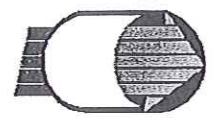


#105747

REV L N #
0 1
0 2
1 3
1 4

Energy Exchanger Company



HEAT EXCHANGER SPECIFICATION SHEET

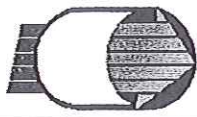
P.O. No.: 56603-P-12-04
REV. 0 AS PURCHASED

3	Customer	SHAW STONE & WEBSTER (GIANT)		Job No.: X-7262 "AS BUILT"	
4	Address	HOUSTON, TX		Rev.: 1	Date: 3/13/07
5	Plant Location	GRAFTON, VA		File:	06-6102
6	Service of Unit	REACTOR FEED/EFFLUENT EXCHANGER		Item: E-641 A/B	
7	Size	59-264	Type	AFU	Horizontal
8	Surf./Unit	Gross / ☒ Eff	13140. ft ² ; Shells/Unit	2	Surf./Shell
9	PERFORMANCE OF ONE UNIT				
10	Fluid Allocation	Shell Side		Tube Side	
11	Fluid Name	REACTOR EFFLUENT		REACTOR FEED	
12	Fluid Quantity, Total	lb/hr			
13	Vapor (In/Out)				
14	Liquid				
15	Steam				
16	Water				
17	Noncondensable				
18	Temperature (In/Out)	°F			
19	Density (Vapor/Liquid)	Lb/Ft ³			
20	Viscosity	cP			
21	Molecular Weight				
22	Molecular Weight, Noncondensable				
23	Specific Heat	Btu/lb-F			
24	Thermal Conductivity	Btu/hr-ft-F			
25	Latent Heat	Btu/lb			
26	Inlet Pressure	psia			
27	Velocity	ft/sec			
28	Pressure Drop, Allow./Calc.	psi			
29	Fouling Resistance (Min.)	Hr-Ft-°F/Btu			
30	Heat Exchanged	Btu/hr; M.T.D. (Corrected)		°F	
31	Transfer Rate, Service	Btu/hr-ft ² -F; Clean		Btu/hr-ft ² -F	
32	CONSTRUCTION OF ONE SHELL				
33		Shell Side		Tube Side	
34	Design/Test Pressure	psig		495/FV/647	
35	Design Temperature (Max/Min)	°F		500/366/0	
36	No. Passes Per Shell	2		2	
37	Corrosion Allowance	inch		0.125	
38	Connections	In		1 - 16" 600RF	
39	Size & Rating	Out		1 - 14" 600RF	
40		Intermediate		1 - 12" 600RF	
41	Tube No.	785 U'S	OD .75 in; Thk.	☒ Min	Avg 0.083 in; Length 22. ft; Pitch 1 in 90°
42	Tube Type	PLAIN		Material SA-179	
43	Shell	SA-516-70	☒ ID	OD 59 in	Shell Cover SA-350-LF2
44	Channel or Bonnet	SA-516-70 (N)			Channel Cover SA-516-70 (N)
45	Tubesheet-Stationary	SA-350-LF2		Tubesheet - Floating	
46	Floating Head Cover			Impingement Protection Circular Plate ON BUNDLE	
47	Baffles-Cross	4 - SA-516-70	Type	V-N.T.I.W.	% Cut (☒ Dia. Area) 20.6 Spacing c/c 50.7 Inlet in
48	Baffles-Long	SA-516-70		Seal Type LAMIFLEX	
49	Supports - Tube	SA-516-70	U-Bend	YES	Type FULL
50	Bypass Seal Arrangement	SA-516-70		Tube-Tubesheet Joint EXPANDED AND WELDED	
51	Expansion Joint			Type	
52	pv ² - Inlet Nozzle	Bundle Entrance		Bundle Exit	
53	Gaskets - Shell Side	S.S. D.J.F.G.F		Tube Side S.S. D.J.F.G.F	
54	- Floating Head				
55	Code Requirements	ASME SECTION VIII, DIV. 1		CODE STAMP	
56	Weight/Shell	76,700 lb. EACH	Filled With Water	109,250 lb. EACH	Bundle 33,250 lb. EACH
57	REMARKS				
58	(1) SHELLS A & B				
59	(2) TWO INTERMEDIATE SUPPORTS PER BAFFLE SPACE (4) FOUR ROW PARTIAL SUPPORTS AT SHELL NOZZLE CENTERLINES				
60	(3) PROVIDE (2) 1-1/2" X 600# RFLWN ON EACH OF INLET AND OUTLET (TUBESIDE AND SHELLSIDE) NOZZLES OF EACH INDIVIDUAL SHELL (EXCHANGER).				
61	(4) TIE ROD SPACER SLEEVES SHALL BE SCH. 40 PIPE THICKNESS.				
62					
63					
64					
65					

