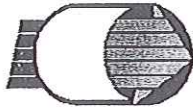


#105757

Energy Exchanger Company

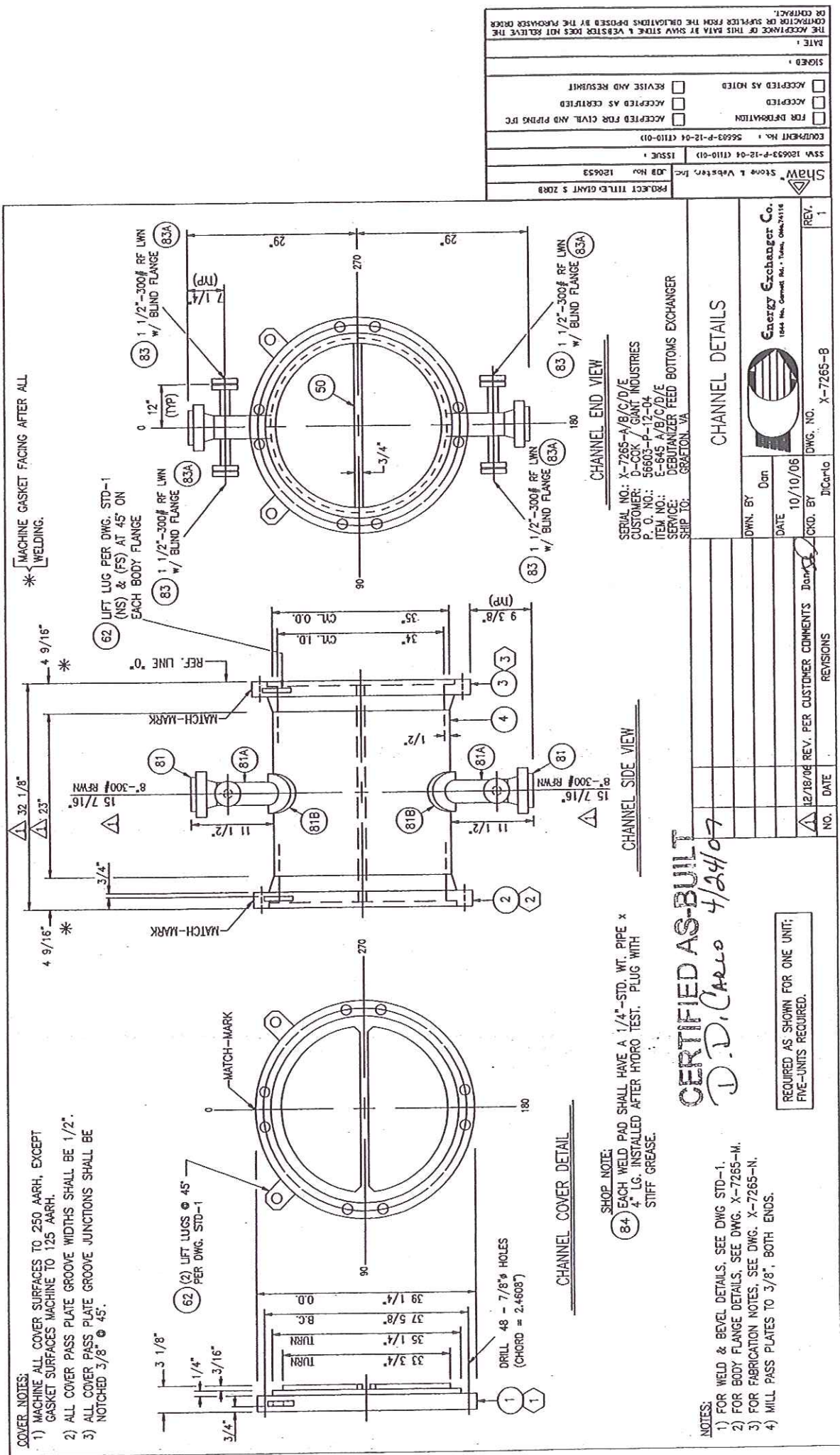
HEAT EXCHANGER SPECIFICATION SHEET

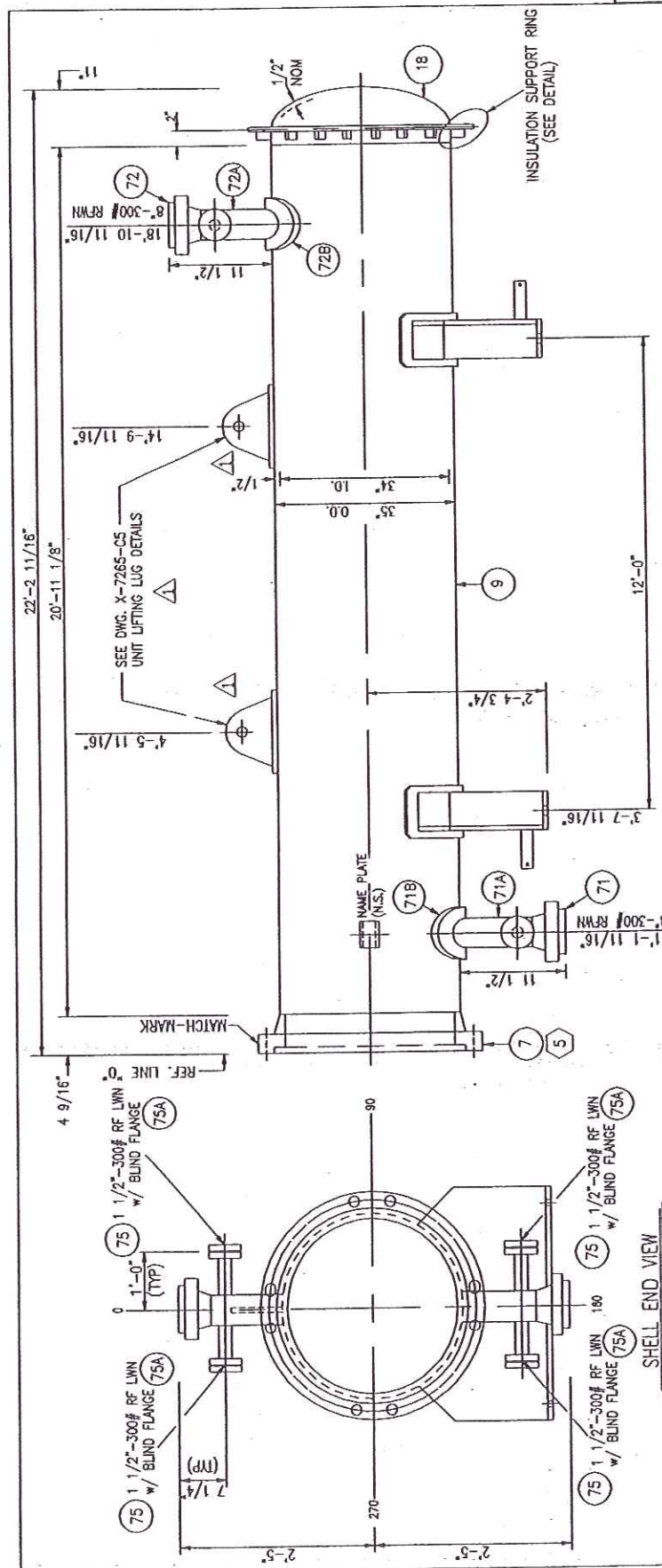


P.O. No.: 56603-P-12-04

REV. 0 AS PURCHASED

Customer	SHAW STONE & WEBSTER (GIANT)		Job No.: X-7265 "AS BUILT"	
Address	HOUSTON, TX		Rev.: 1	Date: 3/13/07
Plant Location	GRAFTON, VA		File:	06-6102
Service of Unit	DEBUTANIZER FEED/BOTTOMS EXCHANGER		Item: E-645 A/B/C/D/E	
Size	34-240	Type	AEU Horizontal	Connected In 1 Parallel 5 Series
Surf./Unit	Gross / ☒ Eff	14164.78 ft ² ; Shells/Unit	5	Surf./Shell Gross ☒ Eff. 2832.96 ft ²
PERFORMANCE OF ONE UNIT				
Fluid Allocation	Shell Side		Tube Side	
Fluid Name	DEBUTANIZER FEED		DEBUTANIZER BOTTOMS	
Fluid Quantity, Total	lb/hr	312999	297443	
Vapor (In/Out)			19071	
Liquid		312999	293928	297443
Steam				
Water				
Noncondensable				
Temperature (In/Out)	°F	121.	349.0	406. 170.
Density (Vapor/Liquid)	Lb/Ft ³	42.95	2.3600 34.11	31.47 41.97
Viscosity	cP	0.331	0.0130 0.124	0.10 0.284
Molecular Weight				
Molecular Weight, Noncondensable				
