

NOTES:
 1. ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES.
 2. WATER TO BE FLOWING PRIOR TO INJECTION OF STEAM.

ITEM NO.	QTY.	DESCRIPTION	MATL.	SPECIFICATIONS	DNV NO.	PAINT NO.
8	1	SHIPPING PLUG 1.50" NPT. SIZE	ELASTIC			4094-1S-0112-00
7	3	SHIPPING PLUG 1" NPT. SIZE	ELASTIC			4094-01-0112-00
6	6	HEX NUT 3/8" - 16 T.P.I.	STEEL			4028-27-0103-00
5	6	CAPSCREW 3/8" - 16 T.P.I. X 1 3/4" LG.	STEEL			4024-27-1401-00
4	1	BASKET	NON-ASS			4014-06-0101-04
3	2	CRADLE	CAST IRON	SA-278-CL35	A	3051-06-319-060
2	1	BONNET (IN/OUT)	CAST IRON	SA-278-CL35	A	3043-05-307-000
1	1	CORE ASSEMBLY	CAST IRON	SA-278-CL35	A	32002E5
					B	2503-05-036-033

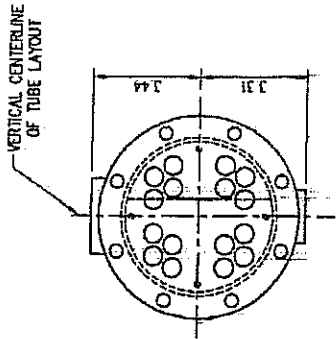
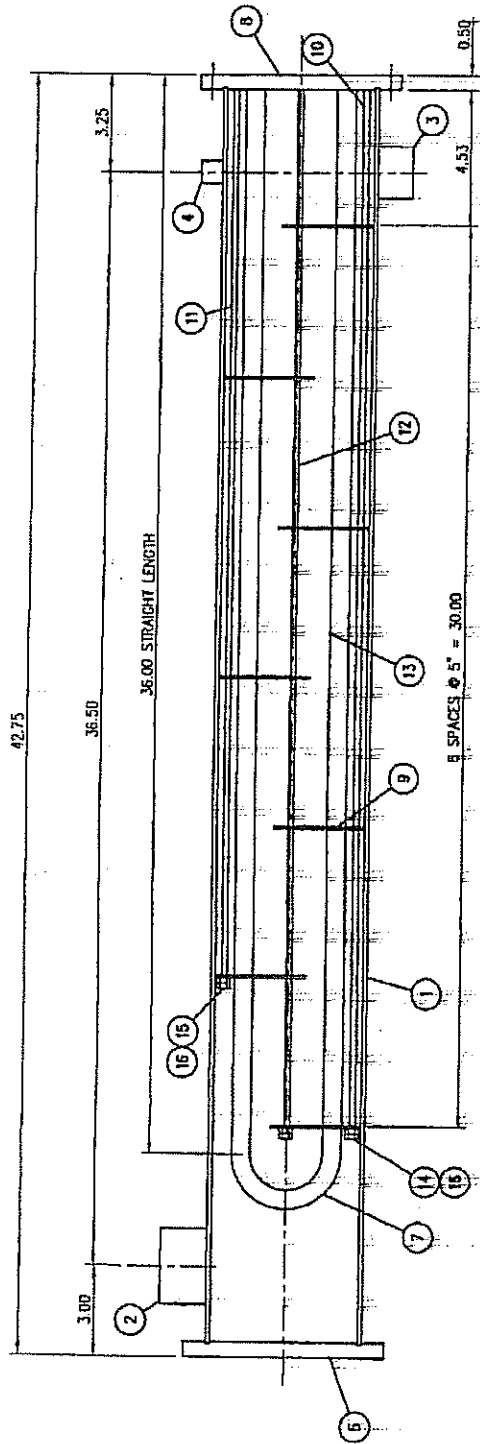
DIMENSIONS & DATA CERTIFIED FOR		DESIGN DATA	SHELL	TUBE
CUST. ORDER:	5025983-101	DESIGN PRESS	300	150
BASCO ORDER:	5025983-101	TEST PRESS	300	150
BY:	5/28/02	DES TEMP	300	300
		CODE:	COMMERCIAL STANDARD	

