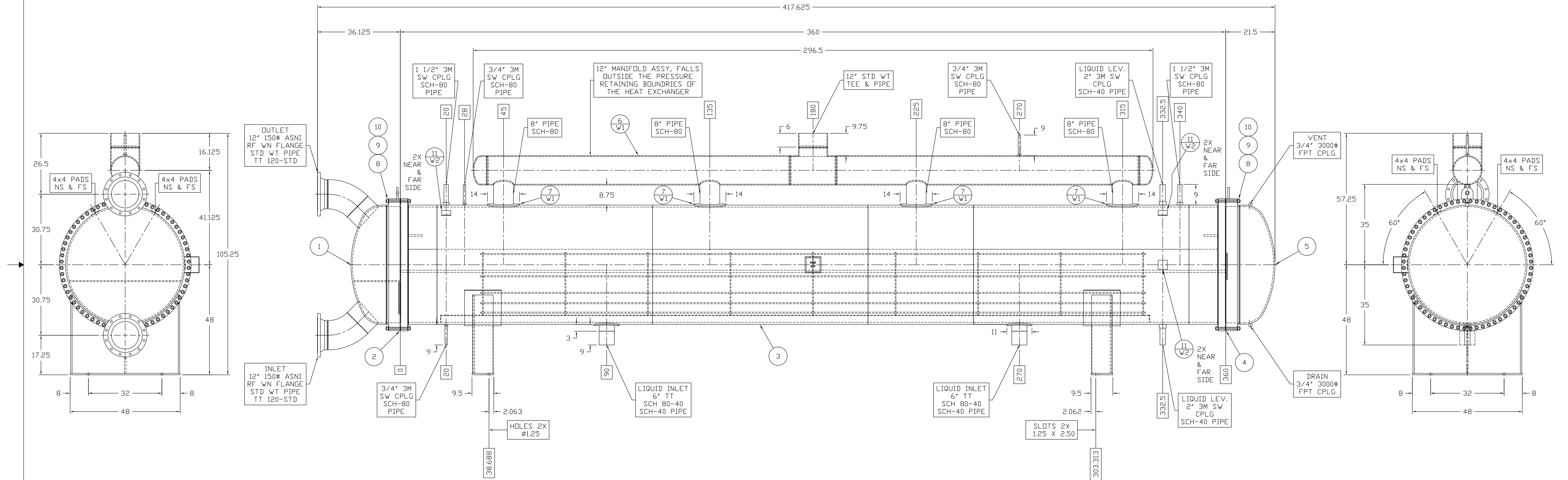


NOTE:  
DO NOT LIFT UNIT BY LUG  
ON EITHER WATERBOX.

CATALOG NUMBER  
0530918P-11



ITEM	PART NUMBER	QTY	DESCRIPTION	REFERENCE	WEIGHT
	0530918P-11		EVAPORATOR, 52" DIA X 360" NTL BXM		
001	171-70191D-000	1.0000	FRONT COVER ASSEMBLY 52" DIA HTEX		2017 LBS
002	170-40191C-000	1.0000	GASKET, 52" DIA HTEX 1" 304L SPRIAL WOUND GRAPHITE FILLED		
003	0530918P-21	1.0000	ASSEMBLY, SHELL & TUBESHEET 52" DIA X 360" NTL		35509 LBS
004	170-50120C-000	1.0000	GASKET, 52" DIA HTEX 10" 304L SPRIAL WOUND GRAPHITE FILLED		
005	171-80156D-000	1.0000	REAR COVER ASSEMBLY 52" DIA HTEX		1339 LBS
006	170-80082D-000	1.0000	12" MANIFOLD ASSEMBLY FOR 52" DIA HTEX 296.50" OAL		1034 LBS
007	0530918P-21-17	0.5000	PROFILE, REPADS .500" THK SA516-70N		36 LBS
008	510-001320-090	128.0000	STUD, ALL THREAD 0.875"-09UNC X 10.50" SA320-L7		
009	510-001780-087	256.0000	NUT, HEAVY HEX 0.875"-09UNC SA194-7		
010	510-002820-087	256.0000	WASHER, FLAT STL 0.875" NOMINAL 1.75" OD X 0.9375 ID X .134 THK		
011	161-00011B-002	9.0000	PAD, SUPPORT 4 X 4 X 1/4 W/ VEEPE HOLE		12 LBS

REV	DATE	REVISION	BY	AP	REV	DATE	REVISION	BY	AP	REV	DATE	REVISION	BY	AP	REV	DATE	REVISION	BY	AP
C-2		CHANGED OVERALL LENGTH OF DISTRIBUTION PLATE ASSEMBLY	DRP	PFA															
C-1		DRAWING UPDATED TO REFLECT CHANGES TO TUBESHEET ASSEMBLY	DRP	PFA	3-3		ADDED WELD DETAIL FOR TUBESHEET ASSEMBLY TO WRAPPER	DRP	PFA										
B-1		QTY ITEM 011 WAS 30000	DRP	PFA	3-2		TUBESHEET INLET AND OUTLET CENTER TO CENTER WAS 6000	DRP	PFA										
A-1		UPDATED FOR CUSTOMER MARKUP	DRP	PFA	3-1		REDESIGNED DISTRIBUTION PLATE ASSEMBLY	DRP	PFA										

TAG NUMBER	JOB NUMBER
E-5801-25	0530918P
E-5802-25	0530918Q
E-5803-25	0530918R

EMPTY WT: EXCHANGER 41,310 LBS.  
OPERATING WT: LBS.  
FULL WT: TOTAL 66,400 LBS.