Specific Heat	Btu/lb-F	0.5160	0.5930 0.714	0.7960 0.5430
Thermal Conductivity	Btu/hr-ft-F	0.0660	0.0200 0.047	0.0440 0.0610
Latent Heat	Btu/lb			
Inlet Pressure	psia	291.7		269.7
Velocity	ft/sec			3.41
Pressure Drop, Allow./Calc.	psi	25.00 /	19.00	25.00 / 8.00
Fouling Resistance (Min.)	Hr-Ft ² -°F/Btu	0.002		0.002
Heat Exchanged	45260000	Btu/hr; M.T.D. (Corrected)		43.25 °F
Transfer Rate, Service	73.87	Btu/hr-ft ² -F; Clean		Btu/hr-ft ² -F
CONSTRUCTION OF ONE SHELL			Sketch (Bundle/Nozzle Orientation)	
Design/Test Pressure	psig	310/FV/408	300/FV/391	
Design Temperature (Max/Min)	°F	450/366/0	480/366/0	
No. Passes Per Shell		1	2	
Corrosion Allowance	inch	0.125	0.125	
Connections	In	1 - 8" 300RF	1 - 8" 300RF	
Size & Rating	Out	1 - 8" 300RF	1 - 8" 300RF	
	Intermediate	(2) 1 - 10" 300RF	1 - 8" 300RF	
Tube No.	365 U'S	OD 0.75 in; Thk.	☒ Min Avg 0.083 in; Length	20. ft; Pitch 1 in 90°
Tube Type	BARE	Material SA-179		
Shell	SA-516-70	☒ ID OD 34.	in ;Shell Cover SA-516-70	☒ Integ. ☐ Remov.
Channel or Bonnet	SA-516-70	Channel Cover SA-516-70 N ☒ Integ. ☒ Remov.		
