

SECTION 2

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Purchase Order	4511951391
Serial No.	
Tag No.	E-11580

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1. Manufacturer's Data Report

As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

Items 6-11 incl. to be completed for single wall vessels, jackets of jacketed vessels, shell of heat exchangers, or chamber of multichamber vessels.

[illegible][illegible][illegible][illegible]

11. Hydro., proof, or comb. test pressure	5700kPa	Proof test	-
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12. Tubesheet	SA765-II+S31803 CLAD	1150mm	73+10mm	1.5mm	WELDED
	[Stationary (material spec. no.)]	[Diameter (subject to press.)]	(Nominal thickness)	(Corr. allow.)	[Attachment (welded or bolted)]
	-	-	-	-	-
Tubes	[Floating (material spec. no.)]	(Diameter)	(Nominal thickness)	(Corr. allow.)	(Attachment)
	SA789-S31803	19.05mm	1.63mm	1952	Straight
	(Material spec. no., grade or type)	(O.D.)	(Nominal thickness)	(Number)	[Type (Straight or U)]

ASMENational Board Number: 2065Mr. Representative: S. N. V. M. J. Date: APR 10/2015Authorized Inspector: [Signature] Date: APR 13, 2015**FORM U-1 (Cont'd)****PAGE 2**

Items 14-18 Incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers.

14. Shell: (a) No. of course(s) 2 (b) Overall length 1948mm

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter	Length	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	I.D. 1150mm	1024mm	SA240-S31803	15mm	0.0mm	1	Full	1.0	1	Full	1.0	-	-
1	I.D. 1150mm	924mm	SA240-S31803	15mm	0.0mm	1	Full	1.0	1	Full	1.0	-	-
	(BLANK)												

Body Flanges on Shells												
No.	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Location	Bolting			
									Num & Size	Bolting Material	Washer (OD,ID,thk)	Washer Material
4	(+2)	1150mm	1358mm	98mm	15mm	(+6)	Single, butt weld	End	60,1 1/8"-8UN×300L	SA320-L7M	58, 32, 6mm	ASTM-F436
(BLANK)												

15. Heads: (a) SA765-II+S31803 CLAD(+1) - H.T-N/A (b) SA765-II+S31803 CLAD(+1) - H.T-N/A

(Material spec, number, grade or type) (H.T.-time and temp.)

(Material spec, number, grade or type) (H.T.-time and temp.)

Location (Top, Bottom, Ends)	Thickness	Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
							Convex	Concave	Type	Full, Spot, None	Eff.
(a) End	88+10mm(+12)	0.0mm	-	-	-	1358mm	-	-	-	-	-
(b) End	88+10mm(+12)	0.0mm	-	-	-	1358mm	-	-	-	-	-

Body Flanges on Heads												
	Location	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Bolting			
									Num & Size	Bolting Material	Washer (OD, ID, thk)	Washer Material
(a)	(BLANK)											
(b)												

16. MAWP 965 kPa F.V at max. temp. 110°C 110°C Min. design metal temp. -45°C at 965 kPa
(Internal) (External) (Internal) (External)17. Impact test YES(CHANNEL-A01) at test temperature of -45°C
(Indicate yes or no and the component(s) impact tested)18. Hydro., ~~pressure~~ test pressure 2500 kPa Proof test -

19. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Type	Material		Nozzle Thickness		Reinforcement Material	Attachment Details		Location (Insp. Open.)
				Nozzle	Flange	Nom.	Corr.		Nozzle	Flange	
SHELL SIDE INLET	1	DN 150	Cl. 300 flg.	SA333-6	(+3)	15.09mm	3.0mm	SA516-70(+1)	(+4)	(+1)	-
SHELL SIDE OUTLET	1	DN 150	Cl. 300 flg.	SA333-6	(+3)	15.09mm	3.0mm	SA516-70(+1)	(+4)	(+1)	-
TUBE SIDE INLET	1	DN 600	Cl. 150 flg.	(+6)	(+6)	25.2mm	0.0mm	INHERENT	(+4)	(+5)	-
TUBE SIDE OUTLET	1	DN 500	Cl. 150 flg.	(+6)	(+6)	26.0mm	0.0mm	INHERENT	(+4)	(+5)	-
TUBE SIDE VENT(+7)	1	DN 50	Cl. 150 lwn.	(+6)	(+6)	13.6mm	0.0mm	INHERENT	(+4)	-	-
TUBE SIDE DRAIN(+7)	1	DN 50	Cl. 150 lwn.	(+6)	(+6)	13.6mm	0.0mm	INHERENT	(+4)	-	-
(BLANK)											

20. Supports: Skirt NO Lugs N/A Legs N/A Others SADDLES Attached WELDED TO SHELL
(Yes or no) (Number) (Number) (Describe) (Where and how)21. Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report (list the name of part, item number, Manufacturer's name, and identifying number):
N/A22. Remarks *1. Single Butt, RT-none, 0.7 *2. Mandatory App.2 Fig.2-4(6) *3. SA350-LF2 CL.1 *4. FIG. UW-16.1 (d) *5. Single Butt, RT-Full, 1.0
*6. SA182-F51(S31803) *7. Pressure retaining cover: (+6), SA320-L7M/SA194-7M, 5/8"-11UNC×95L, 8 SETS.

8. Nameplate is located on the shell. 9. See attached form U-5. 10. Inspection opening is omitted by UG-46(a).

11. Safety valve will be installed in system by others. 12. UCL-23(a) was applied for thickness calculation of the clad part.

13. Length of tube bundle: 6706mm

ASME

National Board Number: 2065
 Mr. Representative: CS-617 Date: APR. 17/2015
 Authorized Inspector: [Signature] Date: APR. 18, 2015

FORM U-1 (Cont'd)**PAGE 3****CERTIFICATE OF SHOP COMPLIANCE**

We certify that the statements in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1.

U Certificate of Authorization Number 32,997 Expires DEC. 04, 2016
 Date APR. 17/2015 Name ILSUNG CORPORATION. Signed [Signature]
(Manufacturer) (Representative)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and the employed by HSB Global Standards of Hartford CT.

have inspected the pressure vessel described in this Manufacturer's Data Report on APR. 18, 2015, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date APR. 18, 2015 Signed S.JANG Commissions NB#14412(A,N)
(Authorized Inspector) [National Board (incl. endorsements)]

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the statements in this report are correct and that the field assembly construction of all parts of this vessel conforms with the requirements of ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. U Certificate of Authorization Number _____ Expires _____

Date _____ Name _____ Signed _____
(Assembler) (Representative)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and employed by _____

I, _____, have compared the statements in this Manufacturer's Data Report with the described pressure vessel and state that parts referred to as data items _____, not included in the certificate of shop inspection, have been inspected by me and to the best of my knowledge and belief, the Manufacturer has constructed and assembled this pressure vessel in accordance with the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of _____. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date _____ Signed _____ Commissions _____
(Authorized Inspector) [National Board (incl. endorsements)]

2. Certificate Of Compliance (including ABSA Registration, CRN, etc.)

ASME

PAGE

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CERTIFICATE OF COMPLIANCE

CERTIFICATE NO. : ISC-QA-COC-SG007-074
PROJECT NAME : CARMON CREEK PROJECT
CUSTOMER : SHELL CANADA ENERGY
P.O NO. : 4511951391
EQUIPMENT NAME : VRU INLET GAS COOLER
EQUIPMENT NO. : E-11580
SERIAL NO. : 14-HE-081

**WE HEREBY CERTIFY THAT THE MATERIAL, DESIGN, FABRICATION,
INSPECTION AND TESTING OF THIS UNIT CONFORM TO THE ASME
SEC. VIII DIV. 1 2010 ED.+2011 ADD.+API660 (8th ED.2007)
+NACE MR0175 / ISO 15156 AND REQUIREMENTS OF PURCHASE ORDER.
THE DEVIATIONS TO CONTRACTUAL REQUIREMENTS (IF ANY) HAVE
BEEN RESOLVED AND APPROVED BY CUSTOMER.**

CERTIFIED BY : S.S.KIM
MANAGER OF Q.A DEPARTMENT**31 . DEC . 2014****DATE****ILSUNG CORPORATION.**



9410 - 20 Ave N.W.
Edmonton, Alberta, Canada T6N 0A4
Tel: (780) 437-9100 / Fax: (780) 437-7787

December 30, 2014

Attention: J.K. Hwang
SMARTEK E&C
RM 303,160,TECHNO 2-RO
YUSEONG-GU
DAEJEON,

The design submission, tracking number 2014-07765, originally received on September 22, 2014 was surveyed and accepted for registration as follows:

CRN : W7852.2

Accepted on: December 30, 2014

Reg Type: New Design

Drawing No. : VP-SG07-E11570-001 THRU 009 Rev 09 As Noted

Design registered in the name of : ILSUNG CORPORATION

Description	MAWP	Design Temperature	MDMT
SS Internal Pressure	3639kPa	110 °C	-45 °C
SS External Pressure	103kPa	110 °C	-45 °C
TS Internal Pressure	965kPa	110 °C	-45 °C
TS External Pressure	103kPa	110 °C	-45 °C

The registration is conditional on your compliance with the following notes:

-This heat exchanger design has been accepted for registration by ABSA based on the specific operating conditions which provide the Shell and Tubes Mean Metal Temperatures as identified in the Mean Metal Temperatures table in the drawing.

Shell Mean Metal Temperature: 53.9 (°C)

Tubes Mean Metal Temperature: 59.8 (°C)

This condition must be listed in the Manufacturer's Data Report.

-This heat exchanger design must be re-evaluated before it is operated at any different operating conditions. Such evaluation records (detailed calculations) must be permanently kept on file with the owner/user of this heat exchanger and be readily available upon request by an A.I.. This note must appear on the Manufacturer's Data Report.

-In addition, this heat exchanger shall be supplementary marked as per UHX-19.2.2

-The External Pressure (Full Vacuum) condition noted above is referring only to a basic design condition; this exchanger shall not be operated with Full Vacuum unless it is re-evaluated for such operating condition. This note shall appear on the Manufacturer's Data Report.



9410 - 20 Ave N.W.
Edmonton, Alberta, Canada T6N 0A4
Tel: (780) 437-9100 / Fax: (780) 437-7787

December 30, 2014

The registration is conditional on your compliance with the following notes:

1. It is our understanding, in accordance with your drawings and calculations that as required by UCS-66 and UHA-51 Impact testing is performed to compliance with UG-84 as follows:

- a) All heat exchanger component materials (for cylinders, heads, body flanges, T1 and T2 nozzle flanges and nozzles boss, cover plates, nozzles, tube-sheets) are Impact tested to -45°C per UG-84(d),
- b) Impact test of welds per UG-84(f) (performed at -45°C or colder) therefore:
- i) Impact test of Welding procedures qualifications per UG-84(h) and
- ii) Production (Vessel) impact testing per UG-84(i)

All impact testing must satisfy the minimum impact test energy requirements per Fig UG-84.1M.

Details of the Impact Testing must be noted in the Manufacturers Data Report (MDR)

2. All of the above noted required Impact testing must be recorded and reports generated. Copy of the reports must be provided to the A.I. who will be signing the Manufacturers Data Report (MDR). The A.I. who will be signing the Manufacturers Data Report (MDR) must confirm the above and this must be noted in the MDR

An invoice covering survey and registration fees will be forwarded from our Revenue Accounts.

If you have any question don't hesitate to contact me by phone at (780) 433-0281 ext 3331 or fax (780) 437-7787 or e-mail petrusevski@absa.ca.

Sincerely,

A handwritten signature in black ink, appearing to read 'Petrusevski', is written over a horizontal line.

PETRUSEVSKI, LJUPCO (LOU)

**3. Inspection Release Note Issued
by Inspector, Packing List including
Preservation Record and Punch List
(if applicable) for the Receiving Party
to Continue Monitoring**



**IL SUNG
CORPORATION**

917, WONSAN-LI, ONSAN-EUP, ULJU-GUN, ULSAN, KOREA

TEL. : 052) 231 - 7573

FAX. : 052) 239 - 0392

PACKING LIST

FOR EQUIPMENT AND ACCESSORY

"DETAILS AS PER THE ATTACHED SHEET"

- Phase1 (38 Items) -

☒ REVIEWED
☒ WITNESSED
Date / Signature: <i>31 Dec 14</i>
Germanischer Lloyd Industrial Services

OLSUNG ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	<i>J. S. LEE</i>
DATE	<i>Dec. 31. 2014</i>

(18 SHEETS WITH COVER)

QA	REVIEWED	08-Dec-14	S.J.HWANG	CLIENT	SHELL CANADA ENERGY		
				PROJECT	Carmon Creek - Phase 1 & 2		
PC	APPROVED	08-Dec-14	K.H.JUNG	P.O NO.	4511951391	DEL. DATE	31-Dec-14
DEPT	REVIEWED	08-Dec-14	S.H.LEE	DESTINATION	FOB Onsan Port, Korea		
	PREPARED	08-Dec-14	J.W.SONG	DOC. NO.	PK-14SG-007-01	REV. NO.	0

ISC-001-1-0

DETAILED PACKING LIST

PJT NAME : Carmon Creek - Phase 1 & 2

IO.: 4511951391

☒ REVIEWED
☒ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd
Industrial Services

ILSUNG	☒ Reviewed by
ISC	☒ Witnessed by
QA DEPT.	J. S. LEE
DATE Dec .31. 2014	

Package No.	Q'ty	ITEM No.	Package Style	N/W	G/W	G/W	CBM	Dimension (cm)				REMARKS	
				Kg	Kg	LBS	m³	L	W	H			
1 OF 40	1 SET	E-10010	(STEEL SKID)	36,345	37,495	82,489	41.880	880	x	176	x	271	
2 OF 40	1 SET	E-10020	(STEEL SKID)	36,345	37,495	82,489	41.880	880	x	176	x	271	
3 OF 40	1 SET	E-20010	(STEEL SKID)	36,345	37,495	82,489	41.880	880	x	176	x	271	
4 OF 40	1 SET	E-20020	(STEEL SKID)	36,345	37,495	82,489	41.880	880	x	176	x	271	
5 OF 40	1 SET	E-10070	(STEEL SKID)	2,310	2,460	5,412	4.740	540	x	66	x	133	
6 OF 40	1 SET	E-10075	(STEEL SKID)	2,405	2,555	5,621	5.200	540	x	66	x	146	
7 OF 40	1 SET	E-10120	(STEEL SKID)	7,230	7,480	16,456	11.470	573	x	110	x	182	
8 OF 40	1 SET	E-10121	(STEEL SKID)	7,445	7,695	16,929	12.480	573	x	110	x	198	
9 OF 40	1 SET	E-10122	(STEEL SKID)	7,230	7,480	16,456	11.470	573	x	110	x	182	
10 OF 40	1 SET	E-10123	(STEEL SKID)	7,445	7,695	16,929	12.480	573	x	110	x	198	
11 OF 40	1 SET	E-10124	(STEEL SKID)	7,445	7,695	16,929	12.480	573	x	110	x	198	
12 OF 40	1 SET	E-20120	(STEEL SKID)	7,230	7,480	16,456	11.470	573	x	110	x	182	
13 OF 40	1 SET	E-20121	(STEEL SKID)	7,445	7,695	16,929	12.480	573	x	110	x	198	
14 OF 40	1 SET	E-20122	(STEEL SKID)	7,230	7,480	16,456	11.470	573	x	110	x	182	
15 OF 40	1 SET	E-20123	(STEEL SKID)	7,445	7,695	16,929	12.480	573	x	110	x	198	
16 OF 40	1 SET	E-20124	(STEEL SKID)	7,445	7,695	16,929	12.480	573	x	110	x	198	
17 OF 40	1 SET	E-10140	(STEEL SKID)	7,325	7,555	16,621	12.840	878	x	92	x	159	
18 OF 40	1 SET	E-10141	(STEEL SKID)	7,500	7,730	17,006	13.650	878	x	92	x	169	
19 OF 40	1 SET	E-10142	(STEEL SKID)	7,325	7,555	16,621	12.840	878	x	92	x	159	
20 OF 40	1 SET	E-10143	(STEEL SKID)	7,500	7,730	17,006	13.650	878	x	92	x	169	
21 OF 40	1 SET	E-10144	(STEEL SKID)	7,325	7,555	16,621	12.840	878	x	92	x	159	
22 OF 40	1 SET	E-10145	(STEEL SKID)	7,500	7,730	17,006	13.650	878	x	92	x	169	
23 OF 40	1 SET	E-20140	(STEEL SKID)	7,325	7,555	16,621	12.840	878	x	92	x	159	
24 OF 40	1 SET	E-20141	(STEEL SKID)	7,500	7,730	17,006	13.650	878	x	92	x	169	
25 OF 40	1 SET	E-20142	(STEEL SKID)	7,325	7,555	16,621	12.840	878	x	92	x	159	

DETAILED PACKING LIST

Package No.	Q'ty	ITEM No.	Package Style	N/W	G/W	G/W	CBM	Dimension (cm)				REMARKS
				Kg	Kg	LBS		m³	L	W	H	
26 OF 40	1 SET	E-20143	(STEEL SKID)	7,500	7,730	17,006	13.650	878	x	92	x	169
27 OF 40	1 SET	E-20144	(STEEL SKID)	7,325	7,555	16,621	12.840	878	x	92	x	159
28 OF 40	1 SET	E-20145	(STEEL SKID)	7,500	7,730	17,006	13.650	878	x	92	x	169
29 OF 40	1 SET	E-10180	(STEEL SKID)	11,135	11,465	25,223	17.840	905	x	110	x	180
30 OF 40	1 SET	E-10190	(STEEL SKID)	11,455	11,785	25,927	18.880	905	x	110	x	191
31 OF 40	1 SET	E-10200	(STEEL SKID)	11,135	11,465	25,223	17.840	905	x	110	x	180
32 OF 40	1 SET	E-10210	(STEEL SKID)	11,455	11,785	25,927	18.880	905	x	110	x	191
33 OF 40	1 SET	E-20180	(STEEL SKID)	11,135	11,465	25,223	17.840	905	x	110	x	180
34 OF 40	1 SET	E-20190	(STEEL SKID)	11,455	11,785	25,927	18.880	905	x	110	x	191
35 OF 40	1 SET	E-20200	(STEEL SKID)	11,135	11,465	25,223	17.840	905	x	110	x	180
36 OF 40	1 SET	E-20210	(STEEL SKID)	11,455	11,785	25,927	18.880	905	x	110	x	191
37 OF 40	1 SET	E-11570	(STEEL SKID)	20,000	20,340	44,748	28.720	955	x	137	x	220
38 OF 40	1 SET	E-11580	(STEEL SKID)	20,000	20,340	44,748	28.720	955	x	137	x	220
39 OF 40	1 BOX	ALL	(WOODEN BOX)	570	720	1,584	1.120	122	x	122	x	75
40 OF 40	1 BOX	ALL	(WOODEN BOX)	710	860	1,892	1.120	122	x	122	x	75
TOTAL		40 PACKAGE(S)		444,275	458,055	1,007,721	664					

*** REMARKS :**

D/C : DANGEROUS CARGO

O/D : OVER DIMENSION (OVER W:2.4M, H:3M, L:12M)

H/C : HEAVY CARGO (OVER 20 TON)

S/C : SUPER HEAVY CARGO

☒ REVIEWED
☒ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd
Industrial Services

ILSUNG	Reviewed by
ISC	Witnessed by
QA DEPT.	J. S. LEE
DATE	Dec. 31, 2014

DETAILED PACKING LIST

PJT NAME : Carmon Creek - Phase 1 & 2

F. NO. : 4511951391

☒ REVIEWED
☒ WITNESSED
Date / Signature: <i>[Signature]</i> 31 Dec 14
Germanischer Lloyd

Cashing by	Reviewed by
ISC	☒ Witnessed by
QA DEPT.	J. S. LEE
DATE Dec 31. 2014	

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Industrial Services		CBM (M³)	Measurement [L x W x H (cm)]				
			Net- Weight (KG)	Gross- Weight (KG)						
EQUIPMENT										
1 OF 40 (STEEL SKID) E-10010	Diluted Produced Liquid Heater/Cooler	1 SET	36,345	37,495	41.880	880	x	176	x	271
2 OF 40 (STEEL SKID) E-10020	Diluted Produced Liquid Heater/Cooler	1 SET	36,345	37,495	41.880	880	x	176	x	271
3 OF 40 (STEEL SKID) E-20010	Diluted Produced Liquid Heater/Cooler	1 SET	36,345	37,495	41.880	880	x	176	x	271
4 OF 40 (STEEL SKID) E-20020	Diluted Produced Liquid Heater/Cooler	1 SET	36,345	37,495	41.880	880	x	176	x	271
5 OF 40 (STEEL SKID) E-10070	Slop Oil Heat Exchanger	1 SET	2,310	2,460	4.740	540	x	66	x	133
6 OF 40 (STEEL SKID) E-10075	Slop Oil Heat Exchanger	1 SET	2,405	2,555	5.200	540	x	66	x	146
7 OF 40 (STEEL SKID) E-10120	Treated Bitumen/Slop Oil Exchanger	1 SET	7,230	7,480	11.470	573	x	110	x	182
8 OF 40 (STEEL SKID) E-10121	Treated Bitumen/Slop Oil Exchanger	1 SET	7,445	7,695	12.480	573	x	110	x	198
9 OF 40 (STEEL SKID) E-10122	Treated Bitumen/Slop Oil Exchanger	1 SET	7,230	7,480	11.470	573	x	110	x	182
10 OF 40 (STEEL SKID) E-10123	Treated Bitumen/Slop Oil Exchanger	1 SET	7,445	7,695	12.480	573	x	110	x	198
11 OF 40 (STEEL SKID) E-10124	Treated Bitumen/Slop Oil Exchanger	1 SET	7,445	7,695	12.480	573	x	110	x	198
12 OF 40 (STEEL SKID) E-20120	Treated Bitumen/Slop Oil Exchanger	1 SET	7,230	7,480	11.470	573	x	110	x	182
13 OF 40 (STEEL SKID) E-20121	Treated Bitumen/Slop Oil Exchanger	1 SET	7,445	7,695	12.480	573	x	110	x	198
14 OF 40 (STEEL SKID) E-20122	Treated Bitumen/Slop Oil Exchanger	1 SET	7,230	7,480	11.470	573	x	110	x	182
15 OF 40 (STEEL SKID) E-20123	Treated Bitumen/Slop Oil Exchanger	1 SET	7,445	7,695	12.480	573	x	110	x	198

ASME

DETAILED PACKING LIST

Olsung ISC QA DEPT. DATE <u>Dec 31, 2014</u>	Reviewed by Witnessed by J. S. LEE Measurement [L x W x H (cm)]
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Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (KG)	Gross- Weight (KG)	CBM (M ³)	Measurement [L x W x H (cm)]				
16 OF 40 (STEEL SKID) E-20124	Treated Bitumen/Slop Oil Exchanger	1 SET	7,445	7,695	12.480	573	x	110	x	198
17 OF 40 (STEEL SKID) E-10140	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,325	7,555	12.840	878	x	92	x	159
18 OF 40 (STEEL SKID) E-10141	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,500	7,730	13.650	878	x	92	x	169
19 OF 40 (STEEL SKID) E-10142	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,325	7,555	12.840	878	x	92	x	159
20 OF 40 (STEEL SKID) E-10143	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,500	7,730	13.650	878	x	92	x	169
21 OF 40 (STEEL SKID) E-10144	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,325	7,555	12.840	878	x	92	x	159
22 OF 40 (STEEL SKID) E-10145	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,500	7,730	13.650	878	x	92	x	169
23 OF 40 (STEEL SKID) E-20140	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,325	7,555	12.840	878	x	92	x	159
24 OF 40 (STEEL SKID) E-20141	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,500	7,730	13.650	878	x	92	x	169
25 OF 40 (STEEL SKID) E-20142	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,325	7,555	12.840	878	x	92	x	159
26 OF 40 (STEEL SKID) E-20143	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,500	7,730	13.650	878	x	92	x	169
27 OF 40 (STEEL SKID) E-20144	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,325	7,555	12.840	878	x	92	x	159
28 OF 40 (STEEL SKID) E-20145	Treated Bitumen/Primary Diluent Exchanger	1 SET	7,500	7,730	13.650	878	x	92	x	169
29 OF 40 (STEEL SKID) E-10180	Treated Bitumen Coolers	1 SET	11,135	11,465	17.840	905	x	110	x	180
30 OF 40 (STEEL SKID) E-10190	Treated Bitumen Coolers	1 SET	11,455	11,785	18.880	905	x	110	x	191
31 OF 40 (STEEL SKID) E-10200	Treated Bitumen Coolers	1 SET	11,135	11,465	17.840	905	x	110	x	180

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (KG)	Gross- Weight (KG)	CBM (M ³)	Measurement [L x W x H (cm)]			
32 OF 40 (STEEL SKID) E-10210	Treated Bitumen Coolers	1 SET	11,455	11,785	18.880	905	x	110	x 191
33 OF 40 (STEEL SKID) E-20180	Treated Bitumen Coolers	1 SET	11,135	11,465	17.840	905	x	110	x 180
34 OF 40 (STEEL SKID) E-20190	Treated Bitumen Coolers	1 SET	11,455	11,785	18.880	905	x	110	x 191
35 OF 40 (STEEL SKID) E-20200	Treated Bitumen Coolers	1 SET	11,135	11,465	17.840	905	x	110	x 180
36 OF 40 (STEEL SKID) E-20210	Treated Bitumen Coolers	1 SET	11,455	11,785	18.880	905	x	110	x 191
37 OF 40 (STEEL SKID) E-11570	VRU Inlet Gas Coolers	1 SET	20,000	20,340	28.720	955	x	137	x 220
38 OF 40 (STEEL SKID) E-11580	VRU Inlet Gas Coolers	1 SET	20,000	20,340	28.720	955	x	137	x 220

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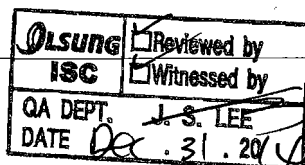
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QA DEPT. <i>J. S. LEE</i>	
DATE <i>Dec. 31. 2018</i>	

DETAILED PACKING LIST

PJT NAME : Carmon Creek - Phase 1 & 2

P. NO. : 4511951391

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kG)	Gross- Weight (kG)	CBM (M3)	Measurement [L x W x H (cm)]
39 OF 40 (WOODEN BOX) ALL	ACCESSORY	1 BOX	570	720	1.120	122 X 122 X 75
INCLUDING						
E-10010	Pulling Eye Bolt	SA-193-B7 1 1/2" - 8UN			4 EA	
	SQ. Washer	SA-283-C t16 * 70 * 70			16 EA	
E-10020	Pulling Eye Bolt	SA-193-B7 1 1/2" - 8UN			4 EA	
	SQ. Washer	SA-283-C t16 * 70 * 70			16 EA	
E-20010	Pulling Eye Bolt	SA-193-B7 1 1/2" - 8UN			4 EA	
	SQ. Washer	SA-283-C t16 * 70 * 70			16 EA	
E-20020	Pulling Eye Bolt	SA-193-B7 1 1/2" - 8UN			4 EA	
	SQ. Washer	SA-283-C t16 * 70 * 70			16 EA	
E-10070/E-10075	Shim Plate	SA-283-C 10t(1+2+3+4) * 390 * 210			2 EA	
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C 1" - 8UNC * 200L			6 EA	
	SQ. Washer	SA-283-C t12 * 45 * 45			12 EA	
	Gasket	See Note 1 6" ASME #300 RF 4.5t			1 EA	



DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kG)	Gross- Weight (kG)	CBM (M3)	Measurement [L x W x H (cm)]
	Stud B/2HN	SA-320-L7 / SA-194-7 3/4" - 10UNC * 140L			12 EA	
	Gasket	See Note 1 4" ASME #300 RF 4.5t			1 EA	
	Stud B/2HN	SA-320-L7M / SA-194-7M 3/4" - 10UNC * 140L			8 EA	
E-10120/E-10121	Pulling Eye Bolt	SA-193-B7 1 1/4" - 8UN			8 EA	
	Shim Plate	SA-283-C 10t(1+2+3+4) * 700 * 280			2 EA	
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C 1 1/4" - 8UN * 250L			6 EA	
	SQ. Washer	SA-283-C t16 * 70 * 70			12 EA	
	Gasket	See Note 1 8" ASME #300 RF 4.5t			1 EA	
	Stud B/2HN	SA-320-L7M / SA-194-7M 7/8" - 9UNC * 160L			12 EA	
	Gasket	See Note 1 6" ASME #300 RF 4.5t			1 EA	
	Stud B/2HN	SA-320-L7M / SA-194-7M 3/4" - 10UNC * 145L			12 EA	
E-10122/E-10123	Pulling Eye Bolt	SA-193-B7 1 1/4" - 8UN			8 EA	
	Shim Plate	SA-283-C 10t(1+2+3+4) * 700 * 280			2 EA	

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kg)	Gross- Weight (kg)	CBM (M3)	Measurement [L x W x H (cm)]
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
		1 1/4" - 8UN * 250L				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
	Gasket	See Note 1			1 EA	
		8" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		7/8" - 9UNC * 160L				
	Gasket	See Note 1			1 EA	
		6" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		3/4" - 10UNC * 145L				
E-20120/E-20121	Pulling Eye Bolt	SA-193-B7			8 EA	
		1 1/4" - 8UN				
	Shim Plate	SA-283-C			2 EA	
		10t(1+2+3+4) * 700 * 280				
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
		1 1/4" - 8UN * 250L				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
	Gasket	See Note 1			1 EA	
		8" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		7/8" - 9UNC * 160L				
	Gasket	See Note 1			1 EA	
		6" ASME #300 RF 4.5t				

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kg)	Gross- Weight (kg)	CBM (M3)	Measurement [L x W x H (cm)]
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		3/4" - 10UNC * 145L				
E-20122/E-20123	Pulling Eye Bolt	SA-193-B7			8 EA	
		1 1/4" - 8UN				
	Shim Plate	SA-283-C			2 EA	
		10t(1+2+3+4) * 700 * 280				
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
		1 1/4" - 8UN * 250L				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
	Gasket	See Note 1			1 EA	
		8" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		7/8" - 9UNC * 160L				
	Gasket	See Note 1			1 EA	
		6" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		3/4" - 10UNC * 145L				
E-10124	Pulling Eye Bolt	SA-193-B7			4 EA	
		1 1/4" - 8UN				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
E-20124	Pulling Eye Bolt	SA-193-B7			4 EA	
		1 1/4" - 8UN				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kG)	Gross- Weight (kG)	CBM (M3)	Measurement [L x W x H (cm)]
Note	1. GASKET MAT'L : SPIRAL WOUND GASKET [t4.5] - FILLER : GRAPHITE - HOOP : 304 S.S - INNER RING : 304 S.S - OUTER RING : C.S					

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kg)	Gross- Weight (kg)	CBM (M3)	Measurement [L x W x H (cm)]
40 OF 40 (WOODEN BOX) ALL	ACCESSORY	1 BOX	710	860	1.120	122 X 122 X 75
INCLUDING						
E-10140/E-10141	Shim Plate SA-283-C 10t(1+2+3+4) * 590 * 285				2 EA	
	Setting B/4N/2W SA-325 / SA-563-A / SA-283-C 1 1/2" - 8UN * 250L				6 EA	
	SQ. Washer SA-283-C t16 * 70 * 70				12 EA	
	Gasket See Note 1 6" ASME #300 RF 4.5t				1 EA	
	Stud B/2HN SA-320-L7M / SA-194-7M 3/4" - 10UNC * 145L				12 EA	
	Gasket See Note 1 4" ASME #300 RF 4.5t				1 EA	
	Stud B/2HN SA-320-L7 / SA-194-7 3/4" - 10UNC * 130L				8 EA	
E-10142/E-10143	Shim Plate SA-283-C 10t(1+2+3+4) * 590 * 285				2 EA	
	Setting B/4N/2W SA-325 / SA-563-A / SA-283-C 1 1/2" - 8UN * 250L				6 EA	
	SQ. Washer SA-283-C t16 * 70 * 70				12 EA	
	Gasket See Note 1 6" ASME #300 RF 4.5t				1 EA	

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kG)	Gross- Weight (kG)	CBM (M3)	Measurement [L x W x H (cm)]
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		3/4" - 10UNC * 145L				
	Gasket	See Note 1			1 EA	
		4" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7 / SA-194-7			8 EA	
		3/4" - 10UNC * 130L				
E-10144/E-10145	Shim Plate	SA-283-C			2 EA	
		10t(1+2+3+4) * 590 * 285				
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
		1 1/2" - 8UN * 250L				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
	Gasket	See Note 1			1 EA	
		6" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		3/4" - 10UNC * 145L				
	Gasket	See Note 1			1 EA	
		4" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7 / SA-194-7			8 EA	
		3/4" - 10UNC * 130L				
E-20140/E-20141	Shim Plate	SA-283-C			2 EA	
		10t(1+2+3+4) * 590 * 285				
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
		1 1/2" - 8UN * 250L				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kG)	Gross- Weight (kG)	CBM (M3)	Measurement [L x W x H (cm)]
	Gasket	See Note 1			1 EA	
	6" ASME #300 RF 4.5t					
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
	3/4" - 10UNC * 145L					
	Gasket	See Note 1			1 EA	
	4" ASME #300 RF 4.5t					
	Stud B/2HN	SA-320-L7 / SA-194-7			8 EA	
	3/4" - 10UNC * 130L					
E-20142/E-20143	Shim Plate	SA-283-C			2 EA	
	10t(1+2+3+4) * 590 * 285					
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
	1 1/2" - 8UN * 250L					
	SQ. Washer	SA-283-C			12 EA	
	t16 * 70 * 70					
	Gasket	See Note 1			1 EA	
	6" ASME #300 RF 4.5t					
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
	3/4" - 10UNC * 145L					
	Gasket	See Note 1			1 EA	
	4" ASME #300 RF 4.5t					
	Stud B/2HN	SA-320-L7 / SA-194-7			8 EA	
	3/4" - 10UNC * 130L					
E-20144/E-20145	Shim Plate	SA-283-C			2 EA	
	10t(1+2+3+4) * 590 * 285					
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
	1 1/2" - 8UN * 250L					

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kG)	Gross- Weight (kG)	CBM (M3)	Measurement [L x W x H (cm)]
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
	Gasket	See Note 1			1 EA	
		6" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		3/4" - 10UNC * 145L				
	Gasket	See Note 1			1 EA	
		4" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7 / SA-194-7			8 EA	
		3/4" - 10UNC * 130L				
E-10180/E-10190	Pulling Eye Bolt	SA-193-B7			8 EA	
		1" - 8UNC				
	Shim Plate	SA-283-C			2 EA	
		10t(1+2+3+4) * 700 * 400				
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
		1 1/4" - 8UN * 250L				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
	Gasket	See Note 1			1 EA	
		8" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		7/8" - 9UNC * 160L				
	Gasket	See Note 1			1 EA	
		6" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7 / SA-194-7			12 EA	
		3/4" - 10UNC * 145L				

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kG)	Gross- Weight (kG)	CBM (M3)	Measurement [L x W x H (cm)]
E-10200/E-10210	Pulling Eye Bolt	SA-193-B7			8 EA	
		1" - 8UNC				
	Shim Plate	SA-283-C			2 EA	
		10t(1+2+3+4) * 700 * 400				
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
		1 1/4" - 8UN * 250L				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
	Gasket	See Note 1			1 EA	
		8" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7M / SA-194-7M			12 EA	
		7/8" - 9UNC * 160L				
	Gasket	See Note 1			1 EA	
		6" ASME #300 RF 4.5t				
	Stud B/2HN	SA-320-L7 / SA-194-7			12 EA	
		3/4" - 10UNC * 145L				
E-20180/E-20190	Pulling Eye Bolt	SA-193-B7			8 EA	
		1" - 8UNC				
	Shim Plate	SA-283-C			2 EA	
		10t(1+2+3+4) * 700 * 400				
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C			6 EA	
		1 1/4" - 8UN * 250L				
	SQ. Washer	SA-283-C			12 EA	
		t16 * 70 * 70				
	Gasket	See Note 1			1 EA	
		8" ASME #300 RF 4.5t				

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DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kg)	Gross- Weight (kg)	CBM (M3)	Measurement [L x W x H (cm)]
	Stud B/2HN	SA-320-L7M / SA-194-7M 7/8" - 9UNC * 160L			12 EA	
	Gasket	See Note 1 6" ASME #300 RF 4.5t			1 EA	
	Stud B/2HN	SA-320-L7 / SA-194-7 3/4" - 10UNC * 145L			12 EA	
E-20200/E-20210	Pulling Eye Bolt	SA-193-B7 1" - 8UNC			8 EA	
	Shim Plate	SA-283-C 10t(1+2+3+4) * 700 * 400			2 EA	
	Setting B/4N/2W	SA-325 / SA-563-A / SA-283-C 1 1/4" - 8UN * 250L			6 EA	
	SQ. Washer	SA-283-C t16 * 70 * 70			12 EA	
	Gasket	See Note 1 8" ASME #300 RF 4.5t			1 EA	
	Stud B/2HN	SA-320-L7M / SA-194-7M 7/8" - 9UNC * 160L			12 EA	
	Gasket	See Note 1 6" ASME #300 RF 4.5t			1 EA	
	Stud B/2HN	SA-320-L7 / SA-194-7 3/4" - 10UNC * 145L			12 EA	
E-11570	SQ. Washer	SA-283-C t16 * 70 * 70			16 EA	
E-11580	SQ. Washer	SA-283-C t16 * 70 * 70			16 EA	

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DATE <i>Dec. 31. 2014</i>	

DETAILED PACKING LIST

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (kG)	Gross- Weight (kG)	CBM (M3)	Measurement [L x W x H (cm)]
Note	1. GASKET MAT'L : SPIRAL WOUND GASKET [t4.5] - FILLER : GRAPHITE - HOOP : 304 S.S - INNER RING : 304 S.S - OUTER RING : C.S					

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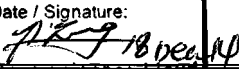
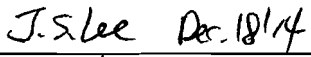
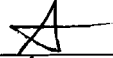
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4. Reports of Major Repairs Performed (NCR, Deviation requests, Concession requests)

N/A

5. Material Certificates With Tabulation of Materials

PAGE 5-1

		TABULATION OF MATERIAL				PAGE NO.	1 OF 2	
						TM NO.	TM-SG007-E-11580-001	
						W/O NO.	P-13SG-007	
P.O NO.		4511951391		CUSTOMER		SHELL CANADA ENERGY		
PROJECT NAME		CARMON CREEK PROJECT		ITEM NAME		VRU INLET GAS COOLER		
ITEM NO.		E-11580		DWG. NO.		VP-SG07-E-11570-001 REV.6		
DWG. NO.	PART CODE		MATERIAL SPEC.	QTY	MATERIAL IDENTIFICATION			
	NO.	NAME OF PART			DIMENSION	HEAT OR CHARGE NO.	PAGE	
VP-SG07-E-11570-002	1	SHELL	SA516-70N	1	T17	PP54201805 PP54201803 PP54201801	3-8	
	2	CHANNEL	SA240-S31803	1	T15	540337001	9-29	
	3	CHANNEL COVER	SA765-II+S31803 CLAD	1	SEE DWG	4-88191/43501	37-58	
	4	CHANNEL	SA240-S31803	1	T15	338801/1-1	30-36	
	5	CHANNEL COVER	SA765-II+S31803 CLAD	1	SEE DWG	4-88191/43501	37-58	
	6	CHANNEL FLANGE	SA182-F51(S531803)	1	SEE DWG	E100287	59-62	
	7	CHANNEL FLANGE	SA182-F51(S531803)	1	SEE DWG	E100287	59-62	
	8	GASKET	SEE NOTE 1	1	T5	201409030023015	63	
	9	GASKET	SEE NOTE 1	1	T5	201409030023015	63	
	10	STUD B/2H.N	SA320-L7M/SA194-7M	60	1 1/8" -8UNx300L	C07469/655465	64	
	12	STUD B/2H.N	SA320-L7M/SA194-7M	60	1 1/8" -8UNx300L	C07469/655465	64	
	14	CHANNEL COVER FLANGE	SA182-F51(S531803)	1	SEE DWG	E100287	59-62	
	15	CHANNEL COVER FLANGE	SA182-F51(S531803)	1	SEE DWG	E100287	59-62	
	16	GASKET	SEE NOTE 1	1	T5	201409030023015	63	
	17	GASKET	SEE NOTE 1	1	T5	201409030023015	63	
	18	STUD B/2H.N	SA320-L7M/SA194-7M	60	1 1/8" -8UNx300L	C07469/655465	64	
	20	STUD B/2H.N	SA320-L7M/SA194-7M	60	1 1/8" -8UNx300L	C07469/655465	64	
	VP-SG07-E-11570-004	1	TUBE	SA789-S31803(SEAMLESS)	1952	O.D19.05x1.63(NIN)X6706L	TB8825/TB6459	65-71
		2	STATIONARY TUBESHEET	SA765-II+S31803 CLAD	1	SEE DETAIL	N11223/43501	37-58
		3	STATIONARY TUBESHEET	SA765-II+S31803 CLAD	1	SEE DETAIL	N11223/43501	37-58
☐ WITNESSED BY ☐ REVIEWED BY				☒ REVIEWED ☐ WITNESSED Date / Signature: 		APPROVED BY J.S. LEE  Dec. 18/14 REVIEWED BY Y. S. LIM  PREPARED BY T.S. LEE 		

ISQ-025-1-0

Industrial Services

ILSUNG CORPORATION

Date of Issue/발행일자 : May., 01, 2014

Spec & Type : SA516-70 10ED 11AD TYPE 3.1 NACE MR0175/ISO15156
규격

ASME

Size/치수	Product No. 제품번호	Quantity 수량	Weight 중량 (kg)	Heat No. 제강번호	Position	Tensile Test 인장시험			Impact Test 충격시험	Hardness 경도 HB	Division	Chemical Composition/화학성분 (%)															
						YP (MPa)	TS	EL (%)	V Notch -45°C Energy (Joule)			C	Si	Mn	P	S	Cr	Ni	B (ppm)	Cu	Mo	Nb	Ti	V			
17x2300x3800	PP54201805	1	1,166	SU36583	T	365	514	33	1:127 2:131 3:136 A:131	151.3	L P	0.1722 0.1663	0.343 0.335	1.133 1.088	0.0088 0.0076	0.0016 0.0015	0.016 0.013	0.270 0.266	2 1	0.224 0.211	0.001 0.002	0.017 0.015	0.0111 0.0110	0.002 0.002			
*** Sub Total (170) ***		1	1,166 (kg)											CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5													
*** Heat Treatment ==> Normalized : 890°C 22min. ***																											
*** Test Coupon Heat Treatment ***																											
** 1. Post Weld Heat Treatment (Times: 3)																											
* Heating Temp : 630°C * Heating Rate : 150 ~ 170°C / h At Above 400°C * Holding Time : 090Min															* Cooling Rate : 150 ~ 170°C / h At Above 400°C												
*** Lot Total ***		1	1,166 (kg)	LOT No. ==> SG07-08-021																							
*** Grade Total ***		1	1,166 (kg)																								
*** Grand Total ***		1	1,166 (kg)																								
E-1150 (005-1D): SHELL (D-02)																											
															=== Last Item ===												
															LSUNG ISC ☒ Reviewed by ☒ Witnessed by QA DEPT. G. T. PYO DATE Jul .11 . 2014 ☒ Reviewed ☐ Witnessed 14412 HSB GS												
															☒ REVIEWED ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services												

* 본 검사증명서에 명기된 규격용도와 사용시 안전상 문제가 발생할 수 있으며, 검사증명서 위·변조시 사문서 위조(형법231조)로 불이익을 당하실 수 있습니다.

36/296

Lee, Yong-Heon



Mill Test Certificate/검사증명서

Certificate No./증명서번호 : 140523, 201KN-00062-0001

Date of Issue/발행일자 : May., 26, 2014

Order No./계약번호 : 01S1098757

PO No./주문번호 : 01S1098757

Supplier : ILSUNG CO., LTD.
/주문자Commodity : PLATE
/품명Customer : ILSUNG CO., LTD.
/고객사Spec & Type : SA516-70 10ED 11AD TYPE 3.1 NACE MR0175/ISO15156
/규격
ASME

Size/치수	Product No. /제품번호	Quantity /수량	Weight /중량 (kg)	Heat No. /제강번호	Position	Tensile Test /인장시험			Impact Test /충격시험	Hardness /경도 HB	Division	Chemical Composition/화합성분 (%)													
						YP (MPa)	TS (MPa)	EL (%)	V Notch -45°C Energy (Joule)			C	Si	Mn	P	S	Cr	Ni	B (ppm)	Cu	Mo	Nb	Ti	V	
17x2300x3800	PP54201803	1	1,166	SU36583	T	365	514	33	1:127 2:131 3:136 A:131	151.3	L P	0.1722 0.1663	0.343 0.335	1.133 1.088	0.0088 0.0076	0.0016 0.0015	0.016 0.013	0.270 0.266	2 1	0.224 0.211	0.001 0.002	0.017 0.015	0.0111 0.0110	0.002 0.002	
*** Sub Total (170) ***		1	1,166 (kg)																						
*** Heat Treatment ==> Normalized : 890°C 22min. ***																									
*** Test Coupon Heat Treatment ***																									
** 1. Post Weld Heat Treatment (Times: 3)																									
* Heating Temp : 630°C		* Heating Rate : 150 ~ 170°C / h At Above 400°C		* Holding Time : 090Min		* Cooling Rate : 150 ~ 170°C / h At Above 400°C																			
*** Lot Total ***		1	1,166 (kg)	LOT No. ==> SG07-08-021																					
*** Grade Total ***		1	1,166 (kg)																						
*** Grand Total ***		1	1,166 (kg)																						
E-11580 (004-1) : SHELL (A-03) (005-4) : Reinf. PAD (S/b PAD) (006-1) : Reinf. PAD (SLS2)												CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5													
*** Last Item ***												ILSUNG ISC QA DEPT. DATE ☒Reviewed by ☒Witnessed by G. T. PYO Jul. 11. 2014 ☒REVIEWED ☒WITNESSED Date / Signature: Germanischer Lloyd Industrial Services 14412 HSB GS 14 Aug 14 14412 HSB GS													

* Position - T : Top, M : Middle, B : Bottom
 * Tensile Test. Direction : Transversal, Gauge Length : 200mm(Rectangular),
 YP Method : 0.2% off-set
 * Impact Test. Direction : 1/4T Longitudinal, Full-Size : 10mmX10mm
 * Division - L : Ladle Analysis, P : Products Analysis
 * Supply Condition : As-Rolled unless otherwise Heat Treated.

We hereby certify that the material herein has been made in accordance with the order and above specification.
 This material has been fully killed and made by basic oxygen process.
 No repair welding was performed to the products.
 This material has been made by vacuum degassing, calcium treated process. This material is fine grained steel.
 Test Certificate is issued according to EN10204 3.1.

* 본 검사증명서에 명기된 규격용도의 사용시 안전상 문제가 발생할 수 있으며,
 검사증명서 위.변조시 사문서 위조(형법231조)로 불이익을 당하실 수 있습니다.

Surveyor To :

37/296

Lee, Yong-Heon

Order No./계약번호 : 01S1098757

PO No./주문번호 : 01S1098757

Supplier /주문자 : ILSUNG CO., LTD.

Commodity /품명 : PLATE

Customer /고객사 : ILSUNG CO., LTD.

Spec & Type : SA516-70 10ED 11AD TYPE 3.1 NACE MR0175/ISO15156



Size/치수	Product No. /제품번호	Quantity /수량	Weight /중량 (kg)	Heat No. /제강번호	Position	Tensile Test /인장시험			Impact Test /충격시험	Hardness /경도 HB	Division	Chemical Composition/화합성분 (%)													
						YP (MPa)	TS	EL (%)	V Notch -45°C Energy (Joule)			C	Si	Mn	P	S	Cr	Ni	B (ppm)	Cu	Mo	Nb	Ti	V	
17x2300x3800	PP54201801	1	1,166	SU36583	T	365	514	33	1:127 2:131 3:136 A:131	151.3	L P	0.1722 0.1663	0.343 0.335	1.133 1.088	0.0088 0.0076	0.0016 0.0015	0.016 0.013	0.270 0.266	2 1	0.224 0.211	0.001 0.002	0.017 0.015	0.0111 0.0110	0.002 0.002	
*** Sub Total (170) ***		1	1,166 (kg)																						
*** Heat Treatment ==> Normalized : 890°C 22min. ***																									
*** Test Coupon Heat Treatment ***																									
** 1. Post Weld Heat Treatment (Times: 3)																									
* Heating Temp : 630°C		* Heating Rate : 150 ~ 170°C / h At Above 400°C		* Holding Time : 090Min		* Cooling Rate : 150 ~ 170°C / h At Above 400°C																			
*** Lot Total ***		1	1,166 (kg)	LOT No. ==> SG07-08-021																					
*** Grade Total ***		1	1,166 (kg)																						
*** Grand Total ***		1	1,166 (kg)																						
						=== Last Item ===																			

CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5

Reviewed

Witnessed

14412

HSB GS

REVIEWED

WITNESSED

Date / Signature:

Germanischer Lloyd
Industrial Services

OLSUNG
ISC

Reviewed by

Witnessed by

QA DEPT.

DATE

G. T. PYO

JUL. 11 . 2014

14412

HSB GS

CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5

☒ Reviewed
☐ Witnessed

14412
HSB GS

ILSUNG ISC	☒ Reviewed by ☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	JUL. 11 . 2014

☒ REVIEWED ☐ WITNESSED
Date / Signature: Germanischer Lloyd Industrial Services

* Position - T : Top, M : Middle, B : Bottom
* Tensile Test. Direction : Transversal, Gauge Length : 200mm(Rectangular),
YP Method : 0.2% off-set
* Impact Test. Direction : 1/4T Longitudinal, Full-Size : 10mmX10mm
* Division - L : Ladle Analysis, P : Products Analysis
* Supply Condition : As-Rolled unless otherwise Heat Treated.

We hereby certify that the material herein has been made in accordance with the order and above specification.
This material has been fully killed and made by basic oxygen process.
No repair welding was performed to the products.
This material has been made by vacuum degassing, calcium treated process. This material is fine grained steel.
Test Certificate is issued according to EN10204 3.1.

* 본 검사증명서에 명기된 규격용도의 사용시 안전상 문제가 발생할 수 있으며,
검사증명서 위.변조시 사문서 위조(형법231조)로 불이익을 당하실 수 있습니다.

Surveyor To :

38/296

Lee, Yong-Heon

Order No./계약번호 : 01S1098757

PO No./주문번호 : 01S1098757

Supplier : ILSUNG CO., LTD.
/주문자

Commodity : PLATE
/품명

Customer : ILSUNG CO., LTD.
/고객사

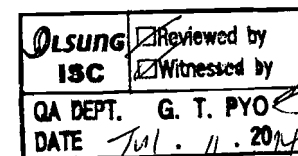
Spec & Type : SA516-70 10ED 11AD TYPE 3.1 NACE MR0175/ISO15156
/규격

ASME

Product No. /제품번호	Division	Sol-AI	CEQ	
PP54201801	L	0.029	0.398	
	P	0.031	0.383	
*** Sub Total (170) ***		1	1,166 (kg)	
*** Lot Total ***		1	1,166 (kg)	LOT No. ==> SG07-08-021
*** Grade Total ***		1	1,166 (kg)	
*** Grand Total ***		1	1,166 (kg)	

CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5

=== Last Item ===



We hereby certify that the material herein has been made in accordance with the order and above specification.
This material has been fully killed and made by basic oxygen process.
No repair welding was performed to the products.
This material has been made by vacuum degassing, calcium treated process. This material is fine grained steel.
Test Certificate is issued according to EN10204 3.1.

* 본 검사증명서에 명기된 규격용도의 사용시 안전상 문제가 발생할 수 있으며,
검사증명서 위.변조시 사문서 위조(형법231조)로 불이익을 당하실 수 있습니다.

Surveyor To :

39/296

Lee, Yong-Heon

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document Document number Bescheinigungsnummer 2014-106953 12/17	Rev 00	Page Sheet Seite 001 / 021	 ArcelorMittal
Client - Purchaser - Besteller		Référence client - Purchase order - Kaufauftrag ST-3478/CF7539			
Projet - Project - Projekt		Industeel Belgium Site : Rue de Châtelet 266 6030 Marchienne-au-Pont			
		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012 ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012			
Produit - Product - Erzeugnis		Plate(s)			
Commande / Poste - Internal order - Werksbestellung		1059069 / 000050			
Bordereau de livraison - Delivery note - Lieferungsdokument		80256920 80257010			

#010 - PRODUITS LIVRES - DELIVERED PRODUCTS - DELIEFERTEN GEGENSTÄNDE	
Nuance - Grade - Werkstoff X2CrNiMoN22-5-3(1.4462) PREN35 UNS S31803 PREN 35 UNS S32205 (2205) X2CrNiMoN22-5-3(1.4462) PREN35 UNS S32205 (2205) UNS S31803 PREN 35	Selon norme - According to - Entsprechend EN 10088-2:2005 ASME IIA ED.2010+AD11 SA 240/M ASME IIA ED.2010+AD11 SA 240/M EN 10028-7:2007+AD2000W2+ADW10 ASTM A240/M:2013a + Norsok D45 ASTM A240/M:2013a + Norsok D45

Epaisseur - Thickness - Dicke	15.00 mm	Largeur - Width - Breite	2,000 mm	Longueur - Length - Länge	12,000 mm
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Spécification - Specification - Spezifikation

- PD5500:2003 ENQUIRY CASE 87/

/SHELL SPECIFICATION MESC SPE 76/222

- PED 97/23/CE



010511

NORSOK D45 REV 5 -

QTR NORSOK M650 N°001 REV 1

Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferzustand

Hypertrempe à l'eau (1100 °C - 2 min/mm) - Solution annealed and water quenched - Wasser abgeschreckt

Procédé d'élaboration - Melting process - Erschmelzungsart

Electric-arc furnace - VOD - Finish n°1 - 1D - HRAP

Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflots nr.	Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflots nr.
540337001	49031	540338.5001 / 540340.4001	01	540338001	49031	540338.5001 / 540340.4001	

Total - Total - Gesamtzahl 002

HEAT NO: 540337001

E-11570/11580 (002-2): CHANNEL (A-01)

(002-26,27): LIFTING LUG

OLSON	☒ Reviewed by
ISC	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 11. 2014

☒ Reviewed
☐ Witnessed

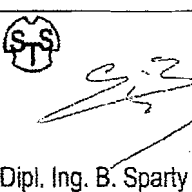

 9/19/2014
 14412
 HSB GS

☒ REVIEWED
☒ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.

Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellvorgeschritten entsprechen.

 Dipl. Ing. B. Sparty	 SGS TÜV SAAR Technische Überwachung	STEPHANIE WALLEMACQ 17/03/2014 Gestionnaire Commande Mill Inspector Werksbeauftragte
---	--	--

2/21

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document Document number Bescheinigungsnummer 2014-106953 14/12	Rev 00 Page 002 Sheet 021 Sete 021	 ArcelorMittal
Client - Purchaser - Besteller				
Référence client - Purchase order - Kaufauftrag		ST-3478/CF7539		
Projet - Project - Projekt				
Industeel Belgium		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012		
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012		
Produit - Product - Erzeugnis		Plate(s)		
Commande / Poste - Internal order - Werksbestellung		1059069 / 000050		
Bordereau de livraison - Delivery note - Lieferungsdocument		80256920 80257010		

#020 - ANALYSE CHIMIQUE DE COULEE - LADLE CHEMICAL COMPOSITION - SCHMELZE CHEMISCHE ZUSAMMENSETZUNG									
	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
	%	%	%	%	%	%	%	%	%
Min.							4.500	22.000	3.000
49031	0.016	1.854	0.0234	0.0003	0.279	0.146	5.136	22.792	3.001
Max.	0.030	2.000	0.0250	0.0050	1.000	0.750	6.500	23.000	3.500
	Nb	Ti	N	(01)	Al				
	%	%	%		%				
Min.			0.1500	35.00					
49031	0.006	0.002	0.1633	35.31	0.014				
Max.	0.100	0.100	0.2000	100.00					

(01) PREN = Cr+(3.3*Mo)+(16*N)

#041 - PMI - POSITIVE MATERIAL IDENTIFICATION - VERWECHSLUNGSPRÜFUNG

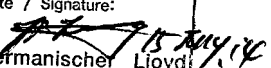
Non confusion de matière - Positive material identification -

PMI Conform

Résultat du contrôle - Examination result - Prüfergebnis

Conforme aux spécifications précitées - Conforming to above specifications - Entspricht der vorgenannten Vorschriften

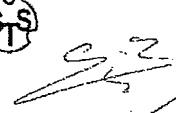
olsung	☐ Reviewed by
ISC	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul .11 . 2014

☒ REVIEWED
☒ WITNESSED
Date / Signature:

Germanischer Lloyd
Industrial Services

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.

Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellvorschriften entsprechen.

 Dipl. Ing. B. Sparty		STEPHANIE WALLEMACQ 17/03/2014 Gestionnaire Commande Mill inspector Werksbeauftragte
		

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document Rev 00 Document number Bescheinigungsnummer 2014-106953 14/12	Page 003 Sheet / Seite 021	 ArcelorMittal
Client - Purchaser - Besteller				
Référence client - Purchase order - Kaufauftrag		ST-3478/CF7539		
Projet - Project - Projekt				
Industeel Belgium		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012		
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012		
Produit - Product - Erzeugnis		Plate(s)		
Commande / Poste - Internal order - Werksbestellung		1059069 / 000050		
Bordereau de livraison - Delivery note - Lieferungsdocument		80256920 80257010		

#072 ESSAIS MECANIKES - MECHANICAL TESTS - MECHANISCHE PRÜFUNGEN

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

DURETE NACE MRO175 HRC < 28									
NACE MRO175 / ISO 15156-3 - NACE MRO175 / ISO 15156-3									
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac			
540338.5001	000	T3/4	PSS	20	°C				
Test result HRC < 28									

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

Rockwell C									
Rockwell C - Rockwell C									
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac			
540338.5001	000	T3/4	PSS	20	°C				

Appendix AN_0001059069_000050_540338001_004_0001

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

Brinell HB									
Brinell HB - Brinell HB									
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	HB10 Ind	HB10 Ind	HB10 Aver
540338.5001	000	T3/4	PSS	20	°C		208	209	205

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

Traction									
Tensile test - Zugversuch									
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Rp 0,2%	Rm	A Lo=50
540338.5001	000	T3/4	1/2SL	20	°C		566	744	37

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

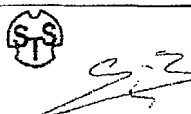
Traction									
Tensile test - Zugversuch									
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Rp 0,2%	Rm	A Lo=50
540338.5001	000	T3/4	1/2ST	20	°C		568	747	37

OLSUNG ISC QA DEPT. DATE 7ul. 11. 2014	Reviewed by Witnessed by G. T. PYO
---	--

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.

Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestimmungsvorschriften entsprechen.

☒ REVIEWED ☒ WITNESSED Date / Signature: 15 Jul 2014 Germanischer Lloyd Industrial Services	 Dipl. Ing. B. Sparty	 STEPHANIE WALLEMACQ 17/03/2014 Gestionnaire Commande MIB inspector Werksbeauftragte
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CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document Rev 00 Document number Bescheinigungsnummer 2014-106953 14/12		Page Sheet Seite 004 021	 ArcelorMittal
Client - Purchaser - Besteller					
Référence client - Purchase order - Kaufauftrag ST-3478/CF7539					
Projet - Project - Projekt					
Industeel Belgium Site : Rue de Châtelet 266 6030 Marchienne-au-Pont		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012 ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012			
Produit - Product - Erzeugnis		Plate(s)			
Commande / Poste - Internal order - Werksbestellung		1059069 / 000050			
Bordereau de livraison - Delivery note - Lieferungsdocument		80256920 80257010			

TRACTION A CHAUD - HOT TENSILE TEST - WARMZUGVERSUCH

TRACTION A CHAUD TRAVERS CYLINDRIQUE EN						Rp 0,2%									
Cylindrical EN - Zylindrisch EN															
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa							
							Min	285							
							Max								
540340.4001	000	T3/4	PST	280	°C			445							

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm						Energy Ind									
KCV ASTM 10X10mm - KCV ASTM 10X10mm															
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	mm	mm	mm	mm
							Min	75	75	75	90	0.380	0.380	0.380	0.380
							Max								
540338.5001	000	T3/4	1/2SL	-50	°C			185	182	166	178	1.900	1.800	1.900	1.867

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm						Energy Ind									
KCV ASTM 10X10mm - KCV ASTM 10X10mm															
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	mm	mm	mm	mm
							Min	75	75	75	90	0.380	0.380	0.380	0.380
							Max								
540338.5001	000	T3/4	1/2ST	-50	°C			156	163	140	153	1.600	1.800	1.500	1.633

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm						Energy Ind									
KCV ASTM 10X10mm - KCV ASTM 10X10mm															
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	mm	mm	mm	mm
							Min	35	35	35	45	0.380	0.380	0.380	0.380
							Max								
540338.5001	000	T3/4	1/2ST	-46	°C			170	163	154	162	1.900	1.900	1.900	1.900

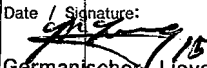
RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm						Energy Ind									
KCV ASTM 10X10mm - KCV ASTM 10X10mm															
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	mm	mm	mm	mm
							Min	75	75	75	90	0.380	0.380	0.380	0.380
							Max								
540338.5001	000	T3/4	1/4SL	-50	°C			185	177	167	176	1.900	1.900	1.900	1.900

 Reviewed by Witnessed by QA DEPT. G. T. PYO DATE 11.11.2014

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestimmungsvorschriften entsprechen.

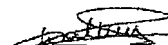
☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services
--



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Milli inspector
Werksbeauftragte



CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document Rev 00 Document number Bescheinigungsnummer 2014-106953 14/12	Page 005 Sheet 021 Seite	 ArcelorMittal
Client - Purchaser - Besteller				
Référence client - Purchase order - Kaufauftrag		ST-3478/CF7539		
Projet - Project - Projekt				
Industeel Belgium		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012		
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012		
Produit - Product - Erzeugnis		Plate(s)		
Commande / Poste - Internal order - Werksbestellung		1059069 / 000050		
Bordereau de livraison - Delivery note - Lieferungsdocument		80256920 80257010		

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm								Energy Ind	Energy Ind	Energy Ind	Energy Ave	LatEx Ind	LatEx Ind	LatEx Ind	LatEx Ave	%Sh.area Ind	%Sh.area Ind	%Sh.area Ind	%Sh.area Ave	
KCV ASTM 10X10mm - KCV ASTM 10X10mm																				
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	mm	mm	mm	mm	%	%	%	%	
							Min	75	75	75	90	0.380	0.380	0.380	0.380	50	50	50	50	
							Max													
540338.5001	000	T3/4	1/4ST	-50 °C				166	168	141	158	1.900	1.900	1.800	1.867	85	85	75	81.667	

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

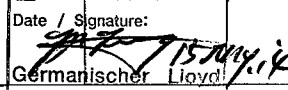
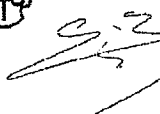
KCV EN 10X10mm								Energy Ind	Energy Ind	Energy Ind	Energy Ave	LatEx Ind	LatEx Ind	LatEx Ind	LatEx Ave	%Sh.area Ind	%Sh.area Ind	%Sh.area Ind	%Sh.area Ave	
KCV EN 10X10mm - KCV EN 10X10mm																				
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	mm	mm	mm	mm	%	%	%	%	
								Min	28	28	28	40	0.380	0.380	0.380	0.380				
								Max												
540338.5001	000	T3/4	PST	-40	°C			158	236	210	201	1.700	2.400	2.200	2.100	75	90	85	83.333	

Loc	3/4	Trois-Quart - 3/4 Width - 3/4 Breite
Loc	T	Tête - Top - Kopf
Epr. Epaisseur	1/2	Mi épaisseur - 1/2 Thickness - 1/2 Dicke
Epr. Epaisseur	1/4	Quart épaisseur - 1/4 Thickness - 1/4 Dicke
Epr. Epaisseur	P	Peau - Rolled Surface - Walzfläche
Epr. Face	S	Supérieure - Upper face - obere
Epr. Sens	L	Long - Longitudinal - Längs
Epr. Sens	S	Standard - Standard - Standard
Epr. Sens	T	Travers - Transverse - Quer
Etat	000	Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferzustand
Epr.Ep./Face/Sens	1/2SL	Mi épaisseur - 1/2 Thickness - 1/2 Dicke / Supérieure - Upper face - obere / Long - Longitudinal - Längs
Epr.Ep./Face/Sens	1/2ST	Mi épaisseur - 1/2 Thickness - 1/2 Dicke / Supérieure - Upper face - obere / Travers - Transverse - Quer
Epr.Ep./Face/Sens	1/4SL	Quart épaisseur - 1/4 Thickness - 1/4 Dicke / Supérieure - Upper face - obere / Long - Longitudinal - Längs
Epr.Ep./Face/Sens	1/4ST	Quart épaisseur - 1/4 Thickness - 1/4 Dicke / Supérieure - Upper face - obere / Travers - Transverse - Quer
Epr.Ep./Face/Sens	PSS	Peau - Rolled Surface - Walzfläche / Supérieure - Upper face - obere / Standard - Standard - Standard
Epr.Ep./Face/Sens	PST	Peau - Rolled Surface - Walzfläche / Supérieure - Upper face - obere / Travers - Transverse - Quer

Q. sung	☒ Reviewed by
ISC	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 11. 2014

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestimmungsvorschriften entsprechen.

☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services	 Dipl. Ing. B. Sparty	 SGS TÜV SAAR GmbH Technische Überwachung	STEPHANIE WALLEMACQ 17/03/2014 Gestionnaire Commande Mill inspector Werksbeauftragte
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CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document Rev 00 Document number Bescheinigungsnummer 2014-106953 14/12	Page 006 Sheet / Seite 021	 ArcelorMittal
Client - Purchaser - Besteller				
Référence client - Purchase order - Kaufauftrag		ST-3478/CF7539		
Projet - Project - Projekt				
Industeel Belgium		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012		
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012		
Produit - Product - Erzeugnis		Plate(s)		
Commande / Poste - Internal order - Werksbestellung		1059069 / 000050		
Bordereau de livraison - Delivery note - Liefersungsdokument		80256920 80257010		

#082 ESSAIS TECHNOLOGIQUES - TECHNOLOGICAL TESTS - TECHNOLOGISCHE PRÜFUNGEN

MICROGRAPHIE - MICROGRAPHY - SCHLIFFBILD

ANALYSE MICROGRAPHIQUE PHASE SIGMA

Micrography - Schlißbild

N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	%											
							Min												
							Max	0.001											
540338.5001	000	T3/4	1/2SS	20	°C														

Standard

MICRO SIGMA

Etchant

N° 96 (ASTM E407)

Test result

Compliant with procedure

N°	Location - Localisation - Lage	Picture - image - bild	Magnification - Grossissement - Vergrößerung
01	Top Surface	AN_0001059069_000050_540338001_003(1)	500X
02	Top Surface	AN_0001059069_000050_540338001_003(2)	500X
03	Top Surface	AN_0001059069_000050_540338001_003(3)	500X
04	1/2 thickness	AN_0001059069_000050_540338001_003(4)	500X
05	1/2 thickness	AN_0001059069_000050_540338001_003(5)	500X
06	1/2 thickness	AN_0001059069_000050_540338001_003(6)	500X
07	Bottom Surface	AN_0001059069_000050_540338001_003(7)	500X
08	Bottom Surface	AN_0001059069_000050_540338001_003(8)	500X
09	Bottom Surface	AN_0001059069_000050_540338001_003(9)	500X

Results of intermetallic volume fraction (Near Surface)

IN %	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15
L1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IN %	F16	F17	F18	F19	F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30
L1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

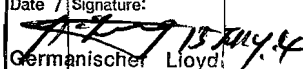
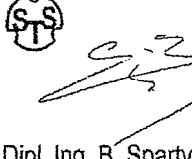
	MAX
Average L1	0.000 %
Average L2	0.000 %
Average L3	0.000 %

OLSUNG ISC	☒ Reviewed by ☒ Witnessed by QA DEPT. G. T. PYO DATE Jul. 11. 2014
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Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.