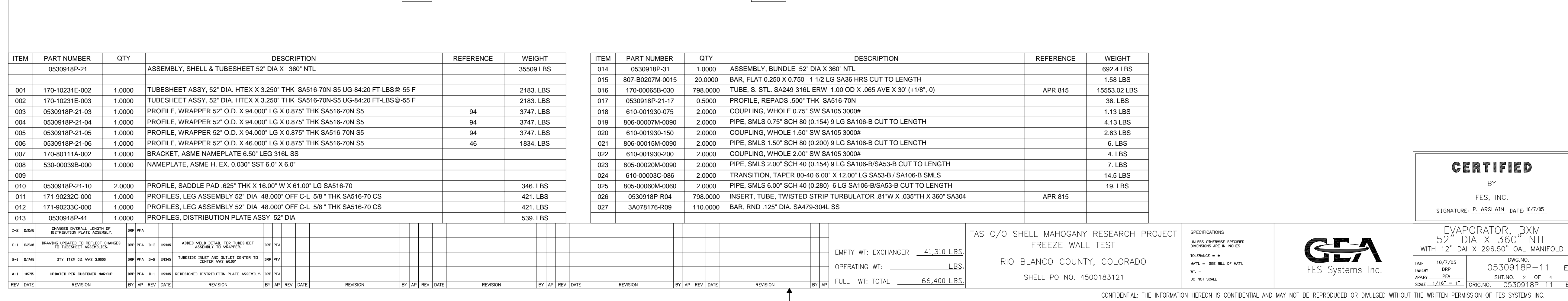
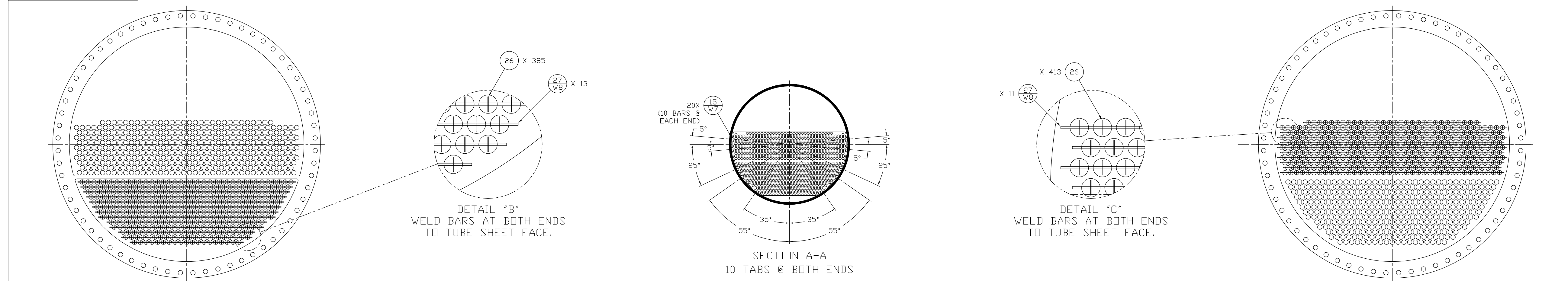
TAS C/O SHELL MAHOGANY RESEARCH PROJECT  
FREEZE WALL TEST  
RIO BLANCO COUNTY, COLORADO  
SHELL PO NO. 4500183121

SPECIFICATIONS  
UNLESS OTHERWISE SPECIFIED  
DIMENSIONS ARE IN INCHES  
TOLERANCES = ±  
UNITS = SEE BILL OF MAT'L  
WT. =  
DO NOT SCALE



**CERTIFIED**  
BY  
FES, INC.  
SIGNATURE: P. ARSLAIN DATE: 10/7/05

EVAPORATOR, BXM  
52" DIA X 360" NTL  
WITH 12" DIA X 296.50" OAL MANIFOLD  
DATE 10/7/05 DWG. NO. 0530918P-11 E  
DWG. BY DRP SHT. NO. 1 OF 4  
APP. BY PFA SCALE 1/16" = 1" ORIG. NO. 0530918P-11 E



ITEM	PART NUMBER	QTY	DESCRIPTION	REFERENCE	WEIGHT
014	0530918P-31	1.0000	ASSEMBLY, BUNDLE 52" DIA X 360" NTL		692.4 LBS
015	807-B0207M-0015	20.0000	BAR, FLAT 0.250 X 0.750 1 1/2 LG SA36 HRS CUT TO LENGTH		1.58 LBS
016	170-00065B-030	798.0000	TUBE, S. STL. SA249-316L ERW 1.00 OD X .065 AVE X 30' (+1/8",-0)		15553.02 LBS
017	0530918P-21-17	0.5000	PROFILE, REPADS .500" THK SA16-70N	APR 815	36. LBS
018	610-001930-075	2.0000	COUPLING, WHOLE 0.75" SW SA105 3000#		1.13 LBS
019	806-00007M-0090	2.0000	PIPE, SMLS 0.75" SCH 80 (0.154) 9 LG SA106-B CUT TO LENGTH		4.013 LBS
020	610-001930-150	2.0000	COUPLING, WHOLE 1.50" SW SA105 3000#		2.63 LBS
021	806-00015M-0090	2.0000	PIPE, SMLS 1.50" SCH 80 (0.200) 9 LG SA106-B CUT TO LENGTH		6. LBS
022	610-001930-200	2.0000	COUPLING, WHOLE 2.00" SW SA105 3000#		4. LBS
023	805-00020M-0090	2.0000	PIPE, SMLS 2.00" SCH 40 (0.154) 9 LG SA106-B/SA53-B CUT TO LENGTH		7. LBS
024	610-00003C-086	2.0000	TRANSITION, TAPER 80-40 6.00" X 12.00" LG SA53-B / SA106-B SMLS		14.5 LBS
025	805-00060M-0060	2.0000	PIPE, SMLS 6.00" SCH 40 (0.280) 6 LG SA106-B/SA53-B CUT TO LENGTH		19. LBS
026	0530918P-R04	798.0000	INSERT, TUBE, TWISTED STRIP TURBULATOR .81"W X .035"TH X 360" SA304	APR 815	
027	3A07817E-R09	110.0000	BAR, RND .125" DIA. SA479-304L SS		