Tubesheet-Stationary	SA-516-70 N	Tubesheet - Floating		
Floating Head Cover		Impingement Protection PLATE ON BUNDLE		
Baffles-Cross	16 - SA-516-70	Type V SEG	% Cut (☒ Dia. ☐ Area)	20. Spacing c/c 12.94 Inlet in
Baffles-Long		Seal Type		
Supports - Tube	SA-516-70	U-Bend YES	Type FULL	
Bypass Seal Arrangement		Tube-Tubesheet Joint ROLLED		
Expansion Joint		Type		
pv ² - Inlet Nozzle		Bundle Entrance Bundle Exit		
Gaskets - Shell Side	S.I. D.J.F.G.F	Tube Side S.I. D.J.F.G.F.		
	- Floating Head			
Code Requirements	ASME SECTION VIII, DIV. 1 CODE STAMP			TEMA Class R
Weight/Shell	19,000 lb. EACH	Filled With Water	27,550 lb. EACH	Bundle 11,100 lb. EACH
REMARKS				
(1) DELETED.				
(2) 10" OUTLET ON SHELL "D". 10" INLET AND OUTLET ON SHELL "E"				
(3) 5 ROW PARTIAL SUPPORT AT SHELL NOZZLE CENTERLINES				
(4) PROVIDE (2) 1-1/2" X 300# RFLWN ON EACH OF INLET AND OUTLET (TUBESIDE AND SHELLSIDE) NOZZLES OF EACH INDIVIDUAL SHELL (EXCHANGER).				
(5) TIE ROD SPACER SLEEVES SHALL BE SCH. 40 PIPE THICKNESS.				
(6) SHELLSIDE SHALL BE DESIGNED FOR HYDROGEN SERVICE.				





