FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured and certified by: ENERGY EXCHANGER COMPANY, 1844 NORTH GARNETT ROAD, TULSA, OK 74116 (Name and address of Manufacturer)
2. Manufactured for: FRONTIER REFINING, INC. 300 MORRIE AVENUE CHEYENNE, WYOMING 82007 (Name and address of Purchaser)
3. Location of installation: FRONTIER REFINING, INC. 8410 TRUCKER TRAIL CHEYENNE, WYOMING 82003 (Name and address)
4. Type: HORIZ. (Horiz., vert., or sphere) | HEAT EXCHANGER (Tank, separator, jkt. vessel, heat exh., etc.) | X-7705 (Mfg's serial No.)
   (CRN) | X-7705-A REV. 2 (Drawing No.) | 5717 (Nat'l Bd. No.) | 2010 (Year built)
5. ASME Code, Section VIII, Div. 1: 2007 EDITION (2008 ADDENDA) [Edition and Addenda (date)] | (Code Case No.) | [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) No. of course(s): 3 (b) Overall length (ft & in.): 22'-2 5/16"

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B, & C)			Heat Treatment	
No.	Diameter, in.	Length (ft & in.)	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
2	40" I.D.	8'-0"	SA-516-70N	5/8"	1/8"	1	FULL	1.0	1	FULL	1.0	1150° F	1 HR.
1	40" I.D.	6'-2 5/16"	SA-516-70N	5/8"	1/8"	1	FULL	1.0	1	FULL	1.0	1150° F	1 HR.

7. Heads: (a) SA-516-70N H.T.@ 1150° F. FOR 1 HR. (Mat'l Spec. No., Grade or Type) (H.T. - Time & Temp.) (b) SA-516-70N; H.T. @ 1150° F. FOR 1 HR. (Mat'l Spec. No., Grade or Type) (H.T. - Time & 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	5/8"	1/8"			2:1					X	S	NONE	1.0
(b)	END	5/8"	1/8"	40" I.D. x 2'-9" LG. R & W CYLINDER								1	FULL	1.0

If removable, bolts used (describe other fastening): SHELL TO SHELL COVER: SA-193-B7; 1"; 52 (Mat'l Spec. No., Grade, size, No.)

8. Type of jacket: | Jacket closure: (Describe as ogee & weld, bar, etc.)
   If bar, give dimensions: | If bolted, describe or sketch.
9. MAWP 460 (internal) 15 (external) psi at max. temp. 480 (internal) 350 (external) °F Min. design metal temp. -20 °F at 460 psi.
10. Impact test: NO - Exempt Per UCS-66 (a,b,c,g) & UCS-68 (c) [Indicate *yes* or *no* and the component(s) impact tested] at test temperature of °F.
11. Hydro., ~~pneu., or comb.~~ Test press. 610 P.S.I.G. *(1)* Proof test:

Items 12 and 13 to be completed for tube sections.

12. Tubesheet: SA-350-LF2 CL1 [Stationary (Mat'l Spec. No.)] | 40 7/8" [Dia., in. (subject to press.)] | 3 9/16" (Nom. thk., in.) | 5/16" (Corr. Allow., in.) | Bolted [Attachment (welded or bolted)]
    SA-350-LF2 CL1 [Floating (Mat'l Spec. No.)] | 36 1/16" (Dia., in.) | 3 9/16" (Nom. thk., in.) | 5/16" (Corr. Allow., in.) | Bolted (Attachment)
13. Tubes: SA-179 (Mat'l Spec. No., Grade or Type) | 3/4" (O.D., in.) | 0.109" THK (MIN) (Nom. thk., in. or gauge) | 915 (Number) | Straight [Type (Strait or U)]

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 (ft & in.): 2'-2 15/16"

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B, & C)			Heat Treatment	
No.	Diameter, in.	Length (ft & in.)	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	40" I.D.	2'-2 15/16"	SA-516-70N	5/8"	1/8"	1	FULL	1.0	1	FULL	1.0	1150° F	1 HR.

