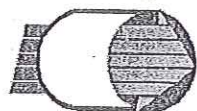


105752

Energy Exchanger Company

HEAT EXCHANGER SPECIFICATION SHEET



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

REV. 0 AS PURCHASED

0	1	Customer		SHAW STONE & WEBSTER (GIANT)		Job No.: X-7263/X-7264 "AS BUILT"	
0	2	Address		HOUSTON, TX		Rev.: 1	Date: 3/13/07
1	3	Plant Location		GRAFTON, VA		File:	06-6102
1	4	Service of Unit		REACTOR FEED/EFFLUENT EXCHANGER		Item: E-641 C/D/E/F	
	5	Size	59-264	Type	AFU	Horizontal	Connected In 1 Parallel 4 Series
	6	Surf./Unit	Gross / ☒ Eff	25732. ft ² /Unit	4	Surf./Shell	Gross ☒ Eff. 6296/6570 ft ²
	7	PERFORMANCE OF ONE UNIT					
	8	Fluid Allocation		Shell Side		Tube Side	
	9	Fluid Name		REACTOR EFFLUENT		REACTOR FEED	
	10	Fluid Quantity, Total		lb/hr			
	11	Vapor (In/Out)					
	12	Liquid					
	13	Steam					
	14	Water					
	15	Noncondensable					
	16	Temperature (In/Out)		°F			
	17	Density (Vapor/Liquid)		Lb/Ft ³			
	18	Viscosity		cP			
	19	Molecular Weight					
	20	Molecular Weight, Noncondensable					
	21	Specific Heat		Btu/lb-F			
	22	Thermal Conductivity		Btu/hr-ft-F			
	23	Latent Heat		Btu/lb			
	24	Inlet Pressure		psia			
	25	Velocity		ft/sec			
	26	Pressure Drop, Allow./Calc.		psi			
	27	Fouling Resistance (Min.)		Hr-Ft ² -°F/Btu			
	28	Heat Exchanged		Btu/hr; M.T.D. (Corrected)		°F	
	29	Transfer Rate, Service		Btu/hr-ft ² -F; Clean		Btu/hr-ft ² -F	
	30	CONSTRUCTION OF ONE SHELL					
	31	Design/Test Pressure		psig		Sketch (Bundle/Nozzle Orientation)	
	32	Design Temperature (Max/Min)		°F			
	33	No. Passes Per Shell		2			
	34	Corrosion Allowance		inch			
	35	Connections	In	1 - 16"	600RF	1 - 16"	600RF
	36	Size & Rating	Out	1 - 16"	600RF	1 - 16"	600RF
	37		Intermediate	1 - 16"	600RF	1 - 16"	600RF
	38	Tube No. 752 U'S (1)		OD .75 in; Thk. ☒ Min	Avg 0.065 in; Length 22. ft; Pitch 1 in 90°		
	39	Tube Type		PLAIN			
	40	Shell		SA-387-11CL2 ☒ ID ☒ OD 59 in ;Shell Cover SA-387-11CL2 ☒ Integ. ☒ Remov.			
	41	Channel or Bonnet		SA-387-11CL2 W/321 OR 347SS OVERLAY Channel Cover SA-182-F11CL2 W/321 OR 347SS OV ☒ Integ. ☒ Remov.			
	42	Tubesheet-Stationary		SA-182-F11CL2 W/321 OR 347SS OVE Tubesheet - Floating			
	43	Floating Head Cover		Impingement Protection Circular Plate ON BUNDLE			
	44	Baffles-Cross	4 - 321SS	Type V-N.T.I.W.	% Cut (☒ Dia. ☒ Area)	20.6	Spacing c/c 50.7 Inlet in
	45	Baffles-Long	1.25 CR -0.5 MO	Seal Type LAMIFLEX			
	46	Supports - Tube	321SS	U-Bend YES	Type FULL		
	47	Bypass Seal Arrangement		Tube-Tubesheet Joint		EXPANDED AND WELDED	
	48	Expansion Joint		Type			
	49	pv ² - Inlet Nozzle		Bundle Entrance		Bundle Exit	
	50	Gaskets - Shell Side	SS DJNAF	Tube Side	SS DJNAF		
	51	- Floating Head					
	52	Code Requirements		ASME SECTION VIII, DIV. 1 CODE STAMP		TEMA Class R	
	53	Weight/Shell	76,700 lb. EACH	Filled With Water	109,250 lb. EACH	Bundle	33,250 lb. EACH
	54	REMARKS					
	55	(1) SHELLS "E" & "F", "C" & "D" HAVE 785U'S					
	56	(2) TUBE SIDE INLET /OUTLET NOZZLES FOR SHELL "C" 12"/16"					
	57	(3) TWO INTERMEDIATE SUPPORTS PER BAFFLE SPACE (4) FOUR ROW PARTIAL SUPPORTS AT SHELL NOZZLE CENTERLINES					
	58	(4) PROVIDE (2) 1-1/2" X 600# RFLWN ON EACH OF INLET AND OUTLET (TUBESIDE AND SHELLSIDE) NOZZLES OF EACH INDIVIDUAL SHELL (EXCHANGER).					
	59	(5) TIE ROD SPACER SLEEVES SHALL BE SCH. 40 PIPE THICKNESS.					
	60						
	61						
	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

