

SECTION 2

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Purchase Order	4511951391
Serial No.	
Tag No.	E-11570

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1. Manufacturer's Data Report

FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS

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

1. Manufactured and certified by Ilseung Coporation #74 Daejeong-Ro, Onsan-Eub, Ulju-Gun, Ulsan 689-892, Republic Korea.
(Name and address of Manufacturer)

2. Manufactured for SHELL CANADA ENERGY 400 4AVE. S.W., BOX 100, STATION M, CALGARY, ALBERTA T2P 0J4
(Name and address of Purchaser)

3. Location of installation CARMON CREEK EXPANSION IN PEACE RIVER COMPLEX, ALBERTA, CANADA
(Name and address)

4. Type Horizontal Heat Exchanger 14-HE-080
(Horizontal, vertical, or sphere) (Tank, separator, jkt. vessel, heat exch., etc.) (Manufacturer's serial number)

W7852.2 VP-SG07-E11570-001 Rev.9 2064 2014
(CRN) (Drawing number) (National Board number) (Year built)

5. ASME Code, Section VIII, Div. 1 2010 ED, 2011 ADD (July.01,2011) N/A N/A
(Edition and Addenda, if applicable (date)) (Code Case number) [Special service per UG-120(d)]

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

6. Shell: (a) Number of course(s) 3 (b) Overall length 6536mm

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
2	I.D 1150mm	2200mm	SA516-70(*1)	17mm	1.5mm	1	Full	1.0	1	Full	1.0	-	-
1	I.D 1150mm	2136mm	SA516-70(*1)	17mm	1.5mm	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
(BLANK)												

7. Heads: (a) - (b) -
(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		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
(a)	(BLANK)													
(b)														

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)												

8. Type of jacket N/A Jacket closure N/A
(Describe as ogee and weld, bar, etc.)

If bar, give dimensions N/A If bolted, describe or sketch.

9. MAWP 3639kPa F.V at max. temp. 110°C 110°C Min. design metal temp. -45°C at 3639kPa
(Internal) (External) (Internal) (External)

10. Impact test YES(SHELL-A02) at test temperature of -45°C
(Indicate yes or no and the component(s) impact tested)

11. Hydro., ~~proof, or comp.~~ test pressure 5600kPa Proof test -

Items 12 and 13 to be completed for tube sections.

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))

[Floating (material spec. no.)] (Diameter) (Nominal thickness) (Corr. allow.) (Attachment)

13. Tubes SA789-S31803 19.05mm 1.63mm 1952 Straight
(Material spec. no., grade or type) (O.D.) (Nominal thickness) (Number) (Type (Straight or U))

National Board Number: 2064

Mfr. Representative: N. G. H. Date: APR. 17, 2015

Authorized Inspector: [Signature] Date: APR. 18, 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		
		Min.	Corr.	Crown	Knuckle					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 (Internal) F.V. at max. temp. 110°C (Internal) 110°C (External) Min. design metal temp. -45°C at 965 kPa

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~~, or ~~bomb~~ 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 fig.	SA333-6	(+3)	15.09mm	3.0mm	SA516-70(+1)	(+4)	(+1)	-
SHELL SIDE OUTLET	1	DN 150	Cl. 300 fig.	SA333-6	(+3)	15.09mm	3.0mm	SA516-70(+1)	(+4)	(+1)	-
TUBE SIDE INLET	1	DN 600	Cl. 150 fig.	(+6)	(+6)	25.2mm	0.0mm	INHERENT	(+4)	(+5)	-
TUBE SIDE OUTLET	1	DN 500	Cl. 150 fig.	(+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 (Yes or no) Lugs N/A (Number) Legs N/A (Number) Others SADDLES (Describe) Attached WELDED TO SHELL (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/A

22. 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"-11UNCx95L, 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: 2064
 Mfr. Representative: S. S. Jang Date: APR 17/2015
 Authorized Inspector: [Signature] Date: APR 18, 2015
PAGE 3**FORM U-1 (Cont'd)****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 _____

of _____, 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))

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

1. Manufactured and certified by _____ (Name and address of Manufacturer)		
2. Manufactured for _____ (Name and address of Purchaser)		
3. Location of installation _____ (Name and address)		
4. Type _____ (Horizontal, vertical, or sphere)	_____ 14-HE-080 _____ (Manufacturer's serial number)	_____ W7852.2 _____ (CRN)
VP-SG07-E11570-001 Rev.9 (Drawing number)	2064 (National Board number)	2014 (Year built)

[illegible][illegible]

Certificate of Authorization: Type Straight No. 32,997 Expires DEC. 04, 2016

Date APR. 17/2015 Name ILSUNG CORPORATION. Signed [Signature]
(Representative)

Date APR. 18, 2015 Name S.JANG Commissions NB#14412(A,N)
(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-SG007-073
PROJECT NAME : CARMON CREEK PROJECT
CUSTOMER : SHELL CANADA ENERGY
P.O NO. : 4511951391
EQUIPMENT NAME : VRU INLET GAS COOLER
EQUIPMENT NO. : E-11570
SERIAL NO. : 14-HE-080

**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.**



the pressure equipment safety authority

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.



the pressure equipment safety authority

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,

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>[Signature]</i>
Germanischer Lloyd
Industrial Services

Olsung	☒ Reviewed by
ISC	☒ 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

FIO : 4511951391

☒ REVIEWED
☒ WITNESSED
Date / Signature: <i>J. S. Lee</i>
Germanischer Lloyd
Industrial Services

ISC	Reviewed by
QA DEPT.	Witessed by
DATE Dec 31. 2014	J. S. LEE

Package No.	Q'ty	ITEM No.	Package Style	N/W	G/W	G/W	CBM	Dimension (cm)				REMARKS
				Kg	Kg	LBS	m'	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

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QA DEPT.	J. S. LEE
DATE	Dec. 31. 2014

DETAILED PACKING LIST

PJT NAME : Carmon Creek - Phase 1 & 2

F NO. : 4511951391

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

DETAILED PACKING LIST

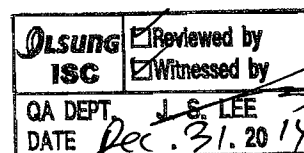
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DATE	Dec 31, 2014
Measurement [L x W x H (cm)]	

Number Of Package & (Packing Style)	Description Of Goods	Quantity	Net- Weight (KG)	Gross- Weight (KG)	CBM (M ³)	[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

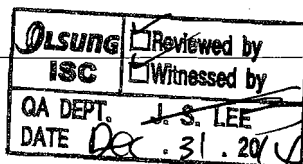


DETAILED PACKING LIST

PJT NAME : Carmon Creek - Phase 1 & 2

F 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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DATE	31.2014

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				

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

ILSUNG
 ISC
 QA DEPT
 DATE *Dec. 31. 2014*
 Renewed by
 Witnessed by
J. S. LEE

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	
		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-20200/E-20210	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-11570	SQ. Washer	SA-283-C			16 EA	
		t16 * 70 * 70				
E-11580	SQ. Washer	SA-283-C			16 EA	
		t16 * 70 * 70				

☒ 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

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 [14.5] - FILLER : GRAPHITE - HOOP : 304 S.S - INNER RING : 304 S.S - OUTER RING : C.S					

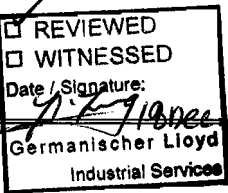
ILSUNG ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT	J. S. LEE
DATE	Dec. 31. 2014

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

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

N/A

5. Material Certificates With Tabulation of Materials

		TABULATION OF MATERIAL				PAGE NO.	1 OF 2	
						TM NO.	TM-SG007-E-11570-001	
						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-11570		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	PP54201807 PP54201806 PP54201804	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	TB9492/TB8825	65-70
		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				APPROVED BY		J.S.LEE <i>J.S. Lee</i> Dec. 18/14		
☒ REVIEWED ☐ WITNESSED Date / Signature: <i>J.S. Lee</i> 				REVIEWED BY		Y. S. LIM <i>Y.S. Lim</i>		
				PREPARED BY		T.S. LEE <i>T.S. Lee</i>		

ISQ-025-1-0

ILSUNG CORPORATION

ILSUNG CORPORATION

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

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	PP54201807	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. ***												CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5													
*** 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 ===													
E-11570 (002-H) : SHELL (A-02)																									
												OLsung ISC ☒ Reviewed by ☒ Witnessed by QA DEPT. G. T. PYO DATE Jul. 11 . 2014 ☒ Reviewed ☐ Witnessed 14412 HSB GS 9/27/14 ☐ REVIEWED ☒ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services													

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

☒ Reviewed
☐ Witnessed

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

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 :

36/309

Lee, Yong-Heon

Order No./계약번호 : 01S1098757

PO No./주문번호 : 01S1098757

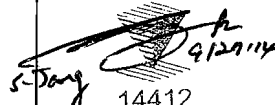
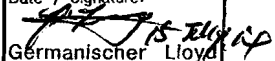
Supplier : ILSUNG CO., LTD.
 /주문자

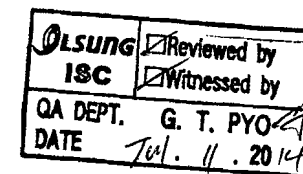
Commodity : PLATE
 /품명

Customer : ILSUNG CO., LTD.
 /고객사

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



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	PP54201806	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)																								
=== Last Item ===																											
E-11570 (002-1): SHELL (A-03) (05-4): Reinf. Pad (S/D PAD) (06-7): Reinf. PAD (S/S2 Reinf. PAD) ☒ Reviewed ☐ Witnessed  14412 HSB GS 9/27/14 OLSUNG ISC ☒ Reviewed by ☒ Witnessed by QA DEPT. G. T. PYO DATE Jul. 11. 2014 ☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services																											



☒ Reviewed
☐ Witnessed

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 :

37/309

Lee, Yong-Heon

Order No./계약번호 : 01S1098757

PO No./주문번호 : 01S1098757

Supplier : ILSUNG CO., LTD.
/주문자

Commodity : PLATE
/품명

Customer : ILSUNG CO., LTD.
/고객사

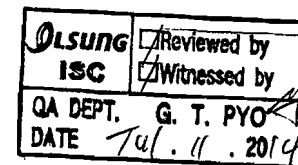
Spec & Type : SA516-70 10ED 11AD TYPE 3.1 NACE MR0175/ISO15156
/규격



Product No. /제품번호	Division	Sol-AI	CEQ	
PP54201806	L P	0.029 0.031	0.397 0.382	
*** 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 :

38/309

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
규격



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/화학적분 (%)													
						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	PP54201804	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. ***												CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5													
*** 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													
*** Lot Total ***												* Holding Time : 090Min													
*** Grade Total ***												* Cooling Rate : 150 ~ 170°C / h At Above 400°C													
*** Grand Total ***												LOT No. ==== SG07-08-021													
E-11570 (002-1) : CHELL (A-04)												=== Last Item ===													
Sung												Reviewed Witnessed 9/27/14 14412 HSB GS Qlsung ISC Reviewed by Witnessed by QA DEPT. G. T. PYO DATE Jul. 11 . 2014 REVIEWED WITNESSED Date / Signature: Germanischer Lloyd Industrial Services													

ILSUNG
ISC

Reviewed by
Witnessed by

QA DEPT. G. T. PYO

DATE Jul. 11. 2014

☒ Reviewed
☐ Witnessed

9/27/14

14412
HSB GS

☒ 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 :

39/309

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	
PP54201804	L	0.029	0.397	
	P	0.031	0.382	
*** 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 ===

ILSUNG ISC	☐ Reviewed by
	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	Jul. 11. 20 14

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

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 :

40/309

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 14/12	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 - GELIEFERTEN 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

Spécification - Specification - Spezifikation

- PD5500:2003 ENQUIRY CASE 87/
/SHELL SPECIFICATION MESC SPE 76/222

- PED 97/23/CE

NORSOK D45 REV 5 -
QTR NORSOK M650 N°001 REV 1

010511

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 Z	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflös nr.	Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflös 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

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

☒ Reviewed
☐ Witnessed

S. Sparty
14412
HSB GS
9/19/2014

☒ 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.



Dipl. Ing. B. Sparty



STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Milli 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 Rev 00 Document number Bescheinigungsnummer 2014-106953 14/12		Page 002 Sheet / Seite 021	 ArcelorMittal
Client - Purchaser - Besteller					
Référence client - Purchase order - Kaufauftrag ST-3478/CF7539					
Projet - Project - Projekt					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
Industeel Belgium Site : Rue de Châtelet 266 6030 Marchienne-au-Pont					
Produit - Product - Erzeugnis					Plate(s)
Commande / Poste - Internal order - Werksbestellung					1059069 / 000050
Bordereau de livraison - Delivery note - Lieferungsdocument					80256920 80257010

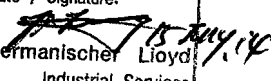
#020 - ANALYSE CHIMIQUE DE COULEE - LADLE CHEMICAL COMPOSITION - SCHMELZE CHEMISCHE ZUSAMMENSETZUNG									
	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
	%	%	%	%	%	%	%	%	%
Min.							4.500	22.000	3.000
49031	0.016	1.854	0.0234	0.0003	0.279	0.146	5.136	22.792	3.001
Max.	0.030	2.000	0.0250	0.0050	1.000	0.750	6.500	23.000	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	PMI Conform
--	-------------

Non confusion de matière - Positive material identification -
 Résultat du contrôle - Examination result - Prüfergebnis

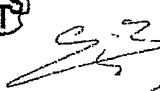
Conforme aux spécifications précitées - Conforming to above specifications - Entspricht der vorgenannten Vorschriften

OLSONG	☒ 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 Bestellungsvorschriften entsprechen.

 Dipl. Ing. B. Sparty	 SGS TÜV SAAR Technische Überwachung	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 14712		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 MECANQUES - 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								HB10 Ind	HB10 Ind	HB10 Ind	HB10 Aver							
Brinell HB - Brinell HB																		
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	Brinell	Brinell	Brinell	Brinell							
							Min											
							Max	293	293	293	293							
540338.5001	000	T3/4	PSS	20	°C			208	209	205	207							

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

Traction Tensile test - Zugversuch								Rp 0,2%	Rm	A Lo=50	A Lo=5,65V So								
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa	MPa	%	%								
							Min	480	680	30	30								
							Max		840										
540338.5001	000	T3/4	1/2SL	20	°C			566	744	37	33								

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

Traction								Rp 0,2%	Rm	A Lo=50	A Lo=5,65V So								
Tensile test - Zugversuch																			
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa	MPa	%	%								
							Min	480	680	25	25								
							Max		840										
540338.5001	000	T3/4	1/2ST	20	°C			568	747	37	33								


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

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

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☒ 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 Bescheinigungsnr 2014-106953 14/12		Page 004 Sheet 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				LatEx Ind				%Sh.area 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	%	%	%	%	Ave	Ave
							Min	75	75	75	90	0.380	0.380	0.380	0.380	50	50	50	50		
							Max														
540338.5001	000	T3/4	1/2SL	-50	°C			185	182	166	178	1.900	1.800	1.900	1.867	85	85	85	85		

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm										Energy Ind				LatEx Ind				%Sh.area 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	%	%	%	%	Ave	Ave
							Min	75	75	75	90	0.380	0.380	0.380	0.380	50	50	50	50		
							Max														
540338.5001	000	T3/4	1/2ST	-50	°C			156	163	140	153	1.600	1.800	1.500	1.633	70	75	70	71.667		

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm										Energy Ind				LatEx Ind				%Sh.area 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	%	%	%	%	Ave	Ave
							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	85	85	85	85		

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm										Energy Ind				LatEx Ind				%Sh.area 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	%	%	%	%	Ave	Ave
							Min	75	75	75	90	0.380	0.380	0.380	0.380	50	50	50	50		
							Max														
540338.5001	000	T3/4	1/4SL	-50	°C			185	177	167	176	1.900	1.900	1.900	1.900	85	85	85	85		

OLSONG	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 Bestellvorgeschritten entsprechen.

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



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

Dipl. Ing. B. Sparty

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		

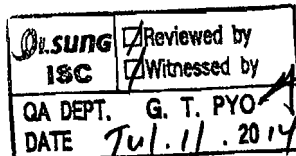
RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

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

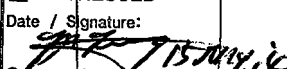
Loc	3/4	Trois-Quart - 3/4 Width - 3/4 Breite
Loc	T	Tête - Top - Kopf
Epr. Epaisseur	1/2	Mi épaisseur - 1/2 Thickness - 1/2 Dicke
Epr. Epaisseur	1/4	Quart épaisseur - 1/4 Thickness - 1/4 Dicke
Epr. Epaisseur	P	Peau - Rolled Surface - Walzfläche
Epr. Face	S	Supérieure - Upper face - obere
Epr. Sens	L	Long - 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
Epr.Ep./Face/Sens	PST	Peau - Rolled Surface - Walzfläche / Supérieure - Upper face - obere / 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 Bestellvorgeschritten entsprechen.

☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Service	Dipl. Ing. B. Sparty	 STEPHANIE WALLEMACQ 17/03/2014 Gestionnaire Commande Mill inspector Werksbeauftragte
---	----------------------	--

6/21

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004		Numéro de document 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 - Lieferungsdokument		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 - Grössenvergrößerung - 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 %

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

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☒ REVIEWED
☒ WITNESSED
Date / Signature:
<i>[Signature]</i>
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		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		

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

CORROSION - CORROSION - KORROSION

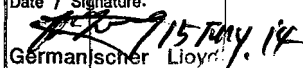
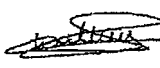
923A																			
ASTM A923 A - ASTM A923 A																			
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac													
540338.5001	000	T3/4	SSS	20	°C														
Standard		ASTM A923A																	
Microstructure		Unaffected Structure																	
Test result		Compliant with Standards																	
N°	Location - Localisation - Lage	Picture - Image - Bild												Magnification - Größenschein - 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

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 Bestimmungsvorschriften entsprechen.

☒ REVIEWED ☒ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Service	 Dipl. Ing. B. Sparty	STEPHANIE WALLEMACQ 17/03/2014 Gestionnaire Commande Mill Inspector Werksbeauftragte 
---	--	---

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

Sensibilisé - Sensitized - Sensibilisiert

EN ISO 3651-2 C

Test description - Prüfbeschreibung

Test result	Satisfactory as per specification
-------------	-----------------------------------

Sensibilisē - Sensitized -Sensibilisiert

EN ISO 3651-2 A

Test description - Prüfbeschreibung

Test result	Compliant with Standards
-------------	--------------------------

CORROSION PROFILES ASTM G48A-NORSOK

Test 1°

Standard ASTM G48A - Norsok D45

Microstructure

No Pitting

Specimen surface preparation

1 20-grit polishing

End grain attack interest

no

Test result

Compliant with Standards

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

Specimen sizes – Dimensions de l'échantillon – Probengrösse

Total area - Surface de l'échantillon - Probenoberfläche

Measurements – Mesures – Messungen

Start of Test - Début de test - Testenbeginn

13/03/2014 09:00

End of Test - fin de test - Testenende

14/03/2014 09:00

Test duration - Durée du test - Testendauer

24.00 h

Initial weight - Poids initial - Anfangsgewicht

148.268 g

Final weight - Poids final - Endgewicht

148.268 g

Weight loss - Perte de poids - Gewichtsverlust

0.000 q

Mass loss – Perte de masse par unité de surface – Masseverlust

0.000 g/m²

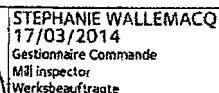
Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.

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

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



Dipl. Ing. B. Sparty



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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 009 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 - Lieferungsdokument		80256920 80257010		

CORROSION - CORROSION - KORROSION

CORROSION PAR PIQUES ASTM A 923 C								pH											
ASTM A923 C - ASTM A923 C								solution											
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni												
							Min	1.250											
							Max	1.350											
540338.5001	000	T3/4	SSS	25 °C				1.300											

Standard ASTM A923C
 Specimen surface preparation 120-grit polishing
 Test result Compliant with Standards

Specimen sizes - Dimensions de l'échantillon - Probengrösse					
Length - Longueur - Länge	Unit - Unité - Einheit	Width - Largeur - Breite	Unit - Unité - Einheit	Thickness - Epaisseur - Dicke	Unit - Unité - Einheit
50.00	mm	25.00	mm	15.00	mm
Total area - Surface de l'échantillon - Probenoberfläche			4750.00	mm ²	

Measurements - Mesures - Messungen	
Start of Test - Début de test - Testenbeginn	13/03/2014 09:30
End of Test - fin de test - Testenende	14/03/2014 09:30
Test duration - Durée du test - Testendauer	24.00 h
Initial weight - Poids initial - Anfangsgewicht	149.347 g
Final weight - Poids final - Endgewicht	149.347 g
Weight loss - Perte de poids - Gewichtsverlust	0.000 g

Corrosion rate - Vitesse de corrosion - Korrosionsrate			
Results - Résultats - Ergebnisse	0.0 mdd	Max requirements - Max requis - Max bedarf	10.0 mdd

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	S	Standard - Standard - Standard
Epr. Face	S	Supérieure - Upper face - obere
Epr. Sens	S	Standard - standard - Standard
Etat	000	Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferzustand
Epr. Ep./Face/Sens	1/2SS	Mi épaisseur - 1/2 Thickness - 1/2 Dicke / Supérieure - Upper face - obere / Standard - Standard - Standard
Epr. Ep./Face/Sens	SSS	Standard - Standard - Standard / Supérieure - Upper face - obere / Standard - Standard - Standard

☒ 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 Bestellungsanforderungen entsprechen.

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



Dipl. Ing. B. Sparty

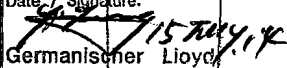


STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 MBI inspector
 Werksbeauftragte

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 010 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 02/06/2011) + 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 Commande / Poste - Internal order - Werksbestellung Bordereau de livraison - Delivery note - Lieferungsdokument		Plate(s) 1059069 / 000050 80256920 80257010			
#192 - MESURE DE FERRITE - FERRITE LEVEL MEASUREMENT - FERRITMESSUNG					
Produit - Product - Erzeugnis 540337001					
Mesure Ferrite - Résultat du contrôle - Examination result - Prüfergebnis Conforme aux spécifications précitées - Conforming to above specifications - Entspricht der vorgenannten Vorschriften		Min: 42.00 % / Max: 55.00 %			
Mesure de ferrite - Ferrite level measurement - Ferritmessung					
Unité - Unit -			%		
	Valeur	Valeur	Valeur	Valeur	
Position - Position - Lage					
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 - Résultat du contrôle - Examination result - Prüfergebnis Conforme aux spécifications précitées - Conforming to above specifications - Entspricht der vorgenannten Vorschriften		Min: 42.00 % / Max: 55.00 %			
Mesure de ferrite - Ferrite level measurement - Ferritmessung					
Unité - Unit -			%		
	Valeur	Valeur	Valeur	Valeur	
Position - Position - Lage					
Mini -	42.00	42.00	42.00	42.00	
Relevé - 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.

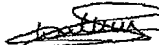
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 Industrial Services



Dipl. Ing. B. Sparty

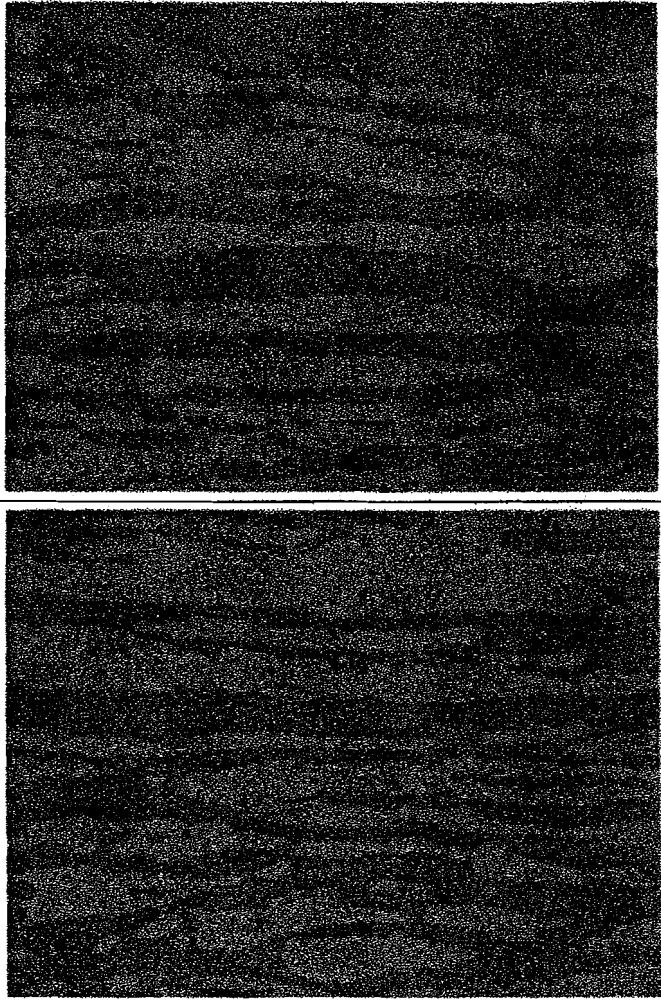


STEPHANIE WALLEMACQ
 17/03/2014
 Gestionnaire Commande
 Mill inspector
 Werksbeauftragte

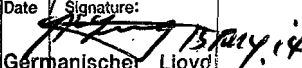


11/21

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev '00 Document number Bescheinigungsnr. 2014-106953 14/12	Page 011 Sheet / Seite 021	 ArcelorMittal
Client - Purchaser - Besteller			
Référence client - Purchase order - Kaufauftrag	ST-3478/CF7539		
Projet - Project - Projekt			

ANNEXES - APPENDIX - ANLAGEN	540338001	AN 0001059859_000050_540338001_001
		

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

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Germanischer Lloyd Industrial Services



Dipl. Ing. B. Sparty

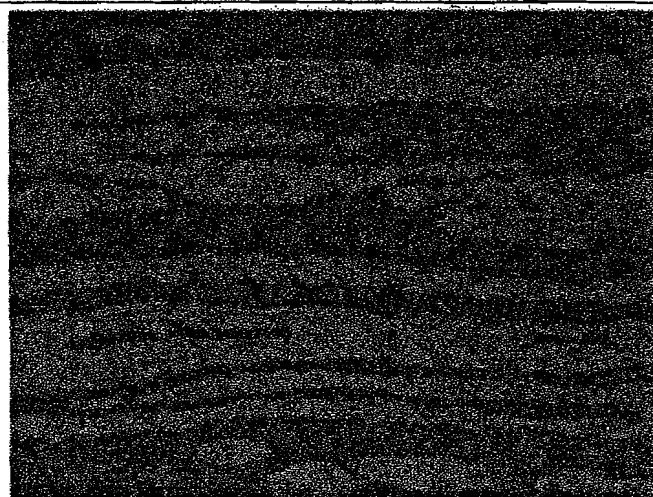


STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
M&I Inspector
Werksbeauftragte



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	Page 012
	Document number Bescheinigungsnummer 2014-106953 14/12	Sheet 021 Seite
Client - Purchaser - Besteller		 ArcelorMittal
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

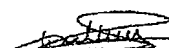
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☒ WITNESSED
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Dipl. Ing. B. Sparty



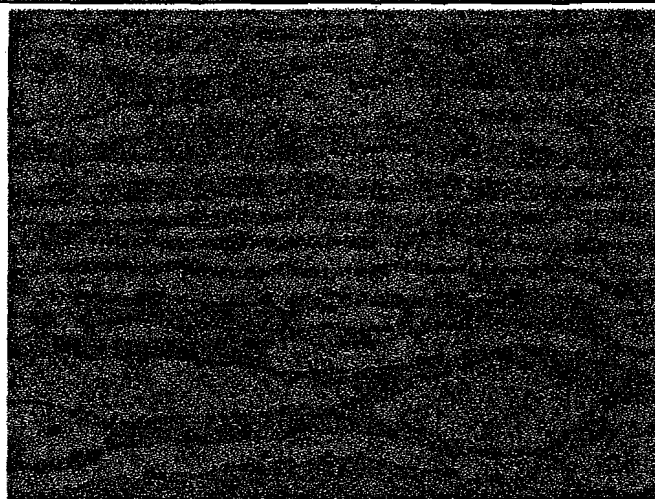
STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
MIR inspector
Werksbeauftragte



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	Page 013
	Document number	Sheet / 021
	Bescheinigungsnummer	
	2014-106953	
Client - Purchaser - Besteller		
Référence client - Purchase order - Kaufauftrag	ST-3478/CF7539	
Projet - Project - Projekt		

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ANNEXES - APPENDIX - ANLAGEN 540338001 AN 0001059059 000050 540338001_001



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DATE	Tu. 11. 2014

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Industrial Services



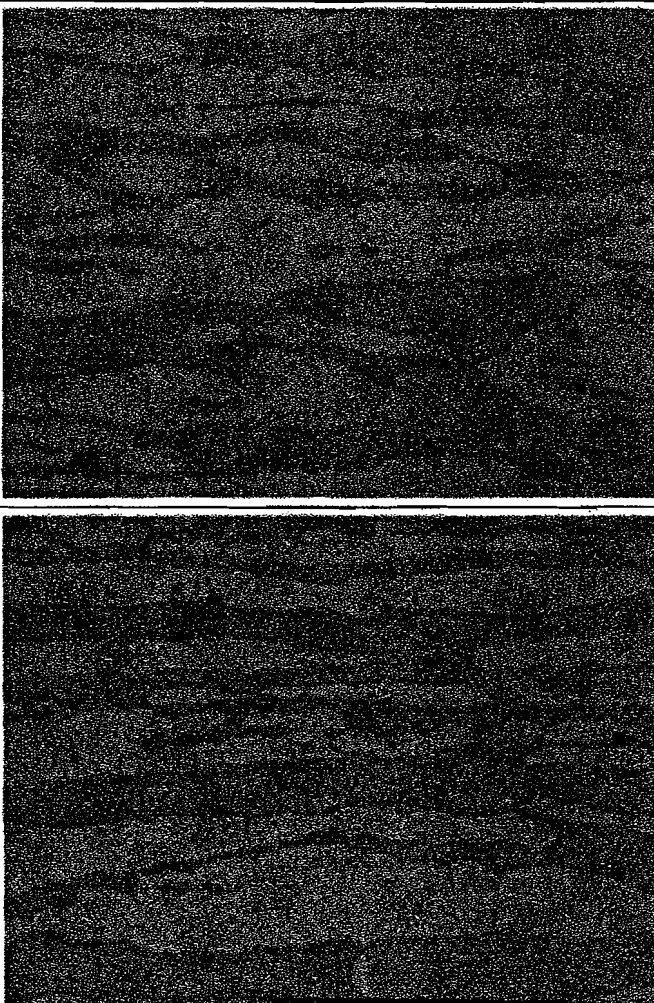
Dipl. Ing. B. Sparty

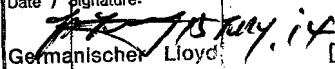
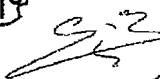


STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Document number Bescheinigungsnummer 2014-106953 14/12	Rev 00 Sheet Seite 014 021	 ArcelorMittal
	Client - Purchaser - Besteller Référence client - Purchase order - Kaufauftrag ST-3478/CF7539 Projet - Project - Projekt		

14/21

ANNEXES - APPENDIX - ANLAGEN		540338001	AN_0001059069_000050_540338001_002								
											
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OLSUNG	☒ Reviewed by										
ISC	☐ Witnessed by										
QA DEPT.	G. T. PYO										
DATE	Tul. 11. 2014										

☒ REVIEWED ☐ WITNESSED Date / Signature:  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
Bescheinigungsnummer
2014-106953
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Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

Projet - Project - Projekt

ArcelorMittal

ANNEXES - APPENDIX - ANLAGEN

540338001

AN_0001059089_000050_540338001_002



Olsung 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 July. 14
Germanische Lloyd Industrial Services



Dipl. Ing. B. Sparty



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

[Signature]

16/21

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

Numéro de document Rev 00
 Document number
 Bescheinigungsnummer
 2014-106953
 14/12

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 Sheet /
 Seite 021



ArcelorMittal

Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

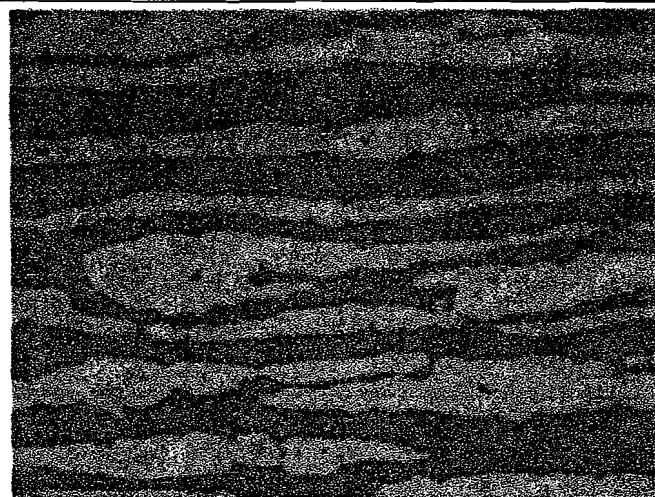
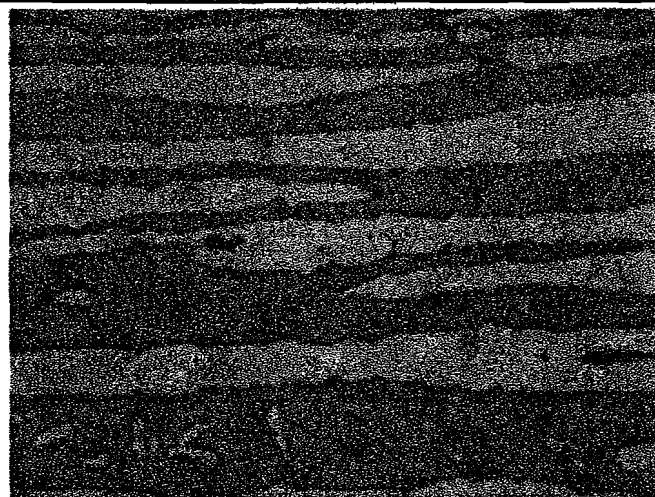
ST-3478/CF7539

Projet - Project - Projekt

ANNEXES - APPENDIX - ANLAGEN

240938001

AN 0001059089_000050_540338001_003



Qlsung
 ISC
 QA DEPT. G. T. PYO
 DATE 16/11. 2014

☒ Reviewed by
☒ Witnessed by

☒ 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
14/17

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Sheet /
Seite 021

Client - Purchaser - Besteller

Référence client - Purchase order - Kaufauftrag

ST-3478/CF7539

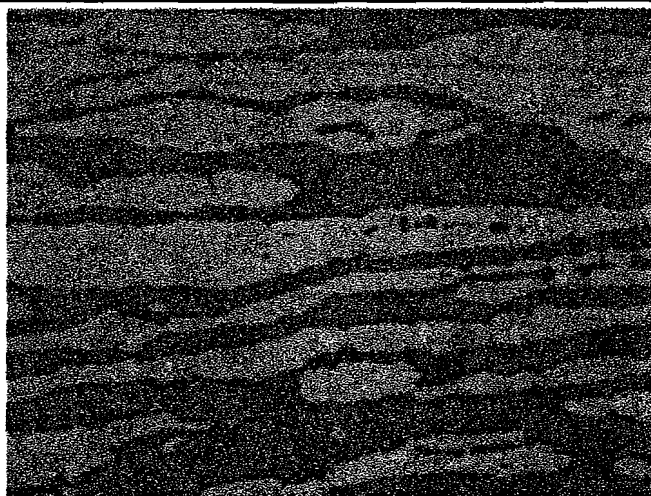
Projet - Project - Projekt

ArcelorMittal

ANNEXES - APPENDIX - ANLAGEN

540338001

AN 0001055069_000050_540338001_003



Q. SUNG
ISC
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

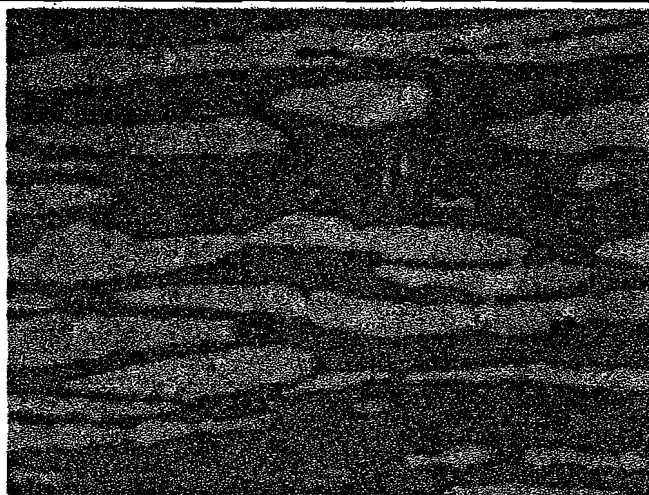
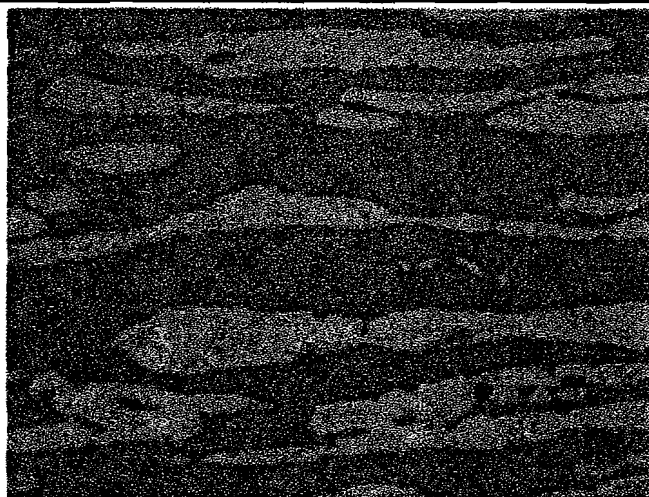


STEPHANIE WALLEMACQ
17/03/2014
Gestörmeire Commande
Milli inspector
Werksbeauftragte

[Signature]

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 018 Sheet / Seite 021	 ArcelorMittal
Client - Purchaser - Besteller			
Référence client - Purchase order - Kaufauftrag ST-3478/CF7539			
Projet - Project - Projekt			

ANNEXES - APPENDIX - ANLAGEN 540338001 AN 0001059069 000050 540338001_003



OLSUNG ISC	☐ Reviewed by ☒ Witnessed by
QA DEPT. DATE 16/11/2014	G. T. PYO

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



Dipl. Ing. B. Sparty



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

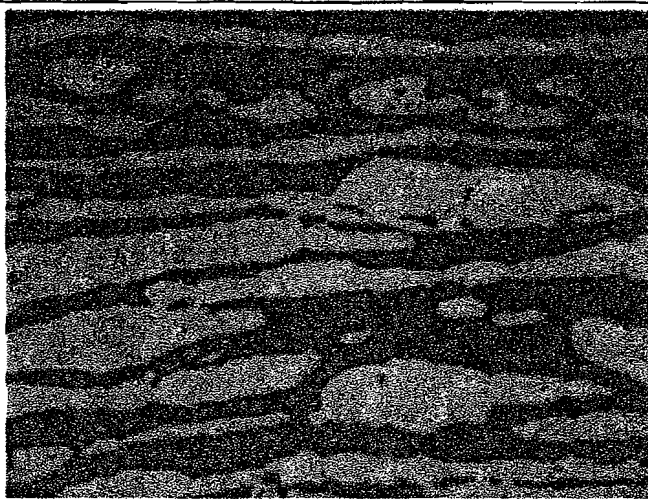
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CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document	Rev 00	Page	019
	Document number		Sheet	021
	2014-106953 14/12			
Client - Purchaser - Besteller				
Référence client - Purchase order - Kaufauftrag			ST-3478/CF7539	
Projet - Project - Projekt				

ArcelorMittal

ANNEXES - APPENDIX - ANLAGEN 540338001 AN_0001059069_000050_540338001_003



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

☒ REVIEWED
☒ WITNESSED
Date / Signature:
15 Jul 14
Germanischer Lloyd Industrial Services



Dipl. Ing. B. Sparty

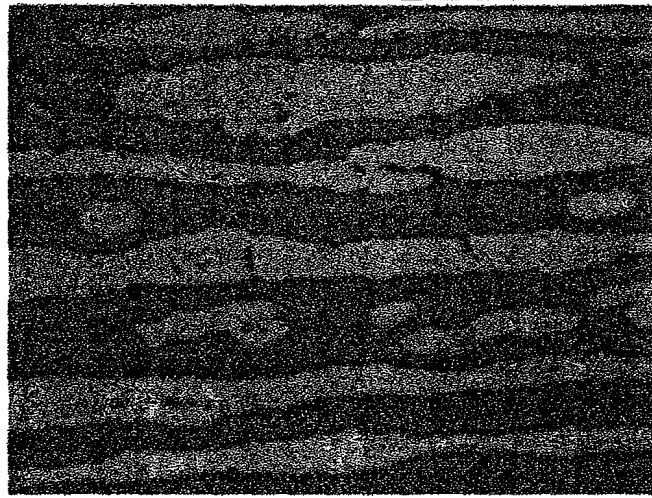


STEPHANIE WALLEMACQ
17/03/2014
Gestionnaire Commande
Mill Inspector
Werksbeauftragte

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	Page	020
	Document number		Sheet	021
	2014-106953		Seite	021
			T4/12	
Client - Purchaser - Besteller				
Référence client - Purchase order - Kaufauftrag ST-347B/CF7539				
Projet - Project - Projekt				

ArcelorMittal

ANNEXES - APPENDIX - ANLAGEN 54033B001 AN 0001050069 000050 54033B001 003



OLSONG ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	G. T. PYC
DATE	7.1.11.2014

☒ 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	Numéro de document Rev 00	Page 021
	Document number Bescheinigungsnummer 2014-106953 14/12	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 004

HARDNESS TESTING AS PER ASTM E18

ORDER 1059069
Plate Nr 540338001

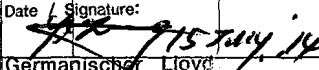
Location 1

	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

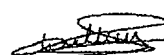
	HRC ind.	HRC ind.	HRC ind.	HRC average
Upper surface - 1mm	20	22	23	22
Mid section	17	18	19	18
Lower surface - 1mm	20	23	21	21

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

☒ REVIEWED
☒ WITNESSED
Date / Signature:
 Dipl. Ing. B. Sparty 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 CALDO

Page : 1

INDUSTEEL EST ISO 9001 CERT 95587-2011, VALID 02/06/2014 - MAQ RE: 11 D11 01-05-2009
INDUSTEEL IS ISO 9001 CERT 95587-2011, VALID 02/06/2014 - QAM RE: 11 D11 01-05-2009Certificat de contrôle des produits par l'usine
Mill test certificate : EN 10204
Prüfzeugnis : ISO 10474
Certificato di controllo interno dei prodotti : 3.2

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 CONTRÔLE / 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 M05 D 45 REV 3 SEPT 2010
PD 5500 2003 ENQUIRY CASE #7
SHELL ES 247 REV 2

Hypertempe - Solution annealed - Lösungsgegluht und abgeschreckt - Iperitemprato 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 - 1D

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 - STEMPEL DES SACHVERSTÄNDIGEN- VG (SIGLA PRODUTTORE) - TIPO - NR COLATA - NR LAMIERA -
PUNZONE DEL COLLAUDATOREMARQUE DU FABRICANT / BRAND OF THE MANUFACTURER
HERSTELLERZEICHEN / MARCA DEL PRODUTTORE

G or VG

- POINÇON DE L'EXPERT / INSPECTOR'S STAMP
STEMPEL DES SACHVERSTÄNDIGEN - PUNZONE DEL COLLAUDATORE

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

☒ Reviewed
☐ Witnessed

14412
USB 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 Bestimmungsvorschriften entsprechen.
 Certifichiamo che i prodotti enumerati qui sopra sono conformi alle prescrizioni dell'ordine.

