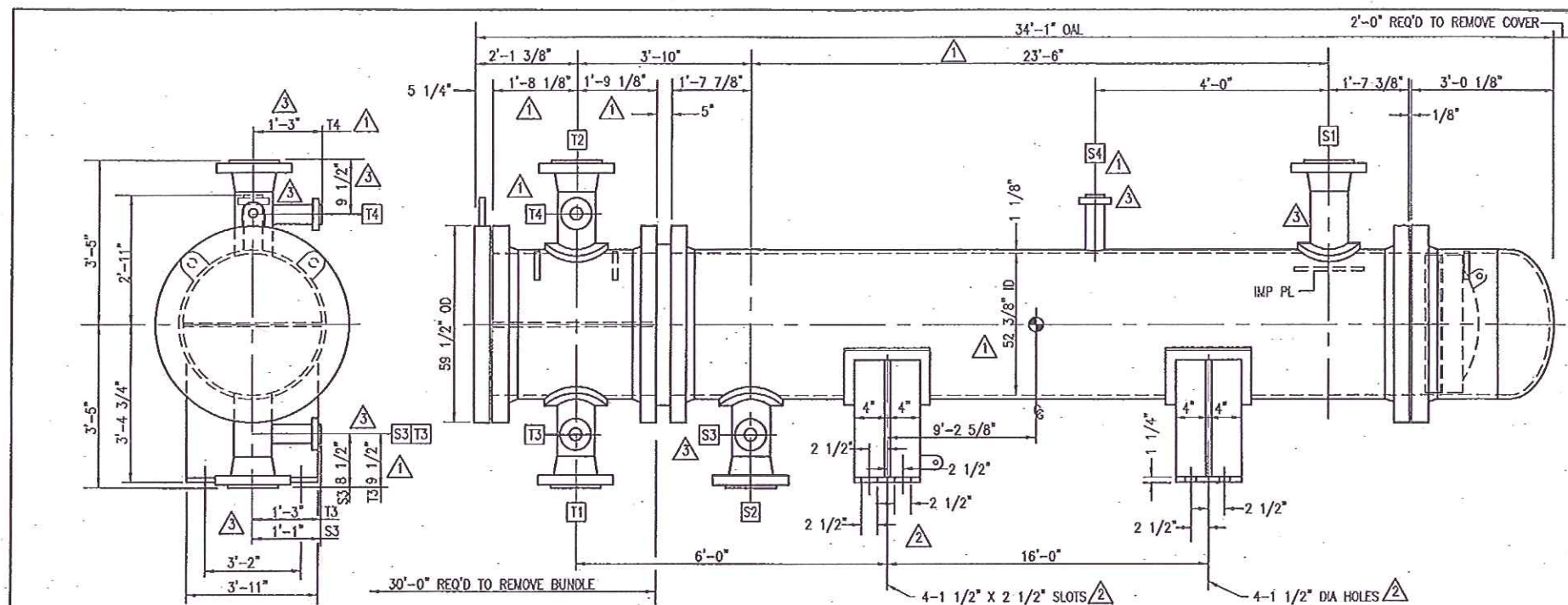


#106518
#106519



DESIGN DATA				SHELL				TUBES				NOZZLE DATA			
DESIGN PRESSURE	PSI	600 & FV/5	500 & FV/5	MARK	SIZE	RATING	FACING	SERVICE							
MAWP	PSI	600 & FV/5	500 & FV/5	T1	14"	300#	RF-WN	INLET							
TEST PRESSURE (SHOP)	PSI	789	679	T2	14"	300#	RF-WN	OUTLET							
TEST PRESSURE (FIELD)	PSI	780	650	T3	2"	300#	RF-LWN	DRAIN							
DESIGN TEMPERATURE	'F	400	400	T4	2"	300#	RF-LWN	VENT							
MDMT	'F	-50	-50	S1	10"	300#	RF-WN	INLET							
CORROSION ALLOWANCE		1/8"	1/8"	S2	10"	300#	RF-WN	OUTLET							
PASSES		.1	2	S3	2"	300#	RF-LWN	DRAIN							
TUBE SURFACE (EFF.)		7110 SQ. FT.		S4	2"	300#	RF-LWN	VENT							
TUBES: 989-1" OD X 12 BWG (MIN) SA-334-6															
DRY WEIGHT (LBS) 78,000				WET WEIGHT (LBS) 108,000				BUNDLE WEIGHT (LBS) 40,500							
MAWP SHELL SIDE LIMITED BY TUBESHEET.				MAWP TUBE SIDE LIMITED BY TUBESHEET.											
USE 60 'F (MIN) TEST WATER.															
REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.
1	JDH	11/14	CUST	2	JDH	12/20	CUST	3	JRF	01/17	CUST	4	JDH	4/24	CUST