Wir bestätigen hiermit, dass die oben genannten Erzeugnisse den Bestimmungsvorschriften entsprechen.

☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services	 Dipl. Ing. B. Sparty
--	---



STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
 Werksbeauftragte



CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document Rev 00 Document number Bescheinigungsnummer 2014-106953 14/12		Page 007 Sheet / Seite 021	 ArcelorMittal
Client - Purchaser - Besteller					
Référence client - Purchase order - Kaufauftrag ST-3478/CF7539					
Projet - Project - Projekt					
Industeel Belgium Site : Rue de Châtelet 266 6030 Marchienne-au-Pont		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012 ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012			
Produit - Product - Erzeugnis				Plate(s)	
Commande / Poste - Internal order - Werksbestellung				1059069 / 000050	
Bordereau de livraison - Delivery note - Lieferungsdocument				80256920 80257010	

FERRITE SUR COUPON - FERRITE ON SAMPLE - FERRIT AUF COUPON

ASTM E562																
ASTM E562 - ASTM E562																
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac										
540338.5001	000	T3/4	SSS	20	°C											
Standard						ASTM E562/E1245										
Number of Fields						5										
Etchant						N° 96 (ASTM E407)										
Magnification						500X										
Test result						Compliant with Standards										
Ferrite Content																
Top Surface	Fields N°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		%	48.640	48.920	50.170	52.310	52.530									
Deviation 1.834 %		95%CI= 2.277 %		%RA= 4.508 %												
Average - Moyenne - Mittel		50.514 %														
Requirements - Requis - Bedarf																
Min		Max														
40.000		55.000														

	Reviewed by
ISC	Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul 11 2014

CORROSION - CORROSION - KORROSION

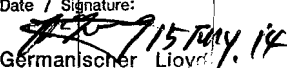
923A															
ASTM A923 A - ASTM A923 A															
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac									
540338.5001	000	T3/4	SSS	20	°C										
Standard						ASTM A923A									
Microstructure						Unaffected Structure									
Test result						Compliant with Standards									
N°	Location - Localisation - Lage					Picture - image - Bild					Magnification - Grössenmassstab - Vergrößerung				
01	Top Surface					AN_0001059069_000050_540338001_002(1)					500X				
02	1/4 thickness					AN_0001059069_000050_540338001_002(2)					500X				
03	1/2 thickness					AN_0001059069_000050_540338001_002(3)					500X				

CORROSION - CORROSION - KORROSION

Sensibilisé - Sensitized - Sensibilisiert															
ASTM A262 E															
ASTM A262 E - ASTM A262 E															
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac									
540338.5001	000	T3/4	SSS	20	°C										
Test result						Compliant with Standards									

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellvorgeschritten entsprechen.

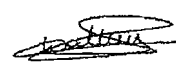
☒ REVIEWED
☒ WITNESSED
Date / Signature:

Germanischer Lloyd
Industrial Service



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Mati Inspector
Werksbeauftragte



ArcelorMittal

STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Müll inspector
Werksbeauftragte

9/21

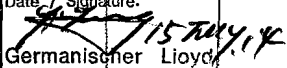
Olusung ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 11. 2014

STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document Rev 00 Document number Bescheinigungsnummer 2014-106953 14/12		Page Sheet Seite 010 021	 ArcelorMittal
Client - Purchaser - Besteller		Référence client - Purchase order - Kaufauftrag		ST-3478/CF7539	
Projet - Project - Projekt		Industeel Belgium Site : Rue de Châtelet 266 6030 Marchienne-au-Pont		ISO 9001 (Cert.95587-2011, Valid 02/06/2011) + MAQ REV 12 du 02/05/2012 ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012	
Produit - Product - Erzeugnis		Plate(s)		1059069 / 000050	
Commande / Poste - Internal order - Werksbestellung		Bordereau de livraison - Delivery note - Lieferungsdokument		80256920 80257010	
#192 - MESURE DE FERRITE - FERRITE LEVEL MEASUREMENT - FERRITMESSUNG					
Produit - Product - Erzeugnis		540337001			
Mesure Ferrite - -		Min: 42.00 % / Max: 55.00 %			
Résultat du contrôle - Examination result - Prüfergebnis					
Conforme aux spécifications précitées - Conforming to above specifications - Entspricht der vorgenannten vorschritten					
Mesure de ferrite - Ferrite level measurement - Ferritmessung					
Unité - Unit -			%		
Position - Position - Lage	Valeur	Valeur	Valeur	Valeur	
Mini - -	42.00	42.00	42.00	42.00	
Relevé - Actual - Ist-wert	50.50	50.90	51.10	50.40	
Maxi - -	55.00	55.00	55.00	55.00	
Produit - Product - Erzeugnis		540338001			
Mesure Ferrite - -		Min: 42.00 % / Max: 55.00 %			
Résultat du contrôle - Examination result - Prüfergebnis					
Conforme aux spécifications précitées - Conforming to above specifications - Entspricht der vorgenannten vorschritten					
Mesure de ferrite - Ferrite level measurement - Ferritmessung					
Unité - Unit -			%		
Position - Position - Lage	Valeur	Valeur	Valeur	Valeur	
Mini - -	42.00	42.00	42.00	42.00	
levé - Actual - Ist-wert	50.80	50.90	51.10	50.20	
Maxi - -	55.00	55.00	55.00	55.00	


☒ Reviewed by
☒ Witnessed by
 QA DEPT. G. T. PYO
 DATE Jul. 11. 2014

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
 We hereby certify that the above mentioned products are complying with the order requirements.
 Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellvorgeschritten entsprechen.

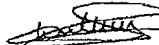
☒ REVIEWED
☒ WITNESSED
 Date / Signature:

 Germanischer Lloyd
 Industrial Services



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
 Werksbeauftragte



CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004
 Inspection Certificate 3.2 / EN 10204:2004
 Prüfbescheinigung 3.2 / EN 10204:2004

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 2014-106953
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Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

Projet - Project - Projekt

ANNEXES - APPENDIX - ANLAGEN

540338001

AN 0001059069 000050 540338001 001



OLSUNG ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 11. 2014

☒ REVIEWED
☒ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd Industrial Services



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
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[Signature]

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14/12

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012
/ 021

Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

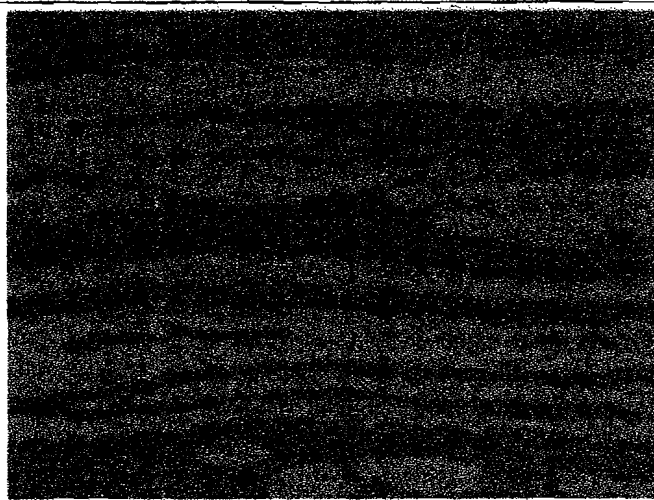
Projet - Project - Projekt

ArcelorMittal

ANNEXES - APPENDIX - ANLAGEN

540338001

AN_0001059069_000050_540338001_001



Qlsung ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 11. 2014

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☒ WITNESSED
Date / Signature:
<i>[Signature]</i> 15 JUL 14
Germanischer Lloyd Industrial Services



Dipl. Ing. B. Sparty

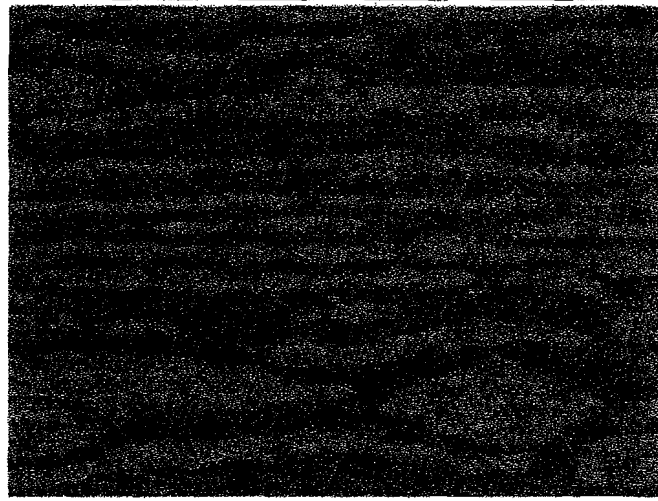


STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Mill inspector
Werksbeauftragte

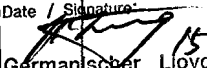
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CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungsnr. 2014-106953	Page 013 Sheet / Seite 021 
Client - Purchaser - Besteller		ArcelorMittal
Référence client - Purchase order - Kaufauftrag ST-3478/CF7539		
Projet - Project - Projekt		

ANNEXES - APPENDIX - ANLAGEN 540338001 AN 0001059069_000050_540338001_001



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QA DEPT. DATE	G. T. PYO Jul. 11. 2014

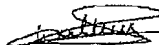
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Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
 Werksbeauftragte



CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004
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 2014-106953
 14/12

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Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

Projet - Project - Projekt

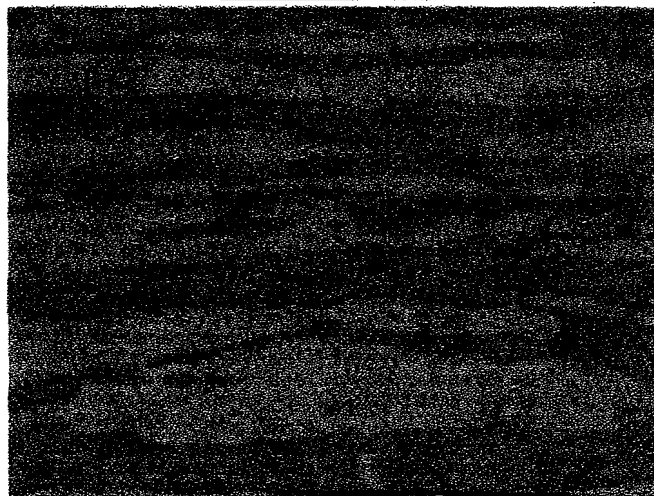
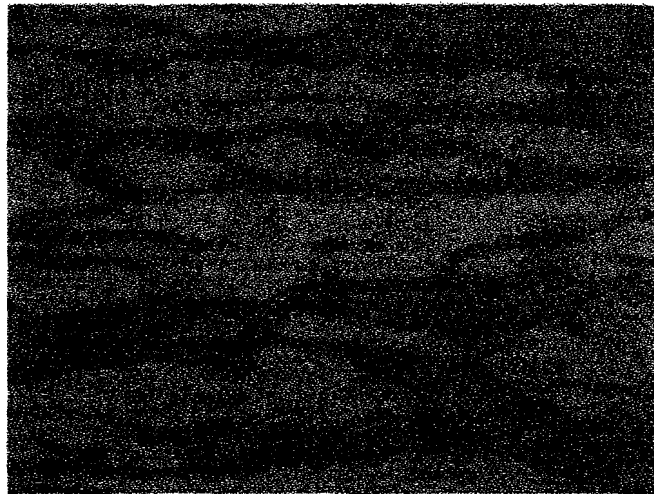
ST-3478/CF7539

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ANNEXES - APPENDIX - ANLAGEN

540338001

AN 0001059069 000050 540338001_002



OLsung
 ISC
 QA DEPT. G. T. PYO
 DATE Jul. 11. 2014

Reviewed by
 Witnessed by

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☒ WITNESSED

Date / Signature:

Germanischer Lloyd
 Industrial Services



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
 Werksbeauftragte

[Signature]

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Document number
Bescheinigungsnummer
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Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

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15/21

ANNEXES - APPENDIX - ANLAGEN

540338001

AN 9001059069-000050-540338001-002



OLSUNG	☐ Reviewed by
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QA DEPT.	G. T. PYO
DATE	Jul. 11. 2014

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Date / Signature:
<i>[Signature]</i> 13 July 14
Germanischer Lloyd Industrial Services



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Mill inspector
Werksbeauftragte

[Signature]

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004
 Inspection Certificate 3.2 / EN 10204:2004
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Numéro de document Rev 00
 Document number
 Bescheinigungsnummer

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2014-106953
 14/12

Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

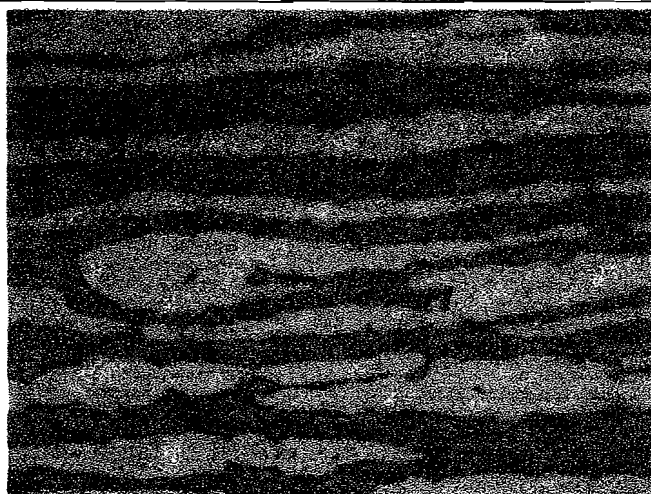
Projet - Project - Projekt

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ANNEXES - APPENDIX - ANLAGEN

540338001

AN: 0001050059-000050-540338001-003



OLSUNG ISC	☒ Reviewed by
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QA DEPT.	G. T. PYO
DATE 10/11/2014	

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Germanischer Lloyd
Industrial Services



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
 Werksbeauftragte

[Signature]

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004
 Inspection Certificate 3.2 / EN 10204:2004
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Numéro de document Rev 00
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 Bescheinigungsnummer
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 14/15

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Client - Purchaser - Besteller

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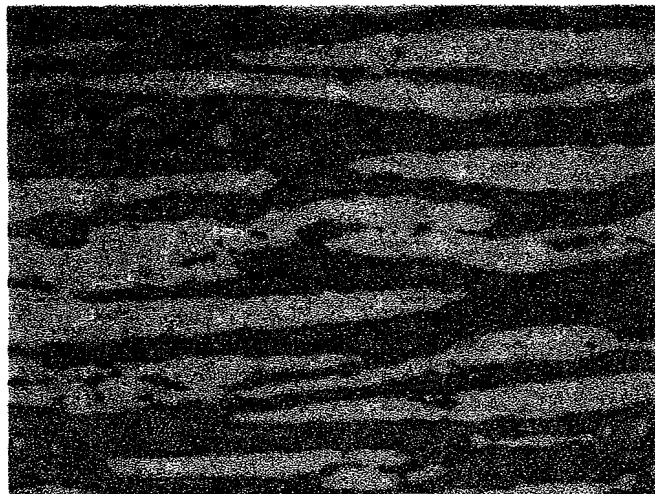
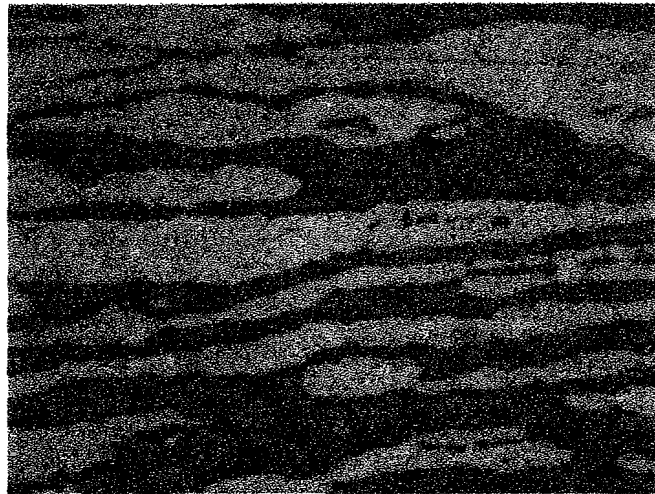
ST-3478/CF7539

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ANNEXES - APPENDIX - ANLAGEN

540338001

AN_0001059069_000050_540338001_003



Reviewed by
 Witnessed by
 QA DEPT. G. T. PYO
 DATE Tu. 11. 2014

☒ REVIEWED
☒ WITNESSED

Date / Signature:

Germanischer Lloyd
 Industrial Services



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
 Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004
Inspection Certificate 3.2 / EN 10204:2004
Prüfbescheinigung 3.2 / EN 10204:2004

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Document number
Bescheinigungsnummer
2014-106953
14/12

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Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

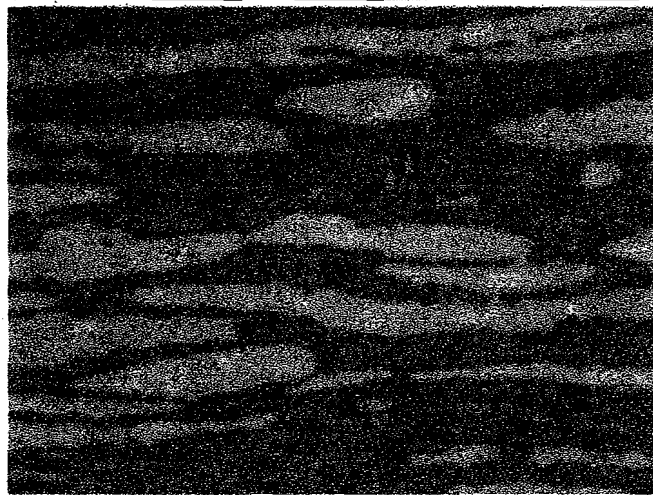
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ANNEXES - APPENDIX - ANLAGEN

540338001

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DATE Jul 11. 2014

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Date / Signature:

Germanischer Lloyd
Industrial Services



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Milli inspector
Werksbeauftragte

[Signature]

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Document number
 Bescheinigungsnummer

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Client - Purchaser - Besteller

réf: Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

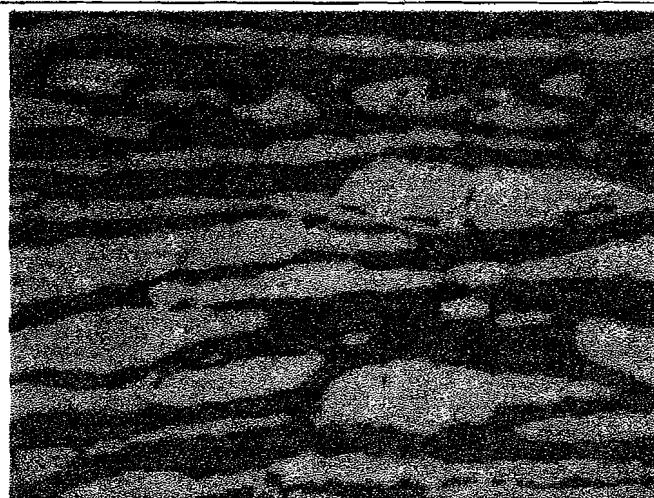
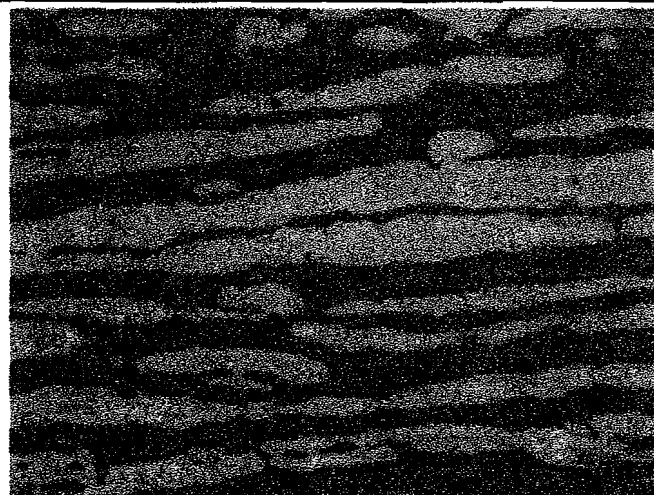
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ANNEXES - APPENDIX - ANLAGEN

540338001

AN-0001059069-000050_540338001-003



OLsung
 ISC
 QA DEPT. G. T. PYO
 DATE Jul. 11. 2014

Reviewed by
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☒ REVIEWED
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Date / Signature:

Germanischer Lloyd
 Industrial Services



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
 Werksbeauftragte

[Signature]

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004
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Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

Projet - Project - Projekt

ANNEXES - APPENDIX - ANLAGEN

540338001

AN_0001059069_000050_540338001_004

HARDNESS TESTING AS PER ASTM E18

ORDER 1059069
Plate Nr 540338001

Location 1

	HRC ind.	HRC ind.	HRC ind.	HRC average
upper surface - 1mm	20	20	21	20
Mid section	18	17	19	18
Lower surface - 1mm	22	22	21	22

Location 2

	HRC ind.	HRC ind.	HRC ind.	HRC average
upper surface - 1mm	20	22	23	22
Mid section	17	18	19	18
Lower surface - 1mm	20	23	21	21

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QA DEPT. G. T. PYO
DATE Jul. 11. 2014

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Date / Signature:

Germanischer Lloyd
Industrial Services



STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Mill Inspector
Werksbeauftragte

ArcelorMittal

INDUSTEEL (Belgium)
B.P. 1739 B-6030 CHARLEROITOLES LAMINEES A CHAUD
HOT ROLLED PLATES
WARMGEWALZTE BLECHE
LAMIERE LAMINATE A CALDOCertificat de contrôle des produits par l'usine
Mill test certificate
Prüfzeugnis
Certificato di controllo interno dei prodottiEN 10204
ISO 10474

3.2

INDUSTEEL EST ISO 9001 / CERT 95587-2011, VALID 02/06/2014 / +MAQ RE-11 DU 01-05-2009
INDUSTEEL IS ISO 9001 / CERT 95587-2011, VALID 02/06/2014 / +QAM RE-11 DU 01-05-2009

CLIENT / CUSTOMER / BESTELLER / CLIENTE

COMMANDE USINE NR / ORDER NR / WERKS NR / ORDINE NR

5186112

CCPU - CERTIFICATE - PRÜFZEUGNIS - CERTIFICATO

625886

BORDEREAU / DELIVERY / VERSANDANZEIGE / BORDERO

330606

ORGANISME DE CONTROLE / INSPECTION AUTHORITY / ÜBERWACHUNG / ORGANISMO DI COLLAUDO
LLOYD'S REGISTER ANT 1232001 / 101

REFERENCE / PURCHASER ORDER / BESTELL. NR. / REFERENZA

ST-2357/CF7041

PRODUIT - ARTICLE - PRÜFGEGENSTAND - PRODOTTO :

TOLES - PLATES - BLECHE - LAMIERE

MATIERE / MATERIAL / WERKSTOFF / MATERIALE

SUIVANT / ACCORDING TO / ENTSPRECHEND / SECONDO

UNS S32205 (2205)

ASTM A 240/M ED.2010a

NORSOK MDS D 45 REV 3 SEPT 2010
PD 5500 2003 ENQUIRY CASE #7
SHELL ES 247 REV 2

Hypertempe - Solution annealed - Lösungsgeglüht und abgeschreckt - Ipertermato 1050°C/1100°C

ETAT DE LIVRAISON / STATE OF DELIVERY :
LIEFERZUSTAND / STATO DI FORNITURA

PROCEDE D'ELABORATION / MELTING PROCESS /

ERSCHMELZUNGSART / PROCEDIMENTO DI ELABORAZIONE

Electric-arc Furnace + VOD - Finish : no 1 - ID

MARQUAGE / MARKING / KENNZEICHNUNG / IDENTIFICAZIONE

- VG (SIGLE PRODUCTEUR) - NUANCE - NR COULEE - NR TOLE -
POINÇON DE L'EXPERT- VG (TRADE MARK) - GRADE - HEAT NR - PLATE NR - INSPECTOR'S STAMP
- VG (HERSTELLERZEICHEN) - MARKENBEZEICHNUNG - SCHMELZE NR -
BLECH NR - STEMPSEL DES SACHVERSTÄNDIGEN- VG (SIGLA PRODUTTORE) - TIPO - NR COLATA - NR LAMIERA -
PUNZONE DEL COLLAUDATOREMARQUE DU FABRICANT / BRAND OF THE MANUFACTURER
HERSTELLERZEICHEN / MARCA DEL PRODUTTORE- POINÇON DE L'EXPERT / INSPECTOR'S STAMP
STEMPSEL DES SACHVERSTÄNDIGEN - PUNZONE DEL COLLAUDATORE

or VG

or RF

Liste descriptive - Extent of material delivery - Umfang der Lieferung - Descrizione del materiale

Marque Markings Zeichen Marca	Nombre Number Stückzahl Quantità	Désignation du produit Article Gegenstand Tipo di prodotto	N° de tôles Plates N° Bleche Nr Lamiere N°	N° coulée Heat N° Schmelze Nr N° colata	N° éprouvette Test N° Probe Nr Provetta N°	Kg Théor.
1-	1	12000 x 3000 x 15.00	338801/1->1	17931	338800.4001 338800.5001 338801.1001 338801.2001	4320
	1					4320

HEAT NO: (17931)

338801-1

E-11570/11580(002-4) CHANNEL (A-05)

☒ SUNG	☒ Reviewed by
☒ SC	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 11. 2014

☒ Reviewed
☐ Witnessed
14412
SB GS

Nous certifions que les produits énumérés ci-dessus sont conformes aux prescriptions de la commande.
 We hereby certify that the above mentioned products are consistent with the order prescriptions.
 Wir bestätigen hiermit daß die obengenannten Erzeugnisse den Bestellungsverschriften entsprechen.
 Certifichiamo che i prodotti enumerati qui sopra sono conformi alle prescrizioni dell'ordine.

Q. C. Manager

Mill Inspector

Date-Datum-Data

DESCHAPPER, MICHELE D'ANGELO, TONINO

6-JAN-2012

☒ REVIEWED
☒ WITNESSED
Date / Signature:
Germanische Lloyd
Industrial Services

INDUSTEEL
(Belgium)

ArcelorMittal

INDUSTEEL (Belgium)
B.P. 1739 B-6030 CHARLEROI

ASME

CCPU - CERTIFICATE - PRÜFZEUGNIS - CERTIFICATO No

625886

COMMANDE USINE NR / ORDER NR / WERKS NR / ORDINE NR

5186112

INDUSTEEL EST ISO 9001 CERT 15587-2011, VALID 01/01/2014, *MAQ REF 11 DU 01/01/2014
INDUSTEEL EST ISO 9001 CERT 15587-2011, VALID 01/01/2014, *MAQ REF 11 Du 01/01/2014ESSAIS MECANIKES
MECHANICAL TESTS
PRÜFUNGEN
PROVE MECCANICHE- ANALYSES CHIMIQUES
- CHEMICAL ANALYSIS
- CHEMISCHE ZUSAMMENSETZUNG
- ANALISI CHIMICHE

Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	TRACTION TRANSVERSALE Transverse tensile test			
					Rp0.2% MPa	Rm/UTS MPa	A 50 %	A 5 %
15.00	17931	338800.5001	20	0	576	748	33.0	31.0
15.00	17931	338801.2001	20	0	551	759		34.0
Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	Resilience Charpy V long. 1/4ep, 10x10mm, ASTM/ASME Long Charpy V notch test 1/4th, 10x10mm, ASTM/ASME			
					INDIV. J	INDIV. J	INDIV. J	MOY/AV J
15.00	17931	338800.5001	-046	0	167	151	159	159
15.00	17931	338801.2001	-046	0	172	165	159	165
					INDIV. J	INDIV. J	INDIV. J	MOY/AV J
15.00	17931	338800.5001	-050	0	117	157	145	140
15.00	17931	338801.2001	-050	0	152	161	147	153
Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	Charpy V longitudinale; 10x10mm; 1/2 ep; A/SA Long charpy V impact test; 10x10mm; 1/2 thick; A/SA			
					INDIV. J	INDIV. J	INDIV. J	MOY/AV J
15.00	17931	338800.5001	-050	0	163	148	152	154
15.00	17931	338801.2001	-050	0	162	157	159	159
Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	RESILIENCE CHARPY V TRANSV; peau ; 10x10mm ; EN TRANSV. CHARPY V NOTCH TEST; Full Size, 10x10mm, EN			
					INDIV. J	INDIV. J	INDIV. J	MOY/AV J
15.00	17931	338800.5001	20	0	189	209	214	204
15.00	17931	338801.2001	20	0	214	222	220	219
Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	Resilience Charpy V transv 1/4ep, 10x10mm, ASTM/ASME Transv Charpy V notch test 1/4th, Full Size, ASTM			
					INDIV. J	INDIV. J	INDIV. J	MOY/AV J
15.00	17931	338800.5001	-050	0	142	126	136	135
15.00	17931	338801.2001	-050	0	139	152	146	146
Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	Charpy V transversale; 10x10mm; 1/2 ep; A/SA Transv Charpy V-Notch 10x10, 1/2 thick, ASTM/ASME			
					INDIV. J	INDIV. J	INDIV. J	MOY/AV J
15.00	17931	338800.5001	-050	0	155	124	143	141

OLSUNG
ISC

QA DEPT.
DATE

☒ Reviewed

☒ Witnessed

G. T. PY

Jul. 11.

Reviewed by
Witnessed by
QA DEPT. G. T. PYO
DATE Jul. 11. 20 14

Résultats de l'inspection et du contrôle de dimensions : SANS REMARQUE.
Results of surface examination and dimensions controls : NO REMARK.
Ergebnis der Besichtigung und Maßkontrollen : OHNE BEANSTANDUNG.
Risultati delle ispezioni e del controllo di dimensioni : SENZA OSSERVAZIONE.

☒ REVIEWED
☒ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

Q. C. Manager
DESCHEPPER. MICHELE D'ANGELO. TONINO

Mill Inspector

Date-Datum-Data
6-JAN-2012

INDUSTEEL
(Belgium)

ArcelorMittal

INDUSTEEL (Belgium)
B.P. 1739 B-6030 CHARLEROI

ASME

CCPU - CERTIFICATE - PRÜFZEUGNIS - CERTIFICATO No

625886

COMMANDE USINE NR / ORDER NR / WERKS NR / ORDINE NR

5186112

INDUSTEEL EST ISO 9001 CERT ISO 9001:2011, N° 01020002014, MAQ RE 11 DU 06/06/2009
INDUSTEEL IS ISO 9001 CERT ISO 9001:2011, N° 01020002014, MAQ RE 11 DU 06/06/2009ESSAIS MECANQUES
MECHANICAL TESTS
PRÜFUNGEN
PROVE MECCANICHE- ANALYSES CHIMIQUES
- CHEMICAL ANALYSIS
- CHEMISCHE ZUSAMMENSETZUNG
- ANALISI CHIMICHE

Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	Charpy V transversale; 10x10mm; 1/2 ep; A/SA Transv Charpy V-Notch 10x10, 1/2 thick, ASTM/ASME
15.00	17931	338801.2001	-050	0	INDIV. INDIV. INDIV. MOY/AV J J J J 160 142 127 143
Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	DURETE BRINNEL 3000kg, PEAU SUPERIEURE BRINELL hardness 3000kg ; sub-surface
15.00	17931	338800.5001	20	0	HB 10 HB 10 HB 10 HB MOY 222 219 225 222
Ep(mm)	COULEE HEAT	ESSAIS SAMPLES	T° (C)	ETAT *	TENEUR EN FERRITE SELON ASTM E 562 Average rate % of ferrite according to ASTM E 562
15.00	17931	338801.1001	20	0	% 49.3
NON CONFUSION DE MATIERE -> TEST CONFORME POSITIVE MATERIAL IDENTIFICATION (PMI) -> TEST IS CONFORM					
CORR. PAR PIQUES ASTM G48 METH. A -> Satisfaisant selon Norme Corrosion according to ASTM G48 method A -> Satisfactory as per Specification					
CORR. PAR PIQUES ASTM A 923, METHODE C -> Satisfaisant selon norme Corrosion according to ASTM A 923 method C -> Satisfactory as per specification					
Analyse MICROGRAPHIQUE selon specification -> satisfaisant MICROGRAPHIC analysis according to specification -> satisfactory					
DURETE NACE MR0175 / ISO 15156-3 ; HRC < 28 -> Valeurs des duretes sont inferieures a 28 HRC (Nace MR-01-75) ROCKWELL C HARD. NACE MR0175/ISO 15156 < 28 HRC -> Hardness values are less than 28 HRC (Nace MR-01-75)					
Corrosion interg EN ISO 3651-2 Méthode A -> Resultat satisfaisant. Pas de fissures. Inter. cor. EN ISO 3651-2 Pract. A -> Satisfactory. No cracks.					

Dr. SUNG ISC	Reviewed by G. T. PYO
QA DEPT.	DATE Jul. 11 2014
Witnessed by	

COULEE HEAT	C	Mn	P	S	Si	Ni	Cr	Mo	N	PRE-N		
17931	0.016	1.890	0.028	0.0006	0.238	5.423	22.785	3.074	0.1722	35.7		

* ETAT :

0 -> ETAT DE LIVRAISON
AS DELIVERY

This supply complies with the main requirements of PED 97/23/CE relating to the basis materials regardless of the specific terms of service.

all elements are in % except H in PPM

Résultats de l'inspection et du contrôle de dimensions : SANS REMARQUE.
Results of surface examination and dimensions controls : NO REMARK.
Ergebnis der Besichtigung und Maßkontrollen : OHNE BEANSTANDUNG.
Risultati delle ispezioni e del controllo di dimensioni : SENZA OSSERVAZIONE.
☒ REVIEWED
☒ WITNESSED

Date / Signature:

Germanischer Lloyd
Industrial ServiceQ. C. Manager
DESCHEPPER, MICHELE D'ANGELO, TONINO

Mill Inspector

Date-Datum-Data
6-JAN-2012INDUSTEEL
(Belgium)



INDUSTEEL (Belgium)
B.P. 1739 B-6030 CHARLEROI

INDUSTEEL EST ISO 9001 (CERT. 95587-2011, VALID 02/06/2014) + N/AQ REV 11 DU 01/09/2009
INDUSTEEL IS ISO 9001 (CERT. 95587-2011, VALID 02/06/2014) + N/AQ REV 11 DU 01/09/2009

CCPU - CERTIFICATE - PRÜFZEUGNIS - CERTIFICATO No

625886

COMMANDE USINE NR / ORDER NR / WERKS NR / ORDINE NR

5186112

Ce certificat comporte 4 feuilles
This certificate includes 4 sheets

Qlsung ISC	☒ Reviewed by ☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	JAN. 11. 2012

☒ REVIEWED ☒ WITNESSED
Date / Signature:
Germanischer Lloyd Industrial Services

Résultats de l'inspection et du contrôle de dimensions : SANS REMARQUE.
Results of surface examination and dimensions controls : NO REMARK.
Ergebnis der Besichtigung und Maßkontrollen : OHNE BEANSTANDUNG.
Risultati delle ispezioni e del controllo di dimensioni : SENZA OSSERVAZIONE.

Q. C. Manager
DESCHEPPER. MICHELE D'ANGELO. TONINO

Mill Inspector

Date-Datum-Data
6-JAN-2012

INDUSTEEL
(Belgium)

Industeel Belgium

ArcelorMittal

QUALITY CONTROL DEPARTMENT - TESTING LABORATORY

FERRIC CHLORIDE CORROSION TEST REPORT - ASTM A923 METHOD C

IB Order : 5186111

Customer :

Coupon nr : 338800001

Thickness : 15,00 mm

Heat nr : 17931

Quality : 1.4462 PREN 35 + S31803 + 2205

Size of Specimen (mm)					
Length	Specified	Width	Specified	Thickness	Specified
50	50	25	25	15,00	Full thickness
Total area in cm ²		47,50			

Instrument :

Balance SARTORIUS LE 623 S

Method

In accordance with ASTM A 923 -03 TEST METHOD C

Solution of 6% FeCl₃ at pH 1,3Volume > 150 ml or 20 ml/cm²

Temperature of Test 25 ± 1 °C +/- 1°C

OLsung	☒ Reviewed by
ISC	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	701.11.2014

Corrosion rate

Initial weigh : 148,5987 g
 Final weigh : 148,5987 g
 weigh loss : 0,0000 g
 Start of Test : 22/12/2011 12:00
 End of Test : 23/12/2011 12:00
 Duration : 24 h
 pH : 1,31

mdd : 0,0 < 10

Conclusions: Test in accordance with ASTM A923-06 Method C and the requirements of the order.

☒ REVIEWED
☒ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd
Industrial Services

Date : 27/12/2011
 Tested by: RARY

Page 1/1

 INDUSTRIEL
 (Belgium)

Industeel Belgium



QUALITY CONTROL DEPARTMENT - TESTING LABORATORY

VOLUME FRACTION OF FERRITE TEST REPORT - ASTM E562 - E1245

IB Order : 5186111

Customer :

Coupon nr 338800001

Thickness : 15,00 mm

Heat nr : 17931

Quality : 1.4462 PREN 35 + S31803 + 2205

Location of Test Specimen :

Thickness of Plate

Instrument :

Imager.Z1m AxioVision

Number of indenter measurements :

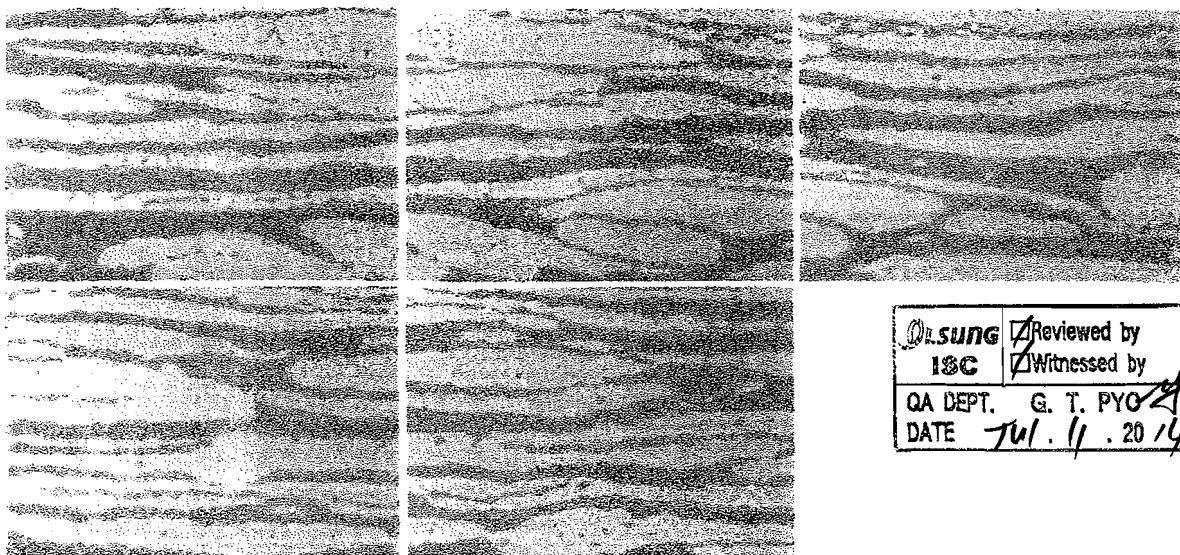
5

Microscope Magnification :

500 X

Image Magnification :

1 X



Results of fraction of ferrite		
Micrograph	Fraction of ferrite in %	
	Measurements	Requirements
1	50,14	
2	49,28	
3	49,73	
4	48,91	
5	48,56	
Average	49,32	35-55
Std Deviation	0,63	
95% CI	0,78	
% RA	1,59	

Determination of volume fraction of ferrite by automatic image analysis

Conclusions : Test in accordance with ASTM E562 through ASTM E1245 and the requirement of the order

☒ REVIEWED
☒ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

Date : 28/12/2011
Tested by: RARY

INDUSTEEL
(Belgium)

Industeel Belgium

ArcelorMittal

QUALITY CONTROL DEPARTMENT - TESTING LABORATORY

FERRIC CHLORIDE PITTING TEST REPORT - ASTM G48 METHOD A

IB Order : 5186111

Customer :

Coupon nr : 338800001

Thickness : 15,00 mm

Heat nr : 17931

Quality : 1.4462 PREN 35 + S31803 + 2205

Dimension of Specimen (mm)		
Length	Width	Thickness
50	25	3,00
Total surface in cm ²		29,50

Method

In accordance with ASTM G48-03 TEST METHOD A
Solution of 6% FeCl₃

Volume > 600 ml or 5 ml/cm²

Temperature of Test (°C):	25
Exposure (h):	24

OLsung ISC	☒ Reviewed by ☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 11. 2011

Corrosion rate

Initial weight : 29,2381 g
Final weight : 29,2368 g
weight loss : 0,0013 g
Start of Test : 21/12/2011 08:00
End of Test : 22/12/2011 08:00
Duration : 24 h

Specimen mass loss : 0,00004 g/cm² <4g/m²

NO VISIBLE PITTING WITH MAGNIFICATION 50 X

Conclusions : Test in accordance with ASTM G48-03 and the requirements of the order.

☒ REVIEWED
☒ WITNESSED
Date / Signature:
Germanischer Lloyd Industrial Services

Date : 23/12/2011
Tested by: RARY

Page 1/1

INDUSTEEL
(Belgium)

ULTRASONIC & VISUAL INSPECTION, MECHANICAL TEST CERTIFICATE

(INSPECTION CERTIFICATE EN10204-3.1)

顧客
CUSTOMER : ILSUNG Corporation
發注番號
ORDER No : CF-20140401-001
作業指示番號
W/O No : P-13SG-007
品名
PRODUCT NAME : S31083 CLAD PLATE

HANWHA CORPORATION

168-1, SANEUM-GIL OEUM-RI HANCHEON-MYEON,

HWASUN-GUN, JEOLLANAM-DO, KOREA

클래드鋼規格
CLAD SPEC. : ASME SA264
材質
ASME SA765 Gr.2
MATERIAL : ASME SA240 S31803



面番號
PAGES : 1/1
文書番號
DOC No : FJ201400890-302
發行年月日
DATE OF ISSUE : July. 24. 2014

製品番號 Item No.	作業番號 EC No.	Order Size 【Production Size ϕ^{+3}_{-0} 】 Dimension(mm)	數量 Q'ty	外觀檢查結果 Visual inspection result	機械的強度試驗結果 Mechanical test result		Raw material heat No.		備考 Remarks
					剪斷強度 Shear Strength (MPa)				
					Min. Max.	140 -	Base metal	Cladding metal	
FJ201400890 E-11570, 11580 : CHANNEL COVER	01	(88+10)T x ϕ 1358 [(93+12)T x ϕ 1358]	1	GOOD	296		4-88191	43501	Reviewed by Sung ISC Witnessed by QA DEPT. S. J. HWANG DATE JUL 28 . 2014 Signature
	02	(88+10)T x ϕ 1358 [(93+12)T x ϕ 1358]	1	GOOD	291		4-88191	43501	
	03	(88+10)T x ϕ 1358 [(93+12)T x ϕ 1358]	1	GOOD	251		4-88191	43501	
	04	(88+10)T x ϕ 1358 [(93+12)T x ϕ 1358]	1	GOOD	301		4-88191	43501	
FJ201400900 E-11570, 11580 : TUBESHEET	01	(73+10)T x ϕ 1358 [(78+12)T x ϕ 1358]	1	GOOD	288		N11223	43501	REVIEWED WITNESSED Date / Signature: Germanischer Lloyd Industrial Services
	02	(73+10)T x ϕ 1358 [(78+12)T x ϕ 1358]	1	GOOD	249		N11223	43501	
	03	(73+10)T x ϕ 1358 [(78+12)T x ϕ 1358]	1	GOOD	289		N11223	43501	
	04	(73+10)T x ϕ 1358 [(78+12)T x ϕ 1358]	1	GOOD	316		N11223	43501	

ILSUNG
ISC
Reviewed by
Witnessed by
QA DEPT. S. J. HWANG
DATE JUL 28. 2014

REVIEWED
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

熱處理
Heat treatment(After cladding)

N/A

*Explosive Bonding Method
*UT (Before Packing) : Accept(IY2014-HW-UT- 083)
*ASME SA264 CLASS 1

檢查者
Examined by

K. B. Shin

檢討/承認者
Reviewed & Approved by

[Signature]

檢查日
Date of examination 2014. 07. 24

立會者
Witnessed by

檢討者
Reviewed by

We hereby certify that the plated described herein have been all acceptable on the ultrasonic examination in accordance with the rules of the contract.

주식회사 이텍기술

CERTIFICAT DE RECEPTION 3.1 / EN 10204:2004
Inspection Certificate 3.1 / EN 10204:2004
Prüfbescheinigung 3.1 / EN 10204:2004

Numéro de document Rev 01
Document number
Bescheinigungsnummer
2013-129217

Page 001
Sheet /
Seite 004

Client - Purchaser - Besteller SNP INT'L CO., LTD.

Référence client - Purchase order - Kaufauftrag 13633F/13633F

Projet - Project - Projekt

Industeel Belgium

Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012

ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis

Plate(s)

Commande / Poste - Internal order - Werksbestellung

1057771 / 000030

Bordereau de livraison - Delivery note - Lieferungsdocument

80252948

ArcelorMittal

#010 - PRODUITS LIVRES - DELIVERED PRODUCTS - GELIEFERTEN GEGENSTÄNDE

Nuance - Grade - Werkstoff
UNS S31803 PREN 35
UNS S31803 PREN 35
UNS S32205 (2205)
UNS S32205 (2205)

Selon norme - According to - Entsprechend
ASTM A 240/M ED.2013a
ASME IIA ED.2010+AD11 SA 240/M
ASME IIA ED.2010+AD11 SA 240/M
ASTM A 240/M ED.2013a

Epaisseur - Thickness - Dicke

12.00 mm

Largeur - Width - Breite

3,048 mm

Longueur - Length - Länge

8,000 mm

Spécification - Specification - Spezifikation

OLSONG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	28. 2014

Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferzustand

Hypertrempe à l'eau (1100 °C - 2 min/mm) - Solution annealed and water quenched - Wasser abgeschreckt

Procédé d'élaboration - Melting process - Erschmelzungsart

Electric-arc furnace - VOD - Finish n°1 - 1D - HRAP

Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflos nr.	Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflos nr.
01	513414001	43501	511463.5001				

T - Total - Gesamtzahl 001

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd
Industrial Services

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.

Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestimmungsvorschriften entsprechen.

LEONARDA ALLEGRO
27/12/2013
Gestionnaire Commande
Mill inspector
Werksbeauftragte

[Signature]

CERTIFICATE OF RECEPTION 3.1 / EN 10204:2004 Inspection Certificate 3.1 / EN 10204:2004 Prüfbescheinigung 3.1 / EN 10204:2004		Numéro de document Document number Bescheinigungsnummer 2013-129217		Rev 01	Page Sheet Seite 002 / 004
Client - Purchaser - Besteller		SNP INT'L CO., LTD.			
Référence client - Purchase order - Kaufauftrag		13633F/13633F			
Projet - Project - Projekt		Industeel Belgium			
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont		ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012 ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012			
Produit - Product - Erzeugnis		Plate(s)			
Commande / Poste - Internal order - Werksbestellung		1057771 / 000030			
Bordereau de livraison - Delivery note - Lieferungsdocument		80252948			

ArcelorMittal

#020 - ANALYSE CHIMIQUE DE COULEE - LADLE CHEMICAL COMPOSITION - SCHMELZE CHEMISCHE ZUSAMMENSETZUNG

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
	%	%	%	%	%	%	%	%	%
Min.							4.500	22.000	3.000
43501	0.019	1.808	0.0205	0.0003	0.228	0.106	5.412	22.862	3.001
Max.	0.030	2.000	0.0300	0.0200	1.000	0.750	6.500	23.000	3.500
	Nb	Ti	N	(01)					
	%	%	%						
Min.			0.1400	35.00					
43501	0.007	0.002	0.1708	35.50					
Max.	0.100	0.100	0.2000	100.00					
(01)	PREN = Cr+(3.3*Mo)+(16*N)								

OLSONG ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	S. J. HWANG
DATE	JUL. 28. 2014

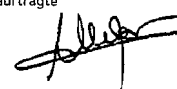
☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd
Industrial Services

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.

Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestimmungsvorschriften entsprechen.

LEONARDA ALLEGRO
27/12/2013
Gestionnaire Commande
Mill inspector
Werksbeauftragte



CCK-4511951391-0100-K01-00001-074

CERTIFICAT DE RECEPTION 3.1 / EN 10204:2004
Inspection Certificate 3.1 / EN 10204:2004
Prüfbescheinigung 3.1 / EN 10204:2004Numéro de document Rev 01
Document number
Bescheinigungsnummer
2013-129217Page
Sheet
Seite
003
/
004

Client - Purchaser - Besteller SNP INT'L CO., LTD.

Référence client - Purchase order - Kaufauftrag 13633F/13633F

Projet - Project - Projekt

Industeel Belgium

Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + MAQ REV 12 du 02/05/2012

ISO 9001 (Cert.95587-2011, Valid 02/06/2014) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis

Plate(s)

Commande / Poste - Internal order - Werksbestellung

1057771 / 000030

Bordereau de livraison - Delivery note - Lieferungsdocument

80252948

ArcelorMittal

#072 ESSAIS MECANQUES - MECHANICAL TESTS - MECHANISCHE PRÜFUNGEN

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

Brinell HB

Brinell HB - Brinell HB

N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	HB10 Ind				HB10 Aver			
							Uni	Brinell	Brinell	Brinell	Brinell			
							Min							
							Max	293	293	293	293			
511463.5001	000	T3/4	PSS	20	°C			223	229	223	225			

Reviewed by
S. J. HWANG
QA DEPT.
DATE 2013.08.20

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

DURETE NACE MRO103 HRC < 28

NACE MRO103 - NACE MRO103

N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac								
511463.5001	000	T3/4	PSS	20	°C									

Test result HRC < 28

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

DURETE NACE MRO175 HRC < 28

NACE MRO175 / ISO 15156-3 - NACE MRO175 / ISO 15156-3

N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac								
511463.5001	000	T3/4	PSS	20	°C									

Test result HRC < 28

REVIEWED
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

Traction

Tensile test - Zugversuch

N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Rp 0,2%		Rm		A Lo=50			
							Uni	MPa	MPa	%				
							Min	450	655	25				
							Max							
511463.5001	000	T3/4	PST	20	°C			592	760	31				

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM A923 B 10X10mm

KCV ASTM A923 B 10X10mm - KCV ASTM A923 B 10X10mm

N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Energy Ind		Energy Ind		Energy Ind		Energy Ave			
							Uni	J	J	J	J					
							Min	34	34	34	51					
							Max									
511463.5001	000	T3/4	1/4ST	-40	°C			264	246	252	254					

Loc 3/4 Trois-Quart - 3/4 Width - 3/4 Breite

Loc T Tête - Top - Kopf

Epr. Epaisseur 1/4 Quart épaisseur - 1/4 Thickness - 1/4 Dicke

Epr. Epaisseur P Peau - Rolled Surface - Walzfläche

Epr. Face S Supérieure - Upper face - obere

Epr. Sens S Standard - Standard - Standard

Epr. Sens T Travers - Transverse - Quer

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

We hereby certify that the above mentioned products are complying with the order requirements.

Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestimmungsvorschriften entsprechen.

LEONARDA ALLEGRO
27/12/2013
Gestionnaire Commande
Mill inspector
Werksbeauftragte

72/296



TEST REPORT

107, Jiwon-ro, Danwon-gu, Ansan-si, Gyeonggi-do, 425-836 Rep. of KOREA TEL 82-31-499-5390 FAX 82-31-499-6867

Report No : TAS-035632

Receipt Date : Jun.16.2014

Client : Gyeong-Seop, Sim

Test Completion Date : Jun.27.2014

HANWHA CORPORATION HWASUN

#168-1, Saneum-gil, Hancheon-myeon, Hwasun-gun, Jeollanam-do, Korea.

Sample : SA240 S31803 PLATE (H/N : 43501)

ILSUNG ISC	☐ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	JUN. 28. 2014

TEST RESULTS

TEST ITEM	UNIT	SAMPLE	RESULT	TEST METHOD
C	%	-	0.025	ASTM A751-14(OES)
Si	%	-	0.27	ASTM A751-14(OES)
Mn	%	-	1.84	ASTM A751-14(OES)
P	%	-	0.021	ASTM A751-14(OES)
S	%	-	0.001	ASTM A751-14(OES)
Cr	%	-	22.51	ASTM A751-14(OES)
Ni	%	-	5.05	ASTM A751-14(OES)
Mo	%	-	3.26	ASTM A751-14(OES)
Nb	%	-	0.02	ASTM A751-14(OES)
Ti	%	-	0.000	ASTM A751-14(OES)
Cu	%	-	0.12	ASTM A751-14(OES)
N	%	-	0.14	ASTM E1019-11

* USAGE : SUBMITTED PURPOSE FOR(ILSUNG Corporation)

NOTE : 1. The test results on this test report are only limited to the samples and sample names provided by the customer and KTR does not guarantee the quality of all products of the customer, and you can confirm the authenticity of the test report online (www.ktr.or.kr) or by using the QR code.

2. This test report shall not be used for public relation, advertisement, lawsuit and any other purposes outside the scope of its defined usage.

Kim Dong-in

Prepared by Kim Dong-in
Tel: +82-32-570-9688
E-mail: kdi0213@ktr.or.kr

Kim Bok-ki

Reviewed by Kim Bok-ki
Technical Manager
E-mail: kbk@ktr.or.kr



Jun.27.2014

Korea Testing & Research Institute

President

Choi Hyeonk

1 of Total 1 Page(s)

CERTIFICATE NO. : TW201405-0633

INSPECTION CERTIFICATE

T.W WORK NO. : 140407-16021-001

ORDER NO. : (주)일성

CUSTOMER : (주)한화 화순공장

PROJECT NO. :

SHIPPER :

DRAWING NO. :

PRODUCT NAME : TUBE SHEET

SPECIFICATION : ASME SEC II PART "A"
SA765 Gr II 10ED 11ADD

TAEWOONG

#67, Noksansandan 27-ro,
Gangseo-Gu, Busan, Korea.

3.1 according to ISO 10474/EN 10204

*POS NO.:FJ20140100890-201 REV.0

DATE : 2014-05-21

Articles				Test Requirements	Tensile Test ※.4								Impact Test				Hardness	Bend Test Radius Angle	Remark
					Direction ※.1	Size of Test Specimen		Temp. ℃	Y.S	T.S	E.L	R.A	Temp. : -45℃ Notch : 2v						
						D	G.L						J	HV10					
						mm	mm												
Unit	Q'ty	Specimen	Min.	Max.															
S/N in:" ft:' mm:Space	(EA)	no.																	
001 1,448.00 X 0.00 X 93.00	4	407-1A	T	12.5	50.0		319.2	501.6	36.2	69.2	75.0	85.0	80.0	80.0	149		☒ REVIEWED ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services		
		407-1B	T	12.5	50.0		337.6	499.6	35.6	69.2	76.0	89.0	81.0	82.0	148				
		407-1C	T	12.5	50.0		327.6	501.8	35.7	69.2	83.0	80.0	84.0	82.3	149				
		407-1D	T	12.5	50.0		332.6	503.4	36.8	68.9	80.0	86.0	88.0	84.6	149				
<< B L A N K >>																			
TAEWOONG																			
Heat No.		Chemical Composition(%)												Customer's Requirement.					
Spec.		C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Nb	Al	Ti					
Min.			0.15	0.60									0.050						
Max.		0.30	0.35	1.35	0.020	0.020	0.50	0.40	0.10	0.35	0.05								
4-88191(L)		0.16	0.22	1.31	0.012	0.003	0.01	0.01	0.003	0.01	0.047	0.018	0.037	0.017					
4-88191(P)		0.17	0.23	1.29	0.012	0.003	0.02	0.01	0.002	0.01	0.046	0.018	0.036	0.015					
Heat Treatment ※.2 N : 880℃ X 5.5HRS A.C, T : 620℃ X 6.0HRS A.C																			
Dimension & Visual														Acceptable (ASME SA388) F.M					
Acceptable														Acceptable (ASME SE709) F.M					
UT ※.3														MT ※.3					
PT ※.3														N/A					
We hereby certify that the material herein has been made by an approved process and tested in accordance with the above specification and also with the requirement called for by the above order. This Certificate is only available with in original. (원본만 유효) This Certificates can be verified as an original in our homepage WWW.TAEWOONG.COM (T: 051-329-5121)																			
Surveyor																			
Manager of Quality Assurance Dep't																			

Notes: ※.1 ... Direction : L=Longitudinal Tr=Transverse T=Tangential R=Radial U=UW-13(Direction Parallel to the Axis of the Vessel) A=Axial

※.2 ... Heat Treatment : N=Normalized A=Annealed Q=Quenched T=Tempered S.T=Solution Treated S.R=Stress Relieved A.C=Air Cooled W.C=Water Cooled F.C=Furnace Cooled O.C=Oil Cooled F.A.C=Forced air cooled

※.3 ... Surface Condition : A.F=As Forged R.M=Rough Machined F.M=Finish Machined ※.4 ... Tensile Test 407-1A T.S=Tensile Strength E.L=Elongation R.A=Reduction Of Area G.L=Gauge Length D=Diameter



TAEWONG

ASME

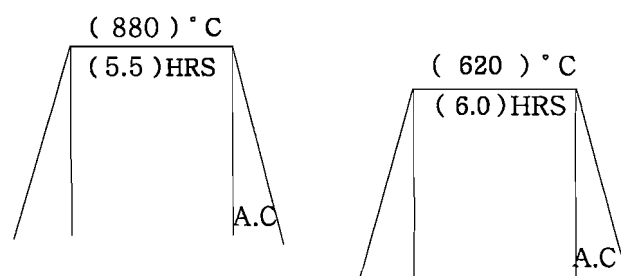
HEAT TREATMENT CERTIFICATE

Report NO. : HR201405-0633

Date : May 03, 2014

Work No.	140407-16021-001
Customer	(주)한화 화순공장
Description	TUBE SHEET
Material	SA765Gr2
Quantity	4 EA
Hardness	-
Method of heat treatment	Normalizing & Tempering
Heat No.	4-88191
Order No.	(주)일성

Heating Cycle



Item List

No.	S/N	SIZE	Q'TY
1.	001	1,448.00 X 0.00 X 93.00	: 4 EA

- B L A N K -

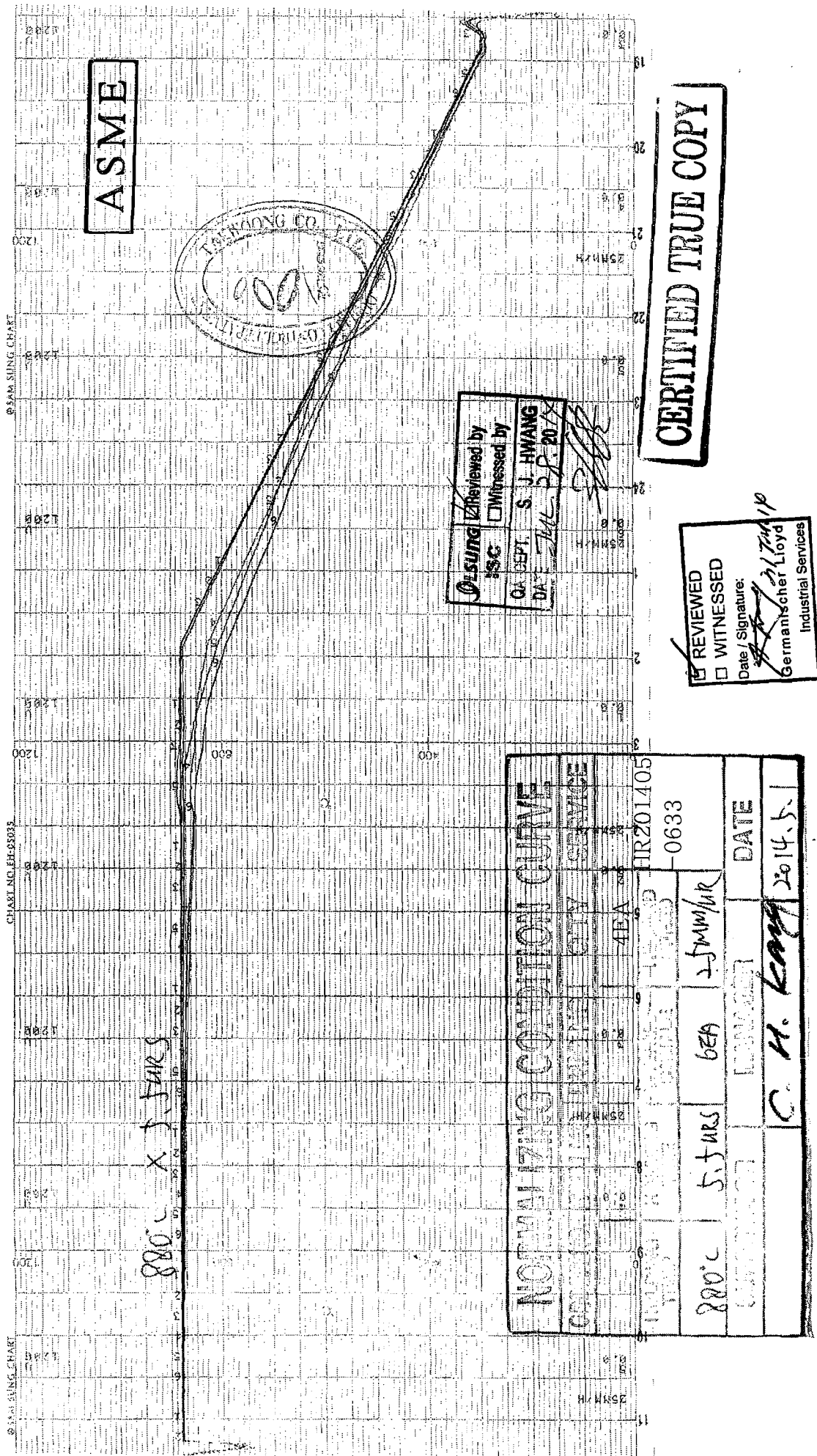
Hardness Data

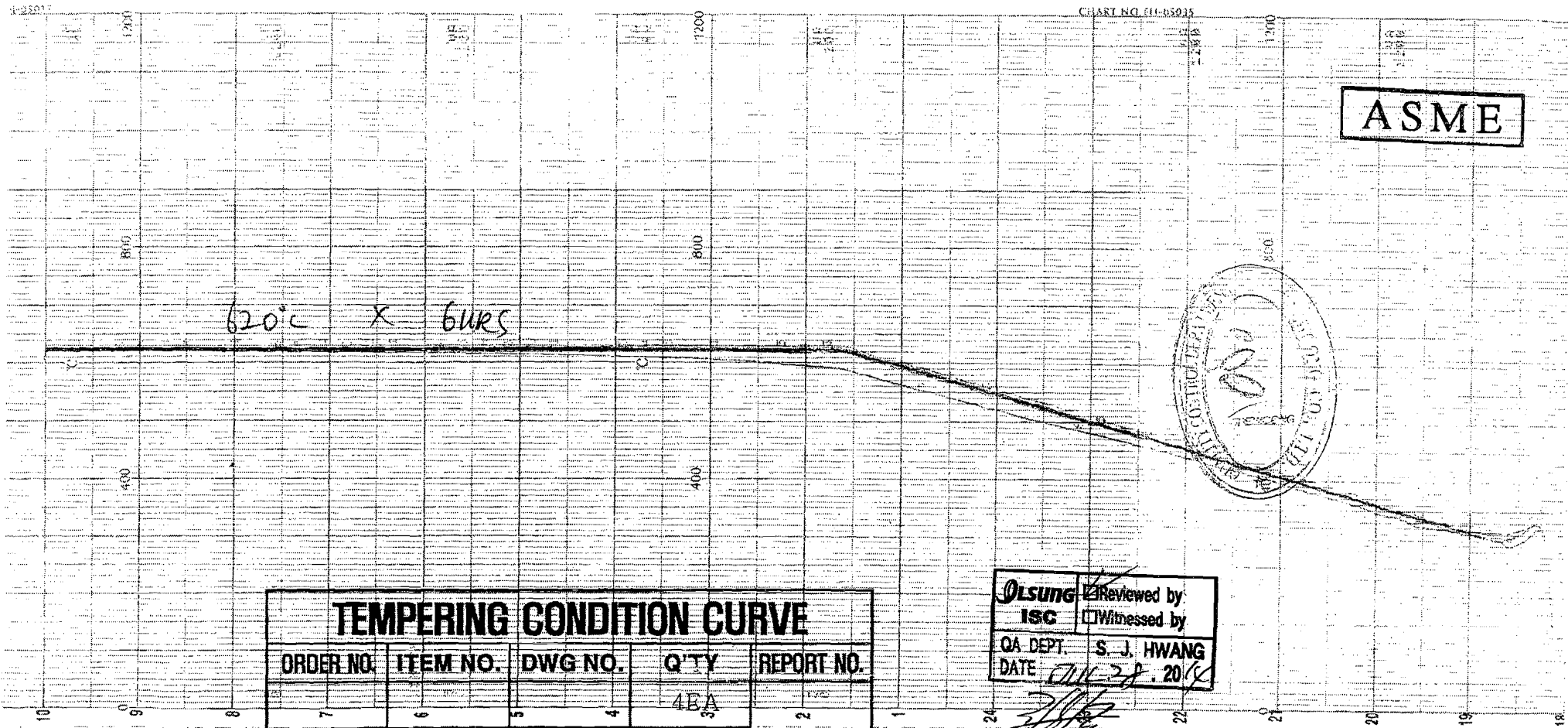
No.	1	2	3
-----	---	---	---

OLSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	JUL. 28. 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

Manager of Quality Assurance Dep't





ASME

TEMPERING CONDITION CURVE				
ORDER NO.	ITEM NO.	DWG NO.	Q'TY	REPORT NO.
			4BA	HR201405
HOLDING TEMP	HOLDING TIME	THERMO-COUPLE	RECORD SPEED	0633
620°C	6hrs	BEA	25mm/hr	
SUPERVISOR		MANAGER	DATE	
		C. H. Kang	2014.5.3	

OLSUNG	Reviewed by:
ISC	Witnessed by:
QA DEPT.	S. J. HWANG
DATE	2014.5.3

CERTIFIED TRUE COPY

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i> 21 July 14
Germanischer Lloyd
Industrial Services

証 明 書 番 号

注 文 番 号

ORDER NO. : 4A85007-001

注 文 者

SHIPPER

需 要 家

CUSTOMER

晶 名

COMMODITY

規格	規格
----	----

SPECIFICATION

INSPECTION CERTIFICATE



JFE スチール 株式会社
JFE Steel Corporation

西日本製鉄所(倉敷)
WEST JAPAN WORKS (KURASHIKI)

JFE

目付

DATE : FEBRUARY 21, 2014

(SD33)

ASME

N05 AG1692

Notes * AL, NB, TI, ZR, SB--X1000 B, N, H--X10000

西日本製鉄所（倉敷地区）品質保証

PAGE: 2

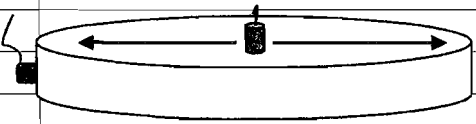
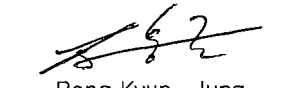
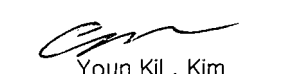
西日本製鉄所(倉敷) 〒712-8511 岡山県倉敷市水島川崎町1丁目 WEST JAPAN WORKS(KURASHIKI), MITSUBISHI, KAWASAKI-DORI, KURASHIKI-CITY, OKAYAMA-PRF.712-8511 JAPAN
このミルシートは特殊偽造防止技術を使用しております This Inspection Certificate is printed with special forgery proof technology.