Q. C. Manager

Mill Inspector

Date-Datum-Data

DESCHEPPER, MICHELE D'ANGELO, TONINO

6-JAN-2012

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

INDUSTEEL
(Belgium)



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

CCPU - CERTIFICATE - PRÜFZEUGNIS - CERTIFICATO No

625886

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

5186112

INDUSTEEL EST ISO 9001 CERT 1557-2011, VALID 01/01/2014 - 31/12/2016
INDUSTEEL IS ISO 9001 CERT 1557-2011, VALID 01/01/2014 - 31/12/2016

ESSAIS 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
15.00	17931	338800.5001	20	0	Rp0.2% Rm/UTS A 50 A 5 MPa MPa % %
15.00	17931	338801.2001	20	0	576 748 33,0 31,0 551 759 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
15.00	17931	338800.5001	-046	0	INDIV. INDIV. INDIV. MOY/AV J J J J
15.00	17931	338801.2001	-046	0	167 151 159 159 172 165 159 165
15.00	17931	338800.5001	-050	0	INDIV. INDIV. INDIV. MOY/AV J J J J
15.00	17931	338801.2001	-050	0	117 157 145 140 152 161 147 153
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
15.00	17931	338800.5001	-050	0	INDIV. INDIV. INDIV. MOY/AV J J J J
15.00	17931	338801.2001	-050	0	163 148 152 154 162 157 159 159
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
15.00	17931	338800.5001	20	0	INDIV. INDIV. INDIV. MOY/AV J J J J
15.00	17931	338801.2001	20	0	189 209 214 204 214 222 220 219
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
15.00	17931	338800.5001	-050	0	INDIV. INDIV. INDIV. MOY/AV J J J J
15.00	17931	338801.2001	-050	0	142 126 136 135 139 152 146 146
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
15.00	17931	338800.5001	-050	0	INDIV. INDIV. INDIV. MOY/AV J J J J
15.00	17931	338801.2001	-050	0	155 124 143 141

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

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 dei controlli 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

CCPU - CERTIFICATE - PRÜFZEUGNIS - CERTIFICATO No

625886

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

5186112

INDUSTEEL EST ISO 9001 CERT. 0387-2011, VALID 02/02/2014 - MAQ RE. 11/01/2009-2009
INDUSTEEL IS ISO 9001 CERT. 13-87-2011, VALID 02/02/2014 - MAQ RE. 11/01/2009-2009ESSAIS MECANIKES
MECHANICAL TESTS
PRÜFUNGEN
PROVE MECCANICHEANALYSES 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 Methode A -> Resultat satisfaisant. Pas de fissures. Inter. cor. EN ISO 3651-2 Pract. A -> Satisfactory. No cracks.					

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

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 SurveyQ. 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 01/05/2009
INDUSTEEL IS ISO 9001 (CERT. 95587-2011, VALID 02/06/2014) + N/AQ REV 11 DU 01/05/2009

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

LSUNG ISC	☒ Reviewed by ☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	JAN. 11. 2014

☒ REVIEWED
☒ WITNESSED
Date / Signature:
<i>[Signature]</i>
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 ± 0,5 °C +/- 1 °C

Qlsung ISC	☒ Reviewed by ☒ 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

 INDUSTRIEEL
 (Belgium)

Industeel Belgium

ArcelorMittal

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 :

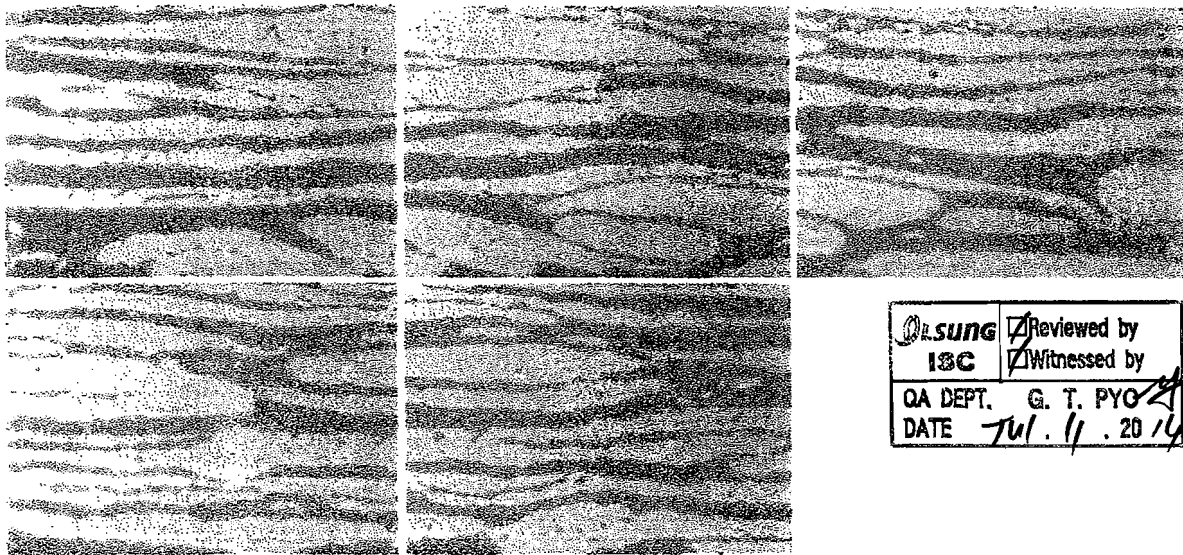
5

Microscope Magnification :

500 X

Image Magnification :

1 X



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

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: RARYINDUSTEEL
(Belgium)

Industeel Belgium

ArceIorMittal

QUALITY CONTROL DEPARTMENT - TESTING LABORATORY

FERRIC CHLORID 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

DLSUNG ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	G. T. PYO
DATE	20.11.2011

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

INDUSTRIEL
(Belgium)

CCK-4511951391-0100-K01-00001-073

ULTRASONIC & VISUAL INSPECTION, MECHANICAL TEST CERTIFICATE

(INSPECTION CERTIFICATE EN10204-3.1)

HANWHA CORPORATION

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

HWASUN-GUN, JEOLLANAM-DO, KOREA

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

클래드鋼規格

CLAD SPEC. : ASME SA264

材質

MATERIAL : ASME SA765 Gr.2
ASME SA240 S31803

ASME

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	ILSUNG ISC ☒Reviewed by ☐Witnessed by QA DEPT. S. J. HWANG DATE JUL 28. 2014 2805
	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: [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	

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檢討/承認者
Reviewed & Approved by

檢查日字

Date of examination 2014. 07. 24

☐ 立會者

Witnessed by

☐ 檢討者

Reviewed by

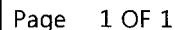
We hereby certify that the plated described herein have been all acceptable on the ultrasonic examination in accordance with the rules of the contract.

HWH-A-305 서식1(REV.0)

69/309

HANCLAD

PAGE 37



Examined By 시 험 자 C. M. Bae	 Level II	☒ Date of Examination 검사일자 2014. 07. 24.
Reviewed & Approved By 검토/승인자 D. Y. Kim	 Level III	☐ Witnessed By 입회자 ☐ Reviewed By 검토자

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 004 Seite 004		ASME		PAGE 39	
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					
NO. 10 - PRODUITS LIVRES - DELIVERED PRODUCTS - LIEFERTEILEN 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									
QSLUNG ISC QA DEPT. S. J. HWANG DATE <i>Jul. 28. 2014</i>									
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						
- Total - Gesamtzahl 001									
☒ REVIEWED ☐ WITNESSED Date / Signature: <i>Jul 31 2014</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 Bestellvorgschriften entsprechen.									
						LEONARDA ALLEGRO 27/12/2013 Gestionnaire Commande Mill inspector Werksbeauftragte 			

CCK-4511951391-0100-K01-00001-073		ASME	PAGE 40
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 002 / 004 Sheet / Seite
Client - Purchaser - Besteller SNP INT'L CO., LTD.		 ArcelorMittal	
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 - Lieferungsdokument 80252948			

020 ANALYSE CHIMIQUE DE COULÉE / LAPEL 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)								

OLsung ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT. S. J. HWANG DATE JUL. 28. 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 Bestimmungsvorschriften entsprechen.

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

CERTIFICAT DE 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

Page
Sheet
Seite
003
/ 004

ArcelorMittal

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 - Lieferungsdokument 80252948

#072 ESSAIS MECANIQUE / MECHANICAL TESTS / MECHANISCHE PRÜFUNGEN

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

Brinell HB							HB10 Ind	HB10 Ind	HB10 Ind	HB10 Aver										
Brinell HB - Brinell HB																				
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	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 28.12.14

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							Rp 0,2%	Rm	A Lo=50											
Tensile test - Zugversuch																				
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	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							Energy Ind	Energy Ind	Energy Ind	Energy Ave										
KCV ASTM A923 B 10X10mm - KCV ASTM A923 B 10X10mm																				
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	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

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. 0 Document number Bescheinigungsnummer 2013-129217		Page 004 Sheet 004 Seite 004	ASME ArcelorMittal	PAGE 42
Client - Purchaser - Besteller		SNP INT'L CO., LTD.				
Référence client - Purchase order - Kaufauftrag		13633F/13633F				
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		1057771 / 000030				
Bordereau de livraison - Delivery note - Lieferungsdokument		80252948				

Etat	000	Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferzustand				
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				

082 ESSAIS TECHNOLOGIQUES / TECHNOLOGICAL TESTS / TECHNOLOGISCHE PRÜFUNGEN

CORROSION - CORROSION - KORROSION
CORROSION PAR PIQURES ASTM A 923 C
 ASTM A923 C - ASTM A923 C

N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac													
511463.5001	000	T3/4	SSS	25	°C														

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

Test result Satisfactory as per specification

Loc	3/4	Trois-Quart - 3/4 Width - 3/4 Breite
Loc	T	Tête - Top - Kopf
Epr. Epaisseur	S	Standard - Standard - Standard
Epr. Face	S	Supérieure - Upper face - obere
Epr. Sens	S	Standard - Standard - Standard
Etat	000	Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferzustand
Epr.Ep./Face/Sens	SSS	Standard - Standard - Standard / Supérieure - Upper face - obere / Standard - Standard - Standard

☒ 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 Bestimmungsvorschriften entsprechen.

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



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	Jul. 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. :

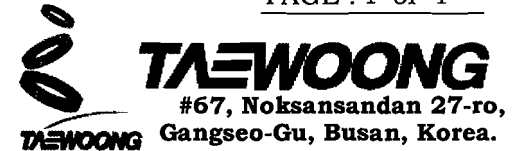
SHIPPER :

DRAWING NO. :

PRODUCT NAME : TUBE SHEET

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

DATE : 2014-05-21



3.1 according to ISO 10474/EN 10204

*POS NO.:FJ20140100890-201 REV.0

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					
														mm	mm				Min.
Unit	S/N	in."	ft.'	mm:Space	Specimen no.	Min.	Max.												

Heat No.		Chemical Composition(%)													Customer's Requirement.		
Spec.	Min.	Max.	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Nb	Al	Ti		
			0.30	0.15	0.60	0.020	0.020	0.50	0.40	0.10	0.35	0.05		0.050			
4-88191(D)			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 : N 380°C X 5.5 HRS A.C 1 320°C X 6.0 HRS A.C															UT ※.3 MT ※.3 PT ※.3 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)

Surveyor

This Certificates can be verified as an original in our homepage WWW.TAEWOONG.COM (T: 051-329-5121)

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 : S.T=Strength T.S=Tensile Strength E.L=Elongation R.A=Reduction Of Area G.L=Gauge Length D=Diameter


TAEWOONG
ASME

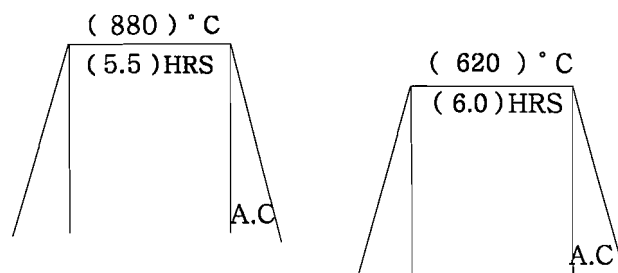
HEAT TREATMENT CERTIFICATE

Report NO. : 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 -

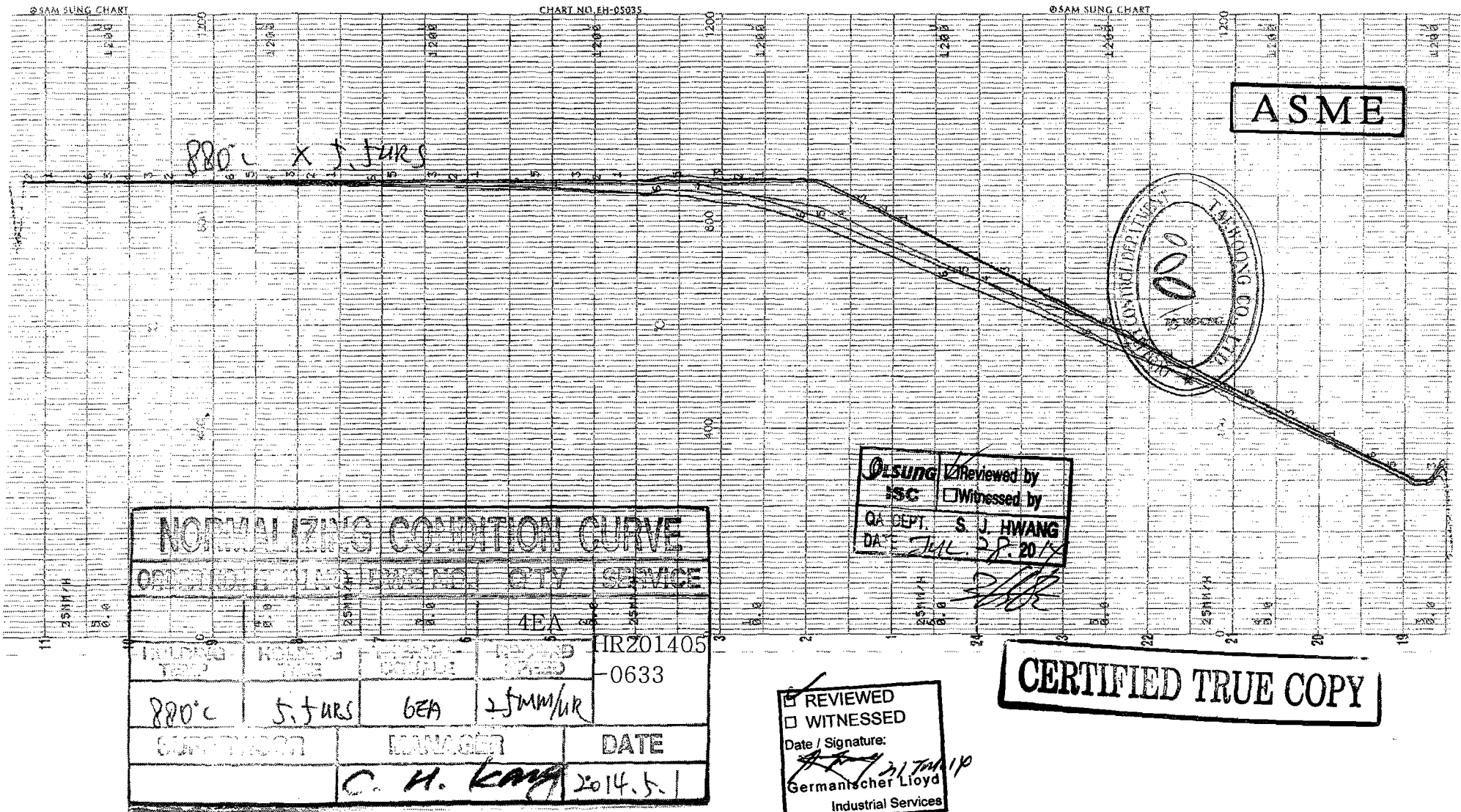
Hardness Data

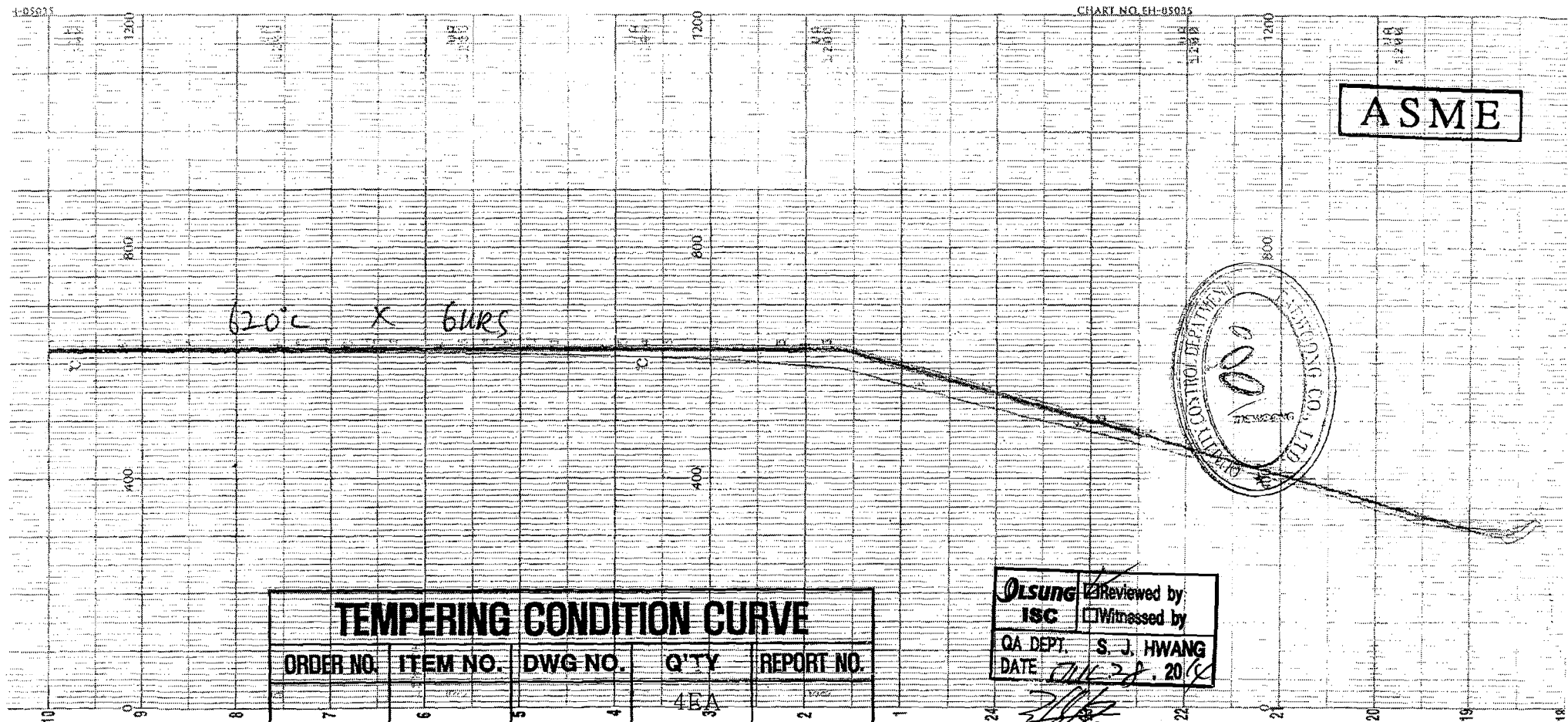
No.	1	2	3
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OLSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	MAY 28. 2014

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

Manager of Quality Assurance Dep't





TEMPERING CONDITION CURVE				
ORDER NO.	ITEM NO.	DWG NO.	Q'TY	REPORT NO.
			4EA	HR201405-0633
HOLDING TEMP	HOLDING TIME	THERMO-COUPLE	RECORD SPEED	
620°C	6HRS	6EA	25mm/HR	
SUPERVISOR		MANAGER	DATE	
		C. H. Kang	2014. 5. 3	

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

CERTIFIED TRUE COPY

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

檢 查 証 明 書



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

DATE FEBRUARY 21, 2014

(SD33)

ASME

N05 AG16921

Notes: * AL, NB, TL, ZR, SB...X1000. B, N, H...X10000

西日本製鉄所(倉敷):〒712-8511 岡山県倉敷市水島川崎通1丁目 WEST JAPAN WORKS (KURASHIKI): 〒712-8511, KAWASAKI-DORI, KURASHIKI-CITY, OKAYAMA-PREF.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。 The Inspection Certificate is printed with special forgery proof technology.

PAGE: 2

西日本製鉄所（倉敷地区）品質保証室長

PAGE 48

REPORT OF ULTRASONIC EXAMINATION

초음파탐상검사보고서

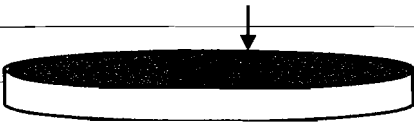
ASME

KTE 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-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				
				☒ Reviewed by ☐ Witnessed by QA DEPT. S. J. HWANG DATE JUL. 28. 2014			
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	
140407-16021-001	4	V		ACCEPT		1,448.00 x 0.00 x 93.00	
				~ 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) 2014.05.21			
Approved by 책임 검사자 Youn Kil, Kim				☐ 주문주/고객 Owner/Customer ☒ 제조자 검사 Vendor Inspector ☐ Witnessed by ☒ Reviewed by TW Q.A H. J.			
				Owner/Customer (주문주/고객 감독관) ☐ Witnessed by ☐ Reviewed by			

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상검사보고서

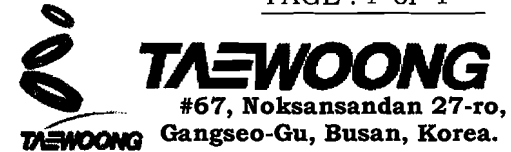
ASME

KTE 한국검사엔지니어링㈜ Korea Testing Engineering Co., Ltd. 본사: 부산광역시 사하구 신평2동 414-2 품질회관 2층 Tel : (051)207-5009 Fax : (051)207-0716				Report No. 보고서 번호 KTENS-TW-140521-M123	
				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.(트레블러) 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 °C	
Yoke/Prod Spacing (극간) / Lifting Power (견인력, Pound) 4 ~ 6 inch / 10 lb (4.5Kg)				Demagnetization(탈자) ☐ Yes ☒ No	
MT Equipment (자분탐상장비)		Model(모델) MP-A2	Maker(제조사) KYUNG DO	Serial No.(일련번호) MP-2582	
Lux Meter (조도계)		Model(모델) TES / 1330A	Maker(제조사) TES	Serial No.(일련번호) 130310959	
Particle Type(자분종류)		☐ Dry(건식) ☒ Wet(습식)	☐ Fluorescent(형광) ☒ Non Fluorescent(비형광)		Due Date of Calibration(교정유효일) 2015.01.02
Magnetic Particle (자분)		Color(색상) BLACK	Maker(제조사) NABAKEM	Model(모델) SM-15	
Black Light (자외선등)		☐ With(사용) ☒ Without(사용무)	Maker(제조사) N/A	Serial No.(일련번호) N/A	
ILluminatation (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 판정	Remarks 비고
140407-16021-001	4	V		ACCEPT	1,448.00 x 0.00 x 93.00
				~ BLANK ~	
					
* EXAM AREA : FINAL MACHINED AREA "MT" CHECKED					
Examined by 검사자 Bong Kyun, Jung			Level 등급 II		
Approved by 책임 검사자 Youn Kil, Kim			Level 등급 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. :

3.1 according to ISO 10474/EN 10204

SHIPPER :

DRAWING NO. :

*POS NO.:FJ20140100890-201 REV.0

PRODUCT NAME : TUBE SHEET

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

ASME

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							
					D mm	G.L mm						J							
												HV10							
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					
☒ Reviewed by ☐ Witnessed by QA DEPT. S. J. HWANG DATE JUL 28. 2014																			
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																
Max.	0.30	0.35	1.35	0.020	0.020	0.50	0.40	0.10	0.35	0.05		0.050							
N11223(P)	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	N:395℃ 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)														Manager of Quality Assurance Dept 2014-07-09					

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

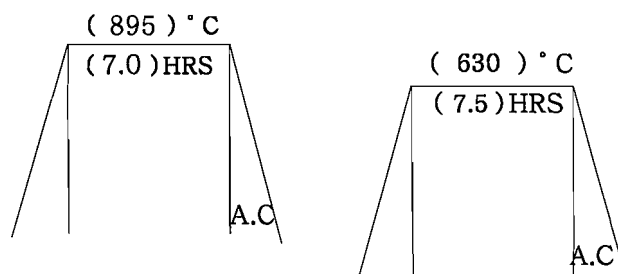
HEAT TREATMENT CERTIFICATE

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

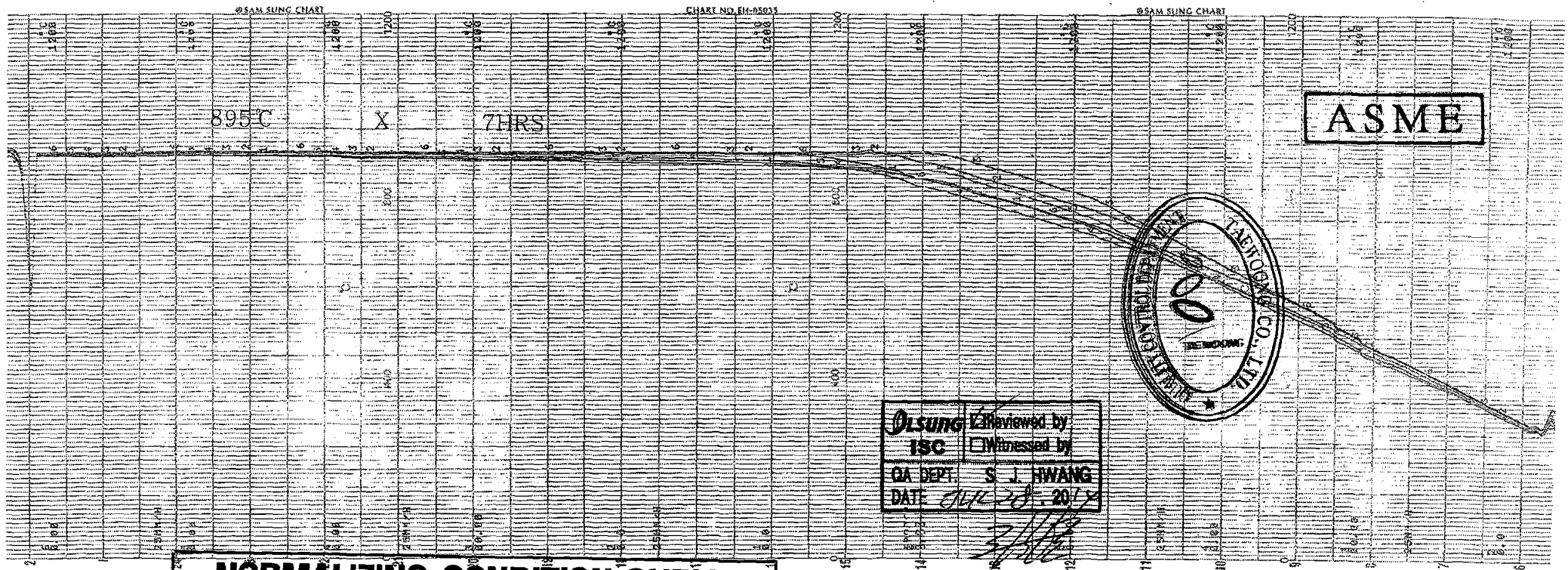
No.	1	2	3
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OLSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	Jul. 28. 2014

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

C. H. Kang

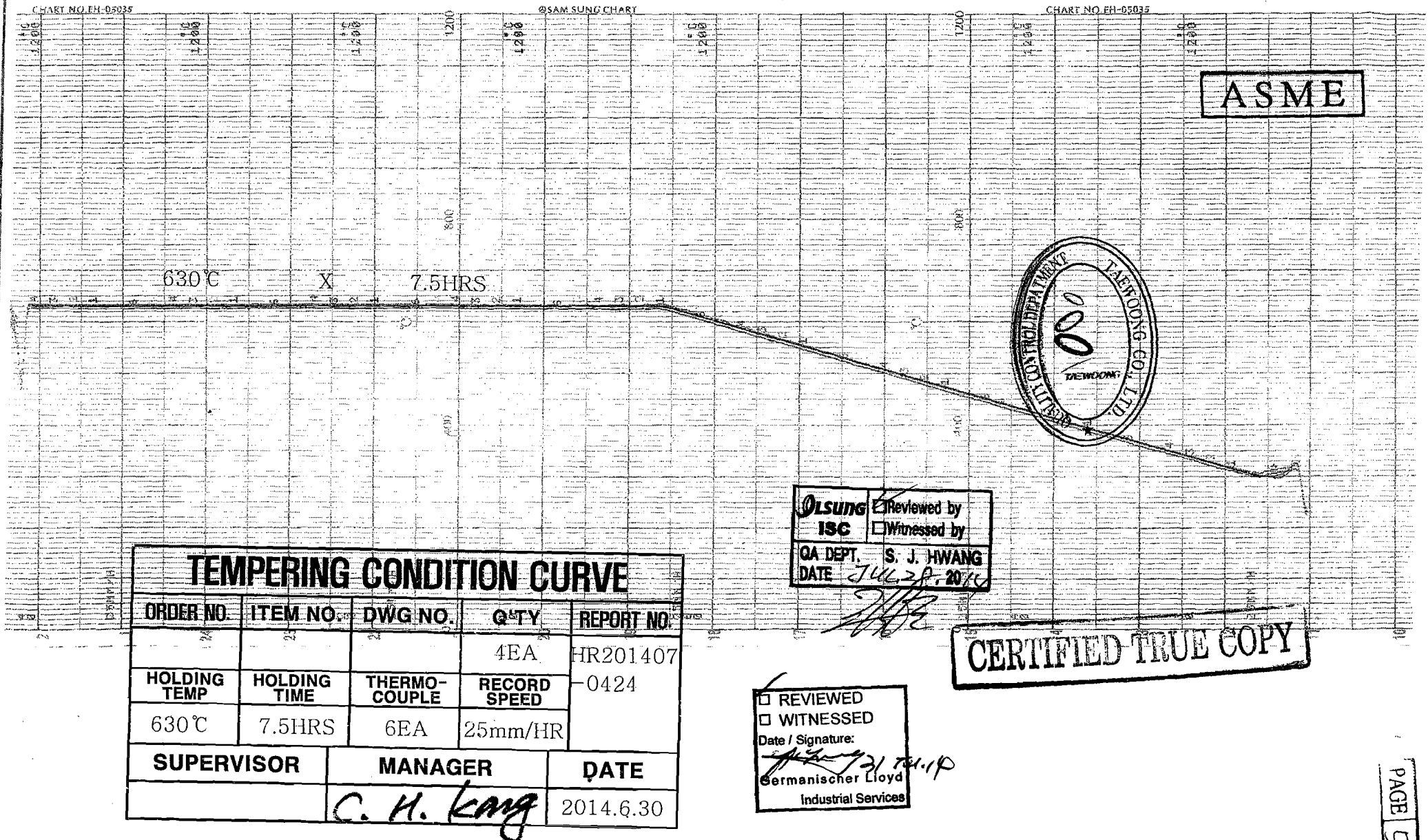
Manager of Quality Assurance Dep't



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



검 사 증 명 서

MILL TEST CERTIFICATE



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

주문번호
Order No. : D140600088

품 명
Commodity : Slab

제품규격
Specification : EN 10025-3 S355NL

고객사
Customer : (주)태웅

주문자
Contractor : (주)태웅

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(%)																단위 Unit 2: x100 3: x1,000 4: x10,000 5: x100,000		
					C	Si	Mn	P	S	Cr	Ni	Cu	Mo	N	Nb	Ti	V	Sol -Al	Total -Al	CEQ			
																					4	3	3
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 + (Ni + Cu)/15 + (Cr + Mo + V)/5

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

NOTE

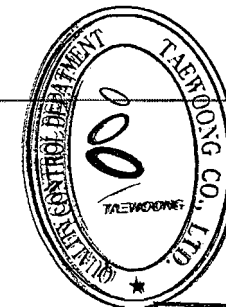
* THE PLATE IS FULLY KILLED AND FINE GRAINED STEEL, BASIC OXYGEN PROCESS AND VACUUM DEGASSING PROCESS WERE APPLIED.

* ANY WELDING SHALL NOT BE PERFORMED FOR THE ORDERED MATERIAL.

* EN 10204.3-1 익거 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



OLsung ☒ Reviewed by
ISC ☐ Witnessed by
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 hyundai-steel's customer portal.(http://sm.hyundai-steel.com/cs/cm/login.jsp)

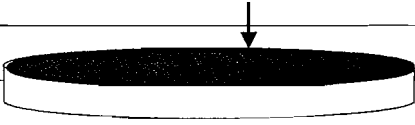
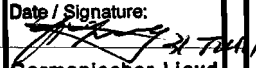
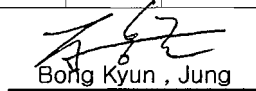
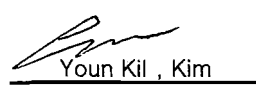
ASME

88/309 KTE Co., Ltd.

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상검사보고서

ASME

KTE 한국검사엔지니어링 Korea Testing Engineering Co., Ltd. 본사:부산광역시 사하구 신평2동 414-2 품질회관 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											
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 (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 ~							
											
						☐ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services					
						* EXAM AREA : FINAL MACHINED AREA "MT" CHECKED					
Examined by 검사자		 Bong Kyun, Jung		Level 등 급 II DATE (검사일자) : 2014.07.09 ☒ 제조자 검사 Vendor Inspector TW Q.A H. J. Ju ☒ 검토 Reviewed ☐ 입회 witnessed ☐ Third Party Inspector 공인검사자							
Approved by 책임 검사자		 Youn Kil, Kim									



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> 31.10.14
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: kbk@ktr.or.kr

Aug.14.2014

Korea Testing & Research Institute

President

Choi Hyeonk

QR Code to verify genuineness

1 of Total 1 Page(s)

CERTIFICATE NO. : TW201408-0706

INSPECTION CERTIFICATE

TAEWOONG
#67, Noksansandan 27-ro,
Gangseo-Gu, Busan, Korea.
3.1 according to ISO 10474/EN 10204

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

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

CUSTOMER : (주)일성

PROJECT NO. : -

SHIPPER : -

DRAWING NO. : -

ASME

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

PRODUCT NAME : FORGED STEEL

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

DATE : 2014-08-22

Articles		Test Requirements	Tensile Test ※.4								Impact Test				Hardness	Bend Test Radius Angle	Remark
			Direction ※.1	Size of Test Specimen		Temp. ℃	Y.S Mpa	T.S Mpa	E.L %	R.A %	Temp. : -45℃ Notch : 2V						
				D mm	G.L mm						J						
											HRC						
Unit S/N in:" ft:" mm:Space	Q'ty (EA)	Specimen Min. no. Max.															
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-07 E-11510/E-11580 CHANNEL FLG & CHANNEL COVER FLG (C-002-61-07) (C-002-147-15) 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. Min. Max.		C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N						
		0.030	1.00	2.00	0.030	0.020	6.50	23.00	3.50		0.08						
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		S.T. 1060℃ X 62HRS W.C										Dimension & Visual Acceptable					
Surveyor		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)										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



TAEWOONG

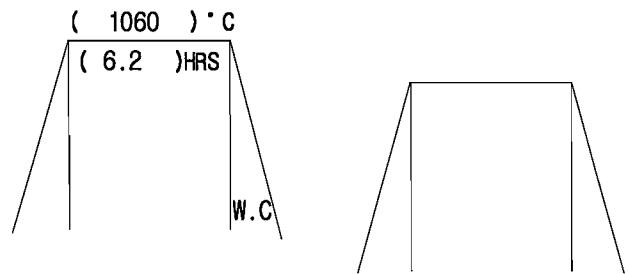
HEAT TREATMENT CERTIFICATE

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



Hardness Data

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 -

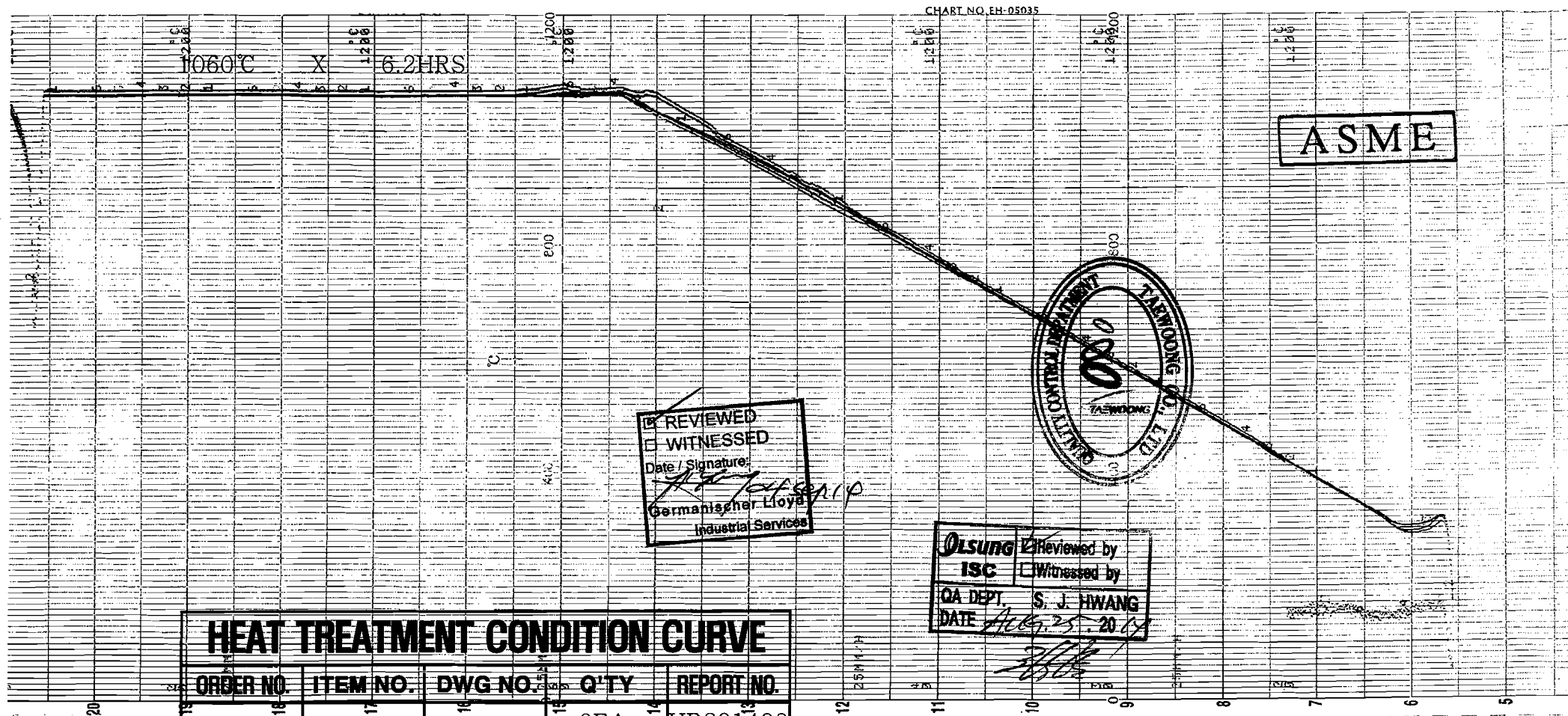
No.	1	2	3
-----	---	---	---

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

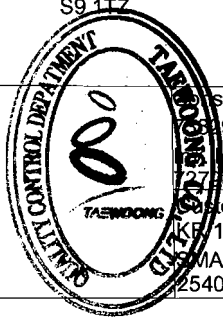


HEAT TREATMENT CONDITION CURVE				
ORDER NO.	ITEM NO.	DWG NO.	Q'TY	REPORT NO.
			8EA	HR201408-0706
HOLDING TEMP	HOLDING TIME	THERMO-COUPLE	RECORD SPEED	
1060°C	6.2HRS	6EA	25mm/HR	
SUPERVISOR		MANAGER		DATE
		C. H. Kang		2014.8.9

CERTIFIED TRUE COPY

Test Certificate ASME

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

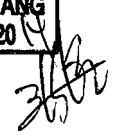
--

Signed for Outokumpu Stainless Ltd

D. Brooks



D. Brooks. Technical Manager SMACC.

olsung ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT. S. J. HWANG DATE 19. 25. 2010	

ORIGINAL

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

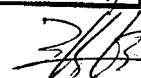
DIMENSION

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

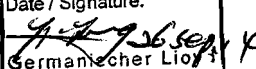


TEST CERTIFICATE IS ISSUED ACCORDING TO EN10204 3.1

PO NO : P-13SG-007

REMARKS

도면

☒ REVIEWED
☐ WITNESSED
Date / Signature:

Germanischer Lloyd
Industrial Services

J. J. RAIL

2014.09.18

SURVEYOR

INSPECTOR

INSPECTION CERTIFICATE

SamSung
Metal Co., Ltd8, Cheoyongsaneop 1-Gil, Ohsan-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 ^D	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	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	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

① S&C-N-E-11510, 11580: STUD B/2H.N (002-10.12, 18.20)

② S&C-N-E-10120~40124: STUD B/2H.N (003-19)

③ S&C-N-E-10140~40145: STUD B/2H.N (002-13)

④ S&C-N-E-10180~40210: STUD B/2H.N (002-13)

MANAGER OF QUALITY CONTROL :

PARK. H. H

ILSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	OCT. 26 2014

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

ASME

EN 10204 TYPE 3.1

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



CERTIFICATE OF MATERIAL TEST REPORT

CERT. No. TT2453

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

DATE : May 19, 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		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 : ASTM : A1016 19	ACC. To : ASTM : A1016 19	ACC. To : ASTM : A1016 19		
TB9492	A4027A1	124	*1	694.91/662.17	886.61/873.54	40.98/41.13	21.0	21.5	G	-	G	G	G	-	-		*H : Heat analysis	
TB9492	A4027A2	124	*1	548.03/602.61	889.14/873.25	42.15/41.94	20.0	21.0	G	-	G	G	G	-	-		*P : Product analysis	
TB9492	A4027A3	124	*1	664.85/638.82	876.12/868.76	36.50/38.65	20.0	21.0	G	-	G	G	G	-	-		*G : Good	
TB9492	A4027A4	124	*1	654.17/619.93	872.17/854.53	38.47/39.70	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						
TB9492	A4027A1	*H															▷ PREN : Cr + 3.3(Mo+0.5W)+16N ▷ Nace MR0175 / NACE MR0103 ▷ No repair welding free from mercury contamination
		*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188						
TB9492	A4027A2	*H															
		*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188						
TB9492	A4027A3	*H															
		*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188						
TB9492	A4027A4	*H															
		*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188						

T-tube Co., Ltd.