Customer SHAW STONE & WEBSTER (GIANT) Job No.: X-7262/X-7263/X-7264 "AS BUILT"

Address HOUSTON, TX Rev.: 1 Date: 3/13/07

Plant Location GRAFTON, VA File: 06-6102

Service of Unit REACTOR FEED/EFFLUENT EXCHANGER Item: E-641 A/B/C/D/E/F

Size 59-264 Type AFU Horizontal

Surf./Unit Gross / ☒ Eff 38872. ft²; Shells/Unit 6 Surf./Shell Gross ☒ Eff. 6296/6570 ft² Connected In 1 Parallel 6 Series

PERFORMANCE OF ONE UNIT

Fluid Allocation	Shell Side				Tube Side			
Fluid Name	REACTOR EFFLUENT				REACTOR FEED			
Fluid Quantity, Total lb/hr	319572				317508			
Vapor (In/Out)	319572				317508			
Liquid	25693				4682			
Steam	293879				312826			
Water								
Noncondensable								
Temperature (In/Out) °F	799.				108.			
Density (Vapor/Liquid) Lb/Ft ³	2.0700				2.7600			
Viscosity cP	0.0220				0.0200			
Molecular Weight								
Molecular Weight, Noncondensable								
Specific Heat Btu/lb-F	0.7490				0.7170			
Thermal Conductivity Btu/hr-ft-F	0.0380				0.0340			
Latent Heat Btu/lb								
Inlet Pressure psia	409.7				498.7			
Velocity ft/sec					9.68			
Pressure Drop, Allow./Calc. psi	25.00				13.00			
Fouling Resistance (Min.) Hr-Ft ² -°F/Btu	0.002				0.005			

Heat Exchanged 148230000 Btu/hr; M.T.D. (Corrected) 80.73 °F

Transfer Rate, Service 47.23 Btu/hr-ft²-F; Clean Btu/hr-ft²-F

CONSTRUCTION OF ONE SHELL

		Shell Side	Tube Side	Sketch (Bundle/Nozzle Orientation)	
Design/Test Pressure	psig				
Design Temperature (Max/Min)	°F				
No. Passes Per Shell					
Corrosion Allowance	inch				
Connections	In				
Size & Rating	Out				
	Intermediate				

Tube No. OD in; Thk. Min Avg in; Length ft; Pitch in

Tube Type Material

Shell ID OD in ; Shell Cover Integ. Remov.

Channel or Bonnet Channel Cover Integ. Remov.

Tubesheet-Stationary Tubesheet - Floating

Floating Head Cover Impingement Protection

Baffles-Cross Type % Cut (Dia. Area) Spacing c/c Inlet in

Baffles-Long Seal Type

Supports - Tube U-Bend Type

Bypass Seal Arrangement Tube-Tubesheet Joint

Expansion Joint Type

pv² - Inlet Nozzle Bundle Entrance Bundle Exit

Gaskets - Shell Side Tube Side

- Floating Head

Code Requirements TEMA Class

Weight/Shell Filled With Water Bundle

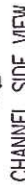
REMARKS

(1) OVERALL PERFORMANCE SHEET FOR SIX EXCHANGERS IN SERIES. SHELLS "E" & "F" HAVE 752U'S TO ALLOW ROOM FOR DERESONATING BAFFLES.