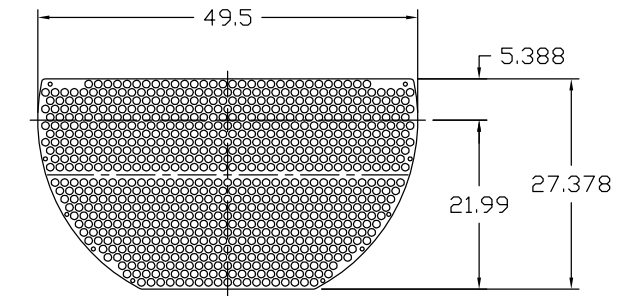
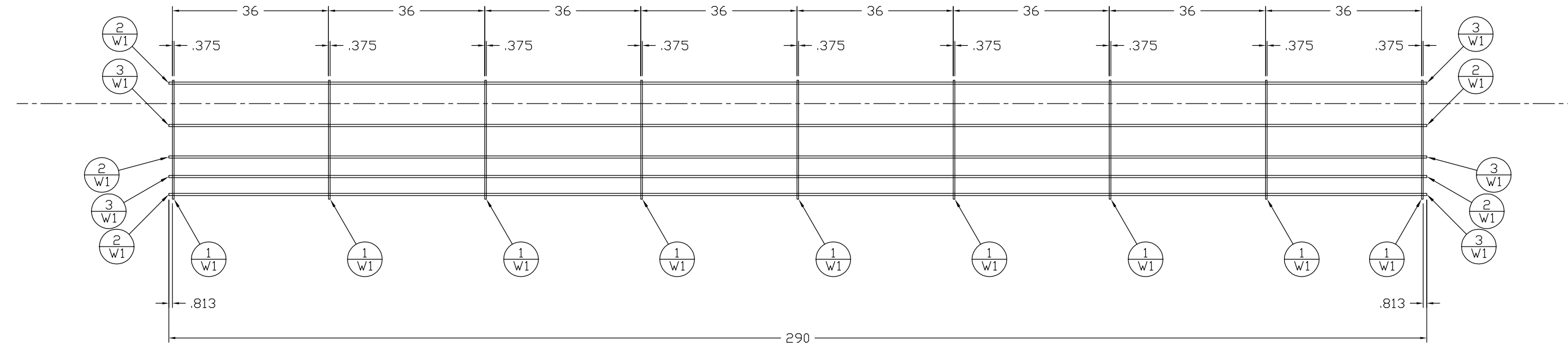
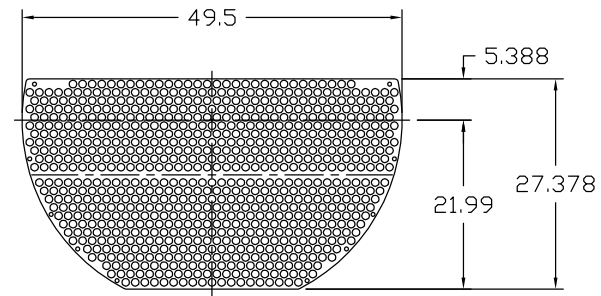
**CERTIFIED**  
BY  
FES, INC.  
SIGNATURE: P. ARSLAIN DATE: 10/7/05

**GEA**  
FES Systems Inc

EVAPORATOR, BXM 52" DIA X 360" NTL WITH 12" DAI X 296.50" OAL MANIFOLD	
DATE	10/7/05
DWG. BY	DRP
APP. BY	PFA
SCALE	1/16" = 1"
DWG. NO.	0530918P-11
SHT. NO.	2 OF 4
ORIG. NO.	0530918P-11

W1 TIE RODS & SUPPORTS

WPS-102 TYP  
TIE RODS TO  
ALL BAFFLES

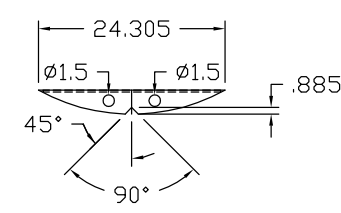
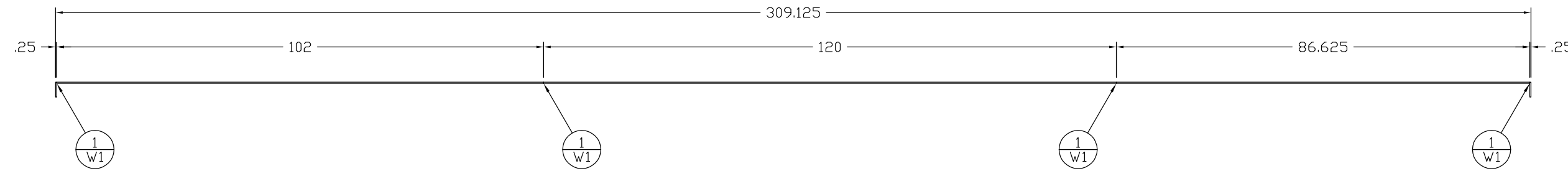
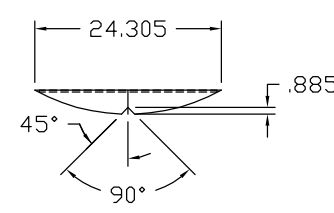
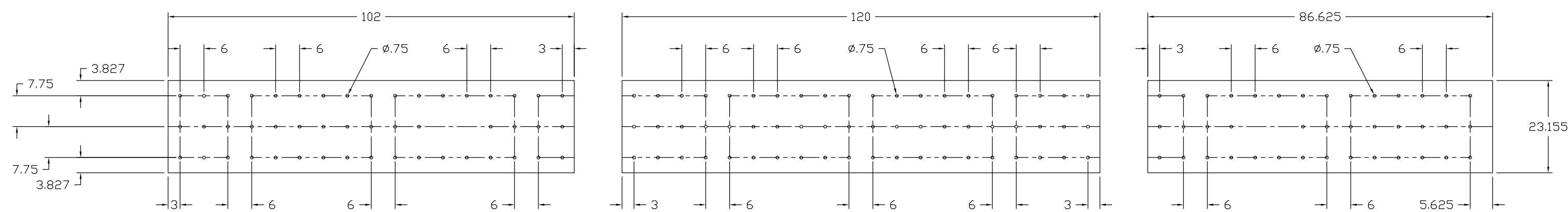