PAGE 48

ASME

WIE KIE

Report No. 보고서 번호
KTE-NS-TW-140521-U121
Page No. 페이지 번호
1 of 1

Owner / Customer(주문주/발주처) ㈜ 한화 화순공장				Project Name./No.(공사명/번호) ㈜일성			
Item Name./No.(제품명/번호) TUBE SHEET				Part Name./No.(부품명/번호) / Dwg No.(도면번호) N/A			
Traveller / PCD No.(트레블라) N/A				Procedure No.(Rev. No.) / Acceptance criteria (합격기준) ASME SA388			
Examination Time(검사시기) ■ AFTER HT □ BEFORE HT				Surface Condition ☐ As Forging ☐ As Casting ☐ As Welded (표면상태) ■ As Machined ☐ As Ground ☐ Etc			
Material Type(재질) SA765 Gr II				Couplant(접촉매질) ■ Oil ☐ CMC ☐ Glycerin ☐ Water ☐ Etc			
Standard Block (표준 시험편)		Type(종류) IIW		Reference Block (대비 시험편)		Type(종류) N/A	
UT Equipment(탐상기)							
Maker(제조사) GE I/T		모델 Model USM GO		Serial No.(일련번호) 12105393		Due Date of Calibration(교정유효일) 2015.01.02	
Screen Height Linearity(직선성) within ± 5 % FSH				Amplitude Control Linearity(증폭성) within ± 10 % FSH			
Probe(탐촉자)							
형 태 Type	각 도 Angle	주 파 수 Frequency	크 기 Size	형 태 Type	각 도 Angle	주 파 수 Frequency	크 기 Size
B2S-E	0 °	2MHz	Ø24				
				OLSON ☐ Reviewed by ISC ☐ Witnessed by QA DEPT. S. J. HWANG DATE JUL. 28. 2014			
Setting Sensitivity Methode(감도설정)							
Cable (케이블)		RG174		Sensitivity Method (감도 조정방법)		BACK REF' METHOD	
Standard Sensitivity (표준감도)		B1 : 80%		Scanning Sensitivity (주사감도)		Standard Sensitivity + 14 dB	
Identification No. 확 인 번 호	(EA) Q'TY	Accept (합격)	Reject (불합격)	Interpretation 판 정		Remarks 비 고	
140407-16021-001	4	V		ACCEPT ~ BLANK ~		1,448.00 x 0.00 x 93.00	
				☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services			
							
				EXAM AREA : ENTIRE VOLUME			
Examined by  Bong Kyun , Jung Level 등 급 Level II				Date of Examination (검사일자) 2014.05.21			
Approved by  Youn Kil , Kim Level 등 급 Level III				☐ 주문주/고객 Owner/Customer ☒ 제조자 검사 Vendor Inspector ☐ Witnessed by ☒ Reviewed by TW Q.A H. J. J. Owner/Customer (주문주/고객 감독관) ☐ Witnessed by ☐ Reviewed by			

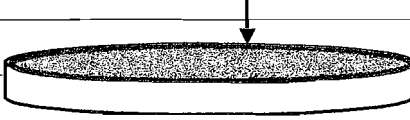
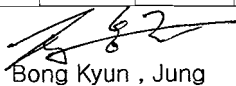
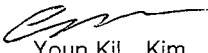
자 분 탐 상 검 사 보 고 서

ASME



Tel : (051)207-5009 Fax : (051)207-0716

1 of 1

Owner / Customer(주문주/발주처) ㈜ 한화 화순공장				Hull No./Project Name./No.(선체번호/공사명/공사번호) ㈜일성			
Item Name./No.(제품명/번호) TUBE SHEET				Dwg No. (도면번호) N/A		OLSUNG ISC ☒ Reviewed by ☐ Witnessed by QA DEPT. S. J. HWANG DATE JUL. 28. 2014	
Traveller / PCD No.(트레블라) N/A				Procedure No. (절차서) ASME SE709			
Examination Time(검사시기) AFTER HEAT TREATMENT				Surface Condition (표면상태)		☐ As Ground ☒ As Machined ☐ As Welded ☐ As Forged	
Method ☒ Continuous(연속법)				Magnetization		☒ Yoke ☐ Coil ☐	
Magnetizing Current ☒ AC(교류)				Surface Temp.(온도)		15 ℃	
Yoke/Prod Spacing (극간) / Lifting Power (견인력,Pound) 4 ~ 6 inch / 10 lb (4.5Kg)				Demagnetization(탈자) ☐ Yes ☒ No		Material / Thickness (재질 / 두께) SA765 Gr II / See Remarks	
MT Equipment (자분탐상장비)	Model(모델) MP-A2	Maker(제조사) KYUNG DO	Serial No.(일련번호) MP-2582	Due Date of Calibration(교정유효일) 2015.01.02			
Lux Meter (조도계)	Model(모델) TES / 1330A	Maker(제조사) TES	Serial No.(일련번호) 130310959	Due Date of Calibration(교정유효일) 2014.12.16			
Particle Type(자분종류)	☐ Dry(건식)	☒ Wet(습식)	☐ Fluorescent(형광)	☒ Non Fluorescent(비형광)			
Magnetic Particle (자 분)	Color(색상) BLACK	Maker(제조사) NABAKEM	Model(모델) SM-15	Particle Density (자분농도) 1.3 ml/100ml			
Black Light (자외선등)	☐ With(사용) ☒ Without(사용무)	Maker(제조사) N/A	Serial No.(일련번호) N/A	Due Date of Calibration(교정유효일) N/A			
ILLumination (조도) ☒ Min. 1000 Lux ☐ Max. Lux				Black Light Intensity(자외선등 강도) ☒ NOT USE ☐ Min.1000 μW/cm²			
Identification No. 확 인 번 호	Q'TY (EA)	Accept (합격)	Reject (불합격)	Interpretation 판 정		Remarks 비 고	
140407-16021-001	4	V		ACCEPT		1,448.00 x 0.00 x 93.00	
				~ BLANK ~			
						☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services	
* EXAM AREA : FINAL MACHINED AREA "MT" CHECKED							
Examined by  검 사 자 Bong Kyun , Jung				Level 등 급 II			
Approved by  책임 검사자 Youn Kil , Kim				Level 등 급 III			
				DATE (검사일자) : 2014.05.21 ☒ 제조자 검사 Vendor Inspector TW Q.A H. J .Ju ☒ 검토 Reviewed ☐ 입회 witnessed ☐ Third Party Inspector 공인검사자			

CERTIFICATE NO. : TW201407-0424

INSPECTION CERTIFICATE

T.W WORK NO. : 140407-16021-002

ORDER NO. : (주)일성

CUSTOMER : (주)한화 화순공장

PROJECT NO. :

SHIPPER :

DRAWING NO. :

PRODUCT NAME : TUBE SHEET

SPECIFICATION : ASME SEC II PART "A"
SA765 Gr II 10ED 11ADD

ASME

TAEWOONG
#67, Noksansandan 27-ro,
Gangseo-Gu, Busan, Korea.

3.1 according to ISO 10474/EN 10204

*POS NO.:FJ20140100890-201 REV.0

DATE : 2014-07-09

Articles			Test Requirements	Tensile Test ※.4								Impact Test				Hardness	Bend Test Radius Angle	Remark					
				Direction ※.1	Size of Test Specimen		Temp. ℃	Y.S	T.S	E.L	R.A	Temp. : -45℃ Notch : 2v			J								
					D mm	G.L mm						MPa	%	%					Min.	Ave.			
																					12.5	50.0	250.0
Unit S/N in." ft.' mm:Space	Q'ty (EA)	Specimen Min. no. Max.																					
002 1,448.00 X 0.00 X 78.00	4	407-2A	T	12.5	50.0		333.0	498.0	36.0	72.0	85.0	86.0	80.0	83.6	148	☒ REVIEWED ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services							
		407-2B	T	12.5	50.0		337.0	497.6	37.2	73.3	82.0	80.0	79.0	80.3	148								
		407-2C	T	12.5	50.0		336.0	496.5	35.6	74.1	79.0	86.0	83.0	82.6	148								
		407-2D	T	12.5	50.0		341.0	499.2	36.6	72.9	87.0	82.0	85.0	84.6	149								
<< B L A N K >>																							
Heat No.			Chemical Composition(%)													Customer's Requirement.							
Spec.	Min.	Max.	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Nb	Al	Ti	* FULLY KILLED & VACUUM DEGASSED & FINE GRAIN PRACTICE * HARDNESS : HV10 220 MAX * NACE STD : NACE MR0175 / ISO 15156 Part-3 (2009) * (L) : LADLE ANALYSIS, (P) : PRODUCT ANALYSIS							
N11223(L)			0.15	0.30	1.30	0.018	0.003	0.01	0.03	0.00	0.019	0.035	0.019	0.035	0.002								
N11223(P)			0.16	0.30	1.29	0.017	0.003	0.02	0.01	0.00	0.017	0.035	0.018	0.036	0.001								
Heat Treatment ※.2 : N : 895℃ X 7.0HRS A.C, T : 630℃ X 7.5HRS A.C																Dimension & Visual Acceptable		Acceptable (ASME SA388) F.M		Acceptable (ASME SE709) F.M		N/A	
We hereby certify that the material herein has been made by an approved process and tested in accordance with the above specification and also with the requirement called for by the above order. This Certificate is only available with in original. (원본만 유효) This Certificates can be verified as an original in our homepage WWW.TAEWOONG.COM (T: 051-329-5121)																UT ※.3		MT ※.3		PT ※.3			
Surveyor																C. H. Kang 2014-07-09 Manager of Quality Assurance Dep't							

Notes: ※.1 ... Direction : L=Longitudinal Tr=Transverse T=Tangential R=Radial U=UW-13(Direction Parallel to the Axis of the Vessel) A=Axial
 ※.2 ... Heat Treatment : N=Normalized A=Annealed Q=Quenched T=Tempered S.T=Solution Treated S.R=Stress Relieved A.C=Air Cooled W.C=Water Cooled F.C=Furnace Cooled O.C=Oil Cooled F.A.C=Forced air cooled
 ※.3 ... Surface Condition : A.F=As Forged R.M=Rough Machined F.M=Finish Machined ※.4 ... Tensile Test : T.S=Tensile Strength E.L=Elongation R.A=Reduction Of Area G.L=Gauge Length D=Diameter

TAEWOONG

ASME

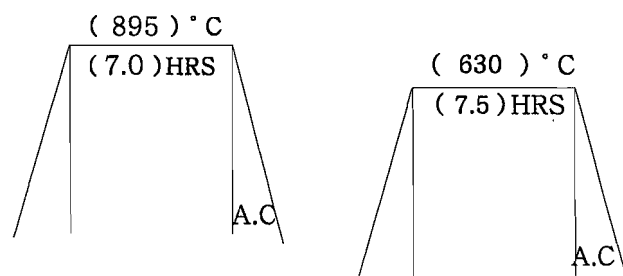
HEAT TREATMENT CERTIFICATE

Report NO. : HR201407-0424

Date : June 30, 2014

Work No.	140407-16021-002
Customer	(주) 한화 화순공장
Description	TUBE SHEET
Material	SA765Gr2
Quantity	4 EA
Hardness	-
Method of heat treatment	Normalizing & Tempering
Heat No.	N11223
Order No.	(주)일성

Heating Cycle



Item List

No.	S/N	SIZE	Q'TY
1.	002	1,448.00 X 0.00 X 78.00	: 4 EA

- B L A N K -

Hardness Data

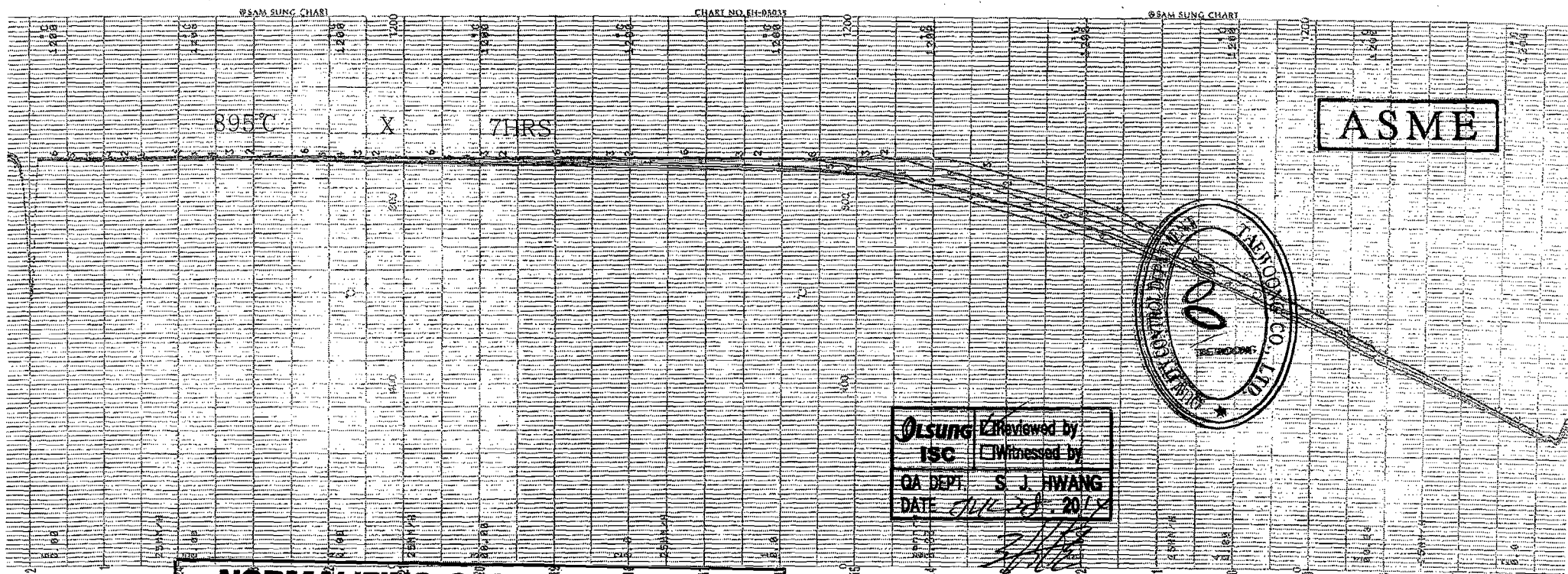
No.	1	2	3
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Dlsung ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT	S. J. HWANG
DATE	JUL. 28. 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd Industrial Services

C. H. Kang

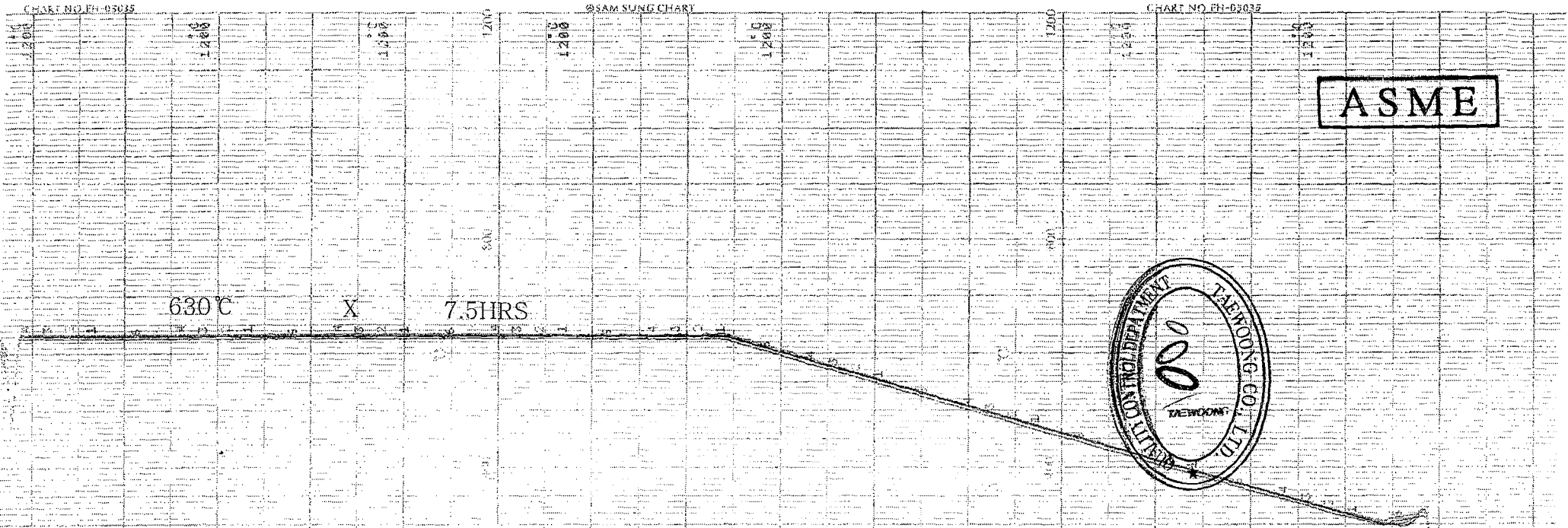
Manager of Quality Assurance Dep't



NORMALIZING CONDITION CURVE				
ORDER NO.	ITEM NO.	DWG NO.	Q'TY	REPORT NO.
			4EA	HR201407
HOLDING TEMP	HOLDING TIME	THERMO-COUPLE	RECORD SPEED	-0424
895°C	7HRS	6EA	25mm/HR	
SUPERVISOR		MANAGER	DATE	
		C. H. Kang	2014.6.28	

☒ REVIEWED
☒ WITNESSED
 Date / Signature: *[Signature]*
 Germanischer Lloyd
 Industrial Services

CERTIFIED TRUE COPY



TEMPERING CONDITION CURVE				
ORDER NO.	ITEM NO.	DWG NO.	QTY	REPORT NO.
			4EA	HR201407
HOLDING TEMP	HOLDING TIME	THERMO-COUPLE	RECORD SPEED	-0424
630°C	7.5HRS	6EA	25mm/HR	
SUPERVISOR		MANAGER		DATE
		C. H. Kang		2014.6.30

☒ Reviewed by
☐ Witnessed by
 QA DEPT. S. J. HWANG
 DATE JUL 28. 2014

☐ REVIEWED
☐ WITNESSED
 Date / Signature:
 Germanischer Lloyd
 Industrial Services

CERTIFIED TRUE COPY

검사증명서

MILL TEST CERTIFICATE



당진제철소 · 충남 당진시 송악읍 북부산업로 1480
1480 Bukbusanup-Ro, Songak-Eup, Dangjin-Si, Chungnam, Korea

주문번호
Order No. : D140600088

품명
Commodity : Slab

제품규격
Specification : EN 10025-3 S355NL

고객사
Customer : (주)대웅

주문자
Contractor : (주)대웅

증명서 번호
Certificate No. : 20140618-CN-003-001

발행일자
Date of Issue : 2014-06-18

제품치수 Dimension	수량 Quantity	중량 Weight (Kg)	재질번호 Heat No.	제품번호 Product No.	화학성분 Chemical Composition(%)																
					Division	Unit															
						2 : x 100	3 : x 1,000	4 : x 10,000	5 : x 100,000	C	Si	Mn	P	S	Cr	Ni	Al	Mo	Nb	As	CEQ
300 x 2000 x 5800	1	27,320	N11214	N11214 03	L	1.533	285	1.261	166	35	2	1	18	0	45	20	2	36	27	27	377
300 x 2000 x 5800	1	27,320	N11214	N11214 04	L	1.533	285	1.261	166	35	2	1	18	0	45	20	2	36	27	27	377
300 x 2000 x 5800	1	27,320	N11214	N11214 54	L	1.533	285	1.261	166	35	2	1	18	0	45	20	2	36	27	27	377
300 x 2000 x 5800	1	27,320	N11223	N11223 01	L	1.501	302	1.304	188	35	3	1	19	0	23	19	2	35	34	35	382
300 x 2000 x 5800	1	27,320	N11223	N11223 02	L	1.501	302	1.304	188	35	3	1	19	0	23	19	2	35	34	35	382
300 x 2000 x 5800	1	27,320	N11223	N11223 03	L	1.501	302	1.304	188	35	3	1	19	0	23	19	2	35	34	35	382
300 x 2000 x 5800	1	27,320	N11223	N11223 51	L	1.501	302	1.304	188	35	3	1	19	0	23	19	2	35	34	35	382
300 x 2000 x 5800	1	27,320	N11223	N11223 53	L	1.501	302	1.304	188	35	3	1	19	0	23	19	2	35	34	35	382
300 x 2000 x 5800	1	27,320	N11225	N11225 02	L	1.503	296	1.288	187	33	3	1	16	0	30	18	1	32	35	36	379
300 x 2000 x 5800	1	27,320	N11225	N11225 04	L	1.503	296	1.288	187	33	3	1	16	0	30	18	1	32	35	36	379
300 x 2000 x 5800	1	27,320	N11225	N11225 05	L	1.503	296	1.288	187	33	3	1	16	0	30	18	1	32	35	36	379
300 x 2000 x 5800	1	27,320	N11225	N11225 52	L	1.503	296	1.288	187	33	3	1	16	0	30	18	1	32	35	36	379
300 x 2000 x 5800	1	27,320	N11225	N11225 53	L	1.503	296	1.288	187	33	3	1	16	0	30	18	1	32	35	36	379
300 x 2000 x 5800	1	27,320	N11225	N11225 54	L	1.503	296	1.288	187	33	3	1	16	0	30	18	1	32	35	36	379
300 x 2000 x 5800	1	27,320	N11225	N11225 55	L	1.503	296	1.288	187	33	3	1	16	0	30	18	1	32	35	36	379

--- Sub Total(001) --- 15 409,800(Kg)

--- Grade Total --- 15 409,800(Kg) Ceq. G = C + Mn/6 + (N + Cu)/15 + (Cr + Mo + V)/5

* Division - C: Check analysis, L: Ladle analysis

NOTE

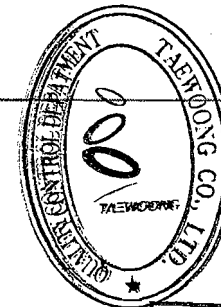
- * THE PLATE IS FULLY KILLED AND FINE GRAINED STEEL, BASIC OXYGEN PROCESS AND VACUUM DEGASSING PROCESS WERE APPLIED.
- * ANY WELDING SHALL NOT BE PERFORMED FOR THE ORDERED MATERIAL.
- * EN 10204-3-1 액거 합격함.

상기의 제품은 검사의 결과 주문요구사항과 지정된 규격에 합격한 것을 증명합니다.
WE HEREBY CERTIFY THAT THE MATERIAL HEREIN HAS BEEN MADE AND TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF ORDER AND SPECIFICATION

Signature

S. B. Park

SURVEYOR TO: Chief Of Quality Assurance Team



ASME

Reviewed by
ISC
QA DEPT. S. J. HWANG
DATE JUL 28. 2014

REVIEWED
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

CERTIFIED TRUE COPY

* 본 검사증명서는 원본인 전자문서(전자서명 정보 포함)로부터 출력된 사본입니다. 전자문서의 내용은 현대제철 고객포털에서 확인하실 수 있습니다.(http://sm.hyundai-steel.com/cs/cm/login.jsp)
* This Mill Test Certificate is a copy that has been printed from original electronic document(with digital signing).
You are able to check an original electronic document at hyundasteel's customer portal.(http://sm.hyundai-steel.com/cs/cm/login.jsp)

REPORT OF ULTRASONIC EXAMINATION

초음파탐상검사보고서

ASME



한국검사엔지니어링㈜
KOREA TESTING ENGINEERING CO., LTD.
□ 본사: 부산광역시 사하구 신평2동 414-2 품질회관2층
□ TEL : (051) 207-0715 FAX : (051) 207-0716

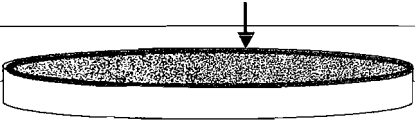
Report No. 보고서 번호
KTE-NS-TW-UT-140709-014
Page No. 페이지 번호
1 of 1

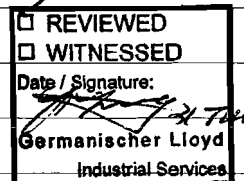
Owner / Customer(주문주/발주처) ㈜ 한화 화순공장				Project Name./No.(공사명/번호) ㈜일성			
Item Name./No.(제품명/번호) TUBE SHEET				Part Name./No.(부품명/번호) / Dwg No.(도면번호) N/A			
Traveller / PCD No.(트레블라) N/A				Procedure No.(Rev. No.) / Acceptance criteria (합격기준) ASME SA388			
Examination Time(검사시기) ■ AFTER HT □ BEFORE HT				Surface Condition □ As Forging □ As Casting □ As Welded (표면상태) ■ As Machined □ As Ground □ Etc			
Material Type(재질) SA765 Gr II				Couplant(접촉매질) ■ Oil □ CMC □ Glycerin □ Water □ Etc			
Standard Block (표준 시험편)		Type(종류) IIW		Reference Block (대비 시험편)		Type(종류) N/A	
UT Equipment(탐상기)							
Maker(제조사) GE I/T		모델 Model USM GO		Serial No.(일련번호) 12105393		Due Date of Calibration(교정유효일) 2015.01.02	
Screen Height Linearity(직선성) within ± 5 % FSH				Amplitude Control Linearity(증폭성) within ± 10 % FSH			
Probe(탐촉자)							
형 태 Type	각 도 Angle	주 파 수 Frequency	크 기 Size	형 태 Type	각 도 Angle	주 파 수 Frequency	크 기 Size
B2S-E	0 °	2MHz	Ø24				
				OLSON Reviewed by ISC Witnessed by QA DEPT S. J. HWANG DATE 2015. 08. 20			
Setting Sensitivity Method(감도설정)							
Cable (케이블)		RG174		Sensitivity Method (감도 조정방법)		BACK REF' METHOD	
Standard Sensitivity (표준감도)		B1 : 80%		Scanning Sensitivity (주사감도)		Standard Sensitivity + 14 dB	
Identification No. 확인 번호	(EA) Q'TY	Accept (합격)	Reject (불합격)	Interpretation 판 정		Remarks 비 고	
140407-16021-002	4	V		ACCEPT		1,448.00 x 0.00 x 78.00	
				~ BLANK ~			
				☒ REVIEWED ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services			
				EXAM AREA : ENTIRE VOLUME			
Examined by 검 사 자 Bong Kyun, Jung				Date of Examination (검사일자) 2014.07.09			
Level 등 급 II				☐ 주문주/고객 Owner/Customer ☒ 제조자 검사 Vendor Inspector ☐ Witnessed by ☒ Reviewed by TW.Q.A H. J. Jung			
Approved by 책임 검사자 Youn Kil, Kim				Owner/Customer (주문주/고객 감독관) ☐ Witnessed by ☐ Reviewed by			
Level 등 급 III							

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상검사보고서

ASME

KTE 한국검사엔지니어링 Korea Testing Engineering Co., Ltd. 본사: 부산광역시 사하구 신평2동 414-2 품질화관 2층 Tel : (051)207-5009 Fax : (051)207-0716				Report No. 보고서 번호 KTENS-TW-MT-140709-015	
				Page No. 페이지 번호 1 of 1	
Owner / Customer(주문주/발주처) ㈜ 한화 화순공장				Hull No./Project Name./No.(선체번호/공사명/공사번호) ㈜일성	
Item Name./No.(제품명/번호) TUBE SHEET				Dwg No. (도면번호) N/A	
Traveller / PCD No.(트레블라) N/A				Procedure No. (절차서) ASME SE709	
Examination Time(검사시기) AFTER HEAT TREATMENT				Surface Condition (표면상태) ☐ As Ground ☒ As Machined ☐ As Welded ☐ As Forged	
Method ☒ Continuous(연속법)				Magnetization ☒ Yoke ☐ Coil ☐	
Magnetizing Current ☒ AC(교류)				Surface Temp.(온도) 20 °C	
Yoke/Prod Spacing (극간) / Lifting Power (견인력, Pound) 4 ~ 6 inch / 10 lb (4.5Kg)				Demagnetization(탈자) ☐ Yes ☒ No	
Material / Thickness (재질 / 두께) SA765 Gr II / See Remarks		Due Date of Calibration(교정유효일) 2015.01.02			
MT Equipment (자분탐상장비) Model(모델) MP-A2 Maker(제조사) KYUNG DO		Serial No.(일련번호) MP-2582		Due Date of Calibration(교정유효일) 2015.01.02	
Lux Meter (조도계) Model(모델) TES / 1330A Maker(제조사) TES		Serial No.(일련번호) 130310959		Due Date of Calibration(교정유효일) 2014.12.16	
Particle Type(자분종류) ☐ Dry(건식) ☒ Wet(습식)		☐ Fluorescent(형광) ☒ Non Fluorescent(비형광)		Particle Density (자분농도) 1.3 ml/100ml	
Magnetic Particle (자분) Color(색상) BLACK Maker(제조사) NABAKEM		Model(모델) SM-15		Particle Density (자분농도) 1.3 ml/100ml	
Black Light (자외선등) ☐ With(사용) ☒ Without(사용무)		Maker(제조사) N/A		Serial No.(일련번호) N/A	
Due Date of Calibration(교정유효일) N/A					
ILLumination (조도) ☒ Min. 1000 Lux ☐ Max. Lux				Black Light Intensity(자외선등 강도) ☒ NOT USE ☐ Min.1000 μW/cm²	
Identification No. 확인 번호	Q'TY (EA)	Accept (합격)	Reject (불합격)	Interpretation 판 정	Remarks 비 고
140407-16021-002	4	V		ACCEPT	1,448.00 x 0.00 x 78.00
				~ BLANK ~	
					
* EXAM AREA : FINAL MACHINED AREA "MT" CHECKED					
Examined by 검사자 <u>Bong Kyun, Jung</u>			Level 등급 II		
Approved by 책임 검사자 <u>Youn Kil, Kim</u>			Level 등급 III		
DATE (검사일자) : 2014.07.09 ☒ 제조자 검사 Vendor Inspector TW Q.A H. J. Ju ☒ 검토 Reviewed ☐ 입회 witnessed ☐ Third Party Inspector 공인검사자					





ASME

TEST REPORT

107, Jiwon-ro, Danwon-gu, Ansan-si, Gyeonggi-do, 425-836 Rep. of KOREA TEL 82-31-499-5390 FAX 82-31-499-6867

Report No : TAS-047040

Receipt Date : Aug.11.2014

Client : Gyeong-Seop, Sim

Test Completion Date : Aug.14.2014

HANWHA CORPORATION HWASUN

#168-1, Saneum-gil, Hancheon-myeon, Hwasun-gun, Jeollanam-do, Korea.

ILSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	Aug. 28. 2014

Sample : Metal Specimen (SA240 S31803 PLATE, H/N : 43501)

TEST RESULTS

TEST ITEM	UNIT	SAMPLE	RESULT	TEST METHOD
Impact Test[Charpy impact value, (-45±1) °C]	J/cm ²	-	400	ASTM A370-14(*)
Impact Test[Charpy impact value, (-45±1) °C]	J/cm ²	-	418	ASTM A370-14(*)
Impact Test[Charpy impact value, (-45±1) °C]	J/cm ²	-	406	ASTM A370-14(*)

* Specimen Size(V-Notched) : 10 mm × 10 mm × 55 mm

The Depth of Notch : 2 mm

Machine Capacity : 406.75 J

* USAGE : SUBMITTED PURPOSE FOR(ILSUNG Corporation)

NOTE : 1. The test results on this test report are only limited to the samples and sample names provided by the customer and KTR does not guarantee the quality of all products of the customer, and you can confirm the authenticity of the test report online (www.ktr.or.kr) or by using the QR code.
2. This test report shall not be used for public relation, advertisement, lawsuit and any other purposes outside the scope of its defined usage.
3. Only original copy (including certified copy) of the test report is valid - electronic copy (hard and/or soft) is for your reference only.

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd
Industrial Services

Ham Jong-oh

Prepared by Ham Jong-oh
Tel: +82-32-570-9681
E-mail: hamjo@ktr.or.kr

Kim Bok-ki

Reviewed by Kim Bok-ki
Technical Manager
E-mail: kbbk@ktr.or.kr

Aug.14.2014

Korea Testing & Research Institute

President

Choi Hyeonk

QR Code to verify genuineness

CERTIFICATE NO. : TW201408-0706

INSPECTION CERTIFICATE

T.W WORK NO. : 140701-15006-005

ORDER NO. : DE-13SG-007-09

CUSTOMER : (주)일성

PROJECT NO. : -

SHIPPER : -

DRAWING NO. : -

PRODUCT NAME : FORGED STEEL

SPECIFICATION : ASME SEC II PART "A"
SA182 F51 10ED 11ADD

TAEWOONG

#67, Noksansandan 27-ro,
Gangseo-Gu, Busan, Korea.

3.1 according to ISO 10474/EN 10204

* MPS NO.:SA182-F51-SG07-01 REV.2

DATE : 2014-08-22

Articles		Test Requirements	Tensile Test ※.4							Impact Test				Hardness	Bend Test Radius Angle	Remark	
			Direction	Size of Test Specimen		Temp. °C	Y.S	T.S	E.L	R.A	Temp. : -45°C Notch : 2V						
				D	G.L						J	HRC					
													mm				mm
Unit	Q'ty	Specimen Min. no.	Max.														
S/N in:" ft' mm:Space	(EA)																
005 1,358.00 X 1,150.00 X 143.00	8	SS8		T	12.5	50.0		499.5	694.1	42.1	75.3	88.0	71.0	110.0	89.6	18	
SG-01 E-11570/E-11580 : CHANNEL FLG. & CHANNEL COVER FLG. (-002-6, -7) (-002-14, -15) REVIEWED WITNESSED Date/Signature: Germanischer Lloyd Industrial Services Reviewed by Witnessed by QA DEPT. S. J. HWANG DATE Aug. 25, 2014																	
Heat No.		Chemical Composition(%)										Customer's Requirement.					
Spec.		C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N	* NACE STD : NACE MR0175/ISO15156 Part-3 * FULLY KILLED, VACUUM DEGAISED & FINE GRAINED STEEL * HARDNESS : MAX 25 HRC * N ≥ 0.15% * FERRITE CONTENT(35-65%) : ACT'L : 49.9% * (L) : LADLE ANALYSIS, (P) : PRODUCT ANALYSIS					
Min.		0.030	1.00	2.00	0.030	0.020	4.50	21.00	2.50	-	0.08						
Max.		0.020	0.47	1.45	0.023	0.001	6.50	23.00	3.50		0.20						
E100287(L)		0.020	0.47	1.45	0.023	0.001	5.21	22.50	2.82	0.196	0.19						
E100287(P)		0.021	0.49	1.44	0.021	0.001	5.30	22.44	2.80	0.194	0.18						
Heat Treatment ※.2 S.T. 1060°C X 6.2HRS W.C										Dimension & Visual Acceptable		UT ※.3 MT ※.3 PT ※.3					
We hereby certify that the material herein has been made by an approved process and tested in accordance with the above specification and also with the requirement called for by the above order. This Certificate is only available with in original. (원본만 유효) This Certificates can be verified as an original in our homepage. WWW.TAEWOONG.COM (T: 051-329-5121)																	
Surveyor		C. H. Kang										Manager of Quality Assurance Dept					

Notes: ※.1 ... Direction : L=Longitudinal Tr=Transverse T=Tangential R=Radial U=UW-13(Direction Parallel to the Axis of the Vessel) A=Axial

※.2 ... Heat Treatment : N=Normalized A=Annealed Q=Quenched T=Tempered S.T=Solution Treated S.R=Stress Relieved A.C=Air Cooled W.C=Water Cooled F.C=Furnace Cooled O.C=Oil Cooled F.A.C=Forced air cooled

※.3 ... Surface Condition : A.F=As Forged R.M=Rough Machined F.M=Finish Machined ※.4 ... Tensile Test : T.S=Tensile Strength E.L=Elongation R.A=Reduction Of Area G.L=Gauge Length D=Diameter



HEAT TREATMENT CERTIFICATE

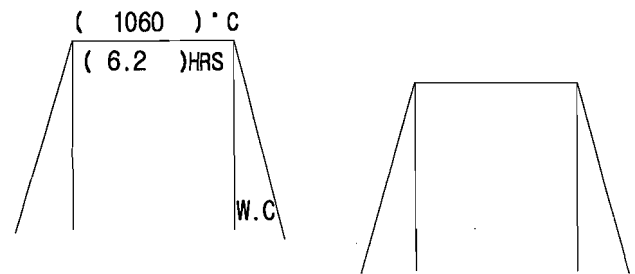
ASME

Report NO. : HR201408-0706

Date : August 09, 2014

Work No.	140701-15006-005
Customer	(주)일성
Description	FORGED STEEL
Material	SA182F51
Quantity	8 EA
Hardness	-
Method of heat treatment	Solution Treated
Heat No.	E100287
Order No.	DE-13SG-007-09

Heating Cycle



Item List

No.	S/N	SIZE	Q'TY
1.	005	1,358.00 X 1,150.00 X 143.00	8 EA

- B L A N K -

Hardness Data

No.	1	2	3
-----	---	---	---

Olsung ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	AUG. 25. 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

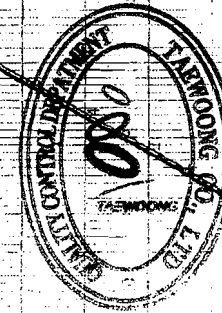
C. H. Kang

Manager of Quality Assurance Dep't

CHART NO. 244 05035

1060°C X 6.2HRS

ASME



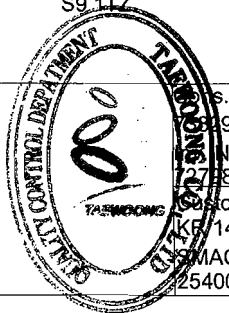
☒ REVIEWED
☐ WITNESSED
 Date / Signature:
[Signature]
 Germanischer Lloyd
 Industrial Services

Olsung ISC
 Reviewed by
 Witnessed by
 QA DEPT. S. J. HWANG
 DATE Aug. 25. 2014

HEAT TREATMENT CONDITION CURVE				
ORDER NO.	ITEM NO.	DWG NO.	Q'TY	REPORT NO.
			8EA	HR201408-0706
HOLDING TEMP	HOLDING TIME	THERMO-COUPLE	RECORD SPEED	
1060°C	6.2HRS	6EA	25mm/HR	
SUPERVISOR		MANAGER	DATE	
		<i>C. H. Kang</i>	2014.8.9	

CERTIFIED TRUE COPY

Test Certificate ASME



To TAEWOONG CO. LTD 1462-1, SONGJEONG-DONG GANGSEO-GU BUSAN KOREA	Customer Order No K01 1489/SHJ SMACC Order No 254001/1	Cast No. E100287 Code 658003 Campaign 15083 Specification Taewoong F51 - Chemical Analysis Only	Cert Date: 12 March 2010 Melt Date: 16 February 2010 Ordered Supply Condition FULLY BLACK
--	---	---	--

CONTINUOUSLY CAST STAINLESS SLABS

Analysis	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Sn	Nb	W	V	Co	Ti	As	B	N	Pb	Ca	Ta	O
	0.020	0.473	1.45	0.023	0.001	22.50	2.82	5.21	0.018	0.196	0.014	0.021	0.03	0.07	0.258	0.004	0.008	0.0020	0.192	0.0004	0.0031	0.001	0.0053

Cast No E100287	No of Items 4	No of Pack	Product CSLAB	Dimensions (mm) 1575*300*5300	Weight (kg) 78860	Certification Text: Test certificate according to EN10204:2004 3.1
--------------------	------------------	------------	------------------	----------------------------------	----------------------	---

Letter of Credit Info:
 Documentary credit no. M06EA002NU00071

Additional Comments:
 Test certificate

All test certificates issued by Outokumpu Stainless Ltd will contain either an embossed seal or be impregnated with an Outokumpu logo, or a combination of both. Any recipient of a copy of an Outokumpu Stainless Ltd Test Certificate without either the seal or watermarking should ensure from the supplier that it is a true reproduction of the original.

We certify that the above material has been tested in accordance with the order specification and that the results comply with the order and specification (note that where more than one specification is involved, only the mechanical properties and cast chemical composition are certified to the requirements of each individual specification).

OUTOKUMPU STAINLESS
 LRQA APPROVAL NUMBER



0880772

Witnessed

--

Inspection Authority

--

Signed for Outokumpu Stainless Ltd

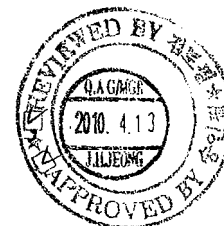
D Brooks



D. Brooks. Technical Manager SMACC.

OLSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. S. J. HWANG DATE 2010. 4. 25	

CERTIFIED TRUE COPY



☒ REVIEWED ☐ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services
--

INSPECTION CERTIFICATE

CUSTOMER : (주)일성

NO. 2014-14622

DATE : 2014.09.18

309, Chungnyeol-ro, Yangsan-si,
Gyeongsangnam-do**JEIL E & S CO., LTD.**NAME OF PRODUCTS : JIC 3850-SE-304(SF)
[METALLIC GASKET]

SIZE : 1220*1252*5.0T

LOT NO : 201409030023015

COMPLIES WITH : -

DATE OF TEST : 2014.09.17

QUANTITY : 8 EA

TEST ITEMS**MATERIAL SPEC****RESULT**

APPEARANCE

ACCORDING TO TECHNICAL
STANDARD TS-A101(REV.5)

Accept

RAW MATERIAL

STS304

STS304

DIMENSION

ACCORDING TO TECHNICAL
STANDARD TS-A101(REV.5)

Accept

SG-07
E-11570, 11580
GASKET (-002-8, -9, -16, -17)

OLSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	SEP. 22. 2014

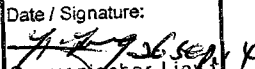


TEST CERTIFICATE IS ISSUED ACCORDING TO EN10204 3.1

PO NO : P-13SG-007

REMARKS

도면

☒ REVIEWED
☐ WITNESSED
Date / Signature:

Germanischer Lloyd
Industrial Services

J. E. S. CO., LTD.

2014.09.18

SURVEYOR

INSPECTOR

INSPECTION CERTIFICATE


**SamSung
Metal Co., Ltd**

 8, Cheoyongsaneop 1-Gil, Onsan-Eup, Ulsan-Gun, Ulsan, Korea TEL : 82-52-275-0758
 http://www.metalsamsung.com FAX : 82-52-271-7079

DESCRIPTION : STUD BOLT / 2 HEAVY HEX NUT / 2 WASHER SA320-L7M / SA194-7M / F436

P/O NO. : DE-13SG-007-31

CERTIFICATE NO. : SMIS14-0077

REPORT TO : ILSUNG

DATE ISSUED : 2014. 09. 30.

DESCRIPTION						HEAT TREATMENT (°C)				
STAMP NO.	NOUN	DIMENSION	QUANTITY	MATERIAL	HEAT NO.	ANNEAL	QUENCH	TEMPER		
01	BOLT	1.1/8"xL-8UN	SEE REMARKS ^①	SA320-L7M	C07469		860	720		
02	NUT	1.1/8"-8UN		SA194-7M	655465		860	650		
03	WASHER	1.1/8"		F436	SR91606		880	420		
STAMP NO.	DESCRIPTION	CHEMICAL COMPOSITION (%)								
		C	Si	Mn	P	S	Ni	Cr	Mo	
DECISION	STANDARD	SA320-L7M	0.38-0.48	0.15-0.35	0.75-1.00	max0.035	max0.040		0.80-1.10	0.15-0.25
		SA194-7M	0.37-0.49	0.15-0.35	0.65-1.10	max0.035	max0.04		0.75-1.20	0.15-0.25
		F436				max0.040	max0.050			
01	BOLT	0.42	0.22	0.85	0.019	0.011		0.86	0.16	
02	NUT	0.40	0.23	0.81	0.015	0.01		1.04	0.16	
03	WASHER				0.007	0.001				
STAMP NO.	DESCRIPTION	MECHANICAL PROPERTIES								
		YIELD STRENGTH	TENSILE STRENGTH	ELONGATION	REDUCTION OF AREA	HARDNESS TEST	PROOF LOAD TEST	IMPACT TEST at -73°C	Sample Nut Hardness after 590°C x 24h	
DECISION	STANDARD	SA320-L7M	ksi min80	ksi min100	% min18	% min50	HRB max99		min ave27J	
		SA194-7M					HRB 84-99	118500 lbf	min ave27J	HRB min84
		F436					HRC 38-45			
01	BOLT	96	128	22	60	97		80,79,79		
02	NUT					97	GOOD	81,81,82	98	
03	WASHER					39				

We hereby certify that the material described here in has been satisfactorily tested in accordance with the above specification and the requirements called for by the above order. Conform EN 10204 3.1 / ISO 10474 3.1

 REMARKS § App. Code : ASME Section II Part A 2010 Edition
 § App. Code : ASTM Section I Vol 01.08 2013 Edition

Macroetch Test : GOOD

① 1.1/8"x300L=480SET, 1.1/8"x320L=880SET, 1.1/8"x370L=864SET, 1.1/8"x420L=768SET

② 1.1/8"x300L=480SET, 1.1/8"x320L=880SET, 1.1/8"x370L=864SET, 1.1/8"x420L=768SET

③ 1.1/8"x300L=480SET, 1.1/8"x320L=880SET, 1.1/8"x370L=864SET, 1.1/8"x420L=768SET

④ 1.1/8"x300L=480SET, 1.1/8"x320L=880SET, 1.1/8"x370L=864SET, 1.1/8"x420L=768SET

⑤ 1.1/8"x300L=480SET, 1.1/8"x320L=880SET, 1.1/8"x370L=864SET, 1.1/8"x420L=768SET

MANAGER OF QUALITY CONTROL :

PARK. H. H

ILSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	OCT. 06, 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd
Industrial Service



EN 10204 TYPE 3.1

Our quality system is
certified in accordance
with ISO 9001 : 2008



CERTIFICATE OF MATERIAL TEST REPORT

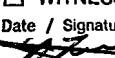
CERT. No. TT2457

ADDRESS : #392, Namyang-dong,
Jinhae-gu, Chanwon-si,
Gyeongsangnam-do, Korea

DATE : May 20, 2014

CUSTOMER - UNSTEEL CO., LTD
PO NO - P-13SG-007
PROJECT NAME - SHELL CANADA ENERGY / Carmon Creek-Phase1&2
COMMODITY - COLD FINISHED SEAMLESS STAINLESS STEEL TUBE
SPECIFICATION - ASME SA789 2010 ED. + 2011 ADD.
GRADE - S31803

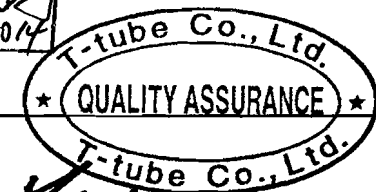
SIZE				HEAT TREATMENT	
O.D	W.T		LENGTH(mm)	TEMPERATURE	HOLDING TIME
19.05	1.65	MIN	6,706	1100°C	17 Min
TOTAL QUANTITY (PCS)			496	* SOLUTION TREATMENT & RAPID COOL	
TOTAL WEIGHT (Kg)			2633		

Heat No.	Lot No.	Pcs	Mechanical property							Eddy Current test	Hydrostatic test	Surface & Dimension	Flaring test	Flattening test	Corrosion test	PMI test	[Notes] *1 : Gauge length 50mm 0.2% offset *H : Heat analysis *P : Product analysis *G : Good
			Spec	Y.S (MPa)	T.S (Mpa)	E.L (%)	Hardness (HRC)										
				Min	450	620	25										
				Max				30									
TB8825	A4027A17	124	*1	674.51/656.32	891.57/881.23	41.17/40.95	21.0	21.5	G	-	G	G	G	-	-		
TB8825	A4027A18	124	*1	621.77/638.06	818.55/830.75	38.30/39.04	19.0	19.0	G	-	G	G	G	-	-		
TB8825	A4027A19	124	*1	590.34/602.14	813.25/821.69	39.15/39.87	19.0	20.0	G	-	G	G	G	-	-		
TB8825	A4027A20	124	*1	629.17/634.67	855.01/843.34	39.31/39.46	20.0	20.0	G	-	G	G	G	-	-		
Heat No.	Lot No.	Chemical Composition %													[REMARK]	☒ REVIEWED ☐ WITNESSED Date / Signature  Germanischer Lloyd Industrial Services	
		Spec	C	Si	Mn	P	S	Ni	Cr	Mo	N	Nb	Ti	PREN			
			Min						4.50	21.00	2.50	0.08					
			Max	0.030	1.00	2.00	0.030	0.020	6.50	23.00	3.50	0.20					
TB8825	A4027A17	*H															No repair welding free from mercury contamination
	*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
TB8825	A4027A18	*H															
	*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
TB8825	A4027A19	*H															
	*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
TB8825	A4027A20	*H															
	*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
olsung ISC QA DEPT. DATE Jul 14, 2014 Reviewed by Witnessed by G. T. PYO 2014 T-tube Co., Ltd. QUALITY ASSURANCE																	

PREN : Cr + 3.3(Mo+0.5W)+16N
Nace MR0175 / NACE MR0103

QLSUNG
18C
QA DEPT. G. T. PYO
DATE Jul 14, 2014

No repair welding free from mercury contamination



Manager, Quality Assurance Section

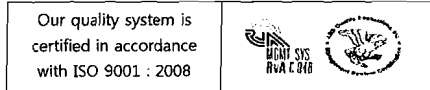


We hereby certify that the material described herein have been manufactured, inspected and tested in accordance with the customer's specification and order.

① E-11580 (004-1) : TUBE (496 PCS)



EN 10204 TYPE 3.1



CERTIFICATE OF MATERIAL TEST REPORT
CERT. No. TT2458

ASME

ADDRESS : #392, Namyang-dong,
Jinhae-gu, Chanwon-si,
Gyeongsangnam-do, Korea

DATE : May 20, 2014

CUSTOMER - UNSTEEL CO., LTD
PO NO - P-13SG-007
PROJECT NAME - SHELL CANADA ENERGY / Carmon Creek-Phase1&2
COMMODITY - COLD FINISHED SEAMLESS STAINLESS STEEL TUBE
SPECIFICATION - ASME SA789 2010 ED. + 2011 ADD.
GRADE - S31803

SIZE				HEAT TREATMENT	
O.D	W.T		LENGTH(mm)	TEMPERATURE	HOLDING TIME
19.05	1.65	MIN	6,706	1100°C	17 Min
TOTAL QUANTITY (PCS)			372	* SOLUTION TREATMENT & RAPID COOL	
TOTAL WEIGHT (Kg)			1975		

Heat No.	Lot No.	Pcs	Mechanical property								Eddy Current test	Hydrostatic test	Surface & Dimension	Flaring test	Flattening test	Corrosion test	PMI test	[Notes]
			Spec	Y.S (MPa)	T.S (Mpa)	E.L (%)	Hardness (HRC)											
			Min	450	620	25												
			Max				30		ACC. To: ASTM Practice E426	ACC To: ASTM A1016 26	ACC To: ASTM A1016 9, 10, 11	ACC To: ASTM A1016 22	ACC To: ASTM A1016 19	ACC To: A262 Practice E Type				
TB8825	A4027A21	124	*1	685.03/664.39	887.76/874.18	35.95/37.31	21.0	21.0	G	-	G	G	G	-	-	*H : Heat analysis		
TB8825	A4027A22	124	*1	674.40/657.26	890.33/886.63	38.74/39.07	21.0	21.5	G	-	G	G	G	-	-	*P : Product analysis		
TB8825	A4027A23	124	*1	623.12/638.94	826.44/834.70	40.51/40.06	19.0	19.0	G	-	G	G	G	-	-	*G : Good		
Heat No.	Lot No.	Chemical Composition %													[REMARK]			
		Spec.	C	Si	Mn	P	S	Ni	Cr	Mo	N	Nb	Ti	PREN				
		Min						4.50	21.00	2.50	0.08							
			Max	0.030	1.00	2.00	0.030	0.020	6.50	23.00	3.50	0.20						
TB8825	A4027A21	*H														▷ PREN : Cr + 3.3(Mo+0.5W)+16N		
		*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175					▷ Nace MR0175 / NACE MR0103		
TB8825	A4027A22	*H														▷ No repair welding free from mercury contamination		
		*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
TB8825	A4027A23	*H																
		*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
		*H																
		*P																

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ISC

QA DEPT.

DATE

Reviewed by

Witnessed by

G. T. PYO

Jul. 14, 2014

T-tube Co., Ltd.

QUALITY ASSURANCE

Reviewed by
G. T. PYO
DATE Jul. 14. 2014



☒ REVIEWED
☐ WITNESSED
Date / Signature: *[Signature]*
Germanischer Lloyd
Industrial Services

We hereby certify that the material described herein have been manufactured, inspected and tested in accordance with the customer's specification and order.

① E-11580(004-1): TUBE (372 pcs)

EN 10204 TYPE 3.1

Our quality system is
certified in accordance
with ISO 9001 : 2008



ASME

CERTIFICATE OF MATERIAL TEST REPORT CERT. No. TT2459

ADDRESS : #392, Namyang-dong,
Jinhae-gu, Chanwon-si,
Gyeongsangnam-do, Korea

DATE : May 20, 2014

CUSTOMER - UNSTEEL CO., LTD
PO NO - P-13SG-007
PROJECT NAME - SHELL CANADA ENERGY / Carmon Creek-Phase1&2
COMMODITY - COLD FINISHED SEAMLESS STAINLESS STEEL TUBE
SPECIFICATION - ASME SA789 2010 ED. + 2011 ADD.
GRADE - S31803

SIZE				HEAT TREATMENT	
O.D	W.T		LENGTH(mm)	TEMPERATURE	HOLDING TIME
19.05	1.65	MIN	6,706	1100°C	17 Min
TOTAL QUANTITY (PCS)			496	* SOLUTION TREATMENT & RAPID COOL	
TOTAL WEIGHT (Kg)			2633		

Heat No.	Lot No.	Pcs	Mechanical property							Eddy Current test	Hydrostatic test	Surface & Dimension	Flaring test	Flattening test	Corrosion test	PMI test	[Notes]
			Spec	Y.S (MPa)	T.S (Mpa)	E.L (%)	Hardness (HRC)										
				Min	450	620	25										
			Max					30									
TB6459	A4027A24	124	*1	654.99/637.60	882.64/869.36	41.29/40.87	20.0	21.0	G	-	G	G	G	-	-	*H : Heat analysis	
TB6459	A4027A25	124	*1	583.75/600.23	858.47/864.15	40.98/40.65	20.0	20.0	G	-	G	G	G	-	-	*P : Product analysis	
TB6459	A4027A26	124	*1	665.14/647.42	880.82/869.52	41.18/40.84	20.0	20.5	G	-	G	G	G	-	-	*G : Good	
TB6459	A4027A27	124	*1	608.91/611.18	832.53/844.63	39.24/39.99	19.0	20.0	G	-	G	G	G	-	-		
Heat No.	Lot No.	Chemical Composition %													[REMARK]		
		Spec	C	Si	Mn	P	S	Ni	Cr	Mo	N	Nb	Ti	PREN			
		Min						4.50	21.00	2.50	0.08						
			Max	0.030	1.00	2.00	0.030	0.020	6.50	23.00	3.50	0.20					
TB6459	A4027A24	*H														▷ PREN : Cr + 3.3(Mo+0.5W)+16N	
		*P	0.022	0.474	1.452	0.016	0.002	4.857	22.579	3.062	0.176					▷ Nace MR0175 / NACE MR0103	
TB6459	A4027A25	*H														▷ No repair welding free from mercury contamination	
		*P	0.022	0.474	1.452	0.016	0.002	4.857	22.579	3.062	0.176						
TB6459	A4027A26	*H															
		*P	0.022	0.474	1.452	0.016	0.002	4.857	22.579	3.062	0.176						
TB6459	A4027A27	*H															
		*P	0.022	0.474	1.452	0.016	0.002	4.857	22.579	3.062	0.176						

OLsung

ISC

QA DEPT.

DATE

☒Reviewed by

☐Witnessed by

G. T. PYO

Jul. 14. 2024

Tube Co., Ltd.

QUALITY ASSURANCE

☒ Reviewed by
☐ Witnessed by
 QA DEPT. G. T. PYO
 DATE Jul. 14. 2014



We hereby certify that the material described herein have been manufactured, inspected and tested in accordance with the customer's specification and order.

☒ REVIEWED
☐ WITNESSED
 Date: _____ Signature: _____
 Germanischer Lloyd
 Industrial Services

① E-11580 (004-1) ; TUBE (496 PCS)



ASME

EN 10204 TYPE 3.1

Our quality system is
certified in accordance
with ISO 9001 : 2008



CERTIFICATE OF MATERIAL TEST REPORT

CERT. No. TT2460

ADDRESS : #392, Namyang-dong,
Jinhae-gu, Chanwon-si,
Gyeongsangnam-do, Korea

DATE : May 20, 2014

CUSTOMER - UNSTEEL CO., LTD
PO NO - P-13SG-007
PROJECT NAME - SHELL CANADA ENERGY / Carmon Creek-Phase1&2
COMMODITY - COLD FINISHED SEAMLESS STAINLESS STEEL TUBE
SPECIFICATION - ASME SA789 2010 ED. + 2011 ADD.
GRADE - S31803

SIZE				HEAT TREATMENT	
O.D	W.T		LENGTH(mm)	TEMPERATURE	HOLDING TIME
19.05	1.65	MIN	6,706	1100°C	17 Min
TOTAL QUANTITY (PCS)			496	* SOLUTION TREATMENT & RAPID COOL	
TOTAL WEIGHT (Kg)			2633		

Heat No.	Lot No.	Pcs	Mechanical property								Eddy Current test	Hydrostatic test	Surface & Dimension	Flaring test	Flattening test	Corrosion test	PMI test	[Notes] *1 : Gauge length 50mm 0.2% offset *H : Heat analysis *P : Product analysis *G : Good
			Spec	Y.S (MPa)	T.S (Mpa)	E.L (%)	Hardness (HRC)											
			Min	450	620	25												
TB6459	A4027A28	124	*1	600.78/611.43	854.40/858.29	40.32/40.17	20.0	20.0	G	-	G	G	G	-	-			
TB6459	A4027A29	124	*1	606.39/612.37	855.05/860.72	39.45/39.78	19.0	20.0	G	-	G	G	G	-	-			
TB6459	A4027A30	124	*1	603.01/607.75	821.29/833.44	38.77/39.15	19.0	19.0	G	-	G	G	G	-	-			
TB6459	A4027A31	124	*1	618.62/622.16	826.16/836.05	39.62/40.04	19.0	20.0	G	-	G	G	G	-	-			
Heat No.	Lot No.	Chemical Composition %												[REMARK]				
		Spec.	C	Si	Mn	P	S	Ni	Cr	Mo	N	Nb	Ti		PREN.			
		Min						4.50	21.00	2.50	0.08							
		Max	0.030	1.00	2.00	0.030	0.020	6.50	23.00	3.50	0.20							
TB6459	A4027A28	*H														▷ PREN : Cr + 3.3(Mo+0.5W)+16N ▷ Nace MR0175 / NACE MR0103 ▷ No repair welding free from mercury contamination		
		*P	0.022	0.474	1.452	0.016	0.002	4.857	22.579	3.062	0.176							
TB6459	A4027A29	*H																
		*P	0.022	0.474	1.452	0.016	0.002	4.857	22.579	3.062	0.176							
TB6459	A4027A30	*H																
		*P	0.022	0.474	1.452	0.016	0.002	4.857	22.579	3.062	0.176							
TB6459	A4027A31	*H																
		*P	0.022	0.474	1.452	0.016	0.002	4.857	22.579	3.062	0.176							

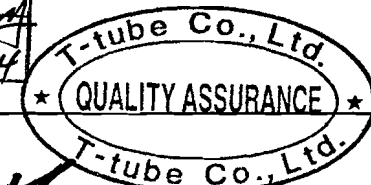
OLSRG
ISC

Reviewed by
G. T. PYO
Witnessed by
G. T. PYO

QA DEPT.
DATE Jul. 14, 2014

T-tube Co., Ltd.
★ QUALITY ASSURANCE ★

Reviewed by
 Witnessed by
 QA DEPT. G. T. PYO
 DATE Jul. 14, 2014



We hereby certify that the material described herein have been manufactured, inspected and tested in accordance with the customer's specification and order.

☒ REVIEWED
☐ WITNESSED
 Date / Signature:

 Germanischer Lloyd
 Industrial Services

① E-11580 (004-1): TUBE (496 PCS)

ASME



DATE : May 20 , 2014

SIZE				HEAT TREATMENT	
O.D	W.T		LENGTH(mm)	TEMPERATURE	HOLDING TIME
19.05	1.65	MIN	6,706	1100°C	17 Min
TOTAL QUANTITY (PCS)			72	* SOLUTION TREATMENT & RAPID COOL	
TOTAL WEIGHT (Kg)			382		



☐ REVIEWED
☐ WITNESSED
Date / Signature:
[Signature]
Germanischer Lloyd
Industrial Services

PAGE 69

6/17

SGS**Test Report**

Report No. : SGS-M14-04273

Sample Name : DUPLEX SEAMLESS TUBE (PO No.P-13SG-001)

Sample Number : Heat No.:TB8825

Material & Specification : SA789 S31803

Use of Test Report : For submission

Date of Test : 2014.05.27

Date of Receipt : 2014.05.20

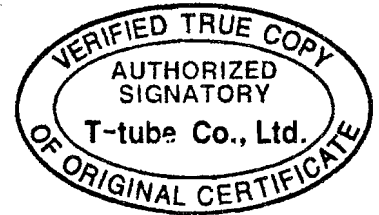
Test Method Used : Refer to test results

Testing Environment : Temperature (20 ± 1) °C

Humidity (46 ± 3) % R.H.

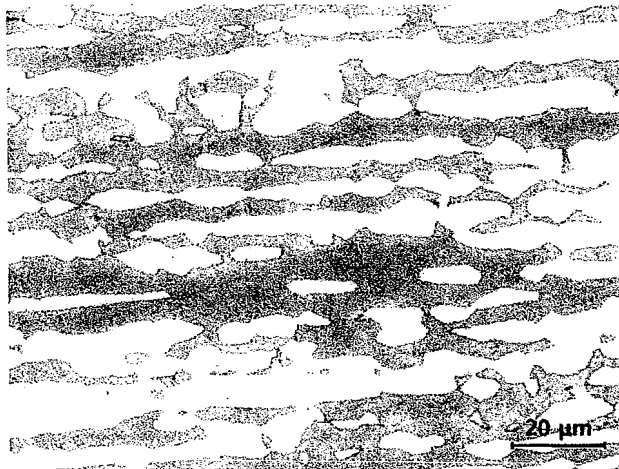
Client Name : UN Steel

Client Address : -

ASME**Test Results****1. Ferrite Content**

Test Item	Unit	Result	Test method
Ferrite Content	%	49.5	ASTM E562-11

* 30 fields and 25 points per field * 95 % CI : 4.81, %R.A : 9.73

2. Microstructure (Test method : ASTM E407-07e1, NaOH etched)

Metallograph at 500x magnification

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd Industrial Services

LSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 14. 2014

- End -

Tested by / Sanghoon Lee

Approved by Technical Manager / Changsu Jeong

May 27, 2014

SGS Korea Co., Ltd. Material Laboratory

Tel. (051) 630-7080 Fax. (051) 630-7096

This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

SGS**Test Report**

Report No. : SGS-M14-04274

Sample Name : DUPLEX SEAMLESS TUBE (PO No.P-13SG-001)
 Sample Number : Heat No.:TB6459
 Material & Specification : SA789 S31803
 Use of Test Report : For submission
 Date of Test : 2014.05.27
 Test Method Used : Refer to test results
 Testing Environment : Temperature (20 ± 1) °C
 Client Name : UN Steel
 Client Address : -

ASME

Date of Receipt : 2014.05.20

Humidity (46 ± 3) % R.H.

Test Results**1. Ferrite Content**

Test Item	Unit	Result	Test method
Ferrite Content	%	56.7	ASTM E562-11

* 30 fields and 25 points per field * 95 % CI : 4.28, %R.A : 7.55

2. Microstructure (Test method : ASTM E407-07e1, NaOH etched)

Metallograph at 500x magnification

☒ REVIEWED
☐ WITNESSED
Date / Signature: <i>[Signature]</i> May 14
Germanischer Lloyd Industrial Services

<i>[Signature]</i>	☒ Reviewed by
ISC	☐ Witnessed by
QA DEPT. G. T. PYO	
DATE Jul. 16, 2014	

- End -

Tested by / Sanghoon Lee

Approved by Technical Manager / Changsu Jeong

May 27, 2014

SGS Korea Co., Ltd. Material Laboratory

Tel. (051) 630-7080 Fax. (051) 630-7096

This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's Instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

INSPECTION CERTIFICATE

(As per EN 10204 Type3.1)



HYUNDAI FORGING CO., LTD.

146-1, Hyeonpo-ro, Gunbuk-myun, Haman-gun
Gyeongnam-do, Korea. TEL:055)580-6500, FAX:055)580-6520

Certificate No. : M201404858

Work No. : A201404852

Product Name : FORGED STEEL

Project No. : N/A

Customer : DONGBU
ENTERPRISE CO.LTDMaterial Spec : ASME SEC II PART "A"
SA182F51-10ED+11ADD

Drawing No. : N/A

PO No. : Y201404-608

Date : Apr. 21, 2014

Description or Dimension	Q'ty (EA)	Test Item T/P No Min. Max	Tension Test							Charpy Impact Test				Hard- ness HB	Bend Test Radius
			*1	Size of Test Specimen *2		Yield STR Mpa	Tensile STR Mpa	Elongation %	Red. Of Area %	Test Temp : -45°C T.P Notch : 2mmV					
				D	G.L					J					
				mm	mm										
				mm	mm										
001 ASME 150# BLRF 2"	4	E131033	T	12.5	50.0	534.0	657.0	54.8	70.9	230.0	218.0	208.0	218.6	208, 205	
002 ASME 150# LWNRF 2" 300L	4														
003 ASME 150# WNRF 20"(S/10T)	2														
004 ASME 150# WNRF 24"(S/10T)	2														

001) E-11570/11580(006-9): T3, T4

002) E-11570/11580(006-8): T3, T4

003) E-11570/11580(006-3): T2

004) E-11570/11580(006-1): T1

REVIEWED

WITNESSED

Date / Signature:

Germanischer Lloyd
Industrial Services

10/10/11

001) E-11570/11580(006-9): T3, T4
 002) E-11570/11580(006-8): T3, T4
 003) E-11570/11580(006-3): T2
 004) E-11570/11580(006-1): T1

☒ REVIEWED
☒ WITNESSED
 Date / Signature:
 Germanischer Lloyd
 Industrial Services

Chemical Composition(%)

Spec. Min. Max.	*3	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N	Sn	Nb	Ti	V	As	
							4.50	21.00	2.50		0.14						
		0.030	1.00	2.00	0.030	0.020	6.50	23.00	3.50		0.20						
Charge No		H	0.023	0.41	1.15	0.027	0.001	5.58	22.22	3.06	0.220	0.188	0.012	0.007	0.003	0.08	0.013
Heat Treatment *4	Normalizing				Hrs		Quenching				Hrs		Solution		1050°C	4.3Hrs	W.C
	Annealing				Hrs		Tempering				Hrs						

Remarks

- *NACE MR-0175/ISO 15156 Part2(2009).was applied
 *N= min 0.15% (Act. 0.188%), Ferrite contents: 58.7% (Certificate No.: 141782-G03526)
 *Fully killed, vacuum degassed, fine grain practice
 * Hardness = max 25HRC (254HB)

OLSONG ISC
☒ Reviewed by (052)
☒ Witnessed by TEL: 287-5881
 QA DEPT. G. T. PYO FAX: 287-5880
 DATE Jul. 05. 2014 5. 21

U.T. Inspection
 M.T/PT Inspection
 Dimensional Inspection
 N/A N/A GOOD

*1(Location) L=Longitudinal, T=Tangential, Tr=Transverse,
 R=Radial, U=UW-13(Direction Parallel to the Axis of the Vessel)

*2 D=Diameter, G.L=Gauge Length

*3 H=Heat analysis, P=Product analysis

*4 A.C=Air Cooled, W.C=Water Cooled, O.C=Oil Cooled,
 F.C=Furnace Cooled, F.A.C=Forced Air Cooled

We hereby certify that the material herein has been
 made and tested in accordance with the above
 specification and also with the requirement called for
 by the above order.