PLACE DERESONATING BAFFLES IN ALL BAFFLE SPACES BUT INLET AND OUTLET JUST ABOVE AND BELOW THE CENTER OF EACH HALF.

(2) DESIGN SHELLSIDE AND TUBESIDE TO BE HYDROGEN SERVICE.

- 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 JUNCTIONS SHALL BE NOTCHED 3/8" @ 45°.



66 EACH SUPPORT PAD SHALL HAVE A 1/4" -STD. WT. PIPE x 4" LG. INSTALLED AFTER HYDRO TEST. PLUG ENDS WITH STIFF GREASE.

- 1) FOR WELD & BEVEL DETAILS, SEE DWG. STD-1.
- 2) FOR BODY FLANGE DETAILS, SEE DWG. X-7263-M.
- 3) FOR FABRICATION NOTES, SEE DWG. X-7263-N.
- 4) MILL PASS PLATES TO 3/8", BOTH ENDS.
- 5) FOR OVERLAY DETAILS, SEE DWG. X-7263-B3.

THE SOUTHERN

BOTTOM CHANNEL DETAILS



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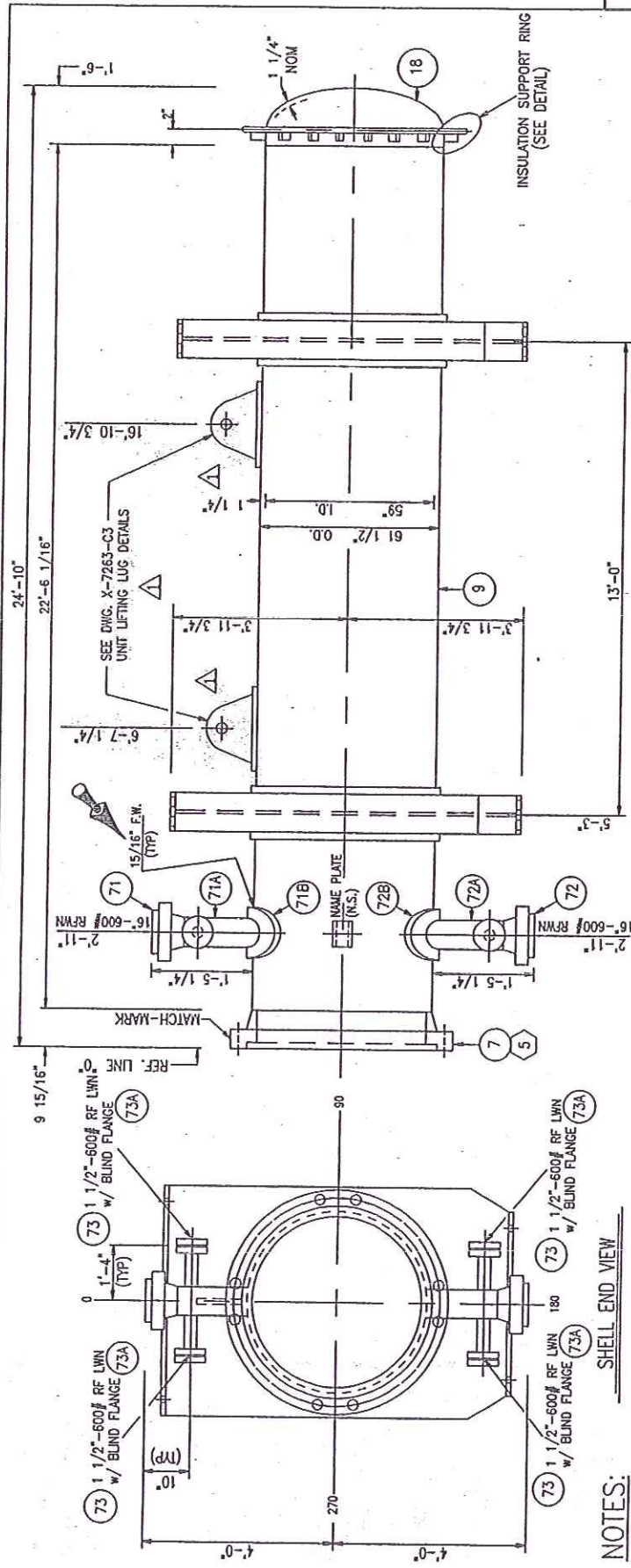
REQUIRED AS SHOWN FOR ONE UNIT:
ONE-UNIT REQUIRED.