15. Heads: (a) SA-350-LF2 CL1 (Mat'l Spec. No., Grade or Type) (H.T. - Time & Temp.) (b) SA-516-70N H.T.@ 1150° F. FOR 2 HRS. (Mat'l Spec. No., Grade or Type) (H.T. - Time & 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	3 5/8"	3/16"						40 3/4"					
(b)	END	1 3/4"	1/4"					35 3/8" I.D.R.		X				

If removable, bolts used (describe other fastening): (a) SA-193-B7; 7/8"; 52 (b) SA-193-B7M; 7/8"; 52 (Mat'l Spec. No., Grade, size, No.)

FORM U-1 (Back)

16. MAWP 352 (internal) 15 (external) psi at max. temp. 660 (internal) 350 (external) °F Min. design metal temp. -20 °F at 352 psi.

17. Impact test NO,Exempt Per UCS-66 (a,b,c,g) & UCS-68 (c) [Indicate *yes* or *no* and the component(s) impact tested] at test temperature of ____ °F.

18. Hydro., ~~pneu., or comb.~~ Test press. 470 P.S.I.G. *(1)* Proof test ____

19. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Flange Type	Material		Nozzle Thickness		Reinforcement Material	How Attached		Location (Insp. Open.)
				Nozzle	Flange	Nom.	Corr.		Nozzle	Flange	
INLET/OUTLET	1/1	14"-300#	RF-WN	SA-333-6	SA-105-N	0.5940"	1/8"	SA-516-70N	WELDED	WELDED	SHELL
OUTLET	1	14"-300#	RF-WN	SA-333-6	SA-105-N	0.5940"	1/8"	SA-516-70N	WELDED	WELDED	CHANNEL
INLET *(2)*	1	14"-300#	RF-WN	SA-105-N	SA-105-N	1.8750"	1/8"	WELD	WELDED	WELDED	FLTG. HEAD
VENT	1	2"-300#	RF-LWN	SA-105	---	0.6600"	1/8"	WELD	WELDED	---	CHANNEL
AUX.	4	2"-300#	RF-LWN	SA-105	---	0.6600"	1/8"	WELD	WELDED	---	SHELL NOZ.
AUX	2	2"-300#	RF-LWN	SA-105	---	0.6600"	1/8"	WELD	WELDED	---	CHAN. NOZ
AUX.	2	2"-300#	RF-LWN	SA-105	---	0.6600"	1/8'	WELD	WELDED	---	STINGER

20. Supports: Skirt NO (Yes or no) Lugs ____ (No.) Legs ____ (No.) Others 2-BELLY BANDS (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, mfg's. name and identifying number)
FLTG. HEAD ASSEMBLY INCLUDES A BELLOWS TYPE EXPANSION JOINT PER KE BURGMANN-EJS - DWG. M8598 - SERIAL NO: 2427
PARTIAL DATA REPORT ATTACHED.

22. Remarks: SERVICE: SECOND STAGE REACTOR FEED/EFFLUENT EXCHANGER; P.O. NO: 090065PO; TAG NO: 20-E-0825B; SIZE: 40-288; TYPE: AET
TUBES DESIGNED W/0" CORROSION ALLOWANCE; SAFETY RELIEF DEVICES FURNISHED BY OTHERS
(1) FIELD TEST: SHELL SIDE = 600 PSIG - TUBE SIDE = 460 PSIG SEE ATTACHED U-4 FORM FOR ADDITIONAL INFORMATION

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 Authorization No. 12370 Expires September 27 ,20 10

Date 4-20-10 Name ENERGY EXCHANGER COMPANY (Manufacturer) Signed ____ (Representative)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commision issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of Oklahoma and employed by OneBeacon America Insurance Company of Lynn, MA have inspected the pressure vessel described in this Manufacturer's Data Report on 4.20.10, 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 employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his 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 4.20.10 Signed ____ (Authorized Inspector) Commissions N.B.# 12064 A OKLA.# 7 (Nat'l Board incl. endorsements, State, Province, and No.)

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the statements on this report are correct and that 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 No.

U Certificate of Authorization No. ____ Expires ____ ,20 ____

Date ____ Name ____ (Assembler) Signed ____ (Representative)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I, the undersigned, holding a valid commision issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of ____ 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 ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. The described vessel was inspected and sut ____ psi. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his 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 ____ (Authorized Inspector) Commissions ____ (Nat'l Board incl. endorsements, State, Province, and No.)