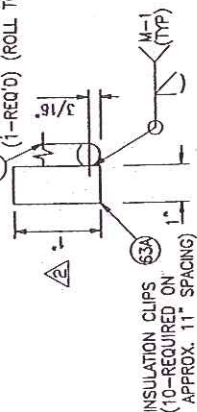
NOTES:

- 1) FOR WELD & BEVEL DETAILS, SEE DWG. STD-1.
- 2) ALL BOLT HOLES TO STRADDLE CENTERLINES.
- 3) FOR SUPPORT DETAILS, SEE DWG. X-7265-01.
- 4) FOR BODY FLANGE DETAILS, SEE DWG. X-7265-M.
- 5) FOR FABRICATION NOTES, SEE DWG. X-7265-N.

SHOP NOTE:

76. EACH WELD PAD SHALL HAVE A 1/4" -STD. WT. PIPE x 3 1/2" LG. INSTALLED AFTER HYDRO TEST. PLUG WITH STIFF GREASE

63 INSULATION SUPPORT RING Δ
 3/8" ϕ ROD x 9'-7 1/8" LG.
 (1-REQ'D) (ROLL TO 36 1/4" I.D.)



SHELL DETAILS

SHELL DETAILS					
			DWN. BY	Don	
☒	4/18/07	REV. PER CUSTOMER COMMENTS	Don	☒	
☒	4/27/06	REV. PER CUSTOMER COMMENTS	Don/DD		
	DATE	REVISIONS			



Energy Exchanger Co.
1844 The Gateway Pl., Tulsa, Okla 74118

DWG. NO.	X-7265-C2	REV.	2
CND. BY	JICarlo		

	Stone & Webster, Inc. 308 Hwy 120653 PROJECT TITLE: CLAY ST 208B
SSVA 120653-P-12-04 (1110-31) ISSUE 1	EQUIPMENT NO. 1 56503-P-12-04 (1110-31)
☐ FOR INFORMATION ☐ ACCEPTED ☐ ACCEPTED AS NOTED ☐ REVISE AND RESUBMIT	ACCEPTED FOR CIVIL AND PIPING PFC ACCEPTED AS CORRECTED ACCEPTED AND RESUBMIT
STATE 1	
THE ACCEPTANCE OF THIS DATA BY SHAW STONE & WEBSTER DOES NOT RELIEVE EITHER CONTRACTOR OR SUPPLIER FROM THE OBLIGATIONS IMPOSED BY THE PURCHASER EITHER OR CONTRACT.	