NO.	DATE	REVISIONS	CKD. BY	DWG. NO.	REV.
				X-7253-B2	1

		PROJECT TITLE: GRANT 5 ZONE JOB NO: 120653	
SSN 120653-P-12-04 (1110-01) ISSUE:		EQUIPMENT NO.: 56503-P-12-04 (1110-01)	
☐ FOR IDENTIFICATION	☐ ACCEPTED AS NOTED	☐ REVISE AND RESUBMIT	☐ ACCEPTED FOR CIVIL AND PAVING P.C.
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.			

#257501

PROJECT TITLE: GIANT S 20R3		JOB NO. 120653	ISSUE 1	SSW 120653-P-12-04 (1110-01)	EQUIPMENT NO. 56603-P-12-04 (1110-01)	FOR PERMANENT RECORD	ACCEPTED AS NOTED	REVISIT AND RESUBMIT	SIGNED 1	DATE 1
THE ACCEPTANCE OF THIS DATA BY SHAW STEEL & WEBSTER DOES NOT RELIEVE THE CONTRACTOR OR SUPPLIER FROM THE OBLIGATIONS IMPOSED BY THE PURCHASER ORDER OR CONTRACT.										



SHELL SIDE VIEW

SHOP NOTE:
 67 EACH WELD PAD SHALL HAVE A 1/4"-STD. WT. PIPE x 5' LG. INSTALLED AFTER HYDRO TEST. PLUG END WITH STIFF GREASE.

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

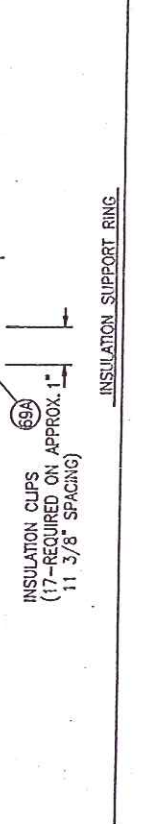
SERIAL NO.: X-7263-B
 CUSTOMER: D-COK / GIANT INDUSTRIES
 P. O. NO.: 56603-P-12-04
 ITEM NO.: E-641 D
 SERVICE: REACTOR FEED/EFFLUENT EXCHANGER
 SHIP TO: GRAFTON, VA