ITEM	PART NUMBER	QTY	DESCRIPTION	REFERENCE	WEIGHT
	0530916P-31	1.0000	ASSEMBLY, BUNDLE 52" DIA X 360" NTL		693.57 LBS
001	170-10231E-001	9.0000	TUBE SUPPORT, 52" DIA. HTEX X 0.375" THK 2 PASS (798)1		132.17 LBS
002	817-R0500M-2400	10.0000	BAR, ROUND .500 240 LG SA36 CS CUT TO LENGTH		133.6 LBS
003	817-R0500M-0500	10.0000	BAR, ROUND .500 50 LG SA36 CS CUT TO LENGTH		27.8 LBS

W1

3/16

WPS-601  
TYP.



ITEM	PART NUMBER	QTY	DESCRIPTION	REFERENCE	WEIGHT
	0530918P-41		PROFILES, DISTRIBUTION PLATE ASSY 52" DIA		
001	630-000270-250	539.0000	PLATE, CS SA36 0.250" THK		506. LBS

[illegible]

EMPTY WT: EXCHANGER	<u>41,310 LBS.</u>
OPERATING WT:	<u>                    LBS.</u>
FULL WT: TOTAL	<u>66,400 LBS.</u>

TAS C/O SHELL MAHOGANY RESEARCH PROJECT  
FREEZE WALL TEST  
RIO BLANCO COUNTY, COLORADO  
SHELL PO NO. 4500183121

SPECIFICATIONS  
UNLESS OTHERWISE SPECIFIED  
DIMENSIONS ARE IN INCHES  
TOLERANCE =  $\pm$   
MAY'L = SEE BILL OF MAY'L  
WT. =  
DO NOT SCALE



**CERTIFIED**  
BY  
FES, INC.  
SIGNATURE: P. ARSLAIN DATE: 10/7/05

EVAPORATOR, BXM 52" DIA X 360" NTL WITH 12" DAI X 296.50" OAL MANIFOLD	
DATE 10/7/05 DWG BY DRP APP BY PFA SCALE 1/16" = 1"	DWG. NO. 0530918P-11 E SHT. NO. 3 OF 4 ORIG. NO. 0530918P-11 E



1. Manufactured and certified by: FES Systems Inc. 3475 Board Road PO Box 2306 (17405) York PA 17402  
(Name and Address of Manufacturer)  
2. Manufactured for: Turbine Air Systems, Ltd. 4300 Dixie Drive; Houston, TX 77021  
(Name and Address of Purchaser)  
3. Location of installation: SHELL EXPLORATION & PRODUCTION CO. NW COLORADO  
(Name and Address)

4. Type: Horizontal 52" OD x 360" NTL EVAPORATOR, BXM 050371  
(Horiz., vert, or sphere) (Tank, separator, jkt. Vessel, heat exh., etc.) (Mfgr's. Serial No.)  
0530918P-11E 14419 2005  
(CRN) (Drawing No.) (Nat'l Bd. No.) (Year built)  
5. ASME CODE, Section VIII, Div. 1. 2004/-  
(Edition and Addenda (date)) (Code Case Nos.) (Special Service per UG-120d)

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) 6 (b) Overall length (ft & in) 29' 4.75"  
Course(s) Material Thickness Long Joint (Cat A, B & C) 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  
3-1 52"-52" 7' - 3' 10" SA 516-70 .875" .125" T-1 Spot 85 T-1 Spot 85 - -  
2 52" 1' .375" SA 516-70 .875" .125" T-1 Spot 85 T-1 Spot 85 1100F 2 h 46 m

7. Heads: (a) (b)  
(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 Conical Hemispherical Flat Side to Pressure Category A  
Min. Corr. Crown Knuckle Ratio Apex Angle Radius Diameter Convex Concave Type Full, Spot, None Eff.  
(a) (b)

If removable, bolts used (describe other fastenings): (Material, 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: 450 - psi at max. temp. 200 - °F. Min. design metal temp: -20 °F at 450 psi.  
(internal) (external) (internal) (external)

10. Impact test: No per UCS 66(b) at test temperature of - °F.  
[Indicate yes or no and the component(s) impact tested]

11. Hydro., pneu., or comb. test press. 585 psi Proof test N/A

Items 12 and 13 to be completed for tube sections.

12. Tubesheet: SA 516-70 57.75" 3.5" .125" WELDED  
[Stationary (Mat'l Spec. No.)] [Dia., In. (subject to press.)] (Nom. thk., in.) (Corr. Allow., in.) [Attachment (welded or bolted)]  
N/A N/A N/A N/A N/A  
[Floating (Mat'l Spec. No.)] (Dia., in.) (Nom. thk., in.) (Corr. Allow., in.) (Attachment)  
13. Tubes: SA 249-316L 1" .065" 798 Straight  
(Mat'l Spec. No., Grade or Type) (O.D., in.) (Nom. thk., in. or gauge) (Number) [Type (Straight 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) (b) Overall length (ft & in.):  
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

15. Heads: (a) SA 516-70 (b) SA 516-70  
(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 Conical Hemispherical Flat Side to Pressure Category A  
Min. Corr. Crown Knuckle Ratio Apex Angle Radius Diameter Convex Concave Type Full, Spot, None Eff.  
(a) End .625" .125" - ELLIP 2:1 - - - - X S None 100  
(b) End .625" .125" - ELLIP 2:1 - - - - X S None 100

If removable, bolts used (describe other fastening) Bolts, SA 320-L7, 1.25", (128) ; Nuts, SA 194-7, 1.25", (256)  
(Mat'l Spec. No., Grade, size, No.)