REV	DATE	BY	REVISION	NO.
0	5-22-02			1

SIZE	DRAWING NUMBER	SCALE
B	1525-05-036-000	30

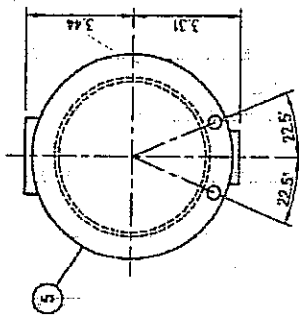
API BASCO
BUFFALO, NY

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BAFFLES SHOWN ROTATED 90°

8 SPACES @ 5" = 30.00



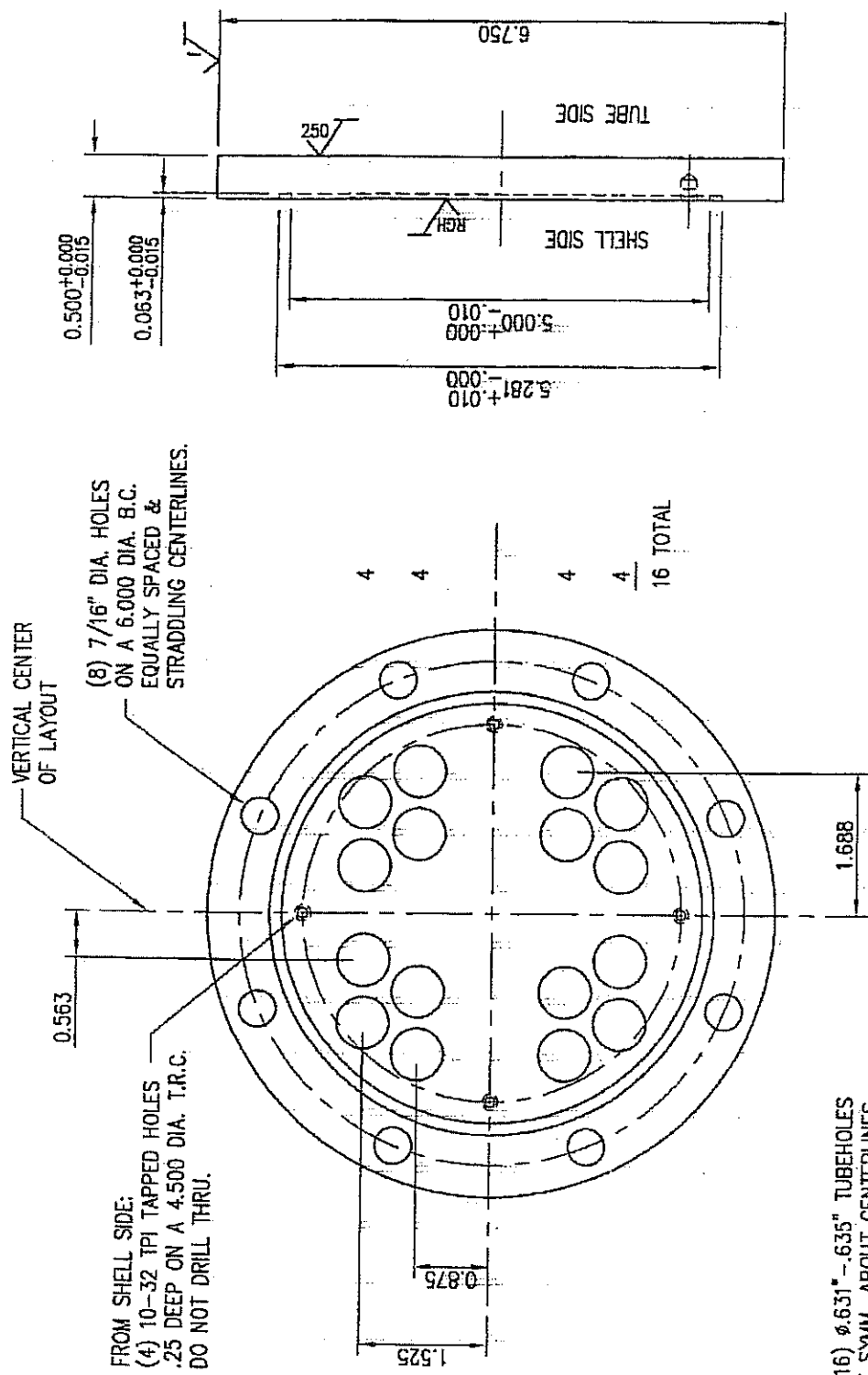
- NOTES:
1. TOLERANCES ARE PER TEMA STANDARDS.
 2. ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES.
 3. BOLT HOLES OF ITEM 5 LOCATED AS SHOWN.