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Energy Exchanger Company

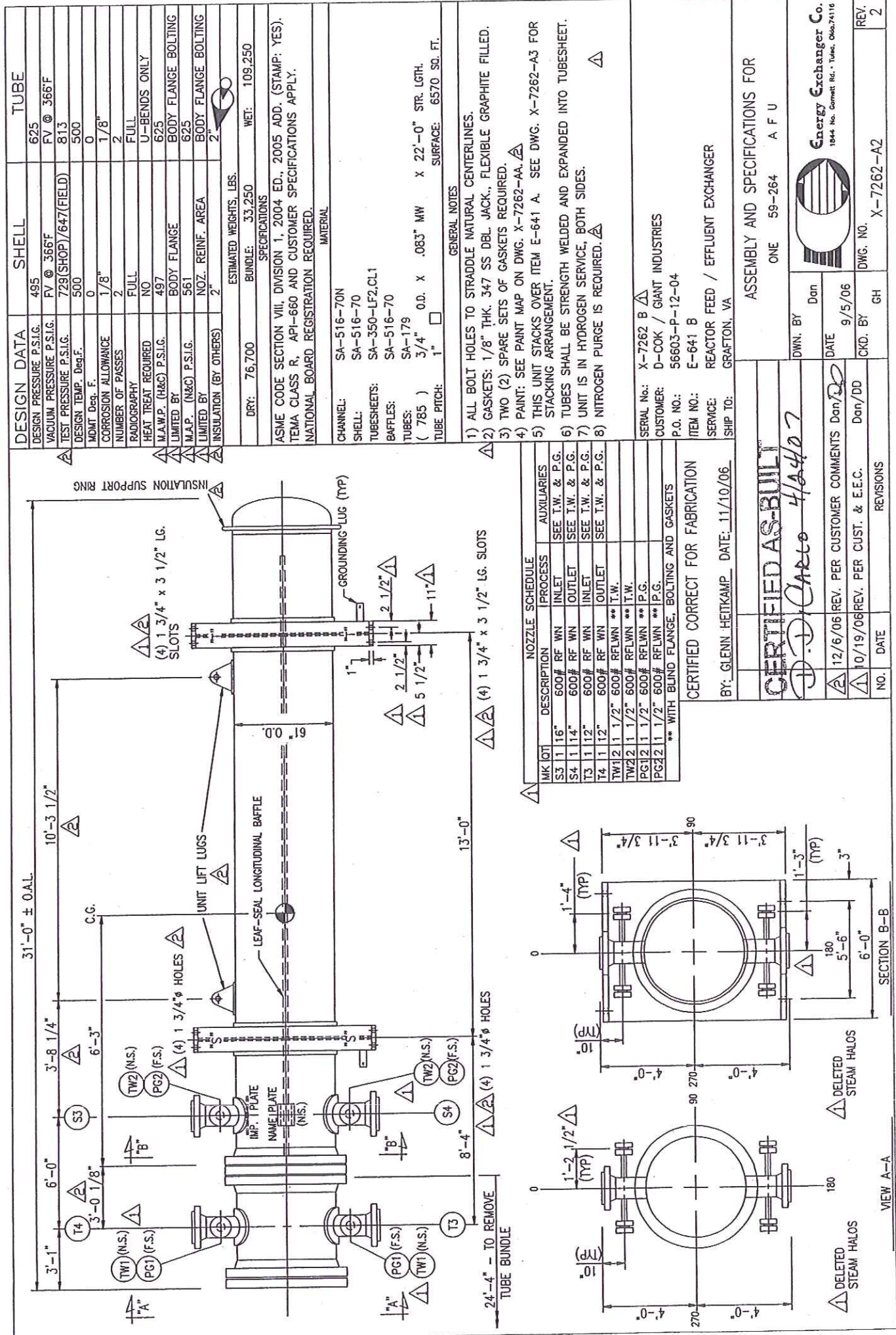
HEAT EXCHANGER SPECIFICATION SHEET



P.O. No.: 56603-P-12-04

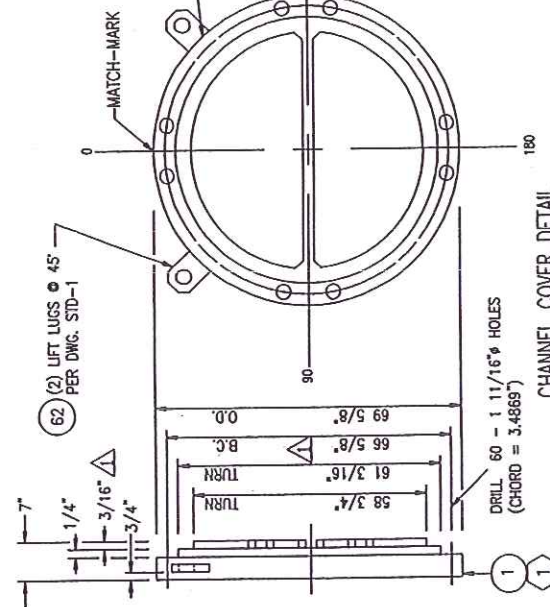
REV. 0 AS PURCHASED

REV	L N #		
0	1		
0	2		
1	3	Customer	SHAW STONE & WEBSTER (GIANT)
1	4	Address	HOUSTON, TX
	5	Plant Location	GRAFTON, VA
	6	Service of Unit	REACTOR FEED/EFFLUENT EXCHANGER
	7	Size	59-264 Type AFU Horizontal
	8	Surf./Unit	Gross / ☒ Eff 38872. ft ² ; Shells/Unit 6
	9	Surf./Shell	Gross ☒ Eff. 6296/6570 ft ²
	10	PERFORMANCE OF ONE UNIT	
	11	Fluid Allocation	Shell Side Tube Side
	12	Fluid Name	REACTOR EFFLUENT REACTOR FEED
	13	Fluid Quantity, Total lb/hr	319572 317508
	14	Vapor (In/Out)	319572 25693 4682 317508
	15	Liquid	293879 312826
	16	Steam	
	17	Water	
	18	Noncondensable	
	19	Temperature (In/Out) °F	799. 235.0 108. 699.
	20	Density (Vapor/Liquid) Lb/Ft ³	2.0700 0.8700 39.02 0.3300 43.45 2.7600
	21	Viscosity cP	0.0220 0.0150 0.199 0.0090 0.353 0.0200
	22	Molecular Weight	
	23	Molecular Weight, Noncondensable	
	24	Specific Heat Btu/lb-F	0.7490 0.7620 0.599 1.8410 0.5050 0.7170
	25	Thermal Conductivity Btu/hr-ft-F	0.0380 0.0430 0.056 0.0790 0.0680 0.0340
	26	Latent Heat Btu/lb	
	27	Inlet Pressure psia	409.7 498.7
	28	Velocity ft/sec	9.68
	29	Pressure Drop, Allow./Calc. psi	25.00 / 26.00 25.00 / 13.00
	30	Fouling Resistance (Min.) Hr-Ft ² -°F/Btu	0.002 0.005