16. MAWP: 250 (internal) - (external) psi at max. temp 200 (internal) - (external) °F. Min design metal temp. -20 °F at 200 psi.
17. Impact test: No Per UCS 66(b) and UHA-51 at test temperature of - °F.  
(Indicate yes or no and the components(s) impact tested)
18. Hydro., pneu., or comb. Test press. 325 Proof test -
19. Nozzles, Inspection, and safety valve openings:
- | Purpose<br>(Inlet, Outlet, Drain, etc) | No. | Diameter<br>or Size | Flange Type | Material |        | Nozzle Thickness |       | Reinforcement<br>Material | How Attached |        | Location<br>(Insp. Open.) |
|--|-----|---------------------|-------------|----------|--------|------------------|-------|---------------------------|--------------|--------|---------------------------|
|  |     |                     |             | Nozzle   | Flange | Nom.             | Corr. |                           | Nozzle       | Flange |                           |
| TS CONNECTION                          | 2   | .75"                | -           | SA 105   | -      | 6000 #           | .125" | -                         | UW16.1c      | -      | -                         |
| TS CONNECTION                          | 2   | 12"                 | -           | SA 53-B  | -      | 120-STD          | .125" | -                         | UW16.1c      | -      | -                         |
| SS CONNECTION                          | 2   | .75"                | -           | SA 105   | -      | 3000#            | .125" | -                         | UW16.1c      | -      | -                         |
| SS CONNECTION                          | 2   | 6"                  | -           | SA 53-B  | -      | SCH 80-40        | .125" | SA 516-70                 | UW16.1c      | -      | -                         |
| SS CONNECTION                          | 2   | 1.500"              | -           | SA 105   | -      | 3000 #           | .125" | -                         | UW16.1c      | -      | -                         |
| SS CONNECTION                          | 2   | 2"                  | -           | SA 105   | -      | 3000 #           | .125" | -                         | UW16.1c      | -      | -                         |
| RISERS                                 | 4   | 8"                  | -           | SA 53-B  | -      | SCH 80           | .125" | SA 516-70                 | UW16.1c      | -      | -                         |
|  |     |                     |             |          |        |                  |       |                           |              |        |                           |
|  |     |                     |             |          |        |                  |       |                           |              |        |                           |
20. Supports: Skirt No (Yes or No) Lugs 2 (No.) Legs 0 (No.) Others 9 (Describe) Supports Attached (Where and How) Welded to O.D. of vessel
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)
22. Remarks: (This vessel not designed for lethal or nuclear service.) Exempt from impact testing per UCS-66(b) and UHA-51  
Inspection opening exempt per UG-46(a) 2 WN Ring flanges, Spot x-ray to head, SA 350 LF2, 52" Dia., x 3.50" Thk. - Shell Side Concident: -70F @ 125 psig  
Tube side Concident: -55F @ 225 psig

#### CERTIFICATE OF SHOP COMPLIANCE

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

"U" Certificate of Authorization Number: 12,647 Expires 5/14/2008

Date 12-16-2005 Name FES Systems Inc. Signed B. M. Ammons  
(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/or the State or Province of PA and employed by HSBCT of Hartford, CT

have inspected the pressure vessel described in this Manufacturer's Data Report on 12-16-2005, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel 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 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 12-16-2005 Signed [Signature] Commissions NTB10801A PA02541  
(Authorized Inspector) (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 the field assembly construction of all parts of this vessel conforms with the Requirements of ASME Code, Section VIII, Division 1. U Certificate of Authorization No.                      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/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 the ASME Code, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of                      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 loss of any kind arising from or connected with this inspection.

Date                      Signed                      Commissions                       
(Authorized Inspector) (Nat'l Board incl. endorsements, State, Province, and No.)



14. 05-309-18P

NATIONAL BOARD		14419	
U	CERTIFIED BY FES SYSTEMS INC.		
	W	SS MAWP	450 PSI AT 200 °F
PHT	SS MDMT		
RT-3	TS MAWP		
RT-3	TS MDMT		



14419

**CERTIFIED BY  
FES SYSTEMS INC.**

U

W

PHT

RT-3

RT-3

SS MAWP 450 PSI AT 200 °F

SS MDMT -20 °F AT 450 PSI

SS MDMT -70 °F AT 125 PSI

TS MAWP 250 PSI AT 200 °F

TS MDMT -20 °F AT 250 PSI

TS MDMT -35 °F AT 225 PSI

YEAR 2005

FES S/N 030371

E-5801-23

1. Manufactured and certified by: FES Systems Inc. 3475 Board Road PO Box 2306 (17405) York PA 17402

(Name and Address of Manufacturer)

2. Manufactured for: Turbine Air Systems, Ltd. 4300 Dixie Drive; Houston, TX 77021

(Name and Address of Purchaser)

3. Location of installation: SHELL EXPLORATION & PRODUCTION CO. NW COLORADO

(Name and Address)

4. Type: Horizontal 52" OD x 360" NTL EVAPORATOR, BXM 050378

(Horiz., vert, or sphere) (Tank, separator, jkt. Vessel, heat exh., etc.) (Mfr's. Serial No.)

0530918P-11E 14426 2005

(CRN) (Drawing No.) (Nat'l Bd. No.) (Year built)

5. ASME CODE, Section VIII, Div. 1. 2004/-

(Edition and Addenda (date)) (Code Case Nos.) (Special Service per UG-120d)

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) 6 (b) Overall length (ft & in) 29' 4.75"

Course(s)			Material	Thickness		Long Joint (Cat A, B & C)			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
3-1	52"-52"	7' - 3' 10"	SA 516-70	.875"	.125"	T-1	Spot	85	T-1	Spot	85	-	-
2	52"	1' .375"	SA 516-70	.875"	.125"	T-1	Spot	85	T-1	Spot	85	1100F	2 h 46 m

7. Heads: (a) (b)

(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)														
(b)														

If removable, bolts used (describe other fastenings):

(Material, Spec. No., Grade, Size, No.)