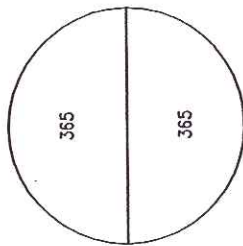
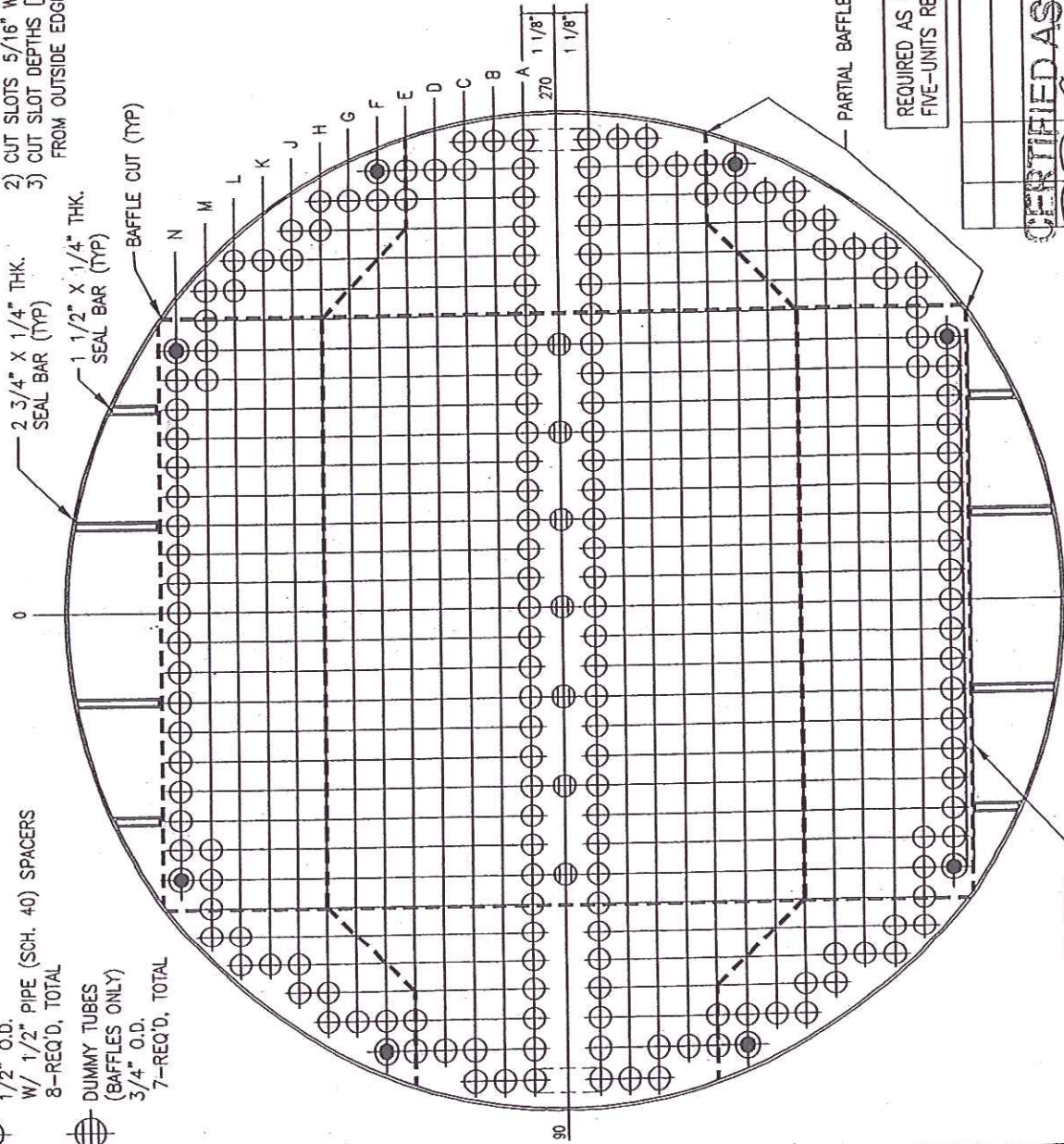
SEAL BAR NOTES:
 1) CUT SLOTS IN BAFFLES ONLY.
 2) CUT SLOTS 5/16" WIDE.
 3) CUT SLOT DEPTHS [SEAL BAR WIDTH + 1/16"]
 FROM OUTSIDE EDGE OF SLOT.

SEAL BAR NOTES:

- 1) CUT SLOTS IN BAFFLES ONLY.
- 2) CUT SLOTS 5/16" WIDE.
- 3) CUT SLOT DEPTHS [SEAL BAR WIDTH + 1/16"]
FROM OUTSIDE EDGE OF SLOT.

TIE RODS
 1/2" O.D.
 W/ 1/2" PIPE (SCH. 40) SPACERS
 8-REQ'D, TOTAL

DUMMY TUBES
 (BAFFLES ONLY)
 3/4" O.D.
 7-REQ'D, TOTAL



TUBE DISTRIBUTION

NOTES:

- 1) DRILL AND REAM TUBE HOLES IN TUBESHEET TO 0.760" + 0.002" - 0.004" DIA. FOR 365 - 3/4" O.D. U-TUBES. TOTAL HOLES = 730.
- 2) TUBE PITCH = 1" SQUARE.
- 3) NUMBER OF PASSES = 2.
- 4) SEE DRAWING X-7265-E FOR TUBE GROOVING DETAILS.
- 5) BAFFLE O.D. = 33 13/16".
- 6) O.T.L. = 33 1/2".