	31	Heat Exchanged 148230000 Btu/hr; M.T.D. (Corrected) 80.73 °F	
	32	Transfer Rate, Service 47.23 Btu/hr-ft ² -F; Clean Btu/hr-ft ² -F	
	33	CONSTRUCTION OF ONE SHELL	
	34	Design/Test Pressure psig	Shell Side Tube Side
	35	Design Temperature (Max/Min) °F	
	36	No. Passes Per Shell	
	37	Corrosion Allowance inch	
	38	Connections In	
	39	Size & Out	
	40	Rating Intermediate	
	41	Tube No. OD in; Thk. Min Avg in; Length ft; Pitch in	
	42	Tube Type	Material
	43	Shell ID OD in ;Shell Cover	Integ. Remov.
	44	Channel or Bonnet Channel Cover	Integ. Remov.
	45	Tubesheet-Stationary Tubesheet - Floating	
	46	Floating Head Cover Impingement Protection	
	47	Baffles-Cross Type % Cut (Dia. Area) Spacing c/c Inlet in	
	48	Baffles-Long Seal Type	
	49	Supports - Tube U-Bend Type	
	50	Bypass Seal Arrangement Tube-Tubesheet Joint	
	51	Expansion Joint Type	
	52	pv ² - Inlet Nozzle Bundle Entrance Bundle Exit	
	53	Gaskets - Shell Side Tube Side	
	54	- Floating Head	
	55	Code Requirements TEMA Class	
	56	Weight/Shell Filled With Water Bundle	
	57	REMARKS	
	58	(1) OVERALL PERFORMANCE SHEET FOR SIX EXCHANGERS IN SERIES. SHELLS "E" & "F" HAVE 752U'S TO ALLOW ROOM FOR DERESONATING BAFFLES.	
	59	PLACE DERESONATING BAFFLES IN ALL BAFFLE SPACES BUT INLET AND OUTLET JUST ABOVE AND BELOW THE CENTER OF EACH HALF.	
	60	(2) DESIGN SHELLSIDE AND TUBESIDE TO BE HYDROGEN SERVICE.	
	61		
	62		
	63		
	64		
	65		