GENERAL NOTES

- DESIGN AND CONSTRUCTION TO BE IN ACCORDANCE WITH:
A) ASME CODE, SECT VIII, DIV 1, 2004 EDITION (2006 ADD) AND SO STAMPED BY NATIONAL BOARD.
B) TEMA "R", API-660 AND NACE MR0175.
C) SPEC'S: CRT-GA-00003, SPC-HT-00001, SPC-MA-00002, AND ENGINEERING NOTES.
- ALL BOLT HOLES TO STRADDLE CENTERLINES.
- SPOT RADIOGRAPH SHELL AND SHELL COVER.
- 100% RADIOGRAPH CHANNEL AFTER PWHT.
- HEAT TREAT CHANNEL, CHANNEL COVER AND FLOATING HEAD COVER.
- PROVIDE TWO SPARE SETS OF GASKETS PER EXCHANGER.
- PROVIDE ONE TEST RING.
- SANDBLAST OUTSIDE PER SSPC-SP10. APPLY TWO COATS OF THERMALINE 450 (4 TO 6 MILS DFT PER COAT) TO BODY OF EXCHANGER. PROJECTIONS ARE TO BE PRIMED WITH CARBOZINC 11 (2 TO 3 MILS DFT) AND FINISHED WITH THERMALINE 4900 (1.5 TO 2.5 MILS DFT).

TUBE SIDE IS IN SOUR SERVICE. **4**
TUBESIDE & SHELLSIDE MATERIAL: CARBON STEEL **3**

CERTIFIED CORRECT FOR FABRICATION

BY: *J.A. Gammis* DATE: 9/6/07

CUSTOMER: WORLEYPARSONS GROUP, INC. FOR BP EXPLORATION **3**

DESTINATION: PRUDHOE BAY, ALASKA

CUST. P.O. 10741209-0008 PROJECT NO. 10741209

ITEM NO. EST-26011 A/B **2** EPT NO. 37305244-02 **2**

SERVICE: PRODUCTION HEATERS NORTH SLOPE, ALASKA

SERIAL: 9683-1/2 BP Z PAD FACILITY

FILE: 144-07 BP GAS PARTIAL PROCESSING (GPP) PROJECT

H/A HUGHES-ANDERSON HEAT EXCHANGERS INC.
1001 NORTH FULTON TULSA, OKLAHOMA 74115

TITLE: OUTLINE DRAWING

WORK ORDER: 9683 NUMBER REQ'D: TWO

DR: JIM DATE: 9/6/07 SIZE: 52" X 28' DRAWING NUMBER

CK: GDS SCALE: NONE TYPE: AET 9683-01

WorleyParsons
ACCOUNTS & TAXES

[Signature]

11/30/08

REVIEWED BY: DATE:

user's review and release for fabrication shall not be construed as relieving seller of any obligation or liabilities with respect to these documents of the items to be furnished by seller pursuant thereto.