102/296

Witnessed By

QA Department Manager

INSPECTION CERTIFICATE

(EN 10204 - 3.1)

Certificate No.: IC201407-050-005

Mat'l Specification : ASME SA182F51 2010ED.2011ADD.

Date : 2014/07/01

Customer : ILSUNG Corporation

P.O No. : FG-20140416-040 (2014-04-16) Project Name

: P-13SG-007(Carmon Creek - Phase 1 & 2)



Description	Q'ty (EA)	MFG Heat I.D No.	Spec Max Min	Tensile Test * 1						Hardness (HB)	Impact Test				Bend Test	Order Entry No	
				Specimen		Y.S	T.S	E.L	R.A		Temp.	Notch	Unit				
				D	G.L	(MPa)	%	-45°C	2V		J						
												Size : 10x10x55(mm)					
												Min.	20	Avg.			27
640 Ø *589.6 Ø *320T	2	BACCS	T	12.5	50	597.6	724.6	32.8	68.6	229 / 229	55.6	50.4	37.6	47.9	A201404-086-015		
540 Ø *488 Ø *300T	2														A201404-086-016		
***** BLANK *****																	
1) E-11570, 11580 (006-2): T1 2) E-11570, 11580 (006-4): T2 OLSUNG ISC ☒ Reviewed by ☐ Witnessed by QA DEPT. G. T. PYO DATE Jul. 14. 2014																	

1) E-11570, 11580 (006-2): T1

2) E-11570, 11580 (006-4): T2

ILSUNG	Reviewed by
ISC	Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 14. 2014

Heat No	Spec	Chemical Composition(%) * 3													Customer's Requirement - POS NO : SA182-F51-SG07-01 REV.2 - NACE MR-0175/ISO15156 PART3(2009) - HARDNESS : MAX.25HRC(=253HB) - FERRITE CONTENT OF BETWEEN 35% AND 65% (ACT'L : 47%) - VACUUM DEGASSED - FULLY KILLED	
	Min	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	Nb	V	N	Al		
	Max	0.030	1.00	2.00	0.030	0.020	6.5	23.0	3.5					0.15		
4E840	H	0.017	0.41	1.11	0.026	0.0003	5.54	22.54	3.08					0.1888		
	P	0.019	0.407	1.114	0.026	0.001	5.544	22.536	3.083					0.191		
Heat Treatment *4 S : 1050°C X 7Hrs W.C							Dimension & Visual	NDE * 5								
								UT		MT		PT				
Job No : HT201405-231							ACCEPT	R.M (ACCEPT) Report No : DCWMS-U14-0701- 042		(N/A)		(N/A)				
Surveyor							We hereby certify that the material herein has been manufactured, tested and inspected in accordance with the above specification.							SHLEE QM General Manager		

Notes : *1 -- Tensile Test : Y.S=Yield Strength, T.S=Tensile Strength, E.L=Elongation, R.A=Reduction of Area, G.L=Gauge Length(mm), D=Diameter(φ)
 *2 -- Location : L=Longitudinal, Tr=Transverse, T=Tangential, R=Radial, U=Hubbed Tension Test 6.25×25.0mm (ASME SEC VIII Div.1 PARA UW-13.3)
 *3 -- Chemical Composition : H=Heat Analysis, P=Product Analysis
 *4 -- Heat Treatment : N=Normalized, A=Annealed, Q=Quenched, T=Tempered, S=Solution Treated, S.R=Stress Relieved, S.T=Stabilization Heat Treatment, A.C=Air Cooled, W.C=Water Cooled, F.C=Furnace Cooled, O.C=Oil Cooled, A.C=Accelerated Cooled By Water
 *5 -- Surface Condition : A.F=As Forged, R.M=Rough Machined, F.M=Finish Machined



INSPECTION CERTIFICATE

WALSIN LIHWA CORP. Y SHUI PLANT

台南市鹽水區洪水里溪州寮12鄰3之10號
NO.3-10, SHIJOU LIAU, CHIN SHUI LI,
YENSHUI DIST TAINAN CITY 73743, TAIWAN, R.O.C.
TEL: 886-6-652-0911 FAX: 886-6-652-0934

CUSTOMER : MYOUNGSUNG METAL CO., LTD

COMMODITY : Stainless Steel Casted Slab

CERTIFICATE NO: A1311290501

Surface Finish:

ORDER NO.: 10211A043/

SPECIFICATION: 2205

ASME

LC NO:

SUPPLY CONDITION: C

DATE OF ISSUE: 2013/11/29

Heat No	Thick (Dia)	Qty	Wt	Chemical Composition(wt%)												Mechanical Property								BOUNDLE NO
	(mm)		(kg)	C x100	Si x100	Mn x100	P x1000	S x1000	Ni x100	Cr x100	Mo x100	N x10000												
Spec	Min								450	2200	300	1400												
	Max			3	100	200	30	20	650	2300	350	2000												
4E838	200.00	1	10725	1.6	37	110	27	0.6	552	2244	310	1891												
4E840	200.00	3	32760	1.7	41	111	26	0.3	554	2254	308	1888												

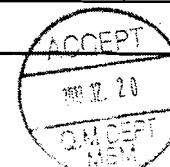
Total: 4 43485

Product ID	Heat No	Thick(mm)	Width(mm)	Length(mm)	Weight(Kg)																			
4E838406	4E838	200.00(200.8)	1245(1246)		5515	10725																		
4E840401	4E840	200.00(200.5)	1245(1246)		5515	10720																		
4E840403	4E840	200.00(200.5)	1245(1247)		5735	11140																		
4E840405	4E840	200.00(195.3)	1245(1243)		5700	10900																		

Q/SUNG	Reviewed by
ISC	Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 14. 2014



ORIGINAL COPY



☒ REVIEWED
☐ WITNESSED
Date / Signature
Germanischer Lloyd
Industrial Service

Remark:

Product ID in this certificate means identification
No. or coil No. in the tag.

- We hereby certify that material described herein has been manufactured and tested with satisfactory results in accordance with requirement of the above material specification.
- We certify that the material is free from mercury and radiation contamination. Qualification No. of Taiwan Atomic Energy Committee: 136
- The Above Testing Results Relate Only To The Items Tested.
- No welding repaired

SUPPLY CONDITION:

A: Annealed
B: Shot Blasted
C: As Casted
E: Reeled/Skin Pass
H: Precipitation Hardening
HR: Hot Rolled
I: Straightened
K: Cut Edge
L: Polished
M: Cold Rolled
P: Pickled
S: Shaved
V: Slit
W: Cut
X: Temper
CD: Cold Draw
CG: Centerless Ground
PL: Turned or Peeled

1. Laboratory accredited by: ISO/IEC17025:2005
Certificate No. L1562-110216

2. Quality management system approval by: TÜV
ISO9001:2008 Certificate No. 011008225836

PED: 97/23/EC & AD2000-MerkblattW0/W2
Certificate No. 01202ROC/Q-02-0016

3. Manufacture system approved: DNV Certificate No. AMM-5661

4. Steel making and semi-finished approval: LR
Certification No. MD00/3063/0004/1

5. Environment management system approval by: TÜV
ISO14001:2004 Certificate No. 011048228145

6. OHSAS 18001:2007 Certificate No. 01113060441
TOSHMS Certificate No. CB07-100003-00

TEST METHOD :

CHEMICAL-ASTM E1806, E415, E1086, E1019

SL Kuan.

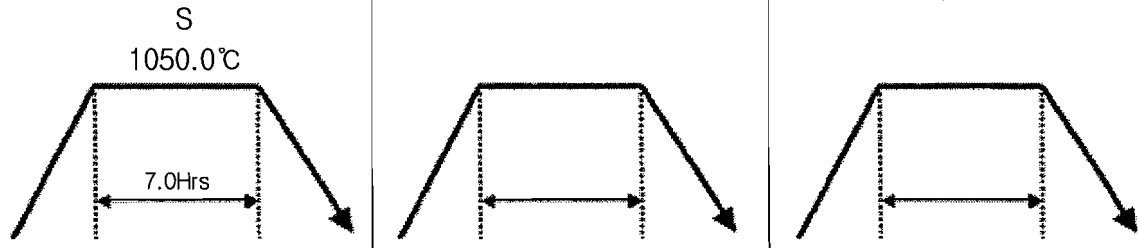
Quality Assurance Responsible Personnel

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HEAT TREATMENT REPORT

 MYSCO CO., LTD 49, Bonsan-ro 193beon-gil, Jinyeong-eup Gimhae-si, Gyeongsangnam-do, KOREA http://www.mysco.co.kr		REPORT NO		HTR201407-050-005	
		ISSUE DATE		2014/05/08	
		CUSTOMER		ILSUNG Corporation	
MATERIAL	SA182F51			HEAT ID NO	SEE BELOW
DATE OF WORK	2014.05.07				
JOB NO	HT201405-231				
H/T METHOD	S				
HOLDING TEMP	1050.0°C				
HOLDING TIME	7.0Hrs				
COOLING METHOD	W.C				
N:Normalizing, A:Annealing, Q:Quenching, T:Tempering, S:Solution, P:PWHT Simulation, S.R:Stress Relieved, S.T:Stabilization Heat Treatment, A.C:Air Cooled, F.C:Furnace Cooled, W.C:Water Cooled, O.C:Oil Cooled, AC.C:Accelerated Cooled By Water					
HEATING CYCLE					
* Description 640 Ø*589.6 Ø*320T 540 Ø*488 Ø*300T					
		2EA	BACCS	A201404-086-015	
		2EA	BACCS	A201404-086-016	
 QA DEPT. DATE Jul . 14 . 2014 Reviewed by G. T. PYO Witnessed by					
☐ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services  General Manager of QM Dep't					
REVIEWED BY ☐ WITNESSED BY ☐		_____ Surveyor			



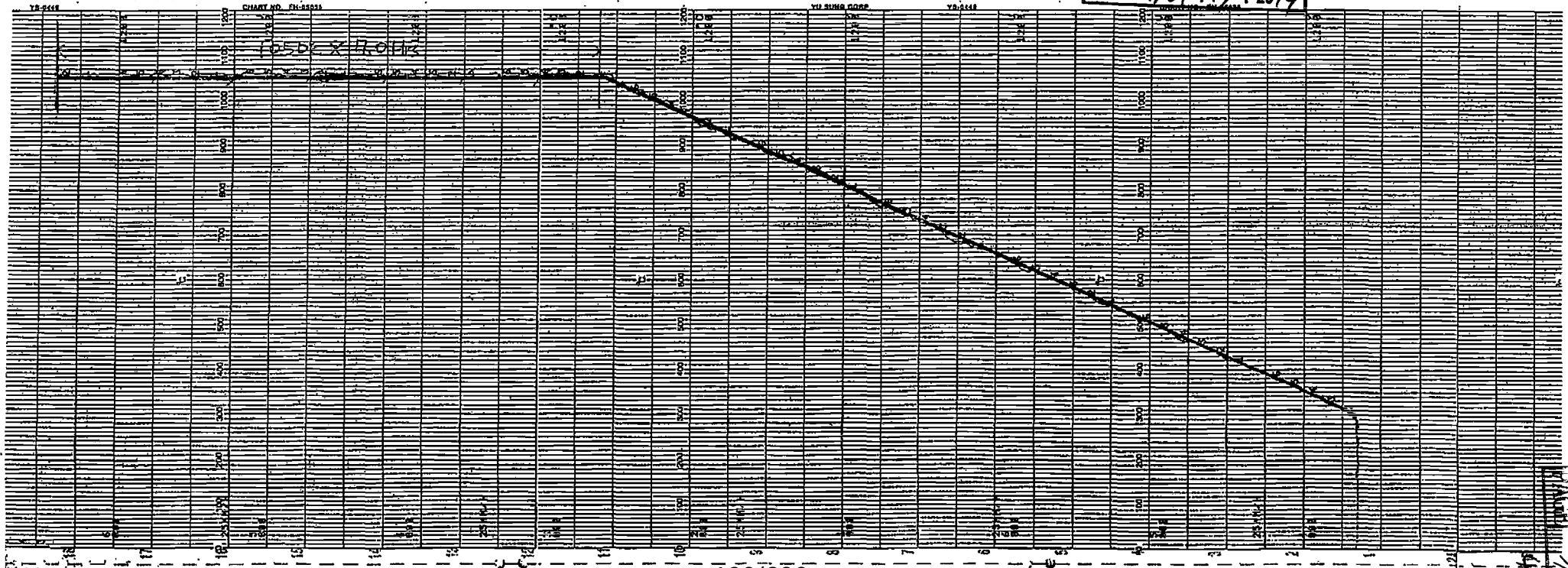
☒ REVIEWED
☐ WITNESSED
 Date / Signature: *[Signature]*
 Germanischer Lloyd
 Industrial Services

Job No	HT201405-231
Material	SA182F51
Heat ID No	BACCS
Date	2014.05.07

ASME

Olsung
 ISC
☒ Reviewed by
☐ Witnessed by
 QA DEPT. G. T. PYO
 DATE 7.14.2014

ORIGINAL COPY



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 4/16



이엔디이 주식회사

e-NDE CO.,LTD.

ULTRASONIC EXAMINATION REPORT

초음파탐상시험보고서

642-971 경상남도 창원시 성산동 77-1
에스케이테크노파크메카동 909
TEL: (055)286-5120, FAX: (055)286-5121



보고서번호 Report No.
DCWMS-U14-0701-042
시험날짜 Date of Exam
2014. 07. 01
페이지번호 Page No.
1 OF 2

주문주/고객 Owner/Customer IL SUNG Corporation / MYSCO CO.,LTD				Project No./Name (공사번호/명) N/A			
제품번호/제품명 Item No./Name See Identification /Joint No				부품번호/부품명 Part No. / Name N/A			
트래블러 TRV. No. N/A	개정 Rev. No. N/A	공정 Oper No. N/A	적용규격 Procedure No. 개정 Rev.No ASME SA388 / ASME SEC.VIII DIV2 PART3				
도면번호 DWG. No. N/A			O.E No (수주번호): A201404-086 P.O No: FG-20140416-040(2014-04-16)				
재질/두께 Material See the remarks.		(여성고) Mater'l Thick.(+) N/A		용접방법 Weld Method ☐ mm ☐ inch ☐ SMAW ☐ SAW ☐ FCAW ☐ GTAW			
표준시험편 Standard Block IIW		검사시기 Examination Time After Heat Treatment		표면조건 Surface Condition ☐ As welded ☒ As Rough Machined ☐ As Final Machined			
장비 Equipment		탐촉자 Probe				교정시험편 Calibration Block	
ID No. : EU-DCW-04	Maker	Model	MHz	size	Angle	Serial No.	Type S/N
Model : USM GO	k/k	B2S-E	2	Ø24	0°	57745-50728	IIW 2841
Maker : GE	k/k	B4S-E	4	Ø24	0°	57746-01530	IIW 2841
Serial No. : 10020515	k/k	MB4S-N	4	Ø10	0°	53465	IIW 2841
Due Date : 2014.09.30	GE	B1S-E	1	Ø24	0°	57744-52461	IIW 2841
Method (검사방법) : ☒ Contact ☐ Immerse							
직선성 Screen Height Linearity : ± 5 %				증폭성 Amplitude Control Linearity : ± 10 %			
Setting Sensitivity Method (감도설정방법)							시험온도 Test Temp. 22 °C
Probe (탐촉자)	Method (방법)	Standard (표준감도)		Scanning (주사감도)			
B2S-E	BACK	B1=80%		Std.Sen:+14dB			
B4S-E	BACK	B1=80%		Std.Sen:+14dB			
MB4S-N	BACK	B1=80%		Std.Sen:+14dB			
B1S-E	BACK	B1=80%		Std.Sen:+14dB			
표면온도 Surface Temp.		장비번호 ID. No. 1203323	모델 Model TECPEL/305B	제조사 Maker TECPEL	유효기간 Due Date 2014.10.03		
SCANNING MAP ☒ Straight beam Probe ☐ Angle beam Probe							
				☒ Reviewed by ☐ Witnessed by QA DEPT. G. T. PYO DATE Jul. 14. 2014			
식별번호 Identification /Joint No.	수량 Q'ty	합격 Accept	불합격 Reject	Interpretation (평가)		Remarks (비고)	
4700*382.40*640T	16EA	Accept		NO RECORDABLE INDICATION		A201404-086-001 SA350LF2CL1	
1350*97.10*130T	4EA	Accept		NO RECORDABLE INDICATION		A201404-086-002 SA350LF2CL1	
800*42.90*180T	2EA	Accept		NO RECORDABLE INDICATION		A201404-086-003 SA350LF2CL1	
2500*198.50*280T	24EA	Accept		NO RECORDABLE INDICATION		A201404-086-004 SA350LF2CL1	
2500*198.50*360T	8EA	Accept		NO RECORDABLE INDICATION		A201404-086-005 SA350LF2CL1	
2500*198.50*360T	16EA	Accept		NO RECORDABLE INDICATION		A201404-086-006 SA350LF2CL1	
1350*97.10*220T	16EA	Accept		NO RECORDABLE INDICATION		A201404-086-007 SA350LF2CL1	
2500*198.50*280T	4EA	Accept		NO RECORDABLE INDICATION		A201404-086-008 SA350LF2CL1	
시험자 J.H, KANG(강정환) Examined By Level II Date				☐ 주문주/고객 Owner/Customer ☐ 검토 Reviewed ☐ 입회 Witnessed			
승인자 J.B, NAM(남정부) Approved By Level III Date				☐ Third Party Inspector ☐ ANI / AI 공인검사관 ☐ 검토 Reviewed ☐ 입회 Witnessed			

INSPECTION CERTIFICATE

(As per EN 10204 Type3.1)



HYUNDAI FORGING CO., LTD.

146-1, Hyeonpo-ro, Gunbuk-myun, Haman-gun
Gyeongnam-do, Korea. TEL:055)580-6500, FAX:055)580-6520

Certificate No. : M201404902

Work No. : A201404906

Product Name : FORGED STEEL

Project No. : N/A

Customer : DONGBU
ENTERPRISE CO.LTDMaterial Spec : ASME SEC II PART "A"
SA350LF2CL1 10ED+11ADD

Drawing No. : N/A

PO No. : Y201404-608

Date : Apr. 28. 2014

Description or Dimension	Q'ty (EA)	Test Item	Tension Test							Charpy Impact Test				Hard- ness	Bend Test Radius
			*1	Size of Test Specimen *2		Yield STR	Tensile STR	Elongation	Red. Of Area	Test Temp : -45°C					
				D	G.L					T.P Notch : 2mmV					
										J					
										mm	mm	Mpa	Mpa		
		Min. Max	12.5	50.0	250.0	485.0 655.0	22.0	30.0		16.0	20.0	197			
001 ASME 300# WNRF 2"(S/160)	2	SB97082	T	12.5	50.0	387.0	585.0	33.9	52.4	72.0	73.0	78.0	74.3	145, 149	
002 ASME 300# WNRF 2"(S/160)	24	001) E-10015/20015	(006-25)	T3B	003) E-10180/10200/20180/20200	(006-31)	T4A	005) E-10120/10122/20120/20122	(008-19, 31)	S4A, T4A					
003 ASME 300# WNRF 2"(S/160)	16	002) E-10140/10142/20144	(006-25)	T4A	E-10190/10210/20190/20210	(006-31)	T3B	E-10121/10123/20121/20123	(008-17, 31)	S3B, T3B					
004 ASME 300# WNRF 4"(S/80)	4	E-20140/20142/20144		T4A	30190/30210/40190/40210			30121/30123/40121/40123							
005 ASME 300# WNRF 4"(S/80)	32	E-40140/40142/40144			004) E-10070/20070	(006-19)	S4A	006) E-10180/10200/20180/20200	(006-25)	S4A					
006 ASME 300# WNRF 4"(S/80)	24	002) E-10140/10142/20144	(006-25)	T3B	E-10075/20075	(006-19)	S3B	30180/30200/40180/40200							
007 ASME 300# WNRF 4"(S/80)	48	20141/20143/20145		T3B	004) E-10075/20075	(006-19)	S3B	E-10190/10210/20190/20210	(006-25)	S3B					
008 ASME 300# WNRF 4"(S/80)	16	30141/30143/30145													

Chemical Composition(%)

Spec.	*3	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Nb	Al	Ti	N
Min.		0.30	0.15	0.60	0.035	0.040	0.40	0.30	0.12	0.40	0.08	0.02			
Max.		0.30	0.30	1.35	0.035	0.040	0.40	0.30	0.12	0.40	0.08	0.02			
Charge No															
SB97082	H	0.1944	0.228	1.013	0.0135	0.0025	0.009	0.023	0.003	0.008	0.002	0.001	0.030	0.0016	0.0035
SB97082	P	0.1938	0.2176	1.0085	0.0132	0.0021	0.0085	0.0215	0.0026	0.0075	0.0015	0.0008	0.0267	0.0015	0.0032
Heat Treatment *4	Normalizing	900 °C		5.0 Hrs	A/C	Quenching			Hrs	Solution			Hrs		
	Annealing			Hrs		Tempering			Hrs				Hrs		

Remarks

*Fully killed carbon steel, Vacuum degassed, fine grain practice

*NACE MR-0175/ISO 15156 Part2(2009) was applied

*Hardness = max 220HV 10 (210HB)

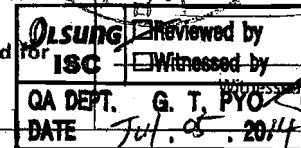
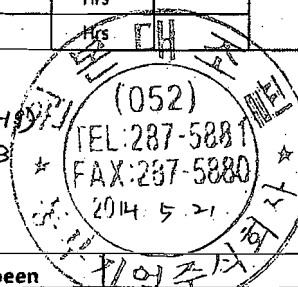
*1(Location) L=Longitudinal, T=Tangential, Tr=Transverse,
R=Radial, U=UW-13(Direction Parallel to the Axis of the Vessel)

*2 D=Diameter, G.L=Gauge Length

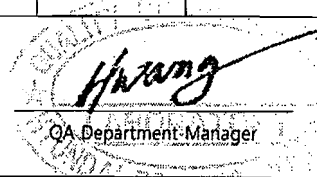
*3 H=Heat analysis, P=Product analysis

*4 A.C=Air Cooled, W.C=Water Cooled, O.C=Oil Cooled,
F.C=Furnace Cooled, F.A.C=Forced Air CooledWe hereby certify that the material herein has been
made and tested in accordance with the above
specification and also with the requirement called for
by the above order.

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U.T. Inspection	M.T/PT Inspection	Dimensional Inspection
N/A	N/A	GOOD



QA Department Manager

REVIEWED

WITNESSED

Date / Signature:

Germanischer Lloyd
Industrial Service

PAGE 1/1

INSPECTION CERTIFICATE

(As per EN 10204 Type 3.1)



HYUNDAI FORGING CO., LTD.

146-1, Hyeonpo-ro, Gunbuk-myun, Haman-gun
Gyeongnam-do, Korea. TEL:055)580-6500, FAX:055)580-6520

Certificate No. : M201404902

Work No. : A201404906

Product Name : FORGED STEEL

Project No. : N/A

Customer : DONGBU
ENTERPRISE CO.LTD.Material Spec : ASME SEC II PART 'A'
SA350LF2CL1 10ED+11ADD

Drawing No. : N/A

PO No. : Y201404-608

Date : Apr. 28. 2014

Description or Dimension	Q'ty (EA)	Test Item	Tension Test						Charpy Impact Test				Hard- ness	Bend Test Radius			
			*1	Size of Test Specimen *2		Yield STR	Tensile STR	Elongation	Red. Of Area	Test Temp : -45°C							
				D	G.L					T.P Notch : 2mmV							
										J							
										mm	mm	Mpa			Mpa	%	%
Min.	12.5	50.0	250.0	485.0	22.0	30.0	Min.	16.0	Avg.	20.0	HB						
Max				655.0								197					
009 ASME 300# WNRF 6"(S/80)	8	SB97082	T	009) E-10070/20070 (006-4,17) : T2A, T1A E-10075/20075 (006-4,17) : T1B, T2B 010) E-10180/20080/20180/20200 } (006-12,24) 30180/30200/40180/40200 } T1B, T2B E-10190/20190/20210/20210 } (006-9,24) 30190/30210/40190/40210 } T2A, T1A						009) E-10120/10122/20120/20122 } (008-1,23) : S2A, S1A 30120/30122/40120/40122 } E-10121/10123/20121/20123 } (008-6,23) : S1B, S2B 30121/30123/40121/40123 } E-10124/20124/30124/40124 (009-12) : S1C, S2C 013) E-10180/20080/20180/20200 } (006-1,21) : S2A, S1A 30180/30200/40180/40200 } E-10190/20190/20210/20210 } (006-6,21) : S1B, S2B 30190/30210/40190/40210 }							
010 ASME 300# WNRF 6"(S/80)	32																
011 ASME 300# WNRF 6"(S/80)	4																
012 ASME 300# WNRF 8"(S/60)	40																
013 ASME 300# WNRF 8"(S/80)	32																

Chemical Composition(%)

Charge No	Spec. Min. Max.	*3	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Nb	Al	Ti	N
			0.15	0.60												
			0.30	0.30	1.35	0.035	0.040	0.40	0.30	0.12	0.40	0.08	0.02			
SB97082	H		0.1944	0.228	1.013	0.0135	0.0025	0.009	0.023	0.003	0.008	0.002	0.001	0.030	0.0016	0.0035
SB97082	P		0.1938	0.2176	1.0085	0.0132	0.0021	0.0085	0.0215	0.0026	0.0075	0.0015	0.0008	0.0267	0.0015	0.0032
Heat Treatment *4	Normalizing		900 °C		5.0 Hrs		A.C		Quenching		Hrs		Solution		Hrs	
	Annealing				Hrs.				Tempering		Hrs					

Remarks

*Fully killed carbon steel, Vacuum degassed, fine grain practice

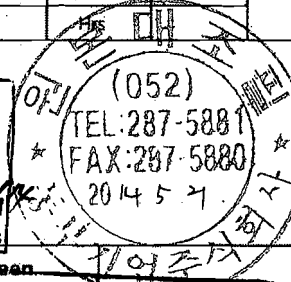
*NACE MR-0175/ISO 15156 Part2(2009) was applied

*Hardness = max 220HV 10 (210HB)

011) E-11570/11580 (006-5) : S1, S2

☒ REVIEWED
☐ WITNESSED

Date Signature:

 Germanischer Lloyd
 Industrial Services
U.T.
InspectionM.T/PT
InspectionDimensional
Inspection

N/A

N/A

GOOD

 *1(Location) L=Longitudinal, T=Tangential, Tr=Transverse,
 R=Radial, U=UW-13(Direction Parallel to the Axis of the Vessel)

*2 D=Diameter, G.L=Gauge Length

*3 H=Heat analysis, P=Product analysis

 *4 A.C=Air Cooled, W.C=Water Cooled, O.C=Oil Cooled,
 F.C=Furnace Cooled, F.A.C=Forced Air Cooled

 We hereby certify that the material herein has been
 made and tested in accordance with the above
 specification and also with the requirement called
 by the above order.

110/296

 Olsung
 ISC

 Reviewed by
 Witnessed by

 QA DEPT.
 DATE

 G. T. PYO
 2014 5 21

Witnessed By

QA Department Manager

CCK-4511951391-0100-K01-00001-074



Vallourec Tubos do Brasil S.A.
 BARREIRO PLANT - Belo Horizonte - MG - Brazil
 CEP: 30161-970 - PO BOX: 1453



ISO 9001
 ISO 14001
 ISO/TS 16949
 OHSAS 18001
 ISO 50001
 BUREAU VERITAS
 Certification



Inspection Certificate

(According to DIN EN 10204.3.1)

Nº: 0030029786

Sheet: 1 / 3

Customer: KEONWOO METALS CO., LTD

Country: BUSAN

Material Number: 389607

Work Order: 357641 / 90

Customer Order: KTC-14-99915

6" 580

Inspection: Vallourec Tubos do Brasil S.A.

PRODUCT: SEAMLESS STEEL PIPE, HOT FINISHED, BEVELED ENDS 37,5 DEG., NORMALIZED

DIMENSIONS: 168,30 mm X 10,97 mm SCHEDULE: 080 GRADE: GR 6 MOD # GR 1

STANDARD: ASTM A 333M - 11 ASTM A 999M - 13

IN ACCORDANCE ALSO TO THE STANDARDS: ASME SA-333M - 13

SURFACE PROTECTION: EXTERNAL: LACQUER PIPE ENDS PROTECTOR: PLASTIC CAP

TOLERANCES: OUTSIDE DIAMETER (PIPE BODY): -0,800 mm / +1,600 mm WALL THICKNESS: -1,371 mm / +1,646 mm

LENGTH: FIXED 6000,00 mm TOLERANCES: -0,00 mm \ +100,00 mm

STANDARD MARKING: Paint stenciled in the pipe body: MANUFACTURER ASTM A/ASME SA-333 6 1 S HF SCH 080 LT -45C HEAT NUMBER 6" X SCH 80 X 6 M LENGTH

SHIPPING MARKING: P.O KTC-14-99915 * KEONWOO METALS CO., LTD. * BUSAN / KOREA * MADE IN BRAZIL * NACE MR 0175

We certify this mat'l meet ASME Sect II
 Part A SA 332 Grade 6
 Ed. 2010 Add. 2011
 Certified by G.T. PYO

Heat	Pieces
128147	42
Total	42

☒ Reviewed by
 ISC ☐ Witnessed by
 QA DEPT. G. T. PYO
 DATE Jul. 05. 2014

THE PRODUCT IS SATISFACTORY IN THE FOLLOWING TESTS / INSPECTIONS: DIMENSIONAL # VISUAL # FLATTENING TEST # HYDROSTATIC TEST: 2700,0 PSI 5 S # ELECTROMAGNETIC TEST :
 ASTM E 570 #

Chemical Composition (%)

Process: Basic Oxygen Furnace, heats fully killed

Ceq: C+ Mn/6+ (Cr+ Mo+ V)/5 + (Ni+ Cu)/15

		C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	Nb	Ceq
Heat Analysis	Min		0,290			0,100							
	Max	0,240	1,350	0,025	0,025		0,400	0,300	0,120	0,400	0,080	0,020	0,400
Product Analysis	Min		0,290			0,100							
	Max	0,240	1,350	0,025	0,025		0,400	0,300	0,120	0,400	0,080	0,020	0,400
Heat	Control Lot												
128147	030002365791	0,11	1,27	0,015	0,002	0,30	0,02	0,04	0,01	0,010	0,004	0,016	0,334
	Check 1	0,12	1,26	0,015	0,001	0,31	0,02	0,04	0,01	0,007	0,004	0,014	0,342
	Check 2	0,12	1,28	0,015	0,001	0,29	0,02	0,04	0,01	0,007	0,004	0,015	0,340

Ceq: Carbon Equivalent;

E-10070 (006-35): T1A, (006-31): T2A
20070E-10070 (006-33): T1B, (006-35): T2B
20070E-11570 (006-6): S1, S2
E-11580

☒ REVIEWED
☒ WITNESSED
 Date / Signature:
 Germanischer Lloyd
 Industrial Services

E-10180/10200 (006-41): T1B, E-10190/10210 (006-39): T2A
 E-20180/20200 E-20190/20210
 E-30180/30200 (006-37): T1B E-30190/30210 (006-41): T1A
 E-40180/40200 E-40190/40210
 111/296



ISO 9001
ISO 14001
ISO/TS 16949
OHSAS 18001
ISO 50001
BUREAU VERITAS
Certification



Inspection Certificate

(According to DIN EN 10204.3.1)

Nº: 0030029786

Sheet: 2 / 3

Tensile Test

Specimen Direction: Longitudinal

Temperature: Room Temperature

Gage Length: L0= 2"

YS Method: 0,50 %

Type of Specimen

Area (MM2)	YS (MPA)	TS (MPA)	E (%)
	240	415	30

Required: Min
Max

Heat	Control Lot	Pipe N°	Type of Specimen	Area (MM2)	YS (MPA)	TS (MPA)	E (%)
128147	030002365791	2	STRIP WIDTH 25,4 MM	275,9	384	505	37
		2	STRIP WIDTH 25,4 MM	274,2	386	501	38

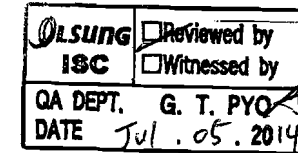
YS-Yield Strength; TS-Tensile Strength; E-Elongation;

Hardness Test

Scale: HV

Required: Min
Max 246,0

Heat	Control Lot	Pipe N°	Max
128147	030002365791	2	151,0



Impact Test

Test Specimen: CHARPY 10X55X10 V NOTCH

Direction: Longitudinal

Temperature: -45°C

Striking tup: 8 mm

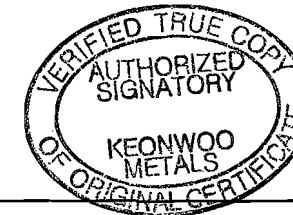
	AE1 (J)	AE2 (J)	AE3 (J)	AE4 (J)	AE5 (J)	AE Avg (J)
Required: Min	14	14	14			18
Max						

Heat	Control Lot	Pipe N°	AE1 (J)	AE2 (J)	AE3 (J)	AE Avg (J)
128147	030002365791	2	282	286	284	284

AE - Absorbed Energy;

Remarks:

MATERIAL IN ACCORDANCE TO ITEM A.2 NACE MR 0175/ISO 15156-2/2003 &
MR 01-03.
NO WELD REPAIR.
NORMALIZED AT 922°C.





ISO 9001
ISO 14001
ISO/TS 16949
OHSAS 18001
ISO 50001
BUREAU VERITAS
Certification



Inspection Certificate

(According to DIN EN 10204.3.1)

Nº: 0030029786

Sheet: 3 / 3

Qlsung ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 05. 2014

☒ REVIEWED
☒ WITNESSED
Date / Signature:
Germanischer Lloyd Industrial Services

We hereby certify that this product has been manufactured and examined in accordance with all requirements of the standards and specifications and all the results are found to be satisfactory. This testimonial and certificate respectively is recorded by a computer system and is valid without signature. Alteration or use for others products are regarded as falsification of documents and will be subject to criminal jurisdiction.

QUALITY CONTROL DEPARTMENT

FAX: (55-31) 3328-2587

e-mail: luiz.silva@vallourec.com

DATE
04.29.2014

ENG. LUIZ FERNANDO DA SILVA - CREA MG-58834-D
TECHNICAL RESPONSIBLE

ECO TUBES: The tubes from Vallourec do Brasil S.A. are manufactured with steel which uses charcoal as a source of energy in its production. This coal comes from more than 100.000 ha of forest planted by Vallourec Florestal Ltda.. With the acquisition of 10,8 ton(s) of steel tubes from Vallourec do Brasil S.A., your company contributed to the reduction of the greenhouse effect, avoiding the accumulation of 19,4 ton(s) of Carbon Dioxide CO2 in the atmosphere.

INSPECTION CERTIFICATE

CUSTOMER : (주)일성

NO. 2014-14627

DATE : 2014.09.18

309, Chungnyeol-ro, Yangsan-si,
Gyeongsangnam-do**JEIL E & S CO., LTD.**NAME OF PRODUCTS : JIC 3834-R-SF-304-SS
[SPIRAL WOUND GASKET]

SIZE : 150LB 2" 4.5T

LOT NO : 201409030023020

COMPLIES WITH : ASME B16.20

DATE OF TEST : 2014.09.17

QUANTITY : 4 EA

<u>TEST ITEMS</u>	<u>MATERIAL SPEC</u>	<u>RESULT</u>
RAW MATERIAL		
FILLER	GRAPHITE PAPER	GRAPHITE PAPER
HOOP	STS304	STS304
OUTER RING	CARBON STEEL	CARBON STEEL
INNER RING	STS304	STS304

COMPRESSION LOAD TEST

AIR (N2 GAS) TEST Kgf/Cm2 10.00 NO-LEAKAGE

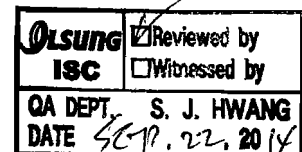
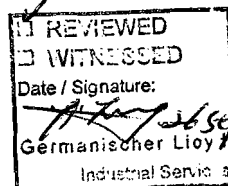
RECOVERY(*100) Min.mm 25.40 26.20

APPEARANCE *SG 07*
E-11570, 11580
T3, T4 GASKET (-006-10) ACCORDING TO TECHNICAL
STANDARD TS-B101(REV.4) Accept

DIMENSION ACCORDING TO TECHNICAL
STANDARD TS-B101(REV.4) Accept

TEST CERTIFICATE IS ISSUED ACCORDING TO EN10204 3.1

PO NO : P-13SG-007

REMARKS_____
SURVEYOR_____
INSPECTOR

INSPECTION CERTIFICATE**SamSung
Metal Co., Ltd**8, Cheoyongsaneop 1-Gil, Onsan-Eup, Ulsan-Gun, Ulsan, Korea TEL : 82-52-275-0758
http://www.metalsamsung.com FAX : 82-52-271-7079

DESCRIPTION : STUD BOLT / 2 HEAVY HEX NUT SA320-L7M / SA194-7M

P/O NO. : DE-13SG-007-30

CERTIFICATE NO. : SMIS14-0068

REPORT TO : ILSUNG

DATE ISSUED : 2014. 09. 30.

DESCRIPTION

HEAT TREATMENT (°C)

STAMP NO.	NOUN	DIMENSION	QUANTITY	MATERIAL	HEAT NO.	ANNEAL	QUENCH	TEMPER
01	BOLT	5/8"x95L-11UNC	16 EA	SA320-L7M	667341		860	720
02	NUT	5/8"-11UNC	32 EA	SA194-7M	645840		860	650

STAMP
NO.

DESCRIPTION

CHEMICAL COMPOSITION (%)

C

Si

Mn

P

S

Ni

Cr

Mo

STANDARD

SA320-L7M

0.38-0.48

0.15-0.35

0.75-1.00

max0.035

max0.040

0.80-1.10

0.15-0.25

SA194-7M

0.37-0.49

0.15-0.35

0.65-1.10

max0.035

max0.04

0.75-1.20

0.15-0.25

DECISION

01

BOLT

0.41

0.23

0.90

0.019

0.009

0.99

0.15

02

NUT

0.41

0.23

0.88

0.017

0.01

0.99

0.18

STAMP
NO.

DESCRIPTION

MECHANICAL PROPERTIES

YIELD
STRENGTHTENSILE
STRENGTH

ELONGATION

REDUCTION
OF AREAHARDNESS
TESTPROOF LOAD
TESTIMPACT TEST
at -73°CSample Nut Hardness
after 590°C x 24h

STANDARD

SA320-L7M

ksi
min80ksi
min100%
min18%
min50HRB
max99

min ave27J

SA194-7M

HRB
84-99

33900 lbf

min ave27J

HRB
min84

DECISION

01

BOLT

98

125

22

58

96

78,78,75

02

NUT

95

GOOD

72,73,70

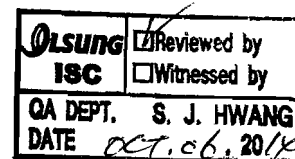
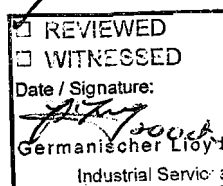
98

We hereby certify that the material described here in has been satisfactorily tested in accordance with the above specification and the requirements called for by the above order. Conform EN 10204 3.1 / ISO 10474 3.1

REMARKS § App. Code : ASME Section II Part A 2010 Edition

Macroetch Test : GOOD

SG-01

E-11570, 11580 : T3, T4 Bolt/NUT
G-006-11)

MANAGER OF QUALITY CONTROL :

PARK. H. H

6. Nondestructive Examination Report (RT, UT, MT, PT)

CCK-4511951391-0100-K01-00001-074

PWHT: NO

CODE STAMP: YES

RADIOGRAPHY EXAMINATION MAP

(OUTLINE SKETCH OF RADIOGRAPHY)

DATE.

DEC. 05. 2014.

W/O NO.

P-13SG-007

PROJECT NAME

CARMON CREEK PROJECT

P/O. NO.

4511951391

CUSTOMER

SHELL CANADA ENERGY

DWG NO.

VP-SG07-E-11570-001

ITEM NAME

VRU INLET GAS COOLER

ITEM NO.

E-11580

APPLICABLE
CODE AND STD.ASME SEC.VIII DIV.1 2010 ED.+2011 ADD.+API 680 (8th ED.2007)
PROCEDURE NO:VP-SG07-COMM-010
(ISC-RT-06)RT
CONDITION

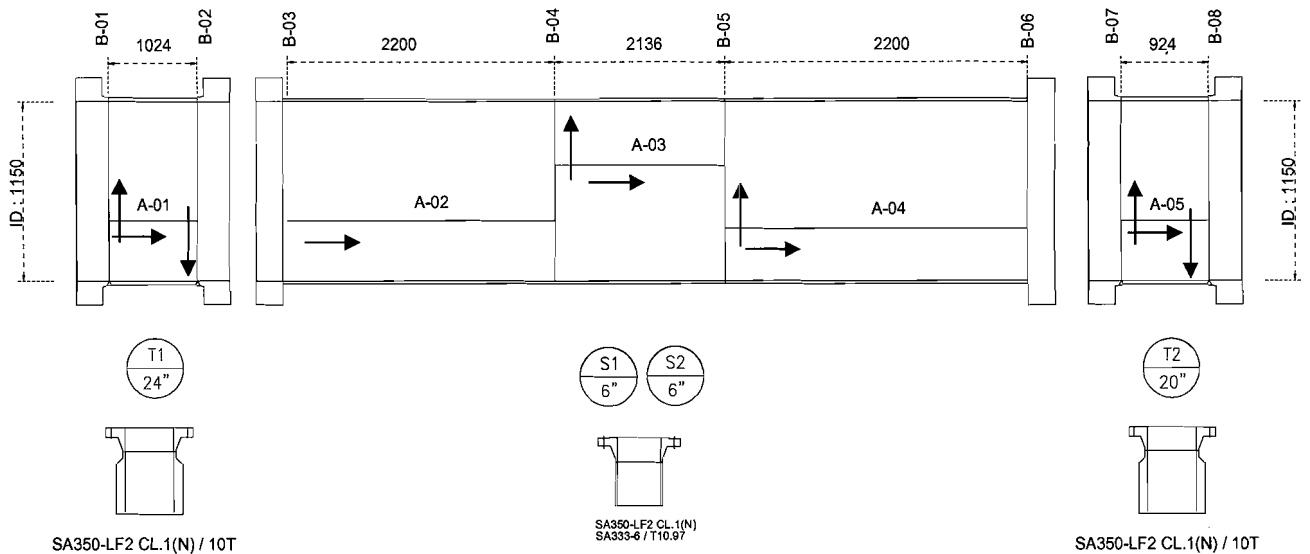
100%

MATERIAL
SPEC. AND TH'K.SHELL : SA516-70N 17T / CHANNEL : SA240-S31803
15TTOTAL
SHEETS

167 SHEETS

SKETCH

*TUBE SIDE SOUR SERVICE



TUBE SIDE (100%)

SHELL SIDE (100%)

TUBE SIDE (100%)

A-01: 5

A-02: 10

B-04: 18

A-05: 4

B-01: 17

A-03: 10

B-05: 17

B-07: 17

B-02: 17

A-04: 10

B-08: 17

T1-B01: 9

S1-B01: 4

S2-B02: 4

T2-B01: 8



PREPARED BY

REVIEWED BY

APPROVED BY

☐ WITNESSED BY
☐ REVIEWED BY

S.S. LEE

S.J. HWANG

J.B. Lee

방사선 투과 시험 보고서

ASME

ILSUNG

ILSUNG CORPORATION

Report No.

IS-APN-E-11580-RT-001

Page 1 of 2

Customer 주문주	SHELL CANADA ENERGY	Project Name 공사명	CARMON CREEK PROJECT
Item Name 품명	VRU INLET GAS COOLER	Traveller/PCS NO. 트레블라	N/A
Item No. 부품번호	E-11580	Work Order No. 공사번호 P/O No.	P-13SG-007 4511951391
Densitometer I.D No. 농도계 기기번호	06013399	Material / Thickness 재질/부재두께	SA333-6+SA350-LF2.CL1 10.97 ☒ mm
Shooting Position 투과위치	☐ Single 단일벽 ☒ Double 이중벽 ☐ Panoramic 원환식	Dwg. No. 도면번호	VP-SG07-E11570-001 Rev.
View 판독	☒ Single 한장 ☐ Double 두장	Weld Thick/Reinforcement 용접두께/용접덧살	10.97 ☒ mm 2 ☒ mm
Joint Config. 용접모양	BUTT JOINT	Penetrameter/Constrometer 투과도계/계조계	ASTM 1B ☐ S. Side N/A ☒ F. Side
X-ray Equipment/Radioisotope 엑스레이 장비/동위원소	N/A KVP mA ☒ Ir-192 ☐ CO-60 35 Ci	Shim Thickness 심 두께	N/A ☐ inch ☐ mm
Focal Spot Size/Source Size 초점 크기	3.0 X 3.0 ☐ inch ☒ mm	Sensitivity Wire type 감도/최소식별도	0.016(W8) ☒ inch ☐ mm
Exposure Time 노출 시간	hr min sec ~ hr 01 min 20 sec	Film Type/Brand/Size 필름 타입/크기	TYPE I / Fuji #80 3 1/3" x 12"
Source to Object Distance 촬영거리(MIN)	150 ☐ inch ☒ mm	Screen 스크린	Front 0.005 ☒ inch Back ☐ mm
Source side of Object to Film Distance 필름거리 (MAX)	12.97 ☐ inch ☒ mm	"B" Attached	☒ Yes 유 ☐ No 무
Specified Density 특화도	2.0 ~ 4.0	Lead Backing 산란방지 납판	☒ Yes 유 ☐ No 무
Surface Condition 표면상태	☐ As Ground 연마 ☒ As Welded 용접	Procedure/Acc. Criteria 절차서 / 판정기준	VP-SG07-COMM-010 Rev. (ISC-RT-06) ASME SEC.VIII DIV.1 2010ED.+2011ADD. UW-51, API660(8th ED.2007)
No. Of Exposures 노출횟수	8	No. Film/Cassette Cassette 내 Film 매수	1 SH'T
Exposure Setup		Total Sheet 8 SH'T 촬영매수	
		Remarks 	
Location Marker Placement ☐ Source Side ☒ Film Side			
Examined by 시험 C.J.KWON	Level 레벨 II	☒ Date of Examination 검사일자 2014.08.13 ☒ Date of Report 보고서 작성일자 2014.08.18	
APN Co., Ltd.		Owner/Customer 주문주/고객감독관	
Approved by 승인 B.M.SHIM	Level 레벨 III	☒ Reviewed ☐ Witnessed ☐ Third Party Inspector 공인검사관	
APN Co., Ltd.		☒ REVIEWED ☐ WITHESSED Date / Signature: Germanischer Lloyd Industrial Services	

ILSUNG CORPORATION

ASME

IS-APN-E-11580-RT-001

Page 2 of 2

☒ REVIEWED
☐ WITNESSED
Date / Signature: *[Signature]* 03 Sep
Germanischer Lloyd
Industrial Services

Level
레벨

 A P N Co., Ltd.



ILSUNG CORPORATION

ASME

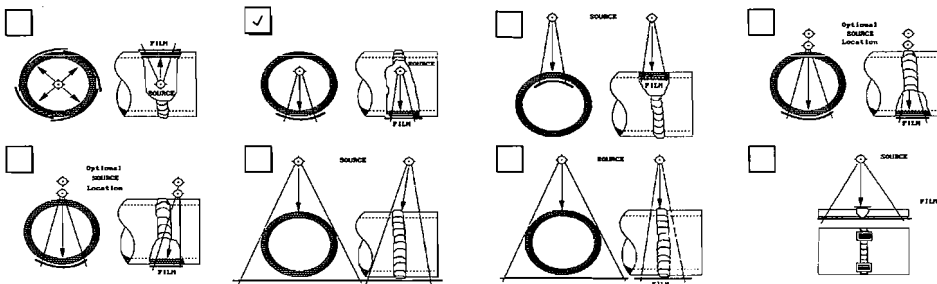
Report No.

IS-APN-E-11580-RT-002

Page 1 of 3

Customer 주문주	SHELL CANADA ENERGY	Project Name 공사명	CARMON CREEK PROJECT
Item Name 품명	VRU INLET GAS COOLER	Traveller/PCS NO. 트레블라	N/A
Item No. 부품번호	E-11580	Work Order No. 공사번호 P/O No.	P-13SG-007 4511951391
Densitometer I.D No. 농도계 기기번호	06013399	Material / Thickness 재질/부재두께	SA516-70N 17 ☒ mm
Shooting Position 투과위치	☒ Single 단일벽 ☐ Double 이중벽 ☐ Panoramic 원환식	Dwg. No. 도면번호	VP-SG07-E11570-001 Rev.
View 판독	☒ Single 한장 ☐ Double 두장	Weld Thick/Reinforcement 용접두께/용접덧살	17 ☒ mm 2 ☒ mm
Joint Config. 용접모양	BUTT JOINT	Penetrameter/Constrometer 투과도계/계조계	ASTM 1B ☒ S. Side N/A ☐ F. Side
X-ray Equipment/Radioisotope 엑스레이 장비/동위원소	N/A KVP mA ☒ Ir-192 ☐ CO-60 50 Ci	Shim Thickness 심 두께	N/A ☐ inch ☐ mm
Focal Spot Size/Source Size 촉점크기	3.0 X 3.0 ☐ inch ☒ mm	Sensitivity Wire type 감도/최소식별도	0.016(W8) ☒ inch ☐ mm
Exposure Time 노출시간	hr min sec ~ hr 4 min 00 sec	Film Type/Brand/Size 필름타입/크기	TYPE I / Fuji #80 4 1/2" x 12"
Source to Object Distance 촬영거리(MIN)	500 ☐ inch ☒ mm	Screen 스크린	Front Back 0.005 ☒ inch ☐ mm
Source side of Object to Film Distance 필름거리 (MAX)	19 ☐ inch ☒ mm	"B" Attached	☒ Yes 유 ☐ No 무
Specified Density 흑화도	2.0 ~ 4.0	Lead Backing 산란방지 납판	☒ Yes 유 ☐ No 무
Surface Condition 표면상태	☐ As Ground 연마 ☒ As Welded 용접	Procedure/Acc. Criteria 절차서 / 판정기준	VP-SG07-COMM-010 Rev. (ISC-RT-06) ASME SEC.VIII DIV.1 2010ED.+2011ADD. UW-51 API660(8th ED.2007)
No. Of Exposures 노출횟수	30	No. Film/Cassette Cassette 내 Film 매수	1 SH'T

Exposure Setup

Location Marker Placement ☐ Source Side ☒ Film Side

Total Sheet 30 SH'T

Remarks: Reviewed by
ISC ☐ Witnessed by
QA DEPT.
ASNT Level III S.S. LEE
Card No. 210561
DATE Aug. 28. 2014

Examined by

시험 C.J.KWON

Level

레벨 II

☒ Date of Examination 검사일자 2014.08.16~21
☒ Date of Report 보고서 작성일자 2014.08.22

A P N Co., Ltd.

Approved by

승인 B.M.SHIM

Level

레벨 III

Owner/Customer 주문주/고객감독관

☒ Reviewed
☐ Witnessed

☐ Third Party Inspector 공인검사관

☒ REVIEWED
☐ WITNESSED

Date / Signature

Germanischer Lloyd
Industrial Services

방사선 투과 시험 보고서



ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11580-RT-002

Page 2 of ~~22~~ 23

Joint No. 합 인 번 호	Film No. 필름번호	합	Reject	① Crack	② Lack of Penet.	③ Lack of Fusion	④ Slag Inclusion	⑤ Porosity	⑥ Undercut	⑦ Burn through	⑧ Tungsten Incl.	⑨ Surface Indications	⑩ Crater pit	⑪ Root Concavity	기 타	Grade 등급	Reject Cause 불합격 원인	Welder ID No. 용접사번호	Remarks 비 고
E-11580																			
A02	1 - 2	V						V										1015	
	2 - 3	V																1015	
	3 - 4	V																1015	
	4 - 5	V																1015	
	5 - 6	V																1015	
	6 - 7	V																1015	
	7 - 8	V																1015	
	8 - 9	V																1015	
	9 - 10	V																1015	
	10 - E	V																1015	
A03	1 - 2	V																1015	
	2 - 3	V																1015	
	3 - 4	V																1015	
	4 - 5	V																1015	
	5 - 6	V																1015	
	6 - 7	V																1015	
	7 - 8	V																1015	
	8 - 9	V																1015	
	9 - 10	V																1015	
	10 - E	V																1015	
A04	1 - 2	V																1015	
	2 - 3	✓																1015	
	3 - 4	V																1015	
	4 - 5	V																1015	
	5 - 6	V					V											1015	

JIS B 1000
 ICG
 QA DEPT.
 ASNT Level III S.S. LEE
 Cert No. 210561
 DATE Aug 8, 2014

☒ REVIEWED
☒ WITNESSED
 Date / Signature:
 Germanischer Lloyd
 Industrial Service

Examined by C. J. KWON
시정

Level **II**
레벨

Approved by
승 인

B.M. SHIM

Level
레벨

 A P N Co., Ltd.

 A P N Co., Ltd.

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IS-APN-E-11580-RT-002

Page 3 of 3



ILSUNG CORPORATION

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Date / Signature: *[Signature]* 03 Sep
Germanischer Lloyd
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레벨

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방사선 투과 시험 보고서

ASME

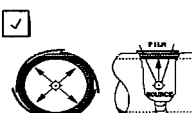
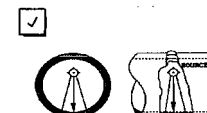
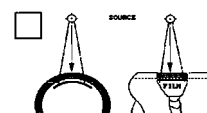
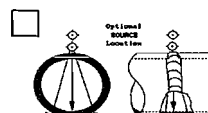
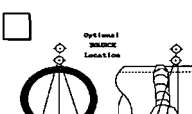
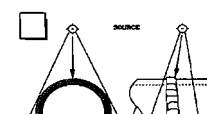
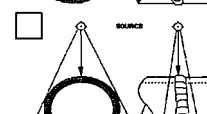
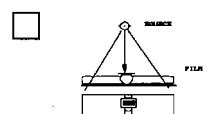
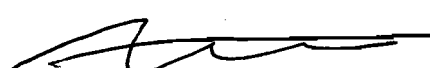
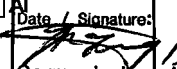
ILSUNG

ILSUNG CORPORATION

Report No.

IS-APN-E-11580-RT-003

Page 1 of 3

Customer 주 문 주	SHELL CANADA ENERGY	Project Name 공사명	CARMON CREEK PROJECT
Item Name 품명	VRU INLET GAS COOLER	Traveller/PCS NO. 트레블라	N/A
Item No. 부품번호	E-11580	Work Order No. 공사번호 P/O No.	P-13SG-007 4511951391
Densitometer I.D No. 농도계 기기번호	06013399	Material / Thickness 재질/부재두께	SA516-70N 10, 15 ☒ mm
Shooting Position 투 과 위 치	☒ Single 단일벽 ☐ Double 이중벽 ☒ Panoramic 원환식	Dwg. No. 도면번호	VP-SG07-E11570-001 Rev. 
View 판독	☒ Single 한장 ☐ Double 두장	Weld Thick/Reinforcement 용접두께/용접덧살	10, 15 ☒ mm 2 ☒ mm
Joint Config. 용 접 모 양	BUTT JOINT	Penetrameter/Constrometer 투과도계/계조계	ASTM 1B ☒ S. Side N/A ☐ F. Side
X-ray Equipment/Radioisotope 엑스레이 장비/동위원소	N/A KVP mA ☒ Ir-192 ☐ CO-60 40 Ci	Shim Thickness 심 두께	N/A ☐ inch ☐ mm
Focal Spot Size/Source Size 촉 점 크 기	3.0 X 3.0 ☐ inch ☒ mm	Sensitivity Wire type 감도/최소식별도	0.013(W7), 0.016(W8) ☒ inch ☐ mm
Exposure Time 노 출 시 간	hr min 55 sec ~ hr 4 min 30 sec	Film Type/Brand/Size 필름 타 입/크기	TYPE I / Fuji #80 4 1/2" x 12"
Source to Object Distance 촬영거리(MIN)	250 ~ 500 ☐ inch ☒ mm	Screen 스크린	Front Back 0.005 ☒ inch ☐ mm
Source side of Object to Film Distance 필름거리 (MAX)	12, 17 ☐ inch ☒ mm	"B" Attached	☒ Yes 유 ☐ No 무
Speafied Density 흑 화 도	2.0 ~ 4.0	Lead Backing 산란방지 납판	☒ Yes 유 ☐ No 무
Surface Condition 표 면 상 태	☐ As Ground 연마 ☒ As Welded 용접	Procedure/Acc. Criteria 절차서 / 판정기준	VP-SG07-COMM-010 Rev.  (ISC-RT-06) ASME SEC.VIII DIV.1 2010ED.+2011ADD. UW-51 API660(8th ED.2007)
No. Of Exposures 노 출 횟 수	11	No. Film/Cassette Cassette 내 Film 매수	1 SH'T
Exposure Setup		Total Sheet 촬영 매 수 26 SH'T	
☒  ☒  ☐  ☐  ☐  ☐  ☐  ☐  Location Marker Placement ☐ Source Side ☒ Film Side		Remarks  ☒ Reviewed by ISC ☐ Witnessed by QA DEPT. ASNT Level III S.S. LEE Certi No. 210561 DATE Oct. 7. 2014	
Examined by 시 형	C.J.KWON 	Level 레벨 II	☒ Date of Examination 검사일자 2014.09.13 ~ 30 ☒ Date of Report 보고서 작성일자 2014.10.01
Approved by 승 인	B.M.SHIM 	Level 레벨 III	Owner/Customer 주문주/고객감독관 ☒ Reviewed ☐ Witnessed ☐ Third Party Inspector 공인검사관 ☐  ☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Industrie

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ILSUNG CORPORATION

IS-APN-E-11580-RT-003

Page 2 of 2

QC	1	Reviewed by
ISC	☐	Witnessed by
QA DEPT.		
ASNT level III		S. S. LEE
Certi No.	210551	
DATE	07	7.20

☒ REVIEWED
☐ WITNESSED
Date / Signature:
7/7/50
Germanischer Lloyd
Industrial Services

Level **III**
레벨

 A P N Co., Ltd.

방사선 투과 시험 보고서



ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11580-RT-003

Page 3 of 3[illegible]

Examined by C. J. KWON
시 험 _____

Level **II**
레벨

Approved by
승 인

B.M.SHIM

Level
레벨 III

 A P N Co., Ltd.

 A P N Co., Ltd.

ILSUNG

ILSUNG CORPORATION

ASME

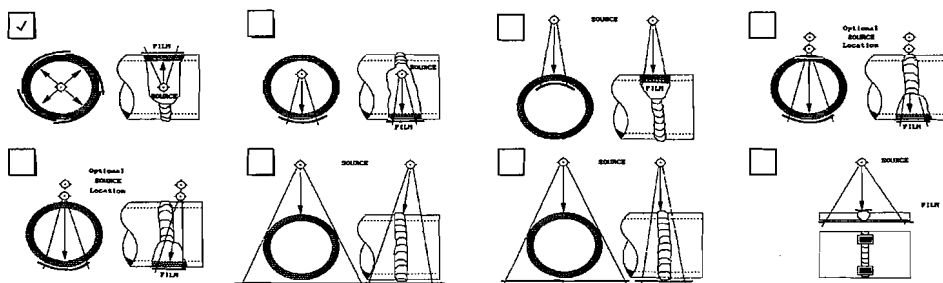
Report No.

IS-APN-E-11580-RT-004

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Customer 주 문 주	SHELL CANADA ENERGY	Project Name 공사명	CARMON CREEK PROJECT
Item Name 품명	VRU INLET GAS COOLER	Traveller/PCS NO. 트레블라	N/A
Item No. 부품번호	E-11580	Work Order No. 공사번호 P/O No.	P-13SG-007 4511951391
Densitometer I.D No. 농도계 기기번호	06013399	Material / Thickness 재질/부재두께	SA240-S31803 15 ☒ mm
Shooting Position 투 과 위 치	☒ Single 단일벽 ☐ Double 이중벽 ☒ Panoramic 원환식	Dwg. No. 도면번호	VP-SG07-E11570-001 Rev.
View 판독	☒ Single 한장 ☐ Double 두장	Weld Thick/Reinforcement 용접두께/용접덧살	15 ☒ mm 2 ☒ mm
Joint Config. 용 접 모 양	BUTT JOINT	Penetrameter/Constrometer 투과도계/계조계	ASTM 1B ☒ S. Side N/A ☐ F. Side
X-ray Equipment/Radioisotope 엑스레이 장비/동위원소	N/A KVP mA ☒ Ir-192 ☐ CO-60 35 Ci	Shim Thickness 심 두께	N/A ☐ inch ☐ mm
Focal Spot Size/Source Size 촬 정 크 기	3.0 X 3.0 ☐ inch ☒ mm	Sensitivity Wire type 감도/최소식별도	0.016(W8) ☒ inch ☐ mm
Exposure Time 노출 시간	hr min sec ~ hr 7 min 30 sec	Film Type/Brand/Size 필름 타입/크기	TYPE I / Fuji #80 4 1/2" x 12"
Source to Object Distance 촬영거리(MIN)	575 ☐ inch ☒ mm	Screen 스크린	Front 0.005 ☒ inch Back ☐ mm
Source side of Object to Film Distance 필름거리 (MAX)	17 ☐ inch ☒ mm	"B" Attached	☒ Yes 유 ☐ No 무
Speafied Density 특 화 도	2.0 ~ 4.0	Lead Backing 산란방지 납판	☒ Yes 유 ☐ No 무
Surface Condition 표 면 상 태	☐ As Ground 연마 ☒ As Welded 용접	Procedure/Acc. Criteria 절차서 / 판정기준	VP-SG07-COMM-010 Rev. (ISC-RT-06) ASME SEC.VIII DIV.1 2010ED.+2011ADD. UW-51 API660(8th ED.2007)
No. Of Exposures 노출 횟수	3	No. Film/Cassette Cassette 내 Film 매수	1 SH'T

Exposure Setup

Location Marker Placement ☐ Source Side ☒ Film Side

Total Sheet

51

SH'T

Remarks

☒ Reviewed by
☒ Witnessed by
 QA DEPT.
 ASNT Level II S.S. LEE
 Cert No. 210501
 DATE 2014.10.20

Examined by

시 험

C.J.KWON

Level

II

☒ Date of Examination 검사일자 2014.10.28 ~ 29
☒ Date of Report 보고서 작성일자 2014.10.31

A P N Co., Ltd.

Owner/Customer 주문주/고객감독관

Approved by

승 인

B.M.SHIM

Level

III

Reviewed

Third Party Inspector 공인검사관

A P N Co., Ltd.

☒ REVIEWED
☐ WITNESSED
 Date / Signature:
 Germanischer Lloyd
 Industrial Servi

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Page 2 of 4

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☐ WITNESSED
Date / Signature:

Germanischer
Industrial

ASME

Page 4 of 4



☒ REVIEWED
☐ WITNESSED
Date / Signature: 
Germanischer Lloyd
Industrial Services

 A P N Co., Ltd.

방사선 투과 시험 보고서

ILSUNG

ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11580-RT-005

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Customer 주 문 주	SHELL CANADA ENERGY	Project Name 공사명	CARMON CREEK PROJECT
Item Name 품명	VRU INLET GAS COOLER	Traveller/PCS NO. 트레블라	N/A
Item No. 부품번호	E-11580	Work Order No. 공사번호 P/O No.	P-13SG-007 4511951391
Densitometer I.D No. 농도계 기기번호	06013399	Material / Thickness 재질/부재두께	SA516-70N, SA240-S31803 15, 17 ☒ mm
Shooting Position 투과위치	☐ Single 단일벽 ☐ Double 이중벽 ☒ Panoramic 원환식	Dwg. No. 도면번호	VP-SG07-E11570-001 Rev.
View 판독	☒ Single 한장 ☐ Double 두장	Weld Thick/Reinforcement 용접두께/용접덧살	15, 17 ☒ mm 2 ☒ mm
Joint Config. 용접모양	BUTT JOINT	Penetrameter/Constrometer 투과도계/계조계	ASTM 1B ☒ S. Side N/A ☐ F. Side
X-ray Equipment/Radioisotope 엑스레이 장비/동위원소	N/A KVP mA ☒ Ir-192 ☐ CO-60 40 Ci	Shim Thickness 심 두께	N/A ☐ inch ☐ mm
Focal Spot Size/Source Size 초점 크기	3.0 X 3.0 ☐ inch ☒ mm	Sensitivity Wire type 감도/최소식별도	0.016(W8) ☒ inch ☐ mm
Exposure Time 노출 시간	hr 5 min 00 sec ~ hr 6 min 30 sec	Film Type/Brand/Size 필름 타입/입/크기	TYPE I / Fuji #80 4 1/2" x 12"
Source to Object Distance 촬영거리(MIN)	500 ~ 575 ☐ inch ☒ mm	Screen 스크린	Front Back 0.005 ☒ inch ☐ mm
Source side of Object to Film Distance 필름거리 (MAX)	17 ☐ inch ☒ mm	"B" Attached	☒ Yes 유 ☐ No 무
Specified Density 특화도	2.0 ~ 4.0	Lead Backing 산란방지 납판	☒ Yes 유 ☐ No 무
Surface Condition 표면상태	☐ As Ground 연마 ☒ As Welded 용접	Procedure/Acc. Criteria 절차서 / 판정기준	VP-SG07-COMM-010 Rev. (ISC-RT-06) ASME SEC.VIII DIV.1 2010ED.+2011ADD. UW-51 API660(8th ED.2007)
No. Of Exposures 노출횟수	4	No. Film/Cassette Cassette 내 Film 매수	1 SHT
Exposure Setup			Total Sheet 촬영매수 52 SHT
Location Marker Placement ☐ Source Side ☒ Film Side			Remarks Reviewed by: [Signature] Date: 2014.12.01 Dec 1, 2014
Examined by 시 형	C.J.KWON	Level 레벨	II
APN Co., Ltd.		☒ Date of Examination 검사일자 2014.10.29 ~ 11.28 ☒ Date of Report 보고서 작성일자 2014.12.01	
Approved by 승 인	B.M.SHIM	Level 레벨	III
APN Co., Ltd.		Owner/Customer 주문주/고객감독관 ☒ Reviewed ☐ Witnessed ☐ Third Party Inspector 공인검사관 2013.11.14	

방사선 투과 시험 보고서

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Report No. **IS-APN-E-11580-RT-005**

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Joint No. 확인번호 E-11580	Film No. 필름번호	합 Accept	불 Reject	균열 ① Crack	관통 ② Lack of Penet.	용접 ③ Lack of Fusion	슬래그 ④ Slag Inclusion	기공 ⑤ Porosity	언더컷 ⑥ Undercut	번스루 ⑦ Burn through	텅스텐 ⑧ Tungsten Incl.	표면지시 ⑨ Surface Indications	크레이터 ⑩ Crater pit	루트 ⑪ Root Concavity	기 다	Grade 등급	Reject Cause 불합격 원인	Welder ID No. 용접사번호	Remarks 비고
B02	1 - 2	V																1279	
	2 - 3	V																1279	
	3 - 4	V																1279	
	4 - 5	V																1279	
	5 - 6	V																1279	
	6 - 7	V																1279	
	7 - 8	V																1279	
	8 - 9	V																1279	
	9 - 10	V																1279	
	10 - 11	V																1279	
	11 - 12	V																1279	
	12 - 13	V																1279	
	13 - 14	V																1279	
	14 - 15	V																1279	
	15 - 16	V																1279	
	16 - 17	V						V										1279	
	17 - 1	V																1279	
B04	1 - 2	V																1279	
	2 - 3	V																1279	
	3 - 4	V						V										1279	
	4 - 5		V				V											1279	
	4 - 5R	V																1279	
	5 - 6	V																1279	
	6 - 7	V																1279	
	7 - 8	V																1279	

Examined by C. J. KWON  Level II
 승인
 Approved by B. M. SHIM  Level III
 승인

 A P N Co., Ltd.
  A P N Co., Ltd.