★ QUALITY ASSURANCE ★



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-11570(604-1): TUBE (496 PCS)

97/30

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

☒ REVIEWED Manager, Quality Assurance Section
☐ WITNESSED
 Date / Signature:
 Germanischer Lloyd
 Industrial Services

CCK - 4511951391 - 0100 - K01 - 00001 - 073



ASME

EN 10204 TYPE 3.1

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



CERTIFICATE OF MATERIAL TEST REPORT

CERT. No. TT2454

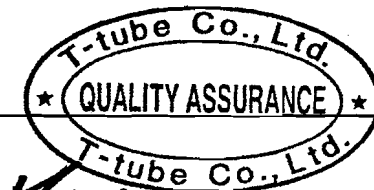
ADDRESS : #392, Namyang-dong,
Jinhae-gu, Chanwon-si,
Gyeongsangnam-do, Korea

DATE : May 19, 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		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		
TB9492	A4027A5	124	*1	613.33/642.58	814.40/856.71	38.87/39.82	20.0	21.0	G	-	G	G	G	-	-	*H : Heat analysis
TB9492	A4027A6	124	*1	628.79/632.24	855.26/836.98	41.58/40.85	19.0	19.5	G	-	G	G	G	-	-	*P : Product analysis
TB9492	A4027A7	124	*1	633.72/649.37	825.97/843.56	38.13/39.44	19.0	20.0	G	-	G	G	G	-	-	*G : Good
TB9492	A4027A8	124	*1	634.03/658.62	890.29/889.14	38.08/38.53	21.0	21.5	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					
TB9492	A4027A5	*H														▷ PREN : Cr + 3.3(Mo+0.5W)+16N ▷ Nace MR0175 / NACE MR0103 ▷ No repair welding free from mercury contamination
		*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188					
TB9492	A4027A6	*H														
		*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188					
TB9492	A4027A7	*H														
		*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188					
TB9492	A4027A8	*H														
		*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188					
T-tube Co., Ltd. ★ QUALITY ASSURANCE ★																



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:
[Signature]
Germanischer Lloyd
Industrial Services

① E-11570(004-1): TUBE (496 pcs)

98/309

[Signature]
Reviewed by
G. T. PYO
DATE Jul. 14. 2014

Manager, Quality Assurance Section

PAGE 66



EN 10204 TYPE 3.1

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



CERTIFICATE OF MATERIAL TEST REPORT

CERT. No. TT2455

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

DATE : May 19, 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	MIN	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)	EL (%)		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. ASTM A262 Practice E Type		
TB9492	A4027A9	124	*1	602.16/634.31	855.38/847.54	39.27/39.86		19.5	20.0	G	-	G	G	G	-	-	*H : Heat analysis
TB9492	A4027A10	124	*1	677.96/658.50	882.45/885.06	39.32/39.67		20.0	21.0	G	-	G	G	G	-	-	*P : Product analysis
TB9492	A4027A11	124	*1	688.65/665.28	882.94/866.92	40.46/39.85		20.0	20.5	G	-	G	G	G	-	-	*G : Good
TB9492	A4027A12	124	*1	605.30/636.77	832.65/845.03	34.57/36.92		20.0	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					
TB9492	A4027A9		*H														▷ PREN : Cr + 3.3(Mo+0.5W)+16N ▷ Nace MR0175 / NACE MR0103 ▷ No repair welding free from mercury contamination
			*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188					
TB9492	A4027A10		*H														
			*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188					
TB9492	A4027A11		*H														
			*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188					
TB9492	A4027A12		*H														
			*P	0.020	0.439	1.378	0.019	0.005	4.872	22.685	3.124	0.188					

☒ REVIEW

☐ WITNES

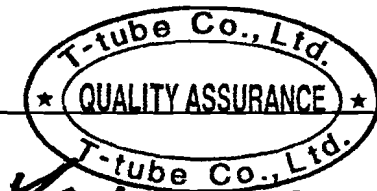
Date / Signat

Germanis

Indus

T-tube Co., Ltd.

★ QUALITY ASSURANCE ★



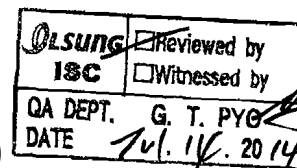
Manager, Quality Assurance Section



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-11570(004-1) : TUBE (496 PCS)

99/309



CCK - 4511951391 - 0100 - K01 - 00001 - 073



EN 10204 TYPE 3.1

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



CERTIFICATE OF MATERIAL TEST REPORT CERT. No. TT2456

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

DATE : May 19, 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		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 ASTM A262 Practice E Type					
TB8825	A4027A13	124	*1	679.98/657.23	875.93/869.33	41.73/40.88		19.0	20.0	G	-	G	G	G	-	-	*H : Heat analysis	
TB8825	A4027A14	124	*1	674.41/678.92	887.45/896.48	38.39/39.63		20.0	21.0	G	-	G	G	G	-	-	*P : Product analysis	
TB8825	A4027A15	124	*1	667.57/649.85	872.38/876.54	39.67/40.03		20.0	20.0	G	-	G	G	G	-	-	*G : Good	
TB8825	A4027A16	124	*1	598.78/612.36	888.89/871.30	39.64/38.78		21.0	21.0	G	-	G	G	G	-	-		
Heat No.	Lot No.	Spec	Chemical Composition %											[REMARK]				
			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	A4027A13	*H																
		*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
TB8825	A4027A14	*H																
		*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
TB8825	A4027A15	*H																
		*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
TB8825	A4027A16	*H																
		*P	0.021	0.513	1.436	0.018	0.003	4.630	22.512	3.076	0.175							
▶ PREN : Cr + 3.3(Mo+0.5W)+16N																		
▶ Nace MR0175 / NACE MR0103																		
▶ No repair welding free from mercury contact																		
☒ REVIEW ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services																		
T-tube Co., Ltd. ★ QUALITY ASSURANCE ★																		

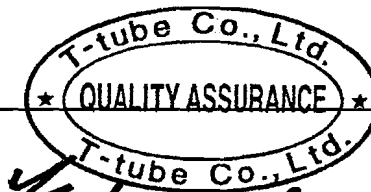


We hereby certify that the material described herein have been manufactured, inspected and tested in accordance with the customer's specification and order.

① E-11570 (004-1): TUBE (372 pcs)
 ② E-11570 (004-1): TUBE (92 pcs)
 E-11570 (004-1): TUBE 100/300

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

Manager, Quality Assurance Section



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SGS**Test Report**

Report No. : SGS-M14-04272

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

Sample Number : Heat No.:TB9492

Material & Specification : SA789 S31803

Use of Test Report : For submission

Date of Test : 2014.05.27

Date of Receipt : 2014.05.20

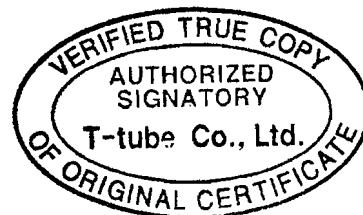
Test Method Used : Refer to test results

Testing Environment : Temperature (20 ± 1) °C

Humidity (46 ± 3) % R.H.

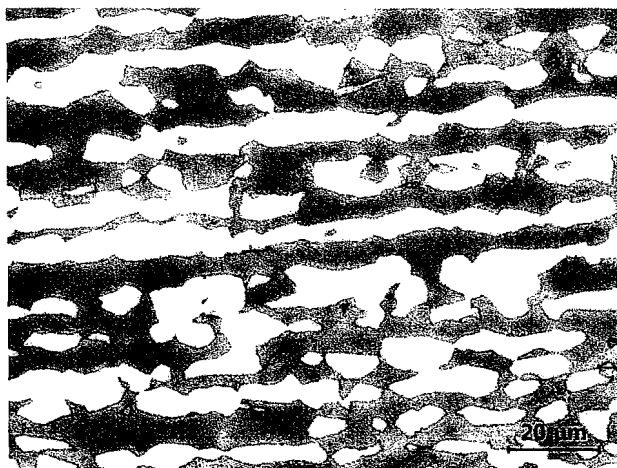
Client Name : UN Steel

Client Address : -

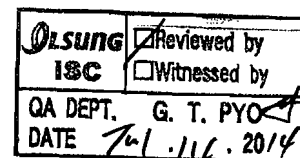
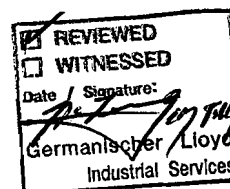
ASME**Test Results****1. Ferrite Content**

Test Item	Unit	Result	Test method
Ferrite Content	%	50.9	ASTM E562-11

* 30 fields and 25 points per field * 95 % CI : 5.12, %R.A : 10.05

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

Metallograph at 500x magnification



- 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 herein 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-M14-04273

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.

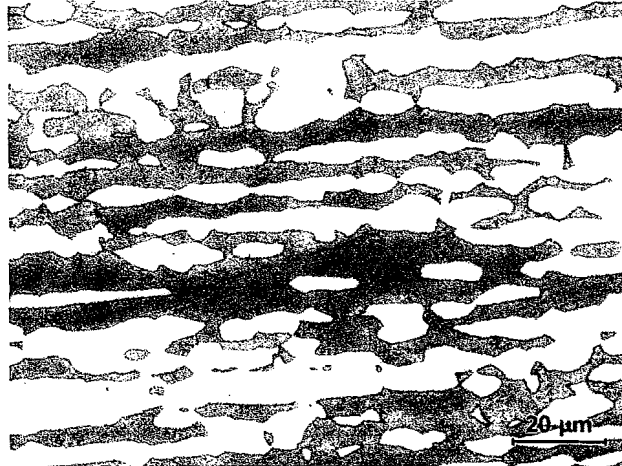
Client Name : UN Steel

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

Olsung 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.

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

P.O No. : Y201404-608

Date : Apr. 21, 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					
				mm	mm					J					
				Min.	Max					Mpa	Mpa	%	%		
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# WNR 20"(S/10T)	2														
004 ASME 150# WNR 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

DATE

10/11/16

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:
<i>[Signature]</i>
Germanischer Lloyd Industrial Services

Chemical Composition(%)

Charge No	Spec. Min. Max.	*3	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N	Sn	Nb	Ti	V	As
			0.030	1.00	2.00	0.030	0.020	6.50	23.00	3.50		0.20					
			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
E131033		H															

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)

Qlsung ISC	☐ Reviewed by	(052)
	☐ Witnessed by	TEL: 287-5881
QA DEPT.	G. T. PYO	FAX: 237-5880
DATE	JUL. 05. 2014	14.5.7

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.

103/309

Witnessed By

QA Department Manager

CCK-4511951391-0100-K01-00001-073

INSPECTION CERTIFICATE

(EN 10204 - 3.1)

Page 1 of 1

Certificate No.: IC201407-050-005

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

Date : 2014/07/01

Customer : ILSUNG Corporation

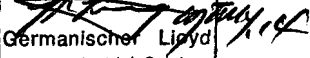
P.O No. : FG-20140416-040 (2014-04-16) Project Name

: 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 . 20 14																

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

Heat No	Spec	Chemical Composition(%) * 3													Customer's Requirement	
		C	Si	Mn	P	S	Ni	Cr	Mo	Cu	Nb	V	N	Al		
		Min	-	-	-	-	-	4.5	21.0	2.5				0.15		
4E840	Max	0.030	1.00	2.00	0.030	0.020	6.5	23.0	3.5				0.20			
	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						☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services		
								UT	MT		PT					
								ACCEPT	R.M (ACCEPT) Report No : DCWMS-U14-0701-042		(N/A)		(N/A)			
Job No : HT201405-231																
_____ Surveyor							We hereby certify that the material herein has been manufactured, tested and inspected in accordance with the above specification.							SHLZZ _____ 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(Ø)
 *2 -- Location : L=Longitudinal, Tr=Transverse, T=Tangential, R=Radial, U=Hubbed Tension Test 6.25x25.0mm (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, AC.C=Accelerated Cooled By Water
 *5 -- Surface Condition : A.F=As Forged, R.M=Rough Machined, F.M=Finish Machined

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QSM-19-01 Rev.0

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 12

CCK-4511951391-0100-K01-00001-073

WALSN**INSPECTION CERTIFICATE**

WALSIN LIHWA CORP. Y. HUI 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 SHUEI 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.1. 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-Merkblatt W0/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

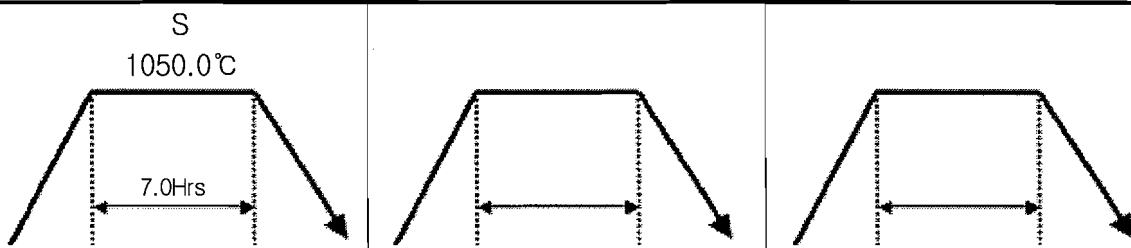
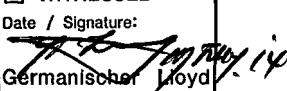
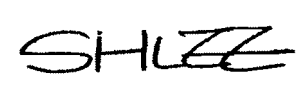
SL Kann.

Quality Assurance Responsible Personnel

105/309

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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 640Ø*589.6Ø*320T 540Ø*488Ø*300T				
2EA BACCS A201404-086-015 2EA BACCS A201404-086-016				
 QA DEPT. DATE Jul . 14 . 2014 ☒ Reviewed by ☐ Witnessed by G. T. PYO Jul . 14 . 2014				
☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services				
REVIEWED BY ☐ WITNESSED BY ☐	_____ Surveyor		 General Manager of QM Dep't	



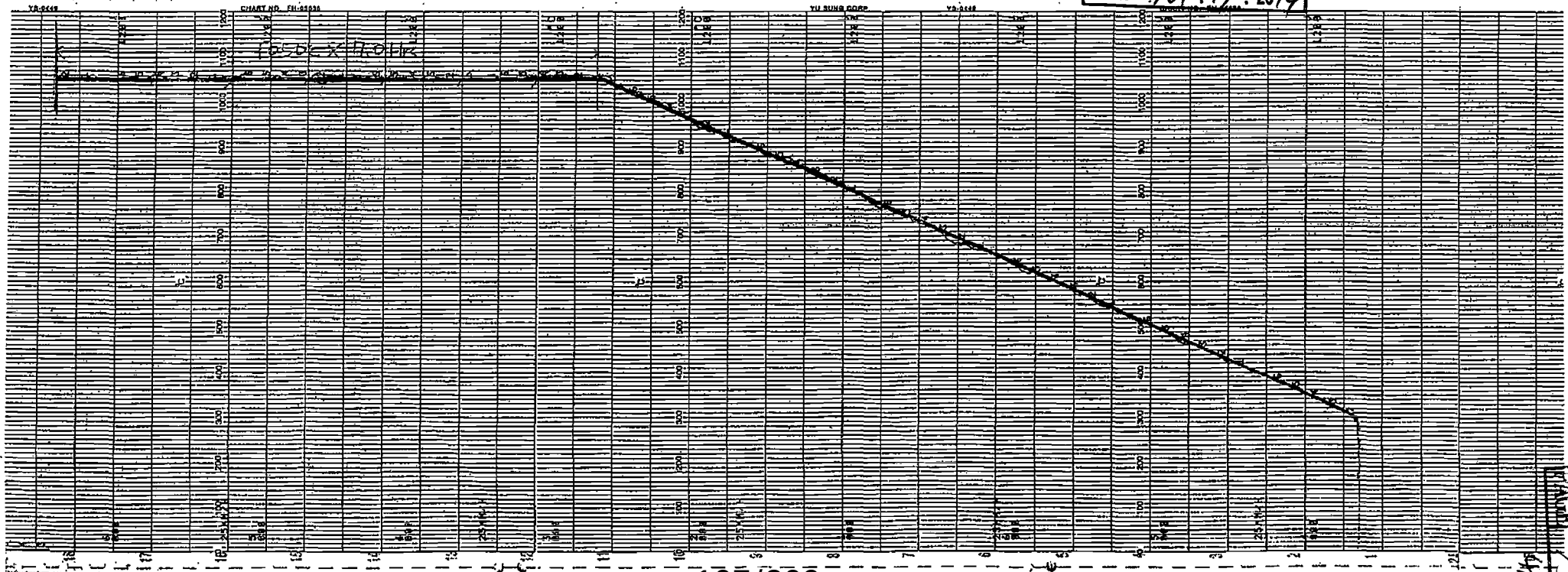
☒ REVIEWED
☐ WITNESSED
 Date / Signature: *[Signature]*
 Germanischer Lloyd
 Industrial Services

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

ASME

ORIGINAL COPY

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



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이엔디이 주식회사

e-NDE CO.,LTD.

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ULTRASONIC EXAMINATION REPORT

초음파탐상시험보고서

ASME

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				Project No./Name (공사번호/명)			
IL SUNG Corporation / MYSCO CO.,LTD				N/A			
제품번호/제품명 Item No./Name				부품번호/부품명 Part No. / Name			
See Identification /Joint No				N/A			
트래블라 TRV. No.	개정 Rev. No.	공정 Oper No.	적용규격 Procedure No.		개정 Rev.No		
N/A	N/A	N/A	ASME SA388 / ASME SEC.VIII DIV2 PART3				
도면번호 DWG. No.			O.E No (수주번호): A201404-086				
N/A			P.O No: FG-20140416-040(2014-04-16)				
재질/두께 Material		(여성고) Mater'l Thick.(+)		용접방법 Weld Method			
See the remarks.		N/A		☐ mm ☐ inch		☐ SMAW ☐ SAW ☐ FCAW ☐ GTAW	
표준시험편 Standard Block		검사시기 Examination Time		표면조건 Surface Condition			
I/W		After Heat Treatment		☐ 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.	
Model : USM GO	k/k	B2S-E	2	Ø24	0°	57745-50728	
Maker : GE	k/k	B4S-E	4	Ø24	0°	57746-01530	
Serial No. : 10020515	k/k	MB4S-N	4	Ø10	0°	53465	
Due Date : 2014.09.30	GE	B1S-E	1	Ø24	0°	57744-52461	
Method (검사방법) : ☒ Contact ☐ Immerse							
직선성				증폭성			
Screen Height Linearity : ± 5 %				Amplitude Control Linearity : ± 10 %			
Setting Sensitivity Method (감도설정방법)							
Probe (탐촉자)	Method (방법)	Standard (표준감도)	Scanning (주사감도)		시험온도 Test Temp.		
B2S-E	BACK	B1=80%	Std.Sen:+14dB		22 °C		
B4S-E	BACK	B1=80%	Std.Sen:+14dB		접촉매질 Couplant		
MB4S-N	BACK	B1=80%	Std.Sen:+14dB		☐ C.M.C ☐ Glycerine		
B1S-E	BACK	B1=80%	Std.Sen:+14dB		☒ Oil		
표면온도 Surface Temp.	장비번호 ID. No.	모델 Model	제조사 Maker	유효기간 Due Date			
	1203323	TECPEL/305B	TECPEL	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)	
470Ø*382.4Ø*640T	16EA	Accept		NO RECORDABLE INDICATION		A201404-086-001 SA350LF2CL1	
135Ø*97.1Ø*130T	4EA	Accept		NO RECORDABLE INDICATION		A201404-086-002 SA350LF2CL1	
80Ø*42.9Ø*180T	2EA	Accept		NO RECORDABLE INDICATION		A201404-086-003 SA350LF2CL1	
250Ø*198.5Ø*280T	24EA	Accept		NO RECORDABLE INDICATION		A201404-086-004 SA350LF2CL1	
250Ø*198.5Ø*360T	8EA	Accept		NO RECORDABLE INDICATION		A201404-086-005 SA350LF2CL1	
250Ø*198.5Ø*360T	16EA	Accept		NO RECORDABLE INDICATION		A201404-086-006 SA350LF2CL1	
135Ø*97.1Ø*220T	16EA	Accept		NO RECORDABLE INDICATION		A201404-086-007 SA350LF2CL1	
250Ø*198.5Ø*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			

e-NDE 이엔디이		이엔디이 주식회사		e-NDE CO.,LTD.	
ULTRASONIC EXAMINATION REPORT 초음파탐상시험보고서 ASME 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. 2 OF 2	
식별번호 Identification /Joint No.	수량 Q'ty	합격 Accept	불합격 Reject	Interpretation (평가)	Remarks (비고)
135Ø*97.1Ø*130T	24EA	Accept		NO RECORDABLE INDICATION	A201404-086-009 SA350LF2CL1
80Ø*42.9Ø*190T	24EA	Accept		NO RECORDABLE INDICATION	A201404-086-010 SA350LF2CL1
250Ø*193.7Ø*230T	24EA	Accept		NO RECORDABLE INDICATION	A201404-086-011 SA350LF2CL1
250Ø*193.7Ø*330T	8EA	Accept		NO RECORDABLE INDICATION	A201404-086-012 SA350LF2CL1
135Ø*97.1Ø*140T	24EA	Accept		NO RECORDABLE INDICATION	A201404-086-013 SA350LF2CL1
80Ø*42.9Ø*240T	24EA	Accept		NO RECORDABLE INDICATION	A201404-086-014 SA350LF2CL1
640Ø*589.6Ø*320T	2EA	Accept		NO RECORDABLE INDICATION	A201404-086-015 SA182F51
540Ø*488Ø*300T	2EA	Accept		NO RECORDABLE INDICATION	A201404-086-016 SA182F51
BLANK					
OLSUNG ISC QA DEPT. DATE 7th. 14. 2014 ☒ Reviewed by ☐ Witnessed by G. T. PYO DATE 7th. 14. 2014					
☐ REVIEWED ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services					

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	T/P No	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
				12.5	50.0	250.0	485.0 655.0	22.0	30.0					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-10075/20075						003) E-10180/10200/20180/20200								
003 ASME 300# WNRF 2"(S/160)	16	002) E-10140/10142/10144						20180/20200/40180/40200								
004 ASME 300# WNRF 4"(S/80)	4	E-20140/20142/20144						E-10190/10210/20190/20210								
005 ASME 300# WNRF 4"(S/80)	32	E-30140/30142/30144						30190/30210/40190/40210								
006 ASME 300# WNRF 4"(S/80)	24	E-40140/40142/40144						004) E-10070/20070								
007 ASME 300# WNRF 4"(S/80)	48	E-10140/10142/10144						E-10075/20075								
008 ASME 300# WNRF 4"(S/80)	16	E-20140/20142/20144														

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		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	H	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						
		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)

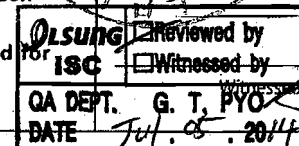
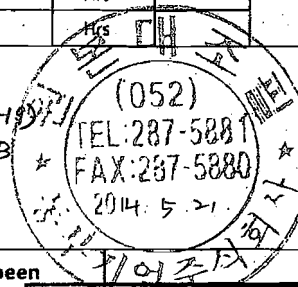
*1(Location) L=Longitudinal, T=Tangential, Tr=Transverse,
R=Radial, U=UW-13(Direction Parallel to the Axis of the Vessel)

*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.

110/309



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

REVIEWED
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Service

PAGE 1/1

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.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. Max			250.0	485.0 655.0	22.0	30.0					HB		
009 ASME 300# WNRF 6"(S/80)	8	SB97082	T												
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(%)

Spec.	Min.	Max.	*3	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Nb	Al	Ti	N
				0.30	0.30	1.35	0.035	0.040	0.40	0.30	0.12	0.40	0.08	0.02			
				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	H			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
SB97082	P																
Heat Treatment *4	Normalizing			900 °C	5.0 Hrs	A.C	Quenching			Hrs	Solution			Hrs			
	Annealing				Hrs		Tempering			Hrs				Hrs			

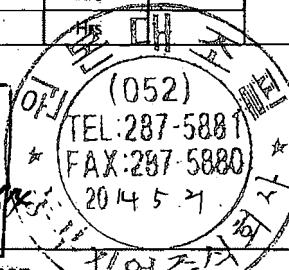
Remarks

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

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

*Hardness = max 220HV 10 (210HB)

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



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
by the above order.

111/309

OLSUNG
 G. T. PYO
 QA DEPT.
 DATE Jul. 05. 2014

QA Department Manager

CCK-4511951391-0100-K01-00001-073



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

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-10180/10200 (006-41): T2B,
 E-20180/20200
 E-30180/30200 (006-37): T1B
 E-40180/40200

E-10190/10210 (006-39): T2A
 E-20190/20210
 E-30190/30210 (006-41): T1A
 E-40190/40210

112/309

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



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



Inspection Certificate

(According to DIN EN 10204.3.1)

N°: 0030029786

Sheet: 2 / 3

Tensile Test

Specimen Direction: Longitudinal

Temperature: Room Temperature

Gage Length: L0= 2"

YS Method: 0,50 %

Type of Specimen

Area

YS

TS

E

(MM2)

(MPA)

(MPA)

(%)

Required: Min

240

415

30

Max

Heat Control Lot

Pipe N°

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

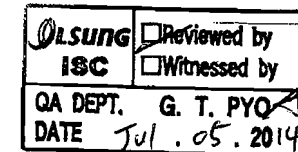
Heat Control Lot

Pipe N°

128147 030002365791

2

151,0



Impact Test

Test Specimen: CHARPY 10X55X10 V NOTCH

Direction: Longitudinal

Temperature: -45°C

Striking tup: 8 mm

AE1

AE2

AE3

AE4

AE5

AE Avg

(J)

(J)

(J)

(J)

(J)

(J)

Required: Min

14

14

14

18

Max

Heat Control Lot

Pipe N°

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 13169
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:
<i>[Signature]</i>
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 - OREA NG-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 01*
E-11570, 11580
T3, T4 GASKET (-006-10) ACCORDING TO TECHNICAL
STANDARD TS-B101(REV.4) AcceptDIMENSION ACCORDING TO TECHNICAL
STANDARD TS-B101(REV.4) Accept

TEST CERTIFICATE IS ISSUED ACCORDING TO EN10204 3.1

PO NO : P-13SG-007

REMARKS

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

olsung ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	2014.09.22

SURVEYOR

INSPECTOR

INSPECTION CERTIFICATE**SamSung
Metal Co., Ltd**8, Cheoyongsaneop 1-Gil, Onsan-Eup, 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 DECISION	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
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 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
STANDARD DECISION	SA320-L7M	ksi min80	ksi min100	% min18	% min50	HRB max99		min ave27J	
	SA194-7M					HRB 84-99	33900 lbf	min ave27J	HRB min84
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-115No, 11580 : T3, T4 BOLT/NUT
(006-11)

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

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

MANAGER OF QUALITY CONTROL :

PARK. H. H.

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

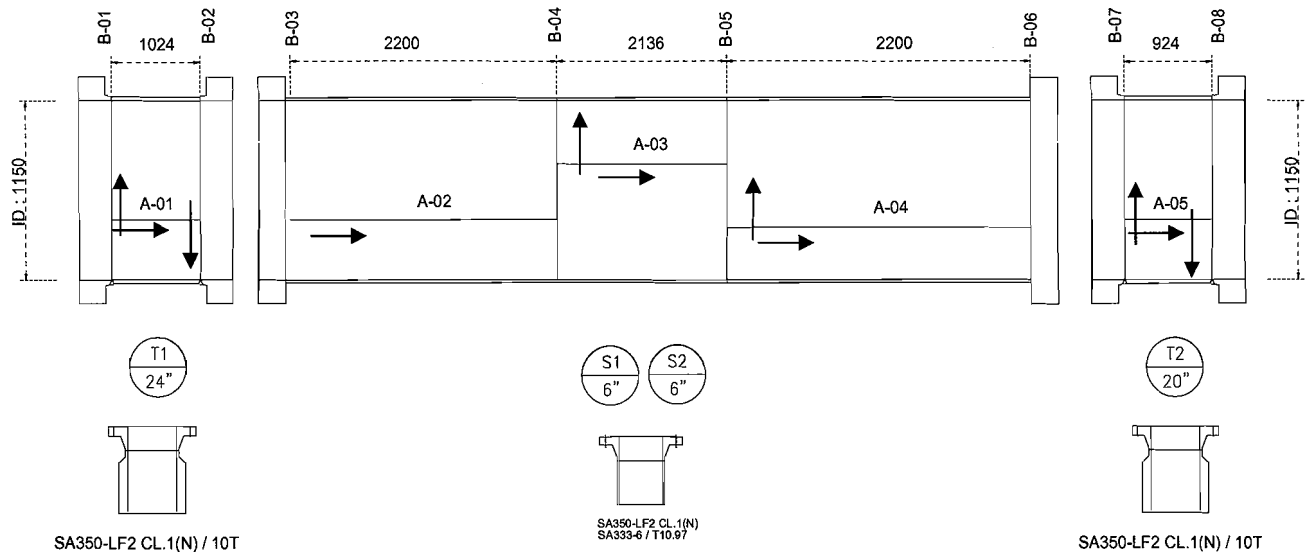
RADIOGRAPHY EXAMINATION MAP (OUTLINE SKETCH OF RADIOGRAPHY)

DATE.	DEC. 05. 2014.
W/O NO.	P-13SG-007
P/O. NO.	4511951391
DWG NO.	VP-SG07-E-11570-001 
ITEM NO.	E-11570
RT CONDITION	100%
TOTAL SHEETS	168 SHEETS

PROJECT NAME	CARMON CREEK PROJECT
CUSTOMER	SHELL CANADA ENERGY
ITEM NAME	VRU INLET GAS COOLER
APPLICABLE CODE AND STD.	ASME SEC.VIII DIV.1 2010 ED.+2011 ADD.+API 660 (8th ED.2007) PROCEDURE NO:VP-SG07-COMM-010 (ISC-RT-06) 
MATERIAL SPEC. AND TH'K.	SHELL : SA516-70N 17T / CHANNEL : SA240-S31803 15T

SKETCH

*TUBE SIDE SOUR SERVICE



SA350-LF2 CL.1(N) / 10T

SA350-LF2 CL.1(N)
SA333-6 / T10.97

SA350-LF2 CL.1(N) / 10T

TUBE SIDE (100%)

SHELL SIDE (100%)

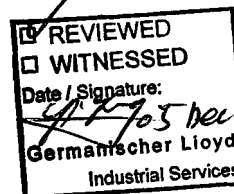
TUBE SIDE (100%)

A-01: 5
B-01: 17
B-02: 18
T1-B01: 9

A-02: 10
A-03: 10
A-04: 11
S1-B01: 4
S2-B02: 4

B-04: 17
B-05: 17

A-05: 4
B-07: 17
B-08: 17
T2-B01: 8



PREPARED BY	REVIEWED BY	APPROVED BY	☐ WITNESSED BY ☐ REVIEWED BY
S.S. LEE <i>S.S. LEE</i> Dec. 5. 2014	G. J. HWANG <i>G. J. HWANG</i> 3/5/14 Dec. 05 '14	J. B. FEO <i>J. B. FEO</i> Dec. 05. '14	

방사선 투과 시험 보고서

ILSUNG**ILSUNG CORPORATION****ASME**

Report No.

IS-APN-E-11570-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-11570	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 표면 상태	☐ 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	8	No. Film/Cassette Cassette 내 Film 매수	1 SH'T
Exposure Setup			Total Sheet 8 SH'T 촬영매수
			Remarks: ☒ Reviewed by ISC ☐ Witnessed by QA DEPT. ASNT Level III S.S. LEE Cert No. 210561 DATE Aug 28. 2014
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 ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Service	

ASME

ILSUNG CORPORATION

Page 2 of 2

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

 A P N Co., Ltd.

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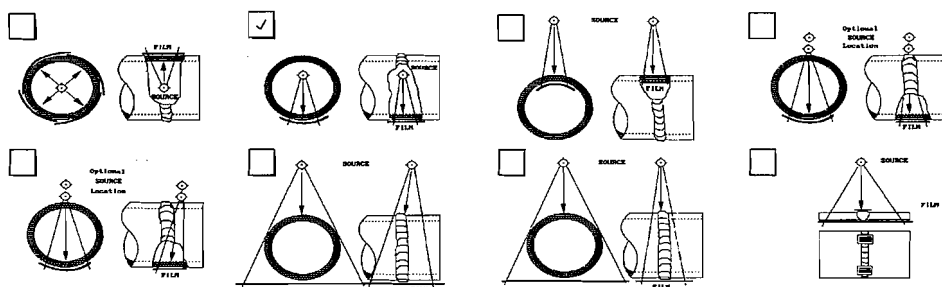
Report No.

IS-APN-E-11570-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-11570	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. 4
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 심두께	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. 3 (ISC-RT-06) ASME SEC.VIII DIV.1 2010ED.+2011ADD. UW-51 API660(8th ED.2007)
No. Of Exposures 노출횟수	31	No. Film/Cassette Cassette 내 Film 매수	1 SH'T

Exposure Setup

Location Marker Placement ☐ Source Side ☒ Film SideTotal Sheet 31 SH'T
촬영매수

Remarks

☒ Reviewed by
☐ Witnessed by

QA DEPT.
ASNT Level III S.S. LEE
Cert No. 210531
DATE Aug. 28. 2014

Examined by

시행 C.J.KWON

Level

레벨 II

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

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
☐ WITNESSED

Date / Signature:

Germanischer Lloyd

Industrial Service

방사선 투과 시험 보고서

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ASME

Report No.

IS-APN-E-11570-RT-002

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Joint No. 확인번호	Film No. 필름번호	합 격	불 합	균열 Crack	용접부 불합격 Lack of Penet.	용접부 불합격 Lack of Fusion	슬래그 불합격 Slag Inclusion	기공 Porosity	언더컷 Undercut	번스루 Burn through	텅스텐 불합격 Tungsten Incl.	표면지시 Surface Indications	크레이터 Crater pit	루트오목부 Root Concavity	기 타	Grade 등급	Reject Cause 불합격 원인	Welder ID No. 용접사번호	Remarks 비고
E-11570																			
A02	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						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					V											1015	
	1 - 2R	V						V										1015	
	2 - 3	V																1015	
	3 - 4	V																1015	
	4 - 5	V																1015	

Reviewed by
ISQ
WITNESSED BY
CALIF. ASNT Level III S.S. EE
Cert. No. 210001
Date Aug 26, 2014

☐ REVIEWED
☐ WITNESSED

Date / Signature:

Germanischer Lloyd
Industrial ServiceExamined by C.J. KWON
시 형Level II
레벨Approved by
승 인

B.M. SHIM

Level III
레벨

A P N Co., Ltd.

A P N Co., Ltd.

방사선 투과 시험 보고서



ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11570-RT-002

Page 3 of 3

[illegible]

Examined by C. J. KWON
시 _____

~~Level~~ II
레벨

Approved by

B.M.SHIM

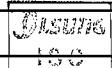
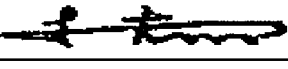
Level
레벨 III

 A P N Co., Ltd.

 A P N Co., Ltd.

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상시험보고서

 ILSUNG CORPORATION		ASME		Report No.	
				IS-APN-E-11570-REP-MT-001	
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-11570		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 불합	Interpretation 판정	Grade 등급	Remarks 비고
A04(1-2)	V		No Recordable Indication		Repaired area
			~ BLANK ~		 ☐ Reviewed by ☐ Witnessed by QA DEPT. ASNT Level III S. S. LEE Card No. 240581 DATE 16. 20. 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 검사일자/시간 2014.08.20 ☒ Date of Report 보고서 작성일자 2014.08.20	
Approved by 승인 B.M. SHIM 		Level 레벨 III		Owner/Customer 주문주/고객감독관	
A P N Co., Ltd.		A P N Co., Ltd.		☐ Third Party Inspector 공인검사관 ☐ ANI/AI	

ILSUNG

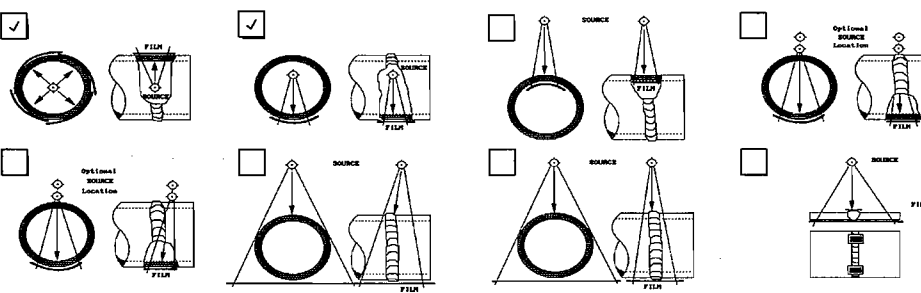
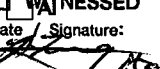
ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11570-RT-003

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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-11570	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 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, 15 ☒ 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	0.013(W7), 0.016(W8) ☒ inch ☐ mm
Exposure Time 노출 시간	hr min 55 sec ~ hr 4 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)	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
Specified Density 특화도	2.0 ~ 4.0	Lead Backing 산란방지 납판	☒ Yes 유 ☐ No 무
Surface Condition 표면 상태	☐ 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	11	No. Film/Cassette Cassette 내 Film 매수	1 SH'T
Exposure Setup		Total Sheet 26 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	☒ Date of Examination 검사일자 2014.09.13 ~ 30 ☒ Date of Report 보고서 작성일자 2014.10.01	
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 ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services	

방사선 투과 시험 보고서

ILSUNG**ILSUNG CORPORATION****ASME**

Report No.

IS-APN-E-11570-RT-003

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Joint No. 확인 번호	Film No. 필름번호	합 격	불 합	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-11570																			
T1-B01	1 - 2	V																837	
	2 - 3	V						V										837	
	3 - 4	V						V										837	
	4 - 5	V																837	
	5 - 6	V																837	
	6 - 7	V						V										837	
	7 - 8	V																837	
	8 - 9	V																837	
	9 - 1	V																837	
T2-B01	1 - 2	V						V										837	
	2 - 3	V																837	
	3 - 4	V																837	
	4 - 5	V																837	
	5 - 6	V																837	
	6 - 7	V																837	
	7 - 8	V																837	
	8 - 1	V																837	
A01	1 - 2	V																025	
	2 - 3	V																025	
	3 - 4	V																025	
	4 - 5	V																025	
	5 - E	V																025	
A05	1 - 2	V																025	
	2 - 3	V																025	
	3 - 4	V																025	

 Reviewed by
 ISC Witnessed by
 QA DEPT.
 ASNT Level III S. S. LEE
 Cert No. 210561
 DATE Oct. 9, 2014

☒ REVIEWED
☐ WITNESSED
 Date / Signature:

 Germanischer Lloyd
 Industrial Services

Examined by C. J. KWON

시 형

Level II
레벨

Approved by B. M. SHIM

승 인

Level III
레벨 A P N Co., Ltd. A P N Co., Ltd.

LSUNG

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IS-APN-E-11570-RT-003

Page 3 of 3

☒ REVIEWED
☐ WITNESSED
Date / Signature: *[Signature]* 15/02
Germanischer Lloyd
Industrial Services

Level III
레벨 III

 A P N Co., Ltd.



ILSUNG CORPORATION

ASME

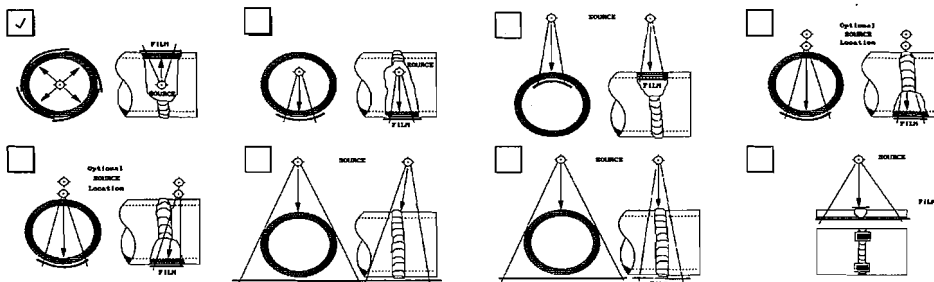
Report No.

IS-APN-E-11570-RT-004

Page 1 of 4

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-11570	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 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	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 촉점 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 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 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	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
I.C. DWitnessed by
QA DEPT.
ASNT Level III 2-8-1112
C-1 No. 210551
DATE 10/3/14

Examined by

시험 C.J.KWON

Level

레벨 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

승인 B.M.SHIM

Level

레벨 III

☒ Reviewed
☒ Witnessed
Third Party Inspector 공인검사관
Date / Signature:
REVIEWED
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Serv

A P N Co., Ltd.

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Report No.

IS-APN-E-11570-RT-004

Page 2 of 4

Joint No. 확인 번호	Film No. 필름번호	합 Accept	불 Reject	균열 ① Crack	용접 불량 ② Lack of Penet.	용접 불량 ③ Lack of Fusion	슬래그 포함 ④ Slag Inclusion	기공 ⑤ Porosity	언더컷 ⑥ Undercut	번스루 ⑦ Burn through	텅스텐 포함 ⑧ Tungsten Incl.	표면지시 ⑨ Surface Indications	크레이터 ⑩ Crater pit	루트오목부 ⑪ Root Concavity	기 다	Grade 등급	Reject Cause 불합격 원인	Welder ID No. 용접사번호	Remarks 비고
E-11570																			
B01	1 - 2	V																1279	
	2 - 3	V						V										1279	
	3 - 4	V																1279	
	4 - 5	V																1279	
	5 - 6	V																1279	
	6 - 7	V						V										1279	
	7 - 8	V						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																1279	
	17 - 1	V																1279	
B07	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	

Examined by C. J. KWON

시 형

Level
레벨

II

Approved by
승 인

B. M. SHIM

Level
레벨

III

A P N Co., Ltd.

A P N Co., Ltd.

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

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ILSUNG CORPORATION

Report No.

IS-APN-E-11570-RT-004

Page 3 of 4

Joint No. 확인 번호	Film No. 필름번호	합 Accept	불 Reject	균열 ① Crack	용접 불량 ② Lack of Penet.	용접 불량 ③ Lack of Fusion	슬래그 포함 ④ Slag Inclusion	기공 ⑤ Porosity	언더컷 ⑥ Undercut	번스루 ⑦ Burn through	텅스텐 포함 ⑧ Tungsten Incl.	표면지시 ⑨ Surface Indications	크레이터 ⑩ Crater pit	루트오목부 ⑪ Root Concavity	기 타	Grade 등급	Reject Cause 불합격 원인	Welder ID No. 용접사번호	Remarks 비고
E-11570																			
B07	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																1279	
	17 - 1	V																1279	
B08	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																1279	

Examined by C. J. KWON
시 형Level II
레벨Approved by
승 인

B. M. SHIM

Level III
레벨

A P N Co., Ltd.

A P N Co., Ltd.