VC RELEASED FOR FABRICATION - CORRECT AND RESUBMIT

VF FINAL - DO NOT RESUBMIT

V1 FINAL - INFORMATION ONLY

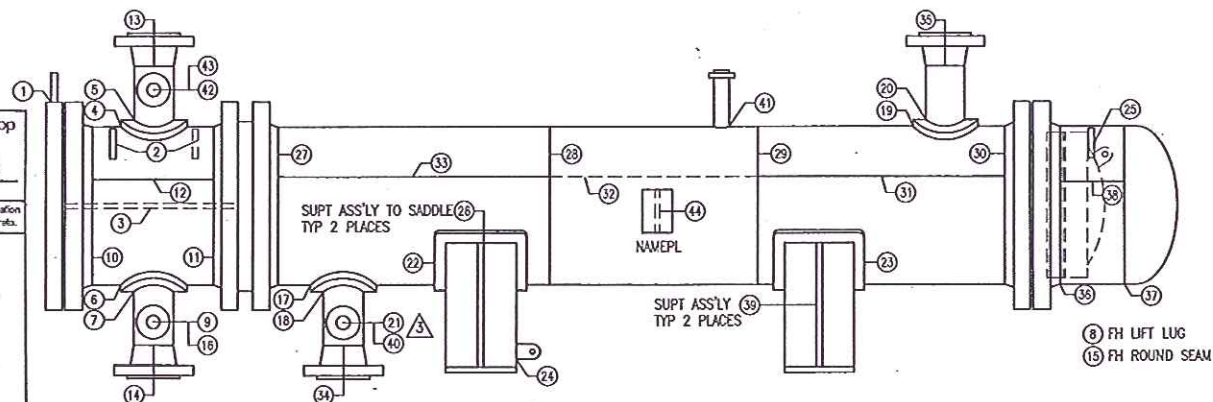
VH NOT RELEASED FOR FABRICATION - CORRECT AND RESUBMIT

VM FINAL, MANUAL(S) - NOT RETURNED TO VENDOR

VEF FINAL - ELECTRONIC FILES

V0 VOID - SEE COMMENTS ON DOCUMENTS

E0 DO NOT ISSUE THIS REVISION SUPERCEDED BY ANOTHER REVISION

[illegible]

1. EXEMPT FROM PRODUCTION IMPACTS DUE TO JOINT TYPE.
2. PRODUCTION IMPACTS REQ'D @ -50 °F WITH VALUES OF 15/12 FT-LBS OR GREATER.

1 PRODUCTION HEATERS EST-26011 A/B
 BP EXPLORATION (ALASKA) INC.
 BP GAS PARTIAL PROCESSING (GPP) PROJECT
 BP Z PAD FACILITY
 NORTH SLOPE, ALASKA
 PROJECT NO. 10741209
 EPT NO. 37305244-02 2 2



HUGHES-ANDERSON HEAT EXCHANGERS INC.
1001 NORTH FULTON TULSA, OKLAHOMA 74115

WELD MAP

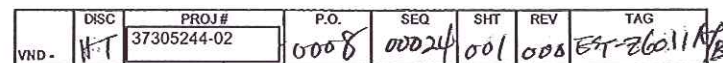
CUSTOMER	WORLEYPARSONS GROUP INC	P.O. NO.	10741209-0008
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SIZE	52" X 28"	ITEM NO.	EST-76011 A/B	QTY.	2
------	-----------	----------	---------------	------	---

52 X 28		ESI-26011 A/B ∇		Z
TYPE	OR	DATE	DRAWING NUMBER	

AET	JM	09/07/2007	9683-02
SERIAL NO. 9683-1/2/1	CK KW	SCALE NONE	

REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH
1	JRF	10/23	CUST	1	JRF	12/17	HA-D	1	KW	01/16	CUST												




WorleyParsons
engineering • construction

 REVIEWED BY *[Signature]*

 DATE 11/25/08

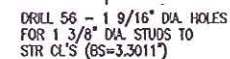
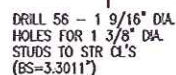
Purchaser's review and/or release for fabrication should not be construed as relieving seller of any obligations or responsibilities with respect to those documents of the same to be furnished by seller pursuant thereto.