SERIAL NO.: X-7265-A, B, C, D, E
 CUSTOMER: D-COK / GIANT INDUSTRIES
 P. O. NO.: 56603-P-12-04
 ITEM NO.: E-645 A, B, C, D, E
 SERVICE: DEBUTANIZER FEED BOTTOMS EXCHANGER
 SHIP TO: GRAFTON, VA

		PROJECT TITLE: GIANT S ZORB
Stone & Webster, Inc. JOB No. 120653		
SSN: 120653-P-12-04 (T110-01)		ISSUE: 1
EQUIPMENT No. 1 56603-P-12-04 (T110-01)		
☐ FOR INFORMATION ☐ ACCEPTED	☐ ACCEPTED FOR CIVIL AND PIPING IFC ☐ ACCEPTED AS CERTIFIED	☐ 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 UNDER OR CONTRACT.		
TUBE LAYOUT		
DWN. BY Dove		
DATE 9/11/06	1044 No. Cornett Rd., Tulsa, Okla 74116	
CKD. BY D. CARLO	DWG. NO. X-7265-F	REV. 0

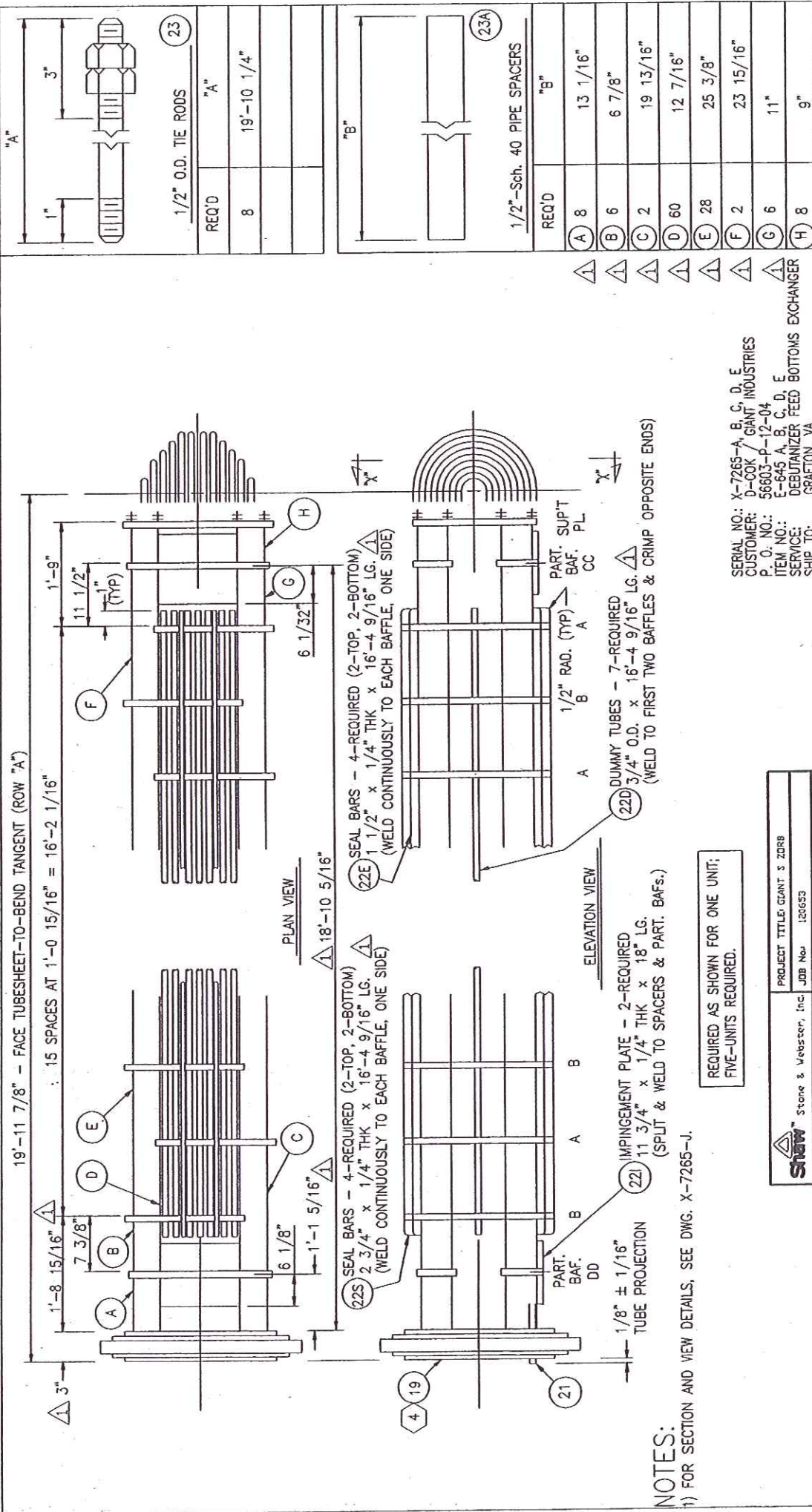
REQUIRED AS SHOWN FOR ONE UNIT;
 FIVE-UNITS REQUIRED.