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

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ILSUNG CORPORATION

Report No.	
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IS-APN-E-11580-RT-004

Page 4 of 4

STATUS	☒ Reviewed by	
	DATE	COMPLETED BY
CANCELED		
ACCT	Level	2-2-LEE
CASE	No.	210301
DATE	10/6	3:20 PM

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

Level
레벨

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

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ASME

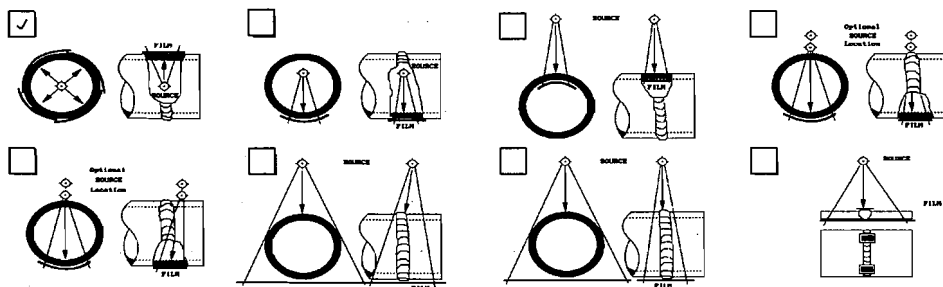
Report No.

IS-APN-E-11570-RT-005

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-11570	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 투과 위치	☐ 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. 용접 모양	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 촉점 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 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 Back 0.005 ☒ inch ☐ mm
Source side of Object to Film Distance 필름거리 (MAX)	19 ☐ inch ☒ mm	"B" Attached	☒ Yes 유 ☐ No 무
Speafied Density 흑화도	2.0 ~ 4.0	Lead Backing 산란방지 납판	☒ Yes 유 ☐ No 무
Surface Condition 표면 상태	☐ 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 API660(8th ED.2007)
No. Of Exposures 노출 횟수	2	No. Film/Cassette Cassette 내 Film 매수	1 SH'T

Exposure Setup

Location Marker Placement ☐ Source Side ☒ Film Side

Total Sheet 34 SH'T

Remarks

Reviewed by
ISC ☐ Witnessed by

QA DEPT.
ASNT Level III S-S LEE
Cert No. 210331
DATE Nov. 21. 2014

Examined by

시 형 C.J.KWON

Level

II

☒ Date of Examination 검사일자 2014.11.19
☒ Date of Report 보고서 작성일자 2014.11.20

APN Co., Ltd.

Approved by

승 인 B.M.SHIM

Level

III

Owner/Customer 주문주/고객감독관

☒ Reviewed
☐ Witnessed

Third Party Inspector 공인검사관

REVIEWED
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Service

방사선 투과 시험 보고서

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Report No.

IS-APN-E-11570-RT-005

Page 2 of 3

Joint No. 확인 번호	Film No. 필름번호	Accept 합격	Reject 불합격	① Crack 균열	② Lack of Penet. 투과 불량	③ Lack of Fusion 용접 불량	④ Slag Inclusion 슬래그 혼입	⑤ Porosity 기공	⑥ Undercut 언더컷	⑦ Burn through 번스루	⑧ Tungsten Incl. 텅스텐 혼입	⑨ Surface Indications 표면지시	⑩ Crater pit 크레이터핏트	⑪ Root Concavity 루트오목부	기타	Grade 등급	Reject Cause 불합격 원인	Welder ID No. 용접사번호	Remarks 비고
E-11570																			
B04	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																1279	
	17 - 1	V																1279	
B05	1 - 2	V							V									1279	
	2 - 3	V					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	

Examined by C. J. KWON
시 험Level II
레벨Approved by
승 인

B. M. SHIM

Level III
레벨

A P N Co., Ltd.

A P N Co., Ltd.



ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11570-RT-005

Page 3 of 3

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Examined by C. J. KWON
시 년 일

Level II
레벨 II

Approved by B.M.SHIM
승 인

Level
수레 III

 A P N Co., Ltd.

 A P N Co., Ltd.

ASME**ILSUNG****ILSUNG CORPORATION**

Report No.

IS-APN-E-11570-RT-006

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-11570	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 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	Penetrameter/Constrometer 투과도계/계조계	ASTM 1B ☒ S. Side N/A ☐ F. Side
X-ray Equipment/Radioisotope 엑스레이 장비/동위원소	N/A KVP mA Ci ☒ Ir-192 ☐ CO-60 40	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 4 min 35 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)	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 측화도	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 API660(8th ED.2007)
No. Of Exposures 노출횟수	2	No. Film/Cassette Cassette 내 Film 매수	1 SH'T
Exposure Setup 			Total Sheet 촬영매수 18 SH'T
Location Marker Placement ☐ Source Side ☒ Film Side			Remarks
Examined by 시험 C.J.KWON	Level 레벨 II	☒ Date of Examination 검사일자 2014.10.29~11.28 ☒ Date of Report 보고서 작성일자 2014.12.01	
 A P N Co., Ltd.		Owner/Customer 주문주/고객감독관 ☒ Reviewed ☐ Third Party Inspector 공인검사관	
Approved by 승인 B.M.SHIM	Level 레벨 III	 A P N Co., Ltd.	
		☒ REVIEWED ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Service	

방사선 투과 시험 보고서



ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11570-RT-006

Page 2 of 2

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Examined by C. J. KWON
시 날

Level
레벨 II

Approved by
승 인

B.M.SHIM

Level
레벨

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

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

침 투 탐 상 시 험 보 고 서

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ILSUNG CORPORATION

Report No.

IS-APN-E-11570-REP PT-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-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-11570		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/cm²		
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 15 ℃		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 ☐ Spray 분사 ☐ Immerse 침적		Handwipe 닦아냄 ☒ 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
B02 (15-16)	V			No Recordable Indication		Repaired area
				~ 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 2014.11.27		
Approved by 승 인 B.M. SHIM Level 레벨 III				☒ Date of Report 보고서 작성일자 2014.11.27		
A P N Co., Ltd.				☐ Owner/Customer주문주/고객감독관		
A P N Co., Ltd.				☐ Third Party Inspector공인검사관 ☐ ANI/AI		



Page 1 of 1

138/309

OLSUNG

ILSUNG CORPORATION

IS-APN-E-11570-UT-001

Page 1 of 1

☒ REVIEWED
☒ WITNESSED
Date / Signature: *[Signature]* 02
Germanischer Lloyd
Industrial Services

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

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-UT-002	
		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.
Item Name 품명 VRU INLET GAS COOLER		Item No. 부품번호 E-11570		Joint No. 용접선 번호 SEE IDENT.NO		

Joint Config 용접모양 "D" Joint		Method 시험방법 ☒ Contact 접촉 ☐ Immerse 수침		Surface Condition 표면상태 AS WELDED and AS GROUND		Material/Thickness 재질/두께 SA516-70N / 17T	
---------------------------------------	--	---	--	--	--	--	--

Test Temp. 시험온도 ☒ Ambient 상온 ☐ Elev. 승온		Test Equipment 시험장비		Type 형태 EPOCH XT		Manufacturer 제조사 OLYMPUS		Serial No. 일련번호 081113804		Due Date 만료일자 2015.06.12	
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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+	2M	KrautKramer
	MWB45-4	45°	4MHz	8*9	MWB	56927-70186		Lemo01		
	MWB70-4	70°	4MHz	8*9	MWB	56929-73828				

Test Angle 시험각도 ☒ 0° ☒ 45° ☐ 60° ☒ 70°			Couplant 점착매질 ☐ Glycerin 글리세린 ☐ Oil 오일 ☒ CMC			Calibration Block 교정블록 IIW, REFERENCE BLOCK		
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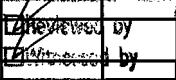
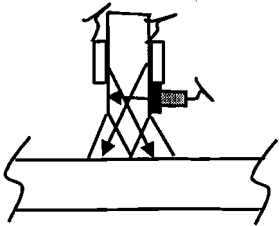
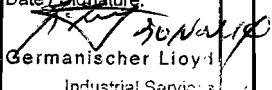
Ident. No. 확인번호	Accept 합	Reject 불	Location 위치 from	Length 길이	Width 폭	Depth 깊이	% DAC (MAX) 보정곡선	Grade 등급	Remarks 비고
Nozzle to shell S1, S2	V		No Recordable Indication						Final
~ BLANK ~									
Reviewed by Witnessed by CA DEPT S. J. HWANG DATE Nov. 13, 2014									

Sketch of Scanning

☐ 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	☒ Date&Time of Examination 검사일자/시간 2014.11.13	
			☒ Date of Report 보고서 작성일자 2014.11.13	
Approved by 승인 B.M. SHIM A P N Co., Ltd.		Level 레벨	☐ Owner/Customer 주문주/고객감독관 ☐ Third Party Inspector 공인검사관	☒ REVIEWED ☐ ANNOTATED Date / Signature Germanische Industrie

ISQ-009-2-2

 ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-UT-003	
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. 트래블러 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) ASME SEC.VIII,div.1 2010 ED.+ 2011 ADD. APP12 ASME SEC V SA578 Level C + API 660(8th ED.2007)		Rev. 	
Item Name 품명 VRU INLET GAS COOLER		Item No. 부품번호 E-11570	
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 / 36T	
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			
Type 형태 4C10N/4MHz		Block Angle 교정각도 0°	
Frequency 주파수 4MHz		Size 크기 10Ø	
Manufacturer 제조사 TKS		Serial No. 일련번호 NEEA226	
Type 형태 MWB45-4		Block Angle 교정각도 45°	
Frequency 주파수 4MHz		Size 크기 8*9	
Manufacturer 제조사 MWB		Serial No. 일련번호 56927-70186	
Type 형태 MWB70-4		Block Angle 교정각도 70°	
Frequency 주파수 4MHz		Size 크기 8*9	
Manufacturer 제조사 MWB		Serial No. 일련번호 56929-73828	
Type 형태 Lemo00+ Lemo01		Length 길이 2M	
Manufacturer 제조사 KrautKramer			
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	
Lifting lug welded area		V	
No Recordable Indication		Final (shell Side)	
~ BLANK ~			
			
QA DEPT.		DATE	
S. I. KANG		2014.11.30	
DATE		2014.11.30	
Sketch of Scanning			
			
☐ SKETCH ON DOT LINE, IF NECESSARY or ☒ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.			
Examined by 시점 C.J. KWON		Level II	
			
Approved by 승인 B.M. SHIM		Level III	
			
☒ Date&Time of Examination 검사일자/시간 2014.11.30		☒ Date of Report 보고서 작성일자 2014.11.30	
☐ Owner/Customer주문주/고객감독관		☐ Third Party Inspector공인검사관 ☐ ANI/AI	

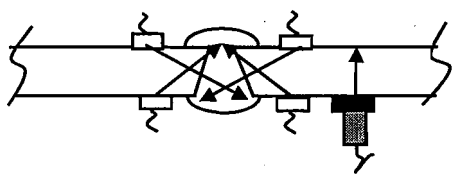
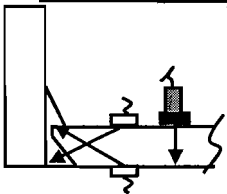
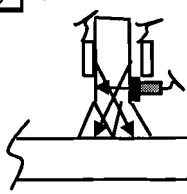


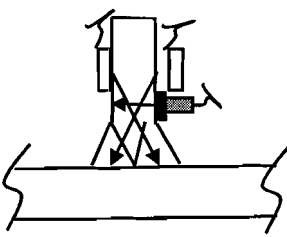
ILSUNG CORPORATION

Report No.

IS-APN-E-11570-UT-004

Page 1 of 1

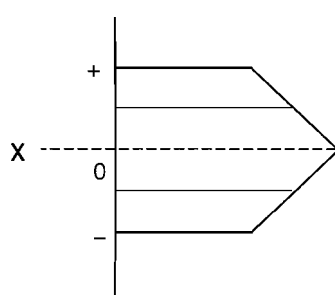
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E10070-001		Rev. 			
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure /Acc. Criteria 절차서/판정기준 VP-SG07-COMM-010(ISC-UT-06) ASME SEC.VIII.div.1 2010 ED.+ 2011 ADD. APP12 ASME SEC V SA578 Level C + API 660(8th ED.2007)					
Item Name 품명 VRU INLET GAS COOLER		Item No. 부품번호 E-11570		Joint No. 용접선 번호 SEE IDENT.NO					
Joint Config 용접모양 Butt Joint, "D" Joint, "T" 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		Type 형태 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		
	MSEB4	0°	4MHz	100	MWB	57462-22034			
	2C8X14LAD60	60°	2MHz	8*14	TKS	DLANB005			
	2C8X14LAD70	70°	2MHz	8*14	TKS	DLANC005			
							Type 형태	Length 길이	Manufacturer 제조사
							Lemo00+ Lemo01	2M	KrautKramer
Test Angle 시험각도 ☒ 0° ☒ 45° ☐ 60° ☒ 70°		Couplant 접촉매질 ☐ 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
~ BLANK ~									
  									
QA DEPT. S. J. HWANG DATE DEC. 09. 2014 Reviewed by Witnessed by									
REVIEWED WITNESSED Date / Signature: Germanischer L Industrial Ser									
☐ SKETCH ON DOT LINE, IF NECESSARY or ☒ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.									
Examined by 시행 C.J. KWON		Level 레벨 II		☒ Date&Time of Examination 검사일자/시간 2014.12.09		☒ Date of Report 보고서 작성일자 2014.12.09			
Approved by 승인 B.M. SHIM		Level 레벨 III		☐ Owner/Customer주문주/고객감독관		☐ Third Party Inspector공인검사관 ☐ ANI/AI			
A P N Co., Ltd. A P N Co., Ltd.									

 ILSUNG CORPORATION		ASME		Report No.						
				IS-APN-E-11570-UT-005						
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-11570		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 합	Reject 불	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)	
~ B L A N K ~										
										
Reviewed by J. S. LEE Witnessed by J. S. LEE QA DEPT. J. S. LEE DATE Dec. 19. 2014										
Sketch of Scanning										
										
☒ REVIEWED ☐ WITNESSED Date / Signature: J. S. LEE 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 2014.12.19 ☒ Date of Report 보고서 작성일자 2014.12.19						
Approved by 승인 B.M. SHIM		Level 레벨 III		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI						
 APN Co., Ltd.		 APN Co., Ltd.								

REPORT OF ULTRASONIC EXAMINATION

초음파탐상검사보고서

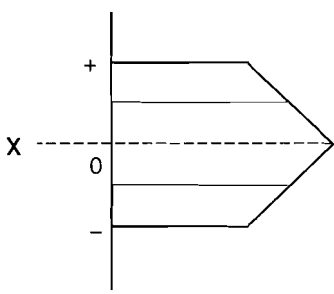
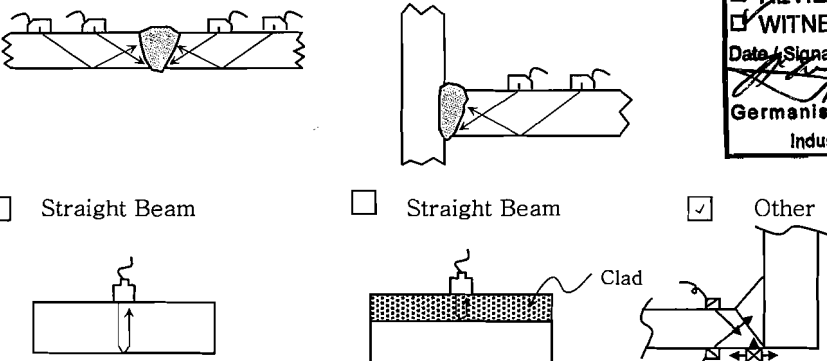
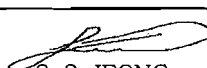
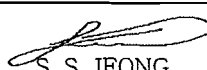
Page 1 of 2

SITCO 서울 검사 주식회사 SEOUL INSPECTION & TESTING Co., Ltd. 서울특별시 서초구 바우피로 41길54(양재동) TEL : (02) 552-1112 FAX : (02) 2058-1120		Customer 발주처 SIEP					
Project Name 공사명 CARMON CREEK PROJECT		Item Name / No. 품명 E-11570 / VRU INLET GAS COOLER					
Job / Contract No. 계약번호 N/A		Report No. 보고서 번호 SITCO/US-SIEP/IS-UT-E-11570-001					
Dwg.도면 / Mfg. No.제작번호 Rev. VP-SG07-E11570-001 04		Surface condition 표면상태 AS WELDED & GROUND					
Material 재질 / Thickness 두께 SA516-70(N) 17 mm		Welding Method 용접방법 SMAW					
Testing Equip. Maker/Type 제작사 및 형식 시험장비 OLYMPUS/EPOCH XT		Serial No. 직선성 131465001					
Method 검사방법 ☒ Contact 접촉 ☐ Immerse 수침		Couplant 접촉매질 ☐ Glycerin ☐ Oil ☒ C.M.C					
Calibration Block 교정시험편 IIW		Reference Block 대비시험편 Basic Calibration Block(19T)					
Groove Type 개선행태 ☐ I ☒ V ☐ X ☒ Bevel		Amp. Control within ± 20 % FSH Screen Height within ± 5 % FSH					
Test Sensitivity 탐상감도 FSH 80 % ☒ + 6 dB ☐ - dB		Calibration Sheet 교정기록 SITCO-UT-001 ☒ Attached 첨부					
Transducer 탐촉자	Type 형태	Nominal Angle 공칭 각도(°)	Calibration Angle 교정각도(°)	Frequency 주파수(MHz)	Size 크기(mm)	Serial No. 일련 번호	Cable Type and Length 케이블 형태 및 길이
	MWB70-4E	70	69.5	4	8X9	56929-71849	RG-174/2M
	MWB60-4E	60	60	4	8X9	56928-72984	RG-174/2M
	MSEB5	0	0	5	Ø9/2(Dual)	57464-50403	RG-174/2M
Distance measured from "0" Testing Method  거리측정은 "0"점부터 할 것. ☐ Angle Beam (Butt-Joint) ☐ Angle Beam (Fillet-Joint) ☐ Straight Beam ☐ Straight Beam ☒ Other REVIEWED & WITNESSED Date / Signature Germanischer Lloyd Industrial Services							
☐ Sketch on line. If necessary or ☐ Attached 필요시 선안에 스케치 또는 첨부할 것							
Examined by : <u>S. S. JEONG</u> Level II 시 험 판 정				☒ Date of Examination 시험일자 2014.11.14			
Interpreted by : <u>S. S. JEONG</u> Level II 판 정				☐ Owner / Customer 주문주 / 고객 감독관			
Approved by : <u>H. Y. CHUN</u> Level III 승 인				☐ Third party Inspector ☐ ANI / AI 공인 검사관			

REPORT OF ULTRASONIC EXAMINATION

초음파탐상검사보고서

Page 1 of 2

SITCO 서울 검사 주식회사 SEOUL INSPECTION & TESTING Co., Ltd. 서울특별시 서초구 바우피로 41길54(양재동) TEL : (02) 552-1112 FAX : (02) 2058-1112		Customer 발 주 처 SIEP					
Project Name 공사명 CARMON CREEK PROJECT		Item Name / No. 품명 E-11570 / VRU INLET GAS COOLER					
Dwg.도면 / Mfg. No.제작번호 Rev. VP-SG07-E11570-001 04		Surface condition 표면상태 AS WELDED & GROUND					
Material 재질 / Thickness 두께 SA240-S31803 15 mm		Welding Method 용접방법 SMAW					
Testing Equip. Maker/Type 제작사 및 형식 시험장비 OLYMPUS/EPOCH XT		Serial No. 131465001					
Method 검사방법 ☒ Contact 접촉 ☐ Immerse 수침		Couplant 접촉매질 ☐ Glycerin ☐ Oil ☒ C.M.C					
Calibration Block 교정시험편 IIW		Reference Block 대비시험편 Basic Calibration Block(19T)					
Groove Type 개선행태 ☐ I ☒ V ☐ X ☒ Bevel		Amp. Control within $\pm 20\%$ FSH Screen Height within $\pm 5\%$ FSH					
Test Sensitivity 탐상감도 FSH 80 % ☒ + 6 dB ☐ - dB		Calibration Sheet 교정기록 SITCO-UT-001 ☒ Attached 첨부					
Transducer 탐 측 자	Type 형 태	Nominal Angle 공칭 각도(°)	Calibration Angle 교정각도(°)	Frequency 주파수(MHz)	Size 크기(mm)	Serial No. 일련 번호	Cable Type and Length 케이블 형태 및 길이
	RTD	CREEP	69.5	2	6x13	12-345	RG-174/2M
	RTD	70	63	2	8x14	12-1941	RG-174/2M
	RTD	70	68	2	10x18	12-347	RG-174/2M
MSEB5	0	0	5	Ø9/2(Dual)	57464-50403	RG-174/2M	
Distance measured from "0" 							
Testing Method ☐ Angle Beam (Butt-Joint) ☐ Angle Beam (Fillet-Joint) ☐ Straight Beam ☐ Straight Beam ☒ Other 							
거리측정은 "0"점부터 할 것. 필요시 선안에 스케치 또는 첨부할 것							
Examined by :  Level II 시 험 S. S. JEONG 등 급				☒ Date of Examination 시험일자 2014.11.14			
Interpreted by :  Level II 판 정 S. S. JEONG 등 급				☐ Owner / Customer 주문주 / 고객 감독관			
Approved by :  Level III 승 인 H. Y. CHUN 등 급				☐ Third party Inspector ☐ ANI / AI 공인 검사관			

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상시험보고서

ASME

ILSUNG

ILSUNG CORPORATION

Report No.

IS-APN-E-11570-MT-003

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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-11570		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
Category "D" of nozzle S1,S2	V		No Recordable Indication		Back gouging 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/Customer 주문주/고객감독관		
A P N Co., Ltd.			☒ Date&Time of Examination 검사일자/시간 2014.10.28 ☒ Date of Report 보고서 작성일자 2014.10.28 ☐ Third Party Inspector 공인검사관 ☐ ANI/		

ILSUNG ISC
Reviewed by
Witnessed by
QA DEPT. S. J. HWANG
DATE 2014.10.28

REVIEWED
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Serv

자 분 탐 상 시 험 보 고 서

ASME

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-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-11570		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 ☐ μw/cm²		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
☒ Date of Report 보고서 작성일자

2014.11.28

2014.11.28

Owner/Customer주문주/고객감독관

☐ Third Party Inspector공인검사관 ☐ ANI/AI

REVIEWED
 WITNESSED
 Date / Signature:
 Germanischer Lloyd
 Industrial Service



ILSUNG CORPORATION

Report No.

IS-APN-E-11570-MT-005

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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-11570

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

4 ~ 6

☐ cm

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
합Reject
불

Interpretation

판정

Grade
등급

Remarks

비고

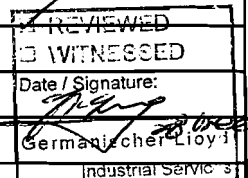
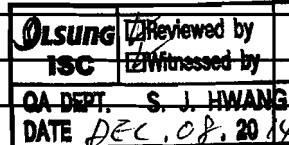
Shell to tubesheet
B03,B06

V

No Recordable Indication

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After 1'st welded

☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.Examined by
시험 C.J. KWONLevel
레벨 II

A P N Co., Ltd.

Approved by
승인 B.M. SHIMLevel
레벨 III

A P N Co., Ltd.

☒ Date&Time of Examination 검사일자/시간 2014.12.08☒ Date of Report 보고서 작성일자 2014.12.08

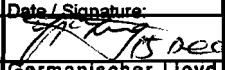
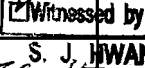
Owner/Customer 주문주/고객감독관

☐ Third Party Inspector 공인검사관 ☐ ANI/AI

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상시험보고서

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 ILSUNG CORPORATION		Report No. IS-APN-E-11570-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 ☒ Reject ☐	
Main seam A02,A03,A04,B03,B04,B05,B06		No Recordable Indication	
All welded of nozzle area S1,S2		No Recordable Indication	
Temporary attachment removed area		No Recordable Indication	
All attachment welded area		No Recordable Indication	
Arc strike removed area		No Recordable Indication	
Lifting lugs welded area		No Recordable Indication	
~ BLANK ~			
		☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services	
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선위에 스케치하거나 또는 첨부할 것.		Reviewed by  Witnessed by  QA DEPT. S. J. HWANG DATE DEC 15 2014	
Examined by 시 형 C.J. KWON  Level 레벨 II		☒ Date&Time of Examination 검사일자/시간 2014.12.15 ☒ Date of Report 보고서 작성일자 2014.12.15	
Approved by 승인 B.M. SHIM  Level 레벨 III		Owner/Customer주문주/고객감독관	
A P N Co., Ltd.		☐ Third Party Inspector공인검사관 ☐ ANI/AI	

ASME ILSUNG CORPORATION		Report No. IS-APN-E-11570-PT-002	
		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-11570		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/cm²		
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 24 ℃		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 ☒ Spray 분사 ☐ Immerse 침적 적용		Dwell time 침투시간 10 min 분	
Emulsifier 유 화 제	Brand상표, Type형태, Batch No.제조번호 N/A		Apply ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적 적용		Dwell time 방치시간 min 분	
Remover 세 척 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14		Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 적용		☐ Wash 씻어냄	
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14		Apply ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적 적용		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		Back gouging area
			~ B L A N K ~		

Reviewed by
Witnessed by

QA DEPT.
DATE: 2014.09.25

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 C.J. KWON Level II 시 형		☒ Date&Time of Examination 검사일자/시간 2014.09.23 ☒ Date of Report 보고서 작성일자 2014.09.23	
A P N Co., Ltd.		☐ Owner/Customer주문주/고객감독관	
Approved by B.M. SHIM Level III 승 인		☐ Third Party Inspector공인검사관 ☐ ANI/AI	
A P N Co., Ltd.			



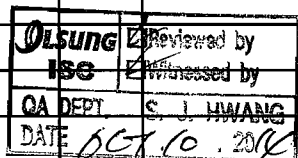
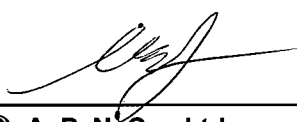
ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11570-PT-003

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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-11570		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 20 ℃		Light Source 조명 장비 GLOW LAMP 550 W	
				Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침투제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분	
Emulsifier 유화제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용	☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분	
Remover 세척제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용	☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄		
Developer 현상제	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. 확인번호	Accept 합	Reject 불	Interpretation 판정	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.			 ☒ REVIEWED ☐ WITNESSED Date / Signature:  Germanischer Lloyd Industrial Services 2014.10.10		
Examined by 시행	S.M. LEE 	Level 레벨	II	☒ Date&Time of Examination 검사일/시간 ☒ Date of Report 보고서 작성일자 2014.10.10 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI	
Approved by 승인	B.M. SHIM 	Level 레벨	III		
 A P N Co., Ltd.		 A P N Co., Ltd.			



ILSUNG CORPORATION

ASME

Report No.

IS-APN-E-11570-PT-004

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ASME ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-PT-005	
		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-11570		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 ☐ μw/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 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	Bleed out 흡출시간 15 min 분
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPDP-4 / 13NPDP14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	

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

ILSUNG
 ISC Reviewed by
 S. J. HWANG Witnessed by
 QA DEPT. DATE OCT. 16 . 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 Level 레벨 II A P N Co., Ltd.	☒ Date&Time of Examination 검사일/시간 2014.10.16 ☒ Date of Report 보고서 작성일자 2014.10.16 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI
Approved by 승 인 B.M. SHIM Level 레벨 III A P N Co., Ltd.	

ASME ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-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. 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-11570		Surface Condition 표면상태 AS GROUND and 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 SA240-S31803 / 15T	Test temp. 시험온도 20 ℃	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침투제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적		Dwell time 침투시간 10 min
Emulsifier 유화제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용	☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적		Dwell time 방치시간 min
Remover 세척제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용	☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄		
Developer 현상제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적		Bleed out 흡출시간 15 min

Ident. No. 확인번호	Accept 합	Reject 불	Interpretation 판정	Grade 등급	Remarks 비고
Main seam B01,B02	V		No Recordable Indication		Back gouging area
			~ B L A N K ~		

Reviewed by
 Witnessed by
 QA DEPT. **S. J. HWANG**
 DATE **OCT. 17. 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 2014.10.17 ☒ Date of Report 보고서 작성일자 2014.10.17
Approved by 승 인 B.M. SHIM A P N Co., Ltd.	Level 레벨	III	☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI

REPORT OF PENETRANT EXAMINATION

침투탐상시험보고서

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-PT-007	
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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-11570		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 18 ℃	Light Source 조명 장비 GLOW LAMP 550 W		Light-Source to Object Distance/LUX 조명거리/광도 150 cm 1130 Lux	
Penetrant 침투제 NAWOO / NPP-2 / 13NPP14	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용 ☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적		Dwell time 침투시간 10 min 분	
Emulsifier 유화제 N/A	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용 ☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적		Dwell time 방치시간 min 분	
Remover 세척제 NAWOO / NPR1-3 / 13NPR14	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용 ☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄			
Developer 현상제 NAWOO / NPD-4 / 13NPD14	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. 확인번호	Accept 합	Reject 불	Interpretation 판정	Grade 등급	Remarks 비고
Category "D" of nozzle T2,T3	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. J. HWANG
 Date NOV. 11. 2014

Examined by
시 형
C.J. KWON

A P N Co., Ltd.

Level
레벨
II

Approved by
승 인
B.M. SHIM

A P N Co., Ltd.

Level
레벨
III

☒ Date&Time of Examination 검사일자/시간 **2014.11.11**
☒ Date of Report 보고서 작성일자 **2014.11.11**
☐ Owner/Customer주문주/고객감독관
☐ Third Party Inspector공인검사관 ☐ ANI/AI

☒ REVIEWED
☐ WITNESSED
 Date / Signature:

Germanischer Lloyd Industrial Services

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-PT-008	
		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-11570		Surface Condition 표면상태 AS GROUND	
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 SA240-S31803 / 15T	Test temp. 시험온도 18 ℃	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,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. J. HWANG
 Witnessed by [Signature]
 DATE NOV. 12. 2014

Examined by C.J. KWON Level **II**
 시 형 A P N Co., Ltd.

Approved by B.M. SHIM Level **III**
 승 인 A P N Co., Ltd.

☒ Date&Time of Examination 검사일자/시간 **2014.11.12**

☒ Date of Report 보고서 작성일자 **2014.11.12**

☐ Owner/Customer주문주/고객감독관

☐ Third Party Inspector공인검사관 ☐ ANI/AI

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

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-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) 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-11570		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/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 T2,T3	V		No Recordable Indication		Back gouging area
			~ B L A N K ~		

Reviewed by
Disseminated by
S. J. HWANG
DATE **2014.12.20**

☒ 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 Level II A P N Co., Ltd.	☒ Date&Time of Examination 검사일자/시간 2014.11.12 ☒ Date of Report 보고서 작성일자 2014.11.12 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI
Approved by 승 인 B.M. SHIM Level III A P N Co., Ltd.	

침 투 탐 상 시 험 보 고 서

ASME

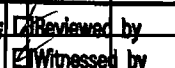
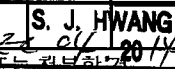
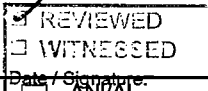


ILSUNG CORPORATION

IS-APN-E-11570-PT-010

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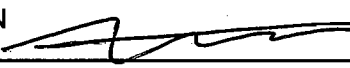
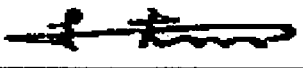
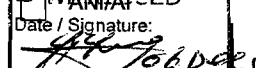
 ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-PT-011	
Page 1 of 1			
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY	
Dwg. No. 도면번호 VP-SG07-E11570-001		Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391	
Procedure / Acc Criteria 절차서/판정기준 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-11570	
Surface Condition 표면상태 AS GROUND and 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/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
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 	
		QA DEPT. S. J. HWANG DATE Dec 04 2014	
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부함			
Examined by 시험 C.J. KWON 		Level II Date&Time of Examination 검사일/시간 2014.12.04 Date of Report 보고서 작성일자 2014.12.04	
Approved by 승인 B.M. SHIM 		Level III Owner/Customer주문주/고객감독관 Third Party Inspector공인검사관	
A P N Co., Ltd.		REVIEWED WITNESSED Date / Signature  Germanischer Lloyd Industrial Service	

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

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ASME

 ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-PT-012	
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-11570	
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 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 흘출시간 15 min 분
Ident. No. 확인 번호	Accept 합	Reject 불	Interpretation 판 정
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 ~
			 Reviewed by Witnessed by QA DEPT. S. J. HWANG 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  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 검사일/시간 2014.12.06 ☒ Date of Report 보고서 작성일자 2014.12.06 ☐ Owner/Customer 주문주/고객감독관 ☐ Third Party Inspector 공인검사관	
		REVIEWED EVALUATED Date / Signature:  Germanischer Lloyd Industrial Services	

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REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-PT-014	
		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-11570		Surface Condition 표면상태 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/cm²	
Material/Thickness 재질/두께 SA789-S31803 / 1.63T	Test temp. 시험온도 16 ℃	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
Tube to tubesheet	V		No Recordable Indication		Final pass layer - 3904hole
			~ B L A N K ~		

QA DEPT.
DATE DEC. 12, 2014

Reviewed by
Witnessed by
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 형 C.J. KWON A P N Co., Ltd.	Level II 레벨 ☒ Date&Time of Examination 검사일/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 III 레벨

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

ILSUNG CORPORATION		Report No.	
		IS-APN-E-11570-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-11570		Surface Condition 표면상태 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/cm²	
Material/Thickness 재질/두께 SA789-S31803 / 1.63T	Test temp. 시험온도 16 ℃	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 Dwell time 침투시간 적용 ☒ Spray 분사 ☐ Immerse 침적 10 min 분			
Emulsifier 유 화 제	Brand상표,Type형태, Batch No.제조번호 N/A	Apply ☐ Flow-on 흘림 Dwell time 방치시간 적용 ☐ Spray 분사 ☐ Immerse 침적 min 분			
Remover 세 척 제	Brand상표,Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply ☐ Brush 솔질 ☒ Handwipe 닦아냄 Dwell time 닦아냄 시간 적용 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄 min 분			
Developer 현 상 제	Brand상표,Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ Brush 솔질 Bleed out 흡출시간 적용 ☒ Spray 분사 ☐ Immerse 침적 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		After tube expending Final pass layer - 3904hole
			~ B L A N K ~		

ISC
Reviewed by
S. J. HWANG
DATE **DEC 18. 2014**

REVIEWED
WITNESSED
Date / Signature:

Germanischer Lloyd
Industrial Services

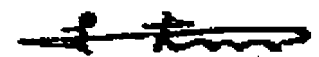
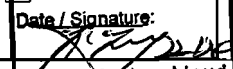
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할 것.

Examined by 시 형 C.J. KWON A P N Co., Ltd.	Level II 레벨 ☒ Date&Time of Examination 검사일자/시간 2014.12.18 ☒ Date of Report 보고서 작성일자 2014.12.18 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐ ANI/AI
Approved by 승 인 B.M. SHIM A P N Co., Ltd.	Level III 레벨

REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 형 보 고 서

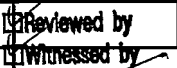
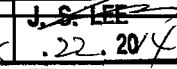
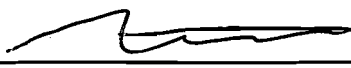
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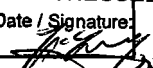
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ILSUNG CORPORATION				Page <u>1</u> of <u>1</u>	
Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / 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-11570		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 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 Witnessed by QA DEPT. S. LEE DATE Dec. 22, 2014		
☐ 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		
Approved by 승 인 B.M. SHIM  A P N Co., Ltd.			Level 레벨 III		
			☒ Date&Time of Examination 검사일/시간 2014.12.22 ☒ Date of Report 보고서 작성일자 2014.12.22 ☐ 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

PAGE 52

 ILSUNG CORPORATION		ASME		Report No.	
				IS-APN-E-11570-PT-017	
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-11570		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/cm²	
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 흘출시간 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		After hydro Channel fixed outside final
All welded of nozzle area T1,T4	V		No Recordable Indication		After hydro Channel fixed outside final
Temporary attachment removed area	V		No Recordable Indication		After hydro Channel fixed outside final
All attachment welded area	V		No Recordable Indication		After hydro Channel fixed outside final
Arc strike removed area	V		No Recordable Indication		After hydro Channel fixed outside final
Lifting lugs welded area	V		No Recordable Indication		After hydro Channel fixed outside final
			~ 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  A P N Co., Ltd.		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  A P N Co., Ltd.		Level 레벨 III		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관 ☐	

 REVIEWED
 WITNESSED
 Date / Signature:

 Germanischer Lloyd
 Industrial Serv

6-1. NDE Records for Lifting Points

ASME

ILSUNG

ILSUNG CORPORATION

Report No.

IS-APN-E-11570-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. 
Item Name 품명 VRU INLET GAS COOLER		Joint No. 용접선 번호 SEE IDENT.NO	

Joint Config 용접모양 Butt Joint, "D" Joint, "T" Joint	Method 시험방법 ☒ Contact 접촉 ☐ Immerse 수침	Surface Condition 표면상태 AS WELDED and AS GROUND	Material/Thickness 재질/두께 SA240-S31803 / 15T
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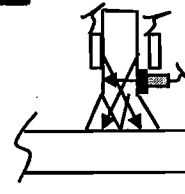
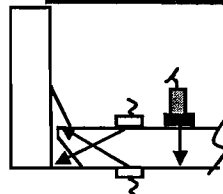
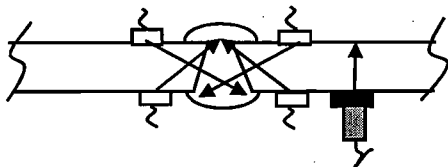
Test Temp. 시험온도 ☒ Ambient 상온 ☐ Elev. 승온	Test Equipment 시험장비 EPOCH XT	Type 형태 OLYMPUS	Manufacturer 제조사 OLYMPUS	Serial No. 일련번호 081113804	Due Date 만료일자 2015.06.12
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Transducer 탐촉자	Type 형태	Block Angle 교정각도	Frequency 주파수	Size 크기	Manufacturer 제조사	Serial No. 일련번호	Cable 케이블	Type 형태	Length 길이	Manufacturer 제조사
	MSEB4	0°	4MHz	10Ø	MWB	57462-22034		Lemo00+	2M	KrautKramer
	2C8X14LAD60	60°	2MHz	8*14	TKS	DLANB005		Lemo01		
	2C8X14LAD70	70°	2MHz	8*14	TKS	DLANC005				

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
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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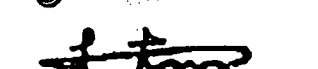
Sketch of Scanning



Reviewed by S. J. HWANG	Witnessed by
QA DEPT.	
DATE DEC. 09. 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 검사일자/시간 2014.12.09
Approved by 승인 B.M. SHIM	Level 레벨 III	☒ Date of Report 보고서 작성일자 2014.12.09
  A P N Co., Ltd.		☐ Owner/Customer 주문주/고객 감독관 ☐ Third Party Inspector 공인검사관 ☐ ANI/AI

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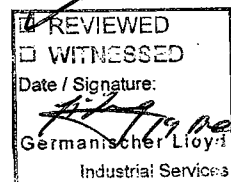
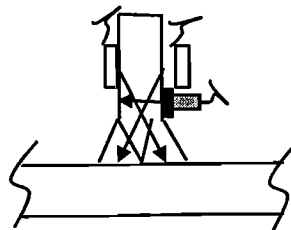
Report No.

IS-APN-E-11570-UT-005

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.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-11570		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		Type 형태 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 점착매질 ☐ 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	
Lifting lug welded area	V		No Recordable Indication						Final(Channel cover side)	
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 ISC Reviewed by Witnessed by QA DEPT. J. S. LEE DATE Dec. 19. 2014										

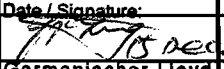
Sketch of Scanning


☐ 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 2014.12.19
Approved by 승인 B.M. SHIM		Level 레벨 III	☒ Date of Report 보고서 작성일자 2014.12.19
 A P N Co., Ltd.		☐ Owner/Customer주문주/고객감독관	
 A P N Co., Ltd.		☐ Third Party Inspector공인검사관 ☐ ANI/AI	

REPORT OF MAGNETIC PARTICLE EXAMINATION

자분탐상시험보고서

 ILSUNG CORPORATION		Report No. IS-APN-E-11570-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	
Reject 불		Grade 등급	
Remarks 비고		Interpretation 판정	
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 ~			
☒ REVIEWED ☐ WITNESSED Date / Signature  Germanischer Lloyd Industrial Services		Reviewed by Witnessed by S. J. HWANG QA DEPT. DATE DEC 15, 2014	
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선위에 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	



ILSUNG CORPORATION

Report No.

IS-APN-E-11570-PT-011

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of

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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-11570		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 침투제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분	
Emulsifier 유화제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용	☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분	
Remover 세척제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용	☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄		
Developer 현상제	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. 확인번호	Accept 합	Reject 불	Interpretation 판정		Grade 등급
Remarks 비고					
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 ~					
 ISC QA DEPT. DATE 2014.12.04 Reviewed by S. J. HWANG Witnessed by 3/5/03					
☐ SKETCH ON DOT LINE, IF NECESSARY or ☐ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부함.					
Examined by 시험 C.J. KWON A P N Co., Ltd.			Level II 레벨		
Approved by 승인 B.M. SHIM A P N Co., Ltd.			Level III 레벨		
			☒ Date&Time of Examination 검사일/시간 2014.12.04 ☒ Date of Report 보고서 작성일자 2014.12.04 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관		
			REVIEWED WITNESSED Date / Signature Germanischer Lloyd Industrial Service		

ASME

ILSUNG

ILSUNG CORPORATION

Report No.