☐ VC RELEASED FOR FABRICATION - CORRECT AND RESUBMIT
☒ VF FINAL - DO NOT RESUBMIT
☐ VI FINAL - INFORMATION ONLY
☐ VN NOT RELEASED FOR FABRICATION - CORRECT AND RESUBMIT
☐ VM FINAL MANUAL(S) - NOT RETURNED TO VENDOR
☐ VEF FINAL - ELECTRONIC FILES
☐ WV VOID - SEE COMMENTS ON DOCUMENTS
☐ EO DO NOT ISSUE THIS REVISION SUPERCEDED BY ANOTHER REVISION

DRILL AND REAM TUBE HOLES TO $1.010^{+/-0.002}$
989 - 1" OD TUBES ON 1 1/4"  PITCH
45 5/8" ACTUAL TUBE CIRCLE
GROOVE TUBE HOLES PER DETAIL "A" ON DWG 9683-09

		HUGHES-ANDERSON HEAT EXCHANGERS INC. 1001 NORTH FULTON TULSA, OKLAHOMA 74115	
TITLE		TUBE LAYOUT	
CUSTOMER WORLEYPARSONS GROUP, INC.		P.O. NO.	10741209-0008
SIZE 52" X 28"	ITEM NO. EST-26011	A/B	QTY. 2
TYPE AET	DR JRF	DATE 11/29/2007	DRAWING NUMBER 9683-08
SERIAL NO. 9683-1/2	CK RF	SCALE NONE	

[illegible]



PROJ #	P.O.	SEQ	SHT	REV	TAG
37305244-02	0008	00021	001	001	EST-26011A/B

1/4" Ø30" BEVEL

55 5/8" TURN

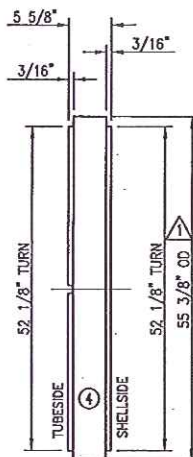
NO NUBBIN

52 3/8" ID

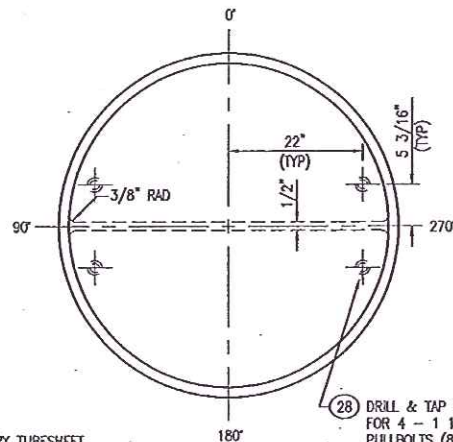
DETAIL "A"

NOZZLE DATA				
WKD	DESCRIPTION	REFIN PAD	NOTE	
S1	10"-300" RF-WN	17" OD x 1 1/8" THK		
S2	10"-300" RF-WN	17" OD x 1 1/8" THK		
S3	2"-300" RF-LWN	NONE		
S4	2"-300" RF-LWN	NONE		
 HUGHES-ANDERSON HEAT EXCHANGERS INC. 1001 NORTH FULTON TULSA, OKLAHOMA 74115				
TITLE SHELL DETAILS				
CUSTOMER WORLEYPARSONS GROUP, INC.		P.O. NO. 10741208-0008		
SIZE 52" X 28"	ITEM NO. EST-Z6011 A/B	QTY. 2		
TYPE AET	DR JRF	DATE 11/29/2007	DRAWING NUMBER 9683-05	
SERIAL NO. 9683-1/2	OK 23	SCALE NONE		