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

1. Manufactured and certified by: ENERGY EXCHANGER COMPANY, 1844 NORTH GARNETT ROAD TULSA, OK 74116 (Name and address of Manufacturer)

2. Manufactured for: FRONTIER REFINING, INC. 300 MORRIE AVENUE CHEYENNE, WYOMING 82007 (Name and address of Purchaser)

3. Location of installation: FRONTIER REFINING, INC 8410 TRUCKER TRAIL CHEYENNE, WY 82003 (Name and address)

4. Type: Horizontal (Horizontal, vertical, or sphere) | Heat Exchanger (Tank, separator, kl, Vessel, heat exh, etc.) | X-7705 (Manufacturer's serial Number)

(CRN)	X-7705-A REV. 2 (Drawing number)	5717 (National Board number)	2010 (Year built)

Datas Report Item Number	Remarks
22. REMARKS:	LINES 6-11 INCLUDES (1) 46 5/8" O.D. x 40" I.D. x 5 15/16" THK. SA-105-N RING
	(1) 46 5/8" O.D. x 40" I.D. x 6" THK. SA-105-N RING
	(1) 46 5/8" O.D. x 40" I.D. x 5 15/16" THK. SA-105-N RING
	(1) 24 3/4" O.D. x 19 5/8" I.D. x 3 3/16" THK. SA-105-N RING
22. REMARKS:	LINES 14-18 INCLUDES (1) 45 15/16" O.D. x 40" I.D. x 5 9/16" THK. SA-105-N RING
	(1) 46 5/8" O.D. x 40" I.D. x 6 1/4" THK. SA-105-N RING
	(1) 39 5/8" O.D x 35 1/2" I.D. x 5 1/2" THK. SA-350-LF2, CL.1 RING
19 - INLET NOZZLE	FLOATING HEAD TAIL PIPE ASSEMBLY WELDED TO DISHED ONLY HEAD - INCLUDES:
	(1) FORGED CYLINDER 16 13/16" OD X 12 13/16" ID X 10" LG. SA-105-N
	(1) BELLOWS TYPE EXPANSION JOINT ***(LISTED ON LINE 22)***
	(1) FORGED CYLINDER 14 5/16 OD X 12 13/16" ID X 5 7/16" LG. SA-105-N
	(1) RING - 19 3/8" O.D. x 12 13/16" I.D. x 4 7/16" THK. SA-105-N
	(1/8" CORROSION ALLOWANCE - FULL X-RAY - JOINT EFFICIENCY = 1.0)
	INLET NOZZLE STINGER ASSEMBLY INCLUDES:
	(1) RING - 24 3/4" O.D. x 12 13/16" I.D. x 4 3/4" thk. SA-105-N
	(1) SMLS. PIPE - 14" O.D. x .594" THK x 9 11/16" LG. SA-333-6
	(1) NOZZLE FLANGE - 14" 300# RF WN SCH 60 BORE - SA-105-N ***(LISTED ON LINE 19)***
	(2) NOZZLE FLANGES - 2" 300# RF LWN x 9" lg. SA-105 with BLIND FLANGES ***(LISTED ON LINE 19)***
	TAIL PIPE BOLTING:
	#13 FLANGE TO #14 FLANGE - SA-193-B7; 3/4"; 20
	#12 FLANGE TO #13 FLANGE - SA-193-B7; 7/8"; 20

Certificate of Authorization: Type U No. 12370 Expires 9/27, 2010

Date 4-20-10 Name ENERGY EXCHANGER CO. (Manufacturer) Signed (representative)

Date 4.20.10 Name (Authorized Inspector) Commission N.B.# 12064 A OKLA # 7 (Nat'l Board incl. endorsement, state, province and no.)