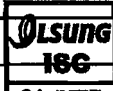
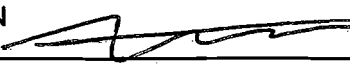
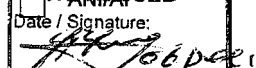
IS-APN-E-11570-PT-012

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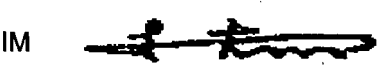
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Project Name 공사명 CARMON CREEK PROJECT		Customer 주문주 SHELL CANADA ENERGY		Dwg. No. 도면번호 VP-SG07-E11570-001 Rev. 	
Traveller/PCS No. 트레블라 N/A		Work Order No. & P/O No. 공사번호 P-13SG-007 / 4511951391		Procedure / Acc Criteria 절차서/판정기준 VP-SG07-COMM-010 (ISC-PT-06) 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-11570		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 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 침투제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPP-2 / 13NPP14	Apply 적용	☐ Brush 솔질 ☒ Spray 분사 ☐ Immerse 침적	Dwell time 침투시간 10 min 분	
Emulsifier 유화제	Brand상표, Type형태, Batch No.제조번호 N/A	Apply 적용	☐ Flow-on 흘림 ☐ Spray 분사 ☐ Immerse 침적	Dwell time 방치시간 min 분	
Remover 세척제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPR1-3 / 13NPR14	Apply 적용	☐ Brush 솔질 ☒ Handwipe 닦아냄 ☐ Spray 분사 ☐ Immerse 침적 ☐ Wash 씻어냄		
Developer 현상제	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. 확인번호	Accept 합	Reject 불	Interpretation 판정		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 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 시험 C.J. KWON  A P N Co., Ltd.			Level II 레벨		
Approved by 승인 B.M. SHIM  A P N Co., Ltd.			Level III 레벨		
			☒ Date&Time of Examination 검사일/시간 2014.12.06 ☒ Date of Report 보고서 작성일자 2014.12.06 ☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관		
			REVIEWED INITIALED Date / Signature:  Germanischer Lloyd Industrial Services		

CCK-4511951391-0100-K01-00001-073 REPORT OF PENETRANT EXAMINATION

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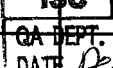
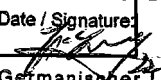
PAGE 59

 ILSUNG CORPORATION		ASME		Report No.	
				IS-APN-E-11570-PT-016	
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-11570		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/cm²	
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 ☒ 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 ☐ 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 ☐ Spray 분사 ☐ Immerse 침적		☐ Wash 씻어냄	
Developer 현 상 제	Brand상표, Type형태, Batch No.제조번호 NAWOO / NPD-4 / 13NPD14	Apply ☐ 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 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  DA DEPT. S. LEE DATE Dec. 22, 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 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  A P N Co., Ltd.		Level 레벨 III		☐ Owner/Customer주문주/고객감독관 ☐ Third Party Inspector공인검사관	
 Germanischer Lloyd Industrial Services					

CCK-4511951391-0100-K01-00001-073 REPORT OF PENETRANT EXAMINATION

침 투 탐 상 시 험 보 고 서

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		ASME ILSUNG CORPORATION		Report No. IS-APN-E-11570-PT-017	
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-11570		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/cm²	
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 16 °C		Light Source 조명 장비 GLOW LAMP 550 W	
Material/Thickness 재질/두께 SA240-S31803 / 15T		Test temp. 시험온도 16 °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 ☒ 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	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		After hydro Channel fixed outside final
All welded of nozzle area T1,T4	V		No Recordable Indication		After hydro Channel fixed outside final
Temporary attachment removed area	V		No Recordable Indication		After hydro Channel fixed outside final
All attachment welded area	V		No Recordable Indication		After hydro Channel fixed outside final
Arc strike removed area	V		No Recordable Indication		After hydro Channel fixed outside final
Lifting lugs welded area	V		No Recordable Indication		After hydro Channel fixed 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 시 험 C.J. KWON		Level 레벨 II		☒ Date&Time of Examination 검사일자/시간 2014.12.22	
Approved by 승 인 B.M. SHIM		Level 레벨 III		☒ Date of Report 보고서 작성일자 2014.12.22	
A P N Co., Ltd.				☐ Owner/Customer주문주/고객감독관	
A P N Co., Ltd.				☐ Third Party Inspector공인검사관 ☐ ANIA	
REVIEWED WITNESSED Date / Signature:  Germanischer Lloyd Industrial Servi					

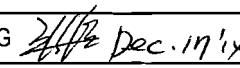
7. PMI & Ferrite Report

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-11570					
Report No.		ISC-QA-PMI-SG007-E11570			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	21.62		8.01		2.58		-	-	-	-	-	Satisfaction
CHANNEL A-05 / GT.SM-10H.10H-101H	21.68		7.83		2.53		-	-	-	-	-	Satisfaction
CHANNEL B-01 / GT.SM-10H.10H-101H	21.71		8.11		2.71		-	-	-	-	-	Satisfaction
CHANNEL B-02 / GT.SM-10H.10H-101H	21.63		7.84		2.58		-	-	-	-	-	Satisfaction
CHANNEL B-07 / GT.SM-10H.10H-101H	21.64		7.92		2.59		-	-	-	-	-	Satisfaction
CHANNEL B-08 / GT.SM-10H.10H-101H	21.62		7.96		2.63		-	-	-	-	-	Satisfaction
N/Z T1 B-01 / GT.SM-10H.10H-102H	21.72		7.83		2.58		-	-	-	-	-	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>							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			
Germanischer Lloyd Industrial Services							309		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-11570	
Report No.		ISC-QA-PMI-SG007-E11570		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	7.85	2.63	-	-	-	Satisfaction
N/Z T1 D-JOINT / SM-10H.10H-101H	21.62	7.62	2.59	-	-	-	Satisfaction
N/Z T2 D-JOINT / SM-10H.10H-101H	21.64	7.67	2.56	-	-	-	Satisfaction
N/Z T3 D-JOINT / SM-10H.10H-101H	21.56	7.73	2.57	-	-	-	Satisfaction
N/Z T4 D-JOINT / SM-10H.10H-101H	21.62	7.64	2.58	-	-	-	Satisfaction
WELD ROD / ER2209 (1.6mm)	21.63	8.67	2.58	-	-	-	Satisfaction
WELD ROD / ER2209 (2.0mm)	21.55	8.63	2.62	-	-	-	Satisfaction
WELD ROD / ER2209 (2.4mm)	21.58	8.76	2.57	-	-	-	Satisfaction
WELD ROD / E2209-16 (4.0mm)	21.72	7.71	2.56	-	-	-	Satisfaction
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■ 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  Dec. 17 '14
	REVIEWED BY	S.S.LEE  Dec 17 '14
	TEST CONDUCTED BY	Y.S.LIM  Dec 17 '14

182/309

ILSUNG CORPORATION

JUL. 21, 2014

Acceptance criteria: ASME Sec.II Part.A / PMI Procedure Doc No. VP-SG07-COMM-021						
Material	Cr	Ni	Mo			
SA240-S31803	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 : $\pm 10\%$

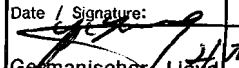
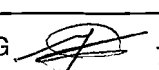
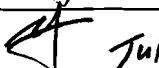
☐ REVIEWED
☒ WITNESSED
Date / Signature:

Germanischer Lloyd
Industrial Services

☐ Witnessed by / ☐ Reviewed by

G.T.PYO

183/309

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

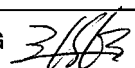
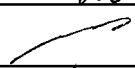
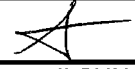
Date

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	<i>[Signature]</i> Sep.15'14	
			REVIEWED BY:		S.S.LEE	<i>[Signature]</i> Sep.15'14	
			PREPARED BY:		Y.S.LIM	<i>[Signature]</i> Sep.15'14	
☒ REVIEWED ☒ WITNESSED Date / Signature: <i>[Signature]</i> 15 sep. 14 Germanischer Lloyd Industrial Services			ILSUNG CORPORATION				

SEP. 15, 2014

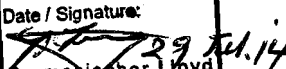
ILSUNG CORPORATION	
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P.M.I CERTIFICATE (1/3)				Date		NOV. 24, 2014	
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT			
P.O No.	4511951391		W/O No.	P-13SG-007			
Drawing No.	-		Item No.	E-11570/E-11580			
REPORT NO.	TUBE-PMI-001		Item 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:  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							

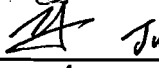
P.M.I CERTIFICATE (2/3)				Date		NOV. 24, 2014	
Customer	SHELL CANADA ENERGY		Project Name	CARMON CREEK PROJECT			
P.O No.	4511951391		W/O No.	P-13SG-007			
Drawing No.	-		Item No.	E-11570/E-11580			
REPORT NO.	TUBE-PMI-001		Item Name	VRU INLET GAS COOLER			
Test part and/or HEAT No.	Cr	Ni	Mo				Result
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: <i>[Signature]</i> 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			

NOV. 24, 2014

ILSUNG CORPORATION

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							
☒ REVIEWED ☒ WITNESSED Date / Signature:  Gernandischer Lloyd Industrial Services			APPROVED BY:	T.M.YANG 			
			REVIEWED BY:	G.T.PYO 			
			PREPARED BY:	G.T.PYO 			
ILSUNG CORPORATION							

ASME

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 			
			REVIEWED BY:	G.T.PYO 			
			PREPARED BY:	G.T.PYO 			
ILSUNG CORPORATION							

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.	-			
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 <i>[Signature]</i> Sep.15'14		
			REVIEWED BY:		S.S.LEE <i>[Signature]</i> Sep.15'14		
			PREPARED BY:		Y.S.LIM <i>[Signature]</i> Sep.15'14		
ILSUNG CORPORATION							

8. Expanding Ratio Check Report

INSPECTION REPORT

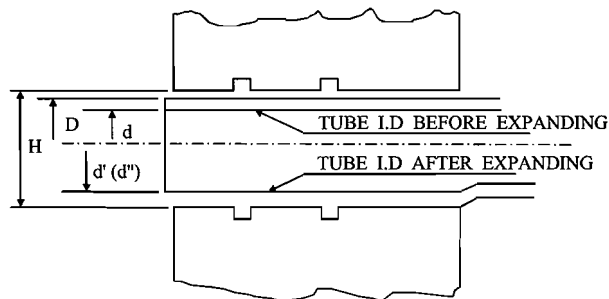
PAGE : 1 OF 2

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-11570
PROJECT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.06
W/O NO.	P-13SG-007	DOC. NO.	SG07 - EXPAND - E11570 - 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		15.97	15.68		0.29	19.25	19.05	0.20	2.79	
2		15.95	15.68		0.27	19.26	19.07	0.19	2.36	
3		15.97	15.67		0.30	19.25	19.05	0.20	2.92	
4		15.96	15.66		0.30	19.26	19.07	0.19	3.26	
5		15.96	15.66		0.29	19.25	19.06	0.20	2.83	
6		15.96	15.68		0.28	19.25	19.06	0.19	2.60	
7		15.95	15.67		0.28	19.25	19.07	0.18	2.97	
8		15.97	15.68		0.29	19.25	19.06	0.19	2.99	
9		15.97	15.67		0.29	19.25	19.06	0.19	3.02	
10	BLANK	15.95	15.66	BLANK	0.29	19.24	19.06	0.18	3.21	BLANK
11		15.96	15.67		0.29	19.24	19.06	0.19	3.02	
12		15.97	15.67		0.29	19.25	19.06	0.19	3.03	
13		15.96	15.67		0.29	19.26	19.06	0.19	2.72	
14		15.95	15.66		0.29	19.26	19.07	0.19	2.96	
15		15.96	15.67		0.29	19.26	19.05	0.21	2.54	
16		15.96	15.67		0.29	19.26	19.05	0.21	2.57	
17		15.97	15.66		0.31	19.24	19.06	0.18	3.62	
18		15.97	15.67		0.30	19.25	19.05	0.20	2.96	
19		15.95	15.67		0.28	19.26	19.05	0.20	2.34	
20		15.95	15.66		0.29	19.24	19.05	0.19	2.82	

☐ 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

INSPECTION REPORT

PAGE : 2 OF 2

FOR EXPANDING RATIO CHECK

DOC. NO.: SG07 - EXPAND - E11570 - 01

NO.	d"	d'	d	d" - d	d' - d	H	D	H - D	R(LIGHT) 2~4%	R'(HEAVY) 4~6%
21		15.96	15.67		0.30	19.24	19.05	0.19	3.24	
22		15.95	15.66		0.29	19.26	19.07	0.19	2.93	
23		15.96	15.66		0.29	19.25	19.06	0.19	3.09	
24		15.96	15.68		0.28	19.24	19.06	0.18	3.06	
25		15.95	15.67		0.28	19.24	19.07	0.18	3.13	
26		15.96	15.67		0.28	19.26	19.07	0.19	2.60	
27		15.96	15.67		0.29	19.25	19.06	0.19	3.09	
28		15.96	15.66		0.30	19.26	19.05	0.20	2.71	
29		15.96	15.68		0.28	19.25	19.05	0.20	2.41	
30	BLANK	15.96	15.67	BLANK	0.30	19.26	19.05	0.21	2.65	BLANK
31		15.96	15.67		0.29	19.24	19.07	0.18	3.32	
32		15.96	15.67		0.29	19.24	19.06	0.19	2.95	
33		15.97	15.66		0.30	19.25	19.05	0.20	2.87	
34		15.96	15.66		0.30	19.26	19.06	0.20	2.80	
35		15.97	15.68		0.29	19.26	19.07	0.19	3.05	
36		15.96	15.67		0.29	19.26	19.05	0.21	2.48	
37		15.97	15.68		0.29	19.25	19.07	0.18	3.20	
38		15.95	15.66		0.29	19.24	19.07	0.17	3.42	
39		15.95	15.67		0.29	19.25	19.07	0.18	3.32	
40		15.96	15.67		0.29	19.25	19.05	0.20	2.64	

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

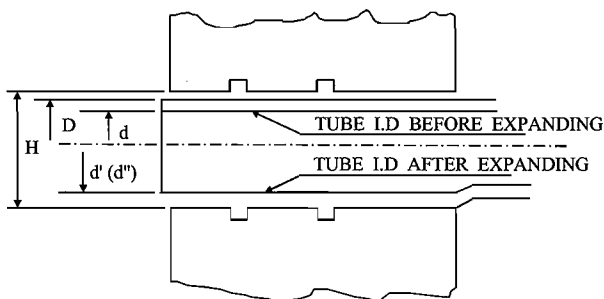
PAGE : 1 OF 2

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-11570
PROJECT NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.06
W/O NO.	P-13SG-007	DOC. NO.	SG07 - EXPAND - E11570 - 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		15.96	15.67		0.29	19.24	19.06	0.18	3.18	
2		15.96	15.66		0.29	19.25	19.05	0.20	2.83	
3		15.96	15.67		0.29	19.25	19.07	0.18	3.27	
4		15.97	15.67		0.30	19.25	19.06	0.19	3.21	
5		15.96	15.66		0.30	19.24	19.05	0.19	3.16	
6		15.97	15.67		0.30	19.26	19.05	0.20	2.74	
7		15.97	15.67		0.30	19.25	19.06	0.19	3.20	
8		15.96	15.68		0.28	19.24	19.07	0.17	3.14	
9		15.95	15.66		0.29	19.24	19.07	0.18	3.30	
10	BLANK	15.96	15.67	BLANK	0.30	19.25	19.07	0.18	3.36	BLANK
11		15.96	15.66		0.30	19.24	19.06	0.19	3.26	
12		15.96	15.66		0.30	19.25	19.06	0.18	3.53	
13		15.96	15.67		0.28	19.25	19.05	0.19	2.68	
14		15.96	15.67		0.29	19.24	19.07	0.18	3.44	
15		15.96	15.68		0.28	19.25	19.07	0.19	2.79	
16		15.95	15.67		0.28	19.25	19.07	0.18	3.06	
17		15.97	15.67		0.29	19.26	19.05	0.20	2.62	
18		15.97	15.67		0.30	19.25	19.05	0.20	3.01	
19		15.95	15.67		0.28	19.26	19.06	0.20	2.38	
20		15.96	15.67		0.29	19.25	19.06	0.19	3.00	

☐ 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

INSPECTION REPORT

PAGE : 2 OF 2

FOR EXPANDING RATIO CHECK

DOC. NO. : SG07 - EXPAND - E11570 - 02

NO.	d"	d'	d	d" - d	d' - d	H	D	H - D	R(LIGHT) 2~4%	R'(HEAVY) 4~6%
21		15.95	15.67		0.29	19.25	19.06	0.19	2.78	
22		15.97	15.67		0.30	19.25	19.06	0.19	3.21	
23		15.95	15.68		0.28	19.26	19.05	0.21	2.04	
24		15.95	15.67		0.28	19.25	19.07	0.18	2.81	
25		15.97	15.66		0.31	19.24	19.06	0.19	3.59	
26		15.95	15.67		0.28	19.25	19.06	0.19	2.73	
27		15.96	15.67		0.29	19.25	19.06	0.18	3.20	
28		15.96	15.66		0.30	19.26	19.07	0.19	3.31	
29		15.97	15.66		0.30	19.25	19.06	0.19	3.26	
30	BLANK	15.95	15.67	BLANK	0.28	19.25	19.06	0.19	2.64	BLANK
31		15.97	15.67		0.29	19.24	19.05	0.19	3.12	
32		15.96	15.67		0.29	19.24	19.06	0.18	3.03	
33		15.95	15.67		0.28	19.25	19.05	0.20	2.27	
34		15.95	15.67		0.28	19.25	19.06	0.19	2.79	
35		15.95	15.68		0.28	19.26	19.05	0.21	2.11	
36		15.97	15.68		0.29	19.25	19.07	0.18	3.33	
37		15.95	15.67		0.28	19.26	19.05	0.21	2.31	
38		15.95	15.67		0.28	19.25	19.07	0.19	2.77	
39		15.97	15.67		0.30	19.25	19.07	0.18	3.40	
40		15.95	15.68		0.27	19.25	19.05	0.19	2.36	

BLANK

☐ 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

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-11570	DWG. NO.	VP-SG07-E11570-001 REV.06	

■ SKETCH

DOC. NO. : SG07 - FINAL - E11570 - 01

REMARKS ;

DIMENSION & VISUAL INSPECTION : SATISFACTION

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

☐ Reviewed

☒ Witnessed

[Signature] Dec. 19. 2014

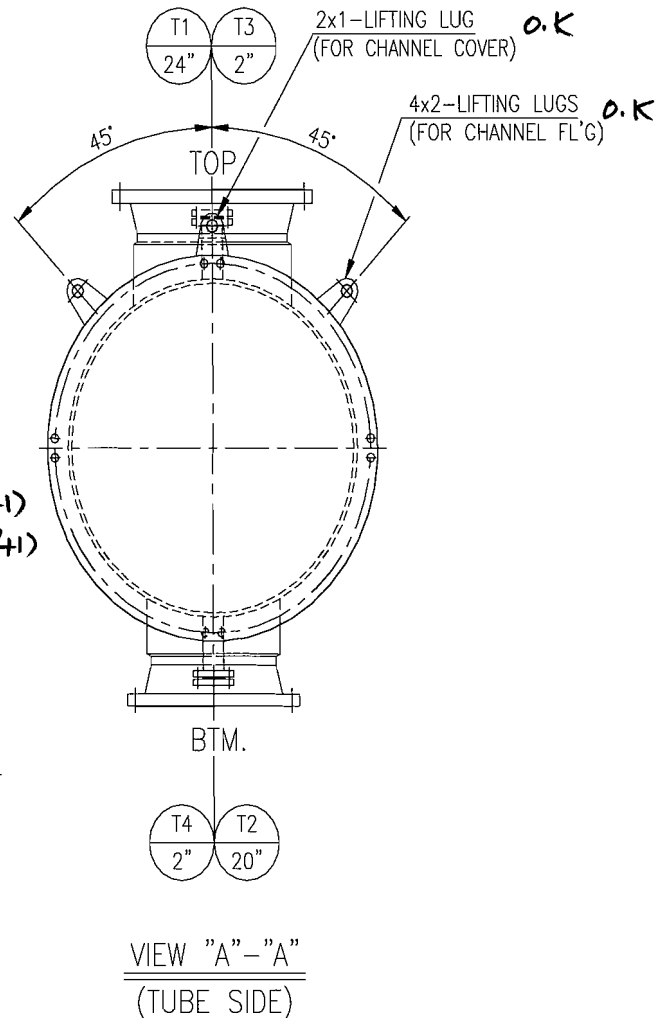
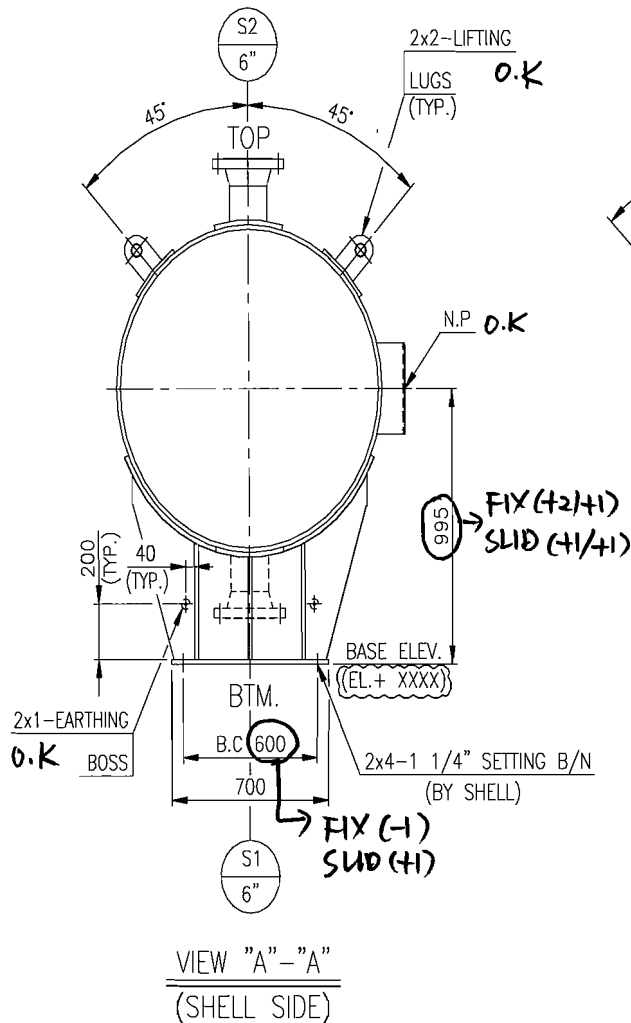
14412 HSB GS

☐ WITNESSED BY ☐ REVIEWED BY	☒ REVIEWED ☒ WITNESSED Date / Signature: <i>[Signature]</i> 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

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-11570	DWG. NO.	VP-SG07-E11570-001 REV.06	

■ SKETCH

DOC. NO. : SG07 - FINAL - E11570 - 02



REMARKS ;

DIMENSION & VISUAL INSPECTION : SATISFACTION

ORIENTATION OF NOZZLE & ATTACHMENTS : SATISFACTION

☐ WITNESSED BY
☐ REVIEWED BY

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

APPROVED BY

S.J.HWANG

REVIEWED BY

S.S.LEE

PREPARED BY

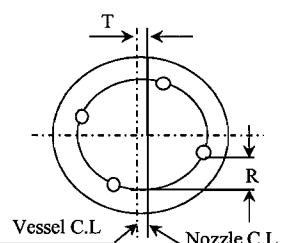
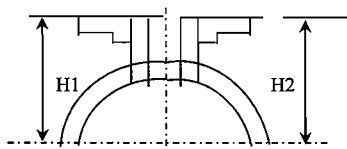
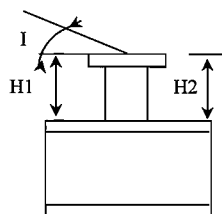
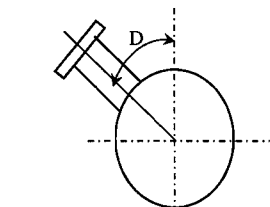
Y.S.LIM

ILSUNG CORPORATION

ILSUNG	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-11570	DWG. NO.	VP-SG07-E11570-001 REV.06	

■ SKETCH

DOC. NO. : SG07 - FINAL - E11570 - 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)	TRANSPARATION (T)	ROTATION (R)	RESULT
					DWG.	TOL.	ACTUAL					
		DWG.	TOL.	ACT.			H1	H2				
S1	6"	BTM.	±3	G	830 TO C.L	±3	830 (0)	830 (0)	G	G	G	ACCEPT
S2	6"	TOP	±3	G	830 TO C.L	±3	832 (+2)	829 (-1)	G	G	G	ACCEPT
T1	24"	TOP	±3	G	900 TO C.L	±3	898 (-2)	899 (-1)	G	G	G	ACCEPT
T2	20"	BTM.	±3	G	900 TO C.L	±3	898 (-2)	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	799 (-1)	801 (+1)	G	G	G	ACCEPT

BLANK

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☒ WITNESSED

Date / Signature:

Germanischer Lloyd

APPROVED BY

S.J.HWANG

REVIEWED BY

S.S.LEE

PREPARED BY

Y.S.LIM

Dec 17 '14

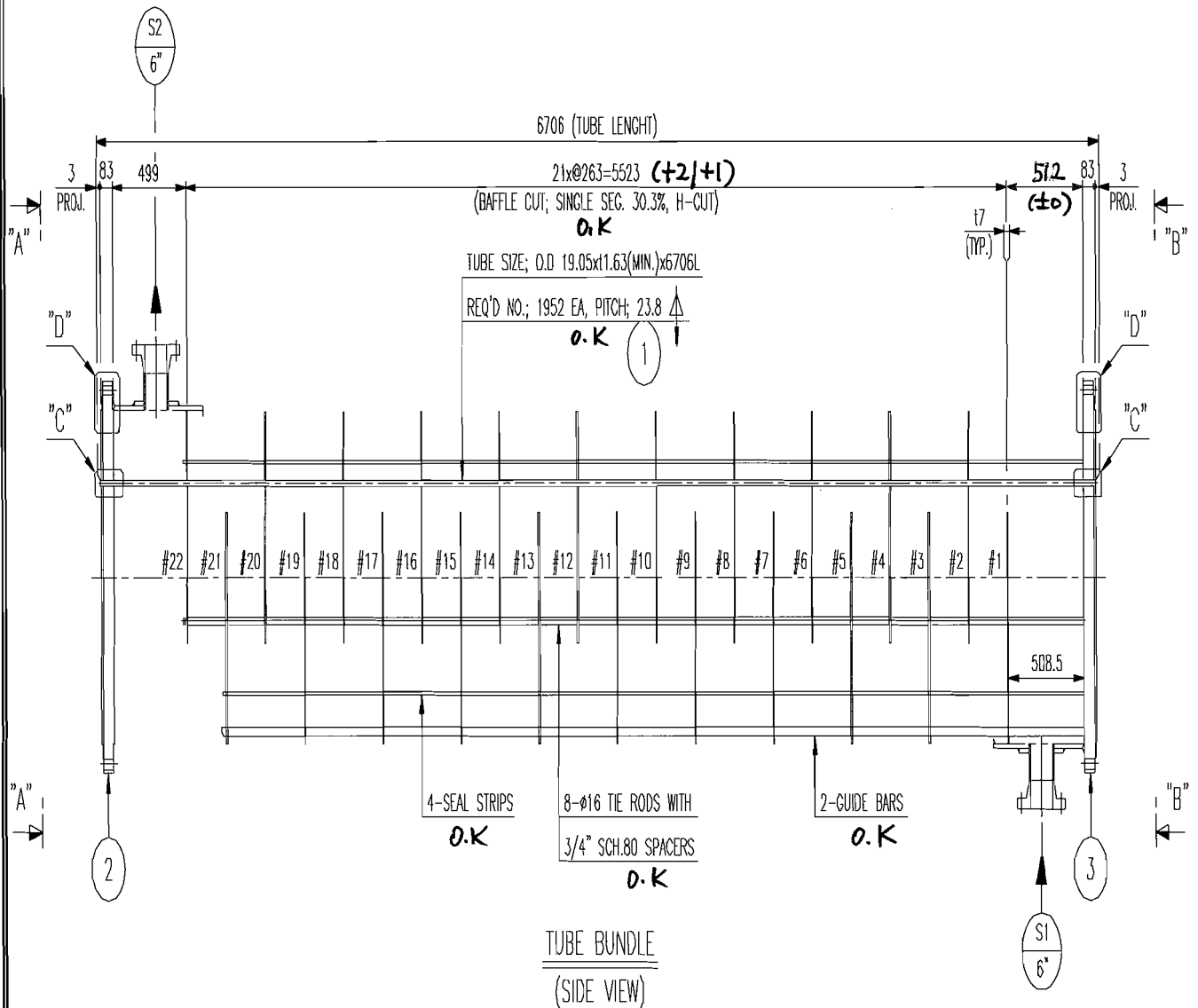
Dec 17 '14

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-11570	DWG. NO.	VP-SG07-E11570-001 REV.06	

■ SKETCH

DOC. NO. : SG07 - FINAL - E11570 - 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 BY

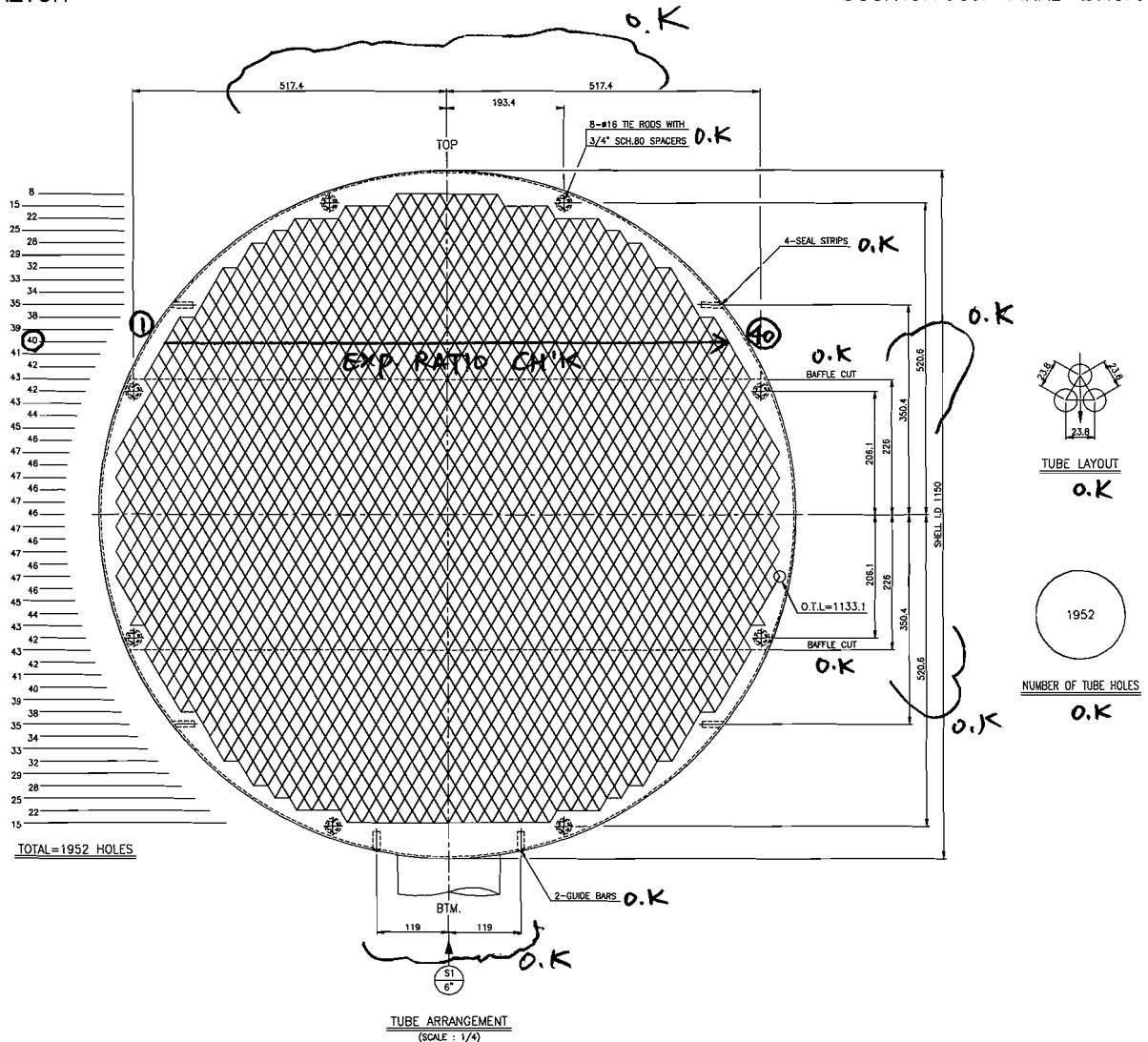
REVIEWED
 WITNESSED
 Date / Signature:
 Y. S. LIM
 Germanischer Lloyd
 Industrial Services

APPROVED BY	S.J.HWANG	3/27/14
REVIEWED BY	S.S.LEE	Nov 27 '14
PREPARED BY	Y.S.LIM	Nov 27 '14

ILSUNG	INSPECTION REPORT FOR TUBE ARRANGEMENT		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-11570	DWG. NO.	VP-SG07-E11570-001 REV.06	

■ SKETCH

DOC. NO.: SG07 - FINAL - E11570 - 06



REMARKS ;

DIMENSION & VISUAL INSPECTION : SATISFACTION

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

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☒ WITNESSED

Date / Signature:

[Signature]
 Germanischer Lloyd
 Industrial Services

APPROVED BY

S.J.HWANG

3/20 Nov 27 14

REVIEWED BY

S.S.LEE

Nov 27 14

PREPARED BY

Y.S.LIM

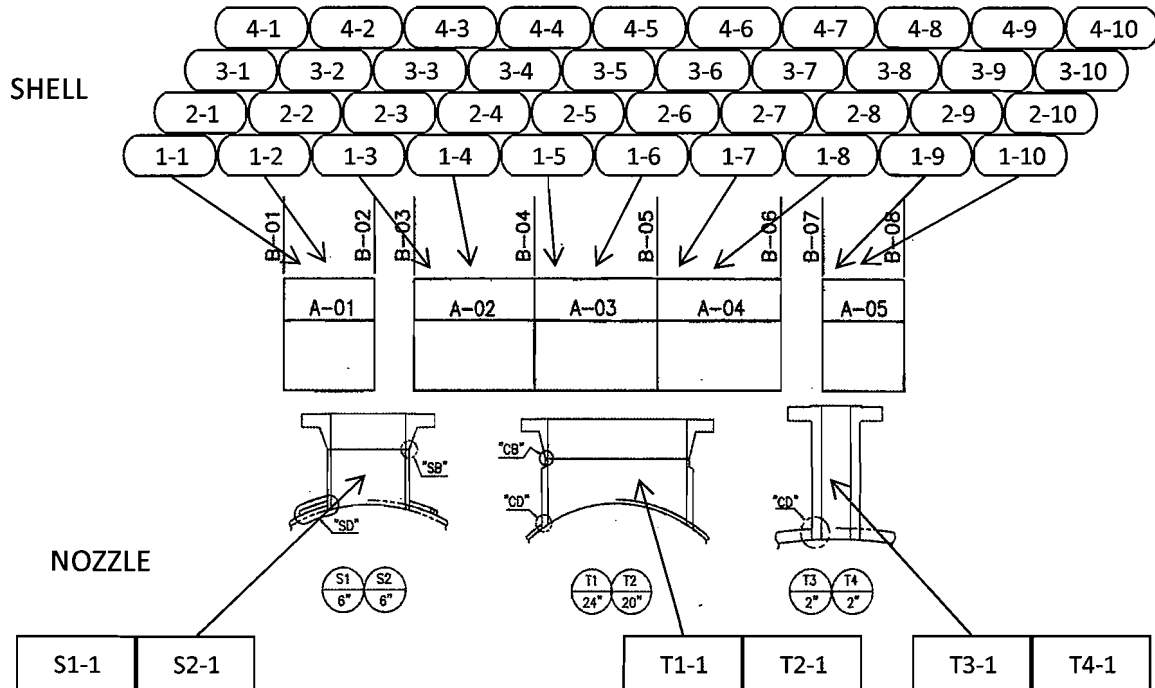
Nov 27 14

ULTRASONIC WALL THICKNESS RECORD

P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY
PT. NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.06
ITEM NO.	E-11570	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	15.29	15.35	17.36	17.27	SHELL & CHANNEL	3 (180°)	9~10 15	15.26	15.23	-	-	
	2 (90°)		15.14	15.19	17.23	17.24		4 (270°)		15.34	15.27	-	-	
	3 (180°)	3~4 17	15.36	15.26	17.27	17.13	PART	LOCATION	DWG. (MIN.)	1		-		
	4 (270°)		15.24	15.28	17.35	17.26	NOZZLE	S1	S2	10.97	10.97	11.23	11.12	-
	LOCATION	DWG.	5	6	7	8		T1	T2	25.2	26	25.76	26.82	-
	1 (0°)	5~8 17	17.25	17.29	17.32	17.19		T3	T4	13.6	13.6	13.87	13.92	-
	2 (90°)		17.39	17.27	17.15	17.23	B L A N K							
	3 (180°)		17.22	17.31	17.24	17.37								
	4 (270°)		17.27	17.17	17.19	17.25								
	LOCATION	DWG.	9	10	-	-								
	1 (0°)	9~10 15	15.25	15.25	-	-								
	2 (90°)		15.18	15.32	-	-								

☐ REVIEWED BY / ☐ WITNESSED BY

☒ REVIEWED
☒ WITNESSED

Date / Signature:

Germanischer Lloyd

Industrial Services

APPROVED BY

S.J.HWANG

REVIEWED BY

S.S.LEE

PREPARED BY

Y.S.LIM

ILSUNG CORPORATION

2087309

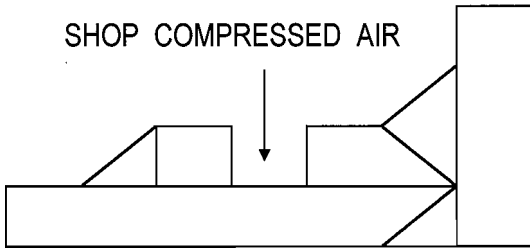
	INSPECTION REPORT OF AIR-SOAP BUBBLE TEST FOR NOZZLE REINFORCING PAD		W/O NO.	P-13SG-007
			DATE	NOV. 27. 2014
			PAGE NO.	1 OF 1
P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY	
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER	
ITEM NO.	E-11570	DWG. NO.	VP-SG07-E11570-001 REV.06	

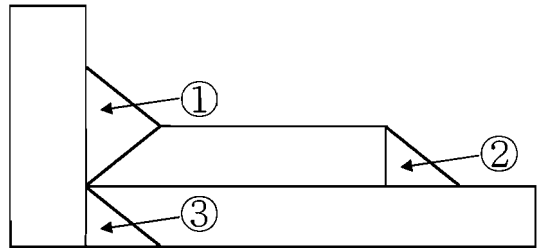
■ SKETCH

THIS TEST WAS CARRIED OUT ON THERE WELD SURFACE (①, ②, ③) OF EACH NOZZLE LISTED BELOW.

■ TEST PRESSURE : 150 KPa

■ HOLDING TIME : 5 MIN.





NO.	NOZZLE	SIZE	DATE	RESULT
1	S1	6"	NOV.27.'14	ACCEPT
2	S2	6"	NOV.27.'14	ACCEPT
B L A N K				

NO.	NOZZLE	SIZE	DATE	RESULT

☐ WITNESSED BY

☐ REVIEWED BY

☒ REVIEWED

☒ WITNESSED

Date / Signature:

[Signature]

Germanischer Lloyd
Industrial Services

APPROVED BY	S.J.HWANG <i>[Signature]</i> Nov 27 '14
REVIEWED BY	S.S.LEE <i>[Signature]</i> Nov 27 '14
PREPARED BY	Y.S.LIM <i>[Signature]</i> Nov 27 '14

ILSUNG		LEAK TEST RECORD	
W / O NO. : P-13SG-007		DOC. NO. : ISC-QA-ALT-SG007-001	
P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER
ITEM NO.	E-11570	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.	P004-039 (DEC.15.2014) P004-055 (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 <i>3/16/14 Dec. 16 '14</i> REVIEWED BY S.S.LEE <i>Dec 16 '14</i> PREPARED BY Y.S.LIM <i>Dec 16 '14</i>
---	---	--

REPORT OF CALIBRATION

교 정 성 적 서

EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-141215-01
SPECIFICATION 사 양	0.4 MPa	SERIAL NO. 일련 번호	P004-039
CALIBRATION DATE 교정 일자	2014.12.15	RECAL. DATE 재교정 일자	2015.12.14
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. <i>P. S. Kim</i>	
DATE <i>Dec. 15, 2014</i>	

<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	0.38	-0.02
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 Sceme.)

REMARKS

☒ REVIEWED ☐ WITNESSED Date / Signature: <i>16 Dec 14</i> 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-141106-03
SPECIFICATION 사 양	0.4 MPa	SERIAL NO. 일련 번호	P004-055
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)

ILSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	D. S. P. K.
DATE	Nov. 6. 20 14

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	0.1	0.1	0.0
2	0.2	0.201	0.001
3	0.3	0.3	0.0
4	0.4	0.4	0.0
5	0.3	0.302	0.002
6	0.2	0.2	0.001
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:
<i>[Signature]</i> 16 Dec 14
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

TEST CERTIFICATE

ASME

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

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				
								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

☒ REVIEWED
☐ WITNESSED

Date / Signature: _____

Germanischer Lloyd
Industrial Services

ILSUNG CORPORATION

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14412
HSB GS

PAGE



Office : 917, Wonsan-Li, Onsan

-Wub, Ulju-Gun, Ulsan, Korea

Tel. : 052) 231-7670

Fax : 052) 239-0335

TEST CERTIFICATE

ASME

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

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-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 × 10 × 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

발급 일자 : 2014.10.22

시험자 : J. H. KIM

승인자 : 기술책임자 : S. M. LEE

Test Date

Issue Date

Tested or Analyzed by

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
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2/21



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ASME

Report No.

IS-APN-E-11570-C/TRT-001

Page 1 of 2

Customer 주 문 주	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/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 두 께	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	0.016(W8) ☒ inch ☐ mm
Exposure Time 노 출 시 간	hr min sec ~ hr 5 min 20 sec	Film Type/Brand/Size 필름 타 입/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)	17 ☐ inch ☒ mm	"B" Attached	☒ Yes 유 ☐ No 무
Specified 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 (ISC-RT-06) Rev. ASME SEC.VIII DIV.1 2010ED.+2011ADD. UW-51 API660(8th ED.2007)
No. Of Exposures 노 출 횟 수	6	No. Film/Cassette Cassette 내 Film 매 수	1 SH'T
Exposure Setup			Total Sheet 6 SH'T 촬영 매 수
			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 시 형	C.J.KWON	Level 레벨	II
APN Co., Ltd.		☒ Date of Examination 검사일자 2014.10.06 ☒ Date of Report 보고서 작성일자 2014.10.07	
Approved by 승 인	B.M.SHIM	Level 레벨	III
APN Co., Ltd.		Owner/Customer 주문주/고객감독관 ☒ REVIEWED ☐ WITNESSED ☐ Third Party Inspector 공인검사 Date / Signature: Germanischer Lloyd Industrial Services	

~~ASME~~

ILSUNG CORPORATION

IS-APN-E-11570-C/TRT-001

Page 2 of 2

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Date / Signature: 7/29/20
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Level III

 **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
--	---	--	---

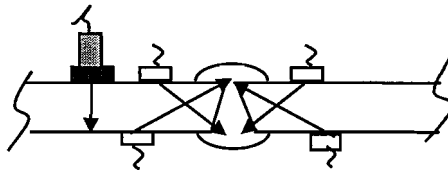
Test Temp. 시험온도 ☒ Ambient 상온 ☐ Elev. 승온	Test Equipment 시험장비 EPOCH XT	Type 형태 OLYMPUS	Manufacturer 제조사 081113804	Serial No. 일련번호 2015.06.12	Due Date 만료일자
---	--	---------------------------	--------------------------------------	--------------------------------------	---------------

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+	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 접촉매질 ☐ 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
A01-1	V		No Recordable Indication					Final	
A01-2	V		No Recordable Indication					Final	
~ B L A N K ~									
☒ Reviewed by ☒ Witnessed by QA DEPT. A01-1 Level 1: S. LEE Date No. 2/10/2014 DATE <i>af. 2.20.14</i>									

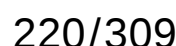
Sketch of Scanning



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Germanischer Lloyd Industrial Services

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

Examined by 시험 C.J. KWON <i>[Signature]</i>	Level 레벨 II	☒ Date&Time of Examination 검사일자/시간 2014.10.08
Approved by 승인 B.M. SHIM <i>[Signature]</i>	Level 레벨 III	☒ Date of Report 보고서 작성일자 2014.10.08
A P N Co., Ltd. A P N Co., Ltd.		☐ Owner/Customer 주문주/고객 감독관 ☐ Third Party Inspector 공인검사관 ☐ ANI/AI





Test Report

Certificate No. : 201410-349-05



ACCREDITED BY
MEMBER OF THE
ISO/IEC 17025

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

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)

MSTECH Co., Ltd.

