

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

1/3

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. HEAT EXCHANGER X-7704
(Horiz., vert., or sphere) (Tank, separator, jkt. vessel, heat exch., etc.) (Mfg's serial No.)

X-7704-A REV. 2 5716 2010
(CRN) (Drawing No.) (Nat'l Bd. No.) (Year built)

5. ASME Code, Section VIII, Div. 1 2007 EDITION (2008 ADDENDA) 5716 2010
(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. (b) SA-516-70N; H.T. @ 1150° F. FOR 1 HR.
(Mat'l Spec. No., Grade or Type) (H.T. - Time & Temp.) (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										

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 15 psi at max. temp. 360 350 °F Min. design metal temp. -20 °F at 463 psi.
(internal) (external) (internal) (external)

9. MAWP 463 15 psi at max. temp. 360 350 °F Min. design metal temp. -20 °F at 463 psi.
(internal) (external) (internal) (external)

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

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 40.9072" 3 9/16" 5/16" Bolted
(Stationary (Mat'l Spec. No.)) (Dia., in. (subject to press.)) (Nom. thk., in.) (Corr. Allow., in.) (Attachment (welded or bolted))

SA-350-LF2 CL1 36 1/16" 3 9/16" 5/16" Bolted
(Floating (Mat'l Spec. No.)) (Dia., in.) (Nom. thk., in.) (Corr. Allow., in.) (Attachment)

13. Tubes: SA-179 3/4" 0.109" THK (MIN) 915 Straight
(Mat'l Spec. No., Grade or Type) (O.D., in.) (Nom. thk., in. or gauge) (Number) (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 (b) SA-516-70N H.T. @ 1150° F. FOR 2 HRS.
(Mat'l Spec. No., Grade or Type) (H.T. - Time & Temp.) (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 9/16"	1/4"					35 5/8" IDR		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 360 15 psi at max. temp. 500 350 °F Min. design metal temp. -20 °F at 360 psi.
 (internal) (external) (internal) (external)
17. Impact test NO, Exempt Per UCS-66 (a,b,c,g) & UCS-68 (c) at test temperature of _____ °F.
 (Indicate yes or no and the component(s) impact tested)
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
INLET	1	14"-300#	RF-WN	SA-333-6	SA-105-N	0.5940"	1/8"	SA-516-70N	WELDED	WELDED	CHANNEL
OUTLET (2)	1	14"-300#	RF-WN	SA-105-N	SA-105-N	1.8750"	1/8"	WELD	WELDED	WELDED	FLTG. HEAD
DRAIN	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 Lugs Legs Others 2-BELLY BANDS Attached Welded to Shell
 (Yes or no) (No.) (No.) (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, mfg's. name and identifying number)
FLTG. HEAD ASSEMBLY INCLUDES A BELLOWS TYPE EXPANSION JOINT PER KE BURGMANN-EJS - DWG. M8597 - SERIAL NO: 2424
PARTIAL DATA REPORT ATTACHED.
22. Remarks: SERVICE: SECOND STAGE REACTOR FEED/EFFLUENT EXCHANGER; P.O. NO: 090065PO; TAG NO: 20-E-0825A; SIZE: 40-288; TYPE: AET
TUBES DESIGNED W/0" CORROSION ALLOWANCE; SAFETY RELIEF DEVICES FURNISHED BY OTHERS
(1) FIELD TEST: SHELL SIDE = 605 PSIG - TUBE SIDE = 470 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

Edu O. Over
 (Representative)

CERTIFICATE OF SHOP 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 Oklahoma and employed by OneBeacon America Insurance Company of Lynn, MA

have inspected the pressure vessel described in this Manufacturer's Data Report on 4-20-2010, 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

[Signature]
 (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 commission 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 su: _____ 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.)

2/3

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 Heat Exchanger X-7704
(Horizontal vertical or sphere) (Tank separator etc Vessel heat exch etc) (Manufacturer's serial Number)

(CRN) X-7704-A REV. 2 5716 2010
(Drawing number) (National Board number) (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 - OUTLET NOZZLE	FLOATING HEAD TAIL PIPE ASSEMBLY WELDED TO DISHED ONLY HEAD - INCLUDES: (1) FORGED CYLINDER 16 9/16" 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) OUTLET 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 W/N 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. Signed Edgar O. Over
(manufacturer) (representative)

Date 4-20-10 Name [Signature] Commission N.B.# 12064 A OKLA.# 7
(Authorized Inspector) (Nat'l Board incl. endorsement, state, province and no.)

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

5716 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** **2424** **NA**
 (Description of vessel part (shell, two-piece head, tube bundle) (Mfg's. serial No.) (CRN))
NA **M8597** **Ke Burgmann-EJS** **2010**
 (Nat'l Bd. No.) (Drawing No.) (Drawing prepared by) (Year built)
5. ASME Code, Section VIII, Div. 1 **2007, 2009b** **None** **None**
 (Edition and Agenda (date)) (Case Code No.) (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** (b) **None**
 (Mat'l Spec. No., Grade or Type) H.T.-Time & (Mat'l Spec. No., Grade or Type) H.T.-Time & Temp.

	Location (Top, Bottom, Ends)	Thickness Min. Corr.	Radius Crown Knuckle	Elliptical Ratio	Conical Apex Angle	Hemispheric al Radius	Flat Diameter	Side to Pressure Convex 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/360 FV/463 psig at **500 deg. F** max. temp. Min. design metal temp. **-20° F** at FV/360 Int. FV/463 Ext. psig
 (Internal) (External) (Internal) (External)

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. **634 psig** Proof test

11. Nozzles, inspection, and safety valve openings:

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

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

13. Remarks: Axial Spring Rate **4569 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, Appendix 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** Signed **Don M. [Signature]**
 (Manufacturer) (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 **1/20/10**, 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 **Will [Signature]** Commissions **CA 4994**
 (Authorized Inspector) (Nat'l Board incl. Endorsement, State, Province and No.)