

HEX002



National Board Number: 2087
Mfr. Representative: S. N. Singh Date: Sep 18/2011
Authorized Inspector: [Signature] Date: Sep 18, 2011

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 Ilsung Coporation #74 Daejeong-Ro, Onsan-Eub, Ulju-Gun, Ulsan 689-892, Republic Korea.
2. Manufactured for SHELL CANADA ENERGY 400 4AVE. S.W., BOX 100, STATION M, CALGARY, ALBERTA T2P 0J4
3. Location of installation CARMON CREEK EXPANSION IN PEACE RIVER COMPLEX, ALBERTA, CANADA
4. Type Horizontal Heat Exchanger 15-HE-003
5. ASME Code, Section VIII, Div. 1 2013 ED (July.01,2013) N/A N/A

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 5325mm

Table with columns: Course(s), Material, Thickness, Long. Joint (Cat. A), Circum. Joint (Cat. A, B & C), Heat Treatment. Rows 1-3.

Table with columns: No., Type, ID, OD, Flange Thk, Min Hub Thk, Material, How Attached, Location, Bolting (Num & Size, Bolting Material, Washer OD, ID, thk, Washer Material).

7. Heads: (a) SA516-70(\*1)/H.T-635°C & 1.1Hr (b) -

Table with columns: Location (Top, Bottom, Ends), Thickness (Min, Corr), Radius (Crown, Knuckle), Elliptical Ratio, Conical Apex Angle, Hemispherical Radius, Flat Diameter, Side to Pressure (Convex, Concave), Category A (Type, Full, Spot, None, Eff).

Table with columns: Location, Type, ID, OD, Flange Thk, Min Hub Thk, Material, How Attached, Bolting (Num & Size, Bolting Material, Washer OD, ID, thk, Washer Material).

8. Type of jacket N/A Jacket closure N/A
If bar, give dimensions N/A If bolted, describe or sketch.

9. MAWP 1266kPa (Internal) F.V at max. temp. 340°C (Internal) 340°C (External) Min. design metal temp. -45°C at 1266kPa

10. Impact test YES(SHELL-A02) at test temperature of -45°C

11. Hydro., proof, or combi test pressure 2000kPa Proof test -

Items 12 and 13 to be completed for tube sections.

12. Tubesheet SA765-II(\*1) 1910mm 231mm 3mm Welded
13. Tubes SA213-T22 19.05mm 2.03mm 2024 U

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## FORM U-1 (Cont'd)

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) 1 (b) Overall length 2103mm

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 1910mm	2103mm	SA516-70(*1)	28mm	1.5mm	1	Full	1.0	1	Full	1.0	634°C	1.3Hr	
	(BLANK)													

Body Flanges on Shells										Bolting			
No.	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Location		Num & Size	Bolting Material	Washer (OD, ID, thk)	Washer Material
1	(*2)	1910mm	2300mm	227mm	28mm	(*3)	Welded, dbl., butt	End		52,2 1/4"-8UN×645L	SA320-L7M	127, 60, 6mm	ASTM-F436
	(BLANK)												

15. Heads: (a) SA765-II(\*1)/H.T-634°C & 1.3Hr (b) N/A  
(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	205mm	1.5mm	-	-	-	-	-	2300mm	-	-	-	-	-

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

16. MAWP 3081 kPa F.V at max. temp. 200°C 200°C Min. design metal temp. -45°C at 3081 kPa  
(Internal) (External) (Internal) (External)

17. Impact test YES(CHANNEL-A01) at test temperature of -45°C  
(Indicate yes or no and the component(s) impact tested)

18. Hydro., ~~pressure~~, or comb. test pressure 4400 kPa Proof test -

19. Nozzles, inspection, and safety valve openings: (\*16)

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 450	w.e.	SA333-6	-	14.27mm	3.0mm	SA516-70(*1)	(*4)	-	-
SHELL SIDE OUTLET	1	DN 200	w.e.	SA333-6	-	12.7mm	3.0mm	SA516-70(*1)	(*5)	-	-
SHELL SIDE VENT(*6)	1	DN 50	Cl. 300 lwn.	(*10)	(*10)	16.65mm	3.0mm	INHERENT	(*4)	-	-
SHELL SIDE DRAIN(*6)	1	DN 50	Cl. 300 lwn.	(*10)	(*10)	16.65mm	3.0mm	INHERENT	(*5)	-	-
INTERM. BLOWDOWN(*6)	1	DN 50	Cl. 300 lwn.	(*10)	(*10)	16.65mm	3.0mm	INHERENT	(*5)	-	-
(*7)(*9)	1	DN 80	Cl. 300 lwn.	(*10)	(*10)	20.6mm	3.0mm	INHERENT	(*4)	-	-
(*8)(*9)	1	DN 80	Cl. 300 lwn.	(*10)	(*10)	20.6mm	3.0mm	INHERENT	(*4)	-	-
SPARE(*9)	1	DN 80	Cl. 300 lwn.	(*10)	(*10)	20.6mm	3.0mm	INHERENT	(*4)	-	-

20. Supports: Skirt NO Lugs N/A Legs N/A Others SADDLES Attached WELDED TO SHELL  
(Yes or no) (Number) (Number) (Describe) (Where and how)

21. Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report (list the name of part, item number, Manufacturer's name, and identifying number):  
NONE

