Muangthong		
WPS No.	WPS-005	Date	June 19, 2012	Supporting PQR No.	N/A
Revision No.	0	Date	N/A		
Welding Process(es)	GTAW	Type	Manual (Automatic, Manual, Machine, or Semi-Auto)		

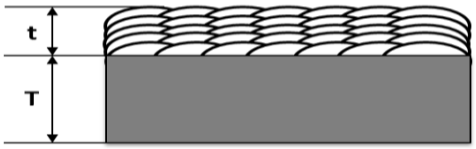
JOINTS (QW-402)

Joint Design	Bead on Plate (Hardfacing)
Backing	N/A
Backing Material (type)	N/A

☐ Metal ☐ Nonfusingmetal

☐ Nonmetallic ☐ Other

Skethes, Production drawing, Weld symbols or Written description should show the general arrangement of the parts to be weld. Where applicable, the root spacing and the details of groove may be specified



BASE METALS (QW-403)

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 Grade: -

OR

Chem. Analysis and Mech. Prop.: -

to Chem. Analysis and Mech. Prop.: -

Thickness Range:

Base Metal (T): 10 – 25 mm

Other: N/A

FILLER METALS (QW-404)

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

* Each base metal - filler metal combination should be recorded individually.

WELDING PROCEDURE SPECIFICATION (WPS)

(Section IX, ASME Pressure Vessel Code 2007)

JOB NO.:	5	DOC. NO.:	WPS-005
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 2/2

WPS No. WPS-005 Rev. 0

POSITION (QW-405)

Position(s) of Groove	All			
Welding Progression	Up	Uphill	Down	-
Position(s) of fillet	All			

POST WELD HEAT TREATMENT (QW-407)

Temperature range	> 595 °C
Time Range	30 min
Other	N/A

PREHEAT (QW-406)

Preheat Temperature, Minimum	25 °C
Interpass Temperature, Maximum	180 °C Max
Preheat Maintenance	N/A

(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

Percent Composition

	Gas(es)	Mixture	Flow Rate
Shielding	Ar	99.99%	15 l/min
Trailing	N/A	N/A	N/A
Backing	N/A	N/A	N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current DC or AC	DC	Polarity	DCEN
Amps (Range)	100 – 120 Amps	Volts (Range)	13 – 14 Volts

(Amps and volts range should be recorded for each electrical size. Position, and thickness, etc. This information maybe listed in a tabular form similar to that shown below)

Tungsten Electrode Size and Type	2.4 mm, 2% Thoriated	(Pure Tungsten, 2% Thoriated, etc.)
Mode Metal Transfer for GMAW	N/A	(Spray Arc, Short Circuit Arc, etc.)
Electrode Wire feed Speed Range	N/A	

TECHNIQUE (QW-410)

Stringer or Weave Bead	Stringer
Orifice or Gas Cup Size	9 – 13 mm
Initial and Interpass Cleaning (Brushing, Grinding, etc.)	Grinding and Brushing by stainless steel tool
Edge Preparation for Base Metal	N/A
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	N/A
Multiple or Single Pass (Per Side)	Multiple pass
Multiple or Single Electrodes	Single
Travel Speed (Range)	8 – 10 cm/min
Peening	N/A
Other	N/A

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Diameter (mm)	Current Type / Polar	Current Amp Range (A)	Volt Range (V)	Travel Speed Range (cm/min)	Other (e.g. remarks, Comment, 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	

WPS สำหรับกระบวนการเชื่อมอาร์กทังสเตนแก๊สคลุม โดยมีการให้ความร้อนหลังการเชื่อมภายหลังการเชื่อมชั้นต้านทานการสึกหรอที่ผิวหน้า

WELDING PROCEDURE SPECIFICATION (WPS)

JOB NO.:	6	DOC. NO.:	WPS-006
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 1 / 2

Company Name	Advanced Surface Technologies Co.,Ltd.	By:	Mr.Chawanop Muangthong		
WPS No.	WPS-006	Date	June 19, 2012	Supporting PQR No.	N/A
Revision No.	0	Date	N/A		
Welding Process(es)	GTAW	Type	Manual		
			(Automatic, Manual, Machine, or Semi-Auto)		

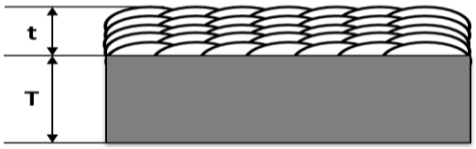
JOINTS (QW-402)

Joint Design	Bead on Plate (Hardfacing)
Backing	N/A
Backing Material (type)	N/A

☐ Metal ☐ Nonfusingmetal

☐ Nonmetallic ☐ Other

Skethes, Production drawing, Weld symbols or Written description should show the general arrangement of the parts to be weld. Where applicable, the root spacing and the details of groove may be specified



BASE METALS (QW-403)

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 Grade	-
OR	
Chem. Analysis and Mech. Prop.	-
to Chem. Analysis and Mech. Prop.	-
Thickness Range:	
Base Metal (T):	10 – 25 mm
Other:	N/A

FILLER METALS (QW-404)

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

* Each base metal - filler metal combination should be recorded individually.

WELDING PROCEDURE SPECIFICATION (WPS)

(Section IX, ASME Pressure Vessel Code 2007)

JOB NO.:	6	DOC. NO.:	WPS-006
Project NAME:	Effect of Surface Coating Processes on Abrasive Wear	DATE:	June 19, 2012 Page 2/2

WPS No. WPS-006 Rev. 0

POSITION (QW-405)

Position(s) of Groove	All			
Welding Progression	Up	Uphill	Down	-
Position(s) of fillet	All			

POST WELD HEAT TREATMENT (QW-407)

Temperature range	> 595 °C
Time Range	30 min
Other	N/A

PREHEAT (QW-406)

Preheat Temperature, Minimum	25 °C
Interpass Temperature, Maximum	180 °C Max
Preheat Maintenance	N/A

(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Gas(es)	Mixture	Flow Rate
		Percent Composition	
Shielding	Ar	99.99%	15 l/min
Trailing	N/A	N/A	N/A
Backing	N/A	N/A	N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current DC or AC	DC	Polarity	DCEN
Amps (Range)	100 – 120 Amps	Volts (Range)	13 – 14 Volts

(Amps and volts range should be recorded for each electrical size. Position, and thickness, etc. This information maybe listed in a tabular form similar to that shown below)

Tungsten Electrode Size and Type	2.4 mm, 2% Thoriated	(Pure Tungsten, 2% Thoriated, etc.)
Mode Metal Transfer for GMAW	N/A	(Spray Arc, Short Circuit Arc, etc.)
Electrode Wire feed Speed Range	N/A	

TECHNIQUE (QW-410)

Stringer or Weave Bead	Stringer
Orifice or Gas Cup Size	9 – 13 mm
Initial and Interpass Cleaning (Brushing, Grinding, etc.)	Grinding and Brushing by stainless steel tool
Edge Preparation for Base Metal	N/A
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	N/A
Multiple or Single Pass (Per Side)	Multiple pass
Multiple or Single Electrodes	Single
Travel Speed (Range)	8 – 10 cm/min
Peening	N/A
Other	N/A

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Diameter (mm)	Current Type / Polar	Current Amp Range (A)	Volt Range (V)	Travel Speed Range (cm/min)	Other (e.g. remarks, Comment, Hot Wire Addition, etc)
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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