[X] REVIEWED
 [X] WITNESSED
 Date / Signature:

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 Industrial

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Page 4 of 4

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☐ WITNESSED
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Germanischer Lloyd
Industrial Services

Level
레벨

 **A P N Co., Ltd.**

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상시험보고서

ASME

ILSUNG

ILSUNG CORPORATION

Report No.

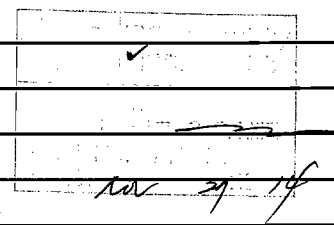
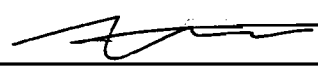
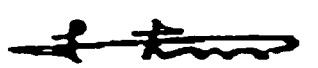
IS-APN-E-11580-REP-MT-001

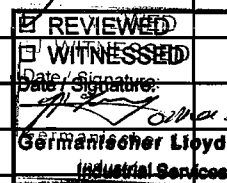
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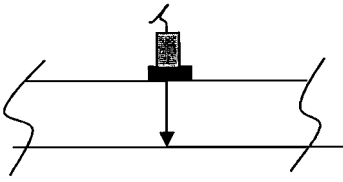
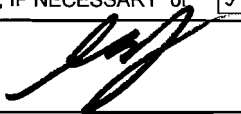
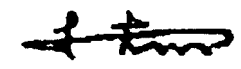
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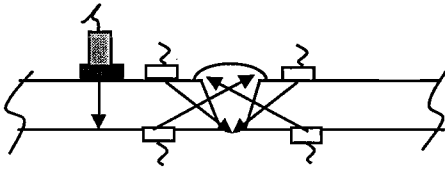
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-MT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.6 + API 660 (8th ED. 2007) Rev. 	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Material/Thickness 재질/두께 SA516-70(N) / 17T		Method 검사방법 ☒ Wet 습식 ☐ Dry 건식		Particle 자분 ☒ Color 염색 ☐ Fluorescent 형광	
Magnetization 자화방법 ☒ Yoke 요오크 ☐ Prod 프로드 ☐ _____		Direction 자화방향 ☒ Long 선형 ☐ Circular 원형 ☐ Both 혼합형		Equipment 장비 Brand 상품명 : NAWOO Model No. 모델 : MY-2 Output 출력 : 10 lb	
Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux		Applying Current 통전법 ☒ Continuous 연속 ☐ Residual 잔류 Magnetization Current 자화전류 ☒ AC 교류 ☐ DC 직류 Current 전류 220V , 2.6A Amps 암페어	
Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ $\mu W/cm^2$		Spacing 거리 ☒ in ☐ cm 4 ~ 6	
Demagnetization 탈자 ☐ Yes 필요 ☒ No 불필요					
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판정	Grade 등급	Remarks 비고
B04(4-5)	V		No Recordable Indication		Repaired area
			~ BLANK ~		
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시험 C.J. KWON 			Level 레벨 II		
Approved by 승인 B.M. SHIM 			Level 레벨 III		
A P N Co., Ltd.			Owner/Customer주문주/고객감독관		
A P N Co., Ltd.			☐ Third Party Inspector공인검사관 ☐ ANI/AI		



초음파탐상시험보고서

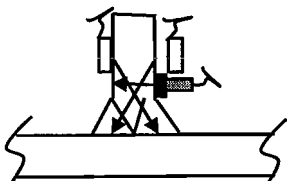
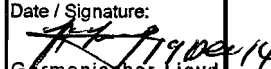
 ILSUNG CORPORATION		ASME		Report No.	
				IS-APN-E-11580-UT-DF001	
Project Name 공사명		Customer 주문주		Dwg. No. 도면번호	
CARMON CREEK PROJECT		SHELL CANADA ENERGY		VP-SG07-E11580-001	
Traveller/PCS No. 트레블라		Work Order No. & P/O No. 공사번호		Procedure /Acc. Criteria 절차서/판정기준	
N/A		P-13SG-007 / 4511951391		N/A	
Item Name 품명		Item No. 부품번호		Joint No. 용접선 번호	
VRC INLET GAS COOLER		E-11580		SEE IDENT.NO	
Joint Config 용접모양		Method 시험방법		Surface Condition 표면상태	
N/A		☒ Contact 접촉 ☐ Immerse 수침		AS MACHINED	
Test Temp. 시험온도		Test Equipment 시험장비		Material/Thickness 재질/두께	
☒ Ambient 상온 ☐ Elev. 승온		EPOCH XT		SA182-F51(S31803) , SA765-II + S31803 CLAD / 83,98,143T	
Type 형태		Manufacturer 제조사		Serial No. 일련번호	
B2S		OLYMPUS		081113804	
Block Angle 교정각도		Due Date 만료일자		2015.06.12	
0°					
Frequency 주파수		Type 형태		Manufacturer 제조사	
2MHz		EPOCH XT		OLYMPUS	
Size 크기		Serial No. 일련번호		Type 형태	
24Ø		57745-59903		Lemo00+ Lemo00	
Manufacturer 제조사		Cable 케이블		Length 길이	
MWB				2M	
Serial No. 일련번호		Manufacturer 제조사		Manufacturer 제조사	
57745-59903				KrautKramer	
Test Angle 시험각도		Couplant 점촉매질		Calibration Block 교정블록	
☒ 0° ☐ 45° ☐ 60° ☐ 70°		☐ Glycerin 글리세린 ☒ Oil 오일 ☐ CMC		IIW, REFERENCE BLOCK	
Ident. No. 확인번호		Accept		Reject	
Channel flange		V			
Channel cover		V			
Channel cover flange		V			
Stationary tubesheet		V			
				~ B L A N K ~	
Sketch of Scanning					
					
☐ SKETCH ON DOT LINE, IF NECESSARY or ☒ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 형		Level		☒ Date&Time of Examination 검사일자/시간	
S.M.LEE		II		2014.08.27	
		레벨		☒ Date of Report 보고서 작성일자	
A P N Co., Ltd.				2014.08.27	
Approved by 승인		Level		☐ Owner/Customer주문주/고객감독관	
B.M. SHIM		III		☐ Third Party Inspector공인검사관	
		레벨		☐ ANI/AI	
A P N Co., Ltd.					

초음파탐상시험보고서

		ASME ILSUNG CORPORATION		Report No.	
				IS-APN-E-11580-UT-001	
Project Name 공사명		Customer 주문주		Dwg. No. 도면번호	
CARMON CREEK PROJECT		SHELL CANADA ENERGY		VP-SG07-E10070-001 Rev. 	
Traveller/PCS No. 트레블러		Work Order No. & P/O No. 공사번호		Procedure /Acc. Criteria 절차서/판정기준	
N/A		P-13SG-007 / 4511951391		VP-SG07-COMM-010(ISC-UT-06) Rev. 	
Item Name 품명		Item No. 부품번호		Joint No. 용접선 번호	
VRU INLET GAS COOLER		E-11580		SEE IDENT.NO	
Joint Config 용접모양		Method 시험방법		Surface Condition 표면상태	
Butt Joint		☒ Contact 접촉 ☐ Immerse 수침		AS WELDED and AS GROUND	
Material/Thickness 재질/두께		SA240-S31803 / 15T			
Test Temp. 시험온도		Test Equipment 시험장비		Type 형태	
☒ Ambient 상온 ☐ Elev. 승온				EPOCH XT	
Manufacturer 제조사		Serial No. 일련번호		Due Date 만료일자	
OLYMPUS		081113804		2015.06.12	
Transducer 탐촉자	Type 형태	Block Angle 교정각도	Frequency 주파수	Size 크기	Manufacturer 제조사
	MSEB4	0°	4MHz	10Ø	MWB
	4C8X15LAD45	45°	4MHz	8*15	TKS
	4C8X15LAD70	70°	4MHz	8*15	TKS
Cable 케이블		Type 형태		Length 길이	Manufacturer 제조사
Lemo00+ Lemo01		2M		KrautKramer	
Test Angle 시험각도		Couplant 접촉매질		Calibration Block 교정블록	
☒ 0° ☒ 45° ☐ 60° ☒ 70°		☐ Glycerin 글리세린 ☐ Oil 오일 ☒ CMC		IIW, REFERENCE BLOCK	
Ident. No. 확인번호	Accept 합	Reject 불	Location 위치 from	Length 길이	Width 폭
Main seam A01, A05	V		No Recordable Indication		
			~ BLANK ~		
Sketch of Scanning  ☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services					
☐ SKETCH ON DOT LINE, IF NECESSARY or ☒ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by C.J. KWON		Level II		☒ Date&Time of Examination 검사일자/시간 2014.10.02 ☒ Date of Report 보고서 작성일자 2014.10.02	
 A P N Co., Ltd.		 B.M. SHIM A P N Co., Ltd.		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI	

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ISQ-009-2-2

		ASME ILSUNG CORPORATION		Report No.						
				IS-APN-E-11580-UT-004						
Page 1 of 1										
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E10070-001 Rev. 						
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure /Acc. Criteria 절차서/판정기준 VP-SG07-COMM-010(ISC-UT-06) Rev.  ASME SEC.VIII,div.1 2010 ED.+ 2011 ADD. APP12 ASME SEC V SA578 Level C + API 660(8th ED.2007)						
Item Name 품명 VRU INLET GAS COOLER		Item No. 부품번호 E-11580		Joint No. 용접선 번호 SEE IDENT.NO						
Joint Config 용접모양 "T" Joint		Method 시험방법 ☒ Contact 접촉 ☐ Immerse 수침		Surface Condition 표면상태 AS WELDED and AS GROUND						
				Material/Thickness 재질/두께 SA516-70N / 15T						
Test Temp. 시험온도 ☒ Ambient 상온 ☐ Elev. 승온		Test Equipment 시험장비 EPOCH XT		Manufacturer 제조사 OLYMPUS						
				Serial No. 일련번호 081113804						
				Due Date 만료일자 2015.06.12						
Transducer 탐촉자	Type 형태	Block Angle 교정각도	Frequency 주파수	Size 크기	Manufacturer 제조사	Serial No. 일련번호	Cable 케이블	Type 형태	Length 길이	Manufacturer 제조사
	4C10N/4MHz	0°	4MHz	10Ø	TKS	NEEA226		Lemo00+ Lemo01	2M	KrautKramer
	MWB45-4	45°	4MHz	8*9	MWB	56927-70186				
	MWB70-4	70°	4MHz	8*9	MWB	56929-73828				
Test Angle 시험각도 ☒ 0° ☒ 45° ☐ 60° ☒ 70°		Couplant 점촉매질 ☐ Glycerin 글리세린 ☐ Oil 오일 ☒ CMC		Calibration Block 교정블록 IIW, REFERENCE BLOCK						
Ident. No. 확인번호	Accept 합격	Reject 불합	Location 위치 from	Length 길이	Width 폭	Depth 깊이	% DAC (MAX) 보정곡선	Grade 등급	Remarks 비고	
Lifting lug welded area	V		No Recordable Indication						Final(Channel cover side)	
			~ BLANK ~							
								Reviewed by Witnessed by QA DEPT. J. S. LEE DATE Dec. 19. 2014		
Sketch of Scanning										
										
☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services										
☐ SKETCH ON DOT LINE, IF NECESSARY or ☒ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.										
Examined by 시험 C.J. KWON		Level II 레벨		☒ Date&Time of Examination 검사일자/시간 2014.12.19		☒ Date of Report 보고서 작성일자 2014.12.19				
Approved by 승인 B.M. SHIM		Level III 레벨		☐ Owner/Customer주문주/고객감독관		☐ Third Party Inspector공인검사관		☐ ANI/AI		
										

ASME



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자분탐상시험보고서

ASME

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ILSUNG CORPORATION

Project Name 공사명 CARMON CREEK PROJECT	Customer 주문주 SHELL CANADA ENERGY	Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.
Traveller/PCS No. 트레블라 N/A	Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391	Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-MT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.6 + API 660 (8th ED. 2007) Rev.
Item Name 품명 VRU INLET GAS COOLER	Item NO. 부품 번호 E-11580	Surface Condition 표면상태 AS GROUND and AS WELDED
Material/Thickness 재질/두께 SA516-70(N) / 17T	Method 검사방법 ☒ Wet 습식 ☐ Dry 건식	Particle 자분 ☒ Color 염색 ☐ Fluorescent 형광
Magnetization 자화방법 ☒ Yoke 요오크 ☐ Prod 프로드 ☐ Direction 자화방향 ☒ Long 선형 ☐ Circular 원형 ☐ Both 혼합형	Equipment 장비 Brand 상품명 : NAWOO Model No. 모델 : MY-2 Output 출력 : 10 lb	Applying Current 통전법 ☒ Continuous 연속 ☐ Residual 잔류 Magnetization Current 자화전류 ☒ AC 교류 ☐ DC 직류 Current 전류 220V , 2.6A Amps 암페어
Light Source 조명 장비 GLOW LAMP 550 W	Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	Spacing 거리 ☒ in ☐ cm 4 ~ 6
Black Light No. 블랙라이트 번호 N/A	Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm²	Demagnetization 탈자 ☐ Yes 필요 ☒ No 불필요

Ident. No. 확인 번호	Accept 합격	Reject 반거부	Interpretation 판 정	Grade 등급	Remarks 비고
Main seam B04,B05	V		No Recordable Indication		Back gouging area
			~ BLANK ~		

Reviewed by _____
 Witnessed by _____
QA DEPT. S. J. HWANG
 DATE SEP 24 2014

☒ REVIEWED
☐ WITNESSED
 Date / Signature
SEP 24 2014
 Germanischer Lloyd Industrial Services

☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

Examined by 시험인 C.J. KWON A P N Co., Ltd.	Level 레벨 II ☒ Date&Time of Examination 검사일자/시간 2014.09.24 ☒ Date of Report 보고서 작성일자 2014.09.24
Approved by 승인인 B.M. SHIM A P N Co., Ltd.	Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI

ISQ-009-2-3

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11580-MT-004	
Page 1 of 1			

Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. △	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-MT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.6 + API 660 (8th ED. 2007) Rev. △	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Material/Thickness 재질/두께 SA516-70(N) / 17T		Method 검사방법 ☒ Wet 습식 ☐ Dry 건식		Particle 자분 ☒ Color 염색 ☐ Fluorescent 형광	
Magnetization 자화방법 ☒ Yoke 요오크 ☐ Prod 프로드 ☐ _____		Direction 자화방향 ☒ Long 선형 ☐ Circular 원형 ☐ Both 혼합형		Equipment 장비 Brand 상품명 : NAWOO Model No. 모델 : MY-2 Output 출력 : 10 lb	
Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux		Applying Current 통전법 ☒ Continuous 연속 ☐ Residual 잔류 Magnetization Current 자화전류 ☒ AC 교류 ☐ DC 직류 Current 전류 220V , 2.6A Amps 암페어	
Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm²		Spacing 거리 ☒ in ☐ cm 4 ~ 6	
Demagnetization 탈자 ☐ Yes 필요 ☒ No 불필요					

Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판정	Grade 등급	Remarks 비고
Main seam A02,A03,A04,B04,B05	V		No Recordable Indication		Shell inside final - before bundle insert
All welded of nozzle area S1,S2	V		No Recordable Indication		Shell inside final - before bundle insert
Temporary attachment removed area	V		No Recordable Indication		Shell inside final - before bundle insert
Arc strike removed area	V		No Recordable Indication		Shell inside final - before bundle insert
~ BLANK ~					

☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

Examined by
시행 **C.J. KWON**

Level
레벨 **II**

A P N Co., Ltd.

Approved by
승인 **B.M. SHIM**

Level
레벨 **III**

A P N Co., Ltd.

☒ Date&Time of Examination 검사일/시간 **2014.11.28**

☒ Date of Report 보고서 작성일자 **2014.11.28**

Owner/Customer주문주/고객감독관

☐ Third Party Inspector공인검사관 ☐ ANI/AI

Reviewed by
S. J. HWANG

Witnessed by

DATE NOV. 28. 2014

REVIEWED
WITNESSED

Date / Signature:

[Signature]

Germanischer Lloyd
Industrial Service

자 분 탐 상 시 험 보 고 서

ASME



ILSUNG CORPORATION

Report No.

IS-APN-E-11580-MT-005

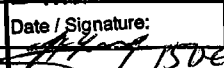
Page 1 of 1

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REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상시험보고서

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 ILSUNG CORPORATION		Report No. IS-APN-E-11580-MT-006	
		Page 1 of 1	
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY	
Traveller/PCS No. 트레블라 N/A		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Item Name 품명 VRU INLET GAS COOLER		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391	
Material/Thickness 재질/두께 SA516-70(N) / 17T		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-MT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.6 + API 660 (8th ED. 2007) Rev. 	
Magnetization 자화방법 ☒ Yoke 요오크 ☐ Prod 프로드 ☐ _____		Direction 자화방향 ☒ Long 선형 ☐ Circular 원형 ☐ Both 혼합형	
Equipment 장비 Brand 상품명 : NAWOO Model No. 모델 : MY-2 Output 출력 : 10 lb		Applying Current 통전법 ☒ Continuous 연속 ☐ Residual 잔류 Magnetization Current 자화전류 ☒ AC 교류 ☐ DC 직류 Current 전류 220V, 2.6A Amps 암페어	
Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ _____ μ w/cm ²	
Ident. No. 확인번호		Accept 합	
Main seam A02,A03,A04,B03,B04,B05,B06		V	
All-welded of nozzle area S1,S2		V	
Temporary attachment removed area		V	
All attachment welded area		V	
Arc strike removed area		V	
Lifting lugs welded area		V	
~ BLANK ~			
Interpretation 판정		Grade 등급	
No Recordable Indication			
No Recordable Indication			
No Recordable Indication			
No Recordable Indication			
No Recordable Indication			
No Recordable Indication			
No Recordable Indication			
REVIEWED		WITNESSED	
Date / Signature: 		Germanischer Lloyd Industrial Services	
Olsung ISC		Reviewed by S. J. HWANG	
QA DEPT. DATE DEC. 15, 2014		Witnessed by	
SKETCH ON DOT LINE, IF NECESSARY or ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.		Date & Time of Examination 검사일자/시간 2014.12.15	
Examined by 시 형 C.J. KWON 		Level 레벨 II	
Approved by 승 인 B.M. SHIM 		Level 레벨 III	
Owner/Customer 주문주/고객감독관		Third Party Inspector 공인검사관 ☐ ANI/AI ☐	

ASME ILSUNG CORPORATION		Report No. IS-APN-E-11580-PT-001	
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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. △	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev. △ ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND	
Process of PT침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm²	
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 24 °C		Light Source 조명 장비 GLOW LAMP 550 W	
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 24 °C		Light Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	

Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용	☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용	☐ Brush 솔질 ☐ Spray 분사 ☒ Handwipe 닦아냄 ☐ Immerse 침적 ☐ Wash 씻어냄	
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분

Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정	Grade 등급	Remarks 비고
Main seam A01, A05	V		No Recordable Indication		Cut edge area
			~ B L A N K ~		

☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

QA DEPT.
DATE 2014.09.22

Reviewed by
S. J. HWANG
Witnessed by

Examined by **C.J. KWON** Level **II**

A P N Co., Ltd.

Approved by **B.M. SHIM** Level **III**

A P N Co., Ltd.

☒ Date&Time of Examination 검사일자/시간 **2014.09.22**
☒ Date of Report 보고서 작성일자 **2014.09.22**

☐ Owner/Customer주문주/고객감독관
☐ Third Party Inspector공인검사관 ☐ ANI/AI

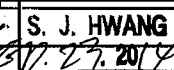
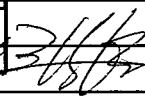
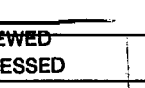


ILSUNG CORPORATION

ASME

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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev.  ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT 침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ $\mu w/cm^2$	
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 24 °C		Light Source 조명 장비 GLOW LAMP 550 W	
Penetrant 침 투 제 NAWOO / NPP-2 / 13NPP14		Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14		Apply ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적 적용 ☒ Spray 분사 ☐ Immerse 침적 Dwell time 침투시간 10 min 분	
Emulsifier 유 화 제 N/A		Brand상표, Type형태, Batch No.제조번호 N/A		Apply ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적 적용 ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적 Dwell time 방치시간 min 분	
Remover 세 척 제 NAWOO / NPR1-3 / 13NPR14		Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14		Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Wash 씻어냄 적용 ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Wash 씻어냄	
Developer 현 상 제 NAWOO / NPD-4 / 13NPD14		Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14		Apply ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적 Bleed out 흡출시간 15 min 분	
Ident. No. 확인 번호		Accept 합	Reject 불	Interpretation 판 정	
Main seam A01,A05		V		No Recordable Indication ~ B L A N K ~	
				Grade 등급	
				Remarks 비고	
				Back gouging area	
				 Reviewed by  Witnessed by 	
				QA DEPT DATE 2014.09.23	
				S. J. HWANG	
					
				☒ REVIEWED ☒ WITNESSED Date / Signature: 	
				Germanischer Lloyd Industrial Service	
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 형 C.J. KWON  Level 레벨 II		☒ Date&Time of Examination 검사일자/시간 2014.09.23 ☒ Date of Report 보고서 작성일자 2014.09.23 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI			
Approved by 승 인 B.M. SHIM  Level 레벨 III A P N Co., Ltd.					

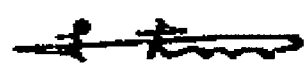
ASME

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ILSUNG CORPORATION

Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007) Rev. 	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND	
Process of PT침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ $\mu w/cm^2$	
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 20 °C		Light Source 조명 장비 GLOW LAMP 550 W	
				Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분	
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용	☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분	
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용	☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄		
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분	
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정	Grade 등급	Remarks 비고
Main seam B01,B02	V		No Recordable Indication ~ B L A N K ~		Cut edge area
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 험 S.M. LEE  A P N Co., Ltd.			Level 레벨 II	☒ Date&Time of Examination 검사일/시간 ☒ Date of Report 보고서 작성일자 2014.10.10	
Approved by 승 인 B.M. SHIM  A P N Co., Ltd.			Level 레벨 III	☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI	

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ILSUNG CORPORATION

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침 투 탐 상 시 험 보 고 서

ASME ILSUNG CORPORATION		Report No.	
		IS-APN-E-11580-PT-005	
		Page <u>1</u> of <u>1</u>	

Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev. ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT 침투탐상과정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm²	
Material/Thickness 재질/두께 SA240-S31803 / 15T	Test temp. 시험온도 20 °C	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	

Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply ☐ Flow-on 흘림 적용 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄	
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분

Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정	Grade 등급	Remarks 비고
Main seam B01,B02,B07,B08	V		No Recordable Indication		Back gouging area
			~ B L A N K ~		

Reviewed by
Witnessed by

QA DEPT.
DATE 2014.10.17

S. J. HWANG

☒ REVIEWED
☐ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

Examined by 시 험 C.J. KWON A P N Co., Ltd.	Level 레벨 II	☒ Date&Time of Examination 검사일자/시간 2014.10.17 ☒ Date of Report 보고서 작성일자 2014.10.17 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI
Approved by 승 인 B.M. SHIM A P N Co., Ltd.	Level 레벨 III	

REPORT OF PENETRANT EXAMINATION

침투탐상시험보고서

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11580-PT-006	
		Page <u>1</u> of <u>1</u>	

Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.	
Traveller/PCS No. 트레블러 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev. ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND	
Process of PT침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ W/cm²	
Material/Thickness 재질/두께 SA240-S31803 / 15T	Test temp. 시험온도 18 °C	Light Source 조명 장비 GLOW LAMP 550 W	Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux		

Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply ☐ Flow-on 흘림 적용 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄	
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분

Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정	Grade 등급	Remarks 비고
Category "D" of nozzle T1,T2,T3,T4	V		No Recordable Indication		Cut edge area
			~ B L A N K ~		

☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

Reviewed by S. I. HWANG
 QA DEPT
 DATE 2014.12.20

☒ REVIEWED
☒ WITNESSED
 Date / Signature: [Signature]
 Germanischer Lloyd
 Industrial Services

Examined by <u>C.J. KWON</u> Level II A P N Co., Ltd. Approved by <u>B.M. SHIM</u> Level III A P N Co., Ltd.	☒ Date&Time of Examination 검사일/시간 2014.11.12 ☒ Date of Report 보고서 작성일자 2014.11.12 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI
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REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

ASME

 ILSUNG CORPORATION		Report No.	
		IS-APN-E-11580-PT-007	
Page 1 of 1			
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY	
Dwg. No. 도면번호 VP-SG07-E11570-001		Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391	
Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06)		Rev. 	
ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)			
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580	
Surface Condition 표면상태 AS GROUND and AS WELDED			
Process of PT 침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A	
Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm ²			
Material/Thickness 재질/두께 SA240-S31803 / 15T	Test temp. 시험온도 18 °C	Light Source 조명 장비 GLOW LAMP 550 W	Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제 조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제 조번호 N/A	Apply ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분
Remover 세 척 제	Brand상표, Type형태, Batch No.제 조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄	
Developer 현 상 제	Brand상표, Type형태, Batch No.제 조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분
Ident. No. 확인번호	Accept 합	Reject 불	Remarks 비고
Category "D" of nozzle T2, T3	V		Back gouging area
No Recordable Indication		~ B L A N K ~	
		☒ Reviewed by ☒ Witnessed by QA DEPT. S. J. HWANG DATE NOV. 12. 2014	
		☒ REVIEWED ☒ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services	
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.			
Examined by 시험 C.J. KWON	Level 레벨 II	☒ Date&Time of Examination 검사일/시간 2014.11.12 ☒ Date of Report 보고서 작성일자 2014.11.12	
Approved by 승인 B.M. SHIM	Level 레벨 III	☐ Owner/Customer 주문주/고객감독관 ☐ Third Party Inspector 공인검사관 ☐ ANI/AI	
 A P N Co., Ltd.		 A P N Co., Ltd.	

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REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

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 ILSUNG CORPORATION		Report No.	
		IS-APN-E-11580-PT-009	
Page 1 of 1			
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY	
Dwg. No. 도면번호 VP-SG07-E11570-001		Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391	
Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06)		Rev. 	
ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)			
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580	
Surface Condition 표면상태 AS GROUND and AS WELDED			
Process of PT 침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A	
Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ $\mu\text{w/cm}^2$			
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 16 °C	
Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제	Brand상표, Type형태, Batch No. 제조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분
Emulsifier 유 화 제	Brand상표, Type형태, Batch No. 제조번호 N/A	Apply ☐ Flow-on 흘림 적용 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분
Remover 세 척 제	Brand상표, Type형태, Batch No. 제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄	Bleed out 흡출시간 15 min 분
Developer 현 상 제	Brand상표, Type형태, Batch No. 제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정
Main seam A05,B07,B08	V		No Recordable Indication
All welded of nozzle area T2,T3	V		No Recordable Indication
Temporary attachment removed area	V		No Recordable Indication
All attachment welded area	V		No Recordable Indication
Arc strike removed area	V		No Recordable Indication
Lifting lugs welded area	V		No Recordable Indication
~ B L A N K ~			
		 Reviewed by Witnessed by CA DEPT. S. J. HWANG DATE DEC 04, 2014	
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.			
Examined by 시 험 C.J. KWON 		Level II 레벨	
Approved by 승 인 B.M. SHIM 		Level III 레벨	
A P N Co., Ltd.		Owner/Customer 주문주/고객감독관	
A P N Co., Ltd.		Third Party Inspector 공인검사관	
		REVIEWED WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services	

REPORT OF PENETRANT EXAMINATION

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ILSUNG CORPORATION

Report No.

IS-APN-E-11580-PT-010

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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev. ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT 침투탐상과정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ W/cm ²	
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 16 °C		Light Source 조명 장비 GLOW LAMP 550 W	
				Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분		
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용 ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분		
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용 ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄			
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분		
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정		Grade 등급
Remarks 비고					
Main seam A01,B01,B02	V		No Recordable Indication		Channel fixed side final
All welded of nozzle area T1,T4	V		No Recordable Indication		Channel fixed side final
Temporary attachment removed area	V		No Recordable Indication		Channel fixed side final
All attachment welded area	V		No Recordable Indication		Channel fixed side final
Arc strike removed area	V		No Recordable Indication		Channel fixed side final
Lifting lugs welded area	V		No Recordable Indication		Channel fixed side final
~ B L A N K ~					
				Reviewed by ISC	Witnessed by S. J. HWANG
				QA DEPT. DATE Dec 06, 2014	
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 험 C.J. KWON		Level 레벨 II		☒ Date&Time of Examination 검사일/시간 2014.12.06 ☒ Date of Report 보고서 작성일자 2014.12.06	
Approved by 승 인 B.M. SHIM		Level 레벨 III		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관	
A P N Co., Ltd.		A P N Co., Ltd.		REVIEWED WITNESSED Date / Signature: Germanischer Lloyd Industrial Service	

침투탐상시험보고서

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ILSUNG CORPORATION

Report No.

IS-APN-E-11580-PT-011

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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007) Rev.	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS WELDED	
Process of PT침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm²	
Material/Thickness 재질/두께 SA789-S31803 / 1.63T	Test temp. 시험온도 16 °C	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제 NAWOO / NPP-2 / 13NPP14	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적		Dwell time 침투시간 10 min 분	
Emulsifier 유 화 제 N/A	Brand상표, Type형태, Batch No.제조번호 N/A	Apply ☐ Flow-on 흘림 적용 ☐ Spray 분사 ☐ Immerse 침적		Dwell time 방치시간 min 분	
Remover 세 척 제 NAWOO / NPR1-3 / 13NPR14	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄			
Developer 현 상 제 NAWOO / NPDP-4 / 13NPDP14	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPDP-4 / 13NPDP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적		Bleed out 흡출시간 15 min 분	
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정	Grade 등급	Remarks 비고
Tube to tubesheet	V		No Recordable Indication ~ B L A N K ~		1 Pass layer - 3904hole
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 형 C.J. KWON A P N Co., Ltd.			Level 레벨 II ☒ Date&Time of Examination 검사일자/시간 2014.12.11 ☒ Date of Report 보고서 작성일자 2014.12.11 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI		
Approved by 승 인 B.M. SHIM A P N Co., Ltd.					

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11580-PT-012	
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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev. ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS WELDED	
Process of PT침투탐상과정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm²	
Material/Thickness 재질/두께 SA789-S31803 / 1.63T	Test temp. 시험온도 16 °C	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	

Penetrant 침 투 제	Brand상표,Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분
Emulsifier 유 화 제	Brand상표,Type형태, Batch No.제조번호 N/A	Apply ☐ Flow-on 흘림 적용 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분
Remover 세 척 제	Brand상표,Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄	
Developer 현 상 제	Brand상표,Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 출출시간 15 min 분

Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정	Grade 등급	Remarks 비고
Tube to tubesheet	V		No Recordable Indication		Final pass layer - 3904hole
			~ B L A N K ~		

ISC
 QA DEPT. S. J. HWANG
 DATE DEC 12 2014

☒ REVIEWED
☐ WITNESSED
 Date / Signature:

 Germanischer Lloyd
 Industrial Services

☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

Examined by 시 형 C.J. KWON A P N Co., Ltd.	Level 레벨 II	☒ Date&Time of Examination 검사일자/시간 2014.12.12 ☒ Date of Report 보고서 작성일자 2014.12.12 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI
Approved by 승 인 B.M. SHIM A P N Co., Ltd.	Level 레벨 III	

REPORT OF PENETRANT EXAMINATION

침투탐상시험보고서

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ILSUNG CORPORATION						Report No. IS-APN-E-11580-PT-013 Page <u>1</u> of <u>1</u>		
Project Name 공사명 CARMON CREEK PROJECT			Customer 주문주 SHELL CANADA ENERGY			Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.		
Traveller/PCS No. 트레블라 N/A			Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391			Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007) Rev.		
Item Name 품명 VRU INLET GAS COOLER			Item NO. 부품 번호 E-11580			Surface Condition 표면상태 AS WELDED		
Process of PT침투탐상공정 VISIBLE, SOLVENT REMOVABLE			Black Light No. 블랙라이트 번호 N/A			Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm ²		
Material/Thickness 재질/두께 SA789-S31803 / 1.63T		Test temp. 시험온도 16 °C		Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux		
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14		Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적		Dwell time 침투시간 10 min 분			
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A		Apply 적용 ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적		Dwell time 방치시간 min 분			
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14		Apply 적용 ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄					
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14		Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적		Bleed out 흡출시간 15 min 분			
Ident. No. 확인 번호	Accept 합격	Reject 불합	Interpretation 판 정			Grade 등급	Remarks 비고	
Tube to tubesheet	V		No Recordable Indication				After tube expending Final pass layer - 3904hole	
			~ B L A N K ~					
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.								
Examined by 시. 형 C.J. KWON			Level 레벨 II		☒ Date&Time of Examination 검사일자/시간 2014.12.18 ☒ Date of Report 보고서 작성일자 2014.12.18			
Approved by 승인 B.M. SHIM			Level 레벨 III		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI			

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

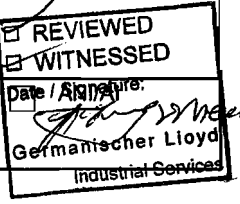
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 ILSUNG CORPORATION		ASME		Report No.	
				IS-APN-E-11580-PT-014	
Page 1 of 1					
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007) Rev. 	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT 침투탐상과정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ $\mu w/cm^2$	
Material/Thickness 재질/두께 SA240-S31803 / 15T	Test temp. 시험온도 16 °C	Light Source 조명 장비 GLOW LAMP 550 W	Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux		
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분		
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용 ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분		
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용 ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄	Bleed out 흡출시간 min 분		
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분		
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정	Grade 등급	Remarks 비고
Main seam A05,B07,B08	V		No Recordable Indication		After hydro Channel sliding outside final
All welded of nozzle area T2,T3	V		No Recordable Indication		After hydro Channel sliding outside final
Temporary attachment removed area	V		No Recordable Indication		After hydro Channel sliding outside final
All attachment welded area	V		No Recordable Indication		After hydro Channel sliding outside final
Arc strike removed area	V		No Recordable Indication		After hydro Channel sliding outside final
Lifting lugs welded area	V		No Recordable Indication		After hydro Channel sliding outside final
			~ B L A N K ~		
			Reviewed by J. S. LEE Witnessed by QA DEPT. DATE Dec .22. 2014		
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by C.J. KWON  A P N Co., Ltd.		Level II-		☒ Date&Time of Examination 검사일/시간 2014.12.22 ☒ Date of Report 보고서 작성일자 2014.12.22	
Approved by B.M. SHIM  A P N Co., Ltd.		Level III-		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐	
☒ REVIEWED ☐ WITNESSED Date/Signature:  Germanischer Lloyd Industrial Services					

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

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 ILSUNG CORPORATION		ASME		Report No. IS-APN-E-11580-PT-015	
				Page <u>1</u> of <u>1</u>	
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007) Rev. 	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT 침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ <u> </u> μ W/cm ²	
Material/Thickness 재질/두께 SA240-S31803 / 15T	Test temp. 시험온도 16 °C	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제	Brand상표, Type형태, Batch No. 제조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적		Dwell time 침투시간 10 min 분	
Emulsifier 유 화 제	Brand상표, Type형태, Batch No. 제조번호 N/A	Apply ☐ Flow-on 흘림 적용 ☐ Spray 분사 ☐ Immerse 침적		Dwell time 방치시간 min 분	
Remover 세 척 제	Brand상표, Type형태, Batch No. 제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄			
Developer 현 상 제	Brand상표, Type형태, Batch No. 제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적		Bleed out 흡출시간 15 min 분	
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정		Grade 등급
Main seam A01,B01,B02	V		No Recordable Indication		
All welded of nozzle area T1,T4	V		No Recordable Indication		
Temporary attachment removed area	V		No Recordable Indication		
All attachment welded area	V		No Recordable Indication		
Arc strike removed area	V		No Recordable Indication		
Lifting lugs welded area	V		No Recordable Indication		
			~ B L A N K ~		
☐ SKETCH ON DOT LINE, IF NECESSARY OF ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시험 C.J. KWON		Level 레벨 II		☒ Date&Time of Examination 검사일/시간 2014.12.22 ☒ Date of Report 보고서 작성일자 2014.12.22	
Approved by 승인 B.M. SHIM		Level 레벨 III		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관	
 A P N Co., Ltd.					
 A P N Co., Ltd.					

6-1. NDE Records for Lifting Points

ILSUNG

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Report No.

IS-APN-E-11580-UT-002

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Project Name 공사명 CARMON CREEK PROJECT	Customer 주문주 SHELL CANADA ENERGY	Dwg. No. 도면번호 VP-SG07-E10070-001 Rev.
Traveller/PCS No. 트레블라 N/A	Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391	Procedure /Acc. Criteria 절차서/판정기준 VP-SG07-COMM-010(ISC-UT-06) Rev. ASME SEC.VII, div.1 2010 ED.+ 2011 ADD. APP12 ASME SEC V SA578 Level C + API 660(8th ED.2007)
Item Name 품명 VRU INLET GAS COOLER	Item No. 부품번호 E-11580	Joint No. 용접선 번호 SEE IDENT.NO

Joint Config 용접모양 "D" Joint, "T" Joint	Method 시험방법 ☒ Contact 접촉 ☐ Immerse 수침	Surface Condition 표면상태 AS WELDED and AS GROUND	Material/Thickness 재질/두께 SA516-70N / 17, 36T
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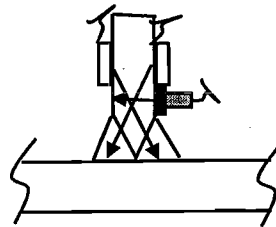
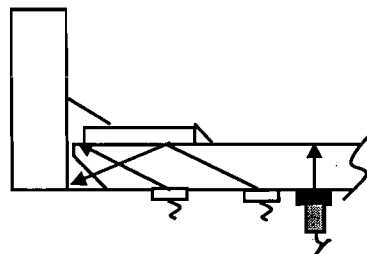
Test Temp. 시험온도 ☒ Ambient 상온 ☐ Elev. 승온	Test Equipment 시험장비 EPOCH XT	Type 형태 OLYMPUS	Manufacturer 제조사 OLYMPUS	Serial No. 일련번호 081113804	Due Date 만료일자 2015.06.12
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Type 형태	Block Angle 교정각도	Frequency 주파수	Size 크기	Manufacturer 제조사	Serial No. 일련번호	Cable 케이블	Type 형태	Length 길이	Manufacturer 제조사
4C10N/4MHz	0°	4MHz	10Ø	TKS	NEEA226		Lemo00+ Lemo01	2M	KrautKramer
MWB45-4	45°	4MHz	8*9	MWB	56927-70186				
MWB70-4	70°	4MHz	8*9	MWB	56929-73828				

Test Angle 시험각도 ☒ 0° ☒ 45° ☐ 60° ☒ 70°	Couplant 접촉매질 ☐ Glycerin 글리세린 ☐ Oil 오일 ☒ CMC	Calibration Block 교정블록 IIW, REFERENCE BLOCK
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Ident. No. 확인번호	Accept 합	Reject 불	Location 위치 from	Length 길이	Width 폭	Depth 깊이	% DAC (MAX) 보정곡선	Grade 등급	Remarks 비고
Nozzle to shell S1, S2	V		No Recordable Indication						Final
Lifting lug welded area	V		No Recordable Indication						Final
~ BLANK ~									

Sketch of Scanning



☐ REVIEWED	☐ WITNESSED
Date / Signature:	
Germanischer Lloyd Industrial Services	

☐ SKETCH ON DOT LINE, IF NECESSARY or ☒ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

Examined by 시험 C.J. KWON	Level 레벨 II	☒ Date & Time of Examination 검사일자/시간 2014.11.30
Approved by 승인 B.M. SHIM	Level 레벨 III	☒ Date of Report 보고서 작성일자 2014.11.30
		☐ Owner/Customer 주문주/고객 감독관
		☐ Third Party Inspector 공인검사관

Germanischer Lloyd
Industrial Services

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ILSUNG CORPORATION

Report No.

IS-APN-E-11580-UT-003

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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E10070-001 Rev.						
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure /Acc. Criteria 절차서/판정기준 VP-SG07-COMM-010(ISC-UT-06) Rev. ASME SEC. VIII, div. 1 2010 ED. + 2011 ADD. APP12 ASME SEC V SA578 Level C + API 660(8th ED.2007)						
Item Name 품명 VRU INLET GAS COOLER		Item No. 부품번호 E-11580		Joint No. 용접선 번호 SEE IDENT.NO						
Joint Config 용접모양 Butt Joint, "D" Joint		Method 시험방법 ☒ Contact 접촉 ☐ Immerse 수침		Surface Condition 표면상태 AS WELDED and AS GROUND						
Test Temp. 시험온도 ☒ Ambient 상온 ☐ Elev. 승온		Test Equipment 시험장비 EPOCH XT		Manufacturer 제조사 OLYMPUS						
Serial No. 일련번호 081113804		Due Date 만료일자 2015.06.12								
Transducer 탐촉자	Type 형태	Block Angle 교정각도	Frequency 주파수	Size 크기	Manufacturer 제조사	Serial No. 일련번호	Cable 케이블	Type 형태	Length 길이	Manufacturer 제조사
	MSEB4	0°	4MHz	10Ø	MWB	57462-22034		Lemo00+ Lemo01	2M	KrautKramer
	2C8X14LAD60	60°	2MHz	8*14	TKS	DLANB005				
	2C8X14LAD70	70°	2MHz	8*14	TKS	DLANC005				
Test Angle 시험각도 ☒ 0° ☒ 45° ☐ 60° ☒ 70°		Couplant 점촉매질 ☐ Glycerin 글리세린 ☐ Oil 오일 ☒ CMC		Calibration Block 교정블록 IIW, REFERENCE BLOCK						
Ident. No. 확인번호	Accept 합	Reject 불	Location 위치 from	Length 길이	Width 폭	Depth 깊이	% DAC (MAX) 보정곡선	Grade 등급	Remarks 비고	
Main seam B01, B02, B07, B08	V		No Recordable Indication						Final	
Nozzle to channel shell T1, T2, T3, T4	V		No Recordable Indication						Final	
Lifting lug welded area	V		No Recordable Indication						Final	
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Sketch of Scanning ISC QA DEPT DATE DEC. 05, 2014 Reviewed by Witnessed by S. J. HWANG										
☐ SKETCH ON DOT LINE, IF NECESSARY or ☒ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.										
Examined by 시험 C.J. KWON		Level 레벨 II		☒ Date & Time of Examination 검사일자/시간 2014.12.05		☒ Date of Report 보고서 작성일자 2014.12.05				
Approved by 승인 B.M. SHIM		Level 레벨 III		☐ Owner/Customer 주문주/고객감독관		☐ Third Party Inspector 공인검사관		☐ ANI/AI		

ISQ-009-2-2

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상시험보고서

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 ILSUNG CORPORATION		Report No.	
		IS-APN-E-11580-MT-006	
Page 1 of 1			
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY	
Dwg. No. 도면번호 VP-SG07-E11570-001		Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391	
Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-MT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.6 + API 660 (8th ED. 2007)		Rev. 	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580	
Surface Condition 표면상태 AS GROUND and AS WELDED			
Material/Thickness 재질/두께 SA516-70(N) / 17T		Method 검사방법 ☒ Wet 습식 ☐ Dry 건식	
Particle 자분 ☒ Color 염색 ☐ Fluorescent 형광			
Magnetization 자화방법 ☒ Yoke 요오크 ☐ Prod 프로드 ☐ _____		Direction 자화방향 ☒ Long 선형 ☐ Circular 원형 ☐ Both 혼합형	
Equipment 장비 Brand 상품명 : NAWOO Model No. 모델 : MY-2 Output 출력 : 10 lb		Applying Current 통전법 ☒ Continuous 연속 ☐ Residual 잔류 Magnetization Current 자화전류 ☒ AC 교류 ☐ DC 직류 Current 전류 220V, 2.6A Amps 암페어	
Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Spacing 거리 4 ~ 6 ☒ in. ☐ cm			
Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ $\mu\text{W/cm}^2$	
Demagnetization 탈자 ☐ Yes 필요 ☒ No 불필요			
Ident. No. 확인번호	Accept 합	Reject 불	Interpretation 판정
Main seam A02,A03,A04,B03,B04,B05,B06	V		No Recordable Indication
All welded of nozzle area S1,S2	V		No Recordable Indication
Temporary attachment removed area	V		No Recordable Indication
All attachment welded area	V		No Recordable Indication
Arc strike removed area	V		No Recordable Indication
Lifting lugs welded area	V		No Recordable Indication
~ BLANK ~			Grade 등급
			Remarks 비고
			☒ REVIEWED
			☒ WITNESSED
			Date / Signature: 
			Germanischer Lloyd Industrial Services
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.			
Examined by 시험 C.J. KWON 	Level 레벨 II	☒ Date&Time of Examination 검사일자/시간 2014.12.15 ☒ Date of Report 보고서 작성일자 2014.12.15	
 A P N Co., Ltd.		Owner/Customer 주문주/고객감독관	
Approved by 승인 B.M. SHIM 	Level 레벨 III	☐ Third Party Inspector 공인검사관 ☐ ANI/AI	
 A P N Co., Ltd.			

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

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ILSUNG

ILSUNG CORPORATION

Report No.

IS-APN-E-11580-PT-009

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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev. ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT 침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm ²	
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 16 °C		Light Source 조명 장비 GLOW LAMP 550 W	
				Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분		
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용 ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분		
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용 ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄			
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분		
Ident. No. 확인 번호	Accept 합	Reject 불합	Interpretation 판 정		Grade 등급
Main seam A05,B07,B08	V		No Recordable Indication		Channel sliding side final
All welded of nozzle area T2,T3	V		No Recordable Indication		Channel sliding side final
Temporary attachment removed area	V		No Recordable Indication		Channel sliding side final
All attachment welded area	V		No Recordable Indication		Channel sliding side final
Arc strike removed area	V		No Recordable Indication		Channel sliding side final
Lifting lugs welded area	V		No Recordable Indication		Channel sliding side final
~ B L A N K ~					
Reviewed by Witnessed by QA DEPT. S. J. HWANG DATE Dec 04 2014					
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 험 C.J. KWON A P N Co., Ltd.			Level II 레벨		
Approved by 승 인 B.M. SHIM A P N Co., Ltd.			Level III 레벨		
			☒ Date & Time of Examination 검사일자/시간 2014.12.04 ☒ Date of Report 보고서 작성일자 2014.12.04 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관		
			REVIEWED WITNESSED AN/AT Date / Signature: Industrial Services		

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

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ILSUNG

ILSUNG CORPORATION

Report No.

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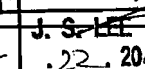
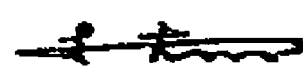
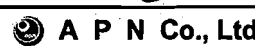
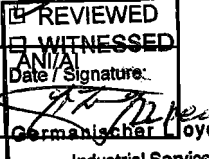
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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev.  ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ $\mu W/cm^2$	
Material/Thickness 재질/두께 SA240-S31803 / 15T	Test temp. 시험온도 16 °C	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분		
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용 ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분		
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용 ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄			
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분		
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정		Grade 등급
Main seam A01,B01,B02	V		No Recordable Indication		Channel fixed side final
All welded of nozzle area T1,T4	V		No Recordable Indication		Channel fixed side final
Temporary attachment removed area	V		No Recordable Indication		Channel fixed side final
All attachment welded area	V		No Recordable Indication		Channel fixed side final
Arc strike removed area	V		No Recordable Indication		Channel fixed side final
Lifting lugs welded area	V		No Recordable Indication		Channel fixed side final
~ B L A N K ~					
				Reviewed by ISC	Witnessed by S. J. HWANG
				QA DEPT. DATE Dec 06, 2014	
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 험 C.J. KWON		Level 레벨 II		☒ Date&Time of Examination 검사일자/시간 2014.12.06	
Approved by 승 인 B.M. SHIM		Level 레벨 III		☒ Date of Report 보고서 작성일자 2014.12.06	
A P N Co., Ltd.				☐ Owner/Customer주문주/고객감독관	
A P N Co., Ltd.				☐ Third Party Inspector공인검사관	
REVIEWED INITIALED Date / Signature: Germanischer Lloyd Industrial Service					

REPORT OF PENETRANT EXAMINATION

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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007) Rev. 	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm ²	
Material/Thickness 재질/두께 SA240-S31803 / 15T	Test temp. 시험온도 16 °C	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적		Dwell time 침투시간 10 min 분	
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply ☐ Flow-on 흘림 적용 ☐ Spray 분사 ☐ Immerse 침적		Dwell time 방치시간 min 분	
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄			
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적		Bleed out 흡출시간 15 min 분	
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정		Grade 등급
Main seam A05,B07,B08	V		No Recordable Indication		
All welded of nozzle area T2,T3	V		No Recordable Indication		
Temporary attachment removed area	V		No Recordable Indication		
All attachment welded area	V		No Recordable Indication		
Arc strike removed area	V		No Recordable Indication		
Lifting lugs welded area	V		No Recordable Indication		
			~ B L A N K ~		
			Reviewed by 		
QA DEPT. DATE Dec . 22 . 2014			Witnessed by 		
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 험 C.J. KWON 		Level 레벨 II		☒ Date&Time of Examination 검사일자/시간 2014.12.22 ☒ Date of Report 보고서 작성일자 2014.12.22	
Approved by 승 인 B.M. SHIM 		Level 레벨 III		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐	
				☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services	

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) Rev. ASME SEC.VIII DIV.1 2010ED.+2011 ADD. APP.8 + API 660 (8th ED. 2007)	
Item Name 품명 VRU INLET GAS COOLER		Item NO. 부품 번호 E-11580		Surface Condition 표면상태 AS GROUND and AS WELDED	
Process of PT 침투탐상공정 VISIBLE, SOLVENT REMOVABLE		Black Light No. 블랙라이트 번호 N/A		Black Light Intensity 블랙라이트 광도 ☒ N/A ft-cd ☐ μ w/cm ²	
Material/Thickness 재질/두께 SA240-S31803 / 15T	Test temp. 시험온도 16 °C	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침 투 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분		
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply ☐ Flow-on 흘림 적용 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분		
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄			
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 적용 ☒ Spray 분사 ☐ Immerse 침적	Bleed out 흡출시간 15 min 분		
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정		Grade 등급
Main seam A01,B01,B02	V		No Recordable Indication		
All welded of nozzle area T1,T4	V		No Recordable Indication		
Temporary attachment removed area	V		No Recordable Indication		
All attachment welded area	V		No Recordable Indication		
Arc strike removed area	V		No Recordable Indication		
Lifting lugs welded area	V		No Recordable Indication		
			Reviewed by J. S. Lee Witnessed by DATE Dec. 22, 2014		
~ B L A N K ~					
☐ SKETCH ON DOT LINE, IF NECESSARY of ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.					
Examined by 시 험 C.J. KWON		Level 레벨 II		☒ Date&Time of Examination 검사일/시간 2014.12.22 ☒ Date of Report 보고서 작성일자 2014.12.22	
Approved by 승 인 B.M. SHIM		Level 레벨 III		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관	
A P N Co., Ltd.		A P N Co., Ltd.		 Date / Signature: Germanischer Lloyd Industrial Services	

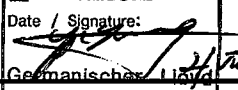
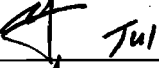
7. PMI & Ferrite Report

P.M.I CERTIFICATE (1 of 2)							DATE		DEC . 17 . 2014		
Manufacturers Name		ILSUNG CORPORATION			Project Name		CARMON CREEK PROJECT				
P.O No.		4511951391			W/O No.		P-13SG-007				
Refence Procedure		VP-SG07-COMM-021			Item No.		E-11580				
Report No.		ISC-QA-PMI-SG007-E11580			Item Name		VRU INLET GAS COOLER				
Method of Examinaton and Equipment Type / Name					SPECTRO TEST TXC01 / SERIAL NO. : 117729/04 X-MET 3000TX / SERIAL NO. : 70410						
MTR number / Heat number and lot number					See, Below Table - Test Part (DWG. No.) / Material or WPS						
Acceptance Criteria : ASME Sec.II Part. C (Within 12.5%)											
Material or WPS	Cr (%)		Ni (%)		Mo (%)		-	-	-	-	Remark
	MIN	MAX	MIN	MAX	MIN	MAX					
ER2209 (GTAW)	21.5	23.5	8.5	10.5	2.5	3.5	-	-	-	-	Weld Rod
E2209-16 (SMAW)	21.5	23.5	7.5	9.5	2.5	3.5	-	-	-	-	Weld Rod
SM-10H.10H-101H	21.5	23.5	7.5	9.5	2.5	3.5	-	-	-	-	Weld
GT.SM-10H.10H-101H	21.5	23.5	7.5	9.5	2.5	3.5	-	-	-	-	Weld
GT.SM-10H.10H-102H	21.5	23.5	7.5	9.5	2.5	3.5	-	-	-	-	Weld
Actual Value											
Test Part (DWG. No.) / Material or WPS	Cr (%)		Ni (%)		Mo (%)		-	-	-	-	Result
CHANNEL A-01 / GT.SM-10H.10H-101H	21.65		7.86		2.66		-	-	-	-	Satisfaction
CHANNEL A-05 / GT.SM-10H.10H-101H	21.58		7.83		2.56		-	-	-	-	Satisfaction
CHANNEL B-01 / GT.SM-10H.10H-101H	21.63		7.78		2.55		-	-	-	-	Satisfaction
CHANNEL B-02 / GT.SM-10H.10H-101H	21.56		7.82		2.58		-	-	-	-	Satisfaction
CHANNEL B-07 / GT.SM-10H.10H-101H	21.58		7.87		2.52		-	-	-	-	Satisfaction
CHANNEL B-08 / GT.SM-10H.10H-101H	21.72		7.84		2.62		-	-	-	-	Satisfaction
N/Z T1 B-01 / GT.SM-10H.10H-102H	21.55		7.89		2.55		-	-	-	-	Satisfaction
■ Note : We hereby certify that the above test was performed in accordance with ASME Sec. II -A or Sec. II -C and the test analyzer has been calibrated to reference material.											
☐ Witnessed by / ☐ Reviewed by		☒ REVIEWED ☒ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd		APPROVED BY S.J.HWANG <i>[Signature]</i> Dec 17 '14		REVIEWED BY S.S.LEE <i>[Signature]</i> Dec 17 '14		TEST CONDUCTED BY Y.S.LIM <i>[Signature]</i> Dec 17 '14		ILSUNG CORPORATION	

P.M.I CERTIFICATE (2 of 2)					DATE		DEC . 17 . 2014		
Manufacturers Name		ILSUNG CORPORATION		Project Name		CARMON CREEK PROJECT			
P.O No.		4511951391		W/O No.		P-13SG-007			
Refence Procedure		VP-SG07-COMM-021		Item No.		E-11580			
Report No.		ISC-QA-PMI-SG007-E11580		Item Name		VRU INLET GAS COOLER			
Test Part (DWG. No.) / Material or WPS	Cr (%)	Ni (%)	Mo (%)	-	-	-	-	-	Result
N/Z T2 B-01 / GT.SM-10H.10H-102H	21.59	7.86	2.59	-	-	-	-	-	Satisfaction
N/Z T1 D-JOINT / SM-10H.10H-101H	21.59	7.64	2.67	-	-	-	-	-	Satisfaction
N/Z T2 D-JOINT / SM-10H.10H-101H	21.63	7.63	2.58	-	-	-	-	-	Satisfaction
N/Z T3 D-JOINT / SM-10H.10H-101H	21.66	7.66	2.62	-	-	-	-	-	Satisfaction
N/Z T4 D-JOINT / SM-10H.10H-101H	21.58	7.63	2.55	-	-	-	-	-	Satisfaction
WELD ROD / ER2209 (1.6mm)	21.63	8.66	2.58	-	-	-	-	-	Satisfaction
WELD ROD / ER2209 (2.0mm)	21.52	8.61	2.56	-	-	-	-	-	Satisfaction
WELD ROD / ER2209 (2.4mm)	21.55	8.62	2.57	-	-	-	-	-	Satisfaction
WELD ROD / E2209-16 (4.0mm)	21.51	7.76	2.52	-	-	-	-	-	Satisfaction
BLANK									

■ Note : We hereby certify that the above test was performed in accordance with ASME Sec. II -A or Sec. II -C and the test analyzer has been calibrated to reference material.

☐ Witnessed by / ☐ Reviewed by ☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services	APPROVED BY	S.J.HWANG <i>3/17/14 Dec 17 '14</i>
	REVIEWED BY	S.S.LEE <i>Dec 17 '14</i>
	TEST CONDUCTED BY	Y.S.LIM <i>Dec 17 '14</i>

P.M.I CERTIFICATE				Date	JUL. 21, 2014	
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT		
P.O No.	4511951391		W/O No.	P-13SG-007		
Drawing No.	-		Item No.	E-11570/E-11580		
REPORT NO.	FLANGE-PMI-001		Item Name	VRU INLET GAS COOLER		
Instrument type and identification number:			MODEL NAME : X-MET3000TX+ / SERIAL NO. : 704101			
Location of P.M.I examination:			ILSUNG SHOP			
Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021						
Material	Cr	Ni	Mo			
SA182-F51	21.0~23.0%	4.5~6.5%	2.5~3.5%			
NOTE : Acceptable criteria range as per PMI Procedure : +/- 10%						
Test part and/or HEAT No.	Cr	Ni	Mo			Result
FLANGE / E131033 (E-15570:T1)	21.16	5.06	3.01			ACCEPT
FLANGE / E131033 (E-15580:T1)	21.38	5.24	3.12			ACCEPT
FLANGE / E131033 (E-15570:T2)	21.28	5.16	3.24			ACCEPT
FLANGE / E131033 (E-15580:T2)	21.64	4.95	3.15			ACCEPT
FLANGE / E131033 (E-15570:T3)	21.75	4.69	3.06			ACCEPT
FLANGE / E131033 (E-15580:T3)	22.25	5.17	2.95			ACCEPT
FLANGE / E131033 (E-15570:T4)	21.30	4.79	2.78			ACCEPT
FLANGE / E131033 (E-15580:T4)	21.72	5.09	2.66			ACCEPT
■ Note: We hereby certify that the above test was performed in accordance with ASME Sec. II-A or Sec. II-C and the test analyzer has been calibrated to reference material. ☐ Witnessed by / ☐ Reviewed by						
☐ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services			APPROVED BY:	T.M.YANG  Jul. 21. '14		
			REVIEWED BY:	G.T.PYO  Jul. 21. 2014		
			PREPARED BY:	G.T.PYO  Jul. 21. 2014		
ILSUNG CORPORATION						

P.M.I CERTIFICATE				Date	JUL. 21, 2014
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT	
P.O No.	4511951391		W/O No.	P-13SG-007	
Drawing No.	-		Item No.	E-11570/E-11580	
REPORT NO.	BOSS-PMI-001		Item Name	VRU INLET GAS COOLER	
Instrument type and identification number:			MODEL NAME : X-MET3000TX+ / SERIAL NO. : 704101		
Location of P.M.I examination:			ILSUNG SHOP		
Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021					
Material	Cr	Ni	Mo		
SA182-F51	21.0~23.0%	4.5~6.5%	2.5~3.5%		
NOTE : Acceptable criteria range as per PMI Procedure : +/- 10%					
Test part and/or HEAT No.	Cr	Ni	Mo	Result	
BOSS / BACCS (E-15570:T1)	21.39	4.91	2.67	ACCEPT	
BOSS / BACCS (E-15580:T1)	21.92	5.06	2.85	ACCEPT	
BOSS / BACCS (E-15570:T2)	22.05	4.75	3.08	ACCEPT	
BOSS / BACCS (E-15580:T2)	21.54	5.31	3.11	ACCEPT	
☒ REVIEWED ☒ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services					
■ Note: We hereby certify that the above test was performed in accordance with ASME Sec. II-A or Sec. II-C and the test analyzer has been calibrated to reference material. ☐ Witnessed by / ☐ Reviewed by					
APPROVED BY:			T.M.YANG <i>[Signature]</i> Jul. 21. 14		
REVIEWED BY:			G.T.PYO <i>[Signature]</i> Jul. 21. 2014		
PREPARED BY:			G.T.PYO <i>[Signature]</i> Jul. 21. 2014		

ILSUNG CORPORATION

P.M.I CERTIFICATE

Date _____

SEP. 15, 2014

P.M.I CERTIFICATE						Date	SEP. 15, 2014
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT			
P.O No.	4511951391		W/O No.	P-13SG-007			
Drawing No.	-		Item No.	E-11570/E-11580			
REPORT NO.	FORGING-PMI-002		Item Name	VRU INLET GAS COOLER			
Instrument type and identification number:			MODEL NAME : SPECTROTEST TXC25 / SERIAL NO. : 09005489				
Location of P.M.I examination:			ILSUNG SHOP				
Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021							
Material	Cr	Ni	Mo				
SA240-S31803	22.0~23.0%	4.5~6.5%	3.0~3.5%				
NOTE : Acceptable criteria range as per PMI Procedure : +/- 10%							
Test part and/or HEAT No.	Cr	Ni	Mo				Result
FORGING / 43501 (CH. COVER, TUBESHEET)	22.14	4.97	3.16				ACCEPT
Note: We hereby certify that the above test was performed in accordance with ASME Sec. II -A or Sec. II -C and the test analyzer has been calibrated to reference material.							
☐ Witnessed by / ☐ Reviewed by				APPROVED BY:	S.J.HWANG	Sep.15'14	
☒ REVIEWED ☒ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services				REVIEWED BY:	S.S.LEE	Sep.15'14	
				PREPARED BY:	Y.S.LIM	Sep.15'14	
				ILSUNG CORPORATION			

P.M.I CERTIFICATE

Date _____

SEP. 15, 2014

Customer	SHELL CANADA ENERGY	Project Name	CARMON CREEK PROJECT
P.O No.	4511951391	W/O No.	P-13SG-007
Drawing No.	-	Item No.	E-11570/E-11580
REPORT NO.	FORGING-PMI-003	Item Name	VRU INLET GAS COOLER
Instrument type and identification number:		MODEL NAME : X-MET3000TX+ / SERIAL NO. : 704101	
Location of P.M.I examination:		ILSUNG SHOP	

Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021

Material	Cr	Ni	Mo			
SA182-F51	21.0~23.0%	4.5~6.5%	2.5~3.5%			

NOTE : Acceptable criteria range as per PMI Procedure : +/- 10%

NOTE : Acceptable criteria range as per PMI Procedure : $\pm 10\%$

[illegible]

■ Note: We hereby certify that the above test was performed in accordance with ASME Sec. II-A or Sec. II-C and the test analyzer has been calibrated to reference material.