ITEM NO.	QTY	DESCRIPTION	MATL.	SPECIFICATIONS	DWG. NO.	PART NO.
16	8	HEX NUT, 3/16" - 410 - 32IFI	STEEL			4026-17-0101-00
15	1	THEROD, 3/16" OD, 30.50" LG, TIE 1/2", TIE 1 1/2"	STEEL			508-03-0205-000
14	3	THEROD, 3/16" OD, 35.50" LG, TIE 1/2", TIE 1 1/2"	STEEL			508-03-0205-000
13	6	SPACER, 5/16" OD, 24 BWC, 0.94" LG	304SS			501-05-2403-000
12	12	SPACER, 5/16" OD, 24 BWC, 4.94" LG	304SS			501-05-2403-000
11	1	SPACER, 5/16" OD, 24 BWC, 9.50" LG	304SS			501-05-2403-000
10	3	SPACER, 5/16" OD, 24 BWC, 4.50" LG	304SS			501-05-2403-000
9	7	BAFFLE, 4.992" DIA, x 1/16" THK FIN DIMS, 45R VERT CUT	STEEL			3016-06-719-005
8	1	TUBESHEET 6 3/4" DIA, x 1/2" THK, FIN. DIMS.	STEEL	SA16		3010-06-505-000
7	1	U-TUBE SET, 5/8" OD, 16 BWC, 35.00" STR. LGTH.	ADM	SB-111-443		4069-10-0519-01
6	1	SHELL COVER 6 3/4" DIA, x 1/2" THK, FIN DIMS.	STEEL	SA516-70		3021-06-205-000
5	4	HALF CPLG, 1/4" NPT SIZE	STEEL	SA-513		4009-92-9109-00
4	1	HALF CPLG, 1" NPT SIZE	STEEL	SA-513		3050-04-709-000
3	2	HALF CPLG, 1-1/2" NPT SIZE	STEEL	SA-513		3050-08-709-001
2	1	PIPE, 5.25" OD, .120" WALL, x 41.88" LG	STEEL	SA513		523-11-5018-04188

CORE ASSEMBLY
SIZE: 05036

API Basco
BUFFALO, NY

DR: 30	SCALE: 3/8	SIZE: B	SIZE: B
DATE: 5-22-02	DWG. NO: 5-22-02	DATE: 5-22-02	DRAWING NUMBER: 2503-05-036-033



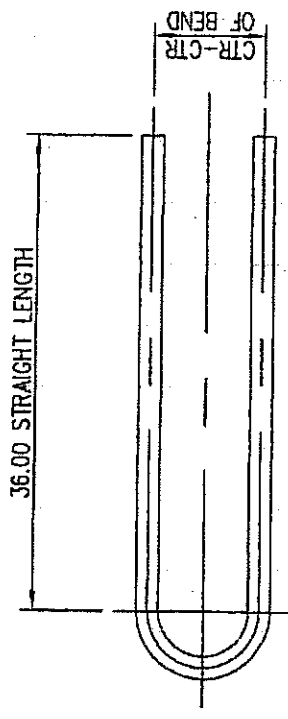
DRILL (16) ϕ 6.31" - .635" TUBEHOLES LAYOUT SYMM. ABOUT CENTERLINES CHAMFER SLIGHTLY SHELL SIDE T-05-0016-04-750-02

OLD P/N 0415T34F5

ITEM NO.	QTY	DESCRIPTION	STEEL	SA-36	SPECIFICATIONS	DWG SIZE	DWG NO.	PART NO.
1	1	CIRCLE, 1/2" TK. x 6.75" DIA.						
5								
4		5" TUBESHEET, TYPE 500						
3		(16) 5/8" ON 3/4" TRI						
2								
1								
NO.		REVISION	BY	DATE	FO	CRD	SCALE	DRAWING NUMBER
				5-21-02		30	1/2	A 3010-06-505-000
								REV
								0

API Basco
BUFFALO, NY

ROW No.	QTY REQ'D	CTR/CTR LENGTH	TOTAL LENGTH BEFORE BEND
1	4	1.750	74.750
2	4	3.063	76.875
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MATERIAL:
 5/8" O.D. x 18 B.W.G. ADMIRALTY
 SB-111-443