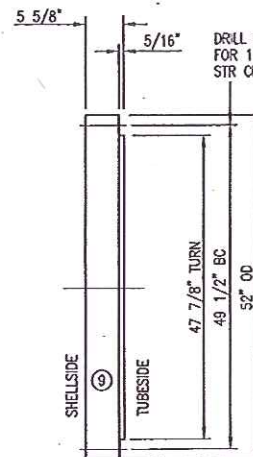
VC RELEASED FOR FABRICATION - CORRECT AND RESUBMIT
 VV FINAL - DO NOT RESUBMIT
 VI FINAL - INFORMATION ONLY
 VN NOT RELEASED FOR FABRICATION - CORRECT AND RESUBMIT
 VM FINAL, MANUAL(S) - NOT RETURNED TO VENDOR
 VEF FINAL - ELECTRONIC FILES
 VW VOID - SEE COMMENTS ON DOCUMENTS
 EO DO NOT ISSUE THIS REVISION SUPERCEDED BY ANOTHER REVISION



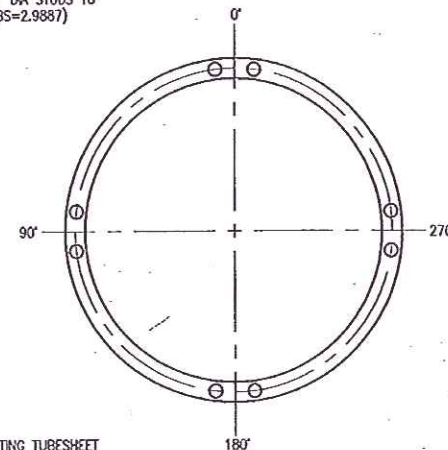
STATIONARY TUBESHEET



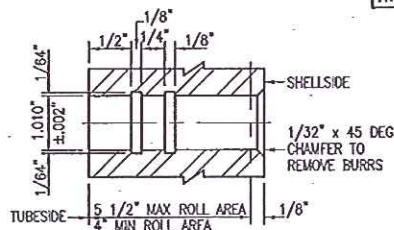
28 DRILL & TAP 1 7/8\"/>



FLOATING TUBESHEET



DRILL 52 - 1 3/8\"/>



DETAIL "A"

PRODUCTION HEATERS EST-Z6011 A/B
 BP EXPLORATION (ALASKA) INC.
 BP GAS PARTIAL PROCESSING (GPP) PROJECT
 BP Z PAD FACILITY
 NORTH SLOPE, ALASKA
 PROJECT NO. 107412089
 EPT NO. 37305244-02

VND	DISC	PROJ#	P.O.	SEQ	SHT	REV	TAG
HT		37305244-02	0008	00025	001	001	EST-Z6011A/B

NOTES

- SEE DWG-03 FOR GENERAL NOTES.
- DRILL AND TAP 3/4\"/>

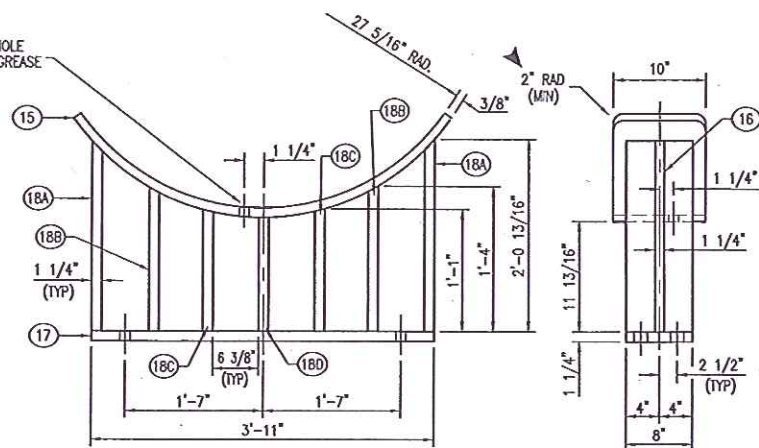
HA HUGHES-ANDERSON HEAT EXCHANGERS INC.
 1001 NORTH FULTON TULSA, OKLAHOMA 74115