(14, Yaksu 8-gil, Buk-gu, Ulsan, Korea. URL:www.mstech.co.kr)

Tel : 052-289-9107~9 / Fax : 052-289-9209

2014. 10. 29.

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Industrial Services



Test Results

Certificate No. : 201410-349-05



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by TRACI

1. HARDNESS TEST RESULTS

1.1. Test method : ASTM E384-2011e1

OLsung
ISC

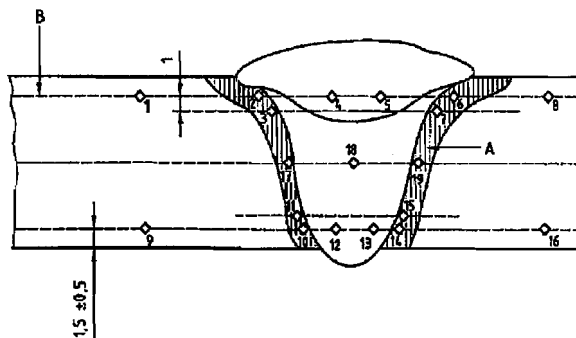
☒ Reviewed by
☒ Witnessed by

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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Test Results

Certificate No. : 201410-349-05



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9/21

2. MACRO ETCHING TEST RESULTS

Measurement Magnification : x 10

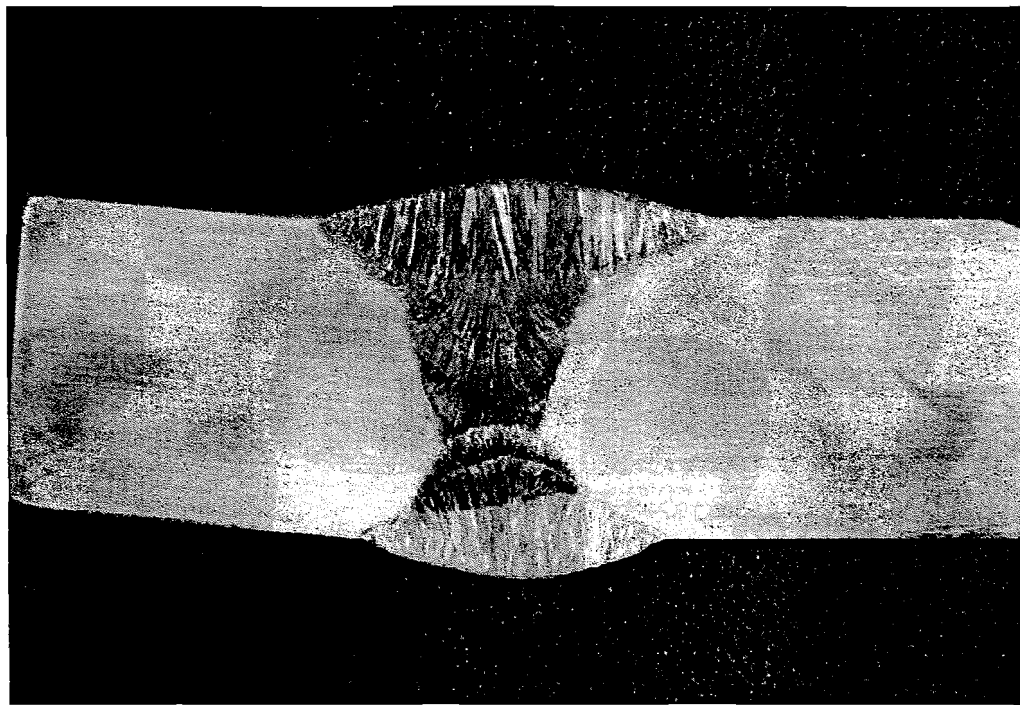
Location :# Base Metal + Heat Affected Zone + Weld

2.1. Test method : ASME BPVC SEC IX : 2013ED / QW-470

OLSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. DATE	S. J. HWANG Oct. 30, 2014

[Handwritten signature]

[Photograph of Macro etching]



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

30 Oct. 14



Test Results

Certificate No. : 201410-349-05



ACCREDITED BY
MEMBER OF THE
IAF-MLA & EFM

Certified ISO 9001
by TRACI

3. MICRO ETCHING TEST RESULTS

Measurement Magnification : x 200

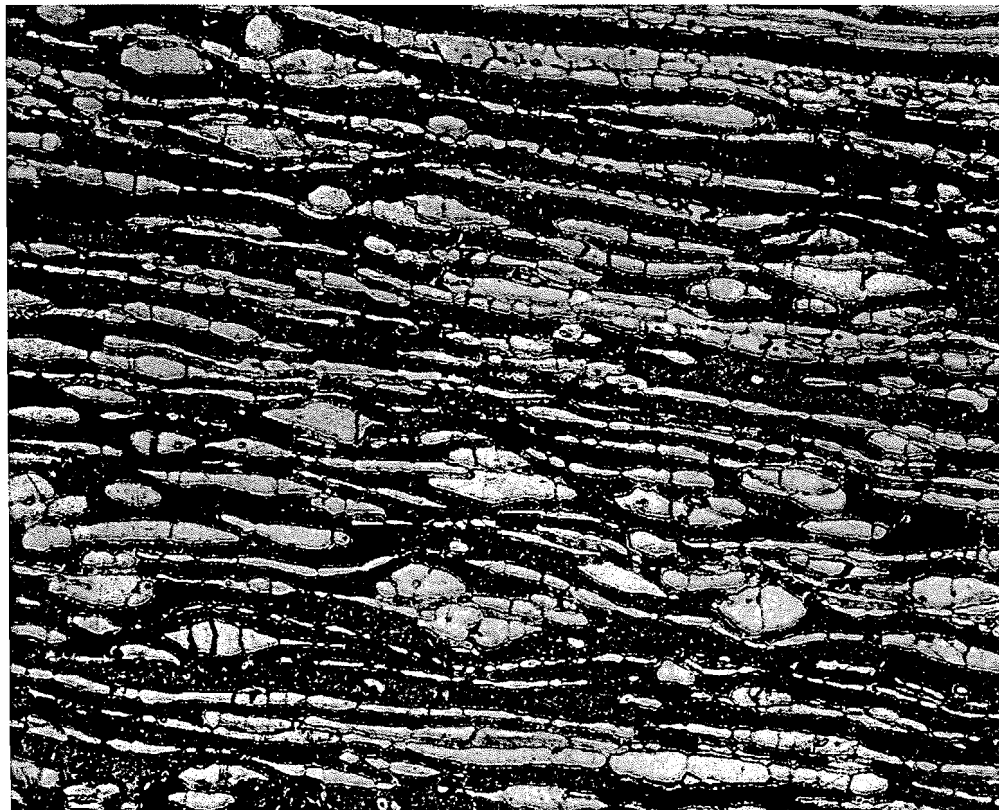
Location :# Base Metal

3.1. Test method : ASTM E407-2007

	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	Oct. 30, 2014

[Signature]

[Photograph of Micro etching]



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Date / Signature:	
<i>[Signature]</i> 30 Oct. 14	
Germanischer Lloyd Industrial Services	



Test Results

Certificate No. : 201410-349-05



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3. MICRO ETCHING TEST RESULTS

Measurement Magnification : x 200

Location :# Heat Affected Zone

3.1. Test method : ASTM E407-2007

OLSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	Oct. 30, 2014

[Handwritten signature]

[Photograph of Micro etching]



☒ REVIEWED
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Date / Signature:
<i>[Handwritten signature]</i> 30 Oct. 14
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Test Results

Certificate No. : 201410-349-05



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MEMBER OF THE
IAF-MILA for EMS

Certified ISO 9001
by TRACI

3. MICRO ETCHING TEST RESULTS

Measurement Magnification : x 200

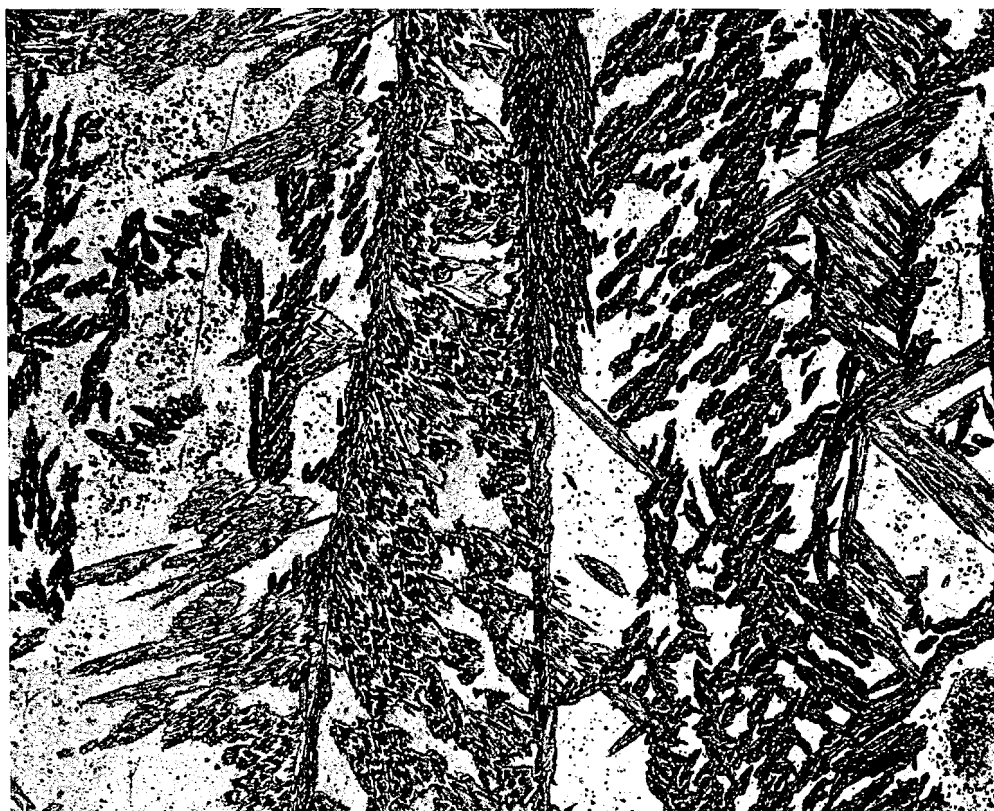
Location : # Weld

3.1. Test method : ASTM E407-2007

OLSON ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	Oct. 30, 2014

3/11/14

[Photograph of Micro etching]



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<i>[Signature]</i>
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- The end -

13/21

Test Report

for

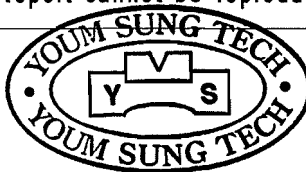
Ferrite Content

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

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☐	WITNESSED
Date / Signature: <i>[Signature]</i> 12/Nov/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

	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	NOV. 12 . 2014



YOUNGSUNG 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

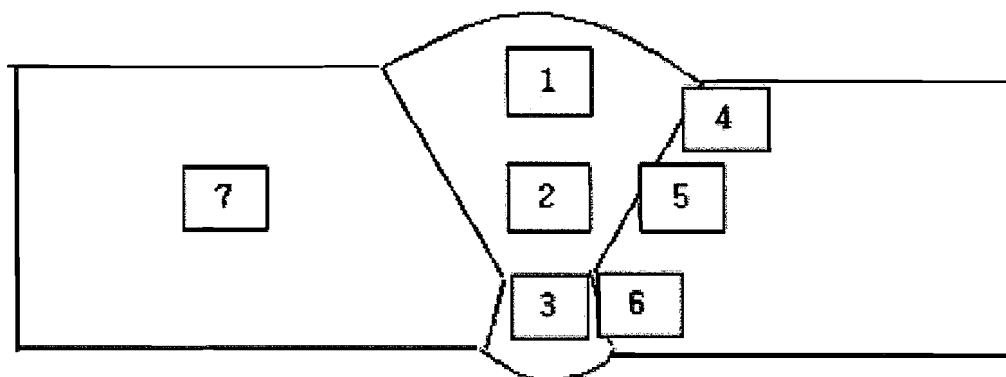
Page : 1 of 5

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



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 Germanischer Lloyd
 Industrial Services

ILSUNG
ISC
☒ Reviewed by
☐ Witnessed by
 QA DEPT. S. J. HWANG
 DATE NOV. 12, 2014
[Signature]

15/21



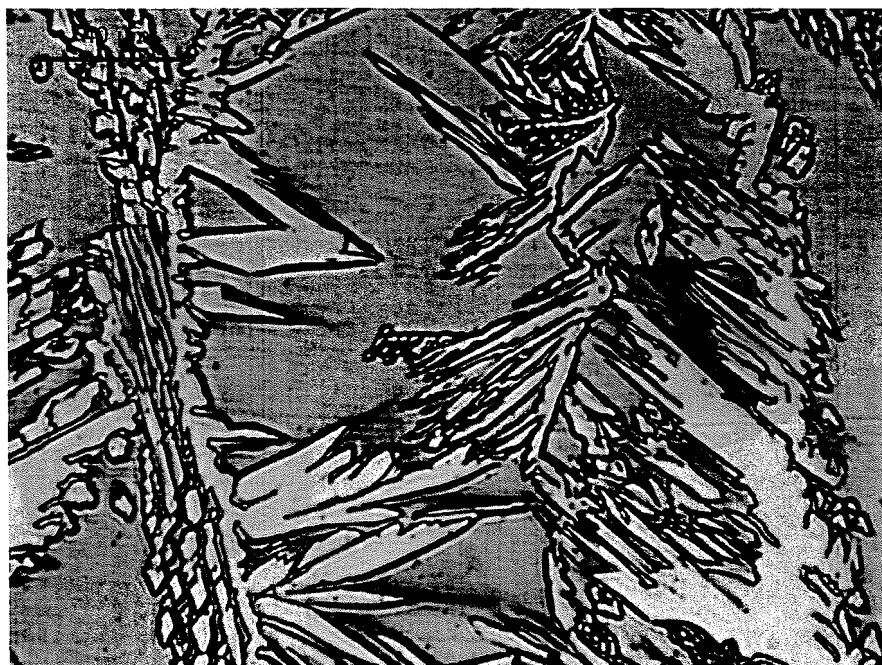
YOUNGSUNG TECH Co., Ltd.

#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

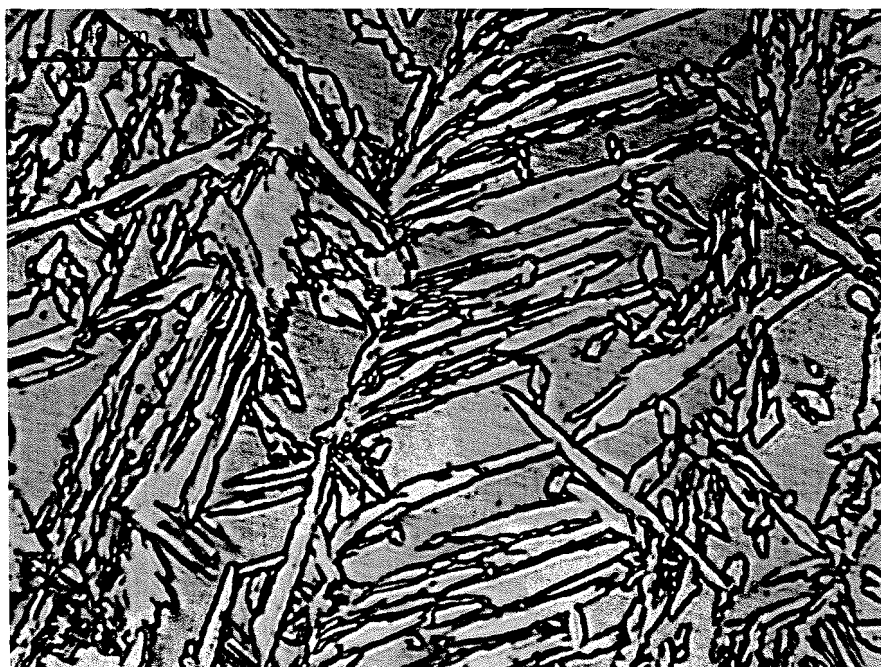
: X500



Location : Cover Pass Weld(1)

Magnification

: X500



Location : Mid-Thickness Weld(2)

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☐	WITNESSED
Date / Signature: <i>[Signature]</i> 12.12.14	
Germanischer Lloyd Industrial Services	

YOUNGSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	Nov. 12, 2014

3/5/14

16/21



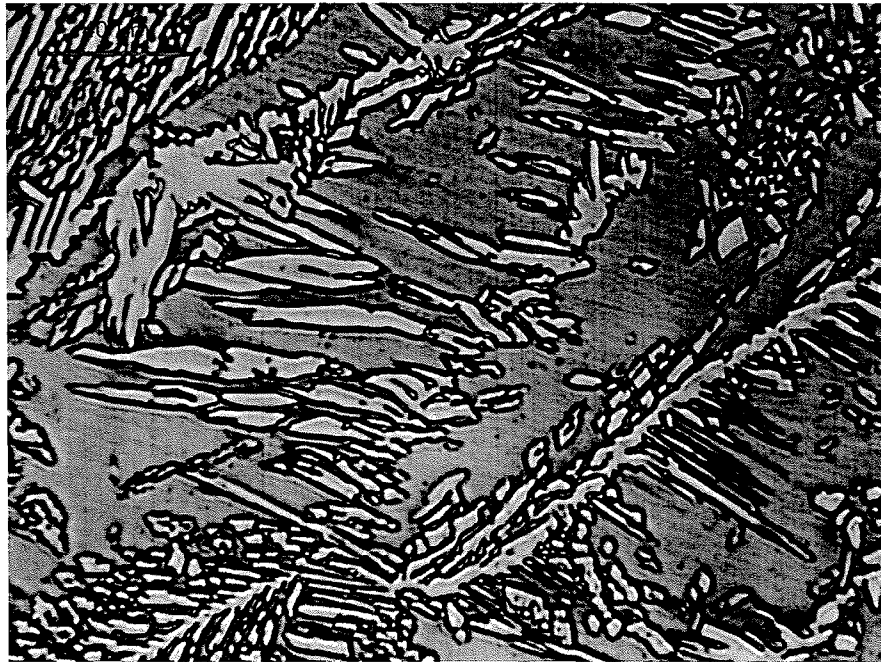
YOUNSUNG TECH Co., Ltd.

#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)

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Date / Signature: <i>[Signature]</i> 12/NOV/14	
Germanischer Lloyd Industrial Services	

YOUNSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. S. J. HWANG	
DATE 10/12/2014	

[Signature]

17/21



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 : 4 of 5

WPS No. : GT.SM-10H.10H-101H

Magnification

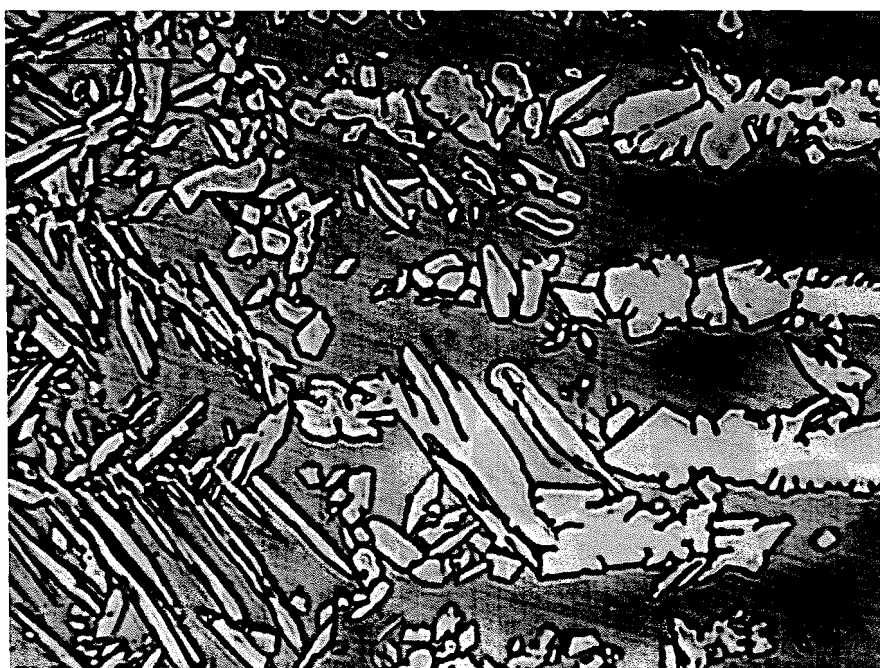
: X500



Location : Mid-Thickness H.A.Z(5)

Magnification

: X500



Location : Root H.A.Z(6)

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

YOUNGSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	NOV. 12. 20 14

3/12

18/21



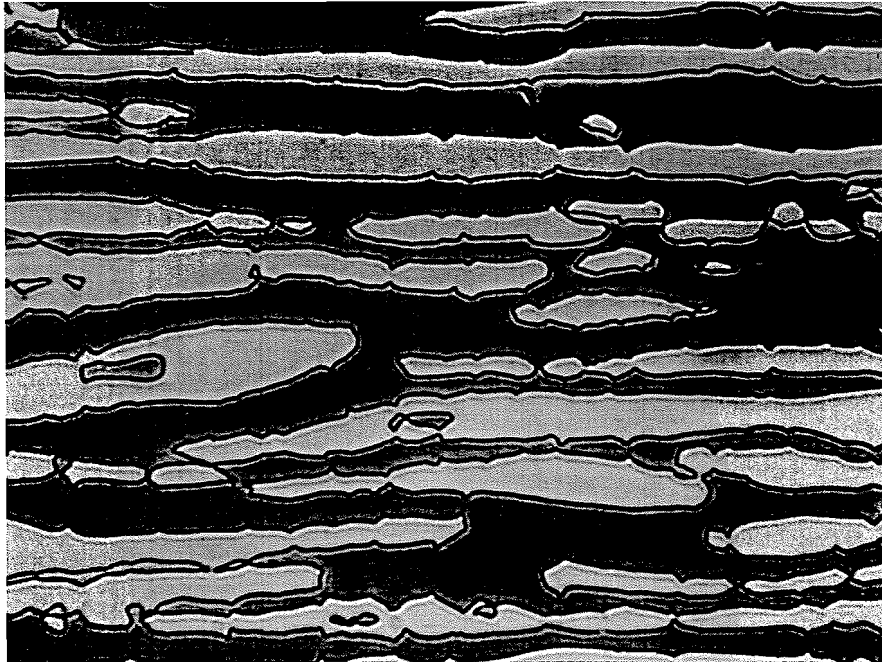
YOUNSUNG TECH Co., Ltd.

#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	

YOUNSUNG ISC	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	S. J. HWANG
DATE	NOV. 12 20 14

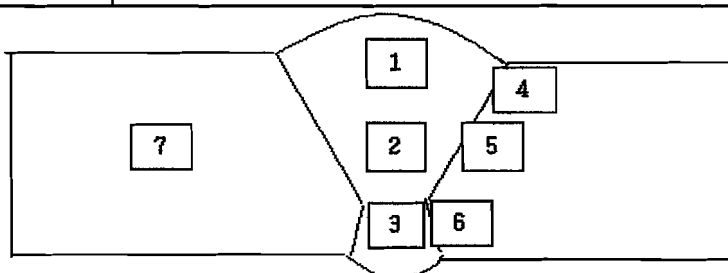
[Signature]

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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 _{P(i)} (%)	[P _{P(i)} -P _{P(avg)}] ²	P _i	P _{P(i)} (%)	[P _{P(i)} -P _{P(avg)}] ²	P _i	P _{P(i)} (%)	[P _{P(i)} -P _{P(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 Σ P _{P(i)} (%)	57.7	47.5	51.2
S = {1/(n-1) Σ [P _{P(i)} -P _P] ² } ^{1/2}	2.8	2.6	2.4
95% CI = t x S/√n (n=20 => t=2.093)	1.3	1.2	1.1
V _v = P _{P(avg)} ± 95% CI (%)	56.4 ~ 59.0	46.2 ~ 48.7	50.0 ~ 52.3
% RA = {(95%CI)/P _{P(avg)} } x 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 Olsung ISC Reviewed by <i>[Signature]</i> QA DEPT. S. J. HWANG DATE Nov. 12, 2014		

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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 _{P(i)} (%)	[P _{P(i)} -P _{P(avg)}] ²	P _i	P _{P(i)} (%)	[P _{P(i)} -P _{P(avg)}] ²	P _i	P _{P(i)} (%)	[P _{P(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 Σ P _{P(i)} (%)				55.4		52.6		54.1	
S = {1/(n-1) Σ [P _{P(i)} -P _P] ² } ^{1/2}				2.5		3.2		3.9	
95% CI = t x S/√n (n=20 => t=2.093)				1.2		1.5		1.8	
V _v ≡ P _{P(avg)} ± 95% CI (%)				54.2 ~ 56.5		51.1 ~ 54.1		52.2 ~ 55.9	
% RA = {(95%CI)/P _{P(avg)} } x 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 OLSUNG ISC Reviewed by <i>[Signature]</i> Witnessed by <i>[Signature]</i> QA DEPT. S. J. HWANG DATE Nov. 12, 2014							

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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 Σ P _{P(i)} (%)			51.1		
S = {1/(n-1) Σ [P _{P(i)} -P _P] ² } ^{1/2}			2.1		
95% CI = t x S/√n (n=20 => t=2.093)			1.0		
V _v ≡ P _{P(avg)} ± 95% CI (%)			50.2 ~ 52.1		
% RA = {(95%CI)/P _{P(avg)} } x 100			1.9		
Test conducted by		D S Lee / Youmsung Tech. Co., Ltd		Test Date	
				Nov. 11, 2014	
Authorized By		☒ REVIEWED ☐ WITNESSED Date / Signature: Germanischer Lloyd Industrial Services Reviewed by: QA DEPT. S. J. HWANG DATE NOV. 12, 2014			

12. Hardness Test Report

A S M E

PAGE

1

ILSUNG	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-11570		DWG. NO.		VP-SG07-E11570-001 REV.06			

■ CHECK LOCATION SKETCH DOC. NO. : SG07 - HARD - E11570 - 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	187	164	ACCEPT	11	B-05	2	179	191	160	ACCEPT	
2	A-03	186	191	158	ACCEPT	12		3	185	182	156	ACCEPT	
3	A-04	178	185	159	ACCEPT	13	B-06	1	186	192	165	ACCEPT	
4	B-03	1	183	195	161	ACCEPT		14	2	182	187	166	ACCEPT
5		2	185	188	167	ACCEPT		15	3	183	188	169	ACCEPT
6		3	188	184	169	ACCEPT	16	S1	SB	187	185	161	ACCEPT
7	B-04	1	187	185	159	ACCEPT	17		SD	178	185	157	ACCEPT
8		2	190	193	166	ACCEPT	18	S2	SB	190	189	158	ACCEPT
9		3	176	183	166	ACCEPT	19		SD	182	185	159	ACCEPT
10	B-05	1	177	190	159	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>3/18/14 Dec. 17 '14</i>
		REVIEWED BY	S.S.LEE <i>Dec. 17 '14</i>
		PREPARED BY	Y.S.LIM <i>Dec. 17 '14</i>

13. Hydrotest Report & Calibration Certificates

olsung		PRESSURE TEST RECORD (1 OF 1)			
		W/O NO. : P-13SG-007		DOC. NO. : ISC-QA-HYD-SG-007-057	
P.O NO.	4511951391		CUSTOMER	SHELL CANADA ENERGY	
PROJECT NAME	CARMON CREEK PROJECT		ITEM NAME	VRU INLET GAS COOLER	
ITEM NO.	E-11570		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 P100-022 (2014.12.10) P100-078 (2014.12.10)
	TEST PRESS.	5195 KPa (5.195 MPa)	2147 KPa (2.147 MPa)	BLANK KPa	2ND STAGE P070-129 (2014.11.13) P070-130 (2014.11.13)
	TEST TEMP.	5~17 °C	5~17 °C	°C	3RD STAGE BLANK
	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	BLANK °C	MIN. °C	3RD STAGE P- (..) P- (..)
	HOLD'G TIME	Min.	Min.	Min.	
	RESULT				
	DATE				
■ SKETCH 1ST STAGE : 5600 Kpa(5.6 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		APPROVED BY S.J.HWANG	REVIEWED BY S.S.LEE
PREPARED BY Y.S.LIM		APPROVED BY S.J.HWANG		REVIEWED BY S.S.LEE	

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)

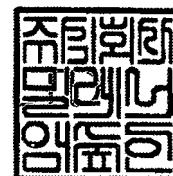
[illegible]

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-141113-01
SPECIFICATION 사 양	7 MPa	SERIAL NO. 일련 번호	P070-129
CALIBRATION DATE 교정 일자	2014.11.13	RECAL. DATE 재교정 일자	2015.11.12
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. <i>P. H.</i>	
DATE <i>Nov. 12, 2014</i>	

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	1.0	1.0	0.0
2	3.0	3.01	0.01
3	4.0	4.01	0.01
4	7.0	7.0	0.0
5	4.0	4.01	0.01
6	3.0	3.0	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. : 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: <i>[Signature]</i> Germanischer Lloyd Industrial Services	CALIBRATED BY <i>[Signature]</i>
	APPROVED BY <i>[Signature]</i>



REPORT OF CALIBRATION

교 정 성 적 서

EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-141113-02
SPECIFICATION 사 양	7 MPa	SERIAL NO. 일련 번호	P070-130
CALIBRATION DATE 교정 일자	2014.11.13	RECAL. DATE 재교정 일자	2015.11.12
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)

	☒ Reviewed by
	☐ Witnessed by
QA DEPT. D. S. P. R.	
DATE 11.13.2014	

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	1.0	1.0	0.0
2	3.0	3.0	0.0
3	4.0	4.0	0.0
4	7.0	7.0	0.0
5	4.0	4.0	0.0
6	3.0	3.0	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. : 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: 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-141210-06
SPECIFICATION 사 양	10 MPa	SERIAL NO. 일련 번호	P100-022
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 D-3	
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 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: <i>[Signature]</i> Germanischer Lloyd Industrial Services	CALIBRATED BY <i>[Signature]</i>
	APPROVED BY <i>[Signature]</i>

REPORT OF CALIBRATION

교 정 성 적 서

EQUIPMENT NAME 기 기 명	PRESSURE GAGE	REPORT NO. 보고서 번호	ROC-141210-03
SPECIFICATION 사 양	10 MPa	SERIAL NO. 일련 번호	P100-078
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)

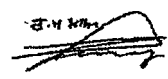
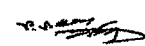
ILSUNG ISC	☒ Reviewed by ☐ Witnessed by
QA DEPT. P.C. R.K.	
DATE 12.10.2014	

<u>NO.</u>	<u>NOMINAL VALUE</u>	<u>REAL VALUE</u>	<u>DEVIATION</u>
1	2.0	2.0	0.0
2	5.0	4.95	-0.05
3	8.0	8.00	0.00
4	10.0	10.0	0.0
5	8.0	7.97	-0.03
6	5.0	5.0	0.0
7	2.0	2.0	0.0

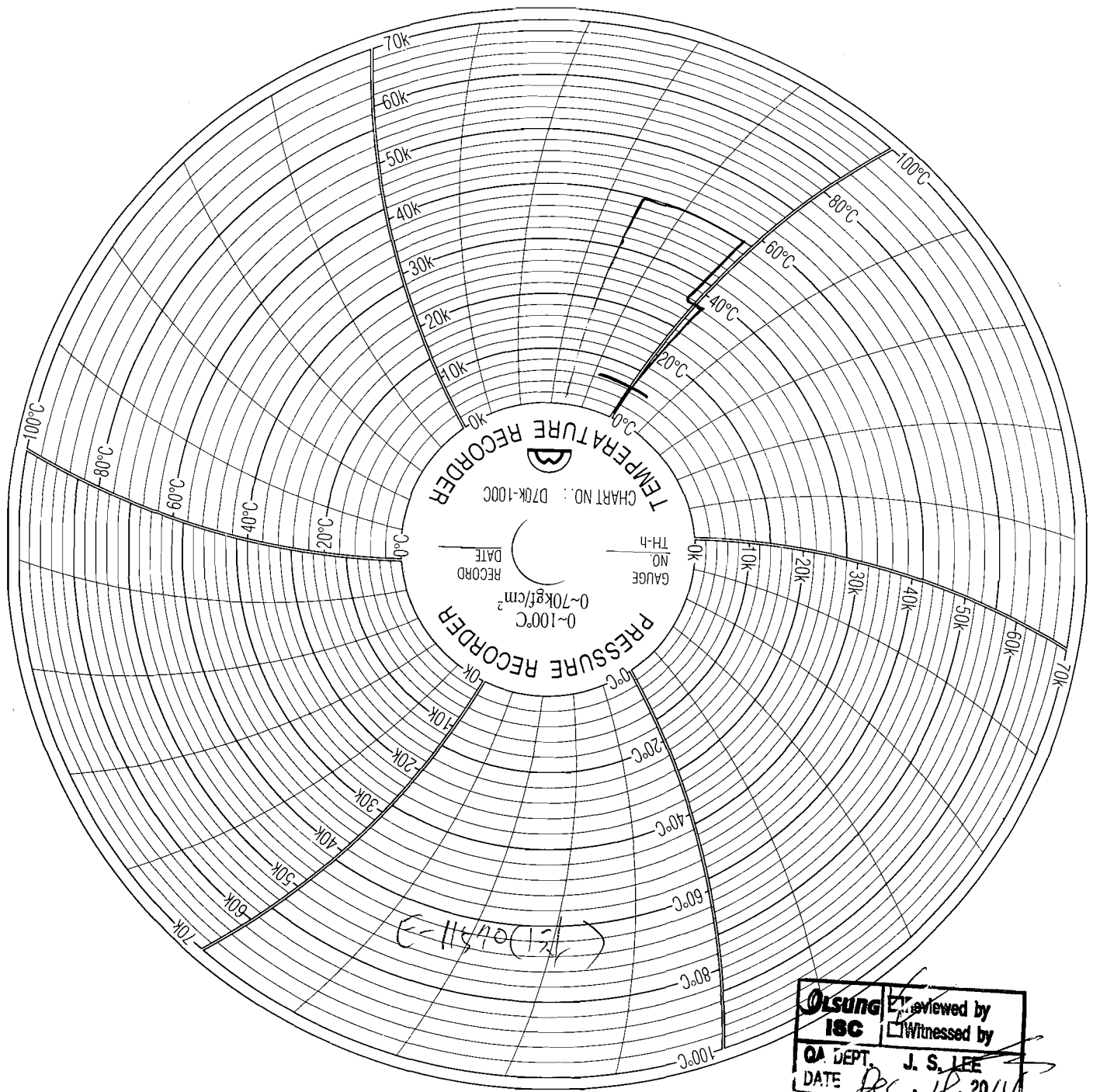
상기 기기는 국가 교정 검사 기관으로부터 교정 검사 되어 소급성이 유지된 PRESSURE CALIBRATOR (Serial No. : Q453, Certificate No. : H14-1773-035) 을 사용하여 교정한 성적서 임을 증명합니다.

(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: Germanischer Lloyd Industrial Services	CALIBRATED BY 
	APPROVED BY 

ASME

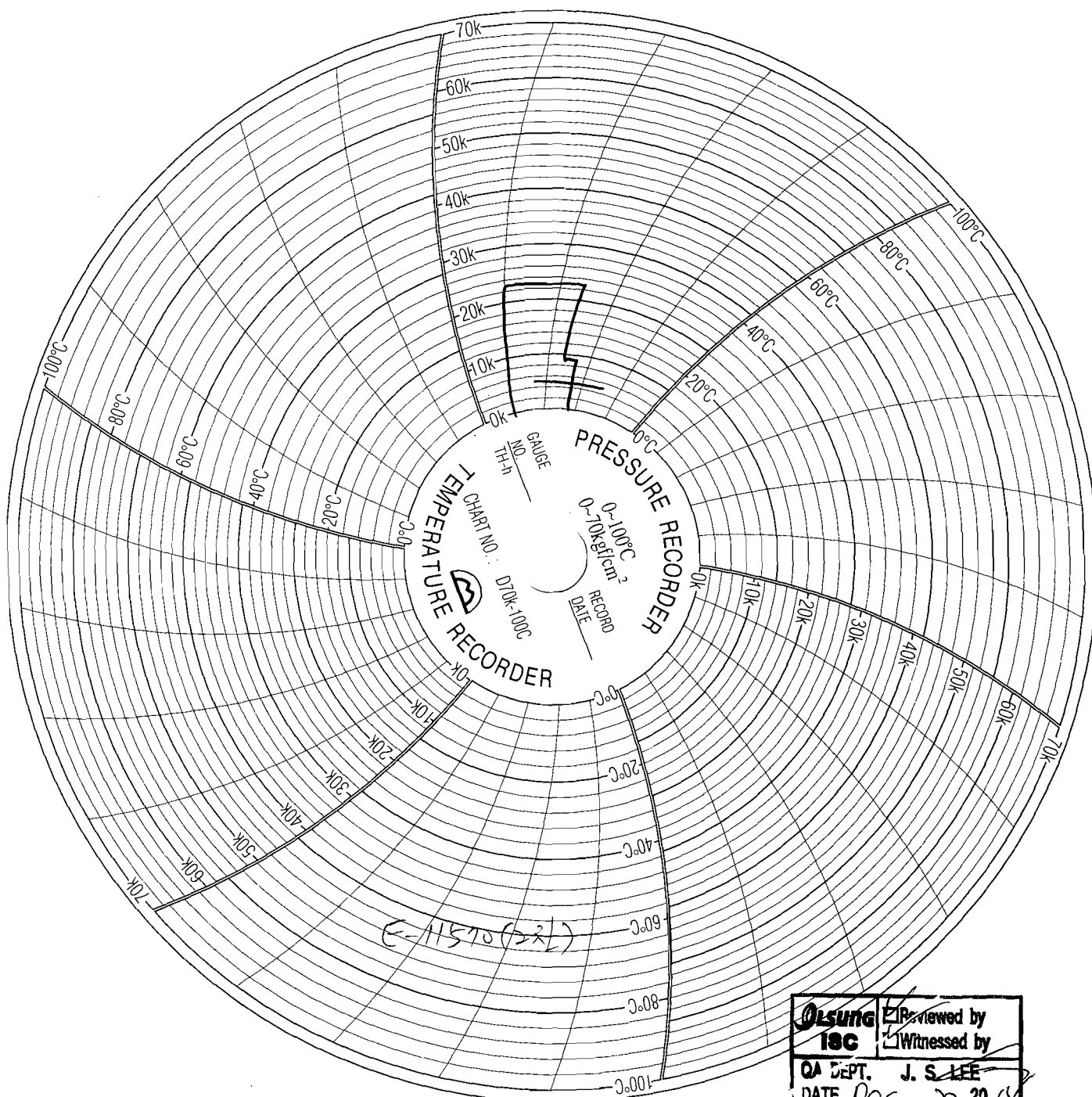


Olsung	☒ Reviewed by
ISC	☐ Witnessed by
QA DEPT.	J. S. LEE
DATE	Dec. 18, 2014

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

ASME

PAGE 8



Olson ISC	☒ Reviewed by
	☒ Witnessed by
QA DEPT.	J. S. LEE
DATE	Dec. 22, 2014

☒ 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-11570			
W/O NO.	P-13SG-007				DWG NO.	VP-SG07-E-11570-001 Rev. 6			
ROUGHNESS (SHELL SIDE) (medium : 40~70µm)			ROUGHNESS (CHANNEL SIDE) (medium : 20~30µm)			ROUGHNESS (SADDLE SIDE) (medium : 40~70µm)			
Abrasive Type : GRIT			Abrasive Type : GARNET			Abrasive Type : GRIT			
Testex PRESS-O-FILM™ HT www.testextape.com 56µm X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 0.8 1.5 2.5 4.5 mil			PRESS-O-FILM™ Made in U.S.A. No. 28µm Reading 28µm Gage less 2.0 mills or 50 µm TESTEX NEWARK, DE 19715 USA COARSE (.8-2.0 mills) or (20 to 50 µm)			Testex PRESS-O-FILM™ HT www.testextape.com 58µm X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 0.8 1.5 2.5 4.5 mil			
CLIMATIC CONDITION :					FINE				
EXTERNAL SURFACE OF SHELL SIDE <SHELL SIDE>									
Sequence	Brand Name	Batch No.	Manuf. Date	W.F.T(µm)	D.F.T(SPEC.)	D.F.T(µm)	Color	Paint System	
Primer	AMERCOAT91	K426621666	26.Aug,2014	225 ~ 250	125 ~ 175	126 ~ 172	GRAY	P3	
Intermediate				N/A					
Finish									
EXTERNAL SURFACE OF CHANNEL SIDE <CHANNEL SIDE>									
Sequence	Brand Name	Batch No.	Manuf. Date	W.F.T(µm)	D.F.T(SPEC.)	D.F.T(µm)	Color	Paint System	
Primer	HITEMP1027	HT10279003	16.Apr,2014	N/A	125 ~ 150	126 ~ 148	LIGHT GRAY	P7	
Intermediate				N/A					
Finish									
EXTERNAL SURFACE OF SADDLE									
Sequence	Brand Name	Batch No.	Manuf. Date	W.F.T(µm)	D.F.T(SPEC.)	D.F.T(µm)	Color	Paint System	
Primer	AMERCOAT132	K436653516	12.Sep,2014	100 ~ 125	50 ~ 75	53 ~ 74	GREEN	P4	
Intermediate				N/A					
Finish	PSX700	K440664436	1.Oct,2014	125 ~ 150	125 ~ 150	186 ~ 223	RAL7040		
N/A									
Sequence	Paint Material	Brand Name	Batch No.	Manuf. Date	W.F.T(µm)	D.F.T(µm)	Color	Paint System	
Primer								-	
Intermediate				N/A					
Finish									
N/A									
Sequence	Paint Material	Brand Name	Batch No.	Manuf. Date	W.F.T(µm)	D.F.T(µm)	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 Date / Signature: 29 Dec. 14 Germanischer Lloyd Industrial Services					APPROVED BY J.S.LEE J.S. Lee Dec. 29.14 REVIEWED BY Y.S.LIM PREPARED BY T.S.LEE				

ILSUNG CORPORATION

[illegible]

249/309

15. Nameplate and Code Stamp Rubbing or Photocopy

NAME PLATE RUBBING SHEET(1/2)

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-11570	DWG. NO.	VP-SG07-E11570-001 REV.05

DOC. NO. : ISC-QA-NP-SG-007-037

MANUFACTURER	ILSUNG CORPORATION		
MANUF. SERIAL NO.	14-HE-080	CODE	ASME SEC. VIII, DIV. 1, 2011 EDITION - 2011 ADDENDUM 1 + SAKE 2007/11/25 SERIAL + ITEM 1, 15-ED-2011
H/EX. NO.	1132-E-11570	CONSTR.	SHELL 1
	SHELL TUBE	CAT.	TUBE 1
PROCESS DESIGN PRESS.	2450/F.V	900/F.V	YEAR 2014
DESIGN TEMP.	110	110	VESSEL CATEGORY 1
TEST PRESS. NEW (S/F)	5195/4731	2147/1254	
VOLUME	3.15	5.16	m ³
SURFACE AREA		767.1	m ²
STRESS RELIEVED	NO	NO	DATE
RADIOGRAPH(S/R)	100%/-	100%/-	REG. No. (CRN No.) W7852.2
PMI	CLAD : S31803 , CHANNEL : S31803		

☐ WITNESSED BY
☐ REVIEWED BY

☒ REVIEWED
☐ WITNESSED
Date / Signature: <i>Y.S. Lee</i> Germanischer Lloyd Industrial Services

APPROVED BY	J.S.LEE	<i>J.S. Lee Jan. 30/15</i>
REVIEWED BY	Y.S.LIM	<i>Y.S. Lim</i>
PREPARED BY	T.S.LEE	<i>T.S. Lee</i>

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-11570	DWG. NO.	VP-SG07-E11570-001 REV.05

DOC. NO. : ISC-QA-NP-SG-007-037

2064		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-080	
	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

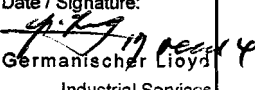
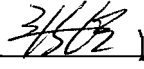
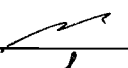
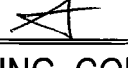
[Signature]
 Apr. 18. 2015
 14412
 HSB GS

☐ WITNESSED BY
☐ REVIEWED BY

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

APPROVED BY	J.S.LEE <i>J.S. Lee Jan-30-15</i>
REVIEWED BY	Y.S.LIM <i>[Signature]</i>
PREPARED BY	T.S.LEE <i>[Signature]</i>

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 - E11570 - 01	
P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY		
PROJECT NAME	CARMON CREEK PROJECT	ITEM NAME	VRU INLET GAS COOLER		
ITEM NO.	E-11570	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:  Germanischer 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

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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

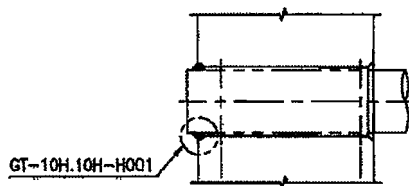
*1) FOR WPS OF CARBON PART, REFER TO DOCUMENT NO.