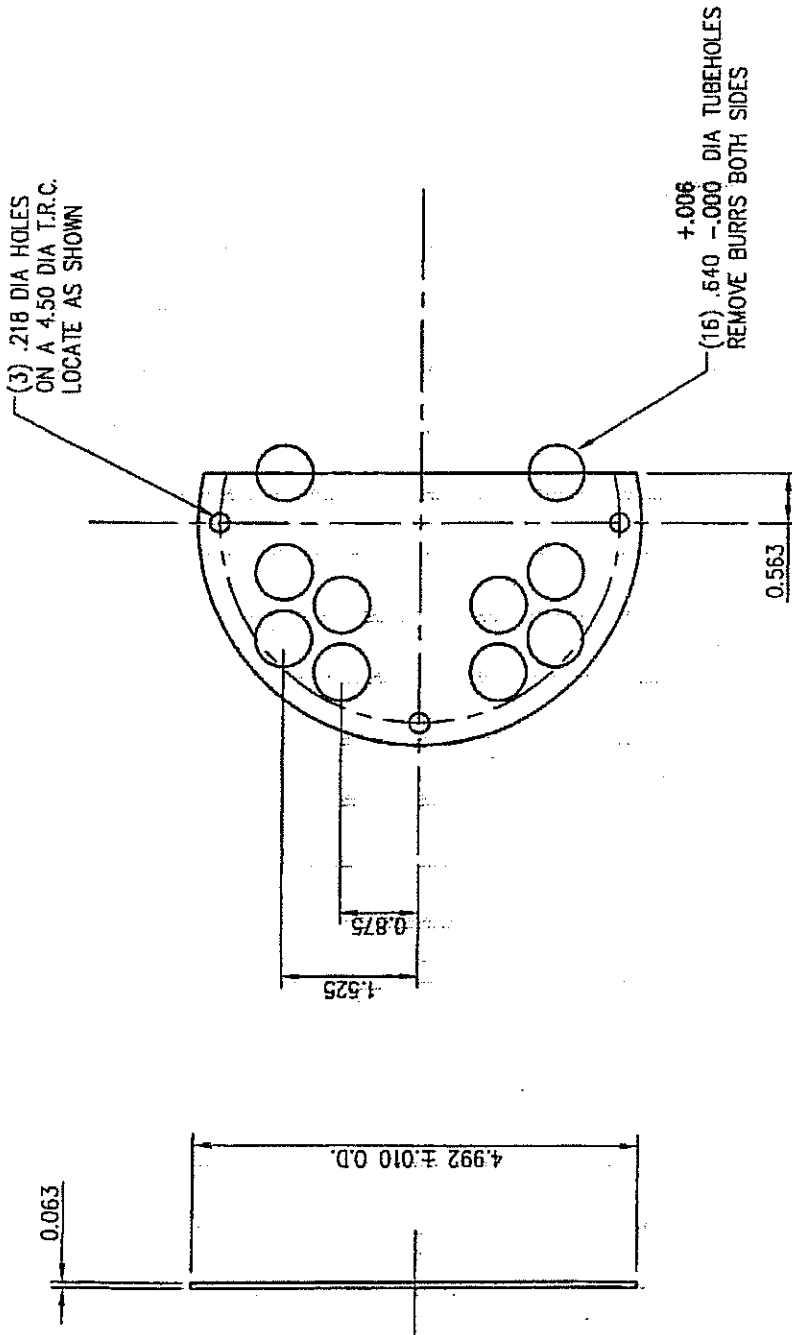
U-BEND PORTION OF TUBES TO BE RELIEF ANNEALED AFTER BENDING.

U-TUBES TO BE BENT IN ACCORDANCE WITH SB-395 AND BASCO SPEC 106-1302-A.

NOTE:
 HYDRO TEST TO 1000 P.S.I. AFTER BENDING
 OLD P/N 63K03B36

5						"U"-TUBE DRAWING		API Basco		REV	
4						8 U'S, 5/8" O.D. ON 75" TRI.				0	
3											
2											
1											
NO.		BY		DATE		SCALE		SIZE		DRAWING NUMBER	
						NTS		A		4069-10-0519-01	
		DATE		DATE		DATE					
		5-21-02		5/21/02		5/21/02					

