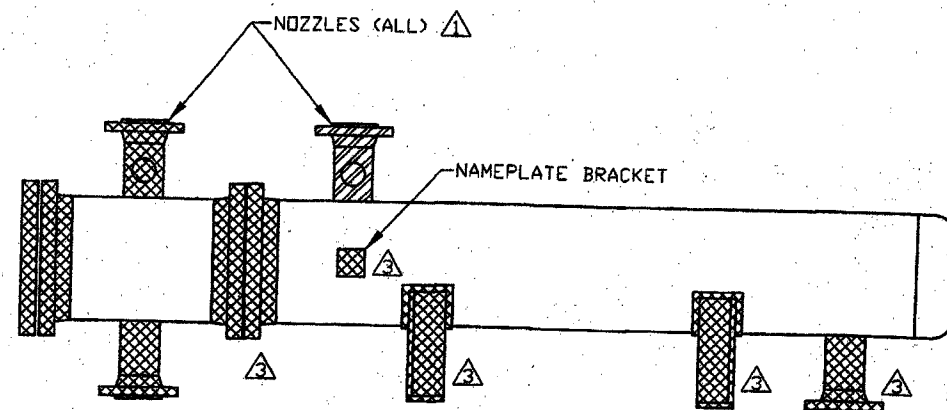




PAIN PROTRUSIONS AS FOLLOWS:

-  CTSE 2001, IZ
SANDBLAST PER SSPC-SP-10 (2 MILS NOMINAL PROFILE)
PAINT W/ ONE COAT OF INORGANIC ZINC (2.5-4 MIL DFT)
-  CTSE 2012, HS/HS
SANDBLAST PER SSPC-SP-10 (1 MIL NOMINAL PROFILE)
PAINT W/ TWO COATS OF HEAT-CURED SILICONE (1-2 MILS DFT PER COAT)
(COLOR TO BE TWILIGHT GRAY)

 DELETED

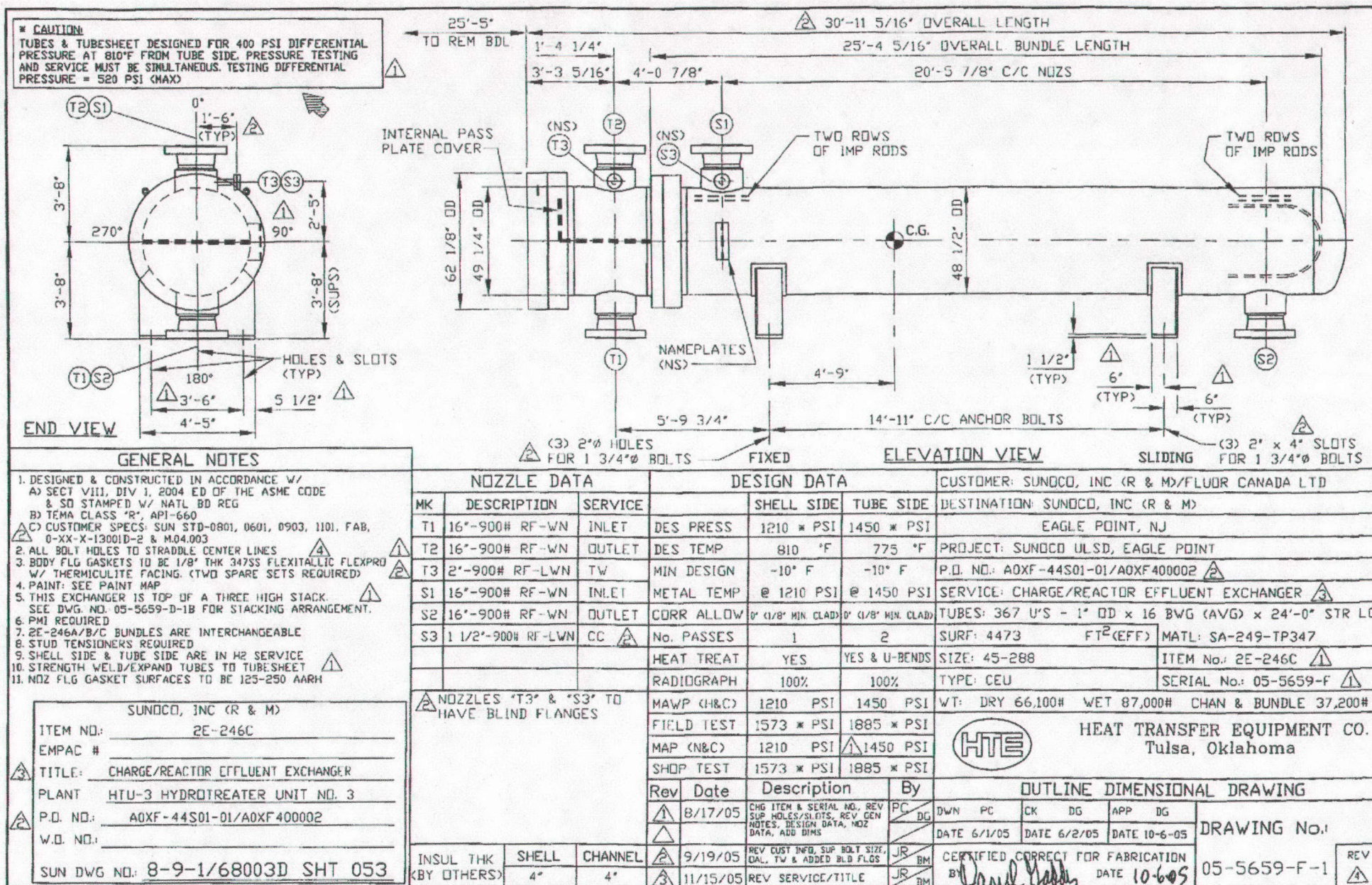
A - PROCEED FLUOR DANIEL
AUTHORIZATION TO PROCEED DOES NOT RELIEVE
CONTRACTOR/VENDOR OF ITS RESPONSIBILITY OR
LIABILITY UNDER THE CONTRACT/PURCHASE
ORDER.