SHELL DETAILS

OWN. BY	Don
DATE	10/25/06
REV. BY	DiCarlo
DWG. NO.	X-7263-C2

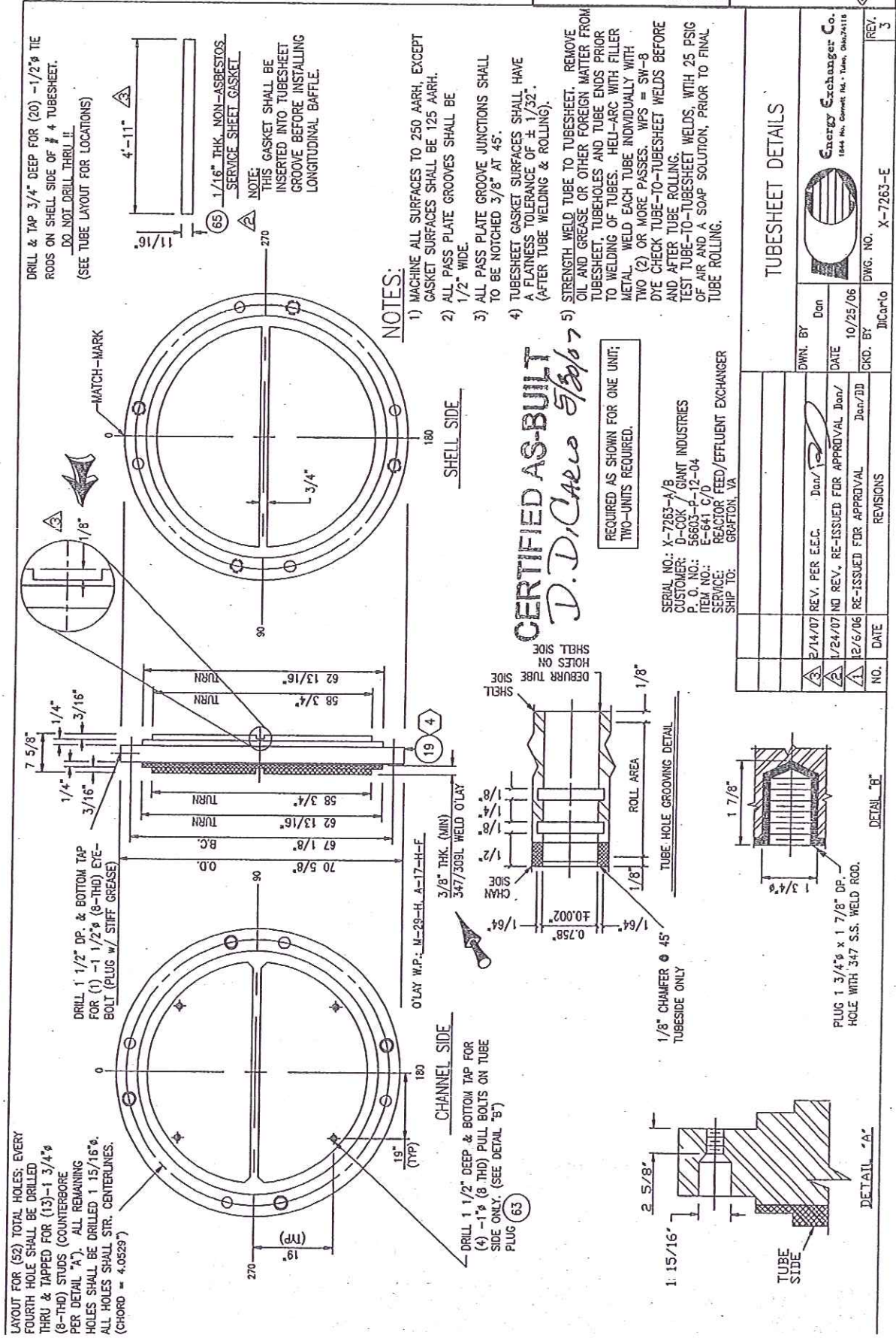
NO.	DATE	REVISIONS
1	12/21/06	REV. PER CUSTOMER COMMENTS