"CCK-4511951391-0100-H04-00001-000".

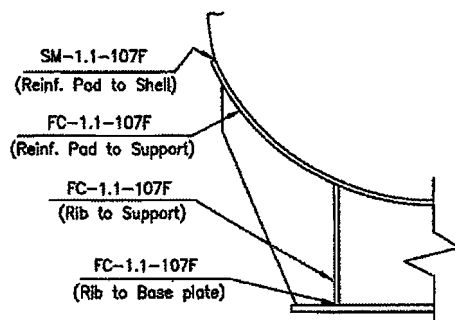
B-01	B-02	B-03	B-04	B-05	B-06	B-07	B-08
A-01	A-02	A-03	A-04			A-05	

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

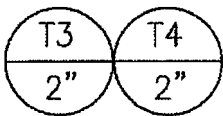
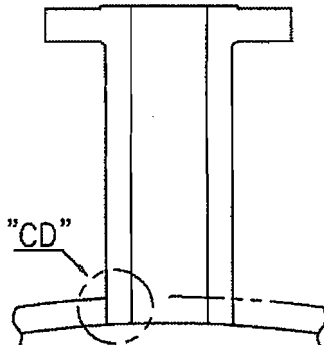
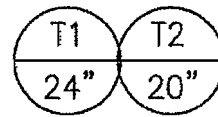
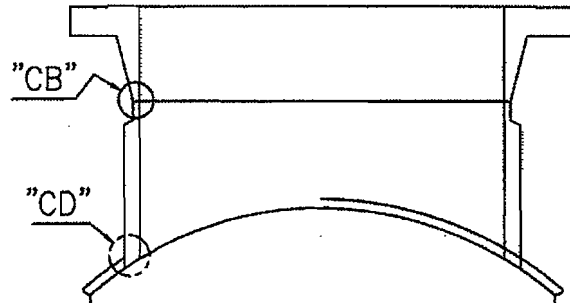
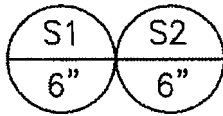
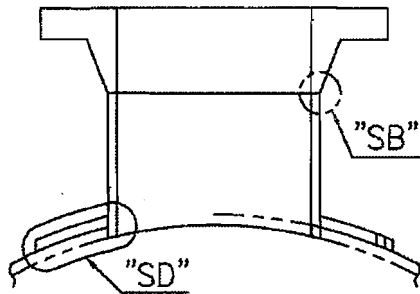
WELDING MAP

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 5

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> 30 Jun 15
Germanischer Lloyd
Industrial Services

[Signature]
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

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

OLSUNG	☒ Reviewed by
ISC	☐ Witnessed by
QA DEPT	J. S. LEE
DATE	SEP 15 2014

[Signature: J.H. O'Leary]
J.H. O'Leary / Quality Assurance Representative

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

PAGE

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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: _____

Customer Reference: _____

Hobart Order: N4670

Customer Order: HMWC-01051101

Part Number: S115951

Distributor: Hankook

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

Test Condition: As Welded

Schedule I, Class "C3"

EN 10204 3.1

WELDING PROCEDURE

Lab Test #: PB4142

Amps 190

Volts 25

Polarity DCEP

Number of Layers 8

Pass Sequence 2,2,2,2,2,2,2,2

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

Total Moisture:

X-Factor: n/a

Overhead Conforms

Method: RC412 - As Received

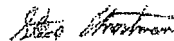
Ferrite: n/a

Vertical Conforms

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



Quality Engineer

2/14/2011

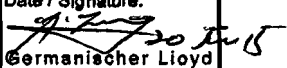
Date

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:

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
Marked For :
Products : HOBART BR-2
Classification : ER70S-2
Specification : AWS A5.18

Diameter : 2.4 X915
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

Amps DCEP	Volts	WFS (CPM)	Shielding Gas	Electrical Stickout	Preheat	Temperature Interpass	Travel Speed
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	97180 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 : HA/100g

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

QSLung
ISC
☒ Reviewed by
☐ Witnessed by
QA DEPT. J. S. LEE
DATE Jun . 20 . 2014

[Signature]
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

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 X916
W.O.#:
Kgs Shipped : 1200 Kgs
Date: 10/29/13

Customer P.O.# : HMW-PO-10011801
Lot No.: 3102247924
Pack Slip/Order #:
Data Tested : 08/25/11
Certificate No. : 102913-1.Rev.2

Amps DCEP	Volts	WFS (CPM)	Shielding Gas	Electrical Stickout	Preheat	Temperature Interpass	Travel Speed
230	16	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 PWHIT 810C / 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	0.008	0.021	0.015	0.001	0.03	0.12	0.07	0.1

HYDROGEN LEVEL : H4/100g

☒ REVIEWED
☐ WITNESSED

Date / Signature:

[Signature]
Germanischer Lloyd
Industrial Services

[Signature]
J.H. O'Leary / Manager, Quality Assurance

[Signature]
QA DEPT. J. S. LEE
DATE Jun . 20. 2014

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.

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 X916
W.O.#:
Kgs Shipped : 1200 Kgs
Date : 10/28/13

Customer P.O.# : HMW-PO-10011301
Lot No. : 3102247824
Pack Slip/Order #:
Data Tested : 08/25/11
Certificate No. : 102913-1.Rev.2

Amps DCEP	Volts	WFS (CPM)	Shielding Gas	Electrical Stickout	Preheat	Temperature Interpass	Travel Speed	
230	16	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 CH25	PWHT	97568 psi 673 Mpa	87180 psi 601 Mpa	26	-51 F -46 C	80 89 108 105 116 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	0.008	0.021	0.015	0.001	0.03	0.12	0.07	0.1

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

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

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 CERTIFICATE OF WELDING CONSUMABLES

(#321, HWASAN-RI, ONSAN-EUB, ULJU-KUN, ULSAN, KOREA / TEL: 052-237-5301 / FAX: 052-237-3311)

PAGE 11

P. O. No. :

CUSTOMER : 주동성웰딩

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 (J) (at -20 °C)	Fig.8
	Y.P (Mpa)	T.S (Mpa)	Elon (%)	R.A(%)		
Spec. (min.)	390	490~670	22	-	27	NR
Result	527	600	29.8		51 57 61 AVE. = 56.3	

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 L1	Fillet Weld Leg L2 L3	Difference Between Length of fillet legs	Convexity	Dimension of Fillet Weld	
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
☒ Witnessed by
 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/12-267879

Rev 01

Date 2012-07-25

Page 1/1

ASME

Rev.date 2014-03-20

INSPECTION CERTIFICATE acc to
EN 10 204 3.1

S.W.M.
CENTUM LEADERS MARK BLDG 1809,
WOO-DONG, 1514
HAEWOONDAE-GU, 612-020 BUSAN
KOREA

Customer References

KI20125027

Customer
order
2012-06-05

901-06427 S.W.M

Sandvik References

Order No. Subs No. ABSMT Dispatch note
500813 21158 44153/55
ABSMT No. C.Code
415-54355 01

Material description

STAINLESS COLD DRAWN WIRE
WELDING WIRE
TIG LENGTHS

Steel 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

Qlsung	☒ Reviewed by
ISC	☐ Witnessed by
QA DEPT. J. S. LEE	
DATE Jun . 20 . 2014	

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

EXTENT OF DELIVERY

It	Product designation	Heat	Lot	Pieces	Kg
01	R22.8.3.L-1.60-1000	532110	19007	200	1000.0
Total				200	1000.0

TEST RESULTS

Chemical composition (weight%)

Heat	PRE	FN WRC-92
532110	35.5	55

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
532110	0.008	0.48	1.48	0.016	<0.0005	22.88	8.61	3.05
	Co	Cu	N					
532110	0.049	0.097	0.16					

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



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 LENGTHS

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

Steel making process

Electric furnace

Technical requirements

OLSONG
ISCReviewed by
Witnessed byQA 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
Heat	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

Delivery Testing Report

WQW 14803 Rev.0

Page 1 (5)

ASME
SANDVIK 22.8.3.L TIG
WQW/Hardner March 2014
List of revisions
Number
Change

0

Original

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

LSUNG	☒ Reviewed by
ISC	☐ 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>[Signature]</i>		

**Certified Material Test Report**

EN 10204 3.1

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)
W14803	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.

OLSUNG 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

PAGE 16
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

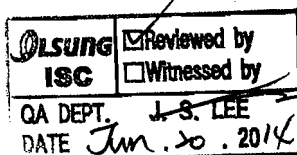
Lot	Dim	Grade	Mo	Ti	Cu	Nb	N	Al	W	Fe	PREn
Requirements in spec. for ER2209			Info	Info	Info	Info	Info				>35
23177	2,40	ER2209	3,2		0,12		0,20				36,7

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

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
<i>Requirements in spec. for ER2209</i>					
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>				<i>As welded</i>	<i>-50</i>	<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

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

QLSUNG ISC
☒ Reviewed by
☐ Witnessed by
 QA DEPT. J. S. LEE
 DATE *Jun .20 . 2014*



Certified Material Test Report

EN 10204 3.1

Delivery Testing Report
WQW 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				

Olsson ISC QA-DEPT. DATE	☒ Reviewed by ☐ Witnessed by J. S. LEE Jan. 20. 2014
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☒ REVIEWED ☐ WITNESSED Date / Signature: 20 Jan 15 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 Material description B01/B04 STAINLESS COLD DRAWN WIRE WELDING WIRE TIG LENGTHS Steel making process C70 Electric furnace	Sandvik References A08 <table style="width:100%;"> <tr> <td>Order No.</td> <td>Subs No.</td> <td>ABSMT Dispatch note</td> </tr> <tr> <td>502069</td> <td>21635</td> <td>13080/55</td> </tr> <tr> <td>ABSMT No.</td> <td>C.Code</td> <td></td> </tr> <tr> <td>415-65449</td> <td>43</td> <td></td> </tr> </table> Steel/material Designations B02 <table style="width:100%;"> <tr> <td>Sandvik</td> <td>AWS</td> </tr> <tr> <td>22.8.3.L</td> <td>ER2209</td> </tr> <tr> <td>EN no</td> <td>EN ISO 14343-A</td> </tr> <tr> <td>22 9 3 N L</td> <td>22 9 3 N L</td> </tr> </table>	Order No.	Subs No.	ABSMT Dispatch note	502069	21635	13080/55	ABSMT No.	C.Code		415-65449	43		Sandvik	AWS	22.8.3.L	ER2209	EN no	EN ISO 14343-A	22 9 3 N L	22 9 3 N L																																		
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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%;"> <tr> <th>It</th> <th>Product designation</th> <th>Heat</th> <th>Lot</th> <th>Pieces</th> <th>Kg</th> </tr> <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="5" style="text-align: right;">Total</td> <td>600 3000.0</td> </tr> </table> TEST RESULTS Chemical composition (weight%) <table style="width:100%;"> <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> <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> </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					
It	Product designation	Heat	Lot	Pieces	Kg																																																		
01	R22.8.3.L-2.40-1000	537592	23177	600	3000.0																																																		
Total					600 3000.0																																																		
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QA DEPT. DATE Jun . 20. 2014 ☒ Reviewed by ☐ Witnessed by J. S. LEE ☐ 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

ASME

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.

	☒ Reviewed by
	☐ Witnessed by
QA DEPT.	J. S. LEE
DATE	Jun .20 . 2014

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

SMP CERTIFICATE OF COMPLIANCE

ESAB SeAH Corporation

36, 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 : (주)세아에스알산총판

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
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	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)

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

OLsung ISC
☒ Reviewed by
☐ Witnessed by
QA DEPT. J.S. Kim
DATE Aug. 14. 2014

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**ESAB SeAH Corporation**

36, 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 : ㈜세아에스알산출판

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 Specification
Compositions Requirements
(EN 10204 - 2.2)

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 Specification
Properties Requirements
As welded 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
☐ Witnessed by

QA DEPT. J. S. LEE
DATE Dec. 25. 2014

☒ REVIEWED
☐ WITNESSED
Date / 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



CERTIFICATE

No. A/12-267879

Rev 01

Date 2012-07-25

Page 1/1

ASME

Rev.date 2014-03-20

INSPECTION CERTIFICATE acc to
EN 10 204 3.1

S.W.M.
CENTUM LEADERS MARK BLDG 1809,
WOO-DONG, 1514
HAEWOONDAE-GU, 612-020 BUSAN
KOREA

Customer References

KI20125027

Customer
order
2012-06-05

901-06427 S.W.M

Sandvik References

Order No. Subs No. ABSMT Dispatch note
500813 21158 44153/55
ABSMT No. C.Code
415-54355 01

Material description

STAINLESS COLD DRAWN WIRE
WELDING WIRE
TIG LENGTHS

Steel 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

Qlsung
ISC
QA DEPT. J. S. LEE
DATE Jan . 20 . 2014

☒ Reviewed by
☐ Witnessed by

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

EXTENT OF DELIVERY

It	Product designation	Heat	Lot	Pieces	Kg
01	R22.8.3.L-1.60-1000	532110	19007	200	1000.0
Total				200	1000.0

TEST RESULTS

Chemical composition (weight%)

Heat PRE FN WRC-92
532110 35.5 55

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
532110	0.008	0.48	1.48	0.016	<0.0005	22.88	8.61	3.05
	Co	Cu	N					
532110	0.049	0.097	0.16					

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

17. Bolt Torque Report

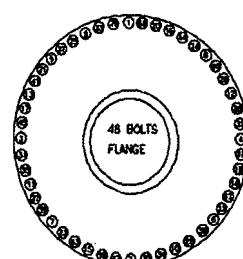
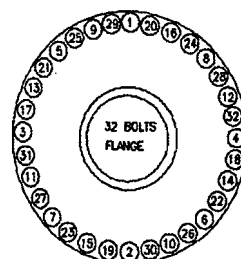
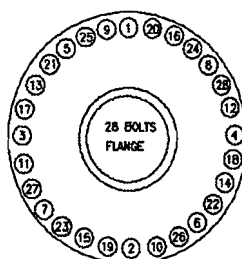
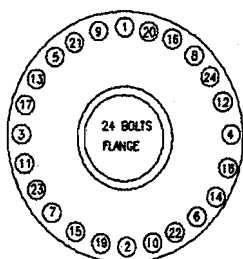
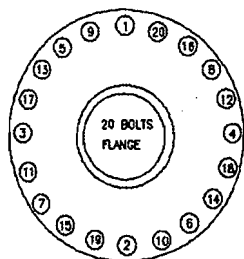
BOLT TIGHTENING RECORDS

General Information

Checked date : DEC. 18~19, 2014

P.O No.	4511951391	Project Name	CARMON CREEK PROJECT
Item No.	E-11570	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

REVIEWED
WITNESSED
Date / Signature:
Germanischer Lloyd
Industrial Services

Approved By S.J.HWANG *[Signature]* Dec 19 '14
Reviewed By S.S.LEE *[Signature]* Dec 19 '14
Prepared By Y.S.LIM *[Signature]* 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"	



TITAN
TECHNOLOGIES INTERNATIONAL, INC

SUPERIOR TECHNOLOGIES • SUPERIOR SOLUTIONS™

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*

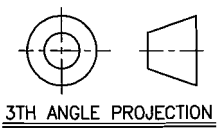
	T-1	T-3	T-5	T-8	T-10	T-25
PUMP PSI (BAR)	Torque - Ft. Lbs (Nm)					
1500 (103)	197 (267)	468 (635)	816 (1107)	1168 (1584)	1662 (2254)	3726 (5052)
1600 (110)	210 (285)	499 (677)	871 (1180)	1246 (1689)	1773 (2404)	4002 (5389)
1800 (124)	236 (321)	562 (762)	979 (1328)	1402 (1901)	1994 (2704)	4554 (6063)
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

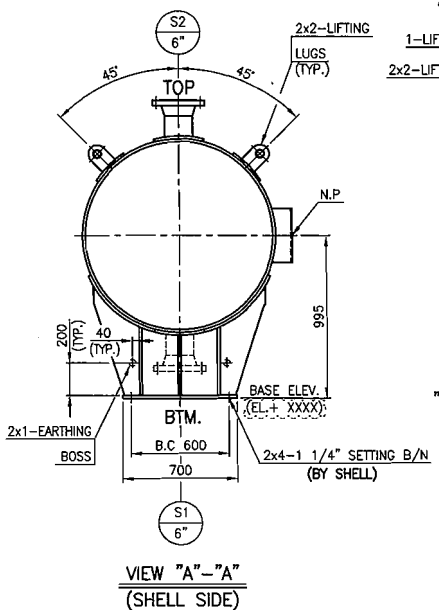
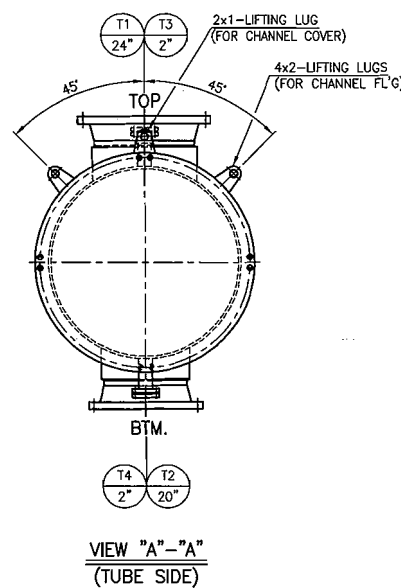
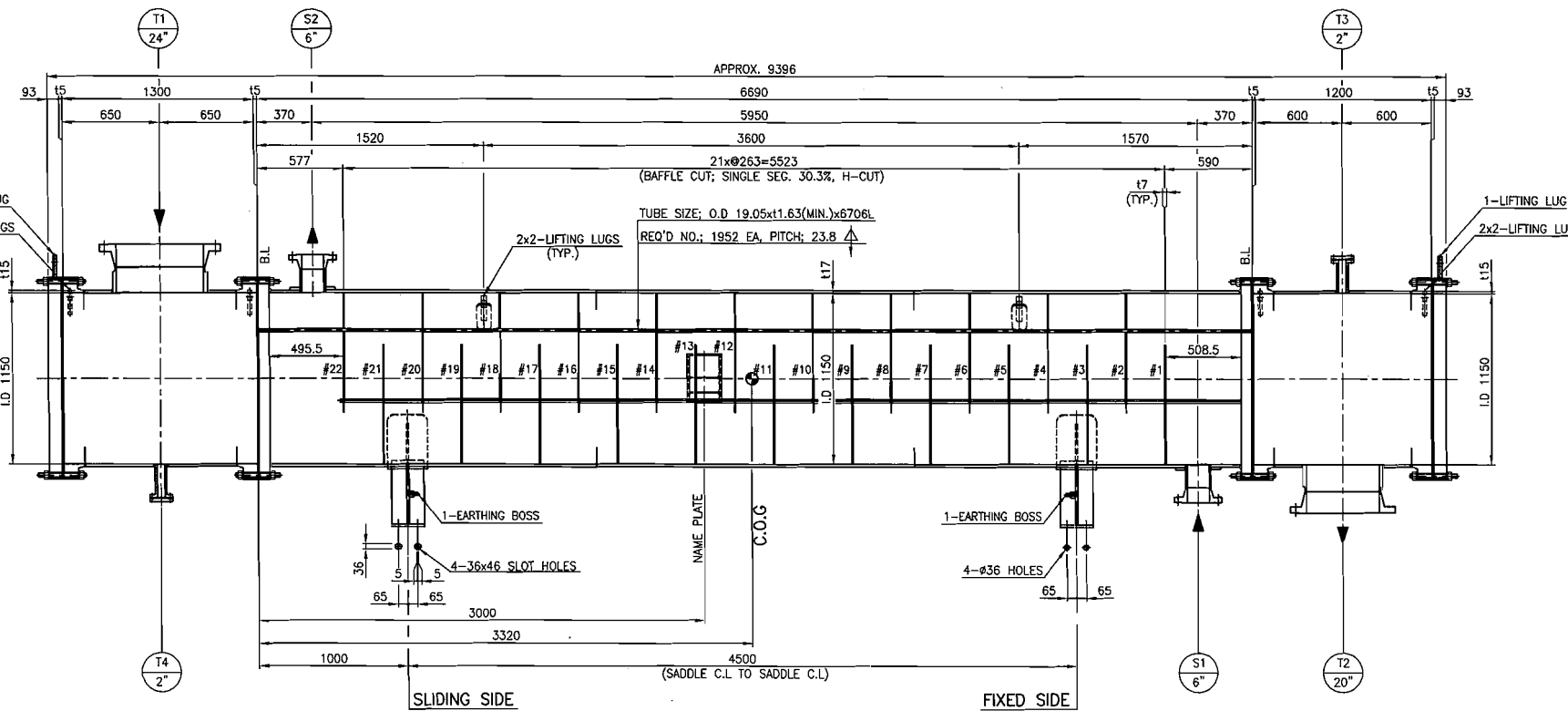
Toll-Free 866.345.8484 Phone 281.449.9994 Fax 281.449.9996 Email sales@titanti.com

www.titanti.com

18. As-built Drawing including Lifting and Transportation Drawing

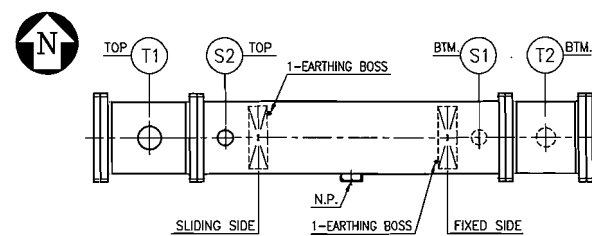


3TH ANGLE PROJECTION

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

SIDE ELEVATION

KEY PLAN



Document Number: CCK-4511951391-0132-B01-00001-001 Rev: 09

Approval Status:

- ☒ 1 - Approved, No Comment - Proceed with Fabrication/Construction
- ☐ 2 - Approved, Note Comments - Revise and Resubmit. Proceed with Fabrication/Construction
- ☐ 3 - Not Approved, Revise and Resubmit - do not proceed with Fabrication/Construction
- ☐ 4 - Information Only

VENDOR PLEASE NOTE: Permission to proceed does not constitute acceptance or approval of design details, calculations, analysis, test methods or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligation.

Responsible Engineer Signature: Wayne Gossett (Wayne.Gossett@shell.com) Date: 02/09/2015

Document Number: SHELL REV:

TAGS:

APPROVAL STATUS:

- ☐ 1 - APPROVED, NO COMMENT - PROCEED WITH FABRICATION
- ☐ 2 - APPROVED WITH COMMENTS - REVISE AND RESUBMIT. PROCEED WITH FABRICATION
- ☐ 3 - NOT APPROVED, REVISE AND RESUBMIT
- ☐ 4 - INFORMATION ONLY

SUPPLIER PLEASE NOTE: PERMISSION TO PROCEED DOES NOT CONSTITUTE ACCEPTANCE OR APPROVAL OF DESIGN DETAILS, CALCULATIONS, ANALYSES, TEST METHODS OR MATERIAL DEVELOPED OR SELECTED BY THE VENDOR AND DOES NOT RELIEVE SUPPLIER FROM FULL COMPLIANCE WITH CONTRACTUAL OBLIGATION.

RESPONSIBLE ENGINEER SIGNATURE: DATE:

NO.	DRAWING NAME	CLIENT DOC. NO. (ISSUING DOC. NO.)
9	GENERAL NOTE	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)
8	DETAIL OF SHIPPING SADDLE	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)
7	DETAIL OF NAME PLATE	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)
6	DETAIL OF NOZZLE	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)
5	DETAIL OF SUPPORT SADDLE	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)
4	DETAIL OF TUBE BUNDLE	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)
3	DETAIL OF TUBE ARRANGEMENT	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)
2	DETAIL OF BODY	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)
1	GENERAL ASSEMBLY	CCK-4511951391-0132-B01-00001-001 (VP-SG07-E11570-000)

DRAWING LIST

DESIGN DATA

CODE	ASME SEC. VIII DIV. 1 2010 ED. + 2011 ADD. + API 660 (8th ED. 2007) + NACE MR0175 / ISO 15156	TEMA CLASS	"R" (9TH ED. - '07)
		TYPE	H-AEL
SURFACE AREA PER UNIT SHELL (EFF.)	767.1/767.1 m ²	CODE STAMP/N.B. REQ'D	ASME (U)/YES
NO. OF REQ'D	2 (TWO)	LOCAL REGULATION	ABSA
	SHELL SIDE		TUBE SIDE
KIND OF FLUID	50wt% MEG, 50wt% H2O	VRU GAS	
SPECIAL SERVICE	SWEET	SOUR	
PROCESS DESIGN PRESS.(INT./EXT.)	2450/F.V. kPa(g)	900/F.V. kPa(g)	
DESIGN TEMP. (INT./EXT.)	110 °C	110 °C	
OPER. PRESS.	1154 kPa(abs)	98 kPa(abs)	
OPER. TEMP. (IN/OUT)	35.3/78.3 °C	85.7/45 °C	
HYDRO. TEST PRESS.	5195 kPa(g)	2147 kPa(g)	
TEST PRESS. FIELD	4731 kPa(g)	1254 kPa(g)	
PNEUM. TEST PRESS.	-	-	kPa(g)
M.A.W.P. / M.A.P.	3639/4008 kPa(g)	965/1665 kPa(g)	
GOWNED COMPONENT(M.A.W.P./M.A.P.)	SHELL SIDE/SHELL SIDE	CHANNEL COVER/CHANNEL COVER	
M.D.M.T. AT M.A.W.P./M.A.E.P.	-45 °C AT 3639/F.V. kPa(g)	-45 °C AT 965/F.V. kPa(g)	
M.M.T. (HOR. OPERATING)	54.3 °C	58.9 °C	
P.W.H.T.	NO	NO	
S.R.O.F. HEAD AFTER COLD FORMING	NO	NO	
IMPACT TEST	YES (SEE NOTE 3)	YES (SEE NOTE 3)	
RADIOGRAPH (S/H)	100%/-	100%/-	
JOINT EFFICIENCY (S/H)	1.0/-	1.0/-	
CORR. ALLOW. (mm)	1.5(SHELL) / 3(NOZZLES)	0.4(TUBES)/0.0	
NO. OF PASS	1 (ONE)	1 (ONE)	
INSULATION (BY OTHERS)	50 mm	50 mm	
FIREPROOFING	-	-	mm
WIND VELOCITY	NBC CANADA 2005		
SEISMIC ZONE	NBC CANADA 2005		
PAINTING	AS PER DEP 30.48.00.31-GEN.		
WEIGHT			
ERECTION	20000 kg	BUNDLE	11190 kg
EMPTY	21360 kg	FULL OF WATER	29745 kg
OPERATING	24500 kg		
TUBE & TUBESHEET JOINT	STRENGTH WELD WITH EXPANDING		

NOZZLE SCHEDULE

MARK NO.	PIPE	FLANGE	FROM C.L. TO FACE	DESCRIPTION	REMARK
S1 1	6" 80 ASME 300# W.N. R.F.	830	830	SHELL SIDE INLET	
S2 1	6" 80 ASME 300# W.N. R.F.	830	830	SHELL SIDE OUTLET	
T1 1	24" t10 ASME 150# W.N. R.F.	900	900	TUBE SIDE INLET	
T2 1	20" t10 ASME 150# W.N. R.F.	900	900	TUBE SIDE OUTLET	
T3 1	2" ASME 150# L.W.N. R.F.	800	800	TUBE SIDE VENT	W/B.F.
T4 1	2" ASME 150# L.W.N. R.F.	800	800	TUBE SIDE DRAIN	W/B.F.

ITEM NO.
1 E-11570
2 E-11580

REV.	DATE	DESCRIPTION	DRWN	CHKD	REVD	APPD
1	2014.12.30	ISSUED FOR APPROVAL	TY-ENG	H.S.JEON	K.B.KIM	Y.G.PARK
2	2014.12.23	ISSUED FOR APPROVAL	TY-ENG	H.S.JEON	K.B.KIM	Y.G.PARK
3	2014.11.17	ISSUED FOR APPROVAL	TY-ENG	H.S.JEON	K.B.KIM	Y.G.PARK
4	2014.09.04	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK
5	2014.08.27	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK
6	2014.08.13	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK
7	2014.07.02	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK
8	2014.05.30	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK
9	2014.01.20	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK

CLIENT: SHELL CANADA ENERGY

PROJECT: CARMON CREEK PROJECT

P/O NO. 4511951391 TITLE: E-11570 (SEE ITEM NO. TABLE)

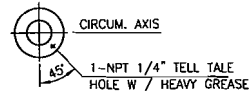
W/O NO. P-135G-007 VRU INLET GAS COOLER (GENERAL ASSEMBLY)

SCALE: 1/22 CLIENT DOC. NO. CCK-4511951391-0132-B01-00001-001 REV NO. 09

ILSUNG ILSUNG CORPORATION ONSAN, KOREA VP-SG07-E11570-001

1. FABRICATION

- ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.
- ALL BOLT HOLES ARE TO STRADDLE NATURAL C.L. OF H/EX. UNLESS OTHERWISE NOTED.
- NOZZLE PROJECTIONS ARE FROM CENTER LINE OF H/EX OR NEAREST TANGENT LINE TO GASKET FACE OF FLANGE.
- ALL WELD SHALL BE CONTINUOUS UNLESS OTHERWISE NOTED.
- DIMENSIONS TO BAFFLES OR SUPPORT ARE MEASURED TO THE CENTER OF EACH PLATE.
- BASE LINE (B.L.) IS INDICATED THE GASKET CONTACT SURFACE OF SHELL FLANGE.
- GASKET SEATING SURFACE SHALL COMPLY WITH THE FOLLOWING :
 - GIRTH FLANGE : 125 TO 250 MICRO INCH AARH
 - STANDARD NOZZLE FLANGE : 125 TO 250 MICRO INCH AARH
- GASKET SPECIFICATION : GROOVED METAL GASKET WITH GRAPHITE [15]
 - METAL : 304 S.S (14)
 - LAYER : GRAPHITE (10.5 ON BOTH SIDE)
- GASKET SPECIFICATION : SPIRAL WOUND GASKET [14.5]
 - FILLER : GRAPHITE - INNER RING : 304 S.S
 - HOOP : 304 S.S - OUTER RING : C.S
- ALL EXTERNAL REINFORCEMENT PADS SHALL BE PROVIDED WITH 1/4" NPT TELL-TALE HOLE FOR VENTING PURPOSE SHALL BE PACKED WITH SHIPPED HEAVY GREASE AFTER TESTING. LONG. AXIS



2. DESIGN NOTE

SEISMIC AND WIND LOAD	
	OPERATING
SEISMIC AT BASE	SHEAR (kN) 23.77
	MOMENT (kN-m) 22.58
WIND AT BASE	SHEAR (kN) 6.26
	MOMENT (kN-m) 5.94

WIND AND SEISMIC	
GROUND SNOW LOAD S _s	2.3 kPa
WIND:	
PREVAILING DIRECTION	SW
MAX. (1/50) WIND SPEED	28 m/s (51 kPa TABLE C-1 ABC CODE)
SEISMIC (ABC CODE SECTION 4.1.8)	
SITE CLASS	D (ABC TABLE 4.1.8.4.A.)
S _a (0.2)	0.124
S _a (0.5)	0.08
S _a (1.0)	0.036
S _a (2.0)	0.011
PGA	0.036

ALLOWABLE NOZZLE LOADS							
NOZZLE MARK	SIZE	FORCES (kN)			MOMENTS (kN-m)		
		AXIAL (F _x)	CIRCUMFERENTIAL (F _y)	LONGITUDINAL (F _z)	CIRCUMFERENTIAL (M _y)	TORSIONAL (M _z)	LONGITUDINAL (M _x)
S1,S2	6"	5.11	5.11	5.11	4.20	4.20	4.20
T1	24"	20.49	20.49	20.49	41.89	41.89	41.89
T2	20"	16.46	16.46	16.46	30.11	30.11	30.11

MEAN METAL TEMPERATURE		
CASE	SHELL (°C)	TUBE (°C)
NORMAL OPERATING	53.9	59.8

3. MATERIALS

- MATERIAL FOR EXTERNAL SUPPORTS WELD TO SHELL OR HEAD SHALL BE OF THE SAME GRADE AND WELDING COMPONENTS (P NO. AND G NO.) AS SPECIFIED FOR THE SHELL OR HEADS.
 - M.D.M.T : -45 °C, HOWEVER THE FOLLOWING REGARDLESS OF THE THICKNESS SHALL BE IMPACT TESTED AT -45 °C
 - LIFTING LUGS
- FOR WELDING OF THE ABOVE COMPONENTS, FOR WITH IMPACT TEST AT -45 °C ARE REQUIRED.

3) TABLE OF MATERIALS

COMPONENTS	MATERIAL	EXEMPTION (ASME SEC. IIC, DIV. 1)	IMPACT TEST (TEMP. (°C) ENERGY VALUE (J))	PRODUCTION IMPACT TEST	JOINT NO.	WPS NO.	REMARK
SHELL	SA516-70(N)		-45 20(AVG.)/14(MIN.)	YES	A-02-04.B-03-06	GT.SM-1.1-107F OF GT.SM.SA-1.1-107F	NOTE 1,2,3,5
SHELL FLANGE	-						
CHANNEL	SA240-S31803		-45 27(AVG.)/20(MIN.)	YES	A-01.05 B-01.02,07,08	GT.SM-10K1.0H-101H	NOTE 1,2,3,5
CHANNEL FLANGE	SA182-F51(S31803)		-45 27(AVG.)/20(MIN.)				
CHANNEL COVER	SA765-11(N)+S31803 CLAD		-45 20(AVG.)/14(MIN.)	N/A			NOTE 1,5
FLOATING FLANGE	-						
FLOATING HEAD	-						
BACKING DEVICE	-						
TUBESHEET	SA765-11(N)+S31803 CLAD		-45 20(AVG.)/14(MIN.)	N/A	TUBE TO TUBESHEET		NOTE 1,5
TUBE	SA788-S31803(SEAMLESS)	UCS-66(d)		N/A			NOTE 5
BAFFLE OR SUPPORT	SA516-70(N)	N/A					
IMPERMEABLE BAFFLE	-						
TIE ROD/2NUT	SA36(KILLED)/SA194-2HM	N/A			INTERNAL ATTACHMENT		
BAFFLE SPACER	SA333-6	N/A					
PASS PARTITION PLATE	-						
SETTING B/N (H.B.G.)	SA325/SA563-A	N/A					
SUP'T SADDLE	SA516-70(N)		-45 20(AVG.)/14(MIN.)	N/A	EXTERNAL ATTACHMENT		
EARTH BOSS	SA105(N)	N/A					
NAME PLATE	SA240-304	N/A					
FLANGE	SA350-LF2 CL-1(N)		-45 20(AVG.)/14(MIN.)	N/A			NOTE 1,5
PIPE	SA333-6		-45 20(AVG.)/14(MIN.)	N/A			NOTE 5
FITTING	-						
CHANNEL NOZZLE	FLANGE SA182-F51(S31803)		-45 27(AVG.)/20(MIN.)	N/A			NOTE 1,5
PIPE	-						
BOSS	SA182-F51(S31803)		-45 27(AVG.)/20(MIN.)	N/A			NOTE 1,5
FITTING	-						
STUD BOLT/NUT	-						
-SHELL COVER	-						
-STATIONARY	SA320-L7M/SA194-7M		-73 27(AVG.)/20(MIN.)	N/A			NOTE 4
-CHANNEL COVER	SA320-L7M/SA194-7M		-73 27(AVG.)/20(MIN.)	N/A			NOTE 4
-FLOATING HEAD	-						
GASKET	-						
-SHELL COVER	-						
-STATIONARY	(SEE NOTE 1.8)	N/A					
-CHANNEL COVER	(SEE NOTE 1.8)	N/A					
-FLOATING HEAD	-						
SHELL NOZZLE	GASKET -						
BOLT/NUT	-						
CHANNEL NOZZLE	GASKET (SEE NOTE 1.9)	N/A					
BOLT/NUT	SA320-L7M/SA194-7M		-73 27(AVG.)/20(MIN.)	N/A			

NOTE :

- 100% UT SCAN IN STRICT ACCORDANCE WITH SA-388.
- (1) SET OF TEST COUPONS REQUIRED.
 - COUPONS SHALL MATCH THE SHELL HEAT NUMBER & THICKNESS.
 - (1) SET OF COUPONS SHALL BE PROVIDED FOR EACH TYPE OF EDGE PREP.
 - SIZE OF COUPON TO BE 200x400 LG. 400 DIMENSION TRANSVERSE TO ROLLING GRAIN DIRECTION.
 - EDGE PREP ON 400 DIMENSION (1) SIDE ONLY.
- FOR EACH VESSEL, ONE TEST PLATE SHALL BE MADE FOR EACH WELDING PROCEDURE USED FOR JOINTS OF CATEGORIES A AND B.
- STUDS, NUTS AND GASKETS : MANUFACTURER'S CERTIFICATION OF COMPLIANCE REQUIRED WITH THE REFERENCED ASME OR ASIM SPECIFICATION. THE DOCUMENT SHALL BE IDENTIFIED WITH THE PO NUMBER AND ITEM CODE NUMBER AND SHALL BE SIGNED BY THE MANUFACTURER'S AUTHORIZED AGENT.
- ALL PRESSURE RETAINING PARTS MATERIALS SHALL MEET ASME SECTION II 2010 EDITION & 2011 ADDENDA FOR MATERIAL SPECIFICATIONS AND GENERAL SPECIFICATIONS TO THE PRODUCT FORM.