Sunoco Ultra Low Sulphur Diesel Project 15/12/2005
Cont: AOXFULF Doc No. 44501-01-024-0001-4
Equip Tag: 2E-246C

ITEM NO:	SUNOCO, INC (R & M)
EMPAC NO:	2E-246C
TITLE:	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT:	HTU-3 HYDROTREATER UNIT NO. 3
P.D. NO:	AOXF-44501-01/AOXF400002
W.D. NO:	
SUN DVG NO:	8-9-1/68003D SHT 054

 HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

Rev	Date	Description	By	PAINT MAP					REV
1	8/17/05	ADD NOTING & REV INFO BLK	PC	DWN	PC	CHK	DG	APP	DG
2	9/20/05	REV PAINT ON SUPPORTS /CUST DEL PRIMER COLOR /HTE	JR	DATE	6/1/05	DATE	6/2/05	DATE	10-6-05
3	11/15/05	REV TITLE & PAINT ON SHELL SIDE PROJECTIONS	JR	05-5659-F-1A					3

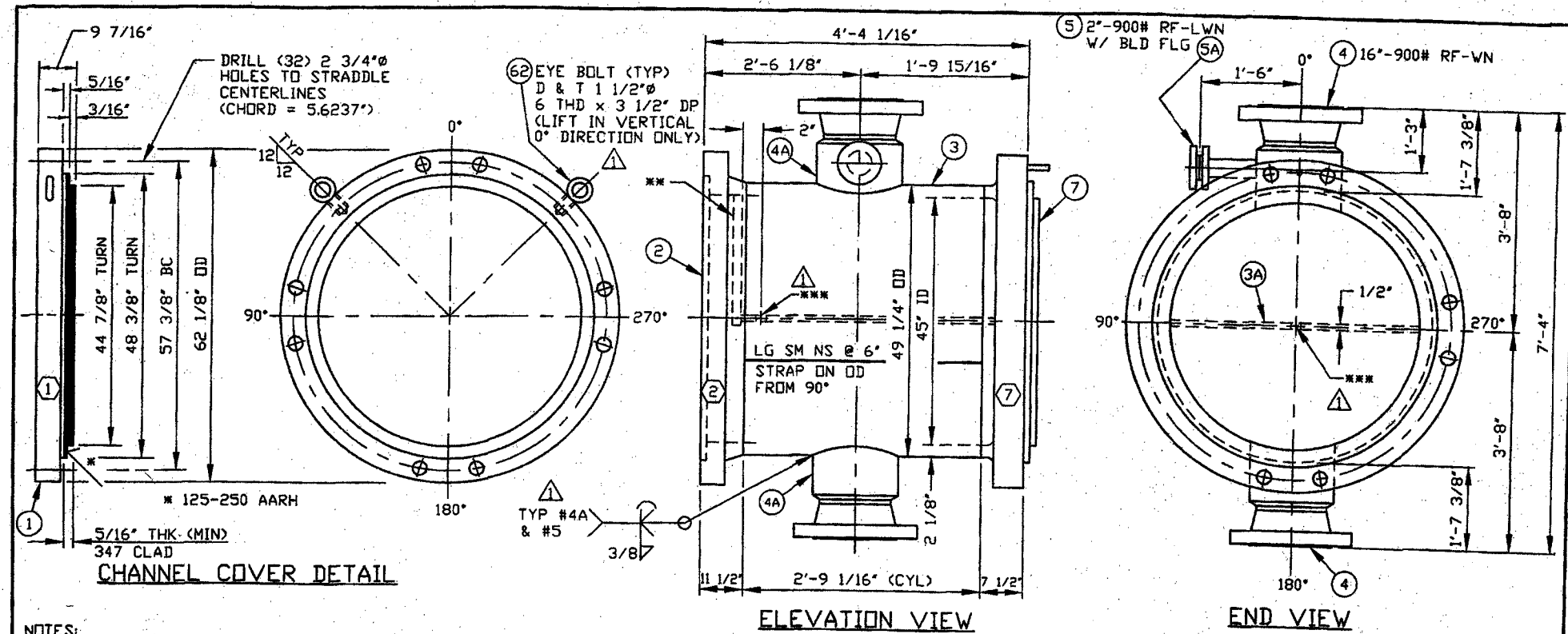


A - PROCEED
8:08 pm, 3/16/04
 AUTHORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/PURCHASE ORDER

Sunoco ULSD Project
Cont.: AOXFULF
Equip/Tag: 2E-246C

Doc No. 44S01-01-024-0002-5

10/02/2006



- NOTES:**
1. 100% RADIOGRAPH
 2. 1/8" (MIN) R ON NOZ ID @ CHAN ID
 3. GRIND ALL INSIDE WELDS SMOOTH
 4. ALL BOLT HOLES TO STRADDLE CENTERLINES
 5. BASE METAL WELDING PROCEDURES: ASA-4-4.1SiCrMoI & SMA-4-4.1
 6. PASS PLATE WELDING PROCEDURE: SMA-B-8.0 (347)
 7. SEE DWG NO. 10 FOR BODY FLG DETAILS