PARTIAL BAFFLE CUTS (TYP)

CERTIFIED AS BUILT
 D. D. Carlo
 H. H. H. H.

180

VIEW LOOKING AT SHELL SIDE OF NO. #4 TUBESHEET



NOTES:

1) FOR SECTION AND VIEW DETAILS, SEE DWG. X-7265-J.

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

SERIAL NO.: X-7265-A, B, C, D, E
 CUSTOMER: D-COK / GIANT INDUSTRIES
 P. O. NO.: 56603-P-12-04
 ITEM NO.: E-645 A, B, C, D, E
 SERVICE: DEBUTANIZER FEED BOTTOMS EXCHANGER
 SHIP TO: GRAFTON, VA

BUNDLE DETAILS

		Energy Exchanger Co. 1544 No. Cornett Rd. • Tulsa, Okla. 74116
DWN. BY Don	DATE 10/10/06	REV. 1
DCD. BY J. Carlo	DWG. NO. X-7265-H	

Shaw Stone & Webster, Inc. PROJECT TITLE: GIANT S ZORB	
EQUIPMENT No. 1 56603-P-12-04 (T110-01)	JOB No. 120653
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.	

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 D-COK LLC, 3657 BRIAR PARK DRIVE, HOUSTON, TEXAS 77042-5205
(Name and address of Purchaser)

3. Location of installation GIANT INDUSTRIES, GRAFTON, VIRGINIA
(Name and address)

4. Type: HORIZONTAL HEAT EXCHANGER X-7265-B X-7265-A2 REV. 3 5258 2007
(Horiz., vert., or sphere) (Tank, separator, jkt. vessel, heat exh., etc.) (Mfg's serial No.) (CRN) (Drawing No.) (Nat'l. Bd. No.) (Year built)

5. ASME Code, Section VIII, Div. 1 2004 EDITION, 2005 ADDENDA 2519
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 multi-chamber vessels.

6. Shell (a) No. of course(s): 3 (b) Overall length (ft & in.): 20'-11 1/8"

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	34" I.D.	8'-0"	SA-516-70	1/2"	1/8"	1		SPOT		.85	1		SPOT		.85	---	---
1	34" I.D.	4'-11 1/8"	SA-516-70	1/2"	1/8"	1		SPOT		.85	1		SPOT		.85	---	---

7. Heads: (a) SA-516-70 (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
(a)	END	7/16"	1/8"			2:1					X	S	NONE		1.0
(b)															

If removable, bolts used (describe other fastening)

(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 314 15 psi at max. temp. 450 366 °F Min. design metal temp. 0 °F at 314 psi.
(internal) (external) (internal) (external)

10. Impact test NO; SHELL SIDE DESIGNED PER UCS-66(a)(c)(g) & UG-20(f) at test temperature of --- °F
(Indicate yes or no and the component(s) impact tested)

11. Hydro., ~~shell~~, ~~head~~ test press. 408 PSIG Proof test ---

Items 12 and 13 to be completed for tube sections.