Document Number: CCK-4511951391-0132-B01-00001-002	Rev: 02
Approval Status: ☒ 1 - Approved, No Comment - Proceed with Fabrication/Construction ☐ 2 - Approved, Note Comments - Revise and Resubmit. Proceed with Fabrication/Construction ☐ 3 - Not Approved, Revise and Resubmit - do not proceed with Fabrication/Construction ☐ 4 - Information Only	
VENDORS PLEASE NOTE: Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligation.	
Responsible Engineer Signature: Wayne Gossett (Wayne.Gossett@shell.com)	Date: 01/22/2015

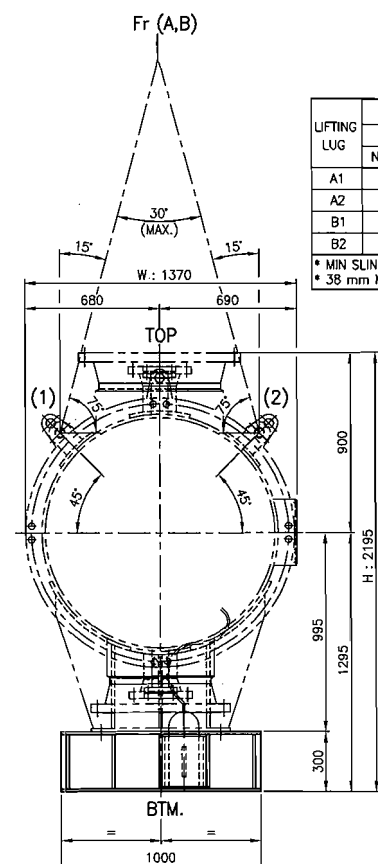
DOCUMENT NUMBER: CCK-4511951391-0132-B01-00001-002	SHELL REV: 02
TAGS: E-11570, E-11580	
APPROVAL STATUS: ☐ 1 - APPROVED, NO COMMENT - PROCEED WITH FABRICATION ☐ 2 - APPROVED WITH COMMENTS - REVISE AND RESUBMIT. PROCEED WITH FABRICATION ☐ 3 - NOT APPROVED, REVISE AND RESUBMIT ☐ 4 - INFORMATION ONLY	
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RESPONSIBLE ENGINEER SIGNATURE:	DATE:

ASME - U
SWEET SERVICE
(SHELL SIDE)
SOUR SERVICE
(TUBE SIDE)

ITEM NO.	
1	E-11570
2	E-11580

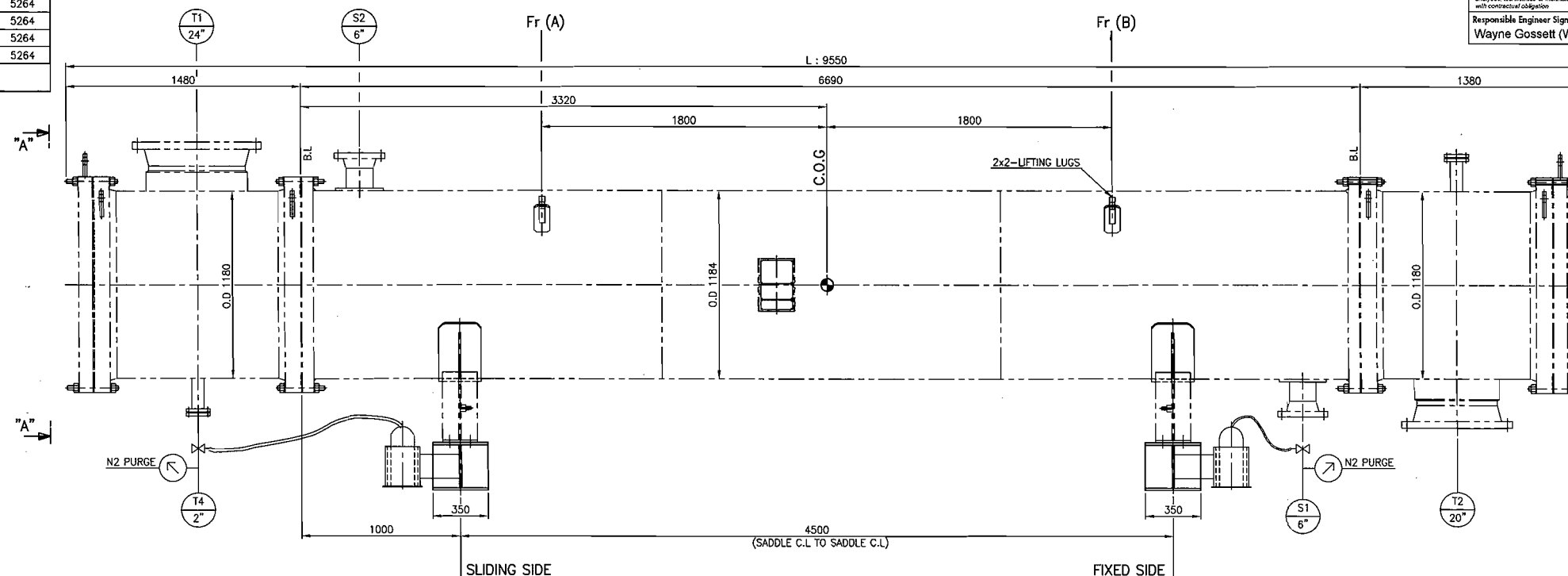
2014.12.30	ISSUED FOR APPROVAL	TY-ENG	W.J.LEE	K.B.KIM	Y.G.PARK	
2014.11.17	ISSUED FOR APPROVAL	TY-ENG	W.J.LEE	K.B.KIM	Y.G.PARK	
REV.	DATE	DESCRIPTION	DRWN	CHKD	REVD	APPD
CLIENT SHELL CANADA ENERGY						
PROJECT CARMON CREEK PROJECT						
P/O NO. 4511951391	TITLE E-11570 (SEE ITEM NO. TABLE) VRU INLET GAS COOLER (GENERAL NOTE)					
W/O NO. P-135G-007						
SCALE NONE	CLIENT DOC. NO. CCK-4511951391-0132-B01-00001-002	REV NO. 02				
ILSUNG ILSUNG CORPORATION ONSAN, KOREA VP-SG07-E11570-009						

Document Number:	CCK-4511951391-0132-B04-00002-001	Rev:	06
Approval Status:	☒ 1 - Approved, No Comment - Proceed with Fabrication/Construction ☐ 2 - Approved, Note Comments - Revise and Resubmit. Proceed with Fabrication/Construction ☐ 3 - Not Approved, Revise and Resubmit - do not proceed with Fabrication/Construction ☐ 4 - Information Only		
REVISIONS PLEASE NOTE: Permission to proceed does not constitute acceptance or approval of design details, calculations, analysis, test methods or materials developed or selected by the supplier and does not release supplier from full compliance with contractual obligation.			
Responsible Engineer Signature:	Wayne Gossett (Wayne.Gossett@shell.com)		Date:
			03/27/2015



LIFTING LUG	SLIDING LOAD (DEG. FROM VERTICAL)			
	0°		75°	
	NET (kg)	GROSS (kg)	NET (kg)	GROSS (kg)
A1	5000	5085	5176	5264
A2	5000	5085	5176	5264
B1	5000	5085	5176	5264
B2	5000	5085	5176	5264

• MIN SLING LENGTH FOR 15° = 1930 mm
• 38 mm MINIMUM SHACKLE PIN DIAMETER



VIEW "A" - "A"

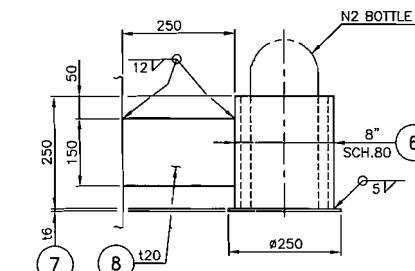
SIDE ELEVATION

SLIDING SIDE

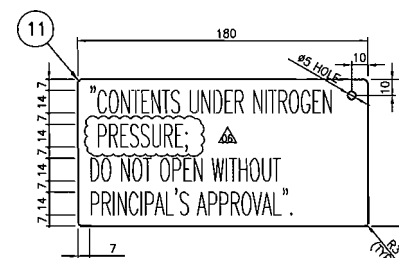
FIXED SIDE

DETAIL OF TEMPORARY FLANGE COVER

NOZZLE NO.	SIZE	RATING	COVER TH'K
S1	6"	300#	t16
S2	6"	300#	t16
T1	24"	150#	t16
T2	20"	150#	t14



DETAIL "B"



TAG PLATE

PACKAGE NO.	E-11570 (SEE ITEM NO. TABLE)
PACKAGE STYLE	STEEL SKID
DIMENSION	9.55Lx1.37Wx2.19SH M
MEASUREMENT	28.72 M ³
NET WEIGHT	20000 kg
GROSS WEIGHT	20340 kg
SADDLE WEIGHT	340 kg

NOTE

1. THE VESSEL TAG NUMBER SHALL BE STENCILED ON EACH VESSEL IN 150mm HIGH LETTERS.
2. UNPAINTED SURFACES WHICH ARE SUSCEPTIBLE TO CORROSION, INCLUDING FLANGE FACINGS, SHALL BE COATED WITH A RUST PREVENTATIVE THE RUST PREVENTATIVE SHALL BE AN EASILY REMOVABLE TYPE.
3. ALL TEMPORARY SHIPPING FLANGE COVERS, SHIPPING BOLTS AND NUTS SHALL BE PAINTED IN A DIFFERENT COLOR THAN H/EX.
4. TEMPORARY COVERS SHALL HAVE A MINIMUM OF FOUR(4) BOLTS AND BE FULLY FASTENED.
5. EXCHANGER SHALL BE PURGED WITH INERT (NITROGEN) TO A MAXIMUM PRESSURE OF 100kPa (15psi) MINIMUM PURGE PRESSURE IS 35 kPa (5 psi).
6. EXCHANGER SHELLS SHALL BE TAGGED WITH RED COLOURED WATERPROOF LABELS.

ITEM	NAME OF PART	MATERIAL	Q'TY	SP1	UNIT	REMARK
11	TAG PLATE	304 S.S.	1	EA	t1	
10	TEMPORARY GASKET	NON-ASBESTOS	4	EA	SEE TABLE	
9	TEMPORARY COVER	SA283-C	4	EA	SEE TABLE	
8	RIB PLATE	SA283-C	2	EA	t20	
7	BTM. PLATE	SA283-C	2	EA	t6	
6	BOTTLE SUP'T PIPE	SA53-B	2	EA	8" SCH.80	
5	HEX. B/N/2W	SA307-B/SA363-A/SA283-C	8	SETS	M33x100L	
4	RIB PLATE	SA283-C	20	EA	t14	
3	WEB PLATE	SA283-C	2	EA	t14	
2	UPPER PLATE	SA283-C	2	EA	t14	
1	LOWER PLATE	SA283-C	2	EA	t14	

(2) SETS TO BE MANUFACTURED

REV.	DATE	DESCRIPTION	DRWN	CHKD	REVD	APPD
1	2015.03.20	ISSUED FOR APPROVAL	TY-ENG	H.S.JEON	K.B.KIM	Y.G.PARK
2	2015.03.05	ISSUED FOR APPROVAL	TY-ENG	H.S.JEON	K.B.KIM	Y.G.PARK
3	2014.11.26	ISSUED FOR APPROVAL	TY-ENG	H.S.JEON	K.B.KIM	Y.G.PARK
4	2014.09.04	ISSUED FOR APPROVAL	TY-ENG	W.L.LEE	K.B.KIM	Y.G.PARK
5	2014.08.13	ISSUED FOR APPROVAL	TY-ENG	W.L.LEE	K.B.KIM	Y.G.PARK
6	2014.07.02	ISSUED FOR APPROVAL	TY-ENG	W.L.LEE	K.B.KIM	Y.G.PARK

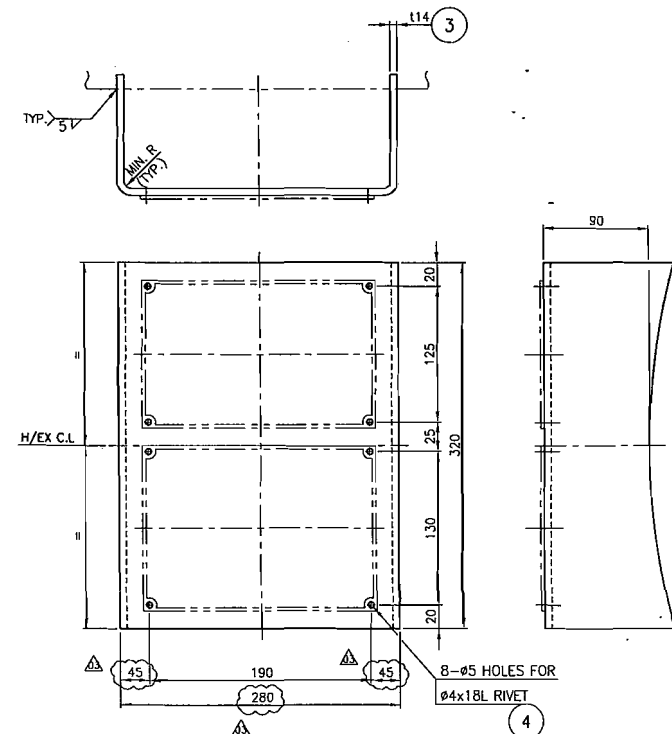
CLIENT	SHELL CANADA ENERGY					
PROJECT	CARMON CREEK PROJECT					
P/O NO.	4511951391	TITLE	E-11570 (SEE ITEM NO. TABLE)			
W/O NO.	P-135G-007		VRU INLET GAS COOLER (DETAIL OF SHIPPING SADDLE)			
SCALE	NONE	CLIENT DOC. NO.	CCK-4511951391-0132-B04-00002-001	REV NO.	O6	
		ILSUNG DOC. NO.	VP-SG07-E11570-008			

ILSUNG ILSUNG CORPORATION
ONSAN, KOREA

Document Number: CCK-4511951391-0132-D04-00002-001	Rev: 04
Approval Status: ☒ 1 - Approved, No Comment - Proceed with Fabrication/Construction ☐ 2 - Approved, Note Comments - Revise and Resubmit. Proceed with Fabrication/Construction ☐ 3 - Not Approved, Revise and Resubmit - do not proceed with Fabrication/Construction ☐ 4 - Information Only	
VENDORS PLEASE NOTE: Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligation.	
Responsible Engineer Signature: Wayne Gossett	Date: 01/06/2015

MANUFACTURER ILSUNG CORPORATION	
MANUF. SERIAL NO. (A)	CODE (SEE NOTE 1)
H/EX. NO. (B)	CONSTR. SHELL 1 TUBE 1
PROCESS DESIGN PRESS. 2450/F.V. 900/F.V. kPa.g	YEAR (SEE NOTE 8)
DESIGN TEMP. 110 110 °C	VESSEL CATEGORY 1
TEST PRESS. NEW (S/F) 5195/4731 2147/1254 kPa.g	27 2
VOLUME (3.15) (5.16) m ³	(SEE NOTE 6)
SURFACE AREA 767.1 m ²	(SEE NOTE 7)
STRESS RELIEVED NO NO	DATE (C)
RADIOGRAPH(S/H) 100%/- 100%/-	REG. No. (CRN No.)
PMI	CLAD : S31803, CHANNEL : S31803

EQUIPMENT NAME PLATE



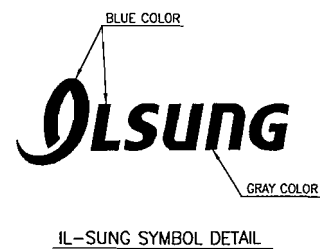
DOCUMENT NUMBER: CCK-4511951391-0132-D04-00002-001	SHELL REV: 03
TAGS: E-11580, E-11570	
APPROVAL STATUS: ☐ 1 - APPROVED, NO COMMENT - PROCEED WITH FABRICATION ☐ 2 - APPROVED WITH COMMENTS - REVISE AND RESUBMIT. PROCEED WITH FABRICATION ☐ 3 - NOT APPROVED, REVISE AND RESUBMIT ☐ 4 - INFORMATION ONLY	
SUPPLIER PLEASE NOTE: PERMISSION TO PROCEED DOES NOT CONSTITUTE ACCEPTANCE OR APPROVAL OF DESIGN DETAILS, CALCULATIONS, ANALYSES, TEST METHODS OR MATERIAL DEVELOPED OR SELECTED BY THE VENDOR AND DOES NOT RELIEVE SUPPLIER FROM FULL COMPLIANCE WITH CONTRACTUAL OBLIGATION.	
RESPONSIBLE ENGINEER SIGNATURE:	DATE:

CERTIFIED BY ILSUNG CORPORATION	
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. (A)
YEAR BUILT (SEE NOTE 8)	
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.	

ASME NAME PLATE

TABLE

ITEM NO.	A	B	C
E-11570	14-HE-080	1132-E-11570	W7852.2
E-11580	14-HE-081	1132-E-11580	W7852.2



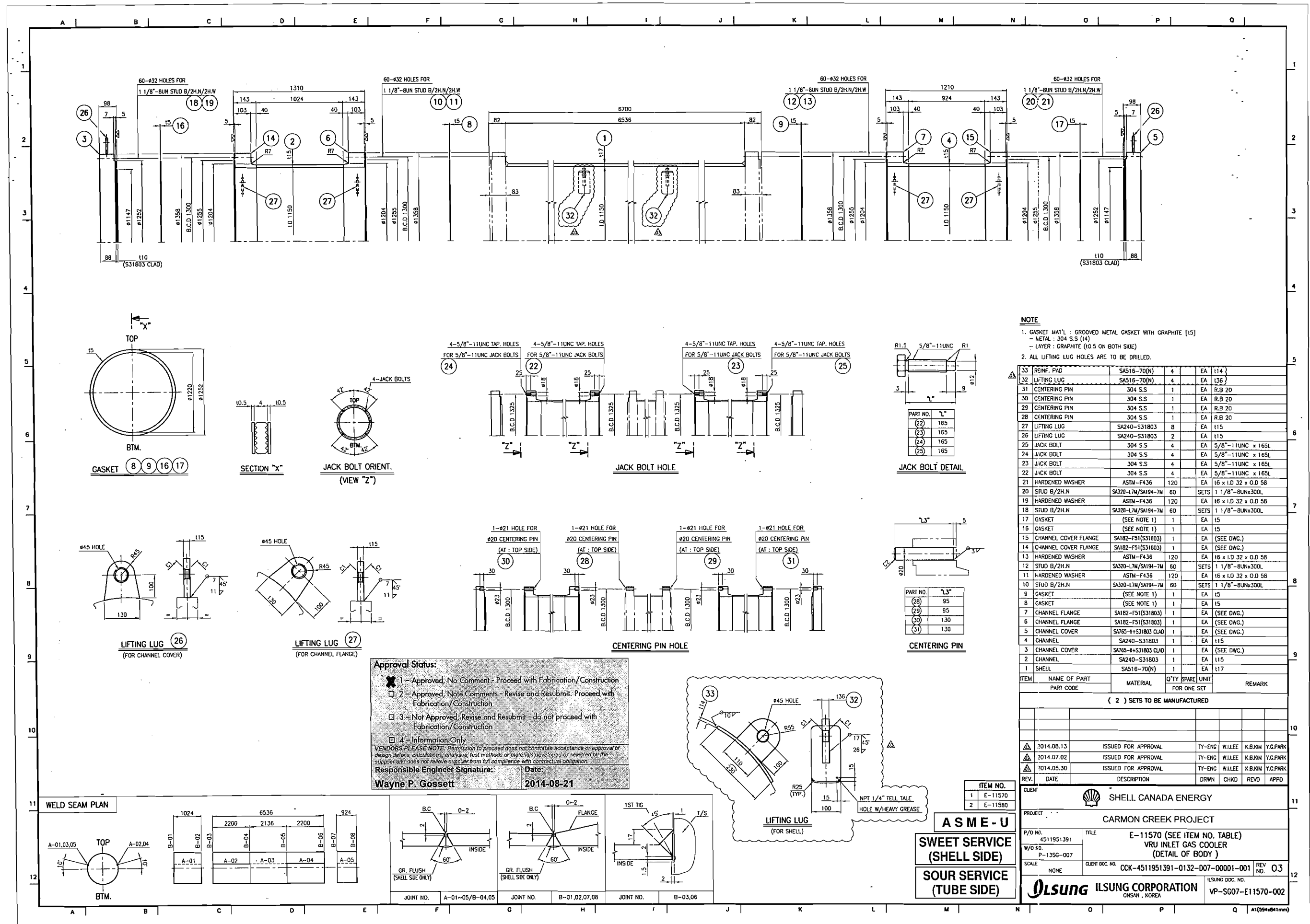
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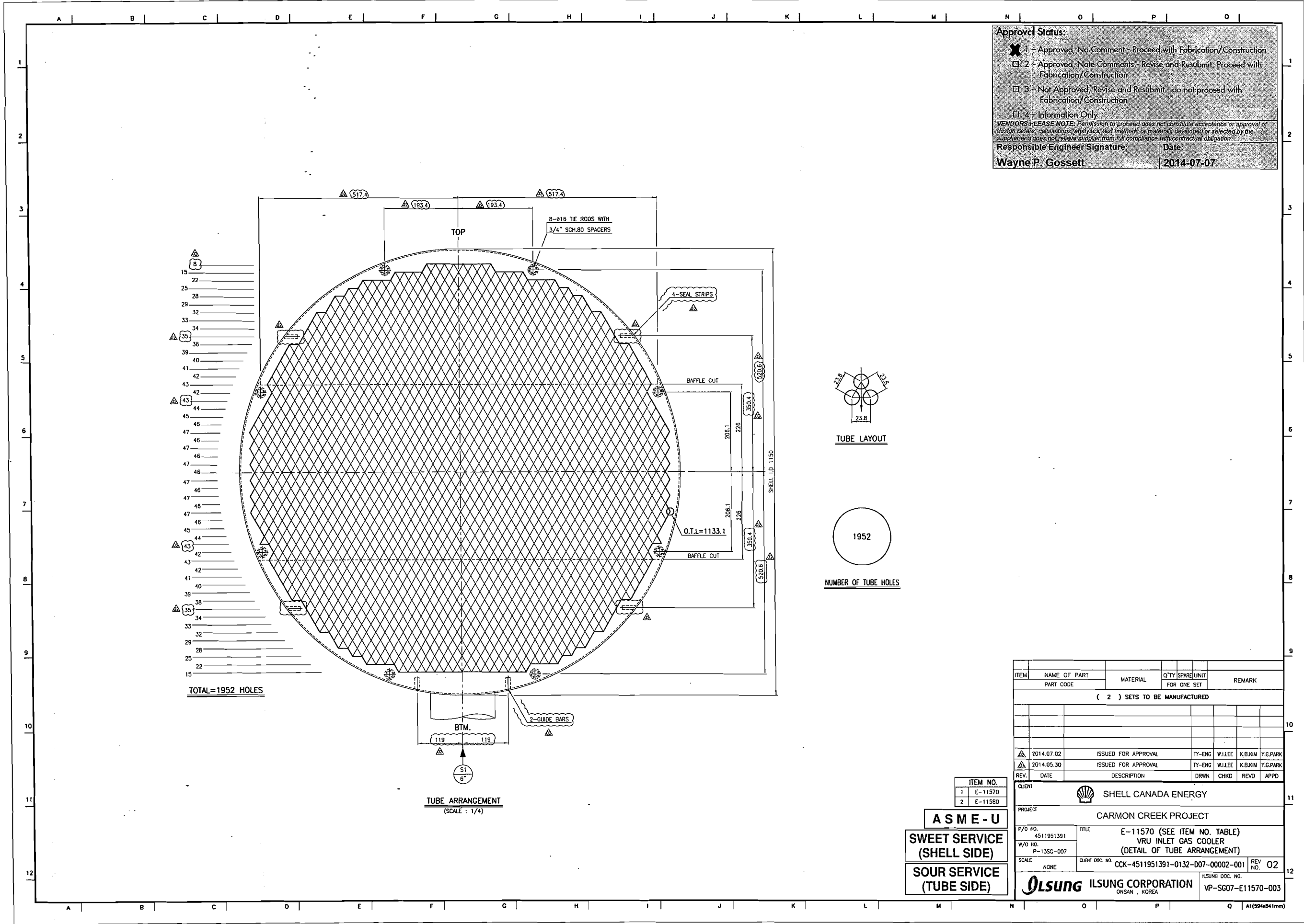
- UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN MM[INCH].
- FINISH: "FACE" MACHINED AND POLISHED INCLUDING CAST LETTERING. BACKGROUND KNURLED AND PAINTED BLACK.
- DATA: DATA ON POLISHED SURFACE IS TO BE INSERTED (IN THE ENGLISH LANGUAGE) BY MEANS OF ENGRAVING OR HARD STAMPING AND MUST BE CLEARLY LEGIBLE. THE HEIGHT OF THE LETTERING SHOULD BE APPROX. 4mm[5/32"]
- FOR NAME PLATE LOCATION, SEE ASS'Y DWG. OF EQUIPMENT.
- AFTER COMPLETION OF THE ITEMS, "ASME & N.B" CERTIFICATION MARK SHALL BE APPLIED UNDER WITNESS OF THE A.I.
- SPACE FOR AUTHORITY APPROVAL STAMP.
- DATE OF AUTHORITY APPROVAL. (EXAMPLE: 31 DEC. 1981)
- "YEAR BUILT" SHALL BE STAMPED AS YEAR AFTER HYDRO. TEST (FOR EXAMPLE: 2012)

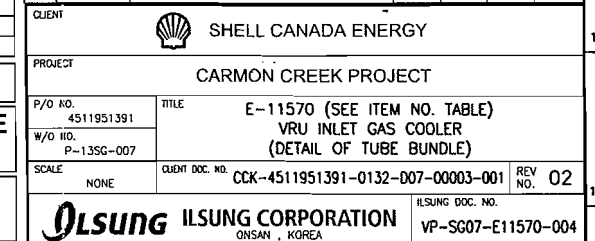
ITEM	NAME OF PART	MATERIAL	Q'TY	SP1	UNIT	REMARK
4	RIVET	304 S.S	16	EA	Ø4x18L	
3	NAME PLATE BRACKET	SA516-70(N)	2	EA	114	
2	ASME NAME PLATE	SA240-304	2	EA	13	
1	EQUIPMENT NAME PLATE	SA240-304	2	EA	13	
(1) SETS TO BE MANUFACTURED						
REV.	DATE	DESCRIPTION	DRWN	CHKD	REVD	APPD
2015.01.02		ISSUED FOR APPROVAL	TY-ENG	H.S.JEON	K.B.KIM	Y.G.PARK
2014.07.02		ISSUED FOR APPROVAL	TY-ENG	W.J.LEE	K.B.KIM	Y.G.PARK
2014.06.10		ISSUED FOR APPROVAL	TY-ENG	W.J.LEE	K.B.KIM	Y.G.PARK

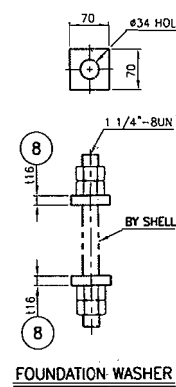
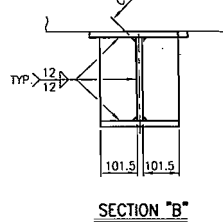
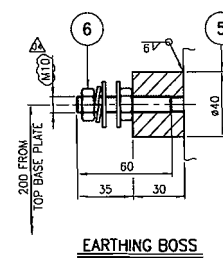
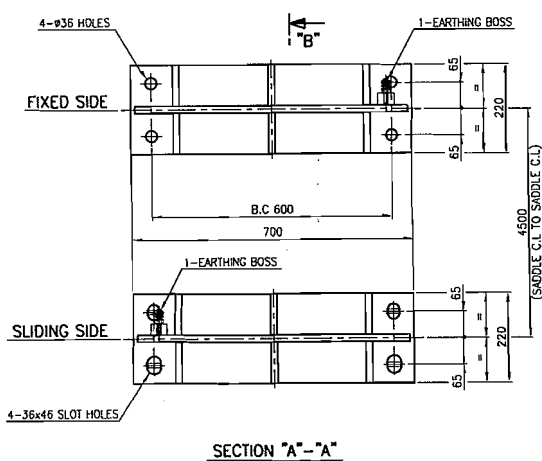
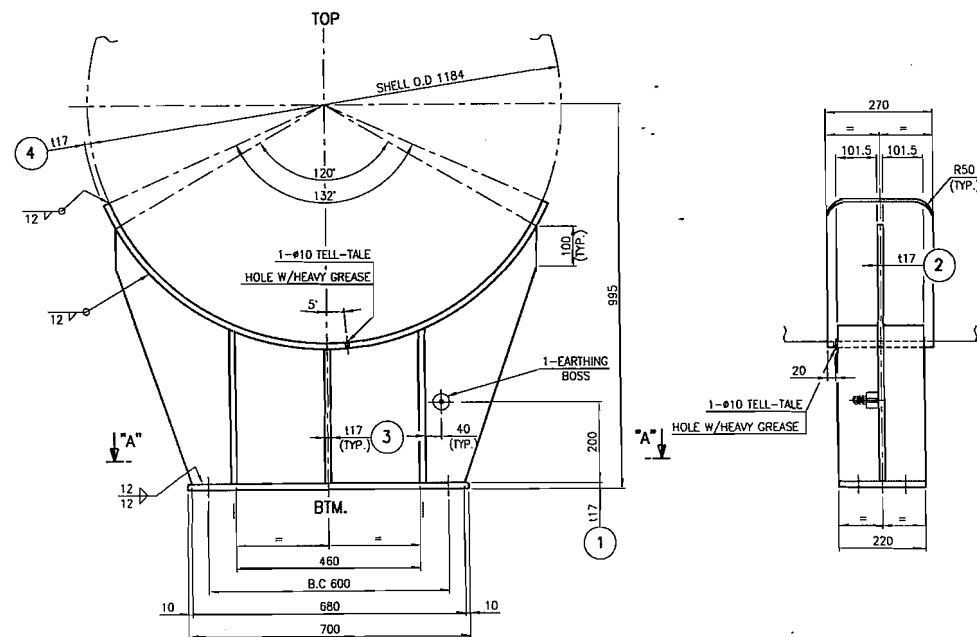
CLIENT SHELL CANADA ENERGY	
PROJECT CARMON CREEK PROJECT	
P/O NO. 4511951391	TITLE E-11570 (SEE ITEM NO. TABLE) VRU INLET GAS COOLER (DETAIL OF NAME PLATE)
W/O NO. P-135G-007	SCALE NONE
CLIENT DOC. NO. CCK-4511951391-0132-D04-00002-001	REV NO. 03
ILSUNG CORPORATION ONSAN, KOREA	
VP-SG07-E11570-007	

ASME - U
SWEET SERVICE
(SHELL SIDE)
SOUR SERVICE
(TUBE SIDE)









Approval Status:

☒ 1 - Approved, No Comment - Proceed with Fabrication/Construction

☐ 2 - Approved, Note Comments - Revise and Resubmit - Proceed with Fabrication/Construction

☐ 3 - Not Approved, Revise and Resubmit - do not proceed with Fabrication/Construction

☐ 4 - Information Only

VENDOR'S PLEASE NOTE: Permission to proceed does not constitute acceptance or approval of design details, calculations, analysis, test methods or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations.

Responsible Engineer Signature: Wayne P. Gossett Date: 2014-09-08

8	SO. WASHER	SA283-C	16	EA	116	
=== DELETED ===						
6	EARTH B/2N/2W/S.W	SA193-BB/SA194-B	2	SETS	M10x60L	
5	EARTHING BOSS	SA105(N)	2	EA	#40	
4	REINF. PAD	SA516-70(N)	2	EA	117	
3	RIB PLATE	SA516-70(N)	12	EA	117	
2	WEB PLATE	SA516-70(N)	2	EA	117	
1	BASE PLATE	SA516-70(N)	2	EA	117	
ITEM	NAME OF PART		Q'TY	SP1	UNIT	REMARK
	PART CODE				FOR ONE SET	
(2) SETS TO BE MANUFACTURED						
2014.09.04	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK	
2014.08.13	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK	
2014.07.02	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK	
2014.05.30	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK	
REV.	DATE	DESCRIPTION	DRWN	CHKD	REV'D	APP'D

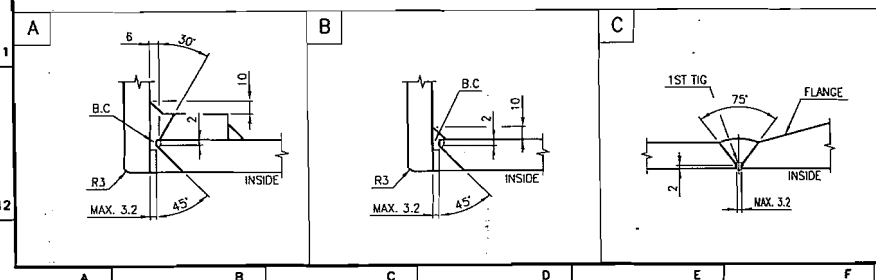
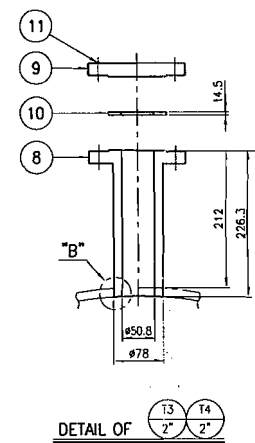
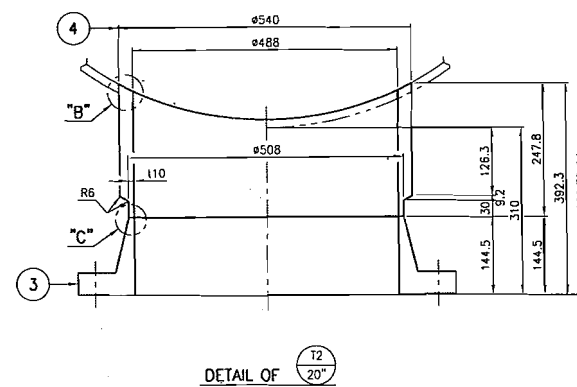
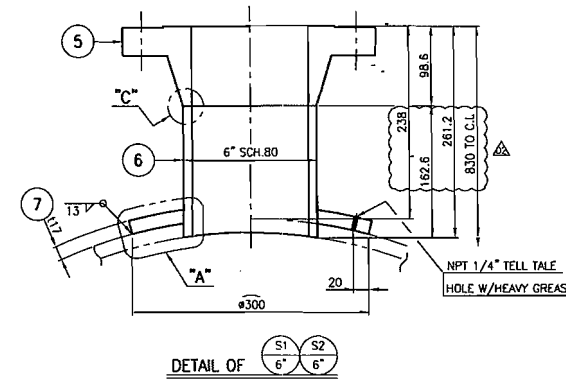
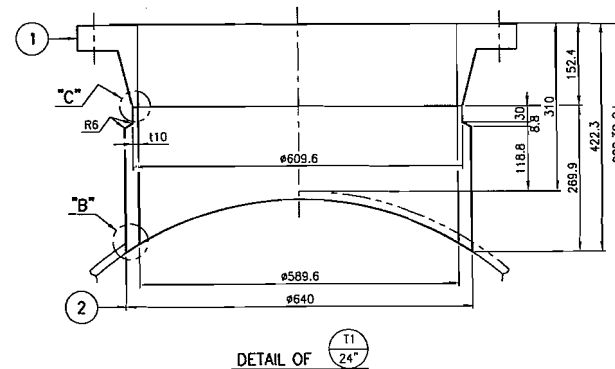
ITEM NO.
1 E-11570
2 E-11580

ASME-U

SWEET SERVICE
(SHELL SIDE)

SOUR SERVICE
(TUBE SIDE)

CLIENT	SHELL CANADA ENERGY				
PROJECT	CARMON CREEK PROJECT				
P/O NO.	4511951391	TITLE	E-11570 (SEE ITEM NO. TABLE)		
W/O P.O.	P-135C-007		VRU INLET GAS COOLER		
SCALE	NONE	CLIENT DOC. NO.	CCK-4511951391-0132-D07-00004-001	REV. NO.	04
		DESCRIPTION	VP-SG07-E11570-005		
		ILSUNG DOC. NO.	VP-SG07-E11570-005		
		ILSUNG CORP.	ILSUNG CORPORATION		
		ONSAN, KOREA	ONSAN, KOREA		



Approval Status:

☒ 1 - Approved, No Comment - Proceed with Fabrication/Construction

☐ 2 - Approved, Note Comments - Revise and Resubmit - Proceed with Fabrication/Construction

☐ 3 - Not Approved, Revise and Resubmit - do not proceed with Fabrication/Construction

☐ 4 - Information Only

VENDOR'S PLEASE NOTE: Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not release supplier from full compliance with contractual obligations.

Responsible Engineer Signature: **Wayne P. Gossett** Date: **2014-08-21**

NOTE:

1. GASKET MAT'L: SPIRAL WOUND GASKET [14.5]
- FILLER: GRAPHITE
 - HOOP: 304 S.S
 - INNER RING: 304 S.S
 - OUTER RING: C.S

11	STUD BOLT/2H.N	SA320-L7M/SA194-7M	8	SETS	5/8"-11UNCx95L
10	GASKET	SEE NOTE 1	2	EA	14.5 2" ASME 150# RF
9	BLIND FLANGE	SA182-F51(S31803)	2	EA	2" ASME 150# B.L.D.-RF
8	FLANGE	SA182-F51(S31803)	2	EA	2" ASME 150# L.W.N.-RF
7	REINF. PAD	SA516-70(N)	2	EA	117
6	NOZZLE NECK	SA333-6	2	EA	6" SCH.80
5	FLANGE (SCH.80)	SA350-LF2 CL.1(N)	2	EA	6" ASME 300# W.N.-RF
4	SELF REINF. NECK	SA182-F51(S31803)	1	EA	#540
3	FLANGE (110)	SA182-F51(S31803)	1	EA	20" ASME 150# W.N.-RF
2	SELF REINF. NECK	SA182-F51(S31803)	1	EA	#640
1	FLANGE (110)	SA182-F51(S31803)	1	EA	24" ASME 150# W.N.-RF

ITEM	NAME OF PART	MATERIAL	Q'TY	SP1	UNIT	REMARK
	PART CODE:				FOR ONE SET	

(2) SETS TO BE MANUFACTURED

	2014.08.13	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK
	2014.05.30	ISSUED FOR APPROVAL	TY-ENG	W.I.LEE	K.B.KIM	Y.G.PARK
REV.	DATE	DESCRIPTION	DRWN	CHKD	REVD	APPD

CLIENT	SHELL CANADA ENERGY
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PRODUCT	CARMON CREEK PROJECT
---------	----------------------

P/O NO.	4511951391	TITLE	E-11570 (SEE ITEM NO. TABLE)
W/O NO.	P-135C-007		VRU INLET GAS COOLER
			(DETAIL OF NOZZLE)

SCALE	NONE	CLIENT DOC. NO.	CCK-4511951391-0132-007-00005-001	REV NO.	02
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ILSUNG DOC. NO.	VP-SG07-E11570-006
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ASME - U

SWEET SERVICE
(SHELL SIDE)

SOUR SERVICE
(TUBE SIDE)

ILSUNG ILSUNG CORPORATION
ONSAN, KOREA

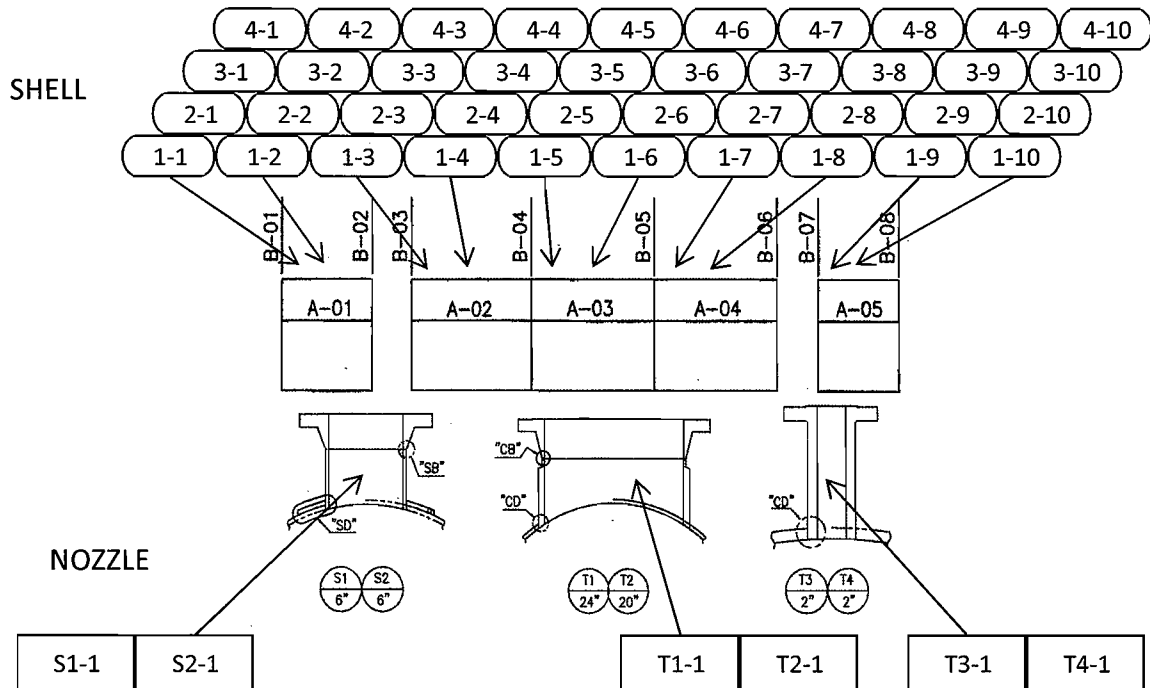
19. As-built UT wall thickness survey

ULTRASONIC WALL THICKNESS RECORD

P.O NO.	4511951391	CUSTOMER	SHELL CANADA ENERGY
WT. NAME	CARMON CREEK PROJECT	DWG. NO.	VP-SG07-E11570-001 REV.06
ITEM NO.	E-11570	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	15.18	15.17	17.13	17.14	SHELL & CHANNEL	3 (180°)	9~10 15	15.36	15.40	-	-	
	2 (90°)		15.22	15.23	17.18	17.20		4 (270°)		15.33	15.39	-	-	
	3 (180°)	3~4 17	15.20	15.14	17.12	17.12	PART	LOCATION	DWG. (MIN.)	1	-			
	4 (270°)		15.11	15.14	17.22	17.16	NOZZLE	S1	S2	10.97	10.97	11.22	11.37	-
	LOCATION	DWG.	5	6	7	8		T1	T2	25.2	26	25.71	26.42	-
	1 (0°)	5~8 17	17.16	17.19	17.15	17.11		T3	T4	13.6	13.6	13.87	13.81	-
	2 (90°)		17.13	17.14	17.15	17.23	B L A N K							
	3 (180°)		17.23	17.17	17.22	17.15								
	4 (270°)		17.24	17.12	17.19	17.22								
	LOCATION	DWG.	9	10	-	-								
	1 (0°)	9~10 15	15.15	15.12	-	-								
	2 (90°)		15.21	15.17	-	-								

☐ REVIEWED BY / ☐ WITNESSED BY

REVIEWED
Date / Signature:
Germanischer Lloyd
Industrial Services

APPROVED BY

J.S.LEE

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-11570	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	3/5/02					
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	3/5/02					

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-11570	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	3/6/16	7/1/17					
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	3/6/16	7/1/17					
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	3/6/16	7/1/17					
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	3/6/16	7/1/17					
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	3/6/16	7/1/17					

296/309

■ 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-11570	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	3/1/02	3/1/02		
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.1 Appendix 6 or 8 DEP 30.10.60.18-Gen	Approved Drawings & ASME Sec.VIII Div.1 Appendix 6 or 8	MT or PT Report	H	3/1/02	3/1/02		
10	100% RT for cat "A & B" weld seams	Approved Drawings NDE Procedure	ASME SEC. V	RT Film, RT Report	H	3/1/02	3/1/02		
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	3/1/02	3/1/02		

297/309

■ 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-11570	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	3/1/02	3/1/02					
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	3/1/02	3/1/02					
14	100% RT for cat "C" weld seams	Approved Drawings NDE Procedure	ASME SEC. V	RT Film, RT Report	H	3/1/02	3/1/02					
	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	3/1/02	3/1/02					
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	3/1/02	3/1/02					
				298/309								

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-11570	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	3/1/2	3/1/2					
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	3/1/2	3/1/2					
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	3/1/2	3/1/2					
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	3/1/2	3/1/2					
21	Leak test for tube to tubesheet 50~100 kPa	Approved Drawings & ISO16812	Approved Drawings & ISO16812	Leak test report	H	3/1/2	3/1/2					

ISC	INSPECTION AND TEST PLAN						Doc. No.	VP-SG07-COMM-008				
PROJECT	CARMON CREEK PROJECT		P.O NO.	4511951391	EQUIPMENT	Heat Exchanger	Rev. No.	2				
ITEM NO.	E-11570		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	3/1/12	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	3/1/12	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	3/1/12	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	3/1/12	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-11570		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	3/6/07	7/1/07					
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	3/6/07	7/1/07					
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	3/6/07	7/1/07					
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	3/6/07	7/1/07					
30	MT after hydro test	ISO 16812 & NDE Procedure	ISO 16812 & NDE Procedure	MT Report	H	3/6/07	7/1/07					
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	3/6/07	7/1/07					

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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-11570		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						
33	Bolt Tightening	Approved Bolt Tightening Procedure	Approved Bolt Tightening Procedure	Bolt Tightening Report	H						SPOT WITNESS
34	Packing & Shipping Preparation Inspection	Approved Packing Procedure	Approved Packing Procedure		H						
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						
36	MDB Review			MDB	H						
37	Inspection Release			Inspection Release Note	H						

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-11570	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;

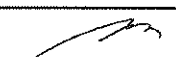
monitoring & nitrogen gas charging inspection : satisfaction

* OWNER / INSPECTOR

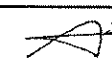
APPROVED BY

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-11570	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

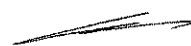
c. N2 charging Check the location nozzles.: T1, S2

REMARK;

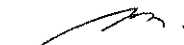
monitoring & nitrogen gas charging inspection : satisfaction

* OWNER / INSPECTOR

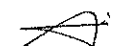
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INSPECTION FOR PRESERVATION RECORD

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-11570	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

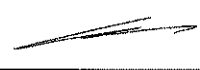
c. N2 charging Check the location nozzles.: T1, S2

REMARK;

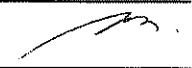
monitoring & nitrogen gas charging inspection : satisfaction

* OWNER / INSPECTOR

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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-11570	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;

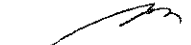
monitoring & nitrogen gas charging inspection : satisfaction

*** OWNER / INSPECTOR**

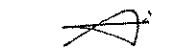
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INSPECTION FOR PRESERVATION RECORD

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-11570	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

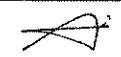
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INSPECTION FOR PRESERVATION RECORD

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-11570	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;

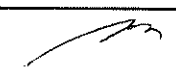
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