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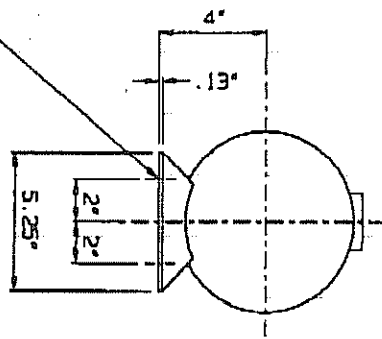


1		1	CIRCLE, 4.992" O.D., 1/16" THK	STEEL		DWG SIZE	520-16-0219-000
REV	QTY	DESCRIPTION	MATL	SPECIFICATIONS	DWG NO.	PART NO.	
5							
4							
3							
2							
1							
	REVISION	BY	DATE		SCALE	DRAWING NUMBER	REV
					1/2	A 3016-06-719-005	0
<p>API Basco BUFFALO, NY</p> <p>BAFFLE, 45% VERT CUT TYPE: 500 (16) 5/8 ON .75" TRI</p>							(PREVIOUSLY 45B12C5)
		BY: TJC	DATE: 12/18/01	CHKD: TJC			
		DATE: 12/18/01		DATE: 12/18/01			



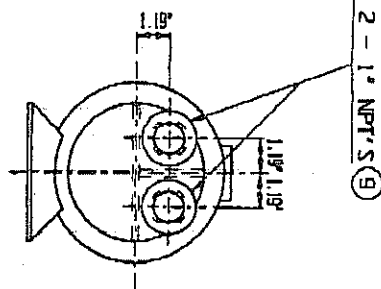
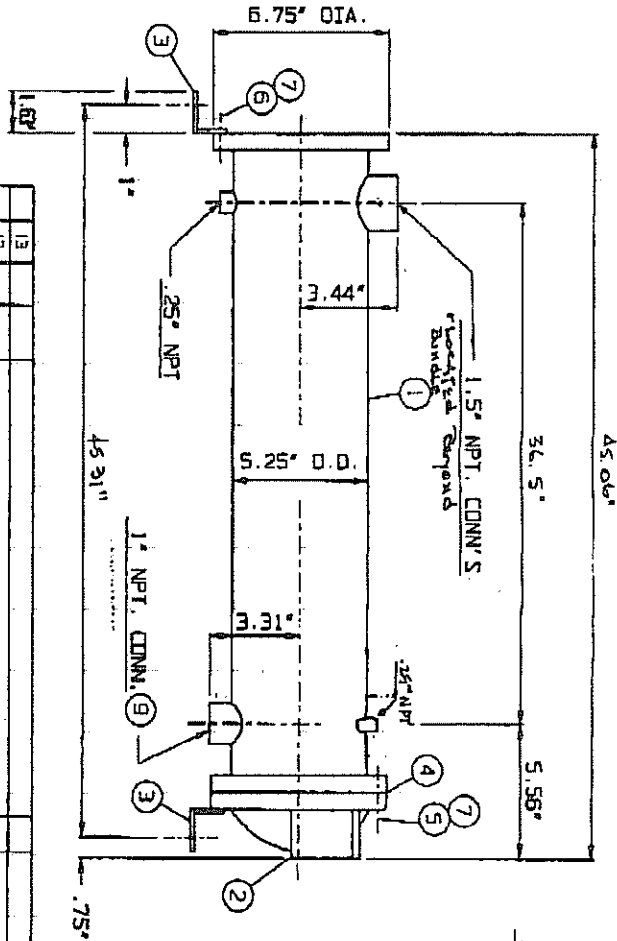
API Heat Transfer Basco/Whitlock Shell and Tube Heat Exchanger