☐ Witnessed by / ☐ Reviewed by

APPROVED BY:

S.J.HWANG

REVIEWED BY:

S.S.LEE

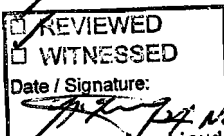
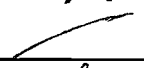
PREPARED BY:

Y.S.LIM

☒ REVIEWED
☐ WITNESSED
Date / Signature:
[Signature]
Germanischer Lloyd
Industrial Services

ILSUNG CORPORATION

P.M.I CERTIFICATE (1/3)				Date		NOV. 24, 2014	
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT			
P.O No.	4511951391		W/O No.	P-13SG-007			
Drawing No.	-		Item No.	E-11570/E-11580			
REPORT NO.	TUBE-PMI-001		Item Name	VRU INLET GAS COOLER			
Instrument type and identification number:			MODEL NAME : SPECTROTEST TXC25 / SERIAL NO. : 09005489				
Location of P.M.I examination:			ILSUNG SHOP				
Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021							
Material	Cr	Ni	Mo				
SA789-S31803	21.0~23.0%	4.5~6.5%	3.0~3.5%				
NOTE : Acceptable criteria range as per PMI Procedure : +/- 10%							
Test part and/or HEAT No.	Cr	Ni	Mo				Result
TUBE / TB9492 (A4027A1) - 1	22.56	4.83	3.28				ACCEPT
TUBE / TB9492 (A4027A1) - 2	22.67	4.76	3.25				ACCEPT
TUBE / TB9492 (A4027A2) - 1	22.62	4.85	3.13				ACCEPT
TUBE / TB9492 (A4027A2) - 2	22.64	4.73	3.17				ACCEPT
TUBE / TB9492 (A4027A3) - 1	22.52	4.87	3.21				ACCEPT
TUBE / TB9492 (A4027A3) - 2	22.67	4.85	3.15				ACCEPT
TUBE / TB9492 (A4027A4) - 1	22.66	4.84	3.13				ACCEPT
TUBE / TB9492 (A4027A4) - 2	22.67	4.86	3.18				ACCEPT
TUBE / TB9492 (A4027A5) - 1	22.63	4.88	3.22				ACCEPT
TUBE / TB9492 (A4027A5) - 2	22.54	4.72	3.23				ACCEPT
TUBE / TB9492 (A4027A6) - 1	22.66	4.86	3.02				ACCEPT
TUBE / TB9492 (A4027A6) - 2	22.53	4.76	3.24				ACCEPT
TUBE / TB9492 (A4027A7) - 1	22.58	4.88	3.15				ACCEPT
TUBE / TB9492 (A4027A7) - 2	22.61	4.73	3.13				ACCEPT
TUBE / TB9492 (A4027A8) - 1	22.67	4.86	3.26				ACCEPT
TUBE / TB9492 (A4027A8) - 2	22.64	4.88	3.14				ACCEPT
TUBE / TB9492 (A4027A9) - 1	22.65	4.83	3.16				ACCEPT
TUBE / TB9492 (A4027A9) - 2	22.52	4.89	3.13				ACCEPT
TUBE / TB9492 (A4027A10) - 1	22.63	4.73	3.17				ACCEPT
TUBE / TB9492 (A4027A10) - 2	22.62	4.86	3.14				ACCEPT
TUBE / TB9492 (A4027A11) - 1	22.77	4.89	3.26				ACCEPT
TUBE / TB9492 (A4027A11) - 2	22.64	4.84	3.11				ACCEPT
■ Note: We hereby certify that the above test was performed in accordance with ASME Sec. II-A or Sec. II-C and the test analyzer has been calibrated to reference material. ☐ Witnessed by / ☐ Reviewed by							
☒ REVIEWED ☒ WITNESSED Date / Signature: <i>[Signature]</i> 24 Nov 14 Germanischer Lloyd Industrial Services			APPROVED BY:		S.J.HWANG <i>[Signature]</i> Nov. 24.14		
			REVIEWED BY:		S.S.LEE <i>[Signature]</i> Nov. 24.14		
			PREPARED BY:		Y.S.LIM <i>[Signature]</i> Nov. 24.14		
ILSUNG CORPORATION							

P.M.I CERTIFICATE (2/3)				Date		NOV. 24, 2014	
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT			
P.O No.	4511951391		W/O No.	P-13SG-007			
Drawing No.	-		Item No.	E-11570/E-11580			
REPORT NO.	TUBE-PMI-001		Item Name	VRU INLET GAS COOLER			
Test part and/or HEAT No.	Cr	Ni	Mo				Result
TUBE / TB9492 (A4027A12) - 1	22.67	4.87	3.16				ACCEPT
TUBE / TB9492 (A4027A12) - 2	22.62	4.84	3.19				ACCEPT
TUBE / TB8825 (A4027A13) - 1	22.65	4.85	3.15				ACCEPT
TUBE / TB8825 (A4027A13) - 2	22.63	4.74	3.17				ACCEPT
TUBE / TB8825 (A4027A14) - 1	22.57	4.83	3.26				ACCEPT
TUBE / TB8825 (A4027A14) - 2	22.64	4.76	3.19				ACCEPT
TUBE / TB8825 (A4027A15) - 1	22.52	4.88	3.03				ACCEPT
TUBE / TB8825 (A4027A15) - 2	22.77	4.84	3.17				ACCEPT
TUBE / TB8825 (A4027A16) - 1	22.64	4.75	3.26				ACCEPT
TUBE / TB8825 (A4027A16) - 2	22.65	4.82	3.18				ACCEPT
TUBE / TB8825 (A4027A17) - 1	22.52	4.88	3.14				ACCEPT
TUBE / TB8825 (A4027A17) - 2	22.66	4.83	3.16				ACCEPT
TUBE / TB8825 (A4027A18) - 1	22.64	4.84	3.05				ACCEPT
TUBE / TB8825 (A4027A18) - 2	22.62	4.85	3.17				ACCEPT
TUBE / TB8825 (A4027A19) - 1	22.68	4.77	3.15				ACCEPT
TUBE / TB8825 (A4027A19) - 2	22.55	4.82	3.24				ACCEPT
TUBE / TB8825 (A4027A20) - 1	22.63	4.84	3.17				ACCEPT
TUBE / TB8825 (A4027A20) - 2	22.65	4.83	3.15				ACCEPT
TUBE / TB8825 (A4027A21) - 1	22.62	4.89	3.16				ACCEPT
TUBE / TB8825 (A4027A21) - 2	22.65	4.73	3.15				ACCEPT
TUBE / TB8825 (A4027A22) - 1	22.74	4.86	3.17				ACCEPT
TUBE / TB8825 (A4027A22) - 2	22.66	4.75	3.14				ACCEPT
TUBE / TB8825 (A4027A23) - 1	22.62	4.88	3.16				ACCEPT
TUBE / TB8825 (A4027A23) - 2	22.74	4.72	3.07				ACCEPT
TUBE / TB8825 (A4027A24) - 1	22.56	4.86	3.24				ACCEPT
TUBE / TB8825 (A4027A24) - 2	22.62	4.82	3.16				ACCEPT
■ Note: We hereby certify that the above test was performed in accordance with ASME Sec. II -A or Sec. II -C and the test analyzer has been calibrated to reference material. ☐ Witnessed by / ☐ Reviewed by							
☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services				APPROVED BY:		S.J.HWANG  Nov 24 '14	
				REVIEWED BY:		S.S.LEE  Nov 24 '14	
				PREPARED BY:		Y.S.LIM  Nov 24 '14	
				ILSUNG CORPORATION			

NOV. 24, 2014

P.M.I CERTIFICATE (1/2)

Date

JUL. 29, 2014

Customer	SHELL CANADA ENERGY	Project Name	CARMON CREEK PROJECT
P.O No.	4511951391	W/O No.	P-13SG-007
Drawing No.	-	Item No.	-
REPORT NO.	PLATE-PMI-002	Item Name	-
Instrument type and identification number:		MODEL NAME : SPECTROTEST TXC25 / SERIAL NO. : 09005489	
Location of P.M.I examination:		ILSUNG SHOP	

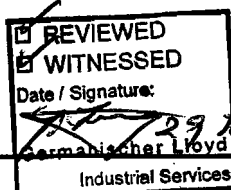
Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021

Material	C	Mn	Si				
SA516-70	0.27%	0.79~1.30%	0.13~0.45%				
NOTE : Acceptable criteria range as per PMI Procedure : +/- 10%							

Test part and/or HEAT No.	C	Mn	Si				Result
PLATE / SB00020	0.137	1.18	0.40				ACCEPT
PLATE / SF41548	0.036	1.09	0.37				ACCEPT
PLATE / SF43168	0.038	1.14	0.35				ACCEPT
PLATE / SB02070	0.011	1.10	0.31				ACCEPT
PLATE / SB03469	0.102	1.08	0.31				ACCEPT
PLATE / SU36584	0.062	1.09	0.32				ACCEPT
PLATE / SB00727	0.117	1.08	0.32				ACCEPT
PLATE / SF41864	0.052	1.14	0.39				ACCEPT
PLATE / SB01389	0.094	1.09	0.46				ACCEPT
PLATE / SB01381	0.064	1.13	0.40				ACCEPT

■ Note: We hereby certify that the above test was performed in accordance with ASME Sec. II-A or Sec. II-C and the test analyzer has been calibrated to reference material.

☐ Witnessed by / ☐ Reviewed by



APPROVED BY:

T.M.YANG

REVIEWED BY:

G.T.PYO

PREPARED BY:

G.T.PYO

ILSUNG CORPORATION

P.M.I CERTIFICATE (2/2)				Date		JUL. 29, 2014	
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT			
P.O No.	4511951391		W/O No.	P-13SG-007			
Drawing No.	-		Item No.	-			
REPORT NO.	PLATE-PMI-002		Item Name	-			
Instrument type and identification number:			MODEL NAME : SPECTROTEST TXC25 / SERIAL NO. : 09005489				
Location of P.M.I examination:			ILSUNG SHOP				
Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021							
Material	C	Mn	Si				
SA516-70	0.27%	0.79~1.30%	0.13~0.45%				
NOTE : Acceptable criteria range as per PMI Procedure : +/- 10%							
Test part and/or HEAT No.	C	Mn	Si	Result			
PLATE / SU36163	0.033	1.11	0.39	ACCEPT			
PLATE / SU36583	0.029	1.12	0.35	ACCEPT			
PLATE / SU36581	0.217	1.23	0.33	ACCEPT			
PLATE / 26653	0.174	1.17	0.33	ACCEPT			
PLATE / 46233	0.173	1.21	0.33	ACCEPT			
PLATE / 38433	0.127	1.29	0.35	ACCEPT			
PLATE / 35623	0.129	1.21	0.36	ACCEPT			
PLATE / SB01384	0.183	1.22	0.34	ACCEPT			
PLATE / SB03471	0.147	1.16	0.33	ACCEPT			
■ Note: We hereby certify that the above test was performed in accordance with ASME Sec. II-A or Sec. II-C and the test analyzer has been calibrated to reference material. ☐ Witnessed by / ☐ Reviewed by							
☒ REVIEWED ☒ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services			APPROVED BY:	T.M.YANG  Jul. 29. 2014			
			REVIEWED BY:	G.T.PYO  Jul. 29. 2014			
			PREPARED BY:	G.T.PYO  Jul. 29. 2014			
ILSUNG CORPORATION							

182/296

JUL. 29, 2014

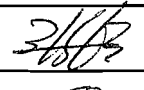
ILSUNG SHOP

ACCEPT

☒ REVIEWED
☒ WITNESSED
Date / Signature:
[Signature]
Germanischer Lloyd
Industrial Services

G.T.PYO

183/296

P.M.I CERTIFICATE				Date		SEP. 15, 2014	
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT			
P.O No.	4511951391		W/O No.	P-13SG-007			
Drawing No.	-		Item No.	-			
REPORT NO.	FORGING-PMI-001		Item Name	-			
Instrument type and identification number:			MODEL NAME : SPECTROTEST TXC25 / SERIAL NO. : 09005489				
Location of P.M.I examination:			ILSUNG SHOP				
Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021							
Material	C	Mn	Si				
SA765-II	0.30%	0.60~1.35%	0.15~0.30%				
NOTE : Acceptable criteria range as per PMI Procedure : +/- 10%							
Test part and/or HEAT No.	C	Mn	Si	Result			
FORGING / 4-88191	0.210	1.25	0.22	ACCEPT			
FORGING / N09644	0.180	1.12	0.19	ACCEPT			
FORGING / N09649	0.230	1.08	0.28	ACCEPT			
FORGING / N09659	0.200	1.13	0.26	ACCEPT			
FORGING / N11214	0.220	1.11	0.23	ACCEPT			
FORGING / N11223	0.210	1.24	0.18	ACCEPT			
FORGING / N11225	0.210	1.21	0.21	ACCEPT			
FORGING / N12804	0.190	1.19	0.20	ACCEPT			
■ Note: We hereby certify that the above test was performed in accordance with ASME Sec. II-A or Sec. II-C and the test analyzer has been calibrated to reference material. ☐ Witnessed by / ☐ Reviewed by							
☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services			APPROVED BY:	S.J.HWANG  Sep.15'14			
			REVIEWED BY:	S.S.LEE  Sep.15'14			
			PREPARED BY:	Y.S.LIM  Sep.15'14			
ILSUNG CORPORATION							

8. Expanding Ratio Check Report

INSPECTION REPORT

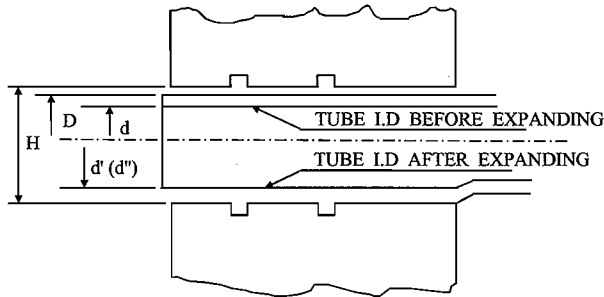
PAGE : 1 OF 2

FOR EXPANDING RATIO CHECK

DATE : DEC . 17 . 2014

P.O NO.	4511951391	ITEM NAME	VRU INLET GAS COOLER
CUSTOMER	SHELL CANADA ENERGY	ITEM NO.	E-11580
PROJECT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.06
W/O NO.	P-13SG-007	DOC. NO.	SG07 - EXPAND - E11580 - 01

■ SKETCH



$$R = \frac{(d' - d) - (H - D)}{2t} \times 100$$

R - EXPANDING RATIO (%)

d' - TUBE I.D AFTER EXPANDING

(d''-TUBE I.D AFTER EXPANDING : HEAVY)

d - TUBE I.D BEFORE EXPANDING

H - TUBE SHEET HOLE DIA

t - TUBE WALL THICKNESS (t=(D-d)/2)

D - TUBE O.D

TUBE SHEET HOLE TOTAL - 1952 HOLES

EXPANDING RATIO CHECK - 40 HOLES

< FIXED SIDE >

NO.	d''	d'	d	d'' - d	d' - d	H	D	H - D	R(LIGHT) 2~4%	R'(HEAVY) 4~6%
1		15.95	15.67		0.29	19.26	19.07	0.19	2.80	
2		15.95	15.67		0.28	19.24	19.06	0.18	3.05	
3		15.95	15.67		0.28	19.24	19.05	0.19	2.70	
4		15.95	15.67		0.28	19.25	19.06	0.18	2.86	
5		15.97	15.66		0.31	19.25	19.06	0.18	3.63	
6		15.95	15.67		0.29	19.24	19.05	0.19	2.92	
7		15.96	15.67		0.29	19.26	19.07	0.19	2.77	
8		15.96	15.66		0.30	19.25	19.06	0.19	3.15	
9		15.97	15.67		0.30	19.26	19.06	0.20	3.00	
10	BLANK	15.96	15.67	BLANK	0.29	19.25	19.07	0.18	3.22	BLANK
11		15.96	15.66		0.30	19.26	19.06	0.20	2.93	
12		15.96	15.66		0.30	19.26	19.07	0.19	3.35	
13		15.96	15.67		0.29	19.25	19.06	0.19	2.96	
14		15.95	15.67		0.28	19.25	19.06	0.19	2.89	
15		15.97	15.66		0.31	19.25	19.06	0.19	3.30	
16		15.96	15.67		0.29	19.24	19.05	0.19	2.96	
17		15.95	15.68		0.27	19.25	19.05	0.19	2.38	
18		15.95	15.68		0.27	19.26	19.06	0.20	2.19	
19		15.96	15.67		0.29	19.26	19.06	0.20	2.69	
20		15.96	15.67		0.29	19.25	19.06	0.19	2.86	

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☒ WITNESSED

Date / Signature:

[Signature]
Germanischer Lloyd
Industrial Services

APPROVED BY

S.J.HWANG

REVIEWED BY

S.S.LEE

PREPARED BY

Y.S.LIM

[Signature] Dec 17 '14
[Signature] Dec 17 '14
[Signature] Dec 17 '14

INSPECTION REPORT

PAGE : 2 OF 2

FOR EXPANDING RATIO CHECK

DOC. NO. : SG07 - EXPAND - E11580 - 01

NO.	d"	d'	d	d" - d	d' - d	H	D	H - D	R(LIGHT) 2~4%	R'(HEAVY) 4~6%
21		15.96	15.68		0.28	19.26	19.05	0.21	2.30	
22		15.95	15.67		0.28	19.24	19.07	0.17	3.00	
23		15.96	15.67		0.30	19.25	19.07	0.19	3.13	
24		15.96	15.67		0.29	19.26	19.07	0.19	3.03	
25		15.96	15.68		0.28	19.26	19.07	0.19	2.74	
26		15.96	15.67		0.29	19.25	19.06	0.19	2.99	
27		15.97	15.67		0.29	19.25	19.07	0.18	3.38	
28		15.96	15.68		0.28	19.25	19.07	0.19	2.87	
29		15.95	15.67		0.28	19.24	19.06	0.18	3.02	
30	BLANK	15.95	15.67	BLANK	0.28	19.25	19.06	0.20	2.59	BLANK
31		15.96	15.67		0.30	19.25	19.06	0.19	3.29	
32		15.97	15.67		0.30	19.24	19.06	0.18	3.43	
33		15.96	15.67		0.29	19.24	19.05	0.19	2.91	
34		15.97	15.68		0.29	19.25	19.06	0.19	2.80	
35		15.96	15.68		0.28	19.25	19.06	0.19	2.53	
36		15.95	15.66		0.29	19.26	19.07	0.19	2.95	
37		15.96	15.67		0.28	19.24	19.06	0.18	3.08	
38		15.95	15.67		0.29	19.25	19.06	0.19	2.94	
39		15.96	15.67		0.29	19.25	19.07	0.18	3.30	
40		15.96	15.67		0.29	19.25	19.05	0.20	2.65	

BLANK

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☒ WITNESSED
Date / Signature:
[Signature]
Germanischer Lloyd
Industrial Services

APPROVED BY

S.J.HWANG

REVIEWED BY

S.S.LEE

PREPARED BY

Y.S.LIM

[Signature] Dec 17 '14
[Signature] Dec 17 '14
[Signature] Dec 17 '14

INSPECTION REPORT

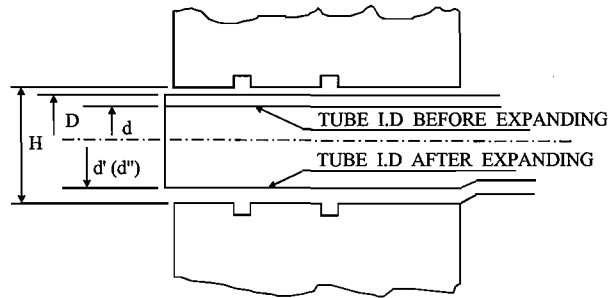
FOR EXPANDING RATIO CHECK

PAGE : 1 OF 2

DATE : DEC . 17 . 2014

P.O NO.	4511951391	ITEM NAME	VRU INLET GAS COOLER
CUSTOMER	SHELL CANADA ENERGY	ITEM NO.	E-11580
PROJECT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.06
W/O NO.	P-13SG-007	DOC. NO.	SG07 - EXPAND - E11580 - 02

■ SKETCH



$$R = \frac{(d' - d) - (H - D)}{2t} \times 100$$

R - EXPANDING RATIO (%)

d' - TUBE I.D AFTER EXPANDING

(d''-TUBE I.D AFTER EXPANDING : HEAVY)

d - TUBE I.D BEFORE EXPANDING

H - TUBE SHEET HOLE DIA

t - TUBE WALL THICKNESS (t=(D-d)/2)

D - TUBE O.D

TUBE SHEET HOLE TOTAL - 1952 HOLES

EXPANDING RATIO CHECK - 40 HOLES

< SLIDING SIDE >

NO.	d''	d'	d	d'' - d	d' - d	H	D	H - D	R(LIGHT) 2~4%	R'(HEAVY) 4~6%
1		15.95	15.68		0.28	19.24	19.05	0.19	2.60	
2		15.97	15.68		0.29	19.25	19.05	0.20	2.61	
3		15.96	15.67		0.29	19.24	19.07	0.18	3.46	
4		15.96	15.66		0.30	19.25	19.06	0.19	3.32	
5		15.97	15.67		0.29	19.25	19.06	0.19	2.92	
6		15.96	15.67		0.29	19.26	19.06	0.19	2.74	
7		15.96	15.66		0.30	19.26	19.06	0.20	2.80	
8		15.96	15.67		0.28	19.25	19.06	0.20	2.62	
9		15.96	15.67		0.30	19.25	19.07	0.18	3.26	
10	BLANK	15.97	15.66	BLANK	0.30	19.25	19.06	0.19	3.33	BLANK
11		15.95	15.67		0.28	19.25	19.07	0.18	2.91	
12		15.96	15.66		0.30	19.25	19.06	0.19	3.03	
13		15.96	15.67		0.29	19.24	19.05	0.19	2.94	
14		15.96	15.67		0.29	19.26	19.06	0.19	2.90	
15		15.96	15.66		0.29	19.25	19.05	0.20	2.83	
16		15.97	15.67		0.30	19.24	19.05	0.19	3.17	
17		15.96	15.67		0.29	19.26	19.06	0.20	2.53	
18		15.96	15.68		0.28	19.24	19.06	0.18	2.81	
19		15.96	15.67		0.29	19.26	19.06	0.20	2.53	
20		15.96	15.68		0.28	19.25	19.05	0.20	2.44	

☐ WITNESSED BY
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☒ REVIEWED
☒ WITNESSED

Date / Signature:

[Signature]
Germanischer Lloyd
Industrial Services

APPROVED BY

S.J.HWANG

REVIEWED BY

S.S.LEE

PREPARED BY

Y.S.LIM

INSPECTION REPORT

PAGE : 2 OF 2

FOR EXPANDING RATIO CHECK

DOC. NO.: SG07 - EXPAND - E11580 - 02

NO.	d"	d'	d	d" - d	d' - d	H	D	H - D	R(LIGHT) 2~4%	R(HEAVY) 4~6%
21		15.97	15.67		0.30	19.25	19.06	0.20	3.15	
22		15.96	15.67		0.28	19.25	19.06	0.19	2.85	
23		15.95	15.67		0.29	19.24	19.06	0.18	3.02	
24		15.97	15.67		0.30	19.25	19.06	0.19	3.15	
25		15.96	15.67		0.28	19.24	19.06	0.18	2.96	
26		15.96	15.68		0.28	19.26	19.06	0.19	2.60	
27		15.96	15.66		0.30	19.24	19.05	0.19	3.37	
28		15.96	15.68		0.28	19.26	19.06	0.20	2.18	
29		15.96	15.67		0.29	19.25	19.05	0.20	2.89	
30	BLANK	15.96	15.66	BLANK	0.30	19.25	19.06	0.19	3.25	BLANK
31		15.97	15.68		0.29	19.25	19.05	0.20	2.69	
32		15.96	15.66		0.30	19.24	19.06	0.18	3.41	
33		15.96	15.66		0.29	19.25	19.06	0.19	2.89	
34		15.97	15.67		0.30	19.25	19.06	0.19	3.18	
35		15.96	15.67		0.29	19.24	19.06	0.18	3.16	
36		15.96	15.68		0.28	19.25	19.05	0.20	2.37	
37		15.96	15.68		0.28	19.25	19.07	0.18	2.95	
38		15.97	15.67		0.30	19.25	19.06	0.18	3.37	
39		15.96	15.67		0.29	19.25	19.06	0.19	2.83	
40		15.96	15.67		0.28	19.25	19.06	0.18	2.89	

BLANK

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☒ WITNESSED
Date / Signature:
[Signature]
Germanischer Lloyd
Industrial Services

APPROVED BY

S.J.HWANG

3/1/14 Dec 17/14

REVIEWED BY

S.S.LEE

Dec 17/14

PREPARED BY

Y.S.LIM

Dec 17/14

9. Dimension & Visual Report

ILSUNG	INSPECTION REPORT FOR DIMENSION & VISUAL		W/O NO.	P-13SG-007
			DATE	DEC. 17. 2014
P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY	
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER	
ITEM NO.	E-11580	DWG. NO.	VP-SG07-E11570-001 REV.06	

■ SKETCH DOC. NO.: SG07 - FINAL - E11580 - 01

APPROX. 9396

T1 24" S2 6" T3 2"

93 15 1300 650 650 370 (-1) 1520 3600 1570 370 600 600 93

(-1) (±0) (±0)

577 21x263-5523 (BAFFLE CUT; SINGLE SEG. 30.3%, H-CUT)

590 17 (TYP.)

1-LIFTING LUG O.K.

2x2-LIFTING LUGS O.K.

1-LIFTING LUG O.K.

2x2-LIFTING LUGS O.K.

TUBE SIZE: O.D. 19.05x1.63(WHL)x6706L

REQ'D NO.: 1952 EA. PITCH: 23.8

1-EARTHING BOSS O.K.

4-36x46 SLOTH HOLES O.K.

NAME PLATE O.K.

C.O.G.

1-EARTHING BOSS O.K.

4-36x46 SLOTH HOLES O.K.

3000 3320 4500 (±0/-1)

1000 (H) (SADDLE C.L. TO SADDLE C.L.)

FIXED SIDE SLIDING SIDE

SIDE ELEVATION

REMARKS ;

DIMENSION & VISUAL INSPECTION : SATISFACTION

THE GASKET FACE OF FLANGE HAVE VISUALLY BEEN CHECKED AND SATISFIED WITHOUT ANY DAMAGE.

☐ REVIEWED BY

☐ REVIEWED BY

☒ REVIEWED

☒ WITNESSED

Date / Signature:

Germanischer Lloyd Industrial Services

APPROVED BY S.J.HWANG 3/16/14 Dec 17 '14

REVIEWED BY S.S.LEE Dec 17 '14

PREPARED BY Y.S.LIM Dec 17 '14

Reviewed

Witnessed

Dec. 19. 2014

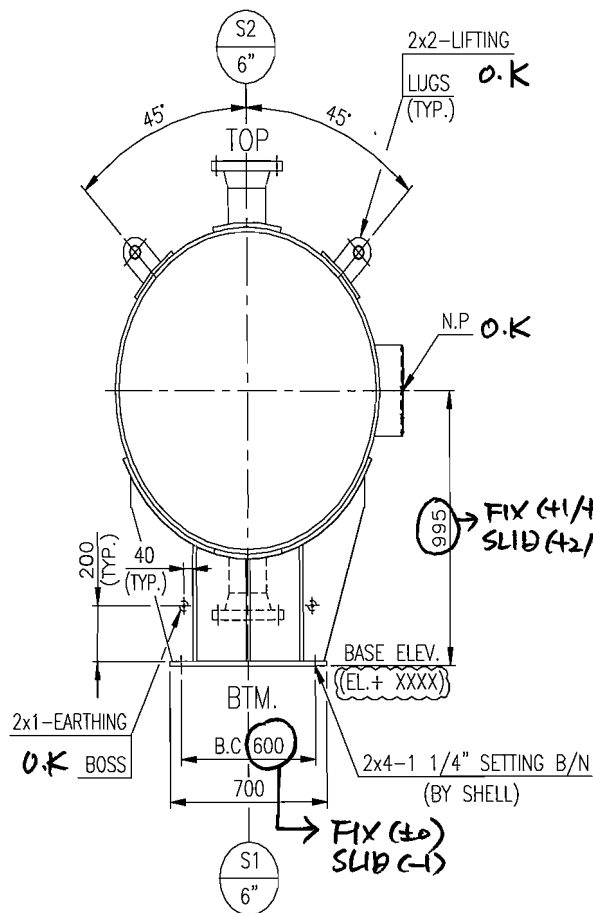
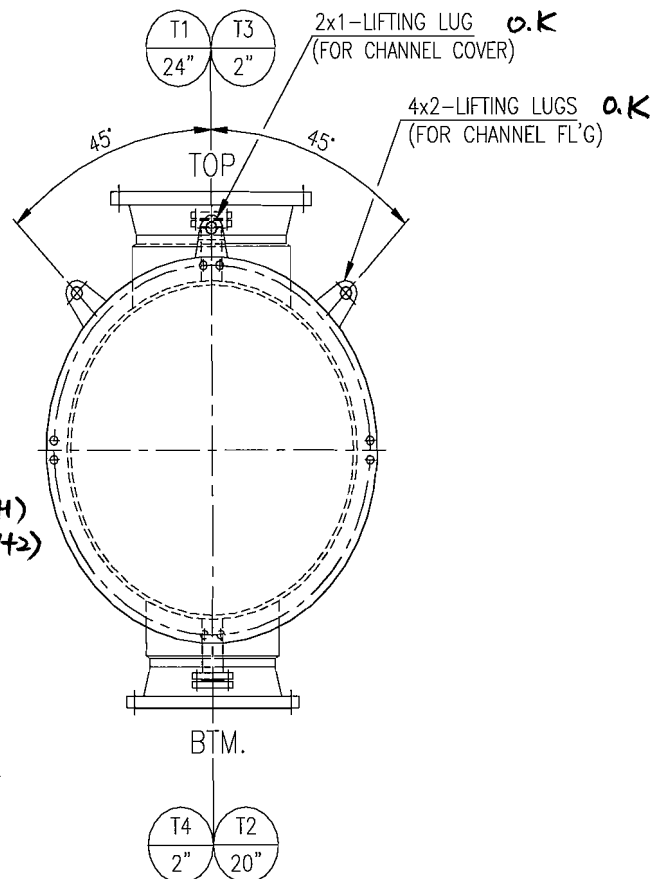
14412

HSB GS

ILSUNG	INSPECTION REPORT FOR DIMENSION & VISUAL	W / O NO.	P-13SG-007
		DATE	DEC . 17 . 2014
P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER
ITEM NO.	E-11580	DWG. NO.	VP-SG07-E11570-001 REV.06

■ SKETCH

DOC. NO. : SG07 - FINAL - E11580 - 02

VIEW "A"-"A"
(SHELL SIDE)VIEW "A"-"A"
(TUBE SIDE)

REMARKS ;

DIMENSION & VISUAL INSPECTION : SATISFACTION

ORIENTATION OF NOZZLE & ATTACHMENTS : SATISFACTION

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☒ WITNESSED
 Date / Signature:
[Signature]
 Germanischer Lloyd
 Industrial Services

APPROVED BY	S.J.HWANG <i>[Signature]</i> Dec 17 '14
REVIEWED BY	S.S.LEE <i>[Signature]</i> Dec 17 '14
PREPARED BY	Y.S.LIM <i>[Signature]</i> Dec 17 '14

	DIMENSIONAL INSPECTION RECORD				W/O NO.	P-13SG-007			
					DATE	DEC. 17. 2014			
					PAGE NO.	1 OF 1			
P.O NO.		4511951391		CUSTOMER		SHELL CANADA ENERGY			
PROJECT NAME		CARMON CREEK PROJECT		ITEM NAME		VRU INLET GAS COOLER			
ITEM NO.		E-11580		DWG. NO.		VP-SG07-E11570-001 REV.06			

(UNIT : MM)

◆ USED EQUIPMENT

*(1) ULTRASONIC TH'K GAGE
MAKER : WORLTECH
I.D NO. : WT610-106-61357 (Q446)

■ SKETCH

"A"

■ INSIDE DIAMETER

C. SEAM

L. SEAM
T-A T-B T-C
* * *

■ THICKNESS *(1)

C. SEAM

□ STRAIGHTNESS

DOC. NO. : SG07 - FINAL - E11580 - 03

SEAM NO.	INSIDE DIAMETER					SEAM NO.	THICKNESS				STRAIGHTNESS				
	0° ~ 180°	45° ~ 225°	90° ~ 270°	135° ~ 315°	ROUND -NESS		DWG.	T-A	T-B	T-C					
											S-A	S-B	S-A	S-B	
B-01	0	-1	0	+1	2	A-01	15	15.3	15.1	15.2					
B-02	+1	0	0	+1	1	A-02	17	17.2	17.3	17.2					
B-03	* OUT - OF - ROUNDNESS * CHECKED BY DISK GAUGE (GAUGE DIA. : BAFFLE O.D)					A-03	17	17.2	17.3	17.2					
B-04						A-04	17	17.3	17.2	17.1					
B-05						A-05	15	15.3	15.2	15.3					
B-06						BLANK									
B-07	0	0	+2	0	2										
B-08	+1	-1	0	+1	2										
BLANK															
RESULT		SATISFACTION				RESULT		SATISFACTION							

☐ WITNESSED BY

☐ REVIEWED BY

☒ REVIEWED

☒ WITNESSED

Date / Signature:

[Signature]

Germanischer Lloyd Industrial Services

APPROVED BY: S.J.HWANG *[Signature]* Dec 17 '14

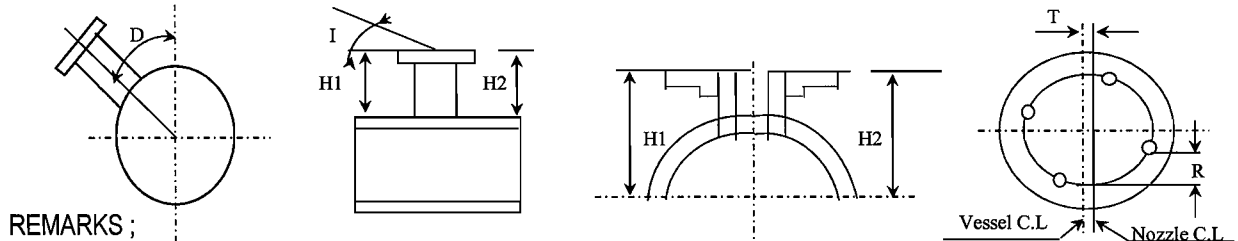
REVIEWED BY: S.S.LEE *[Signature]* Dec 17 '14

PREPARED BY: Y.S.LIM *[Signature]* Dec 17 '14

	INSPECTION REPORT FOR NOZZLE ORIENTATION & DIMENSION		W/O NO.	P-13SG-007
			DATE	DEC. 17. 2014
			PAGE NO.	1 OF 1
P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY	
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER	
ITEM NO.	E-11580	DWG. NO.	VP-SG07-E11570-001 REV.06	

■ SKETCH

DOC. NO. : SG07 - FINAL - E11580 - 04



REMARKS ;

1. MARKED *

: NOZZLE IN HEAD

2. ORIENTATION

: VIEW "SLIDING SIDE"

3. G

: GOOD

4. ACCEPTABLE CRITERIA

: DEP 31.21.01.31-Gen & TEMA CLASS "R" (9TH ED. - 07)

NOZZLE NO.	S I Z E	ORIENTATION (D) (mm)			PROJECTION (H) (mm)				INCLINATION (I)	TRANSGRATION (T)	ROTATION (R)	RESULT
					DWG.	TOL.	ACTUAL					
		DWG.	TOL.	ACT.			H1	H2				
S1	6"	BTM.	±3	G	830 TO C.L	±3	833 (+3)	832 (+2)	G	G	G	ACCEPT
S2	6"	TOP	±3	G	830 TO C.L	±3	830 (0)	830 (0)	G	G	G	ACCEPT
T1	24"	TOP	±3	G	900 TO C.L	±3	901 (+1)	900 (0)	G	G	G	ACCEPT
T2	20"	BTM.	±3	G	900 TO C.L	±3	900 (0)	898 (-2)	G	G	G	ACCEPT
T3	2"	TOP	±3	G	800 TO C.L	±3	798 (-2)	800 (0)	G	G	G	ACCEPT
T4	2"	BTM.	±3	G	800 TO C.L	±3	800 (0)	801 (+1)	G	G	G	ACCEPT

BLANK

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☒ WITNESSED

Date / Signature:


 Germanischer Lloyd
 Industrial Services

APPROVED BY

S.J.HWANG

REVIEWED BY

S.S.LEE

PREPARED BY

Y.S.LIM

Dec 17 '14

Dec 17 '14

Dec 17 '14

ILSUNG	INSPECTION REPORT FOR BUNDLE DIMENSION & VISUAL		W/O NO.	P-13SG-007
			DATE	NOV. 27. 2014
P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY	
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER	
ITEM NO.	E-11580	DWG. NO.	VP-SG07-E11570-001 REV.06	

■ SKETCH DOC. NO. : SG07 - FINAL - E11580 - 05

REMARKS ;

DIMENSION & VISUAL INSPECTION : SATISFACTION

TUBE PROJECTION & TACK WELDING CONDITION ON TIE ROD HAVE BEEN CHECKED AND SATISFIED

THE BAFFLE PLATE HAVE BEEN CHECKED AND SATISFIED

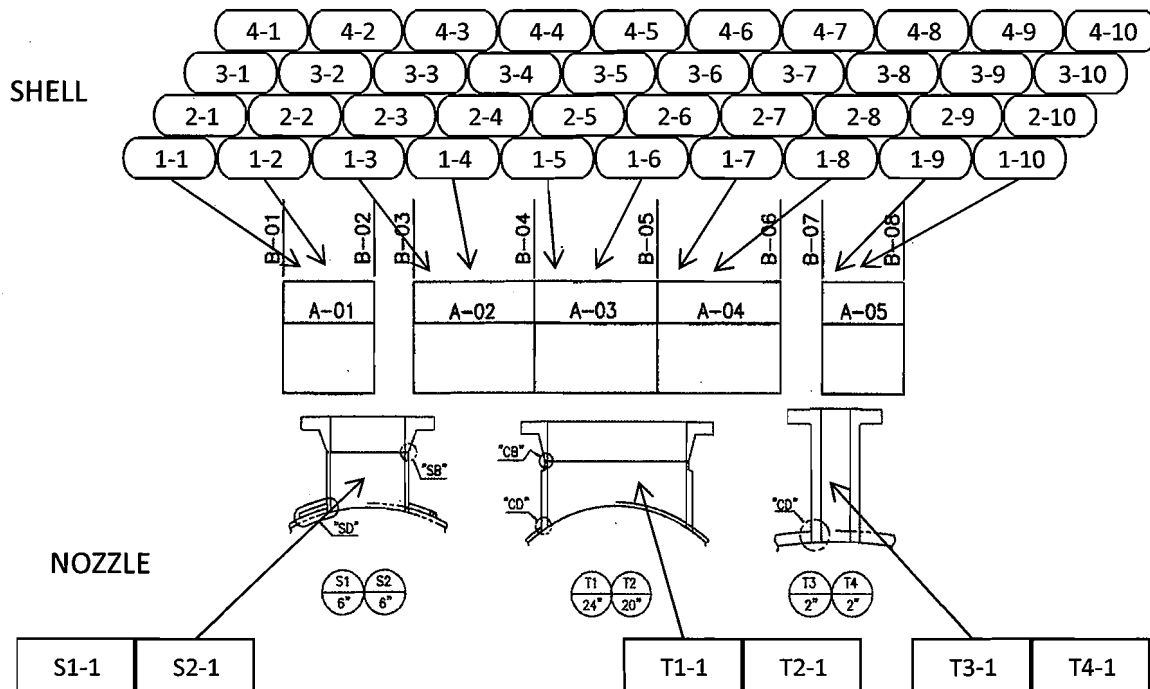
☐ WITNESSED BY	☒ REVIEWED ☒ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services	APPROVED BY	S.J.HWANG <i>[Signature]</i> Nov 27 '14
☐ REVIEWED BY		REVIEWED BY	S.S.LEE <i>[Signature]</i> Nov 27 '14
		PREPARED BY	Y.S.LIM <i>[Signature]</i> Nov 27 '14

ULTRASONIC WALL THICKNESS RECORD

P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY
PJT. NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.06
ITEM NO.	E-11580	ITEM NAME	VRU INLET GAS COOLER

W/O NO : P-13SG-007

DATE : DEC. 17. 2014



TEST LOCATION : IN ACCORDANCE WITH STANDARD DRAWING S10.118. / TEST EQUIP. : ULTRASONIC TH'K GAUGE (MAKER - WORLTECH, SN - WT610-106-61357)

PART	LOCATION (GRID LINE)	THICKNESS (mm)					PART	LOCATION (GRID LINE)	THICKNESS (mm)					
		DWG. (MIN.)	LOCATION (GRID POINT)						DWG. (MIN.)	LOCATION (GRID POINT)				
			1	2	3	4				9	10	-	-	
SHELL & CHANNEL	1 (0°)	1~2 15	15.27	15.33	17.24	17.25	SHELL & CHANNEL	3 (180°)	9~10 15	15.26	15.21	-	-	
	2 (90°)		15.33	15.17	17.28	17.34		4 (270°)		15.33	15.25	-	-	
	3 (180°)	3~4 17	15.14	15.24	17.15	17.26	PART	LOCATION	DWG. (MIN.)	1		-		
	4 (270°)		15.25	15.36	17.36	17.14	NOZZLE	S1	S2	10.97	10.97	11.22	11.19	-
	LOCATION	DWG.	5	6	7	8		T1	T2	25.2	26	25.94	26.58	-
	1 (0°)	5~8 17	17.21	17.35	17.23	17.37		T3	T4	13.6	13.6	13.79	13.83	-
	2 (90°)		17.36	17.21	17.17	17.23	B L A N K							
	3 (180°)		17.24	17.24	17.24	17.22								
	4 (270°)		17.15	17.33	17.31	17.34								
	LOCATION	DWG.	9	10	-	-								
	1 (0°)	9~10 15	15.37	15.18	-	-								
	2 (90°)		15.23	15.36	-	-								

☐ REVIEWED BY / ☐ WITNESSED BY

☒ REVIEWED
☒ WITNESSED
 Date / Signature:
 Germanischer Lloyd
 Industrial

APPROVED BY

S.J.HWANG

REVIEWED BY

S.S.LEE

PREPARED BY

Y.S.LIM

ILSUNG CORPORATION

ILSUNG CORPORATION

ILSUNG		LEAK TEST RECORD	
W/O NO. : P-13SG-007		DOC. NO. : ISC-QA-ALT-SG007-002	
P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER
ITEM NO.	E-11580	DWG. NO.	VP-SG07-E11570-001 REV.06

■ SKETCH

TUBE TO TUBESHEET INSPECTION

TUBESHEET TUBE

TUBE TO TUBESHEET (WELDED BY STRENGTH CONDITION)			PRESS. GAGE I.D NO. & CALIBRATION DATE
BEFORE EXPANDING	TYPE OF TEST	☒ AIR ☐ N2 ☐ ETC.	P004-034 (DEC.18.2013) P004-054 (NOV.06.2014)
	TEST PRESS.	1.0 kg/cm ² G	
	TEST TEMP.	10 °C	
	HOLDING TIME	30 MIN.	
	TEST RESULT	ACCEPT	
	TEST DATE	DEC . 16 . 2014	

☐ WITNESSED BY ☐ REVIEWED BY	REVIEWED WITNESSED Date / Signature: Germanischer Lloyd Industrial Services	APPROVED BY S.J.HWANG Dec.16 '14 REVIEWED BY S.S.LEE Dec.16 '14 PREPARED BY Y.S.LIM Dec.16 '14
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ASME

REPORT OF CALIBRATION

교 정 성 적 서

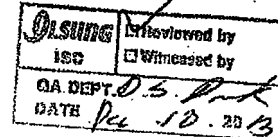
EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-131218-01
SPECIFICATION 사 양	0.4 MPa	SERIAL NO. 일련 번호	P004-034
CALIBRATION DATE 교정 일자	2013.12.18	RECAL. DATE 재교정 일자	2014.12.17
MAKER 제 작 자	WISE	ACCEPTANCE CRITERIA 합격 기준	KS B 5305

RESULT

1. 외 관 : 양 호

(Visual) (Accept)

2. 교정 결과 (Calibration Result)



<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	0.1	0.1	0.0
2	0.2	0.2	0.0
3	0.3	0.31	0.01
4	0.4	0.41	0.01
5	0.3	0.3	0.0
6	0.2	0.22	0.02
7	0.1	0.1	0.0

상기 기기는 국가 교정 검사 기관으로부터 교정 검사 되어 소급성이 유지된 PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H12-1488-036) 을 사용하여 교정한 성적서임을 증명합니다.

(The above certification certified calibration item by PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H12-1488-036) which is approved Korea Laboratory Accreditation Scheme.)

REMARKS

☒ REVIEWED
☐ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

CALIBRATED BY

APPROVED BY

REPORT OF CALIBRATION

교 정 성 적 서

EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-141106-02
SPECIFICATION 사 양	0.4 MPa	SERIAL NO. 일련 번호	P004-054
CALIBRATION DATE 교정 일자	2014.11.06	RECAL. DATE 재교정 일자	2014.11.05
MAKER 제 작 자	WISE	ACCEPTANCE CRITERIA 합격 기준	KS B 5305

RESULT

1. 외 관 : 양 호

(Visual) (Accept)

2. 교정 결과 (Calibration Result)

Olsung ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT. D.S. - [Signature]	
DATE Nov. 6. 2014	

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	0.1	0.1	0.0
2	0.2	0.2	0.0
3	0.3	0.3	0.0
4	0.4	0.4	0.0
5	0.3	0.3	0.0
6	0.2	0.2	0.0
7	0.1	0.1	0.0

상기 기기는 국가 교정 검사 기관으로부터 교정 검사 되어 소급성이 유지된 PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H14-1773-035) 을 사용하여 교정한 성적서임을 증명합니다.

(The above certification certified calibration item by PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H14-1773-035) which is approved Korea Laboratory Accreditation Scheme.)

REMARKS

☒ REVIEWED
☐ WITNESSED
Date / Signature:
[Signature]
Germanischer Lloyd
Industrial Services

CALIBRATED BY

[Signature]

APPROVED BY

[Signature]

10. Heat Treatment Records & Charts

11. Production Test Records



Office : 917, Wonsan-Li, Onsan

-Wub, Ulju-Gun, Ulsan, Korea

Tel. : 052) 231-7670

Fax : 052) 239-0335

Report No. : ISC-141022-06

Date of Issue : 2014.10.22

Project : Carmon Creek Project

PO No. : 4511951391

W/O No. : P-14SG-007

Material : SA240-S31803 (15T)

PWHT : **No**

TEST CERTIFICATE

ASME

Item No / Joint No / WPS No.	TENSILE TEST							CHARPY-V IMPACT TEST						BEND TEST		HARDNESS TEST	
	ID No.	SIZE (mm)	Y.S (mpa)	T.S (mpa)	E.L (%)	R/A (%)	Type of Failure & Location	Test Temp (°C)	Absorbed Energy (J)				Test Location	Kind	Result	Kind	Result
		t × w							1	2	3	A.V					
E-11570 / A-01 / GT.SM-10H.10H- 101H	T-1	15 × 19	587.2	745.8	36.5	-	BASE	-45	32.9	28.0	94.1	51.7	WELD	SIDE	GOOD	BLANK	
	T-2	15.1 × 19	590.0	744.6	38.0	-	BASE	-45	195.7	181.1	179.8	185.5	HAZ	SIDE	GOOD		
			BLANK					-45	112.5	103.5	120.2	112.1	BASE	SIDE	GOOD		
								Specimen Size (mm) 10 × 10 × 55 (Transverse Direction)				Acceptance Criteria (J) A.V : 20 / Min. : 14		SIDE	GOOD		
									BLANK								
Specimen Type	ASME Sec.IX QW-462.1(a)							ASME Sec. II .A 370						ASME Sec. II .A 370		-	
Test Method	ASME Sec. II .A 370							ASME Sec. II .A 370						ASME Sec. II .A 370		-	

시험 일자 : 2014.10.22

Test Date

발급 일자 : 2014.10.22

Issue Date

시 험 자 : J. H. KIM

Tested or Analyzed by

승인자 : 기술책임자 : S. M. LEE

Approved by Technical manager

* Remarks

1. Universal Testing Machine I. D : 61048, Calibration Due Date : 2014.08.18 ~2015.08.17
2. Charpy Impact Machine for Metals I.D : 07-1990, Calibration Due Date : 2014.10.10 ~ 2015.10.09

☐ Reviewed
☒ Witnessed

14412

14412
HSB GS

☐ REVIEWED
☐ WITNESSED

Date / Signature:

Germanischer Lloyd
Industrial Services

PAGE 11-1



Office : 917, Wonsan-Li, Onsan

-Wub, Ulju-Gun, Ulsan, Korea

Tel. : 052) 231-7670

Fax : 052) 239-0335

Report No. : ISC-141022-07

Date of Issue : 2014.10.22

Project : Carmon Creek Project

PO No. : 4511951391

W/O No. : P-14SG-007

Material : SA516-70 (17T)

PWHT : No

TEST CERTIFICATE

ASME

Item No / Joint No / WPS No.	TENSILE TEST							CHARPY-V IMPACT TEST						BEND TEST		HARDNESS TEST	
	ID No.	SIZE (mm)	Y.S (mpa)	T.S (mpa)	E.L (%)	R/A (%)	Type of Failure & Location	Test Temp (°C)	Absorbed Energy (J)				Test Location	Kind	Result	Kind	Result
		t x w							1	2	3	A.V					
E-11570 / A-02 / GT.SM.SA-1.1-107F		BLANK						-45	42.2	55.3	23.7	40.4	WELD	BLANK		BLANK	
								-45	137.7	140.1	113.6	130.5	HAZ				
								Specimen Size (mm) 10 x 10 x 55 (Transverse Direction)				Acceptance Criteria (J) A.V : 20 / Min. : 14					
								BLANK									
Specimen Type	-							ASME Sec. II .A 370						-		-	
Test Method	-							ASME Sec. II .A 370						-		-	

시험 일자 : 2014.10.22

Test Date

발급 일자 : 2014.10.22

Issue Date

시 험 자 : J. H. KIM

Tested or Analyzed by

승인자 : 기술책임자 : S. M. LEE

Approved by Technical manager

* Remarks

1. Universal Testing Machine I. D : 61048, Calibration Due Date : 2014.08.18 ~2015.08.17
2. Charpy Impact Machine for Metals I.D : 07-1990, Calibration Due Date : 2014.10.10 ~ 2015.10.09

☐ Reviewed
☒ Witnessed

☒ REVIEWED
☐ WITNESSED

Date / Signature:

Germanischer Lloyd
Industrial Services

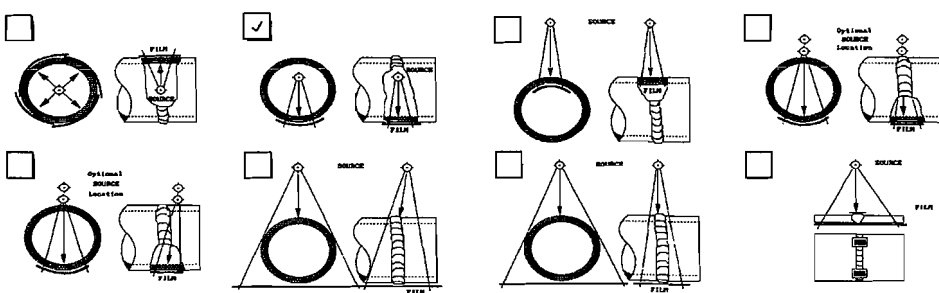
ILSUNG CORPORATION

205/296

14412
HSB GS

PAGE

2/21

 ILSUNG CORPORATION		ASME		Report No. IS-APN-E-11570-C/TRT-001
				Page <u>1</u> of <u>2</u>
Customer 주문주	SHELL CANADA ENERGY	Project Name 공사명	CARMON CREEK PROJECT	
Item Name 품명	CONTROL TEST COUPON	Traveller/PCS NO. 트레블라	N/A	
Item No. 부품번호	E-11570	Work Order No. 공사번호 P/O No.	P-13SG-007 4511951391	
Densitometer I.D No. 농도계 기기번호	06013399	Material / Thickness 재질/두께	SA240-S31803 15 ☒ mm	
Shooting Position 투과위치	☒ Single 단일벽 ☐ Double 이중벽 ☐ Panoramic 원환식	Dwg. No. 도면번호	VP-SG07-E11570-001 Rev. 	
View 판독	☒ Single 한장 ☐ Double 두장	Weld Thick/Reinforcement 용접두께/용접덧살	15 ☒ mm 2 ☒ mm	
Joint Config. 용접모양	BUTT JOINT	Penetrometer/Constrometer 투과도계/계조계	ASTM 1B ☒ S. Side N/A ☐ F. Side	
X-ray Equipment/Radioisotope 엑스레이 장비/동위원소	N/A KVP mA ☒ Ir-192 ☐ CO-60 35 Ci	Shim Thickness 심 두께	N/A ☐ inch ☐ mm	
Focal Spot Size/Source Size 촉점크기	3.0 X 3.0 ☐ inch ☒ mm	Sensitivity Wire type 감도/최소식별도	0.016(W8) ☒ inch ☐ mm	
Exposure Time 노출시간	hr min sec ~ hr 5 min 20 sec	Film Type/Brand/Size 필름타입/크기	TYPE I / FUJI #80 4 1/2" x 12"	
Source to Object Distance 촬영거리(MIN)	500 ☐ inch ☒ mm	Screen 스크린	Front 0.005 ☒ inch Back ☐ mm	
Source side of Object to Film Distance 필름거리(MAX)	17 ☐ inch ☒ mm	"B" Attached	☒ Yes 유 ☐ No 무	
Specified Density 흑화도	2.0 ~ 4.0	Lead Backing 산란방지 납판	☒ Yes 유 ☐ No 무	
Surface Condition 표면상태	☐ As Ground 연마 ☒ As Welded 용접	Procedure/Acc. Criteria 절차서 / 판정기준	VP-SG07-COMM-010 (ISC-RT-06) Rev.  ASME SEC.VIII DIV.1 2010ED.+2011ADD. UW-51 AP1660(8th ED.2007)	
No. Of Exposures 노출횟수	6	No. Film/Cassette Cassette 내 Film 매수	1 SH'T	
Exposure Setup			Total Sheet 6 SH'T 촬영매수	
			Remarks  Reviewed by ISC ☐ Witnessed by QA DEPT. ASNT Level III S.S. LEE Certi No. 210561 DATE Oct. 7. 2014	
Location Marker Placement ☐ Source Side ☒ Film Side				
Examined by 시험	C.J.KWON 	Level 레벨	II	
A P N Co., Ltd.				
Approved by 승인	B.M.SHIM 	Level 레벨	III	
A P N Co., Ltd.				
		☒ Date of Examination 검사일자 2014.10.06 ☒ Date of Report 보고서 작성일자 2014.10.07		
		Owner/Customer 주문주/고객감독관 ☒ REVIEWED ☐ WITNESSED ☐ Third Party Inspector 공인검사자 Date / Signature:  Germanischer Lloyd Industrial Services		

~~ASME~~

Page 2 of 2

☒ REVIEWED
☐ WITNESSED
Date / Signature: 11/29/20
Germanischer Lloyd
Industrial Services

 **A P N Co., Ltd.**

ASME

ILSUNG

ILSUNG CORPORATION

Report No.

IS-APN-E-11570-C/T-UT-001

Page 1 of 1

Project Name 공사명 CARMON CREEK PROJECT	Customer 주문주 SHELL CANADA ENERGY	Dwg. No. 도면번호 VP-SG07-E11570-001 Rev.
Traveller/PCS No. 트레블라 N/A	Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391	Procedure /Acc. Criteria 절차서/판정기준 VP-SG07-COMM-010(ISC-UT-06) Rev. ASME SEC.VIII.div.1 2010 ED.+ 2011 ADD. APP12 ASME SEC V SA578 Level C + API 660(8th ED.2007)
Item Name 품명 CONTROL TEST COUPON	Item No. 부품번호 E-11570	Joint No. 용접선 번호 SEE IDENT.NO

Joint Config 용접모양 Butt Joint	Method 시험방법 ☒ Contact 접촉 ☐ Immerse 수침	Surface Condition 표면상태 AS WELDED and AS GROUND	Material/Thickness 재질/두께 SA240-S31803 / 15T
--	---	--	---

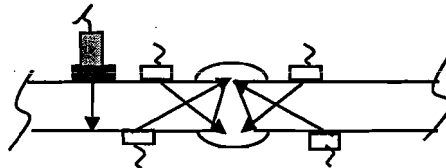
Test Temp. 시험온도 ☒ Ambient 상온 ☐ Elev. 승온	Test Equipment 시험장비 EPOCH XT	Type 형태 OLYMPUS	Manufacturer 제조사 OLYMPUS	Serial No. 일련번호 081113804	Due Date 만료일자 2015.06.12
---	--	---------------------------	------------------------------------	-------------------------------------	------------------------------------

Type 형태	Block Angle 교정각도	Frequency 주파수	Size 크기	Manufacturer 제조사	Serial No. 일련번호	Cable 케이블	Type 형태	Length 길이	Manufacturer 제조사
MSEB4	0°	4MHz	10Ø	MWB	57462-22034		Lemo00+	2M	KrautKramer
4C8X15LAD45	45°	4MHz	8*15	TKS	DLANB08		Lemo01		
4C8X15LAD70	70°	4MHz	8*15	TKS	DLANB14				

Test Angle 시험각도 ☒ 0° ☒ 45° ☐ 60° ☒ 70°	Couplant 점착매질 ☐ Glycerin 글리세린 ☐ Oil 오일 ☒ CMC	Calibration Block 교정블록 IIW, REFERENCE BLOCK
--	---	---

Ident. No. 확인번호	Accept 합격	Reject 불합	Location 위치 from	Length 길이	Width 폭	Depth 깊이	% DAC (MAX) 보정곡선	Grade 등급	Remarks 비고
A01-1	V		No Recordable Indication						Final
A01-2	V		No Recordable Indication						Final
- BLANK -									
☒ Reviewed by ☒ Witnessed by CA DEPT. ASNT Level III, B. Shim Date: 2014.10.08 DATE <i>af. 2014</i>									

Sketch of Scanning



☒ REVIEWED
☐ WITNESSED
Date / Signature: <i>[Signature]</i>
Germanischer Lloyd Industrial Services

☐ SKETCH ON DOT LINE, IF NECESSARY or ☒ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

Examined by 시험 C.J. KWON	Level 레벨 II	☒ Date&Time of Examination 검사일자/시간 2014.10.08
Approved by 승인 B.M. SHIM	Level 레벨 III	☒ Date of Report 보고서 작성일자 2014.10.08
A P N Co., Ltd. A P N Co., Ltd.		☐ Owner/Customer주문주/고객감독관
		☐ Third Party Inspector공인검사관 ☐ ANI/AI

~~ASME~~



Page 1 of 1

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Test Report

Certificate No. : 201410-349-05



Certified ISO 9001
by TRACI

1. Client

O Name : ILSUNG

O Address : 74, Daejeong-ro, Onsan-eup, Ulju-gun, Ulsan, Korea

O Date of Receipt : 2014. 10. 17

2. Use of Report : Quality Management

3. Test Sample

- Item : E-11570

- Part : CHANNEL

- Joint : A-01

- Material : SA240-S31803

- Thickness : 15T

- WPS/PWHT/TEST : GT.SM-10H.10H-101H/NO/PQR-3

4. Date of Test : 2014. 10. 17

5. Test method used

- ASME BPVC SEC IX : 2013ED / QW-470

- ASTM E407-2007

- ASTM E384-2011e1

ILSUNG ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	S. J. HWANG
DATE	OCT. 30. 2014

WITNESS OCT. 17 '14

[Signature]

6. Testing Environment : Temperature : (22.6 ±0.6) °C , Relative Humidity : (68 ±8) % R.H.

7. Test Results : Test results reference

NOTE 1)The test results on this test report are only limited to the samples and sample names provided by the customer and MSTECH CO.,LTD do not guarantee the quality of all products of the customer.

NOTE 2)This test report shall not be used for public relation, advertisement lawsuit and any other purposes outside the scope of its defined usage.

Affirmation	Tested by	Approver
	Name : Bo-Ra Kang (Signature)	Official Position : Technical Manager Name : Mu-Sik Joung (Signature)

2014. 10. 29.

MSTECH Co., Ltd.

(14, Yaksu 8-gil, Buk-gu, Ulsan, Korea. URL:www.mstech114.com)

Tel : 052-289-9107~9 / Fax : 052-289-9209

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i> 30 Oct. 14
Germanischer Lloyd Industrial Services



Test Results

Certificate No. : 201410-349-05



Certified ISO 9001
by TRACI

1. HARDNESS TEST RESULTS

1.1. Test method : ASTM E384-2011e1

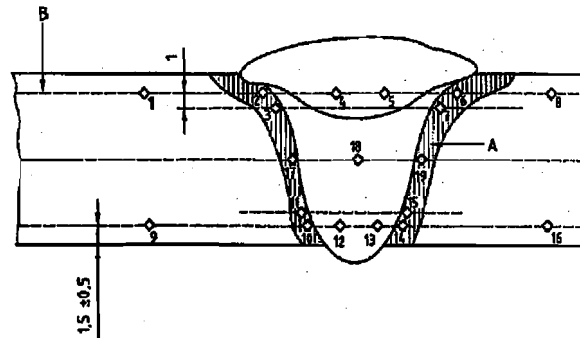
OLSON ☒ Reviewed by
ISC ☒ Witnessed by

QA DEPT. S. J. HWANG
DATE OCT. 30, 2014

WITNESS OCT. 17, 2014

[Signature]

HARDNESS POINT



HARDNESS TEST (HV 10)

Result	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	247	249	255	279	263	256	249	250	245	273	276	274	271	262	279	246	277	232	258

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☐ WITNESSED
Date / Signature: *[Signature]*
Germanischer Lloyd
Industrial Services



Test Results

Certificate No. : 201410-349-05



Certified ISO 9001
by TRACI

2. MACRO ETCHING TEST RESULTS

Measurement Magnification : x 10

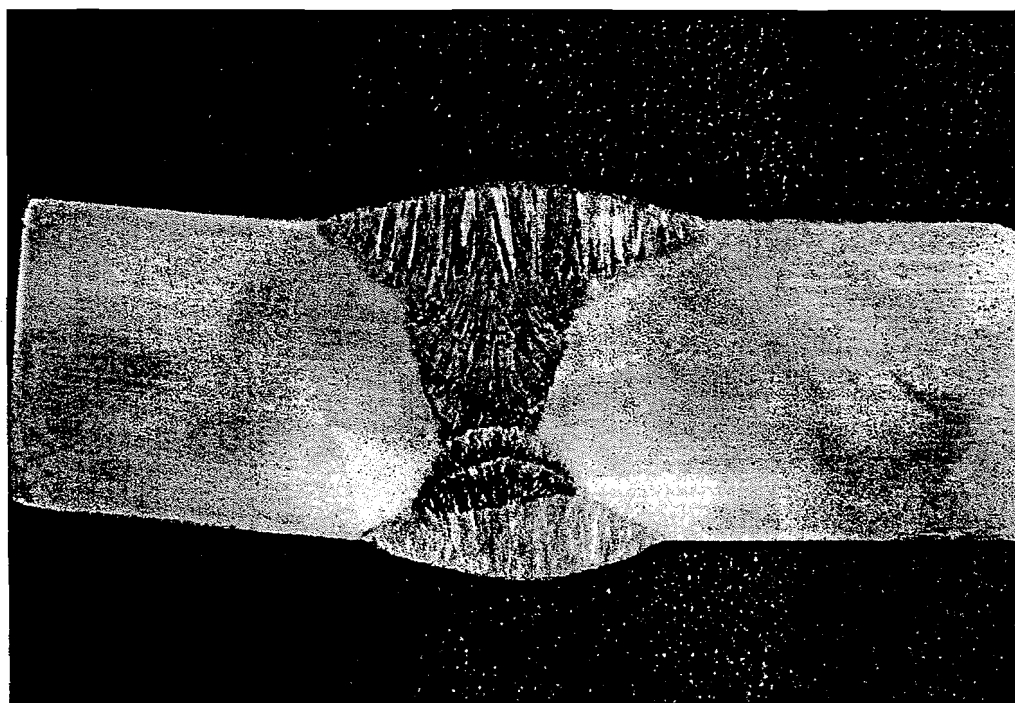
Location :# Base Metal + Heat Affected Zone + Weld

2.1. Test method : ASME BPVC SEC IX : 2013ED / QW-470

Qlsung ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT. DATE <i>Oct. 30, 2014</i>	S. J. HWANG

3/1/15

[Photograph of Macro etching]



☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i> 30 Oct. 14
Germanischer Lloyd Industrial Services



Test Results

Certificate No. : 201410-349-05



Certified ISO 9001
by TRACI

3. MICRO ETCHING TEST RESULTS

Measurement Magnification : x 200

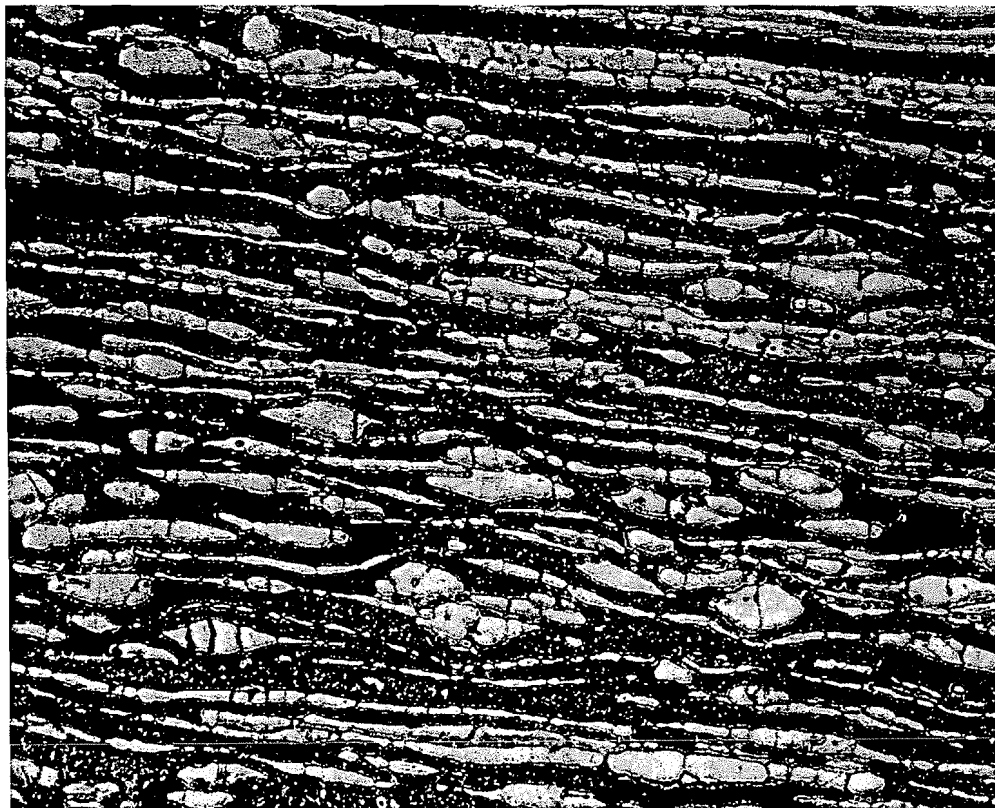
Location :# Base Metal

3.1. Test method : ASTM E407-2007

Olsung ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. DATE	S. J. HWANG OCT. 30, 2014

3/1/14

[Photograph of Micro etching]



☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i> 20 Oct. 14
Germanischer Lloyd Industrial Services



Test Results

Certificate No. : 201410-349-05



ACCREDITED BY
MEMBER OF THE
IAF/MLA & FMS

Certified ISO 9001

by TRACI

3. MICRO ETCHING TEST RESULTS

Measurement Magnification : x 200

Location : # Heat Affected Zone

3.1. Test method : ASTM E407-2007

Qlsung ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	OCT. 30, 2014

[Signature]

[Photograph of Micro etching]



☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i> 30 Oct 14
Germanischer Lloyd Industrial Services



Test Results

Certificate No. : 201410-349-05



Certified ISO 9001
by TRACI

3. MICRO ETCHING TEST RESULTS

Measurement Magnification : x 200

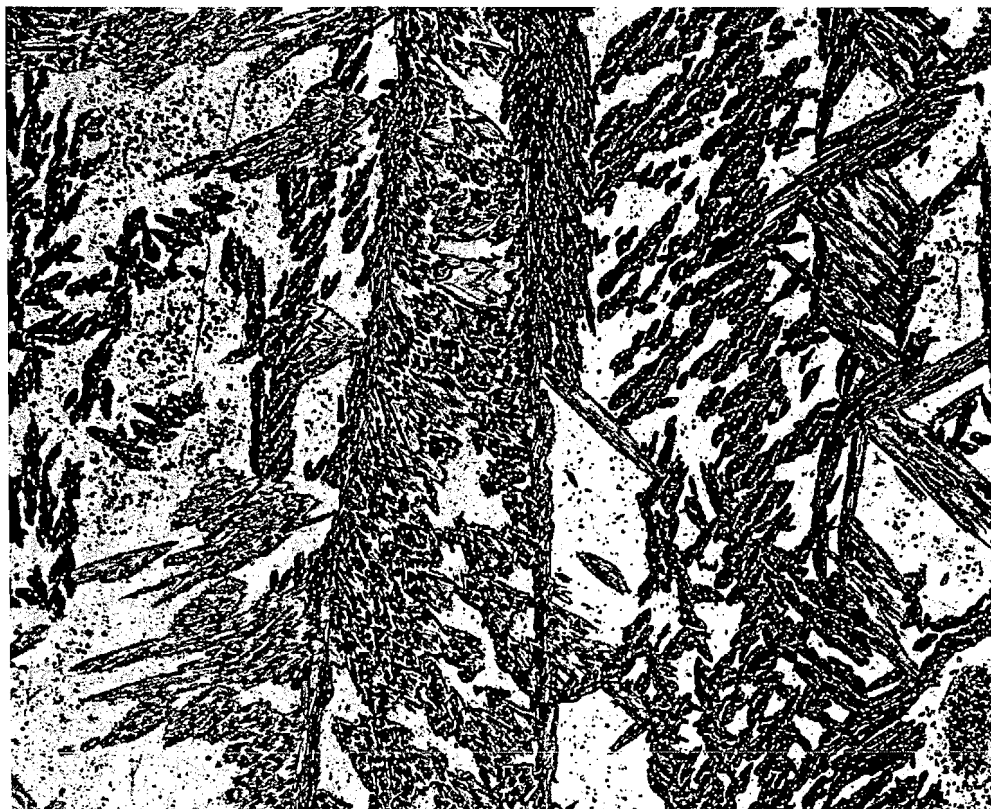
Location :# Weld

3.1. Test method : ASTM E407-2007

OLsung ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	OCT. 30. 2014

[Signature]

[Photograph of Micro etching]



☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd Industrial Services

- The end -

13/21

Test Report

for

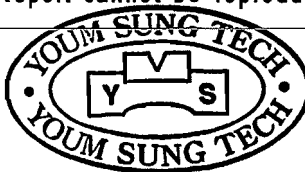
Ferrite Content

Report No. : YSM14-1111-1F
 Customer : ILSUNG CORPORATION
 Date : Nov. 11, 2014

Etching Method : 10% Sodium hydroxide,(Electrolytic)

Attachment : Ferrite Content Test Report 5 Page(s)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full



Test Conducted by D .S. Lee

☐	REVIEWED
☐	WITNESSED
Date / Signature: <i>[Signature]</i> 12/11/14	
Germanischer Lloyd Industrial Services	



YOUMSUNG TECH Co., Ltd.