22. Remarks \*1. Normalized condition. \*2. Mandatory App.2 Fig.2-4(6) \*3. SA765-II(\*1) \*4. FIG. UW-16.1 (e) \*5. FIG. UW-16.1 (c)  
 \*6. Pressure retaining cover : (\*10), SA320-L7M/SA194-7M, 5/8"-11UNC×100L, 8SETS. \*7. MIN. FLOW PUMP INLET(1)  
 8. MIN. FLOW PUMP INLET(2) \*9. Pressure retaining cover : (\*10), SA320-L7M/SA194-7M, 5/8"-10UNC×125L, 8 SETS.  
 \*10. SA350-LF2.CL.1 \*11.TUBE SIDE PRESS CONN \*12. Inspection opening is removable bundle & removed Channel Cover.  
 \*13. Shell flanges were connected by same bolting materials, refer to shell side bolting of ITEM No.6. 14. Nameplate is located on the shell.  
 15. Length of tube bundle : 4331.7mm \*16. ITEM No.6 & 19 WILL BE CONTINUED ON THE U-4 FORM. \*17. Single Butt, RT-Full, 1.0

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Mfr. Representative: S. J. Wang Date: Sep. 18/2015

Authorized Inspector: [Signature] Date: Sep. 18, 2015

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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 Sep. 18/2015 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 Sep. 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 Sep. 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))



National Board Number: 2087  
 Mfr. Representative: S. J. JANG Date: Sep. 18, 2015  
 Authorized Inspector: S. JANG Date: Sep. 18, 2015

**FORM U-4 MANUFACTURER'S DATA REPORT SUPPLEMENTARY SHEET**  
**As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1**

1. Manufactured and certified by Ilung 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 15-HE-003  
 (Horizontal, vertical, or sphere) (Tank, separator, heat exch., etc.) (Manufacturer's serial number)

W9955.2 VP-SG08-E14730-001 Rev.5 2087 2015  
 (CRN) (Drawing number) (National Board number) (Year built)

**Data Report Item Number** **Remarks**

10. 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	
AIR VENT	1	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+4)	-	-
PSV SHELL SIDE(+6)	1	DN 200	w.e.	SA333-6	-	12.7mm	3.0mm	INHERENT	(+4)	-	-
P.I. CONN.(+6)	1	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+4)	-	-
LEVEL IND. CONN(+6)	4	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+4)	-	-
LEVEL IND. CONN(+6)	4	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+5)	-	-
LEVEL GAUGE CONN(+6)	1	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+4)	-	-
EVEL GAUGE CONN(+6)	1	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+5)	-	-
TI CONN(+6)	1	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+4)	-	-
PRESS. GAUGE(+6)	1	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+4)	-	-
TUBE SIDE INLET	1	DN 700	w.e.	SA516-70(+1)(+17)	-	18mm	3.0mm	INHERENT	(+4)	-	-
TUBE SIDE OUTLET	1	DN 700	w.e.	SA516-70(+1)(+17)	-	18mm	3.0mm	INHERENT	(+4)	-	-
TUBE SIDE PSV(+6)	1	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+4)	-	-
(+11)(+6)	2	DN 50	Cl. 300 lwn.	(+10)	(+10)	16.65mm	3.0mm	INHERENT	(+4)	-	-

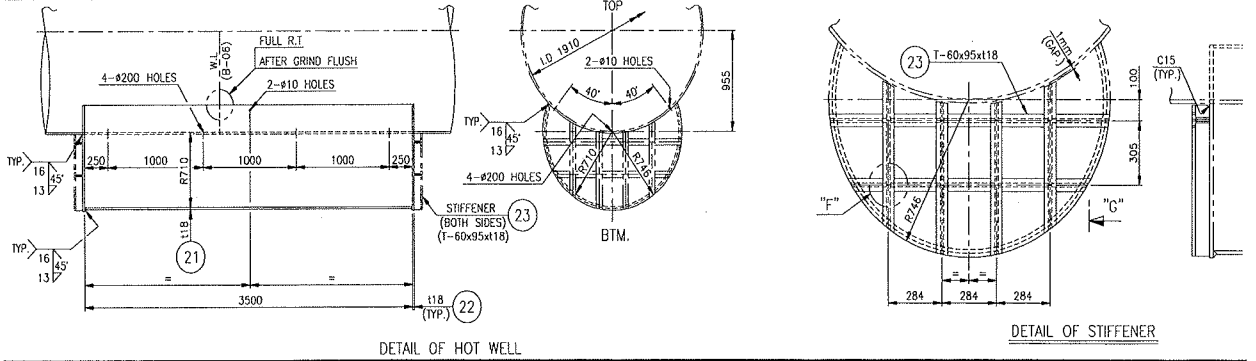
12. Remarks.

18. HOT WELL is attached to main shell in the shape of half-circle. The both end side closed by flat cover in the form of a round. And the flat cover is reinforced by stiffeners. Refer to below detail. Thus it has complex shape, to evaluate the stability by FEM(Finite Element Method) Analysis.

\*Hot well shell : Material SA516-70(+1), I.D 1420mm, Length 3500mm, Thickness(Nom.18mm, Corr. 1.5mm), H.T-635°C & 1.1Hr

\*Hot well cover : Material SA516-70(+1), Thickness(Nom.18mm, Corr. 1.5mm), Flat Diameter 1492mm, H.T-635°C & 1.1Hr

\*Stiffener : Material SA516-70(+1), H.T-635°C & 1.1Hr



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

Date Sep. 18, 2015 Name Ilung Corporation Signed S. JANG  
 (Manufacturer) (Representative)

Date Sep. 18, 2015 Name S. JANG Commissions NB#14412(A,N)  
 (Authorized Inspector) (National Board (incl. endorsements))