8. Type of Jacket: - Jacket closure -

If bar, give dimensions - If bolted, describe or sketch.

Describe as ogee & weld, bar etc.

9. MAWP: 450 - psi at max. temp. 200 - °F. Min. design metal temp. -20 °F at 450 psi.

(internal) (external) (internal) (external)

10. Impact test: No per UCS 66(b) at test temperature of - °F.

[Indicate yes or no and the component(s) impact tested]

11. Hydro., pneu., or comb. test press. 585 psi Proof test N/A

Items 12 and 13 to be completed for tube sections.

12. Tubesheet: SA 516-70 57.75" 3.5" .125" WELDED

[Stationary (Mat'l Spec. No.)] [Dia., In. (subject to press.)] (Nom. thk., in.) (Corr. Allow., in.) [Attachment (welded or bolted)]

N/A N/A N/A N/A N/A

[Floating (Mat'l Spec. No.)] (Dia., in.) (Nom. thk., in.) (Corr. Allow., in.) (Attachment)

13. Tubes: SA 249-316L 1" .065" 798 Straight

(Mat'l Spec. No., Grade or Type) (O.D., in.) (Nom. thk., in. or gauge) (Number) [Type (Straight 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) (b) Overall length (ft & in.):

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

15. Heads: (a) SA 516-70 (b) SA 516-70

(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	.625"	.125"	-	ELLIP	2:1	-	-	-	-	X	S	None	100
(b)	End	.625"	.125"	-	ELLIP	2:1	-	-	-	-	X	S	None	100

If removable, bolts used (describe other fastening) Bolts, SA 320-L7, 1.25", (128) ; Nuts, SA 194-7, 1.25", (256)

(Mat'l Spec. No., Grade, size, No.)



16. MAWP: 250 (internal) - (external) psi at max. temp. 200 (internal) - (external) °F. Min design metal temp. -20 °F at 200 psi.

17. Impact test: No Per UCS 66(b) and UHA-51 at test temperature of - °F.  
(Indicate yes or no and the component(s) impact tested)

18. Hydro., pneu., or comb. Test press. 325 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	
TS CONNECTION	2	.75"	-	SA 105	-	6000 #	.125"	-	UW16.1c	-	-
TS CONNECTION	2	12"	-	SA 53-B	-	120-STD	.125"	-	UW16.1c	-	-
SS CONNECTION	2	.75"	-	SA 105	-	3000#/	.125"	-	UW16.1c	-	-
SS CONNECTION	2	6"	-	SA 53-B	-	SCH 80-40	.125"	SA 516-70	UW16.1c	-	-
SS CONNECTION	2	1.500"	-	SA 105	-	3000 #	.125"	-	UW16.1c	-	-
SS CONNECTION	2	2"	-	SA 105	-	3000 #	.125"	-	UW16.1c	-	-
RISERS	4	8"	-	SA 53-B	-	SCH 80	.125"	SA 516-70	UW16.1c	-	-

20. Supports: Skirt No (Yes or No) Lugs 2 (No.) Legs 0 (No.) Others 9 Supports (Describe) Attached Welded to O.D. of vessel (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)

22. Remarks: (This vessel not designed for lethal or nuclear service.) Exempt from impact testing per UCS-66(b) and UHA-51

Inspection opening exempt per UG-46(a) 2 WN Ring flanges, Spot x-ray to head, SA 350 LF2, 52" Dia., x 3.50" Thk. - Shell Side Coincident: -70F @ 125 psig

Tube side Coincident: -55F @ 225 psig

### CERTIFICATE OF SHOP COMPLIANCE

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

"U" Certificate of Authorization Number: 12,647 Expires 5/14/2008

Date 12-15-2005 Name FES Systems Inc. Signed B. M. Leonard  
(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/or the State or Province of PA and employed by HSBCT of Hartford, CT

have inspected the pressure vessel described in this Manufacturer's Data Report on 12-15-2005, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel 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 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 12-15-2005 Signed [Signature] Commissions NB310821A PA02541  
(Authorized Inspector) (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 the field assembly construction of all parts of this vessel conforms with the Requirements of ASME Code, Section VIII, Division 1. U Certificate of Authorization No. 12,647 Expires 5/14/2008

Date 12-15-2005 Name FES Systems Inc. Signed B. M. Leonard  
(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/or the State or Province of PA and employed by HSBCT, 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 Code, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of 325 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 loss of any kind arising from or connected with this inspection.

Date 12-15-2005 Signed [Signature] Commissions NB310821A PA02541  
(Authorized Inspector) (Nat'l Board incl. endorsements, State, Province, and No.)

14. 05-309-18Q

NATIONAL BOARD		14426	
U	CERTIFIED BY FES SYSTEMS INC.		
W	SS MAWP	450	PSI AT 200 °F

NB		14426	
CERTIFIED BY FES SYSTEMS INC.			
U	SS MAWP	450	PSI AT 200 °F
W	SS MDMT	-20	° F AT 450 PSI
PH	SS MDMT	-70	° F AT 125 PSI
RT-3	TS MAWP	250	PSI AT 200 ° F
RT-3	TS MDMT	-20	° F AT 250 PSI
	TS MDMT	-55	° F AT 225 PSI
YEAR	2005	FES S / N	050376
E-5802-25			



FES Systems Inc.