#598-17, HWAJEON-DONG, KANGSEO-KU, BUSAN, KOREA
 TEL : 051)941-1369 FAX : 051)941-1370

Ylsung ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. S. J. HWANG	
DATE NOV. 12. 2014	

[Signature]

14/21



YOUNSUNG TECH Co., Ltd.
 #598-17, HWAJEON-DONG, KANGSEO-KU, BUSAN, KOREA
 TEL : 051)941-1369 FAX : 051)941-1370

Ferrite Content Examination Report

Report No. : YSM14-1111-1F
 Customer : ILSUNG CORPORATION
 Item / Part / Joint : E-11570 / CHANNEL / A-01
 Material : SA240-S31803(15T)
 PWHT : NO
 Issue Date : Nov. 11, 2014

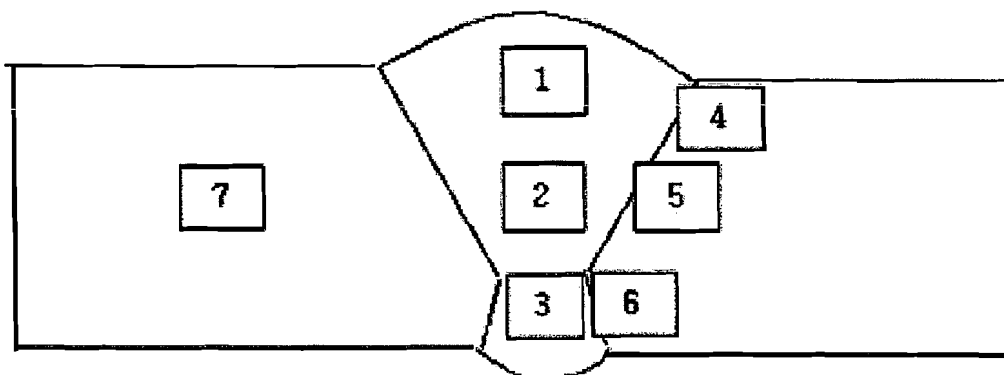
Page : 1 of 5

Ferrite Content Test Result

Test Method: ASTM E562-11

WPS No.	Location		Result (%)	Remark
GT.SM-10H.10H -101H	1	Cover Pass Weld	57.7	• Grid : 10 x 10 Square Type • Number of Fields : 20
	2	Mid-Thickness Weld	47.5	
	3	Root Weld	51.2	
	4	Cover Pass H.A.Z	55.4	
	5	Mid-Thickness H.A.Z	52.6	
	6	Root Weld H.A.Z	54.1	
	7	Base Metal	51.1	

Locations for Examination



☒	REVIEWED
☐	WITNESSED
Date / Signature:	
 S. J. HWANG Germanischer Lloyd Industrial Services	

	☒ Reviewed by
	☐ Witnessed by
QA DEPT. S. J. HWANG	
DATE NOV. 12, 2014	

3/5/12

15/21



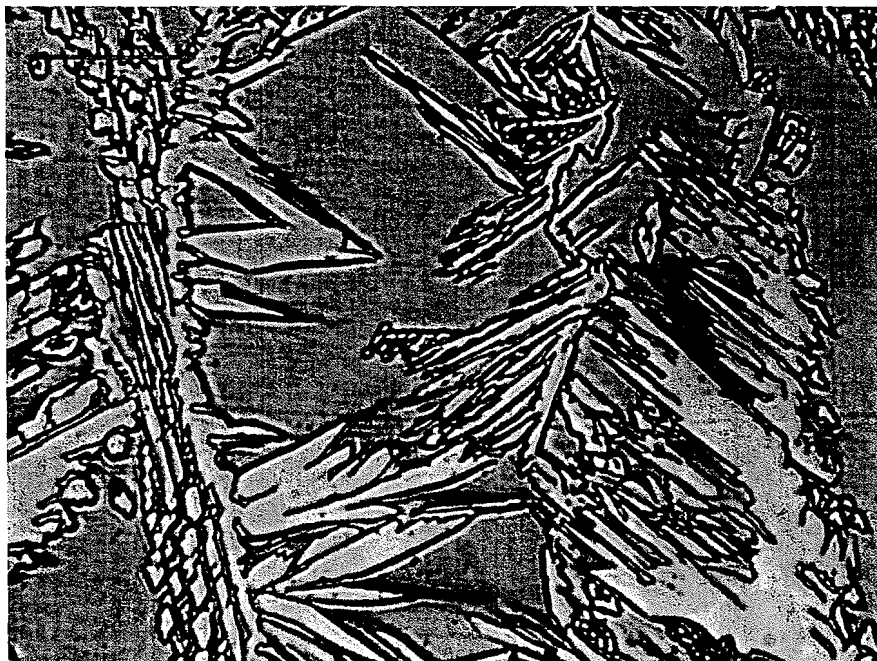
YOUNGSUNG TECH Co., Ltd.

#598-17, HWAJEON-DONG, KANGSEO-KU, BUSAN, KOREA
TEL : 051)941-1369 FAX : 051)941-1370

Report No. : YSM14-1111-1F	Page : 2 of 5
WPS No. : GT.SM-10H.10H-101H	

Magnification

: X500



Location : Cover Pass Weld(1)

Magnification

: X500



Location : Mid-Thickness Weld(2)

☐	REVIEWED
☐	WITNESSED
Date / Signature:	
Germanischer Lloyd	
Industrial Services	

Olsung ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	Nov. 12, 2014

16/21

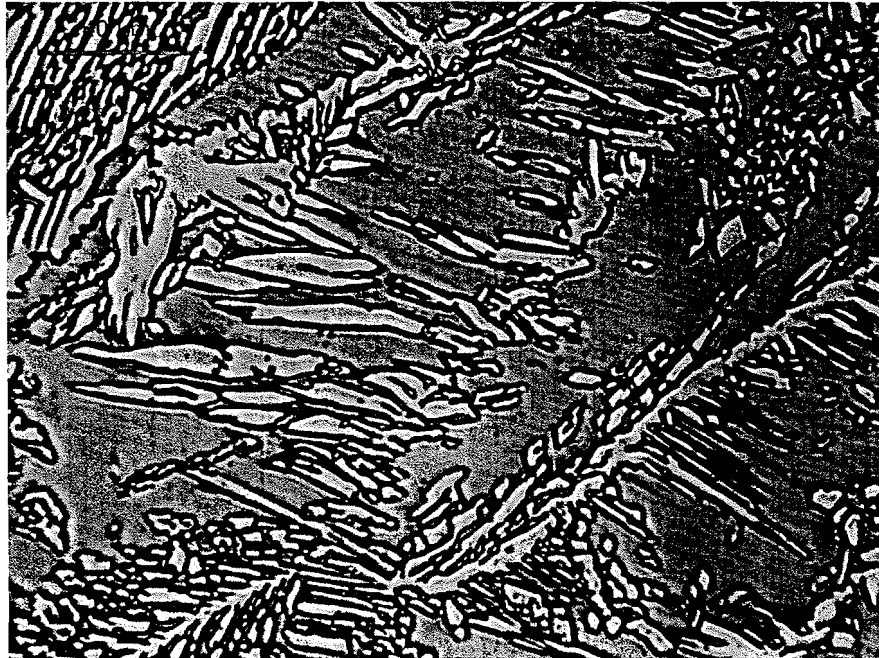


YOUNGSUNG TECH Co., Ltd.
 #598-17, HWAJEON-DONG, KANGSEO-KU, BUSAN, KOREA
 TEL : 051)941-1369 FAX : 051)941-1370

Report No. : YSM14-1111-1F	Page : 3 of 5
WPS No. : GT.SM-10H.10H-101H	

Magnification

: X500



Location : Root Weld(3)

Magnification

: X500



Location : Cover Pass H.A.Z(4)

☒	REVIEWED
☐	WITNESSED
Date	Signature:
	<i>[Signature]</i>
Germanischer Lloyd Industrial Services	

YOUNGSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	NOV. 12, 2014

[Signature]

17/21



YOUNG SUNG TECH Co., Ltd.

#598-17, HWAJEON-DONG, KANGSEO-KU, BUSAN, KOREA
TEL : 051)941-1369 FAX : 051)941-1370

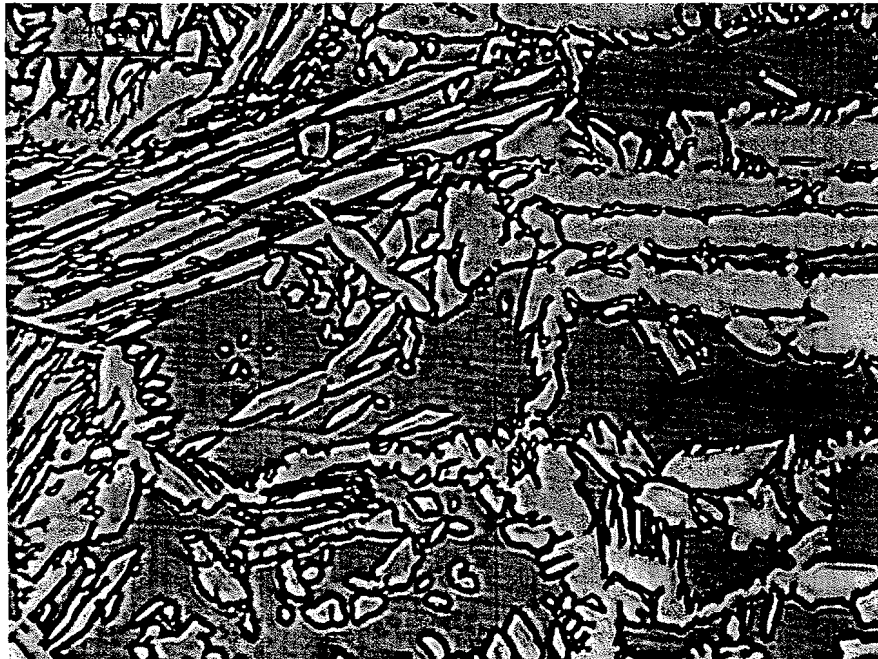
Report No. : YSM14-1111-1F

Page : 4 of 5

WPS No. : GT.SM-10H.10H-101H

Magnification

: X500



Location : Mid-Thickness H.A.Z(5)

Magnification

: X500



Location : Root H.A.Z(6)

☒	REVIEWED
☐	WITNESSED
Date / Signature:	
<i>[Signature]</i>	
Germanischer Lloyd	
Industrial Services	

YOUNG SUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	10.12.2014

[Signature]

18/21



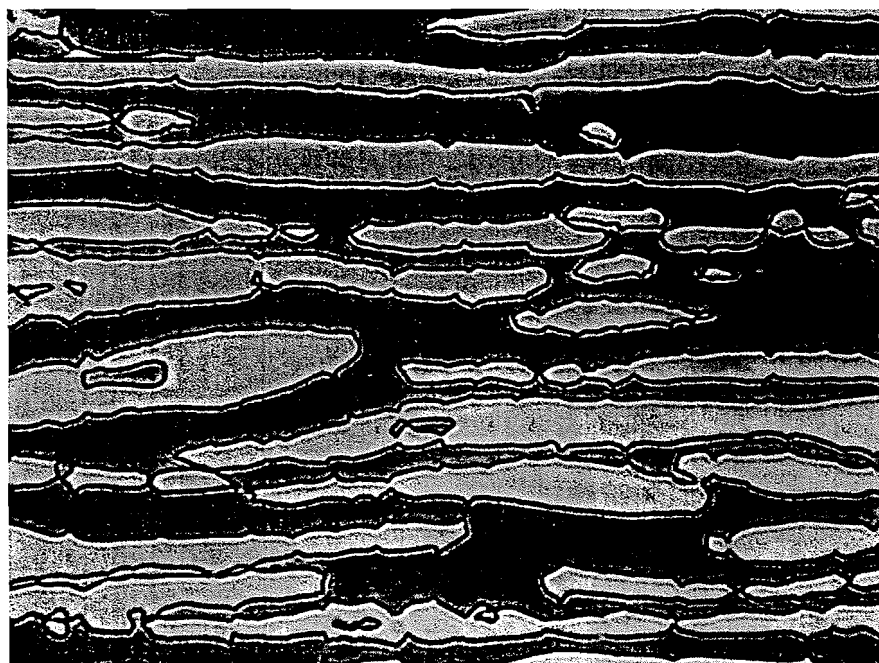
YOUNGSUNG TECH Co., Ltd.

#598-17, HWAJEON-DONG, KANGSEO-KU, BUSAN, KOREA
TEL : 051)941-1369 FAX : 051)941-1370

Report No. : YSM14-1111-1F	Page : 5 of 5
WPS No. : GT.SM-10H.10H-101H	

Magnification

: X500



Location : Base Metal(7)

☒	REVIEWED
☐	WITNESSED
Date / Signature:	
<i>[Signature]</i> 12 Nov. 14	
Germanischer Lloyd Industrial Services	

YOUNGSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	NOV. 12 20 14

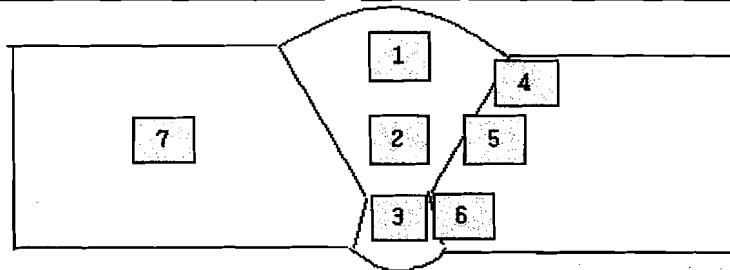
[Signature]

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Ferrite Contents Measurement Record

Report No.	YSM14-1111-1F	Page : 1 of 3
WPS No.	GT.SM-10H.10H-101H	
TEST METHOD	ASTM E 562-11	
MATERIAL	SA240-S31803	



Grid Type	10 x 10 Square Type			Magnification			x 500		
Field No.	Cover Pass Weld(1)			Mid-Thickness Weld(2)			Root Weld(3)		
	P _i	P _{F(i)} (%)	[P _{F(i)} -P _{F(avg)}] ²	P _i	P _{F(i)} (%)	[P _{F(i)} -P _{F(avg)}] ²	P _i	P _{F(i)} (%)	[P _{F(i)} -P _{F(avg)}] ²
1	62.0	62.0	18.3	47.5	47.5	0.0	49.5	49.5	2.7
2	54.0	54.0	13.9	49.0	49.0	2.4	52.0	52.0	0.7
3	55.0	55.0	7.4	43.5	43.5	15.6	53.5	53.5	5.5
4	58.0	58.0	0.1	48.0	48.0	0.3	50.0	50.0	1.3
5	60.5	60.5	7.7	48.5	48.5	1.1	49.0	49.0	4.6
6	61.5	61.5	14.3	51.0	51.0	12.6	46.5	46.5	21.6
7	54.0	54.0	13.9	50.0	50.0	6.5	53.0	53.0	3.4
8	54.5	54.5	10.4	43.5	43.5	15.6	52.5	52.5	1.8
9	59.0	59.0	1.6	45.0	45.0	6.0	54.0	54.0	8.1
10	57.0	57.0	0.5	49.5	49.5	4.2	52.0	52.0	0.7
11	57.5	57.5	0.1	49.0	49.0	2.4	49.5	49.5	2.7
12	62.0	62.0	18.3	43.5	43.5	15.6	48.0	48.0	9.9
13	58.5	58.5	0.6	46.0	46.0	2.1	55.5	55.5	18.9
14	58.0	58.0	0.1	46.0	46.0	2.1	49.0	49.0	4.6
15	56.0	56.0	3.0	48.0	48.0	0.3	50.0	50.0	1.3
16	54.5	54.5	10.4	51.0	51.0	12.6	54.0	54.0	8.1
17	57.0	57.0	0.5	50.5	50.5	9.3	52.5	52.5	1.8
18	62.5	62.5	22.8	49.0	49.0	2.4	51.0	51.0	0.0
19	57.0	57.0	0.5	47.5	47.5	0.0	48.0	48.0	9.9
20	56.0	56.0	3.0	43.0	43.0	19.8	53.5	53.5	5.5

TEST RESULTS	Cover Pass Weld(1)	Mid-Thickness Weld(2)	Root Weld(3)
$P_{P(avg)} = 1/n \sum P_{P(i)} (%)$	57.7	47.5	51.2
$S = \{1/(n-1) \sum [P_{P(i)} - P_{P}]^2\}^{1/2}$	2.8	2.6	2.4
95% CI = $t \times S / \sqrt{n}$ (n=20 => t=2.093)	1.3	1.2	1.1
$V_v \cong P_{P(avg)} \pm 95\% CI (%)$	56.4 ~ 59.0	46.2 ~ 48.7	50.0 ~ 52.3
% RA = $\{(95\% CI) / P_{P(avg)}\} \times 100$	2.3	2.6	2.2

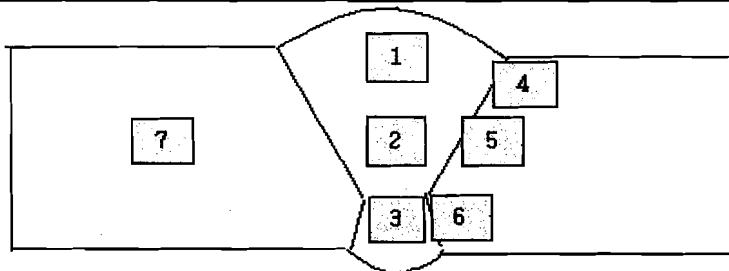
Test conducted by	D S Lee / Youmsung Tech. Co., Ltd	Test Date	Nov. 11, 2014
Authorized By	☒ REVIEWED ☐ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services <i>[Signature]</i> Reviewed by QA DEPT. S. J. HWANG DATE NOV. 12, 2014		

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Ferrite Contents Measurement Record

Report No.	YSM14-1111-1F	Page : 2 of 3
WPS No.	GT.SM-10H.10H-101H	
TEST METHOD	ASTM E 562-11	
MATERIAL	SA240-S31803	



Grid Type	10 x 10 Square Type			Magnification			x 500		
Field No.	Cover Pass H.A.Z(4)			Mid-Thickness H.A.Z(5)			Root H.A.Z(6)		
	P_i	$P_F(i)(\%)$	$[P_F(i)-P_{P(avg)}]^2$	P_i	$P_F(i)(\%)$	$[P_F(i)-P_{P(avg)}]^2$	P_i	$P_F(i)(\%)$	$[P_F(i)-P_{P(avg)}]^2$
1	56.5	56.5	1.3	49.5	49.5	9.8	57.0	57.0	8.7
2	54.0	54.0	1.9	51.0	51.0	2.6	59.5	59.5	29.7
3	57.0	57.0	2.6	53.0	53.0	0.1	51.0	51.0	9.3
4	57.5	57.5	4.5	48.0	48.0	21.4	58.0	58.0	15.6
5	52.0	52.0	11.4	54.5	54.5	3.5	49.5	49.5	20.7
6	54.0	54.0	1.9	56.0	56.0	11.4	55.0	55.0	0.9
7	54.0	54.0	1.9	49.5	49.5	9.8	53.0	53.0	1.1
8	59.0	59.0	13.1	54.0	54.0	1.9	60.5	60.5	41.6
9	52.5	52.5	8.3	52.0	52.0	0.4	52.0	52.0	4.2
10	56.0	56.0	0.4	54.0	54.0	1.9	55.0	55.0	0.9
11	58.0	58.0	6.9	53.5	53.5	0.8	59.0	59.0	24.5
12	60.5	60.5	26.3	51.0	51.0	2.6	51.0	51.0	9.3
13	54.0	54.0	1.9	48.0	48.0	21.4	48.0	48.0	36.6
14	57.5	57.5	4.5	57.0	57.0	19.1	51.0	51.0	9.3
15	53.0	53.0	5.6	54.0	54.0	1.9	50.0	50.0	16.4
16	54.0	54.0	1.9	48.5	48.5	17.0	52.0	52.0	4.2
17	58.0	58.0	6.9	53.5	53.5	0.8	59.5	59.5	29.7
18	52.5	52.5	8.3	59.0	59.0	40.6	57.0	57.0	8.7
19	54.0	54.0	1.9	57.0	57.0	19.1	53.0	53.0	1.1
20	53.5	53.5	3.5	49.5	49.5	9.8	50.0	50.0	16.4

TEST RESULTS	Cover Pass H.A.Z(4)	Mid-Thickness H.A.Z(5)	Root H.A.Z(6)
$P_{P(avg)} = 1/n \sum P_F(i)(\%)$	55.4	52.6	54.1
$S = \{1/(n-1) \sum [P_F(i)-P_{P(avg)}]^2\}^{1/2}$	2.5	3.2	3.9
95% CI = $t \times S/\sqrt{n}$ ($n=20 \Rightarrow t=2.093$)	1.2	1.5	1.8
$V_F \approx P_{P(avg)} \pm 95\% \text{ CI } (\%)$	54.2 ~ 56.5	51.1 ~ 54.1	52.2 ~ 55.9
% RA = $\{(95\% \text{ CI})/P_{P(avg)}\} \times 100$	2.1	2.9	3.4

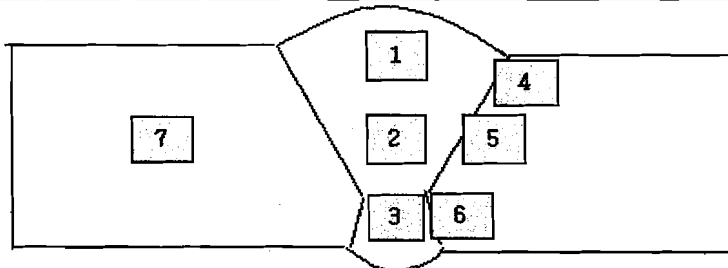
Test conducted by	D S Lee / Youmsung Tech. Co., Ltd	Test Date	Nov. 11, 2014
Authorized By	☒ REVIEWED ☐ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services <i>[Signature]</i> Reviewed by QA DEPT. S. J. HWANG DATE Nov. 12, 2014		

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Ferrite Contents Measurement Record

Report No.	YSM14-1111-1F	Page : 3 of 3
WPS No.	GT.SM-10H.10H-101H	
TEST METHOD	ASTM E 562-11	
MATERIAL	SA240-S31803	



Grid Type	10 x 10 Square Type			Magnification	x 500			
Field No.	Base Metal(7)							
	P _i	P _{P(i)} (%)	[P _{P(i)} -P _{P(avg)}] ²					
1	51.0	51.0	0.0					
2	54.0	54.0	8.3					
3	52.5	52.5	1.9					
4	53.0	53.0	3.5					
5	52.0	52.0	0.8					
6	54.0	54.0	8.3					
7	52.5	52.5	1.9					
8	51.0	51.0	0.0					
9	51.0	51.0	0.0					
10	48.5	48.5	6.9					
11	52.5	52.5	1.9					
12	54.0	54.0	8.3					
13	51.0	51.0	0.0					
14	50.5	50.5	0.4					
15	50.0	50.0	1.3					
16	49.0	49.0	4.5					
17	49.5	49.5	2.6					
18	52.0	52.0	0.8					
19	46.5	46.5	21.4					
20	48.0	48.0	9.8					

TEST RESULTS	Base Metal(7)		
$P_{P(avg)} = 1/n \sum P_{P(i)} (%)$	51.1		
$S = \{1/(n-1) \sum [P_{P(i)} - P_{P(avg)}]^2\}^{1/2}$	2.1		
95% CI = $t \times S/\sqrt{n}$ (n=20 $\Rightarrow$ t=2.093)	1.0		
$V_v \approx P_{P(avg)} \pm 95\% \text{ CI } (%)$	50.2 ~ 52.1		
% RA = $\{(95\% \text{ CI})/P_{P(avg)}\} \times 100$	1.9		

Test conducted by	D S Lee / Youmsung Tech. Co., Ltd	Test Date	Nov. 11, 2014
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Authorized By	☒ REVIEWED ☐ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services Olsung ISC Reviewed by <i>[Signature]</i> Witessed by <i>[Signature]</i> QA DEPT. S. J. HWANG DATE Nov. 12, 2014
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12. Hardness Test Report

A S M E

PAGE

12-1

	HARDNESS TEST REPORT				W / O NO.		P-13SG-007		
					DATE		DEC . 17 . 2014		
					PAGE NO.		1 OF 1		
P.O NO.		4511951391		CUSTOMER		SHELL CANADA ENERGY			
PROJECT NAME		CARMON CREEK PROJECT		ITEM NAME		VRU INLET GAS COOLER			
ITEM NO.		E-11580		DWG. NO.		VP-SG07-E11570-001 REV.06			

■ CHECK LOCATION SKETCH

DOC. NO. : SG07 - HARD - E11580 - 01

NO.	CHECK POSITION	ACTUAL VALUE (UNIT : HB)			RESULT	NO.	CHECK POSITION	ACTUAL VALUE (UNIT : HB)			RESULT		
		W.M	HAZ	B.M				W.M	HAZ	B.M			
1	A-02	184	183	164	ACCEPT	11	B-05	2	181	189	166	ACCEPT	
2	A-03	183	189	165	ACCEPT	12		3	186	186	168	ACCEPT	
3	A-04	185	191	165	ACCEPT	13	B-06	1	189	190	167	ACCEPT	
4	B-03	1	178	186	160	ACCEPT		14	2	179	186	168	ACCEPT
5		2	185	194	160	ACCEPT		15	3	183	193	167	ACCEPT
6		3	186	192	165	ACCEPT	16	S1	SB	177	181	166	ACCEPT
7	B-04	1	180	185	157	ACCEPT	17		SD	180	189	159	ACCEPT
8		2	190	181	168	ACCEPT	18	S2	SB	181	188	166	ACCEPT
9		3	185	193	157	ACCEPT	19		SD	189	192	159	ACCEPT
10	B-05	1	179	181	162	ACCEPT	B L A N K						

■ REMARK

1. TEST EQUIPMENT (I.D No.)
: BRINEL HARDNESS TESTER _ TELEBRINELL (Q317) / MIC10 (Q476)

2. ACCEPTABLE CRITERIA : MAX. 237 HB (248 HV10)

☐ WITNESSED BY ☐ REVIEWED BY	☒ REVIEWED ☒ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services	APPROVED BY	S.J.HWANG <i>[Signature]</i> Dec.17 '14
		REVIEWED BY	S.S.LEE <i>[Signature]</i> Dec.17 '14
		PREPARED BY	Y.S.LIM <i>[Signature]</i> Dec.17 '14

13. Hydrotest Report & Calibration Certificates

ILSUNG		PRESSURE TEST RECORD (1 OF 1)			
		W/O NO.: P-13SG-007		DOC. NO.: ISC-QA-HYD-SG-007-058	
P.O. NO.	4511951391		CUSTOMER	SHELL CANADA ENERGY	
PROJECT NAME	CARMON CREEK PROJECT		ITEM NAME	VRU INLET GAS COOLER	
ITEM NO.	E-11580		DWG. NO.	VP-SG07-E11570-001 REV.06	
SECTION		1ST STAGE ■ SHELL	2ND STAGE ■ CHANNEL	3RD STAGE □	PRESS. GAGE I.D NO. & CALIBRATION DATE
DESCRIPTION					
M.A.W.P.		3639 KPa	965 KPa	KPa	
HYDRO. TEST	TYPE OF TEST	■ HYDROSTATIC □ OIL PRESSURE	■ HYDROSTATIC □ OIL PRESSURE	□ HYDROSTATIC □ OIL PRESSURE	1ST STAGE P100-021 (2014.12.10) P100-120 (2014.12.10)
	TEST PRESS.	5195 KPa (5.195 MPa)	2147 KPa (2.147 MPa)	B L A N K KPa	2ND STAGE P050-005 (2014.09.12) P050-145 (2014.09.12)
	TEST TEMP.	5~17 °C	5~17 °C	°C	3RD STAGE B L A N K
	HOLD'G TIME	60 MIN.	60 MIN.	MIN.	
	RESULT	ACCEPT	ACCEPT		
	DATE	DEC. 19, 2014	DEC. 22, 2014		
PNEUM. TEST	TYPE OF TEST	□ AIR □ N2 □	□ AIR □ N2 □	□ AIR □ N2 □	1ST STAGE P-.. P-..
	TEST PRESS.	Kg/cm2G	Kg/cm2G	Kg/cm2G	2ND STAGE P-.. P-..
	TEST TEMP.	MIN. °C	B L A N K °C	MIN. °C	3RD STAGE P-.. P-..
	HOLD'G TIME	Min.	Min.	Min.	
	RESULT				
	DATE				
■ SKETCH 1ST STAGE : 5700 Kpa (5.7 Mpa) 2ND STAGE : 2500 Kpa (2.5 Mpa) 1ST STAGE : 75 Min. 2ND STAGE : 75 Min.					ACT'L TEST TEMP. 1ST STAGE : 9 °C 2ND STAGE : 9 °C
☐ WITNESSED BY ☐ REVIEWED BY		☒ REVIEWED ☒ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services		APPROVED BY S.J.HWANG	REVIEWED BY S.S.LEE
PREPARED BY Y.S.LIM		DATE Dec 22 2014		DATE Dec 22 2014	

TEST REPORT

Applicant Company	IL SUNG CORPORATION	Client	
Address	917 WONSAN-LI, ONSAN-EUB, ULJU-GUN, ULSAN, KOREA		
Receipt Number	SW14120809	Receipt Date	Dec. 08. 2014
Sampling Gatherer	Kim Dong il	Sampling Date	Dec. 08. 2014
application	Reference	Analysis Manager	Pyun Won Sung

Test Result

(Unit : mg/l)

[illegible]

This test report shall be used only within the purpose of its defined usage and also shall not be used for public relation, advertisement and suit without approval

Dec. 09. 2014.



MILLENNIUM SUP CO.,



421, DAUN DONG, JUNG-KU, ULSAN, KOREA

Tel. 82-052-258-3741/ Fax. 82-052-258-3748/ Site : <http://www.millsup.co.kr> / E-mail: milenvi@hanmail.net

REPORT OF CALIBRATION

교 정 성 적 서

EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-140912-07
SPECIFICATION 사 양	5 Mpa	SERIAL NO. 일련 번호	P050-005
CALIBRATION DATE 교정 일자	2014.09.12	RECAL. DATE 재교정 일자	2015.09.11
MAKER 제 작 자	WISE	ACCEPTANCE CRITERIA 합격 기준	KS B 5305

RESULT

1. 외 관 : 양 호

(Visual) (Accept)

2. 교정 결과 (Calibration Result)

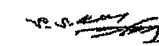
ILSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT	DATE 12.20.14

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	1.0	1.0	0.0
2	2.0	2.0	0.0
3	3.5	3.5	0.0
4	5.0	5.02	0.02
5	3.5	3.5	0.0
6	2.0	2.0	0.0
7	1.0	1.0	0.0

상기 가기는 국가 교정 검사 기관으로부터 교정 검사 되어 소급성이 유지된 PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H12-1488-036) 을 사용하여 교정한 성적서 임을 증명합니다.

(The above certification certified calibration item by PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H12-1488-036) which is approved Korea Laboratory Accreditation Scheme.)

REMARKS

☒ REVIEWED ☒ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services	CALIBRATED BY 
	APPROVED BY 

ASME

PAGE

4

REPORT OF CALIBRATION

교 정 성 적 서

EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-140912-08
SPECIFICATION 사 양	5 Mpa	SERIAL NO. 일련 번호	P050-145
CALIBRATION DATE 교정 일자	2014.09.12	RECAL. DATE 재교정 일자	2015.09.11
MAKER 제 작 자	WISE	ACCEPTANCE CRITERIA 합격 기준	KS B 5305

RESULT

1. 외 관 : 양 호

(Visual) (Accept)

2. 교정 결과 (Calibration Result)

ILSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	DATE 12.20/14

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	1.0	1.0	0.0
2	2.0	2.0	0.0
3	3.5	3.5	0.0
4	5.0	5.0	0.0
5	3.5	3.5	0.0
6	2.0	2.0	0.0
7	1.0	1.0	0.0

상기 기기는 국가 교정 검사 기관으로부터 교정 검사 되어 소급성이 유지된 PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H12-1488-036) 을 사용하여 교정한 성적서임을 증명합니다.

(The above certification certified calibration item by PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H12-1488-036) which is approved Korea Laboratory Accreditation Scheme.)

REMARKS

☒ REVIEWED
☐ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

CALIBRATED BY

APPROVED BY

REPORT OF CALIBRATION

교 정 성 적 서

EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-141210-05
SPECIFICATION 사 양	10 MPa	SERIAL NO. 일련 번호	P100-021
CALIBRATION DATE 교정 일자	2014.12.10	RECAL. DATE 재교정 일자	2015.12.09
MAKER 제 작 자	WISE	합격 기준	KS B 5305

RESULT

1. 외 관 : 양 호

(Visual) (Accept)

2. 교정 결과 (Calibration Result)

ILSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. <i>D.C.</i>	
DATE 12.10.2014	

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	2.0	2.0	0.0
2	5.0	5.0	0.0
3	8.0	8.0	0.0
4	10.0	10.0	0.0
5	8.0	8.0	0.0
6	5.0	5.0	0.0
7	2.0	2.0	0.0

상기 기기는 국가 교정 검사 기관으로부터 교정 검사 되어 소급성이 유지된 PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H14-1773-035) 을 사용하여 교정한 성적서 임을 증명합니다.

(The above certification certified calibration item by PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H14-1773-035) which is approved Korea Laboratory Accreditation Scheme.)

REMARKS

☐ REVIEWED ☒ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services
--

CALIBRATED BY

[Signature]

APPROVED BY

[Signature]

REPORT OF CALIBRATION

교 정 성 적 서

EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-141210-04
SPECIFICATION 사 양	10 MPa	SERIAL NO. 일련 번호	P100-120
CALIBRATION DATE 교정 일자	2014.12.10	RECAL. DATE 재교정 일자	2015.12.09
MAKER 제 작 자	WISE	합격 기준	KS B 5305

RESULT

1. 외 관 : 양 호
(Visual) (Accept)
2. 교정 결과 (Calibration Result)

ILSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. <i>P.S. Lee</i>	
DATE <i>12.10.2014</i>	

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	2.0	2.0	0.0
2	5.0	5.0	0.0
3	8.0	8.0	0.0
4	10.0	10.0	0.0
5	8.0	8.0	0.0
6	5.0	4.96	-0.04
7	2.0	2.0	0.0

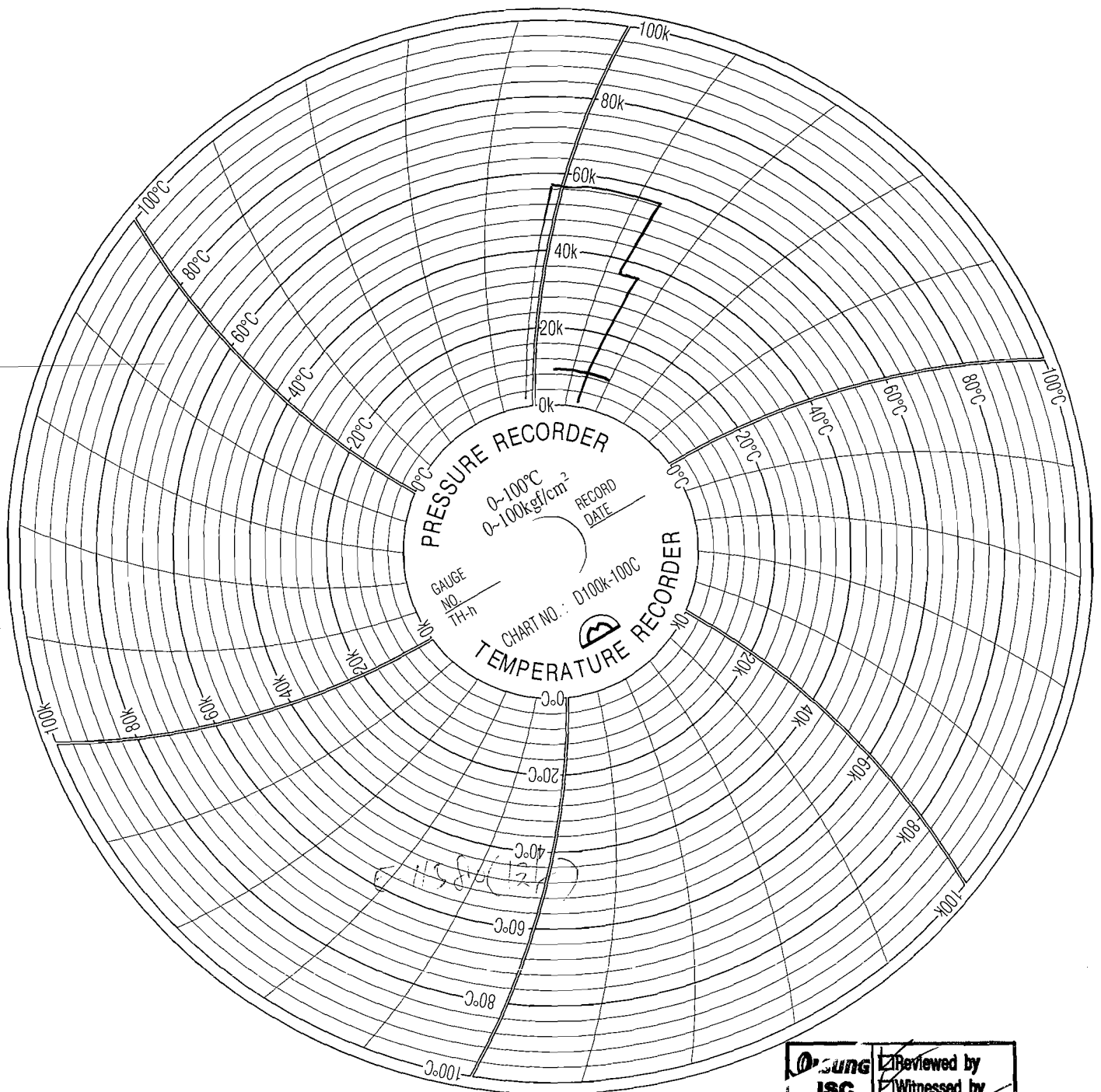
상기 기기는 국가 교정 검사 기관으로부터 교정 검사 되어 소급성이 유지된 PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H14-1773-035) 을 사용하여 교정한 성적서 임을 증명합니다.

(The above certification certified calibration item by PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H14-1773-035) which is approved Korea Laboratory Accreditation Scheme.)

REMARKS

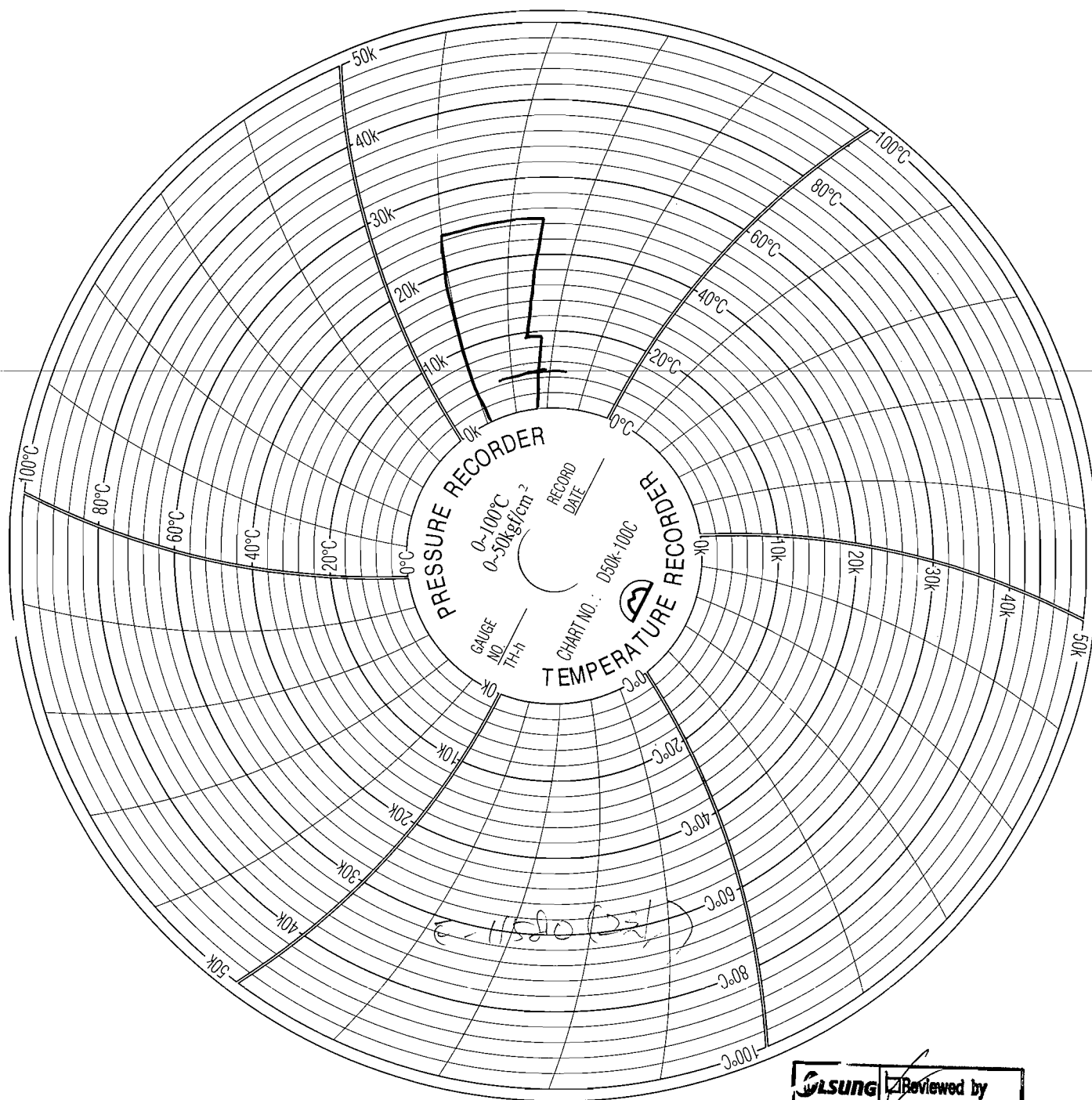
☒ REVIEWED ☐ WITNESSED Date / Signature: <i>[Signature]</i> Germanischer Lloyd Industrial Services	CALIBRATED BY <i>[Signature]</i>
	APPROVED BY <i>[Signature]</i>

ASME



☒ Reviewed by	☒ Witnessed by
QA DEPT. J. S. LEE	
DATE Dec. 17. 2014	

☒ REVIEWED
☒ WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services



ISC QA DEPT. DATE	☒ Reviewed by ☒ Witnessed by
	J. S. LEE Dec. 22. 20

☒ REVIEWED ☒ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services

14. Painting Inspection Reports

ASME



CERTIFICATE OF SURFACE PREPARATION & PAINT REPORT

						Date	29.Dec,2014		
CLIENT	SHELL CANADA ENERGY				ITEM name	VRU INLET GAS COOLER			
PROJECT	CARMON CREEK PROJECT				ITEM NO.	E-11580			
W/O NO.	P-13SG-007				DWG NO.	VP-SG07-E-11570-001 Rev. 6			
ROUGHNESS (SHELL SIDE) (medium : 40~70 μ m)			ROUGHNESS (CHANNEL SIDE) (medium : 20~30 μ m)			ROUGHNESS (SADDLE SIDE) (medium : 40~70 μ m)			
Abrasive Type : GRIT			Abrasive Type : GARNET			Abrasive Type : GRIT			
CLIMATIC CONDITION :			FINE						
EXTERNAL SURFACE OF SHELL SIDE <SHELL SIDE>									
Sequence	Brand Name	Batch No.	Manuf. Date	W.F.T(μ m)	D.F.T(SPEC.)	D.F.T(μ m)	Color	Paint System	
Primer	AMERCOAT91	K426621666	26.Aug,2014	225 ~ 250	125 ~ 175	132 ~ 171	GRAY	P3	
Intermediate				N/A					
Finish									
EXTERNAL SURFACE OF CHANNEL SIDE <CHANNEL SIDE>									
Sequence	Brand Name	Batch No.	Manuf. Date	W.F.T(μ m)	D.F.T(SPEC.)	D.F.T(μ m)	Color	Paint System	
Primer	HITEMP1027	HT10279003	16.Apr,2014	N/A	125 ~ 150	128 ~ 149	LIGHT GRAY	P7	
Intermediate				N/A					
Finish									
EXTERNAL SURFACE OF SADDLE									
Sequence	Brand Name	Batch No.	Manuf. Date	W.F.T(μ m)	D.F.T(SPEC.)	D.F.T(μ m)	Color	Paint System	
Primer	AMERCOAT132	K436653516	12.Sep,2014	100 ~ 125	50 ~ 75	54 ~ 74	GREEN	P4	
Intermediate				N/A					
Finish	PSX700	K440664436	1.Oct,2014	125 ~ 150	125 ~ 150	179 ~ 223	RAL7040		
N/A									
Sequence	Paint Material	Brand Name	Batch No.	Manuf. Date	W.F.T(μ m)	D.F.T(μ m)	Color	Paint System	
Primer								-	
Intermediate				N/A					
Finish									
N/A									
Sequence	Paint Material	Brand Name	Batch No.	Manuf. Date	W.F.T(μ m)	D.F.T(μ m)	Color	Paint System	
Primer								-	
Intermediate				N/A					
Finish									
Grit Contamination Test					ACCEPT				
MEK Test (ASTM D 4285)					N/A				
Adhesion Test (ISO2409&ISO4624)					0.9,1 ~ 10.6 Mpa				
Visual Examination / Final Color					ACCEPT / LIGHT GRAY,GRAY, RAL7040				
☐ WITNESSED BY / ☒ REVIEWED BY ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services					APPROVED BY		J.S.LEE		
					REVIEWED BY		Y.S.LIM		
					PREPARED BY		T.S.LEE		

ILSUNG CORPORATION

CONDITION OF SURFACE PREPARATION		Item No.	E-11580
SURFACE PREPARATION (SSPC-SP10)		STEEL IMPERFECTION	
ACCEPT		ACCEPT	
CLEANLINESS (class1)		CONTAMINANTS AND SOLUBLE SALTS max(2.5µg/cm²)	
ACCEPT		0.4µg/cm²	

DAILY WEATHER CONDITIONS

DATE	TIME	AIR TEMP(℃)	HUMIDITY (%)	DEW POINT(℃)	STEEL TEMP(℃)	PAINT STEP	LOCATION
25.Dec, 2014	13:00	21.0	52.0	11.0	20.5	Shot	Shot Room
"	14:00	21.5	53.0	11.0	21.0	ditto	ditto
"	15:00	22.0	57.0	13.0	21.0	Primer	Paint Room
"	16:00	22.0	57.0	13.0	21.5	ditto	ditto
"	17:00	21.5	53.0	11.0	21.5	ditto	ditto
26.Dec, 2014	13:00	22.0	57.0	13.0	21.0	Finish	ditto
"	14:00	22.5	58.0	14.0	21.5	ditto	ditto
"	15:00	23.0	58.0	14.0	22.0	ditto	ditto

~BLANK~

☒ REVIEWED
☒ WITNESSED
Date / Signature:
[Signature]
Germanischer Lloyd
Industrial Services

15. Nameplate and Code Stamp Rubbing or Photocopy

DATE : JAN. 30. 2015

DOC. NO. : ISC-QA-NP-SG-007-038

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☐ WITNESSED
 Date / Signature: *J. P. Kelly*
 Germanischer Lloyd
 Industrial Services

IL SUNG CORPORATION.

NAME PLATE RUBBING SHEET(2/2)

DATE : JAN. 30. 2015

P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER
ITEM NO.	E-11580	DWG. NO.	VP-SG07-E11570-001 REV.05

DOC. NO. : ISC-QA-NP-SG-007-038

2065 CRN NO. **W7852.2**

CERTIFIED BY ILSUNG ILSUNG CORPORATION

	SHELL SIDE		TUBE SIDE	
U	M.A.W.P. 3639	kPa.g AT 110 °C	965	kPa.g AT 110 °C
W	M.A.W.P. F.V	kPa.g AT 110 °C	F.V	kPa.g AT 110 °C
RT1/RT1	M.D.M.T -45 °C	AT 3639 kPa.g	-45 °C	AT 965 kPa.g
-/-	MFR'S SERIAL NO. 14-HE-081			
	YEAR BUILT 2014			

CAUTION: THE CODE REQUIRED PRESSURES AND TEMPERATURES MARKED ON THE HEAT EXCHANGER RELATE TO THE BASIC DESIGN CONDITIONS. THE HEAT EXCHANGER DESIGN HAS BEEN EVALUATED FOR SPECIFIC OPERATING CONDITIONS AND SHALL BE RE-EVALUATED BEFORE IT IS OPERATED AT DIFFERENT OPERATING CONDITIONS.

☐ Reviewed
☒ Witnessed

s. Jung
 14412
 458 06

☐ WITNESSED BY
☐ REVIEWED BY

☐ REVIEWED
☐ WITNESSED
 Date / Signature:
Jan 30 2015
 Germanischer Lloyd
 Industrial Services

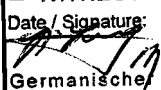
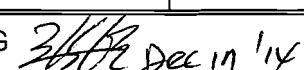
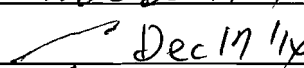
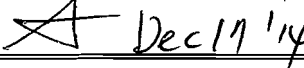
APPROVED BY J.S.LEE

J.S. Lee Jan-30-15

REVIEWED BY Y.S.LIM

PREPARED BY T.S.LEE

16. Weld Map Supporting WPS's/PQR's

	WELDER STAMP MAP W/O NO.: P-13SG-007			DATE	DEC. 17. 2014
				PAGE NO.	1 OF 2
				DOC. NO.: SG07 - WELD - E11580 - 01	
P.O. NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY		
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER		
ITEM NO.	E-11580	DWG. NO.	VP-SG07-E11570-001 REV.06		
NO.	CATEGORY	JOINT NO.	WPS NO.	WELDER I.D NO.	REMARK
1	"A"	A-01	GT.SM-10H.10H-101H	W-025	
2	"A"	A-02	GT.SM.SA-1.1-107F	W-1015	
3	"A"	A-03	GT.SM.SA-1.1-107F	W-1015	
4	"A"	A-04	GT.SM.SA-1.1-107F	W-1015	
5	"B"	A-05	GT.SM-10H.10H-101H	W-025	
6	"B"	B-01	GT.SM-10H.10H-101H	W-1279	
7	"B"	B-02	GT.SM-10H.10H-101H	W-1279	
8	"B"	B-03	GT.SM-1.1-107F	W-1279	
9	"B"	B-04	GT.SM.SA-1.1-107F	W-1279	
10	"B"	B-05	GT.SM.SA-1.1-107F	W-1279	
11	"C"	B-06	GT.SM-1.1-107F	W-1279	
12	"D"	B-07	GT.SM-10H.10H-101H	W-1279	
13	"C"	B-08	GT.SM-10H.10H-101H	W-1279	
14	TUBE TO TUBESHEET JOINT		GT-10H.10H-H001	W-1302	
15	"C"	S1 "SB"	GT.SM-1.1-107F	W-837	
16	"D"	S1 "SD"	SM-1.1-107F	W-1484	
17	"C"	S2 "SB"	GT.SM-1.1-107F	W-837	
18	"D"	S2 "SD"	SM-1.1-107F	W-1484	
19	"C"	T1 "CB"	GT.SM-10H.10H-102H	W-837	
20	"D"	T1 "CD"	SM-10H.10H-101H	W-1279	
21	"C"	T2 "CB"	GT.SM-10H.10H-102H	W-837	
22	"D"	T2 "CD"	SM-10H.10H-101H	W-1279	
23	"D"	T3 "CD"	SM-10H.10H-101H	W-1279	
☐ WITNESSED BY ☐ REVIEWED BY		☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanische Lloyd Industrial Services		APPROVED BY	S.J.HWANG  Dec 17 '14
				REVIEWED BY	S.S.LEE  Dec 17 '14
				PREPARED BY	Y.S.LIM  Dec 17 '14

ASME

PAGE

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WELDING MAP

PAGE

1 OF 2

ITEM NO.

E-11570 / E-11580

	MAT'L	TH'K	PWHT	IMPACT	MDMT
SHELL SIDE (*1)	SA516-70N	t17	NO	YES	-45°C
CHANNEL SIDE	SA240-S31803	t15	NO	YES	-45°C
SADDLE (*1)	SA516-70N	t17	NO	YES	-45°C

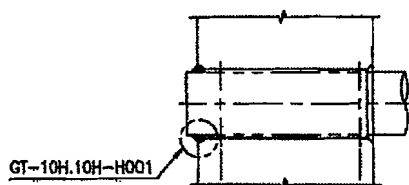
*1) FOR WPS OF CARBON PART, REFER TO DOCUMENT NO.

"CCK-4511951391-0100-H04-00001-000".

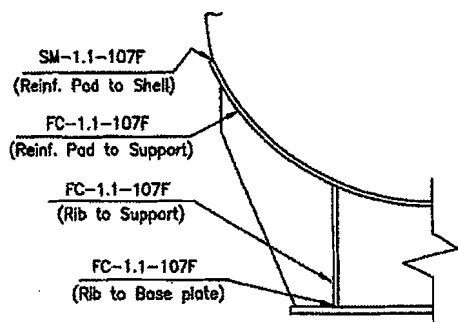
B-01	B-02	B-03	B-04	B-05	B-06	B-07	B-08
A-01	A-02	A-03	A-04			A-05	

WPS NO. TABLE

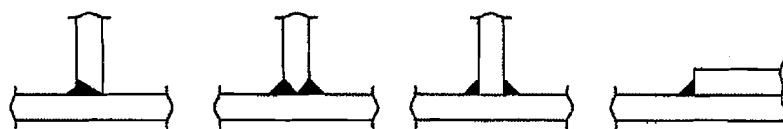
SEAM NO.	WPS NO.
A-01,05 B-01,02,07,08	GT.SM-10H.10H-101H
A-02~04 B-03~06	GT.SM-1.1-107F or GT.SM.SA-1.1-107F



TUBE TO TUBE SHEET JOINT



SADDLE



		EXTERNAL	INTERNAL
ATTACHMENT OF SHELL SIDE	PRESSURE PART (*1)	SM-1.1-107F or GT.SM-1.1-107F	SM-1.1-107F or GT.SM-1.1-107F
	NON-PRESSURE PART (*2)	SM-1.1-107F or FC-1.1-107F or GT.SM-1.1-107F	SM-1.1-107F or FC-1.1-107F or GT.SM-1.1-107F
ATTACHMENT OF CHANNEL SIDE	PRESSURE PART (*1)	SM-10H.10H-101H or GT.SM-10H.10H-101H	
	NON-PRESSURE PART (*2)	SM-10H.10H-101H or GT.SM-10H.10H-101H	

(*1) PRESSURE TO PRESSURE PART or PRESSURE TO NON-PRESSURE PART

(*2) NON-PRESSURE TO NON-PRESSURE PART

ASME

PAGE

4

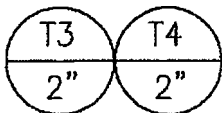
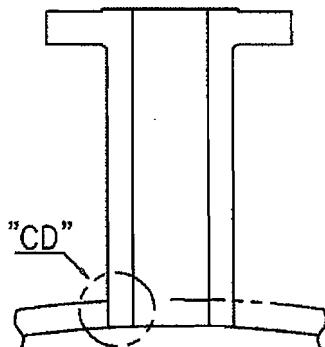
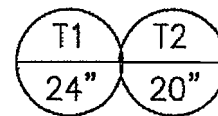
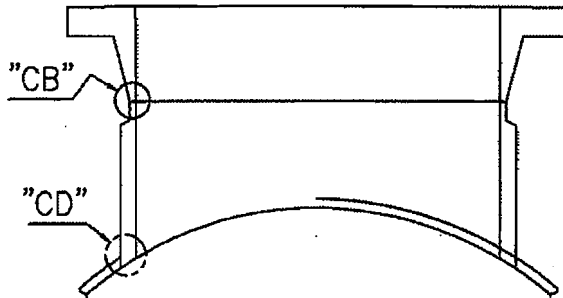
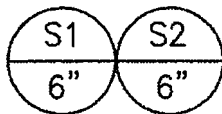
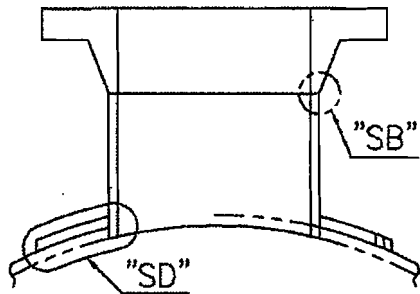
WELDING MAP

PAGE

2 OF 2

ITEM NO.

E-11570 / E-11580



WPS NO. TABLE

NOZZLE NO.	JOINT NO.	WPS NO.
ALL	"SB"	GT.SM-1.1-107F or GT.SM.SA-1.1-107F
ALL	"SD"	SM-1.1-107F
ALL	"CB"	GT.SM-10H.10H-102H
ALL	"CD"	SM-10H.10H-101H

ASME

PAGE

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HOBART BROTHERS101 Trade Square East
Troy, Ohio 45373 937-332-4000**CERTIFIED MATERIAL
TEST REPORT**Hobart Order : N/A
Part Number : S245115-053
Date : 06/30/2014Customer : Hankook McKay Weld Co. Ltd.
Customer Order : N/A; Test specifications via e-mail
instructions per Apple Xi dated 05/30/2014.**PRODUCT INFORMATION**Product Type : FORMULA XL-550 (H4) Diameter: .052" X 33# VPSP
Quantity : N/A Customer supplied test sample Lot #: 4037A**TEST SPECIFICATION**Test Specification: SFA5.20 Classification: E71T-12CJ
ASME SEC. II Part C
(2010 Ed. & 2011 Add.)
ASME SFA5.01 Lot Class T1; Schedule K Test Condition: AS-WELDED
EN 10204 type 3.1**WELDING PROCEDURE**

Lab Test #: PC3646 Amps: 225 DCEP Volts: 26 Travel Speed: 10 ± 1 ipm Shielding Gas: 100% CO2

Number of Layers: 7 (2 passes on each layer 1 through 6, 3 passes on layer 7. Direction reversed each layer).

Number of Passes: 15

Preheat Temperature: 60° F min.

Interpass Temperature: 300 ± 25°F

TEST RESULTS

Tensile (MPa): 536 Yield (MPa / .02% offset): 502 % Elongation in 2 in.: 29

Charpy V-Notch Impact Values, Joules @ -50°C: 129, 125, 96, 129, 149 / Avg: 128

Radiographics: Conforms

Fillets Weld Test: N/A

Diffusible Hydrogen: N/A

CHEMISTRY (Deposited Weld Metal)**FOR INFORMATION ONLY**

250 amps, 27 volts, 10 ± 1 ipm travel speed, 7 Layers

C	Mn	P	S	Si	Cr	Ni	Mo	V	Cu	Nb.
.02	1.06	.007	.004	.21	.05	.41	.01	.02	.01	.01

☒ REVIEWED
☒ WITNESSED
Date / Signature: <i>[Signature]</i>
Germanischer Lloyd Industrial Services

[Signature: J.H. O'Leary]
J.H. O'Leary / Quality Assurance Representative

OLSUNG	☒ Reviewed by
ISC	☒ Witnessed by
QA DEPT.	J. S. LEE
DATE	Jul. 10. 20 14

Certification and Limited Warranty

Data for the above supplied product are those obtained when welded and tested in accordance with the above specification. All tests for the above classification were satisfied. Other tests and procedures may produce different results. Hobart Brothers produces welding consumables under continuing quality assurance programs audited and approved by the American Bureau of Shipping ("ABS")

ASME

HOBART BROTHERS

101 Trade Square East
Troy, Ohio 45373 937-332-4000

CERTIFIED MATERIAL TEST REPORT

Hobart Order : N/A
Part Number : S245115-053
Date : 08/20/2014

Customer : Hankook McKay Weld Co. Ltd.
Customer Order : HMW-07081401 Rev. 0

PRODUCT INFORMATION

Product Type : FORMULA XL-550 (H4) Diameter: .052" X 33# VPSP
Quantity : N/A Customer supplied test sample Lot #: 4058A

TEST SPECIFICATION

Test Specification: SFA5.20 Classification: E71T-12CJ
ASME SEC. II Part C
ASME SFA5.01 Lot Class T1; Schedule K Test Condition: S.R. 20 hrs. @ 620±C ±14°C
EN 10204 type 3.1

WELDING PROCEDURE

Lab Test #: PC4010 Amps: 225 DCEP Volts: 26 Travel Speed: 10 ±1 ipm Shielding Gas: 100% CO2
Number of Layers: 6 (2 passes on each layer 1 through 5, 3 passes on layer 6. Direction reversed each layer).
Number of Passes: 13
Preheat Temperature: 60° F min. Interpass Temperature: 300 ± 25°F

TEST RESULTS

Tensile (MPa): 548 Yield (MPa / .02% offset): 470 % Elongation in 2 in.: 28
Charpy V-Notch Impact Values, Joules @ -46°C: 68, 108, 122, 118, 122 / Avg: 116
-50°C: 31, 115, 126, 19, 11 / Avg: 55
Radiographics: Conforms Fillets Weld Test: N/A
Diffusible Hydrogen: 3.6, 3.6, 3.7, 3.9 / Avg: 3.7 ml/100g. weld metal Relative Humidity: 66%

CHEMISTRY (Deposited Weld Metal)

300 amps, 28 volts, 10 ± 1 ipm travel speed, 7 Layers

C	Mn	P	S	Si	Cr	Ni	Mo	V	Cu	Nb.
.01	1.31	<.001	.004	.25	.04	.44	.01	.02	.02	.01

J.H. O'Leary
J.H. O'Leary / Quality Assurance Representative

LSUNG ISC QA DEPT DATE <i>Sp. 15. 20 14</i>	☒ Reviewed by
	☐ Witnessed by
J. S. LEE	

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>A. Zeng</i>
Germanischer Lloyd
Industrial Services

Certification and Limited Warranty

Data for the above supplied product are those obtained when welded and tested in accordance with the above specification. All tests for the above classification were satisfied. Other tests and procedures may produce different results. Hobart Brothers produces welding consumables under continuing quality assurance programs audited and approved by the American Bureau of Shipping ("ABS")

ASME

HOBART BROTHERS**CERTIFIED MATERIAL
TEST REPORT**101 Trade Square East
Troy, Ohio 45373

937-332-4000

Date Report Generated : 2/14/2011

Test Date: 1/27/2011

Hobart Reference:
Hobart Order: N4670
Part Number: S115951
Distributor: HankookCustomer Reference:
Customer Order: HMWC-01051101
Customer: Hankook**PRODUCT INFORMATION**

Product Type:	HOBART 718MC	Diameter:	5/32"
Classification:	E7018, E7018-1 H4R	Lot #:	21N338
Quantity:	25,000 lbs 11,340 kg	Heat #:	20999

TEST SPECIFICATION

Test Specification:	AWS A5.1/A5.1M:2004 Schedule I, Class "C3" EN 10204 3.1	Test Condition:	As Welded
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WELDING PROCEDURE

Lab Test #:	PB4142	Amps	190	Volts	25	Polarity	DCEP
Number of Layers	8	Pass Sequence	2,2,2,2,2,2,2	Position	flat		
Preheat Temperature	225	Interpass Temperature	300				

TEST RESULTS

Tensile Testing Condition:		As Welded	
Tensile (ksi):	79	Yield (ksi/.02% offset):	67
		% Elongation in 2in:	24
Impact Testing Condition:		SR 22.5 Hrs @ 1130F Impact Type: Charpy-V-Notch	
Test Temp (deg F)	-60	Individuals (ft.lb)	130 128 190
		Average (ft.lb):	149
Radiographics:	Conforms	Fillet Weld Test:	Hydrogen (ml/100g): 2.1
Hardness:	n/a	Horizontal	n/a
X-Factor:	n/a	Overhead	Conforms
Ferrite:	n/a	Vertical	Conforms
		Total Moisture:	Method: RC412 - As Received
		Result:	0.15

CHEMISTRY

C	Mn	P	S	Si	Cu	Cr	V	Ni	Mo	Al	Ti	Nb	Co	B	W	Sn	As	Sb	N
0.04	0.78	0.01	0.01	0.17	n/a	0.07	0.01	0.08	0.002	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

John J. Hoffman
Quality Engineer

2/14/2011
Date

원본대조필

Certification and Limited Warranty Agreement

Data for the above supplied product are those obtained when welded and tested in accordance with the above specification. All tests for the above classification were satisfied. Other tests and procedures may produce different results. Hobart Brothers produces welding consumables under continuing quality assurance programs audited and approved by the American Bureau of Shipping ("ABS")

Olsung ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	J. S. LEE
DATE	Jan. 20. 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd
Industrial Services

ASME

HOBART BROTHERS

Certificate of Compliance
to Requirements for Welding Electrode
EN 10204 3.1

Customer : HANKOOK MCKAY WELD CO., LTD	Diameter : 2.4 X915	Customer P.O.# : HMW-PO-10011301
Marked For :	W.O.# :	Lot No.: 3102247924
Products : HOBART BR-2	Kgs Shipped : 1200 Kgs	Pack Slip/Order #:
Classification : ER70S-2	Date: 10/28/13	Date Tested : 08/25/11
Specification : AWS A5.18		Certificate No. : 102913-1, Rev.2

Amps DCEP	Volts	WFS (CPM)	Shielding Gas	Electrical Stickout	Temperature		Travel Speed
					Preheat	Interpass	
230	18	NONE	100%Ar	NONE	F±25 C±14	302 F±27 150 C±15	ipm
					F±25 C±14	F±25 C±14	ipm

7 Layers, 2 passes on each layer 1 through 7, Direction reversed on each layer.

Mechanical Properties Lab Test # And

Shielding Gas	Testing Conditions	Ult. Tensile Strength	Yield Strength	Elong. % in 2"	Impact Test Temp	Charpy V-Notch Values Ft-Lbs PWHT 610C / 12Hrs
100%Ar QH25	PWHT	97568 psi 673 Mpa	87180 psi 601 Mpa	26	-51 F -46 C	80 89 108 105 115 Average 100 (130 J)
		psi Mpa	psi Mpa		F C	Average (J)

Gas 1: Radiographic Inspection : Conforms.
Gas 2:

Chemical Analysis Chem Pad #

Filler metal	C	Mn	P	S	Si	Ni	Cr	Mo	V	Cu	Ti	Zr	Al
100%Ar	0.03	1.16	0.004	0.002	0.46	0.006	0.021	0.015	0.001	0.03	0.12	0.07	0.1

HYDROGEN LEVEL : H4/100g

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i>
Germanischer Lloyd Industrial Services

OLSON ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	J. S. LEE
DATE Jun. 20. 2014	

J.H. O'Leary
J.H. O'Leary / Manager, Quality Assurance

MILD STEEL SOLID WIRES(GTAW)

The information contained or otherwise referenced herein is presented only as (typical) without guarantee or warranty, and Hobart Brothers Company expressly disclaims any liability incurred from any reliance thereon. Typical data are those obtained when welded and tested in accordance with AWS A5.18 Specification. Other tests and procedures may produce different results. No data is to be construed as a recommendation for any welding condition or Technique not controlled by ITW-Hobart Brothers.