1			JOB NO.	
2	CUSTOMER	University of Michigan	REFERENCE NO.	Dave Caspary
3	ADDRESS		PROPOSAL NO.	
4	PLANT LOCATION		DATE	5/10/2002
5	SERVICE OF UNIT	Water Heater	ITEM NO.	01 Revision #1
6	SIZE	#05036-5"-4 Pass	TYPE	"500" U-tube
7	SQ.FT.SURF/UNIT	(GROSS) 7.9 (EFF.)	SHELLS/UNIT	ONE (1)
8			SQ.FT.SURF/SHELL	(GROSS) 7.9 (EFF.)
PERFORMANCE OF ONE UNIT				
9			SHELL SIDE	TUBE SIDE
10	FLUID CIRCULATED		STEAM	WATER
11	TOTAL FLUID ENTERING	LB/HR	344.8 Lb/Hr	5.0 GPM
12	VAPOR	LB/HR		
13	LIQUID	LB/HR		2481.0
14	STEAM	LB/HR	344.8	
15	NON-CONDENSABLES	LB/HR		
16	FLUID VAPORIZED OR CONDENSED	LB/HR		
17	STEAM CONDENSED	LB/HR	344.8	
18	SPECIFIC GRAVITY			0.99
19	VISCOSITY @ TEMP	cP @ °F	@	0.59 @ 115
20	MOLECULAR WEIGHT			
21	SPECIFIC HEAT	BTU/LB-°F		0.998
22	THERMAL CONDUCTIVITY	BTU/HR-FT-°F		0.366
23	LATENT HEAT	BTU/LB		
24	TEMPERATURE IN	°F	266.8	50.0
25	TEMPERATURE OUT	°F	266.8	160.0
26	OPERATING PRESSURE	PSIA	39.7	
27	NO. PASSES PER SHELL		ONE (1)	FOUR (4)
28	VELOCITY	FT/SEC		1.8
29	PRESSURE DROP	PSI	Nil	<1.0
30	FOULING RESISTANCE (Min)	°F-FT ² -HR/BTU	0.0007	0.0005
31	HEAT EXCHANGED	321975. BTU/HR	MTD CORRECTED	142.0 °F
32	TRANSFER RATE - SERVICE	288.7	CLEAN	BTU/HR-FT ² -°F
CONSTRUCTION OF ONE SHELL				
34	DESIGN PRESSURE	PSIG	300	150
35	TEST PRESSURE	PSIG	---	---
36	DESIGN TEMPERATURE (Max/Min)	°F	300 / +20	300 / +20
37	TUBES	Admiralty	NO. 8 U's	OD 0.625" BWG 18 LENGTH 36" Str. Lg.ITCH 0.75" Tr
38	SHELL	Carbon Steel	ID 5.010	OD 5.25" SHELL COVER --- (INTEG)(REMOV)
39	BONNET/CHANNEL	Cast Iron		CHANNEL COVER ---
40	TUBESHEET-STATIONARY	Carbon Steel		TUBESHEET-FLOATING ---
41	BAFFLES-CROSS	Carbon Steel	TYPE Seg.	FLOATING HEAD COVER ---
42	BAFFLES-LONG	---	TYPE ---	IMPINGEMENT PROTECTION ---
43	TUBE SUPPORTS	---		
44	TUBE TO TUBESHEET JOINT	Mechanically Rolled		
45	GASKETS	Compressed Fiber	PACKING	---
46	CONNECTIONS-SHELL SIDE	IN 1-1/2" Top *	OUT 1" Bottom	RATING NPT
47	BONNET/CHANNEL SIDE	IN 1"	OUT 1"	RATING NPT
48	CORROSION ALLOWANCE - SHELL SIDE	---	TUBE SIDE	---
49	CODE REQUIREMENTS	Commercial Standard		TEMA CLASS ---
50	OTHER	* Note- The Steam Inlet Connection to be locate beyond the Bundle		
51	REMARKS	Water to be flowing prior to Injection of steam.		
52		Note: Non-Removable Bundle		
53				
54				



2 - 50° X .75" SLOTTED HOLES EACH SUPPORT

NOTE:
 1.) ALL BOLT HOLES TO BE EQUALLY SPACED AND TO STRADDLE CENTERLINE.
 2.) ARROW DIMENSIONS - NOT CENTERLINE



DIMENSIONS & DATA
 CERTIFIED FOR
 CUST. ORDER
 BAR ORDER

DESIGN DATA	SHELL	TUBE
DES. PRESS. P.S.I.G.	300	150
TEST PRESS. P.S.I.G.		
DES. TEMP. °F	300	300

NO.	REV.	DESCRIPTION	DATE	BY	DATE	BY	DATE	DATE
13								
12								
11								
10	2	SHIPPING PLUG 1 1/2" NPT SIZE						
9	3	SHIPPING PLUG 1" NPT SIZE						
8								
7	10	HEX NUT 3/8" - 16 T.P.I. FINISHED						
6	2	CAPSCREW 3/8" - 16 T.P.I. X 1 1/8" LG.						
5	8	CAPSCREW 3/8" - 16 T.P.I. X 1 3/4" LG.						
4	1	GASKET						
3	2	ORACLE						
2	1	BRACKET (IN/OUT)						
1	1	DIRE ASSEMBLY						