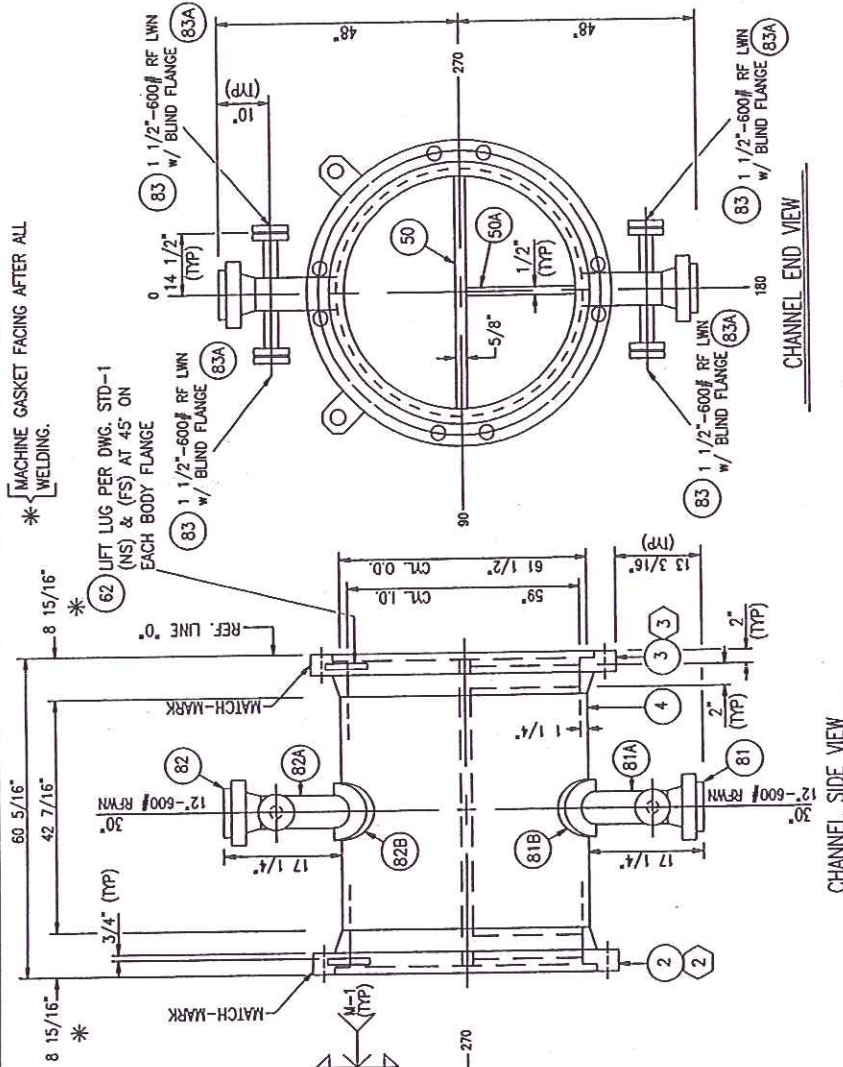


COVER NOTES:

- 1) MACHINE ALL COVER SURFACES TO 250 AARH, EXCEPT GASKET SURFACES MACHINE TO 125 AARH.
- 2) ALL COVER PASS PLATE GROOVE WIDTH SHALL BE 1/2".
- 3) ALL COVER PASS PLATE GROOVE JOINTS SHALL BE NOTCHED 3/8" @ 45°.



CHANNEL COVER DETAIL



CHANNEL SIDE VIEW

CHANNEL END VIEW

SERIAL NO.: X-7262-A/B
 CUSTOMER: D-COK / GANT INDUSTRIES
 P. O. NO.: 56603-P-12-04
 ITEM NO.: E-641 A/B
 SERVICE: REACTOR FEED/EFFLUENT EXCHANGER
 SHIP TO: GRAFTON, VA

CHANNEL DETAILS

OWN. BY	Don
DATE	10/19/06
CHKD. BY	Don Carlo
DWG. NO.	X-7262-B
REV.	1

NOTES:

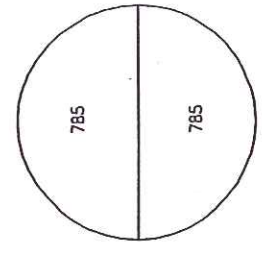
- 1) FOR WELD & BEVEL DETAILS, SEE DWG STD-1.
- 2) FOR BODY FLANGE DETAILS, SEE DWG. X-7262-M.
- 3) FOR FABRICATION NOTES, SEE DWG. X-7262-N.
- 4) MILL PASS PLATES TO 3/8", BOTH ENDS.

REQUIRED AS SHOWN FOR ONE UNIT;
 TWO-UNITS REQUIRED.

CERTIFIED AS-BUILT

D.D. CARLO 4/24/07

PROJECT TITLE: GANT 5 ZONE	ISSUE:
SSV: 12053-P-12-04 (C110-01)	FOR INFORMATION
EQUIPMENT NO.: 56603-P-12-04 (C110-01)	ACCEPTED
SHAW Stone & Webster, Inc.	ACCEPTED AS NOTED
108 Hwy 120653	REVISIT AND RESUBMIT
SIGNED:	DATE:
THE ACCEPTANCE OF THIS DATA BY SHAW STONE & WEBSTER DOES NOT RELIEVE THE CONTRACTOR OR SUPPLIER FROM THE OBLIGATIONS IMPOSED BY THE PURCHASER ORDER OR CONTRACT.	



TUBE DISTRIBUTION

SEAL BAR NOTES:

- 1) CUT SLOTS IN BAFFLES ONLY.
- 2) CUT SLOTS 7/16" WIDE.
- 3) CUT SLOT DEPTHS [SEAL BAR WIDTH + 1/16"] FROM OUTSIDE EDGE OF SLOT.