 8. SEE DWG NO. 2A FOR PASS PL & BOLTING RING WELDING
 9. SEE DWG NO. 11 FOR GEN NOTES
 10. SEE DWG NO. 2A FOR INTERNAL PASS PLATE COVER DETAILS
 11. SEE DWG NO. 2B, 2C & 2D FOR OVERLAY DETAILS
 12. POSTWELD HEAT TREAT (NOT INCLUDING COVER) AS FOLLOWS:
 - A. HEAT FROM 800°F TO 1275°F @ 200°F PER HOUR
 - B. HOLD @ 1275°F +25°F, -0°F FOR 2 HOURS MIN
 - C. COOL FROM 1275°F TO 800°F @ 250°F PER HOUR
 - D. FURTHER COOLING IN STILL AIR
 13. SEE DWG NO. 2E FOR FORGED NOZZLE NECK DETAILS
 14. SEE DWG NO. 5 FOR TUBESHEET DETAIL
 15. FINISH MACHINE FACE OF BODY FLG & TUBESHEET AFTER PWHT
 16. WELD IN PASS PL & PASS PL COVER BOLTING RING AFTER PWHT

ITEM NO. SUNDOD, INC (R & M)
 EMPAC NO. EE-246C
 TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
 PLANT: HTU-3 HYDROTREATER UNIT NO. 3
 P.O. NO. AOXF-44501-01/AOXF 400002
 V.O. NO.
 SUN DWG NO. 8-9-1/68003D SHT 055

Rev	Date	Description	By
1	11/15/05	ADDED NOTE 16, NOZ WELD NOTE, PASS PLATE DRAIN HOLE & LIFTING NOTE, REV TITLE, DEL TEX-FAB WELDING, REV NOTE 7	JR
2			
3			

A - PROCEED FLAVOR DANIEL
 ALL INFORMATION IS PROVIDED DOES NOT RELY ON CONTRACTOR VERIFICATION OF ITS REPRODUCIBILITY OR LIABILITY UNDER THE CONTRACT FOR CAUSE OR CONSEQUENCE