TYPE "500" U-TUBE
 4-PASS ASSEMBLY
 5/8" TUBES 5" SPA

BASCO AMERICAN
 PRECISION
 DIVISION
 BEARING NUMBER
 05036

500-500UAP31

INPUT DATA:	SHELL SIDE	TUBE SIDE
FLUID CONDITION/FLUID CODE	HOT STEAM / 0	COLD LIQUID/ 1
FLUID NAME	USER DEFINED	WATER
TOTAL FLOW RATE (LB/HR)/(GPM)	344.8 / 0.0	2481.0 / 5.0
IN/OUT TEMPERATURES (DEG F)	266.8 / 266.8	50.0 / 180.0
OPERATING PRESSURE (PSIA)	39.7	0.0
ALLOWABLE PRESSURE DROP (PSI)	0.00	10.00
FOULING RESISTANCE	0.0007	0.0005
MAX/MIN VELOCITY ALLOW. (FT/SEC)	0.0 / 0.0	9.0 / 0.0
THERMAL COND. (BTU/HR/FT/DEG F)	0.000	0.366
SPECIFIC HEAT (BTU/LB/DEG F)	0.000	0.998
SPECIFIC GRAVITY	0.0000	0.9913
DENSITY (LB/CU FT)	0.0000	61.8548
BULK/WALL VISCOSITY (cP)	0.000 / 0.000	0.587 / 0.332
LATENT HEAT (BTU/LB)	933.9	

TOTAL HEAT LOAD, BTU/HR:	321975.	CORRECTED MTD, DEG F:	142.007
PASSES (ACTUAL: 4; LAYOUT: 4)		FLOW - QUADRANT (MTD CEL.000)	
PERCENT CLEAN.....:100.0		MAX TUBE LENGTH.....: 15.0	
RECT. PITCH WIDTH.....IN: 0.0		SERVICE FACTOR.....: 3.0	

SEGMENTAL SELECTION # 1

TUBE MATERIAL : COPPER	TUBE O.D., IN....: 0.6250	TUBE I.D., IN.: 0.5270
TUBE PITCH, IN.: 0.750000	TUBE PATTERN....: TRIANG	OTL.....:STANDARD
UNIT TYPE:.....: 61	DESIGN PSIG, SS.: 300	TS.....: 150
DRILLING.....: STANDARD	SHELLS IN SERIES: 1	SEAL STRIPS?...: NONE

GEOMETRY: SHELL I.D.....IN.: 5.010	SHELL SIDE: TOTAL DELTA P.PSI:	0.000
REQ'D/ACT TL.....FT.: 2.97/ 3.00	SHELL NOZZLE LOSS.....PSI:	0.000
NUMBER OF TUBES.....: 16	SS CLEAN COEFFICIENT.....: 2000.00	
ACT. SURFACE AREA...SQ. FT.: 7.85	SS FOULED COEFFICIENT.....: 833.33	
MIN/ACT END ZONES..IN.: 0.000/ 0.000	SS REYNOLDS NO.....: 0.	
OUTER TUBE LIMIT.....IN.: 4.414	ENTRANCE VELOCITY...FT/SEC:	0.000
BAFFLE SPACING.....IN.: 22.500	BUNDLE CROSS VEL....FT/SEC:	0.000
SHELL/TUBE NOZZLE I.D.IN.: 0.000/ 1.049	NOZZLE VELOCITY.....FT/SEC:	0.000
WINDOW AREA.....SQ. FT.: 0.000	WINDOW VELOCITY.....FT/SEC:	0.000
BAFFLE CUT..(%diam)/(%area): 0.0/ 0.0	TUBE SIDE: PRESSURE DROP..PSI:	0.358
NUMBER OF CROSSES.....: 0	TS CLEAN COEFFICIENT.....: 733.51	
SHELL EFFECTIVENESS.....: 0.000	TS FOULED COEFF.(REF S/S)...: 452.53	
OVERALL: HEAT TRANSFER RATE...: 288.68	TS REYNOLDS NO.....: 12676.	
TUBE MEAN METAL TEMP..DEF F: 216.7	TUBE VELOCITY.....FT/SEC:	1.839
SHELL MEAN METAL TEMP.DEG F: 266.8	LENGTH CORR.(REI<10000).....: 0.000	
DIFF. THERMAL EXP.....IN.: 0.0022		

Unit Selected: 05036 - 22.500 - 4 Special