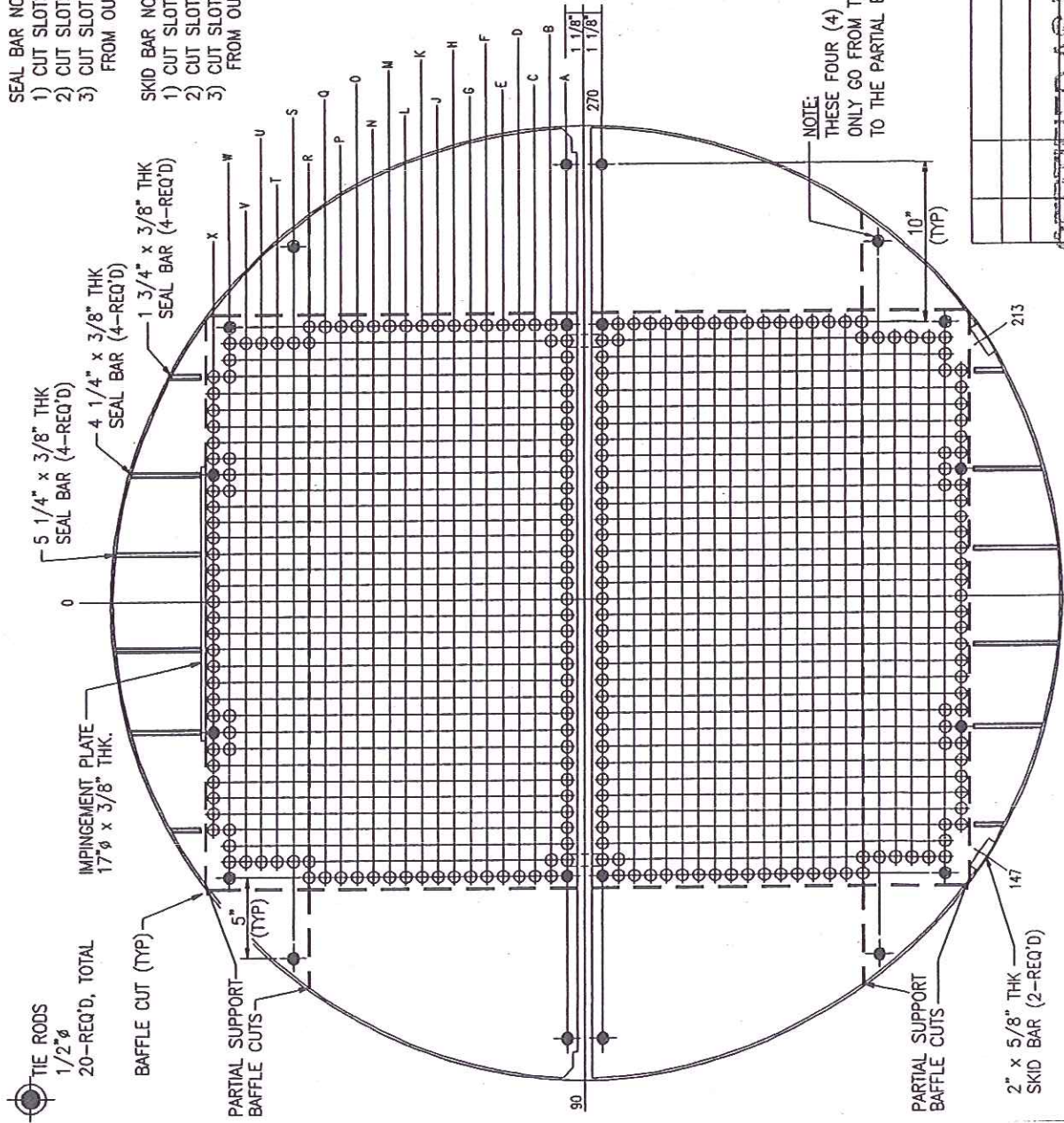
SKID BAR NOTES:

- 1) CUT SLOTS IN BAFFLES ONLY.
- 2) CUT SLOTS 2 1/16" WIDE.
- 3) CUT SLOT DEPTHS [SKID BAR THK. + 1/16"] FROM OUTSIDE EDGE OF SLOT.

NOTES:

- 1) DRILL AND REAM TUBE HOLES IN TUBESHEET TO 0.758" ± 0.002" DIAMETER, FOR 785 - 3/4" O.D. U-TUBES. TOTAL HOLES = 1570.
- 2) TUBE PITCH = 1" SQUARE.
- 3) NUMBER OF PASSES = 2.
- 4) SEE DRAWING X-7262-E FOR TUBE GROOVING DETAILS.
- 5) BAFFLE O.D. = 58 11/16".
- 6) O.T.L. = 55 3/8".

SERIAL NO.: X-7262 A/B
 CUSTOMER: D-COK / GIANT INDUSTRIES
 P. O. NO.: 56603-P-12-04
 ITEM NO.: E-641 A/B
 SERVICE: REACTOR FEED/EFFLUENT EXCHANGER
 SHIP TO: GRAFTON, VA



NOTE:
 THESE FOUR (4) TIE RODS SHALL ONLY GO FROM THE TUBESHEET TO THE PARTIAL BAFFLES.