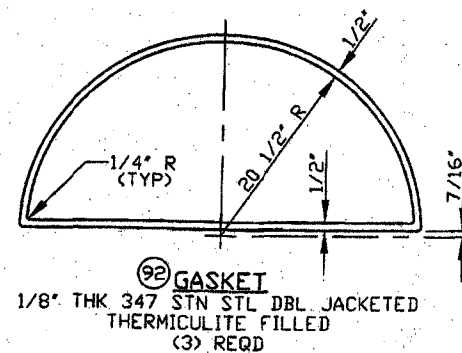
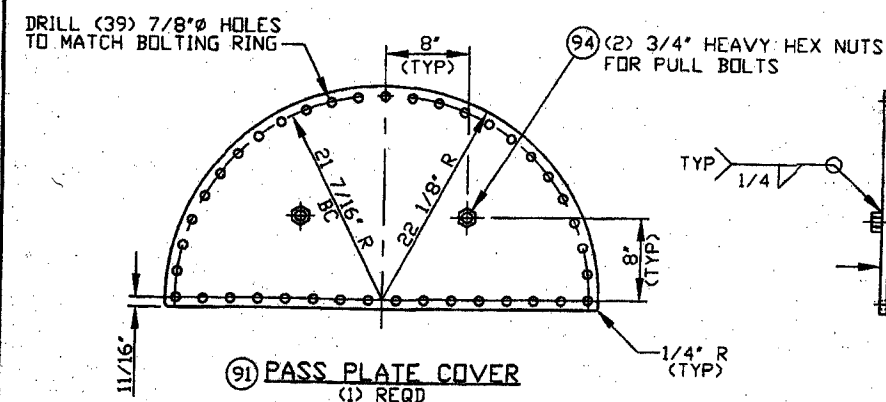
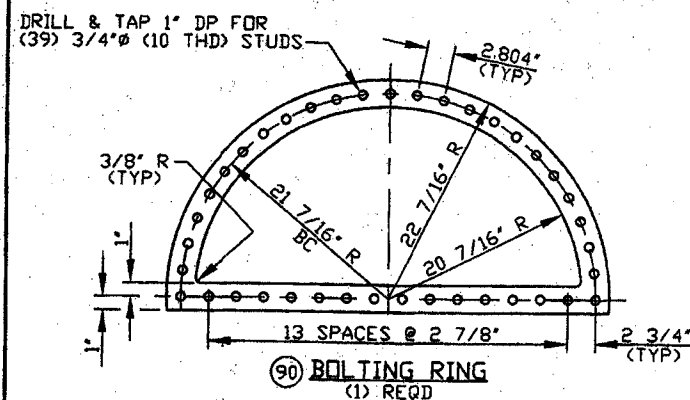
Sunoco Ultra Low Sulphur Diesel Project
 Cont. AOXFULF
 Equ. Tag 2E-246C

15/12/2005
 Doc No. 44501-01-024-0003-2

HTE HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

CHANNEL DETAILS

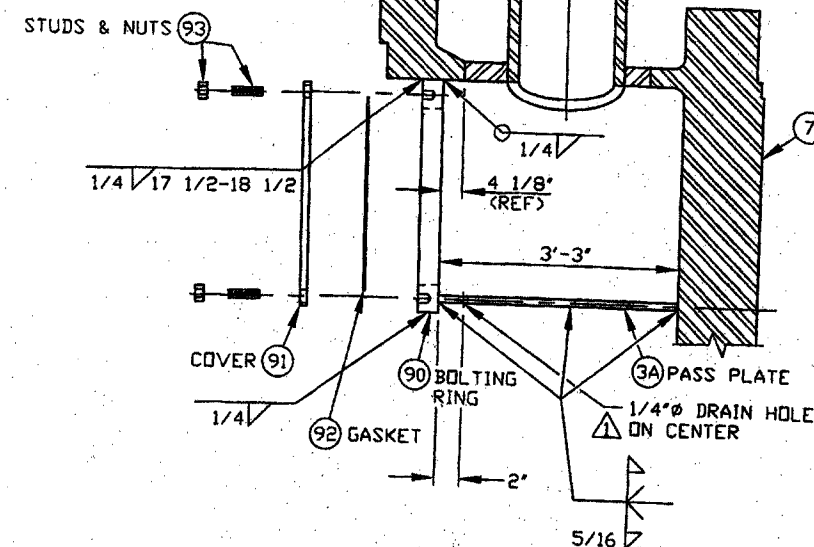
DWN	JR	CHK	BM	APP	DG	05-5659-F-2	REV
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05					



NOTES:

1. (3) GASKETS REQD. USE ONE IN EXCHANGER AND BOX SPARES. MARK WITH P.O. NO. AND ITEM NO., SHIP WITH UNIT
2. GASKET MATERIAL TO BE SUITABLE FOR 775°F
3. LIQUID PENETRANT EXAMINE WELDS
4. WELDING PROCEDURE: SMA-8-B.0 (347)
5. DELETED
6. WELD IN PASS PL & BOLTING RING AFTER PWHT

Rev	Date	Description	By
1	11/15/05	ADDED NOTE 6 & PASS PL DRAIN HOLE. REV TITLE, ADDED PASS PL & BOLTING RING WELD SYMBOLS. DEL NOTE 5	JR
2			
3			



A - PROCEED FLAVOR DANIEL
ATTENTION: TO PREPARE DOES NOT RELIEVE
CONTRACTOR FROM ITS RESPONSIBILITY OF
COMPLETING UNDER THE CONTRACTOR'S OBLIGATION.

Sunoco Ultra Low Sulphur Diesel Project
Cont: AOXF/ULF Doc No. 44501-01-024-0004-2
Equip Tag: 2E-246C

12/12/2005

ITEM NO.	SUNOCO, INC (R & M)
EMPAC NO.	2E-246C
TITLE	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT	HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO.	AOXF-44501-01/AOXF400002
W.O. NO.	
SUN DWG NO.	8-9-1/68003D SHT 056



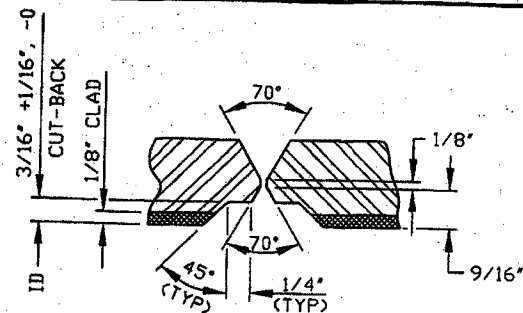
HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

PASS PLATE COVER

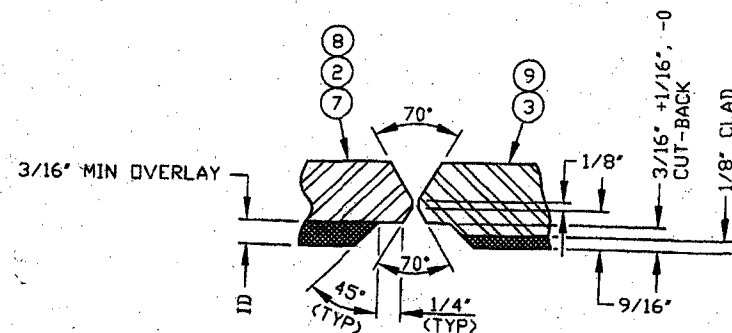
DWN JR CHK BM APP DG
DATE 9/19/05 DATE 10-5-05 DATE 10-6-05

05-5659-F-2A

REV

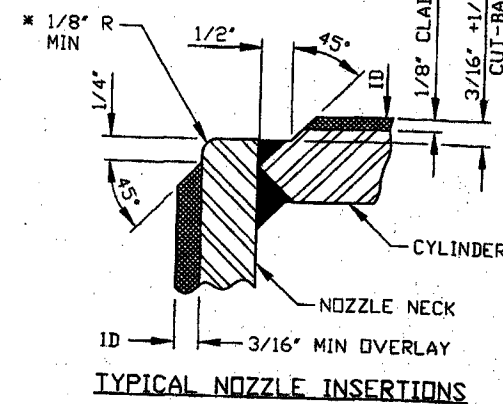


TYPICAL CLAD TO CLAD JOINTS
 (#3 & #9 CYL LG SEAMS, #9 CYL INTER CIRC SEAMS & #9 CYL TO #9A HEAD)

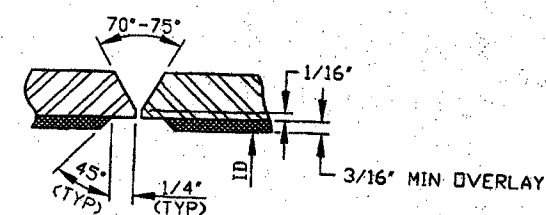


TYPICAL OVERLAY TO CLAD JOINTS
 (#2 FLG & #7 TSHT TO #3 CYL & #8 FLG TO #9 CYL)