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

Form # NB-26, Rev. 1

FES Sales Order # 05-309-18R

1. Manufactured and certified by: FES Systems Inc. 3475 Board Road PO Box 2306 (17405) York PA 17402  
(Name and Address of Manufacturer)
2. Manufactured for: Turbine Air Systems, Ltd. 4300 Dixie Drive; Houston, TX 77021  
(Name and Address of Purchaser)
3. Location of installation: SHELL EXPLORATION & PRODUCTION CO. NW COLORADO  
(Name and Address)
4. Type: Horizontal 52" OD x 360" NTL EVAPORATOR, BXM 050377  
(Horiz., vert, or sphere) (Tank, separator, jkt. Vessel, heat exh., etc.) (Mfg's. Serial No.)  
0530918P-11E REV C-2 14425 2005  
(CRN) (Drawing No.) (Nat'l Bd. No.) (Year built)
5. ASME CODE, Section VIII, Div. 1. 2004/-  
(Edition and Addenda (date)) (Code Case Nos.) (Special Service per UG-120d)

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) 6 (b) Overall length (ft & in) 29' 4.75"

Course(s)			Material		Thickness		Long Joint (Cat A, B & C)			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
3-1	52"-52"	7' - 3' 10"	SA 516-70		.875"	.125"	T-1	Spot	85	T-1	Spot	85	-	-
2	52"	1' .375"	SA 516-70		.875"	.125"	T-1	Spot	85	T-1	Spot	85	1100F	2 h 46 m

7. Heads: (a) (Mat'l Spec. No., Grade or Type) (H.T. - Time & Temp.) (b) (Mat'l Spec. No., Grade or Type) (H.T. - Time & Temp.)
- |     | Location<br>(Top Bottom, Ends) | Thickness |       | Radius |         | Elliptical<br>Ratio | Conical<br>Apex Angle | Hemispherical<br>Radius | Flat<br>Diameter | Side to Pressure |         | Category A |                  |      |
|-----|--------------------------------|-----------|-------|--------|---------|---------------------|-----------------------|-------------------------|------------------|------------------|---------|------------|------------------|------|
|     |                                | Min.      | Corr. | Crown  | Knuckle |                     |                       |                         |                  | Convex           | Concave | Type       | Full, Spot, None | Eff. |
| (a) |                                |           |       |        |         |                     |                       |                         |                  |                  |         |            |                  |      |
| (b) |                                |           |       |        |         |                     |                       |                         |                  |                  |         |            |                  |      |

If removable, bolts used (describe other fastenings):

8. Type of Jacket: - Jacket closure - (Material, Spec. No., Grade, Size, No.)  
Describe as ogee & weld, bar etc.  
If bar, give dimensions -  
If bolted, describe or sketch.
9. MAWP: 450 - psi at max. temp. 200 - °F. Min. design metal temp. -20 °F at 450 psi.  
(internal) (external) (internal) (external)

10. Impact test: No per UCS 66(b) at test temperature of - °F.  
(Indicate yes or no and the component(s) impact tested)

11. Hydro., pneu., or comb. test press. 585 psi Proof test N/A

Items 12 and 13 to be completed for tube sections.

12. Tubesheet: SA 516-70 57.75" 3.5" .125" WELDED  
[Stationary (Mat'l Spec. No.)] [Dia., in. (subject to press.)] (Nom. thk., in.) (Corr. Allow., in.) [Attachment (welded or bolted)]  
N/A N/A N/A N/A N/A  
[Floating (Mat'l Spec. No.)] (Dia., in.) (Nom. thk., in.) (Corr. Allow., in.) (Attachment)  
13. Tubes: SA 249-316L 1" .065" 798 Straight  
(Mat'l Spec. No., Grade or Type) (O.D., in.) (Nom. thk., in. or gauge) (Number) [Type (Straight 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) - (b) Overall length (ft & in.): -

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

15. Heads: (a) SA 516-70 (b) SA 516-70  
(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<br>Ratio | Conical<br>Apex Angle | Hemispherical<br>Radius | Flat<br>Diameter | Side to Pressure |         | Category A |                  |      |
|----|------------------------------|-----------|-------|--------|---------|---------------------|-----------------------|-------------------------|------------------|------------------|---------|------------|------------------|------|
|    |                              | Min.      | Corr. | Crown  | Knuckle |                     |                       |                         |                  | Convex           | Concave | Type       | Full, Spot, None | Eff. |
| a) | End                          | .625"     | .125" | -      | ELLIP   | 2:1                 | -                     | -                       | -                | -                | X       | S          | None             | 100  |
| b) | End                          | .625"     | .125" | -      | ELLIP   | 2:1                 | -                     | -                       | -                | -                | X       | S          | None             | 100  |

If removable, bolts used (describe other fastening)

Bolts, SA 320-L7, 1.25", (128); Nuts, SA 194-7, 1.25", (256)

(Mat'l Spec. No., Grade, size, No.)

COPY

16. MAWP: 250 (internal) - (external) psi at max. temp 200 (internal) - (external) °F. Min design metal temp. -20 °F at 200 psi.

17. Impact test: No Per UCS 66(b) and UHA-51 at test temperature of - °F.  
(Indicate yes or no and the components(s) impact tested)

18. Hydro., pneu., or comb. Test press. 325 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	
TS CONNECTION	2	.75"	-	SA 105	-	6000 #	.125"	-	UW16.1c	-	-
TS CONNECTION	2	12"	-	SA 53-B	-	120-STD	.125"	-	UW16.1c	-	-
SS CONNECTION	2	.75"	-	SA 105	-	3000#	.125"	-	UW16.1c	-	-
SS CONNECTION	2	6"	-	SA 53-B	-	SCH 80-40	.125"	SA 516-70	UW16.1c	-	-
SS CONNECTION	2	1.500"	-	SA 105	-	3000 #	.125"	-	UW16.1c	-	-
SS CONNECTION	2	2"	-	SA 105	-	3000 #	.125"	-	UW16.1c	-	-
RISERS	4	8"	-	SA 53-B	-	SCH 80	.125"	SA 516-70	UW16.1c	-	-