TITLE		TUBESHEET DETAILS				
CUSTOMER		WORLEYPARSONS GROUP, INC.		P.O. NO.	10741209-0008	
SIZE	52" X 28"	ITEM NO.	EST-26011 A/B		QTY.	2
TYPE	AET	DR	JRF	DATE	11/30/2007	
SERIAL NO.	9683-1/2	CK	JLC	SCALE	NONE	
				BRANDING NUMBER	9683-09	

REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH
1	JRF	03/13	HA-S																

WorleyParsons
 3/21/08
 DATE
 REVIEWED BY
 3/21/08

Purchased a review and/or release for information and not be construed as a warranty of any obligation or responsibility with respect to these documents or the items to be furnished by other pursuant thereto.

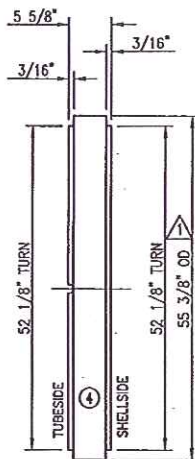


SUPPORTS MKD "X"

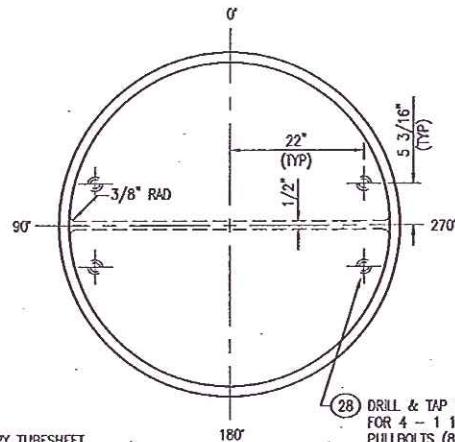
SUPPORTS MKD Y

 HUGHES-ANDERSON HEAT EXCHANGERS INC. 1001 NORTH FULTON TULSA, OKLAHOMA 74115			
TITLE		SUPPORT DETAILS	
CUSTOMER		P.O. NO.	
WORLEYPARSONS GROUP, INC.		10741209-0008	
SIZE	ITEM NO.	A/B	
52" X 28"	EST-26011	QTY. 2	
TYPE	DR	DATE	DRAWING NUMBER
AET	JRF	11/29/2007	
SERIAL NO.	CK	SCALE	
9683-1/2	RF	NONE	9683-07

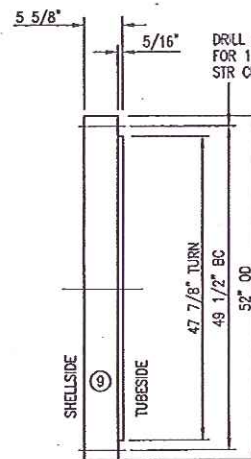
WorleyParsons
INNOVATE. LEAD. IMPROVE.



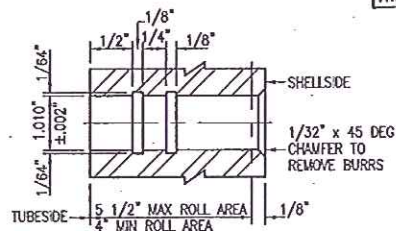
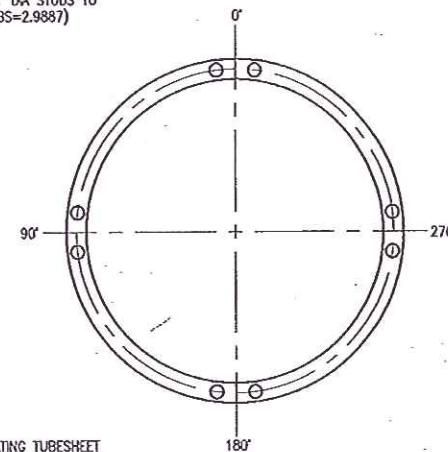
STATIONARY TUBESHEET