TUBE LAYOUT

CERTIFIED AS-BUILT
 D.D. Caruso 4/24/07

DWN. BY Don
 DATE 10/10/06

CHK. BY D. Caruso

DWG. NO. X-7262-F

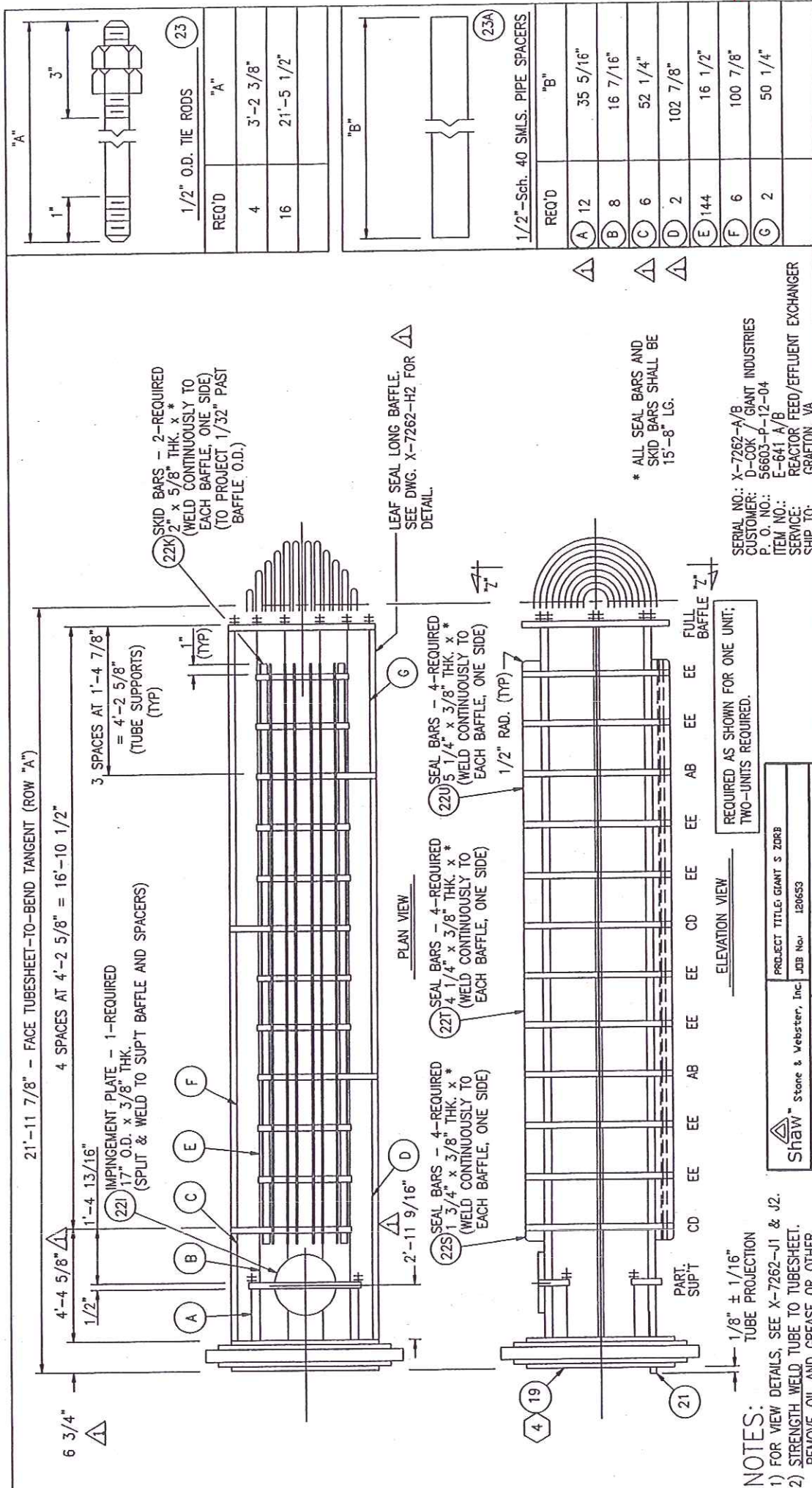
REV. 0

VIEW LOOKING AT SHELL SIDE OF NO. 4 TUBESHEET



PROJECT TITLE: GIANT S 20RB	
Stone & Webster, Inc.	JOB No. 120653
SSA 120653-P-12-04 CT110-03	ISSUE 1
EQUIPMENT No. 56603-P-12-04 CT110-03	
☐ FOR INFORMATION	☐ ACCEPTED FOR CIVIL AND PIPING IFC
☐ ACCEPTED	☐ ACCEPTED AS CERTIFIED
☐ ACCEPTED AS NOTED	☐ REVISE AND RESUBMIT
SIGNED :	
DATE :	
THE ACCEPTANCE OF THIS DATA BY SHAW STONE & WEBSTER DOES NOT RELIEVE THE CONTRACTOR OR SUPPLIER FROM THE OBLIGATIONS IMPOSED BY THE PURCHASER ORDER OR CONTRACT.	