X-7705

FORM U-2A

FORM U-2A MANUFACTURER'S PARTIAL DATA REPORT (ALTERNATIVE FORM)
A Part of a Pressure Vessel Fabricated by One manufacturer for Another Manufacturer
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

5717

3/3

1. Manufactured and certified by: **KE BURGMANN-EJS 8575 Roland Acres Drive Santee, CA 92071 USA**
(Name and address of Manufacturer)

2. Manufactured for: **Energy Exchanger Company, 1844 N. Garnett Road, Tulsa OK 74116**
(Name and address of Purchaser)

3. Location of installation: **Unknown**
(Name and address)

4. Type: **14.313" ID Single Weld End Expansion Joint Assembly** (Description of vessel part (shell, two-piece head, tube bundle)) **2427** (Mfg's. serial No.) **NA** (CRN)

NA (Nat'l Bd. No.1) **M8598** (Drawing No.) **Ke Burgmann-EJS** (Drawing prepared by) **2010** (Year built)

5. **ASME Code, Section VIII, Div. 1** **2007, 2009b** (Edition and Agenda (date)) None (Case Code No.) None (Special Service per UG-120(d))

6. Shell (a) No. of courses: **3** Overall Length (ft & in) **20.00"**

Courses			Material	Thickness		Long. Joint (Cat A.)			Circum. Joint (Cat A, B, & C)			Heat Treatment	
No.	Dia. In.	Length ft. & in.	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	14.313" OI	5.375"	SA 105 N	0.750"	0.125"	S	None	1	*				
2	14.313" ID	11.250"	SB443-625 Gr 1	0.062"	0.0"	1	Full	1	*				
3	14.313" OI	5.375"	SA 105 N	0.750"	0.125"	S	None	1	*				

7. Heads: (a) None (Mat'l Spec. No., Grade or Type) H.T.-Time & (b) None (Mat'l Spec. No., Grade or Type) H.T.-Time & Temp.

	Location (Top, Bottom, Ends)	Thickness Min.	Thickness Corr.	Radius Crown	Radius Knuckle	Elliptical Ratio	Conical Apex Angle	Hemispheric al Radius	Flat Diameter	Side to Pressure Convex	Side to Pressure Concave	Catagory A Full, Spot, None	Eff.
a													
b													

If removable, bolts used (describe other fastening) (Mat'l Spec. N., Grade, Size, No.)

8. MAWP **FV/352 FV/460** psig at **660 deg. F** max. temp. (Internal) (External) (Internal) (External) Min. design metal temp. **-20° F** at **FV/352 Int. FV/460 Ext.** psig

9. Impact test **No not required per UG-20 (F).**
Indicate *yes* or *no* and the component(s) impact tested)

10. Hydro., Pneu., or comb. Test press. **661 psig** Proof test

11. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, drain, etc.)	No.	Diameter or size	Flange type	Material Nozzle	Material Flange	Nozzle Thickness Nom.	Nozzle Thickness Corr.	Reinforcement Material	How Attached Nozzle	How Attached Flange	Location (Insp. Open.)

12. Supports: Skirt (Yes or No) Lugs (No.) Legs (No.) Others: (Describe) Attached (Where and how)

13. Remarks: Axial Spring Rate **4449** lbs./in. Axial Movment **+0.625"/-875"** Design Cycle life per Appendix 26, **500** cycles

Ke Burgmann-EJS Inc. is responsible for the design of the expansion joint per ASME VIII, Div., 1, Apendix 26, 2007 Edition **2009b Add**

***Per Appendix 26 figure 26.13 Reinforced with solid plate Band and Clips Appendix 26 Figure 26.1**

CERTIFICATE OF SHOP/FIELD COMPLIANCE

We certify that the statements made in this report are correct and that all details of material, construction, and workmanship of this pressure vessel part conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.

U Certificate of Authorization No. **24,671** Expires: **March 6, 2011**

Date Jan 20, 2010 Name Ke Burgmann-EJS (Manufacturer) Signed Don Mateo (Representative)

CERTIFICATE OF SHOP/FIELD INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of California and employed by HSB CT of Hartford, CT. have inspected the pressure vessel part described in this Manufacturer's Data Report on 1/20, 20 10, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel part in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel part described in this Manufacturer's Data report. Furthermore, neither the Inspector nor his 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 1/20/10 Signed (Authorized Inspector) Commissions LA1494 (Nat'l Board incl. Endorsement, State, Province and No.)