28 DRILL & TAP 1 7/8" DEEP
FOR 4 - 1 1/4" DIA
PULLBOLTS (8 THDS PER INCH)
ON TUBESIDE ONLY! DO NOT
DRILL THRU! PLUG!



FLOATING TUBESHEET



DETAIL "A"

PRODUCTION HEATERS EST-Z6011 A/B
BP EXPLORATION (ALASKA) INC.
BP GAS PARTIAL PROCESSING (GPP) PROJECT
BP Z PAD FACILITY
NORTH SLOPE, ALASKA
PROJECT NO. 107412089
EPT NO. 37305244-02

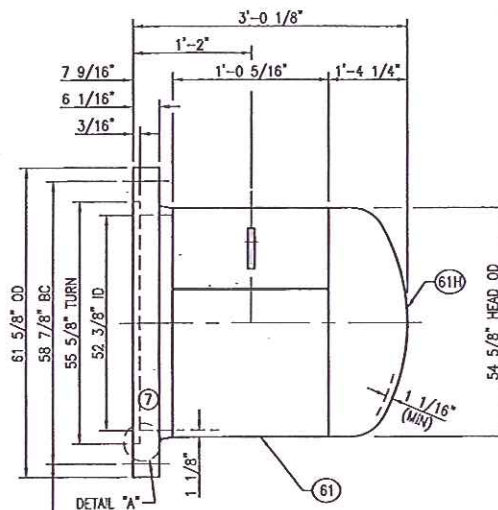
REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH	REV	BY	DATE	AUTH
1	JRF	03/13	HA-S																				

VND.	DSC	PROJ#	P.O.	SEQ	SHT	REV	TAG
	HT	37305244-02	0008	00025	001	001	EST-2601

NOTES

1. SEE DWG-03 FOR GENERAL NOTES.
2. DRILL AND TAP $3/4"$ DEEP FROM SHELL SIDE OF NO. 4 TUBESHEET ONLY FOR $10-1/2"$ DIA THERMOS. DO NOT DRILL THRU! SEE TUBE LAYOUT FOR LOCATIONS.
3. DRILL AND REAM TUBE HOLES TO 1.010 ± 0.002 FOR $989 - 1"$ OD TUBES ON $1 \frac{1}{4}"$ PITCH AND $45 \frac{5}{8}"$ ACTUAL TUBE CIRCLE.
GROOVE TUBE HOLES PER DETAIL "A"

		HUGHES-ANDERSON HEAT EXCHANGERS INC. 1001 NORTH FULTON TULSA, OKLAHOMA 74115	
TITLE			
TUBESHEET DETAILS			
CUSTOMER WORLEYPARSONS GROUP, INC.		P.O. NO. 10741209-0008	
SIZE 52" X 28"		ITEM NO. EST-Z6011 A/B	
TYPE AET		QTY. 2	
DR JRF		DATE 11/30/2007	
SCALE NONE		DRAWING NUMBER 9683-09	
SERIAL NO. 9683-1/2		CK JRF	



	DISC	PROJ #	P.O.	SEQ	SHT.	REV	TAG
VND -	HT	37305244-02	0008	00022	001	000	EST-86011A/E

		HUGHES-ANDERSON HEAT EXCHANGERS INC. 1001 NORTH FULTON TULSA, OKLAHOMA 74115	
TITLE SHELL COVER DETAILS			
CUSTOMER WORLEYPARSONS GROUP, INC.		P.O. NO. 10741209-0008	
SIZE 52" X 28'		ITEM NO. EST-26011 A/B	
TYPE AET		DRAWING NUMBER 9683-06	
SERIAL NO. 9683-1/2		DATE 11/29/2007	
OR JRF		SCALE NONE	
OK RF		QTY 2	

REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	REV	BY	DATE	AUTH.	TYPE	AET	OR	JRF	DATE	11/29/2007	DRAWING NUMBER
																													SERIAL NO.	9683-1/2	OK	RE	SCALE	NONE	9683-06			

☐ E0 DO NOT ISSUE THIS REVISION SUPERCEDED BY ANOTHER REVISION

[illegible]