20. Supports: Skirt No (Yes or No) Lugs 2 (No.) Legs 0 (No.) Others 9 Supports (Describe) Attached Welded to O.D. of vessel (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)

22. Remarks: (This vessel not designed for lethal or nuclear service.) Exempt from impact testing per UCS-66(b) and UHA-51

Inspection opening exempt per UG-46(a) 2 WN Ring flanges, Spot x-ray to head, SA 350 LF2, 52" Dia., x 3.50" Thk. - Shell Side Concident: -70F @ 125 psig  
Tube side Coincident: -55F @ 225 psig Shell to Tubesheet weld repaired after PWHT in accordance with UCS-66

### CERTIFICATE OF SHOP COMPLIANCE

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

"U" Certificate of Authorization Number: 12,647 Expires 5/14/2008

Date 12-21-2005 Name FES Systems Inc. Signed B. M. J. J. J.  
(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/or the State or Province of PA and employed by HSBCT of Hartford, CT

have inspected the pressure vessel described in this Manufacturer's Data Report on 12-21-2005, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel 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 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 1-2-2006 Signed [Signature] Commissions WB 19801A P2025V1  
(Authorized Inspector) (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 the field assembly construction of all parts of this vessel conforms with the Requirements of ASME Code, Section VIII, Division 1. U Certificate of Authorization No.                      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/or the State or Province of                      and employed by                     , 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 Code, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of                      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 loss of any kind arising from or connected with this inspection.

Date                      Signed                      Commissions                       
(Authorized Inspector) (Nat'l Board incl. endorsements, State, Province, and No.)



14. 05-309-18R

NATIONAL BOARD		14425	
U	CERTIFIED BY FES SYSTEMS INC.		
W	SS MAWP	450	PSI AT 200 °F

NB		14425	
CERTIFIED BY FES SYSTEMS INC.			
U	SS MAWP	450	PSI AT 200 °F
W	SS MDMT	-20	° F AT 450 PSI
PHT	SS MDMT	-70	° F AT 125 PSI
RT-3	TS MAWP	250	PSI AT 200 °F
RT-3	TS MDMT	-20	° F AT 250 PSI
	TS MDMT	-55	° F AT 225 PSI
YEAR	2003	FES S / N	050377
E-5803-25			





# HEAT EXCHANGER SPECIFICATION SHEET

1	SHELL OIL CO		**ALTERNATE**	
2	Location:			
3	Service of Unit:	EVAPORATOR FOR AN	Our Reference:	
4	Item No.:E-1	AQUEOUS AMMONIA CHILLER	Your Reference:	
5	Date:07-14-05	Rev No.:2	Job No.:	
6	Size 51-360	Type BXM hor	Connected in	1 parallel 1 series
7	Surf/unit(eff) 6182	ft2; Shells/unit	1	Surf/shell(eff) 6182 ft2
8	PERFORMANCE OF ONE UNIT			
9	Fluid allocation	Shell Side		Tube Side
10	Fluid name	CO2		AQUEOUS AMMONIA 26%
11	Fluid quantity, total	lb/h	124648	1246539
12	Vapor (in/out)	lb/h	20775	124648
13	Liquid	lb/h	103873	1246539
14	Noncondensable	lb/h		1246539
15	Temperature (in/out)	F	-57	-57
16	Dew point/bubble point	F		-35
17	Density	lb/ft3	72.206	1.124
18	Viscosity	cp	0.227	0.014
19	Molecular weight, vapor			56.091
20	Molecular weight, noncondensable			57
21	Specific heat	Btu/(lb*F)	0.444	0.241
22	Thermal conductivity	Btu/(ft*h*F)	0.099	0.009
23	Latent heat	Btu/lb	125	125
24	Inlet pressure	psia	101.4	100
25	Velocity	ft/s		3.7
26	Pressure drop, allow./calc.	psi	/	10 / 6.459
27	Fouling resist. (min.)	ft2*h*F/Btu	0.0005	0.002
28	Heat exchanged	12964000	Btu/h; MTD (corrected)	16.4 F
29	Transfer rate, service	128	dirty 128 clean	175 Btu/(ft2*h*F)
30	CONSTRUCTION OF ONE SHELL			
31		Shell Side		Tube Side
32	Design/ Alt pressure	psig	450/125	250/100
33	Design temperature	F	-70 TO 200	-50 TO 200
34	No. passes per shell		1	2
35	Corrosion allowance	in	0.125	0.125
36	Connections	in	8/B.W.	14/150
37	size/rating	out	8(3)/B.W.	14/150
38			/	/
39	Tube no.	798	od 1.0 ;thk-avg	0.065 in;length 30 ft;pitch 1.25 in
40	Tube type	plain, SA-249	Material	SS316 Pattern 30
41	Shell	CS	id 52 in	Shell cover
42	Channel or bonnet	CS	SA516-70N	Channel cover
43	Tubesheet-stationary	CS	SA516-70N	Tubesheet-floating
44	Floating head cover			Impingement protection on bundle
45	Baffles-cross	CS	Type full sup	Cut (%d) ;Spacing: c/c 36.0 in
46	Baffles-long		Seal type	Inlet 36 in
47	Supports-tube	CS	U-bend	Type
48	Bypass seal		Tube-tubesheet joint	exp./seal wld
49	Expansion joint		Type	
50	Rho*V2-inlet nozzle	3133	Bundle entrance	Bundle exit
51	Gaskets-shell side		Tube side	spiral wound
52	-floating head			
53	Code requirements	ASME Code Sec VIII Div 1		TEMA class
54	Weight/shell	49444	Filled with water	78084 Bundle 28768 lb
55	Remarks			
56	FREEZING POINT OF 26% AQUEOUS AMMONIA IS -80 DEG F.			
57	TUBES FITTED WITH 304 SS TWISTED TAPE.			
58	PER ASME CODE PARA UCS-66.1, SHELL SIDE MEETS -60F MDMT. NO NEED FOR SS.			