ASME

HOBART BROTHERS

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to Requirements for Welding Electrode
EN 10204 3.1

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Products : HOBART BR-2
Classification : ER70S-2
Specification : AWS A5.18

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W.O.#:
Kgs Shipped : 1200 Kgs
Date: 10/29/13

Customer P.O.# : HMW-PO-10011301
Lot No.: 3102247924
Pack Slip/Order #:
Data Tested : 08/25/11
Certificate No. : 102913-1.Rev.2

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HYDROGEN LEVEL : H4/100g

☒ REVIEWED
☐ WITNESSED

Date / Signature:

[Signature]
Germanischer Lloyd
Industrial Services

[Signature]
J.H. O'Leary / Manager, Quality Assurance

QSLUNG
ISC
Reviewed by
Witnessed by
QA DEPT. J. S. LEE
DATE Jun . 20. 2014

MILD STEEL SOLID WIRES(GTAW)

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HOBART BROTHERS**ASME**

Certificate of Compliance
to Requirements for Welding Electrode
EN 10204 3.1

Customer : HANKOOK MCKAY WELD CO.,LTD
Marked For :
Products : HOBART BR-2
Classification : ER70S-2
Specification : AWS A5.18

Diameter : 2.4 X915
W.O.#:
Kgs Shipped : 1200 Kgs
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		psi Mpa	psi Mpa		F C	Average (J)

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HYDROGEN LEVEL : H4/100g

J.H. O'Leary
J.H. O'Leary / Manager, Quality Assurance

Qlsung
ISC
Reviewed by
Witnessed by
QA DEPT. J. S. LEE
DATE Jun . 20. 2014

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[Signature]
Germanischer Lloyd
Industrial Services

MILD STEEL SOLID WIRES(GTAW)

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ASME CERTIFICATE OF WELDING CONSUMABLES

PAGE 11

#321, HWASAN-RI, ONSAN-EUB, ULJU-KUN, ULSAN, KOREA / TEL:052-237-5301 / FAX:052-237-3311

P. O. No.:

CUSTOMER: (주)동성웰딩

DATE: MAY 07, 2014

Certificate No.: CSO-1405-P023

Brand Name	Classification	Diameter (mm)	Lot No.	Weight (kg)	Remark
CSF-71T	AWS E71T-1C/ AWS E491T-1C	1.4	F71TA00003141	-	-

1. APPLIED CODE : AWS A5.20/A5.20M: 2005, EN10204 3.1

2. MECHANICAL PROPERTIES OF WELD METAL						3. RADIOGRAPHIC TEST	4. HEAT TREATMENT
Item	Tension Test				Charpy Absorbed Energy		Fig.8
	Y.P (Mpa)	T.S (Mpa)	Elon (%)	R.A(%)	(J) (at -20 °C)		
Spec. (min.)	390	490~670	22	-	27		NR
Result	527	600	29.8		51 57 61 AVE. = 56.3	Accept	

5. CHEMICAL COMPOSITION (☒ Weld Metal ☐ Filler Metal) (unit : %)

Elements	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	V		Ferrite Number (FN)
Spec. (max.)	0.12	1.75	0.90	0.03	0.03	0.35	0.50	0.20	0.30	0.08		-
Result	0.042	1.31	0.61	0.012	0.008	0.01	0.01	0.02	0.02	0.02		-

6. FILLET WELD TEST (unit : mm)

Welding Position	Item	Fillet Weld Size	Fillet Weld Leg		Difference Between Length of fillet legs	Convexity	Dimension of Fillet Weld	
		L1	L2	L3				
H	Spec. (max.)	Not required						
	Result							
OH	Spec. (max.)	10.0			3.0	2.5		
	Result	7.5	8.0	7.5	0.5	0.5		
V	Spec. (max.)	10.0			3.0	2.5		
	Result	7.5	8.0	7.5	0.5	0.5		

7. THE OTHER TESTS

Item	Moisture Test		Hydrogen Test		Bend Test		Remark
Spec.	max.	(%)	max.	(ml/100g)	Crack : max.	mm	
Result	NR		7.3		Result	NR	
						NR	

We hereby certify that the above materials are satisfactory in compliance with the requirement specified in the contract.
Our quality system is certified in accordance with ISO9001:2008 by DNV CERTIFICATION B.V., THE NETHERLAND.

원본대조필



H. J. Lee

Manager of Quality Assurance Department

CS-500-B08-F2

Reviewed by
ISC
QA DEPT. J. S. LEE
DATE Jun. 20. 2014

CHOSUN WELDING CO., LTD.

REVIEWED 4(210×297)
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services



CERTIFICATE

No. A/13-335759

Rev 02

Date 2013-05-17

Page 1/1

Rev.date 2014-03-21

INSPECTION CERTIFICATE acc to
EN 10 204 3.1S.W.M
CENTUM LEADERS MARK BLDG 1809,
WOO-DONG, 1514
HAEWOONDAE-GU, 612-020 BUSAN
KOREA

ASME

Customer References

KI20136010

Customer
order
2013-04-09

901-06427 S.W.M

Sandvik References

Order No. Subs No. ABSMT Dispatch note
501440 21373 06180/55
ABSMT No. C.Code
415-59808 01

Material description

STAINLESS COLD DRAWN WIRE
WELDING WIRE
TIG LENGTHSSteel making process
Electric furnace

Steel/material Designations

Sandvik AWS
22.8.3.L ER2209
EN no EN ISO 14343-A
22 9 3 N L 22 9 3 N L
SFA/AWS A 5.9
ER2209

Technical requirements

OLSONG
ISC

Reviewed by
Witnessed by

QA DEPT. J. S. LEE
DATE Jun. 20. 2014

REVIEWED
WITNESSED

Date / Signature:
Germanischer Lloyd
Industrial Services

EXTENT OF DELIVERY

It	Product designation	Heat	Lot	Pieces	Kg
01	R22.8.3.L-2.00-1000	532545	21248	93	465.0
		532545	21249	49	245.0
Total				142	710.0

TEST RESULTS

Chemical composition (weight%)

Heat	PRE	FN WRC-92
532545	35.4	55

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
532545	0.009	0.49	1.50	0.016	0.0005	22.94	8.64	3.02
	Co	Cu	N					
532545	0.052	0.095	0.158					

The delivered products comply with the specifications and requirements of the order.

The material is manufactured according to a Quality system, approved and registered to ISO 9001:2008.

The certificate is produced with EDP and valid without signature.

Quality assurance - Basid Azizi/QA-manager Wire
MTC Service / Certificates

Wire Sandviken AB Reg No. 556779-3897 VAT No. SE663000-060901
SE-81181 SANDVIKEN SWEDEN www.smt.sandvik.com mtc_service.smt@sandvik.com



Certified Material Test Report

EN 10204 3.1

PAGE 13

Delivery Testing Report

WQW 14803 Rev.0

Page 1 (5)

SANDVIK 22.8.3.L TIG

WQW/Hardner March 2014

List of revisions

Number

Change

0

Original

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Date / Signature: <i>[Signature]</i>
Germanischer Lloyd Industrial Services

<i>Qlsung</i> ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. J. S. LEE	
DATE Jun .20 . 2014	

Issued and Approved by WQW/Anders Hardner	Reviewed by WQW/Thomas Jönsson		Third party inspection
<i>[Signature]</i> 	<i>TJ</i>		

**Certified Material Test Report**

EN 10204 3.1

PAGE 14

Delivery Testing Report
WQW 14803 Rev.0
Page 2 (5)

DELIVERY TESTING

ASME

CUSTOMER NUMBER	901-6427
CUSTOMER NAME	S.W.M.
ORDER NUMBER	415-65449
SPECIFICATION	MPS-DSWELD- ClairRidge-2209-GTAW (2)

Reference	Pos	Grade	ASME Grade SFA 5.9	Heat	Lot	Dim (mm)
WI4803	I	Sandvik 22.8.3.L	ER2209	537592	23177	2.40

All testing has been performed according to customer specification.

Test results
Welding protocol

Page 3-4,
Page 5.

All results are in conformance with customer requirements.

Qlsung ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	J. S. LEE
DATE	Jun. 20. 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i> 20 Jun 14
Germanischer Lloyd Industrial Services



Certified Material Test Report

EN 10204 3.1

Delivery Testing Report

WQW 14803 Rev.0

Page 3 (5)

ASME

TEST PROTOCOL

Customer name S.W.M.	Customer number 901-6427	Order number 415-65449
Consumable Sandvik 22.8.3.L	Heat number 537592	Lot number 23177
Dimension Ø 2,40 mm.	Flux / Batch	Welding method TIG

RESULTS

NDT – Non Destructive Testing

Testing method	Assembly	Reference	Acceptance limit	Result
Radiographic testing		ASME section II, Part C.		Approved

Chemical composition of Undiluted Deposited Metal

Grade Sandvik 22.8.3.L = ER2209				Reference SFA 5.9					
Lot	Dim	Grade	C	Si	Mn	P	S	Cr	Ni
Requirements in spec. for ER2209			Info	Info	Info	Info	Info	Info	Info
23177	2,40	ER2209	0,01	0,51	1,69	0,02	0,001	22,9	8,6

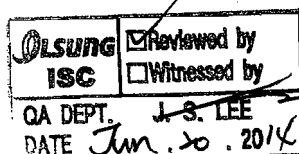
Lot	Dim	Grade	Mo	Ti	Cu	Nb	N	Al	W	Fe	PREn
Requirements in spec. for ER2209			Info		Info		Info				>35
23177	2,40	ER2209	3,2		0,12		0,20				36,7

Ferrite content on undiluted weld metal

Grade Sandvik 22.8.3.L = ER2209			Reference			Remarks		
Lot			WRC-92 (%)	Fischer (%)	ASTM E562 (%)			
Requirements in spec.			30-65	Info	30-65			
23177			45	37	43			

Mechanical properties - Tensile test

Grade Sandvik 22.8.3.L = ER2209			Reference AWS B4.0				Remark			
Sample	Lot	Grade	Dim (mm)	Condition	Retest	Temp (°C)	Rp 0,2 (MPa)	Rm (MPa)	A (%)	
Requirements in spec. for ER2209				As welded		RT	Info	Info	Info	
W14803	23177	ER2209	2.40	As welded		RT	706	887	34	





Certified Material Test Report

EN 10204 3.1

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Delivery Testing Report
WQW 14803 Rev.0
Page 4 (5)

TEST PROTOCOL

ASME

Customer name S.W.M.	Customer number 901-6427	Order number 415-65449
Consumable Sandvik 22.8.3.L	Heat number 537592	Lot number 23177
Dimension Ø 2.40 mm	Flux / Batch	Welding method TIG

Mechanical properties – Hardness weld metal

Grade Sandvik 22.8.3.L = ER2209			Reference		Remarks HV10
Sample	Lot	Condition	Dot 1	Dot 2	Dot 3
Requirements in spec. for ER2209					
W14803	23177	As welded	280	280	280

Mechanical properties – Impact

Reference	Remarks Average value is calculated by discarding the highest & the lowest values.							
Sample	Lot	Grade	Dim (mm)	Condition	Temp (°C)	KV (J)	Average	Lateral exp. (mm)
<i>Requirements in spec. for ER2209</i>				As welded	-50	<i>Single value ≥ 40J. Avg. ≥ 54J.</i>		<i>Info.</i>
W14803-1	23177	ER2209	2.40	As welded	-50	209	212	1.75
W14803-2	23177	ER2209	2.40	As welded	-50	206		1.84
W14803-3	23177	ER2209	2.40	As welded	-50	247		1.98
W14803-4	23177	ER2209	2.40	As welded	-50	202		1.89
W14803-5	23177	ER2209	2.40	As welded	-50	222		1.99

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Date / Signature: *[Signature]* 20 Jun 15
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Industrial Services

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☐ Witnessed by
QA DEPT. J. S. LEE
DATE Jun .20. 2014



Certified Material Test Report

EN 10204 3.1

Delivery Testing Report
WOW 14803 Rev.0
Page 5 (5)

ASME

WELDING PROTOCOL

Welder S.H	Date 2014-02-14	Marking int. no. W14803	Project no. WHT-Svets017-Mstöd
Type of test Deliverytest	Method TIG	Customer S.W.M	Order no. 415-65449

Marking	W14803-111				
Bead number	33				
Layer					
Base material	2205				
Heat number	283823				
Dimension [mm]	20				
Consumable	Sandvik 22.8.3.L				
Heat number	537592				
Lot number	23177				
Dimension [mm] Ø	2,4				
Current [A]	200				
Voltage [V]	13-15				
Travel speed [mm/min]	100-150				
Heat input [kJ/mm]	0,62-1,08				
Wire feed speed [cm/min]					
Total arc time [s]					
Wire consumed [mm/min]					
Working temp. [°C]	RT				
Interpass temp.[°C]	150				
Shielding gas	Ar+2%N ₂				
Gas flow [l/min]	11				
Root gas					
Gas flow [l/min]					
Method	TIG				

OLSONG
ISC
 QA DEPT.
 DATE *Jan. 20. 2014*

Reviewed by
 Witnessed by

☒ REVIEWED
☐ WITNESSED
 Date / Signature:
20 Jan 14
 Germanischer Lloyd
 Industrial Services



CERTIFICATE

ASME

A03/Z02

No. A/14-392757 Rev 00
Date 2014-01-27 Page 1/2

A02/Z03

INSPECTION CERTIFICATE acc to
EN 10 204 3.1

A06

S.W.M

612-020 BUSAN

INSPECTION STAMP
WQ

Customer References A07 KI20145006 901-06427 S.W.M Customer order 2014-01-21	Sandvik References A08 Order No. Subs No. ABSMT Dispatch note 502069 21635 13080/55 ABSMT No. C.Code 415-65449 43																																																						
Material description B01/B04 STAINLESS COLD DRAWN WIRE WELDING WIRE TIG LENGTHS Steel making process C70 Electric furnace	Steel/material Designations B02 Sandvik AWS 22.8.3.L ER2209 EN no EN ISO 14343-A 22 9 3 N L 22 9 3 N L																																																						
Technical requirements B03 ASME SECT II PART C SFA 5.9, EDITION 2010 NO ADDENDA. AWS A5.9-06. ASME Section II Part C, SFA 5.01 Class S3 DSWELD-CLAIRRIDGE-GTAW2209 REV 0																																																							
EXTENT OF DELIVERY B07-B13 <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>It</th> <th>Product designation</th> <th>Heat</th> <th>Lot</th> <th>Pieces</th> <th>Kg</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>R22.8.3.L-2.40-1000</td> <td>537592</td> <td>23177</td> <td>600</td> <td>3000.0</td> </tr> <tr> <td colspan="4" style="text-align: right;">Total</td> <td>600</td> <td>3000.0</td> </tr> </tbody> </table> TEST RESULTS Chemical composition (weight%) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Heat</th> <th>C</th> <th>Si</th> <th>Mn</th> <th>P</th> <th>S</th> <th>Cr</th> <th>Ni</th> <th>Mo</th> </tr> </thead> <tbody> <tr> <td>537592</td> <td>0.012</td> <td>0.49</td> <td>1.71</td> <td>0.017</td> <td><0.0005</td> <td>22.90</td> <td>8.61</td> <td>3.18</td> </tr> <tr> <td></td> <th>Co</th> <th>Cu</th> <th>N</th> <td colspan="5"></td> </tr> <tr> <td>537592</td> <td>0.068</td> <td>0.12</td> <td>0.15</td> <td colspan="5"></td> </tr> </tbody> </table> The delivered products comply with the specifications and requirements of the order. The material is manufactured according to a Quality system, approved and registered to ISO 9001:2008.		It	Product designation	Heat	Lot	Pieces	Kg	01	R22.8.3.L-2.40-1000	537592	23177	600	3000.0	Total				600	3000.0	Heat	C	Si	Mn	P	S	Cr	Ni	Mo	537592	0.012	0.49	1.71	0.017	<0.0005	22.90	8.61	3.18		Co	Cu	N						537592	0.068	0.12	0.15					
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QSLUNG ISC QA DEPT. J. S. LEE DATE Jun . 20. 2014 ☒ Reviewed by ☐ Witnessed by ☐ REVIEWED ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services																																																							
Quality assurance - Basid Azizi/QA-manager Wire MTC Service / Certificates A05/Z02																																																							



CERTIFICATE

 No. A/14-392757 Rev 00
 Date 2014-01-27 Page 2/2


No unauthorized alterations. The contents of this Inspection Certificate may not be modified or revised in any way without the prior written approval of AB Sandvik Materials Technology. Unauthorized alterations to the Inspection Certificate, including introduction of false, fictitious or fraudulent statements or entries, may be punishable by fines, imprisonment, or both. This Inspection Certificate may be copied only in the manner and for the purposes specified in Section 6 of EN 10204:2004. Contravention of this notice will be prosecuted to the fullest extent of applicable law.

The certificate is produced with EDP and valid without signature.

OLSONG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	J. S. LEE
DATE	Jun .20. 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature:
<i>[Signature]</i> 20 Jun 14
Germanischer Lloyd Industrial Services

SMP CERTIFICATE OF COMPLIANCE

ESAB SeAH Corporation

3, JEONGDONG-RO 62BEON-GIL, SEONGSAN-GU
CHANGWON-SI, GYEONGNAM, KOREA 641-120
TEL:82-55-289-8111 FAX: 82-55-267-5344

Certificate No:14-2449-0661
Issued Date :2014.07.17

Brand Name : INOX 2209

Customer Name : ㈜세아에스알산출판

This material conforms to specification :
AWS A5.4/A5.4M:2006, ASME SFA-5.4/5.4M:2013

P/O No. : *
Item No. :
EAN Code :
Diameter : 4 mm
Weight : 110.0 KG
Lot Number : E135A4B500
Shielding Gas : N/A

Type : E2209-16

Chemical Compositions (EN 10204 - 2.2)

Chemical	Specification	Requirements
C	0.03	max 0.04
Mn	1.06	0.50 - 2.00
Si	0.87	max 1.00
S	0.014	max 0.03
P	0.028	max 0.04
Cr	22.71	21.50 - 23.50
Ni	9.28	8.50 - 10.50
Mo	3.43	2.50 - 3.50
V		N/A
Al		N/A
Cu	0.27	max 0.75
Ti		N/A
Co		N/A
N	0.110	0.080 - 0.200
Cb+Ta		N/A
Fe		N/A
Zn		N/A
Be		N/A
Pb		N/A
Sn		N/A
W		N/A
Others		N/A

Mechanical Properties As welded (EN 10204 - 2.2)

Tensile	Specification
Y.S.(0.2%) MPa	min 690
T.S. MPa	min 800
Elongation(2"),%	min 20
Reduction of Area,%	N/A

Fillet Weld Test Satisfactory
Radiographic test Satisfactory

Ferrite contents 49.1(1992 WRC)

OLsung ISC
Reviewed by ☒ J. S. Lee
Witnessed by ☐
QA DEPT. ☒
DATE Aug. 14. 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature: *[Signature]*
Germanischer Lloyd
Industrial Services

Remarks:

The undersigned certifies that the products supplied will meet the applicable AWS filler metal specification (if, applicable) when tested in accordance with those specifications.

By : Y.S. Kim
Y.S.Kim, Manager, Q.M.Team

SMP CERTIFICATE OF COMPLIANCE

CSAB SeAH Corporation

1, JEONGDONG-RO 62BEON-GIL, SEONGSAN-GU
CHANGWON-SI, GYEONGNAM, KOREA 641-120
TEL: 82-55-289-8111 FAX: 82-55-267-5344

Certificate No: 14-2449-1091
Issued Date : 2014.11.10

Brand Name : INOX 2209

Customer Name : ㈜세아에스알산총판

This material conforms to specification :
AWS A5.4/A5.4M:2006, ASME SFA-5.4/5.4M:2013

Type : E2209-16

P/O No. : *
Item No. :
EAN Code :
Diameter : 4 mm
Weight : 60.0 KG
Lot Number : E135A4J500
Shielding Gas : N/A

Chemical Compositions

(EN 10204 - 2.2)

Specification Requirements

C	0.03	max	0.04
Mn	1.06		0.50 - 2.00
Si	0.87	max	1.00
S	0.014	max	0.03
P	0.028	max	0.04
Cr	22.71		21.50 - 23.50
Ni	9.28		8.50 - 10.50
Mo	3.43		2.50 - 3.50
V			N/A
Al			N/A
Cu	0.27	max	0.75
Ti			N/A
Co			N/A
N	0.110		0.080 - 0.200
Cb+Ta			N/A
Fe			N/A
Zn			N/A
Be			N/A
Pb			N/A
Sn			N/A
W			N/A
Others			N/A

Mechanical Properties

As welded (EN 10204 - 2.2)

Tensile			
Y.S.(0.2%) MPa			N/A
T.S. MPa	800	min	690
Elongation(2"),%	27	min	20
Reduction of Area, %			N/A

Fillet Weld Test Satisfactory
Radiographic test Satisfactory

Ferrite contents 49.1(1992 WRC)

OLsung ISC

☒ Reviewed by J. S. LEE
☐ Witnessed by

QA DEPT. DATE Dec. 25. 2014

☒ REVIEWED
☐ WITNESSED
Date / Signature: *[Signature]* 2014.11.15
Germanischer Lloyd
Industrial Services

Remarks:

The undersigned certifies that the products supplied will meet the applicable AWS filler metal specification (if, applicable) when tested in accordance with those specifications.

By : Y.S. Kim
Y.S. Kim, Manager, Q.M. Team

17. Bolt Torque Report

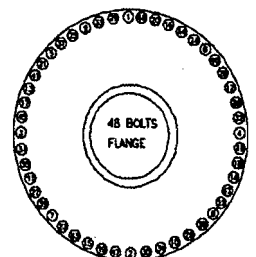
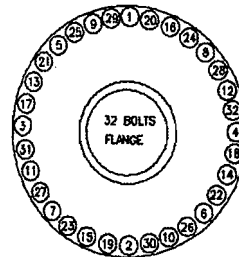
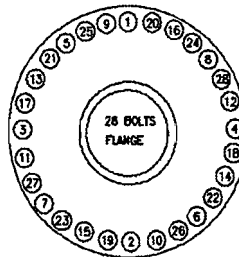
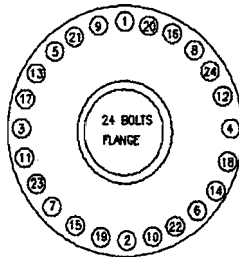
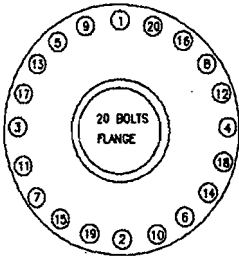
BOLT TIGHTENING RECORDS

General Information

Checked date : DEC. 18~19, 2014

P.O No.	4511951391	Project Name	CARMON CREEK PROJECT
Item No.	E-11580	Customer	SHELL CANADA ENERGY
Item Name	VRU INLET GAS COOLER	Dwg. No.	VP-SG07-E11570-001 REV.06

BOLTING SEQUENCE

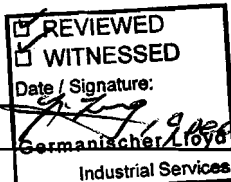


NO.	Check Points	Result
1	Initial gap between flange	ACCEPTED
2	Centering Guide for the Gasket	ACCEPTED
3	Balance of the Stud-Bolts	ACCEPTED
4	Hand Tighten All Studs and Nuts	ACCEPTED
5	Uniform gap between girth flanges	ACCEPTED

Detail of Torque Wrenches

Equipment Name	RAPID-TORC	Req. Torque Value (FT-LBS)				
Equipment Tool No.	T-5	PART	SH. FLG.	CH. COVER FLG.	SH. COVER FLG.	FLOAT. HEAD FLG.
Used tool quantity	One (1)	VALUE	840	840	N / A	N / A
Actual Torque Value (PSI)	SH. FLG.	CH. COVER FLG.	SH. COVER FLG.		FLOAT. HEAD FLG.	
	Bolt No. 1~60 : 1500	Bolt No. 1~60 : 1500	N / A		N / A	

NOTE.:

Leakage during hydrotest ? Yes ☐ No ☒ if Yes, reason☐ Witnessed By / ☐ Reviewed By

Approved By	S.J.HWANG	3/18/14 Dec 19 '14
Reviewed By	S.S.LEE	Dec 18 '14
Prepared By	Y.S.LIM	Dec 19 '14

SG-07 STUD BOLT TORQUE VALUE LIST

ITEM NO.	PART	BOLT SIZE	TORQUE VALUE (FT-LBS)
E-10010 SERIES	SH. FLG.	1-5/8"	2733
	CH. COVER FLG.	1-5/8"	
	SH. COVER FLG.	1-5/8"	
	FLOAT. HEAD FLG.	1-3/8"	1602
E-10070 SERIES	SH. FLG.	1"	573
	CH. COVER FLG.	1"	
E-10120 SERIES	SH. FLG.	1-1/4"	1181
	CH. COVER FLG.	1-1/4"	
	SH. COVER FLG.	1-1/8"	840
	FLOAT. HEAD FLG.	1-1/8"	
E-10140 SERIES	SH. FLG.	1-1/8"	
	CH. COVER FLG.	1-1/8"	
E-10180 SERIES	SH. FLG.	1-1/8"	
	CH. COVER FLG.	1-1/8"	
E-10180 SERIES	SH. FLG.	1-1/8"	
	CH. COVER FLG.	1-1/8"	



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TORQUE ESTIMATING CHART

ASTM A193, GRADE B7 STUDS

LUBRICANT: MOLY PASTE

NUT FACTORS (K): 0.14, 0.18 OR 0.20

TORQUE VALUES CALCULATED USING MECHANICAL ENGINEERING "SHORT FORMULA":

$$T = K (\text{Nut Factor}) \times \text{Clamp Load (Lbs)} \times \frac{D [\text{Bolt Diameter (Inches)}]}{12}$$

STUD DIAMETER (INCHES)	NUT SIZE (ATF)	TORQUE VALUES (FT-LBS)								
		40% YIELD			50% YIELD			60% YIELD		
		K=.14	K=.18	K=.20	K=.14	K=.18	K=.20	K=.14	K=.18	K=.20
1/2	7/8	35	45	50	43	56	62	52	67	75
5/8	1-1/16	69	89	99	87	111	124	104	134	148
3/4	1-1/4	123	158	175	153	197	219	184	237	263
7/8	1-7/16	198	255	283	248	318	354	297	382	424
1	1-5/8	297	382	424	371	477	530	445	573	636
1-1/8	1-13/16	435	560	622	544	700	778	653	840	933
1-1/4	2	613	788	875	766	984	1,094	919	1,181	1,313
1-3/8	2-3/16	831	1,068	1,187	1,038	1,335	1,483	1,245	1,602	1,780
1-1/2	2-3/8	1,097	1,410	1,567	1,371	1,762	1,958	1,645	2,115	2,350
1-5/8	2-9/16	1,417	1,822	2,025	1,772	2,278	2,531	2,126	2,733	3,037
1-3/4	2-3/4	1,784	2,293	2,548	2,230	2,867	3,185	2,675	3,440	3,822
1-7/8	2-15/16	2,214	2,847	3,163	2,768	3,559	3,954	3,321	4,270	4,745
2	3-1/8	2,715	3,490	3,878	3,393	4,090	4,848	4,072	5,235	5,817
2-1/4	3-1/2	3,925	5,046	5,607	4,906	6,308	7,009	5,887	7,569	8,411
2-1/2	3-7/8	4,921	6,327	7,030	6,151	7,909	8,788	7,382	9,491	10,545
2-3/4	4-1/4	6,620	8,512	9,457	8,275	10,639	11,822	9,930	12,767	14,186
3	4-5/8	8,658	11,132	12,369	10,823	13,915	15,461	12,987	16,698	18,554
3-1/4	5	11,080	14,246	15,829	13,850	17,807	19,786	16,620	21,369	23,743
3-1/2	5-3/8	13,903	17,875	19,861	17,379	22,344	24,827	20,854	26,813	29,792
3-3/4	5-3/4	17,190	22,102	24,558	21,488	27,627	30,697	25,785	33,153	36,836
4	6-1/8	20,943	26,927	29,919	26,179	33,659	37,398	31,415	40,390	44,878
MATERIAL YIELD STRENGTH					NUMBER OF THREADS					
1/2" - 2-1/4" DIAMETER STUDS : 105,000 PSI 2-1/2" - 4" DIAMETER STUDS : 95,000 PSI					1/2" DIAMETER STUDS: 13 TPI 5/8" DIAMETER STUDS: 11 TPI 3/4" DIAMETER STUDS: 10 TPI 7/8" DIAMETER STUDS: 9 TPI 1" - 4" DIAMETER STUDS: 8 TPI					

The K Factor is an experimentally determined constant that relates the torque applied to the load induced in the fastener. This factor is affected by the condition of the fastener, the lubricant used and the condition of the flange. For example, the 0.18 K Factor listed above is based on the following conditions:

1. New condition of flanges, studs and nuts.
2. Thorough application of lubricant on all mating surfaces of flange, nut and stud.
3. Use of hardened steel washers.

Pressure Vs Torque Conversion Chart *Titan T Series Tools*

	<i>T-1</i>	<i>T-3</i>	<i>T-5</i>	<i>T-8</i>	<i>T-10</i>	<i>T-25</i>
PUMP PSI (BAR)	Torque - Ft. Lbs (Nm)					
1500 (103)	197 (267)	468 (635)	816 (1107)	1168 (1584)	1662 (2254)	3726 (5052)
1600 (110)	210 (285)	499 (677)	871 (1180)	1246 (1689)	1773 (2404)	4002 (5389)
1800 (124)	236 (321)	562 (762)	979 (1328)	1402 (1901)	1994 (2704)	4554 (6063)
2000 (138)	271 (367)	644 (873)	1101 (1493)	1574 (2134)	2236 (3032)	5106 (6924)
2200 (152)	298 (404)	708 (961)	1212 (1643)	1731 (2348)	2460 (3335)	5626 (7616)
2400 (165)	325 (441)	773 (1048)	1322 (1792)	1889 (2561)	2683 (3638)	6145 (8308)
2600 (179)	352 (477)	837 (1135)	1432 (1942)	2046 (2775)	2907 (3942)	6665 (9001)
2800 (193)	379 (514)	902 (1223)	1542 (2091)	2204 (2988)	3130 (4245)	7184 (9693)
3000 (207)	411 (557)	961 (1303)	1656 (2246)	2378 (3225)	3365 (4563)	7704 (10447)
3200 (221)	438 (594)	1025 (1390)	1767 (2396)	2537 (3440)	3589 (4867)	8221 (11143)
3400 (234)	465 (631)	1089 (1477)	1877 (2546)	2695 (3655)	3814 (5171)	8738 (11840)
3600 (248)	493 (668)	1153 (1564)	1988 (2695)	2854 (3869)	4038 (5476)	9254 (12536)
3800 (262)	520 (705)	1217 (1651)	2098 (2845)	3012 (4084)	4262 (5780)	9771 (13232)
4000 (276)	549 (745)	1278 (1733)	2230 (3023)	3216 (4361)	4456 (6042)	10288 (13951)
4200 (290)	577 (782)	1342 (1820)	2341 (3174)	3377 (4579)	4679 (6344)	10809 (14648)
4400 (303)	604 (820)	1406 (1906)	2452 (3326)	3538 (4797)	4902 (6647)	11330 (15346)
4600 (317)	632 (857)	1470 (1993)	2564 (3477)	3698 (5015)	5124 (6949)	11852 (16043)
4800 (331)	659 (894)	1534 (2080)	2675 (3628)	3859 (5233)	5347 (7251)	12373 (16741)
5000 (345)	686 (930)	1592 (2159)	2790 (3783)	3990 (5410)	5588 (7577)	12894 (17484)
5200 (359)	714 (968)	1656 (2245)	2902 (3935)	4150 (5627)	5812 (7880)	13385 (18184)
5400 (372)	741 (1005)	1719 (2331)	3013 (4086)	4309 (5843)	6035 (8184)	13876 (18883)
5600 (386)	769 (1042)	1783 (2418)	3125 (4237)	4469 (6060)	6259 (8487)	14366 (19582)
5800 (400)	796 (1079)	1847 (2504)	3237 (4389)	4628 (6276)	6482 (8790)	14857 (20282)
6000 (414)	824 (1118)	1896 (2571)	3353 (4547)	4848 (6574)	6717 (9108)	15348 (20812)
6200 (428)	852 (1155)	1959 (2657)	3465 (4699)	5010 (6793)	6941 (9412)	15834 (21506)
6400 (441)	879 (1192)	2022 (2742)	3577 (4850)	5171 (7012)	7165 (9715)	16320 (22199)
6600 (455)	907 (1230)	2086 (2828)	3689 (5002)	5333 (7231)	7389 (10019)	16806 (22893)
6800 (469)	934 (1267)	2149 (2914)	3800 (5153)	5494 (7450)	7613 (10323)	17292 (23587)
7000 (483)	962 (1305)	2190 (2970)	3891 (5276)	5660 (7675)	7746 (10504)	17778 (24107)
7200 (496)	990 (1342)	2253 (3054)	4002 (5427)	5822 (7894)	7967 (10804)	18252 (24796)
7400 (510)	1017 (1379)	2315 (3139)	4114 (5578)	5983 (8114)	8189 (11104)	18725 (25485)
7600 (524)	1045 (1417)	2378 (3224)	4225 (5729)	6145 (8333)	8410 (11404)	19199 (26173)
7800 (538)	1072 (1454)	2440 (3309)	4336 (5880)	6307 (8552)	8631 (11704)	19672 (26862)
8000 (552)	1098 (1489)	2497 (3386)	4492 (6092)	6476 (8781)	8867 (12024)	20146 (27318)
8200 (565)	1125 (1526)	2559 (3471)	4605 (6244)	6638 (9001)	9089 (12324)	20619 (28001)
8400 (579)	1153 (1563)	2622 (3555)	4717 (6396)	6800 (9221)	9310 (12625)	21092 (28684)
8600 (593)	1180 (1600)	2684 (3640)	4829 (6549)	6962 (9440)	9532 (12925)	21564 (29367)
8800 (607)	1208 (1637)	2747 (3725)	4942 (6701)	7124 (9660)	9754 (13226)	22037 (30050)
9000 (621)	1233 (1672)	2810 (3810)	5056 (6856)	7240 (9817)	10075 (13662)	22510 (30524)
9200 (634)	1261 (1709)	2872 (3895)	5168 (7008)	7401 (10036)	10299 (13965)	22958 (31202)
9400 (648)	1288 (1747)	2935 (3980)	5281 (7160)	7562 (10254)	10523 (14269)	23406 (31880)
9600 (662)	1315 (1784)	2997 (4064)	5393 (7313)	7723 (10472)	10747 (14572)	23852 (32558)
9800 (676)	1343 (1821)	3060 (4149)	5505 (7465)	7884 (10690)	10971 (14876)	24301 (33237)
10000 (690)	1359 (1843)	3124 (4236)	5605 (7601)	8062 (10932)	11067 (15007)	24749 (33560)

9001 Jameel Street, Suite 180 • Houston, TX 77040

Toll-Free 866.345.8484 Phone 281.449.9994 Fax 281.449.9996 Email sales@titanti.com

www.titanti.com

18. As-built Drawing including Lifting and Transportation Drawing

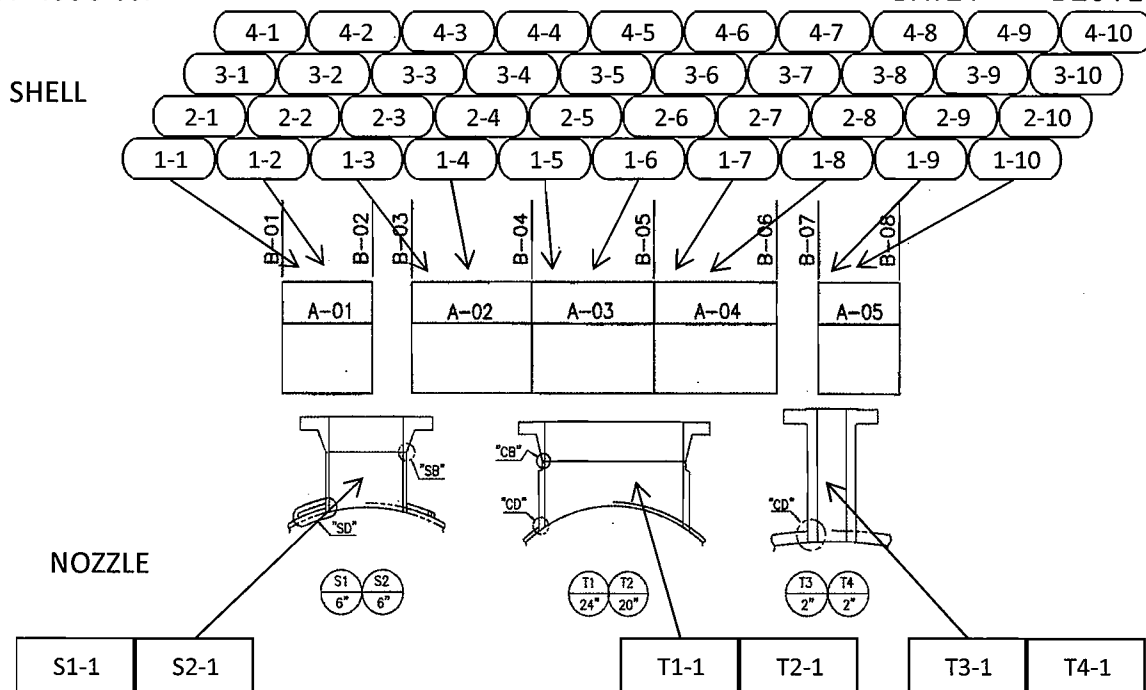
19. As-built UT wall thickness survey

ULTRASONIC WALL THICKNESS RECORD

P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY
PLANT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.06
ITEM NO.	E-11580	ITEM NAME	VRU INLET GAS COOLER

W/O NO : P-13SG-007

DATE : DEC . 23 . 2014



TEST LOCATION : IN ACCORDANCE WITH STANDARD DRAWING S10.118. / TEST EQUIP. : ULTRASONIC TH'K GAUGE (MAKER - WORLTECH, SN - WT610-106-61357)

PART	LOCATION (GRID LINE)	THICKNESS (mm)					PART	LOCATION (GRID LINE)	THICKNESS (mm)					
		DWG. (MIN.)	LOCATION (GRID POINT)						DWG. (MIN.)	LOCATION (GRID POINT)				
			1	2	3	4				9	10	-	-	
SHELL & CHANNEL	1 (0°)	1~2 15	15.12	15.19	17.17	17.21	SHELL & CHANNEL	3 (180°)	9~10 15	15.37	15.31	-	-	
	2 (90°)		15.14	15.24	17.11	17.24		4 (270°)		15.30	15.33	-	-	
	3 (180°)	3~4 17	15.21	15.16	17.23	17.21	PART	LOCATION	DWG. (MIN.)	1		-		
	4 (270°)		15.15	15.22	17.20	17.24	NOZZLE	S1	S2	10.97	10.97	11.21	11.21	-
	LOCATION	DWG.	5	6	7	8		T1	T2	25.2	26	25.65	26.39	-
	1 (0°)	5~8 17	17.22	17.19	17.17	17.15		T3	T4	13.6	13.6	13.90	13.78	-
	2 (90°)		17.16	17.13	17.16	17.14	B L A N K							
	3 (180°)		17.17	17.14	17.16	17.17								
	4 (270°)		17.21	17.23	17.18	17.17								
	LOCATION	DWG.	9	10	-	-								
	1 (0°)	9~10 15	15.11	15.20	-	-								
	2 (90°)		15.19	15.22	-	-								

☐ REVIEWED BY / ☐ WITNESSED BY

☒ REVIEWED
☒ WITNESSED
 Date / Signature:

 Germanischer Lloyd
 Industrial Services

APPROVED BY

J.S.LEE J.S. Lee Dec. 23/14

REVIEWED BY

Y.S.LIM

PREPARED BY

T.S.LEE

20. ITP-Signed Off

ISC		INSPECTION AND TEST PLAN					ASME		Doc. No.		VP-SG07-COMM-008	
PROJECT	CARMON CREEK PROJECT		P.O NO.	4511951391	EQUIPMENT	Heat Exchanger		Rev. No.	2			
ITEM NO.	E-11580		VENDOR	ILSUNG CORPORATION	COMPANY	SHELL CANADA ENERGY		SHELL MATERIAL	SA516-70N / SA240-S31803			
ITEM NAME	TREATED BITUMEN COOLERS		M.D.M.T	-45 °C / -45 °C	RT	100%		PWHT	No			
No	DESCRIPTION OF TEST / INSPECTION	Applicable Code or Specifications		Records Required	Inspection Involvement						REMARK	
		Reference	Acceptance Criteria		ISC	SHELL(TPI)						
1	Pre-Inspection Meeting				H	2/5/02	ASME					
2	Reference Documents 1) Handling and Shipping Procedure (CCK-4511951391-0100-G03-00001-000) 2) Long Term Storage, Maintenance & Preservation Procedure (CCK-4511951391-0100-G07-00001-000) 3) Quality Manual (CCK-4511951391-0100-H01-00001-000) 4) Inspection and Test Plan (CCK-4511951391-0100-H02-00001-000) 5) Weld Procedure and Qualification Records (CCK-4511951391-0100-H04-00001-000) 6) Non-destructive Examination Procedure (CCK-4511951391-0100-H05-00001-000) 7) Forming & Heat Treatment Procedure (CCK-4511951391-0100-H06-00001-000) 8) Hydrostat/Flushing/Pneumatic Test Procedure (CCK-4511951391-0100-H07-00001-000) 9) Surface Preparation & Painting Procedure (CCK-4511951391-0100-H09-00001-000) 10) Quality Control Plan (CCK-4511951391-0100-H12-00001-000) 11) PMI Procedure (CCK-4511951391-0100-L31-00001-000)				H	3/6/02	ASME					

ISC	INSPECTION AND TEST PLAN						ASME		Doc. No.	VP-SG07-COMM-008		
PROJECT	CARMON CREEK PROJECT		P.O NO.	4511951391	EQUIPMENT	Heat Exchanger		Rev. No.	2			
ITEM NO.	E-11580		VENDOR	ILSUNG CORPORATION	COMPANY	SHELL CANADA ENERGY		SHELL MATERIAL	SA516-70N / SA240-S31803			
ITEM NAME	TREATED BITUMEN COOLERS		M.D.M.T	-45 °C / -45 °C	RT	100%		PWHT	No			
No	DESCRIPTION OF TEST / INSPECTION	Applicable Code or Specifications		Records Required	Inspection Involvement						REMARK	
		Reference	Acceptance Criteria		ISC	SHELL(TPI)						
3	Welder & welding operator performance qualification test review	ASME SEC. IX DEP 30.10.60.18-Gen	ASME SEC. IX	WPQR record & certificate	H	2/5/16	7/2/17					
4	NDE Qualifications Review of NDE qualifications for UT, RT, MT and PT	ASNT SNT-TC-1A DEP 31.22.20.31-Gen	ASNT SNT-TC-1A	NDE Certificate	H	3/5/16	7/2/17					
5	Material Certificates Review (Including weld consumable) 1) Mechanical Properties 2) Chemical Composition 3) Metallurgical Properties 4) Traceable by heat 5) Heat treatment record 6) UT of all forgings 50mm or greater nominal thickness	ASME Sec. II A,C DEP 31.22.20.31-Gen	ASME Sec. II A,C & ASME Sec VIII Div.2 part 3	Mill Certificates & Material Receiving Report	H	2/5/16	7/2/17					
6	Material Inspection 1) Material Identification by Marking 2) Visual, Dimensional & Thickness Check 3) Inspection for nozzle size and rating 4) PMI	ASME Sec. II A, Inspection Test Procedure, PMI Procedure	ASME Sec. II A, Inspection Test Procedure, PMI Procedure	Mill Certificates, PMI Report	H	2/5/16	7/2/17					
Fabrication of Head												
7	Forming Inspection 1) Formed Head Inspection - Visual & Dimensional Inspection 2) MT on ID and OD of knuckle portions 3) Heat treatment after forming	ASME Sec. II A, Inspection Test Procedure & MT Procedure	Approved Drawings & ASME Sec.VIII Div.1	Dimensional Report, MT Report & Heat Treatment Chart with report	H	2/5/16	7/2/17					

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ISC	INSPECTION AND TEST PLAN						ASME		Doc. No.	VP-SG07-COMM-008			
PROJECT	CARMON CREEK PROJECT		P.O NO.	4511951391	EQUIPMENT	Heat Exchanger		Rev. No.	2				
ITEM NO.	E-11580		VENDOR	ILSUNG CORPORATION	COMPANY	SHELL CANADA ENERGY		SHELL MATERIAL	SA516-70N / SA240-S31803				
ITEM NAME	TREATED BITUMEN COOLERS		M.D.M.T	-45 °C / -45 °C	RT	100%		PWHT	No				
No	DESCRIPTION OF TEST / INSPECTION	Applicable Code or Specifications		Records Required	Inspection Involvement						REMARK		
		Reference	Acceptance Criteria		ISC	SHELL(TPI)							
Fabrication of Shell Course													
8	Edge preparation & Fit-up Inspection before Welding 1) Visual Inspection for Edge 2) Alignment, Root Face and Root Gap Check 3) Orientation of circumferential seams at fit-up 4) For sour side: MT for plate edge	Approved Drawings & WPS / PQR & Inspection Test Procedure, NDE Procedure, DEP 30.10.60.18-Gen & ISO 16812	ASME Sec.VIII Div.1 UW-31, 32, 33 & Appendix 6	MT Report	H	3/1/18	3/1/18						
9	Welding (longitudinal & circumference weld) 1) Check of Welding Rods & Consumable 2) Check of Parameter as per WPS 3) Monitoring of welding operations	Approved Drawings & ASME Sec.VIII Div.1Appendix 6 or 8 DEP 30.10.60.18-Gen	Approved Drawings & ASME Sec.VIII Div.1Appendix 6 or 8	MT or PT Report	H	3/1/18	3/1/18						
10	100% RT for cat "A & B" weld seams	Approved Drawings NDE Procedure	ASME SEC. V	RT Film, RT Report	H	3/1/18	3/1/18						
Fabrication of Nozzle (Flange to neck plate / pipe)													
11	Marking Inspection - The transfer of identification marks	Approved Drawings & Quality Control Plan	Approved Drawings & Quality Control Plan		H	3/1/18	3/1/18						

ISC	INSPECTION AND TEST PLAN						ASME		Doc. No.	VP-SG07-COMM-008			
PROJECT	CARMON CREEK PROJECT			P.O NO.	4511951391	EQUIPMENT	Heat Exchanger			Rev. No.	2		
ITEM NO.	E-11580			VENDOR	ILSUNG CORPORATION	COMPANY	SHELL CANADA ENERGY			SHELL MATERIAL	SA516-70N / SA240-S31803		
ITEM NAME	TREATED BITUMEN COOLERS			M.D.M.T	-45 °C / -45 °C	RT	100%			PWHT	No		
No	DESCRIPTION OF TEST / INSPECTION	Applicable Code or Specifications		Records Required	Inspection Involvement								REMARK
		Reference	Acceptance Criteria		ISC	SHELL(TPI)							
12	Fit-up Inspection - Missalinent, root gap check	Approved Drawings, Quality Control Plan, ASME Sec. VIII Div.1 DEP 30.10.60.18-Gen	Approved Drawings& Quality Control Plan		H								
13	Weld for flange to neck plate or pipe	Approved Drawings, Inspection Test Procedure & ASME Sec.VIII Div.1Appendix 6 or 8 DEP 30.10.60.18-Gen	Approved Drawings, Inspection Test Procedure & ASME Sec.VIII Div.1Appendix 6or8	MT or PT Report	H								
14	100% RT for cat "C" weld seams	Approved Drawings NDE Procedure	ASME SEC. V	RT Film, RT Report	H								
	Nozzle assembly to Shell / Head												
15	Nozzle Marking Inspection before Cutting - Layout marking inspection for nozzle openings on shell and head	Approved Drawings& Quality Control Plan	Approved Drawings& Quality Control Plan		H								
16	Edge preparation & Fit-up Inspection before Welding 1) Visual Inspection for Edge 2) Alignment, Root Face and Root Gap Check 3) Inspection for nozzle size and rating 4) Flatness check of peripheral gasket contact surface 5) For sour side: MT for plate edge	Approved Drawings, Quality Control Plan, NDE Procedure, DEP 30.10.60.18-Gen & ISO 16812	Approved Drawings& Quality Control Plan, ASME Sec.VIII Div Appendix 6 & ISO 16812 Table 3	MT Report	H								
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ISC	INSPECTION AND TEST PLAN						ASME		Doc. No.	VP-SG07-COMM-008			
PROJECT	CARMON CREEK PROJECT		P.O NO.	4511951391	EQUIPMENT	Heat Exchanger		Rev. No.		2			
ITEM NO.	E-11580		VENDOR	ILSUNG CORPORATION	COMPANY	SHELL CANADA ENERGY		SHELL MATERIAL		SA516-70N / SA240-S31803			
ITEM NAME	TREATED BITUMEN COOLERS		M.D.M.T	-45 °C / -45 °C	RT	100%		PWHT		No			
No	DESCRIPTION OF TEST / INSPECTION	Applicable Code or Specifications		Records Required	Inspection Involvement								REMARK
		Reference	Acceptance Criteria		ISC	SHELL(TPI)							
17	Welding for shell to nozzle seams 1) Check of Welding Rods & Consumable 2) Check of Parameter as per WPS 3) Monitoring of welding operations 4) 100% UT for cat "D" weld seams (SNT-TC-1A certified operator) 5) 5% UT cross check - "H" point	Approved Drawings & ASME Sec.VIII Div.1 Appendix 6 or 8 30.10.60.18-Gen	Approved Drawings & ASME Sec.VIII Div.1 Appendix 6 or 8		H	3/11/14	3/11/14						
Fabrication of Tube Bundle													
18	Tube sheet, baffle & holes dimensions 1) Check for baffle and tube sheet holed diameters 2) Baffle diameter	Approved Drawings & DEP 31.21.01.30-Gen	Approved Drawings, Quality Control Plan & Heat Exchanger Fabrication Tolerance		H	3/11/14	3/11/14						
19	Visual and Dimension Check for bundle	Approved Drawings & DEP 31.21.01.30-Gen	Approved Drawings, Quality Control Plan & Heat Exchanger Fabrication Tolerance	Dimension report	H	3/11/14	3/11/14						
20	Tube to tubesheet welding	Approved Drawings, Quality Control Plan, DEP 30.10.60.18-Gen & DEP 31.21.01.30-Gen	Approved Drawings & Quality Control Plan		H	3/11/14	3/11/14						
21	Leak test for tube to tubesheet 50~100 kPa	Approved Drawings & ISO16812	Approved Drawings & ISO16812	Leak test report	H	3/11/14	3/11/14						

ISC	INSPECTION AND TEST PLAN						ASME		Doc. No.	VP-SG07-COMM-008		
PROJECT	CARMON CREEK PROJECT		P.O NO.	4511951391	EQUIPMENT	Heat Exchanger		Rev. No.	2			
ITEM NO.	E-11580		VENDOR	ILSUNG CORPORATION	COMPANY	SHELL CANADA ENERGY		SHELL MATERIAL	SA516-70N / SA240-S31803			
ITEM NAME	TREATED BITUMEN COOLERS		M.D.M.T	-45 °C / -45 °C	RT	100%		PWHT	No			
No	DESCRIPTION OF TEST / INSPECTION	Applicable Code or Specifications		Records Required	Inspection Involvement						REMARK	
		Reference	Acceptance Criteria		ISC	SHELL(TPI)						
22	Tube to tubesheet expanding 1) Check for tube expanding ratio	Approved Drawings, Quality Control Plan, ISO 16812 & DEP 31.21.01.30	Approved Drawings, Quality Control Plan ISO 16812 & DEP 31.21.01.30 Table 4	Expanding report	H	3/16/20	SW					
23	PT for tube to tubesheet welds	Approved Drawings, Quality Control Plan & NDE Procedure & DEP 31.21.01.30-Gen	Approved Drawings & Quality Control Plan	PT report	H	3/16/20	SW					
Final Testing and Inspection												
24	Air Leak Test for Reinforcing Pad 1) 150 kPa (25 psi)	Approved Drawings, Quality Control Plan & DEP 31.22.20.31-Gen	No Leakage	Air leak test Report	H	3/16/20	SW					
25	Final & Visual & Dimensional Inspection 1) Overall Dimension, Roundness and straightness 2) Visual inspection for all welds, including internal and external attachments 3) orientations, projections, elevations, sizes and ratings of nozzle 4) Wall thickness of shell, heads and nozzle necks 5) 100% WFMT inspection of internal welds 6) 100% MT inspection of external welds 7) UT for all lifting point full penetration welds 8) Pull through mock-up for bundle	Approved Drawings, Quality Control Plan, NDE Procedure, DEP 31.21.01.31-Gen & ISO16812	Approved Drawings & Quality Control Plan & Heat Exchanger Fabrication Tolerance, ASME Sec.VIII Div.1 Appendix 6 & 12, DEP 31.21.01.31-Gen & ISO16812	Dimensional Report (As per Final drawing) MT and UT Report	H	3/16/20	SW					

ISC	INSPECTION AND TEST PLAN					ASME		Doc. No.	VP-SG07-COMM-008			
PROJECT	CARMON CREEK PROJECT		P.O NO.	4511951391	EQUIPMENT	Heat Exchanger		Rev. No.	2			
ITEM NO.	E-11580		VENDOR	ILSUNG CORPORATION	COMPANY	SHELL CANADA ENERGY		SHELL MATERIAL	SA516-70N / SA240-S31803			
ITEM NAME	TREATED BITUMEN COOLERS		M.D.M.T	-45 °C / -45 °C	RT	100%		PWHT	No			
No	DESCRIPTION OF TEST / INSPECTION	Applicable Code or Specifications		Records Required	Inspection Involvement						REMARK	
		Reference	Acceptance Criteria		ISC	SHELL(TPI)						
26	MT on temporary attachment areas	ASME SEC. VIII DIV.1 & ASME Sec.VIII Div.1Appendix 6 NDE Procedure	ASME SEC. VIII DIV.1 & ASME Sec.VIII Div.1Appendix 6	MT Report	H	2/6/22	7/7/22					
27	Hardness test	Quality Control Plan & DEP 31.22.20.31-Gen	Quality Control Plan & DEP 30.10.02.15-Gen	Hardness test report	H	2/6/22	7/7/22					
28	Hydrostatic Test 1) Water analysis certificate 2) Calibration of pressure gauges 3) Metal temperature 4) Test pressure and holding time 5) Bundle insertion	Approved Drawings, Hydro test procedure DEP 74.00.10.10-Gen	No leakage (ASME Sec. VIII Div.1 UG-99)	Pressure Test Report & Chart	H	2/6/22	7/7/22					
29	Check of Drain Out 1) Inspection for cleanliness after draining and drying 2) For sour side: After the hydrostatic test, MT shall be performed on all external pressure-retaining welds and all internal nozzle welds that are accessible without disassembling the heat exchanger.	Approved Drawings, Hydro test procedure, ISO 16812, DEP 31.21.01.21-Gen & DEP 74.00.10.10-Gen	Approved Drawings & Hydro test procedure	MT Report	H	2/6/22	7/7/22					
30	MT after hydro test	ISO 16812 & NDE Procedure	ISO 16812 & NDE Procedure	MT Report	H	2/6/22	7/7/22					
31	As built wall thickness measurements	DEP 31.22.20.31-Gen 6.4.1.8	DEP 31.22.20.31-Gen 6.4.1.8	Thickness Measurement Report	H	2/6/22	7/7/22					

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■ LEGEND ► H : Hold Point, W : Witness Point, SW : Spot Witness, R : Review

ISC	INSPECTION AND TEST PLAN ASME						Doc. No.	VP-SG07-COMM-008			
PROJECT	CARMON CREEK PROJECT	P.O NO.	4511951391	EQUIPMENT	Heat Exchanger	Rev. No.	2				
ITEM NO.	E-11580	VENDOR	ILSUNG CORPORATION	COMPANY	SHELL CANADA ENERGY	SHELL MATERIAL	SA516-70N / SA240-S31803				
ITEM NAME	TREATED BITUMEN COOLERS	M.D.M.T	-45 °C / -45 °C	RT	100%	PWHT	No				
No	DESCRIPTION OF TEST / INSPECTION	Applicable Code or Specifications		Records Required	Inspection Involvement						REMARK
		Reference	Acceptance Criteria		ISC	SHELL(TPI)					
32	Blast & Paint Inspection 1) Cleanliness and dryness inspection	Approved Painting Procedure	Approved Painting Procedure	Painting Report	H	<i>3/1/12</i>	<i>ART</i>				
33	Bolt Tightening	Approved Bolt Tightening Procedure	Approved Bolt Tightening Procedure	Bolt Tightening Report	H	<i>3/1/12</i>	<i>ART</i>				
34	Packing & Shipping Preparation Inspection	Approved Packing Procedure	Approved Packing Procedure		H	<i>3/1/12</i>	<i>ART</i>				
35	Name Plate Stamping 1) ASME name plate with ASME code stamp and CRN 2) Customer name plate	Approved Drawings	Approved Drawings	Name plate rubbing sheet	H	<i>3/1/12</i>	<i>ART</i>				
36	MDB Review			MDB	H	<i>3/1/12</i>	<i>ART</i>				
37	Inspection Release			Inspection Release Note	H	<i>3/1/12</i>	<i>ART</i>				

21. Preservation Records

INSPECTION FOR PRESERVATION RECORD

W/O NO.	P-13SG-007	CUSTOMER	SHELL CANADA ENERGY
PJT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.6
ITEM NO.	E-11580	P.O NO.	4511951391

a. MONITORING

- 1) appearance of equipments and boxes.
- 2) state of the paints and lubricants on machined surfaces.
- 3) packing condition of the nozzle opening and flange openings.
- 4) condition of equipments and boxes are described speical shipping marks.
- 5) pressure of the nitrogen gas charging.

section	Date	Required 1.	Required 2.	Required 3.	Required 4.	Required 5.	Remark
1th	2015.01.02	Good	Good	Good	Good	Good	
2th	2015.01.09	Good	Good	Good	Good	Good	
3th	2015.01.16	Good	Good	Good	Good	Good	
4th	2015.01.23	Good	Good	Good	Good	Good	
5th	2015.01.30	Good	Good	Good	Good	Good	
6th	2015.02.06	Good	Good	Good	Good	Good	

b. Check the pressure of N2 gas (Kpa.g)

section	Date	Required	Act's(CHANNEL)	Act's(SHELL)	Result
1th	2015.01.02	35	50	50	Accept
2th	2015.01.09	35	50	50	Accept
3th	2015.01.16	35	50	50	Accept
4th	2015.01.23	35	50	50	Accept
5th	2015.01.30	35	50	50	Accept
6th	2015.02.06	35	50	50	Accept

c. N2 charging Check the location nozzles.: T1, S2

REMARK;

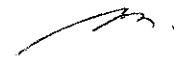
monitoring & nitrogen gas charging inspection : satisfaction

* OWNER / INSPECTOR

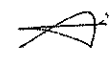
APPROVED BY

J.S.LEE 

REVIEWED BY

S.S.LEE 

PREPARED BY

Y.S.LIM 

INSPECTION FOR PRESERVATION RECORD

W/O NO.	P-13SG-007	CUSTOMER	SHELL CANADA ENERGY
PJT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.6
ITEM NO.	E-11580	P.O NO.	4511951391

a. MONITORING

- 1) appearance of equipments and boxes.
- 2) state of the paints and lubricants on machined surfaces.
- 3) packing condition of the nozzle opening and flange openings.
- 4) condition of equipments and boxes are described speical shipping marks.
- 5) pressure of the nitrogen gas charging.

section	Date	Required 1.	Required 2.	Required 3.	Required 4.	Required 5.	Remark
7th	2015.02.13	Good	Good	Good	Good	Good	
8th	2015.02.20	Good	Good	Good	Good	Good	
9th	2015.02.27	Good	Good	Good	Good	Good	
10th	2015.03.06	Good	Good	Good	Good	Good	
11th	2015.03.13	Good	Good	Good	Good	Good	
12th	2015.03.20	Good	Good	Good	Good	Good	

b. Check the pressure of N2 gas (Kpa.g)

section	Date	Required	Act's(CHANNEL)	Act's(SHELL)	Result
7th	2015.02.13	35	50	50	Accept
8th	2015.02.20	35	50	50	Accept
9th	2015.02.27	35	50	50	Accept
10th	2015.03.06	35	50	50	Accept
11th	2015.03.13	35	50	50	Accept
12th	2015.03.20	35	50	50	Accept

c. N2 charging Check the location nozzles.: T1, S2

REMARK;

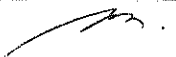
monitoring & nitrogen gas charging inspection : satisfaction

* OWNER / INSPECTOR

APPROVED BY

J.S.LEE 

REVIEWED BY

S.S.LEE 

PREPARED BY

Y.S.LIM 

INSPECTION FOR PRESERVATION RECORD

W/O NO.	P-13SG-007	CUSTOMER	SHELL CANADA ENERGY
PJT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.6
ITEM NO.	E-11580	P.O NO.	4511951391

a. MONITORING

- 1) appearance of equipments and boxes.
- 2) state of the paints and lubricants on machined surfaces.
- 3) packing condition of the nozzle opening and flange openings.
- 4) condition of equipments and boxes are described speical shipping marks.
- 5) pressure of the nitrogen gas charging.

section	Date	Required 1.	Required 2.	Required 3.	Required 4.	Required 5.	Remark
13th	2015.03.27	Good	Good	Good	Good	Good	
14th	2015.04.03	Good	Good	Good	Good	Good	
15th	2015.04.10	Good	Good	Good	Good	Good	
16th	2015.04.17	Good	Good	Good	Good	Good	
17th	2015.04.24	Good	Good	Good	Good	Good	
18th	2015.05.01	Good	Good	Good	Good	Good	

b. Check the pressure of N2 gas (Kpa.g)

section	Date	Required	Act`s(CHANNEL)	Act`s(SHELL)	Result
13th	2015.03.27	35	50	50	Accept
14th	2015.04.03	35	50	50	Accept
15th	2015.04.10	35	50	50	Accept
16th	2015.04.17	35	50	50	Accept
17th	2015.04.24	35	50	50	Accept
18th	2015.05.01	35	50	50	Accept

c. N2 charging Check the location nozzles.: T1, S2

REMARK;

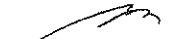
monitoring & nitrogen gas charging inspection : satisfaction

* OWNER / INSPECTOR

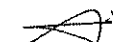
APPROVED BY

J.S.LEE 

REVIEWED BY

S.S.LEE 

PREPARED BY

Y.S.LIM 

INSPECTION FOR PRESERVATION RECORD

W/O NO.	P-13SG-007	CUSTOMER	SHELL CANADA ENERGY
PJT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.6
ITEM NO.	E-11580	P.O NO.	4511951391

a. MONITORING

- 1) appearance of equipments and boxes.
- 2) state of the paints and lubricants on machined surfaces.
- 3) packing condition of the nozzle opening and flange openings.
- 4) condition of equipments and boxes are described speical shipping marks.
- 5) pressure of the nitrogen gas charging.

section	Date	Required 1.	Required 2.	Required 3.	Required 4.	Required 5.	Remark
19th	2015.05.08	Good	Good	Good	Good	Good	
20th	2015.05.15	Good	Good	Good	Good	Good	
21th	2015.05.22	Good	Good	Good	Good	Good	
22th	2015.05.29	Good	Good	Good	Good	Good	
23th	2015.06.05	Good	Good	Good	Good	Good	
24th	2015.06.12	Good	Good	Good	Good	Good	

b. Check the pressure of N2 gas (Kpa.g)

section	Date	Required	Act's(CHANNEL)	Act's(SHELL)	Result
19th	2015.05.08	35	50	50	Accept
20th	2015.05.15	35	50	50	Accept
21th	2015.05.22	35	50	50	Accept
22th	2015.05.29	35	50	50	Accept
23th	2015.06.05	35	50	50	Accept
24th	2015.06.12	35	50	50	Accept

c. N2 charging Check the location nozzles.: T1, S2

REMARK;

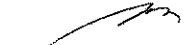
monitoring & nitrogen gas charging inspection : satisfaction

* OWNER / INSPECTOR

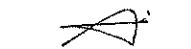
APPROVED BY

J.S.LEE 

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PREPARED BY

Y.S.LIM 

INSPECTION FOR PRESERVATION RECORD

W/O NO.	P-13SG-007	CUSTOMER	SHELL CANADA ENERGY
PJT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.6
ITEM NO.	E-11580	P.O NO.	4511951391

a. MONITORING

- 1) appearance of equipments and boxes.
- 2) state of the paints and lubricants on machined surfaces.
- 3) packing condition of the nozzle opening and flange openings.
- 4) condition of equipments and boxes are described speical shipping marks.
- 5) pressure of the nitrogen gas charging.

section	Date	Required 1.	Required 2.	Required 3.	Required 4.	Required 5.	Remark
25th	2015.06.19	Good	Good	Good	Good	Good	
26th	2015.06.26	Good	Good	Good	Good	Good	
27th	2015.07.03	Good	Good	Good	Good	Good	
28th	2015.07.10	Good	Good	Good	Good	Good	
29th	2015.07.17	Good	Good	Good	Good	Good	
30th	2015.07.24	Good	Good	Good	Good	Good	

b. Check the pressure of N2 gas (Kpa.g)

section	Date	Required	Act's(CHANNEL)	Act's(SHELL)	Result
25th	2015.06.19	35	50	50	Accept
26th	2015.06.26	35	50	50	Accept
27th	2015.07.03	35	50	50	Accept
28th	2015.07.10	35	50	50	Accept
29th	2015.07.17	35	50	50	Accept
30th	2015.07.24	35	50	50	Accept

c. N2 charging Check the location nozzles.: T1, S2

REMARK;

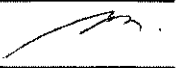
monitoring & nitrogen gas charging inspection : satisfaction

* OWNER / INSPECTOR

APPROVED BY

J.S.LEE 

REVIEWED BY

S.S.LEE 

PREPARED BY

Y.S.LIM 

INSPECTION FOR PRESERVATION RECORD

W/O NO.	P-13SG-007	CUSTOMER	SHELL CANADA ENERGY
PJT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.6
ITEM NO.	E-11580	P.O NO.	4511951391

a. MONITORING

- 1) appearance of equipments and boxes.
- 2) state of the paints and lubricants on machined surfaces.
- 3) packing condition of the nozzle opening and flange openings.
- 4) condition of equipments and boxes are described speical shipping marks.
- 5) pressure of the nitrogen gas charging.

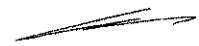
section	Date	Required 1.	Required 2.	Required 3.	Required 4.	Required 5.	Remark
31th	2015.07.31	Good	Good	Good	Good	Good	
32th	2015.08.07	Good	Good	Good	Good	Good	

b. Check the pressure of N2 gas (Kpa.g)

section	Date	Required	Act's(CHANNEL)	Act's(SHELL)	Result
31th	2015.07.31	35	50	50	Accept
32th	2015.08.07	35	50	50	Accept

c. N2 charging Check the location nozzles.: T1, S2**REMARK;**

monitoring & nitrogen gas charging inspection : satisfaction

*** OWNER / INSPECTOR****APPROVED BY****J.S.LEE** **REVIEWED BY****S.S.LEE** **PREPARED BY****Y.S.LIM** 