12. Tubesheet: SA-516-70N 34 3/4 3" 5/16 BOLTED
Stationary (Mat'l Spec. No.) Dia., in. (subject to press.) Nom. thk., in. Corr. Allow., in. Attachment (welded or bolted)

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

13. Tubes: SA-179 3/4 .083" (MIN) 365 U
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): 1 (b) Overall length (ft & in.): 1'-11"

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	34" I.D.	1'-11"	SA-516-70	1/2"	1/8"	1	SPOT	.85	1	SPOT	.85	---	---

15. Heads: (a) SA-516-70N (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
(a)	END	3 1/8"	3/16"						34 3/4"						
(b)															

If removable, bolts used (describe other fastening)

(a) SA-193-B7, 3/4", 48; CHAN-TO-SHELL: SA-193-B7, 3/4", 48

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

16. MAWP 301 15 psi at max. temp. 480 366 °F Min. design metal temp. 0 °F at 301 psi.
(internal) (external) (internal) (external)

17. Impact test NO; CHANNEL SIDE DESIGNED PER UCS-66(a)(c)(g) & UG-20(I) at test temperature of ... °F

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

18. Hydro., ~~pressure~~, ~~test~~ press. 391 PSIG 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	8"-300#	RFLWN	SA-106-B	SA-105	.500"	1/8"	SA-516-70	WELDED	WELDED	CHANNEL
T.W./P.G.	2/2	1 1/2" 300#	RFLWN	SA-105	...	.630"	1/8"	WELD	WELDED	...	CH. NOZS.
INLET/OUTLET	1/1	8"-300#	RFLWN	SA-106-B	SA-105	.500"	1/8"	SA-516-70	WELDED	WELDED	SHELL
T.W./P.G.	2/2	1 1/2" 300#	RFLWN	SA-105	...	.630"	1/8"	WELD	WELDED	...	SH. NOZS.

20. Supports: Skirt NO Lugs ... Legs ... Others (2) SADDLES Attached SHELL; WELDED
(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)

22. Remarks: SERVICE: DEBUTANIZER FEED BOTTOMS EXCHANGER, P.O. NO: 56603-P-12-04, ITEM NO: E-645 B; SIZE: 34-240, TYPE: AEU

TUBES DESIGNED W/O" C.A. PRESSURE RELIEF DEVICES PROVIDED BY OTHERS.

LINES 6-11 INCLUDE (1) 39 1/4 O.D. x 34 I.D. x 4 9/16" THK., SA-105N, RING

LINES 14-18 INCLUDE (2) 39 1/4" O.D. x 34" I.D. x 4 9/16" THK., SA-105N, RING;

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 No. 12370 Expires 9/27/2007

Date 3-8-07 Name ENERGY EXCHANGER COMPANY Signed Edgar O. Over
(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 State or Province of OKLAHOMA and employed by OneBeacon America Insurance Company of BOSTON, MASS. have inspected the pressure vessel described in this Manufacturer's Data Report on 3-8-07, 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 3-8-07 Signed [Signature] Commissions N.B.# 11921 BA OKLA.# 823
(Authorized Inspector) (Nat'l Board incl. endorsement, 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 ...

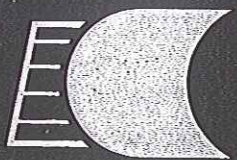
Date ... Name ... Signed ...
(Assembler) (Representative)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and 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 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 a loss of any kind arising from or connected with this inspection.

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

13 5258



CERTIFIED BY
Energy Exchanger Company
TULSA, OKLAHOMA



MAWP SHELL	314 *	P.S.I.G. @	450 *	OF	408	TEST P.S.I.G.
MAWP TUBE	301 *	P.S.I.G. @	480 *	OF	391	TEST P.S.I.G.
MIN. DESIGN METAL TEMP.	SHELL		0	OF @	314 *	P.S.I.G.
	TUBE		0	OF @	301 *	P.S.I.G.
SERIAL NO.	X-7265 B				YEAR BUILT	2007
P.O. NO.	56603-P-12-04					
SERVICE	DEBUTANIZER FEED BOTTOMS EXCHANGER					

ITEM	E-645 B	SIZE	34-240	TYPE	AEU
------	---------	------	--------	------	-----

* MAX. ALLOW. EXT. PRESS. = 15 PSIG @ 366° F.

550
Jack Campbell