103747



BUNDLE DETAILS



Energy Exchanger Co.
1844 No. Connet Rd. - Tulsa, Okla. 74116

DWN. BY	Don
DATE	10/23/06
CKD. BY	DiCarlo
DWG. NO.	X-7262-H1
REV.	1

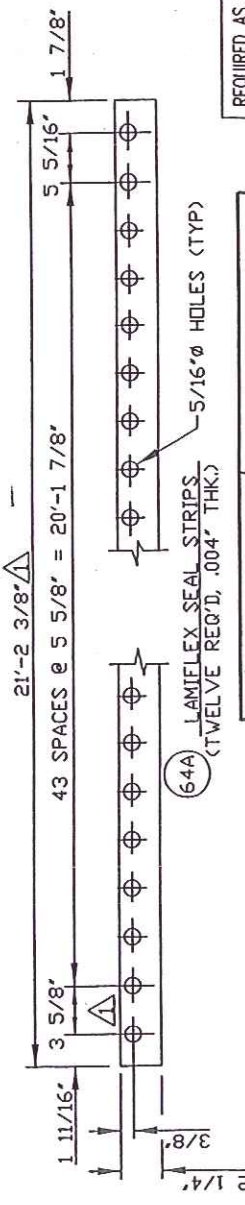
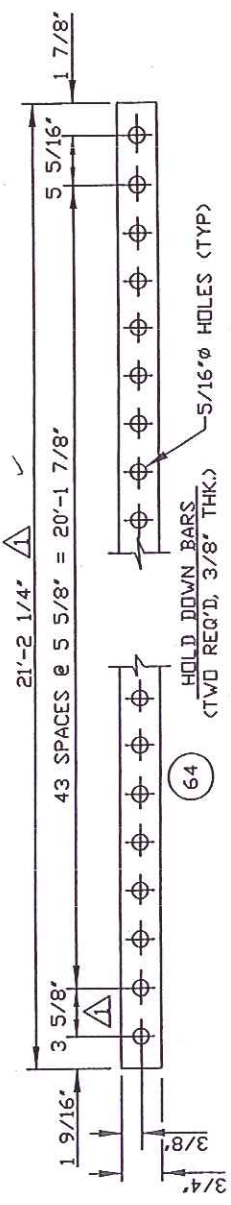
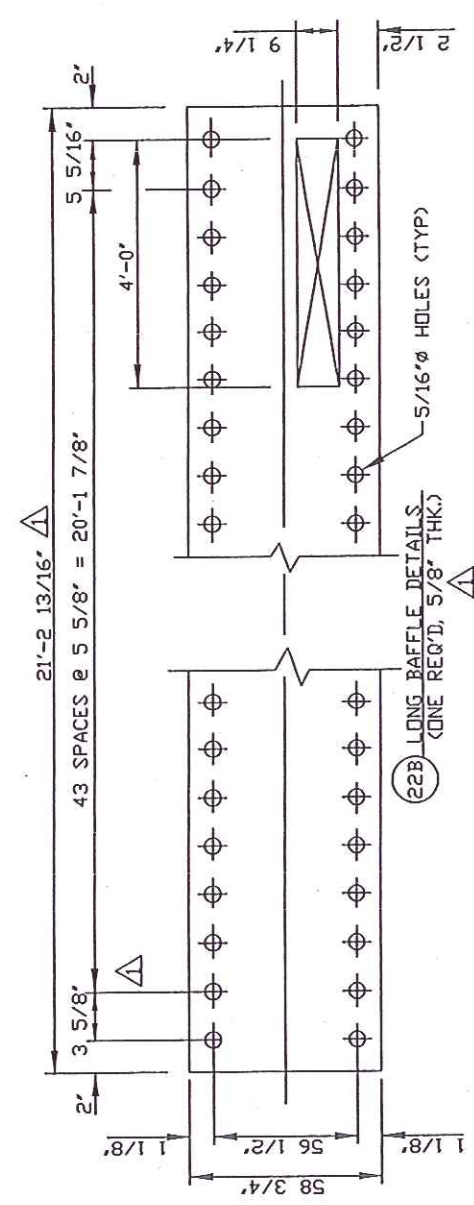
CERTIFIED AS BUILT
Don Carlo 1/24/07

Shaw	Stone & Webster, Inc.	PROJECT TITLE: GIANT S ZOR3
SSW 120653-P-12-04 (1110-01)	JOB No. 120653	
EQUIPMENT No. 1 56603-P-12-04 (1110-01)	ISSUE 1	
☐ FOR INFORMATION	☐ ACCEPTED FOR CIVIL AND PIPING IFC	
☐ ACCEPTED	☐ ACCEPTED AS CERTIFIED	
☐ ACCEPTED AS NOTED	☐ REVISE AND RESUBMIT	
SIGNED		
DATE		

THE ACCEPTANCE OF THIS DATA BY SHAW STONE & WEBSTER DOES NOT RELIEVE THE CONTRACTOR OR SUPPLIER FROM THE OBLIGATIONS IMPOSED BY THE PURCHASER ORDER OR CONTRACT.

NOTES:

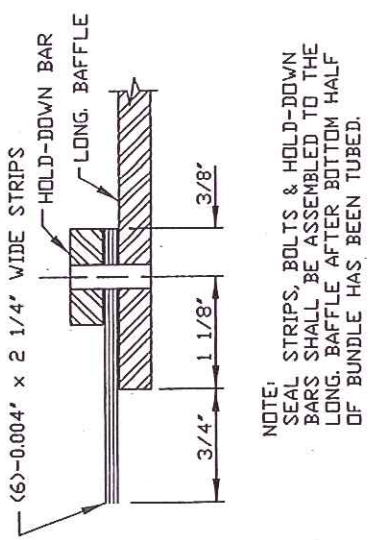
- 1) FOR VIEW DETAILS, SEE X-7262-J1 & J2.
- 2) STRENGTH WELD TUBE TO TUBESHEET. REMOVE OIL AND GREASE OR OTHER FOREIGN MATTER FROM TUBESHEET, TUBE-TO-TUBESHEET ENDS PRIOR TO WELDING OF HOLES & TUBE ENDS PRIOR TO WELDING OF TUBES. HELI-ARC WITH FILLER METAL. WELD EACH TUBE INDIVIDUALLY WITH TWO (2) OR MORE PASSES. WPS = SW-1. DYE CHECK TUBE-TO-TUBESHEET WELDS BEFORE AND AFTER TUBE ROLLING. TEST TUBE-TO-TUBESHEET WELDS WITH 25 PSIG AIR PRESSURE AND SOAP SOLUTION, PRIOR TO FINAL TUBE ROLLING.