CERTIFIED AS-BUILT

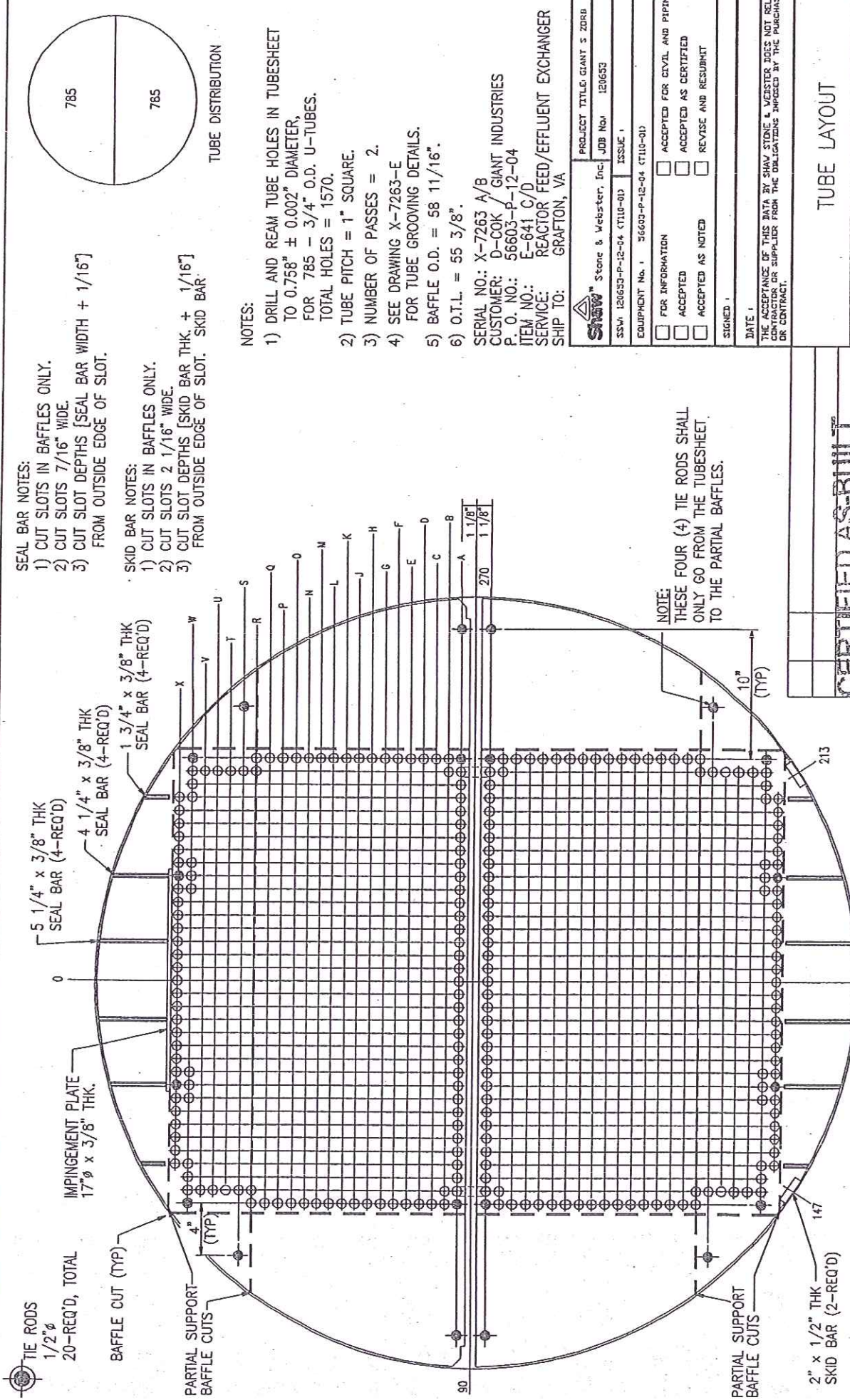


- NOTES:
- 1) FOR WELD & BEVEL DETAILS, SEE DWG. STD-1.
 - 2) ALL BOLT HOLES TO STRADDLE CENTERLINES.
 - 3) FOR SUPPORT DETAILS, SEE DWG. X-7263-02.
 - 4) FOR BODY FLANGE DETAILS, SEE DWG. X-7263-M.
 - 5) FOR FABRICATION NOTES, SEE DWG. X-7263-N.

		Shaw's Stone & Webster, Inc.		JOB No 120653	
PROJECT TITLE: GWT 3 2028		SSN: 120653-p-12-04 (1110-01) ISSUE: 1			
EQUIPMENT No.: 56693-p-12-04 (1110-01)		☐ FOR INFORMATION ☐ ACCEPTED FOR CIVIL AND PIPING DFC ☐ ACCEPTED AS CERTIFIED ☐ REVISE AND RESUBMIT			
STORED:					
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.					



105752



- 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. SKID BAR.

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-7263-E FOR TUBE GROOVING DETAILS.
 - 5) BAFFLE O.D. = 58 11/16".
 - 6) O.T.L. = 55 3/8".
- SERIAL NO.: X-7263 A/B
CUSTOMER: D-COK / GIANT INDUSTRIES
P.O. NO.: 56603-P-12-04
ITEM NO.: E-641 C/D
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.

2" x 1/2" THK
SKID BAR (2-REQ'D)

TUBE LAYOUT

CERTIFIED AS-BUILT

DD Chao 5/8/04

VIEW LOOKING AT SHELL SIDE OF NO. 4 TUBESHEET

PROJECT TITLE: GIANT S ZORB	
SSW: 120653-P-12-04 (T110-01)	JOB No: 120653
EQUIPMENT No: 1 36603-P-12-04 (T110-01)	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.	
TUBE LAYOUT	
OWN. BY: Don	REV. 1
DATE: 10/25/06	
CHKD. BY: DiCarlo	
DWG. NO. X-7263-F	
Energy Exchanger Co. 1544 N. Cornett Rd., Tulsa, OK 74116	

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