REQUIRED AS SHOWN FOR ONE UNIT;
TWO-UNITS REQUIRED.

Shaw Stone & Webster, Inc.		PROJECT TITLE: GIANT S ZORB	
SSW 120653-P-12-04 (T110-03)		JOB No. 120653	
EQUIPMENT No. 1 56603-P-12-04 (T110-03)		ISSUE 1	
FOR INFORMATION	☐ ACCEPTED FOR CIVIL AND PIPING IFC		
ACCEPTED	☐ ACCEPTED AS CERTIFIED		
ACCEPTED AS NOTED	☐ REVISE AND RESUBMIT		
SIGNED			
DATE			

THE ACCEPTANCE OF THIS DATA BY SHAW STONE & WEBSTER DOES NOT RELIEVE THE CONTRACTOR OR SUPPLIER FROM THE OBLIGATIONS IMPOSED BY THE PURCHASER ORDER OR CONTRACT.



ASSEMBLY DETAIL

CERTIFIED AS-BUILT
D. DiCarlo 4/24/07

SERIAL NO.: X-7262-A/B
CUSTOMER: D-COK / GIANT INDUSTRIES
P. O. NO.: 56603-P-12-04
ITEM NO.: E-641 A/B
SERVICE: REACTOR FEED/EFFLUENT EXCHANGER
SHIP TO: GRAFTON, VA

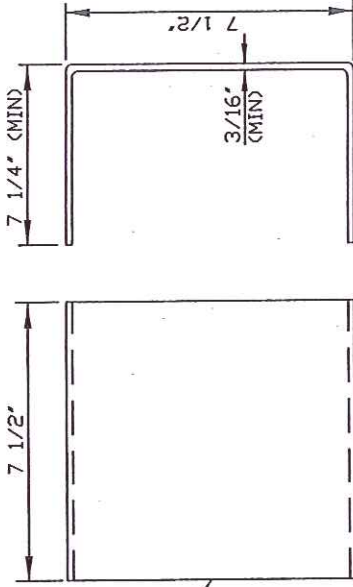
LONGITUDINAL BAFFLE DETAILS

OWN. BY		Don	
DATE		10/23/06	
CKD. BY		DiCarlo	
DWC. NO.		X-7262-H2	
REV.		1	



Energy Exchanger Co.
1844 No. Cornett Rd. - Tulsa, Okla. 74116

SHOP TO ASSIGN AT COMPLETION OF FABRICATION



NAME PLATE BRACKET DETAIL
2-REQUIRED

SERIAL NO.: X-7262-A/B
CUSTOMER: D-COK / GIANT INDUSTRIES
P. O. NO.: 56603-P-12-04
ITEM NO.: E-641 A/B
SERVICE: REACTOR FEED/EFFLUENT EXCHANGER
SHIP TO: GRAFTON, VA

Shaw Stone & Webster, Inc.		PROJECT TITLE: GIANT S ZORB
SSN: 120653-P-12-04	CT110-00	JOB NO: 120653
ISSUE:		
EQUIPMENT NO. 1	56603-P-12-04 CT110-00	
☐ FOR INFORMATION	☐ ACCEPTED FOR CIVIL AND PIPING IFC	
☐ ACCEPTED	☐ ACCEPTED AS CERTIFIED	
☐ ACCEPTED AS NOTED	☐ REVISE AND RESUBMIT	
SIGNED:		
DATE:		
THE ACCEPTANCE OF THIS DATA BY SHAW STONE & WEBSTER DOES NOT RELIEVE THE CONTRACTOR OR SUPPLIER FROM THE OBLIGATIONS IMPOSED BY THE PURCHASER ORDER OR CONTRACT.		

NAME PLATE DETAILS

DWN. BY	Dan
DATE	10/23/06
CKD. BY	DiCarlo
DWG. NO.	X-7262-L
REV.	1



CERTIFIED BY	
Energy Exchanger Company	
TULSA, OKLAHOMA	
MAWP SHELL	497 *
MAWP TUBE	625 *
MIN. DESIGN METAL TEMP.	0
SHELL TUBE	0
TEST P.S.I.G.	729
TEST P.S.I.G.	813
P.S.I.	497 *
P.S.I.	625 *
SERIAL NO.	①
P.O. NO.	56603-P-12-04
SERVICE	REACTOR FEED/EFFLUENT EXCHANGER
ITEM	②
SIZE	59-264
TYPE	AFU
* MAX. ALLOW. EXT. PRESS. = 15 PSIG @ 366°F.	
FIELD TEST PRESS.: SHELL = 647 PSIG ; TUBE = 813 PSIG	

NAME PLATE DETAIL
2-REQUIRED

NOTE
CLIP CORNERS AND SEAL WELD NAMEPLATE TO BRACKET.

CERTIFIED AS-BUILT
D.D. CARLO 4/24/07

NO.	DATE	REVISIONS
①	12/6/06	REV. PER EEC. Dan/DC