△ * 1/8" R MIN, 5/16" R MAX ON FINISHED OVERLAY



TYPICAL NOZZLE INSERTIONS



TYPICAL NOZZLE SEAMS

FABRICATION SEQUENCE:

1. WHERE CLADDING IS STRIPPED BACK FROM THE BASE METAL, VERIFY COMPLETE REMOVAL OF CLADDING BY CHECKING WITH COPPER SULFATE SOLUTION
2. BOTH THE STRIPPED SECTION OF THE BASE METAL AND THE WELD SHALL BE EXAMINED BY THE MAGNETIC PARTICLE METHOD PRIOR TO APPLYING WELD OVERLAY
3. WELD BASE METAL USING PROCEDURES: ASA-4-4.1SiCrMo1 & SMA-4-4.1
4. OVERLAY STRIPPED BACK AREAS WITH 3/16" THK OVERLAY (MIN) IN ACCORDANCE WITH PROCEDURES: ASA-4-90.1 (309L/347) & SMA-4-90.1 (309L/347)
5. CUT HOLES FOR NOZZLES AND STRIP BACK CLAD (SEE NOTE 1)
6. WELD IN NOZZLES AND OVERLAY STRIPPED BACK AREAS WITH 3/16" THK (MIN) OVERLAY
7. CHEMICAL ANALYSIS REQUIRED ON OVERLAY AT A DEPTH OF 1/16" MEASURED AT INTERVALS NOT EXCEEDING 12". VERIFY %C (MAX) = 0.08; %Cr (MIN) = 17.0, (MAX) = 25.0; %Ni (MIN) = 9.0, (MAX) = 12.0; %Cb (Nb) = 10x, MIN TO 1.0 MAX
8. FERRITE CONTENT ANALYSIS REQUIRED ON OVERLAY AT A DEPTH OF 1/16" MEASURED AT INTERVALS NOT EXCEEDING 12". FERRITE CONTENT TO BE FROM 5FN TO 11FN BEFORE PWHT
9. LIQUID PENETRANT INSPECT OVERLAY AFTER PWHT

GEN NOTES:

1. ALL FINISHED OVERLAY, INCLUDING AT STRIPPED BACK AREAS SHALL BE 3/16" THK MIN
2. MIN THK AFTER STRIP BACK:
 CHAN CYL #3=1 15/16"
 SHELL CYL #9=1 9/16"

A - PROCEED FLUOR DANIEL
 AUTHORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR FROM ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT TERMS AND CONDITIONS

ITEM NO.	SUNOCO, INC CR & MD
EMPAC NO.	2E-246C
TITLE	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT	HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO.	A0XF-44S01-01/A0XF 400002
V.O. NO.	
SUN DWG NO.	8-9-1/68003D SHT 057

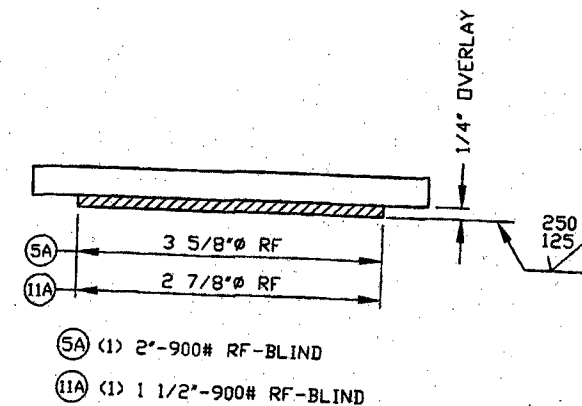
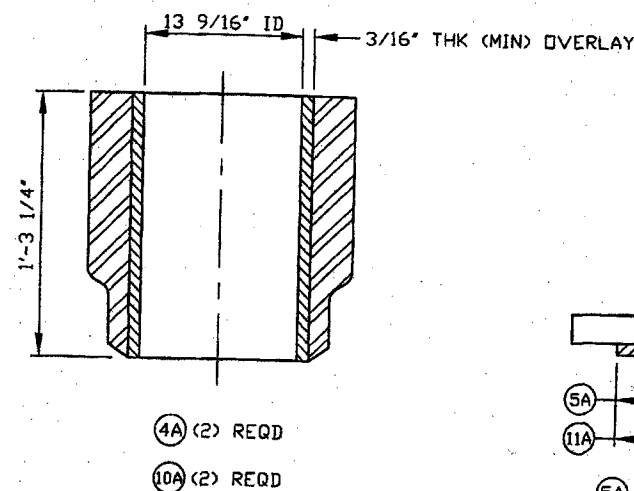
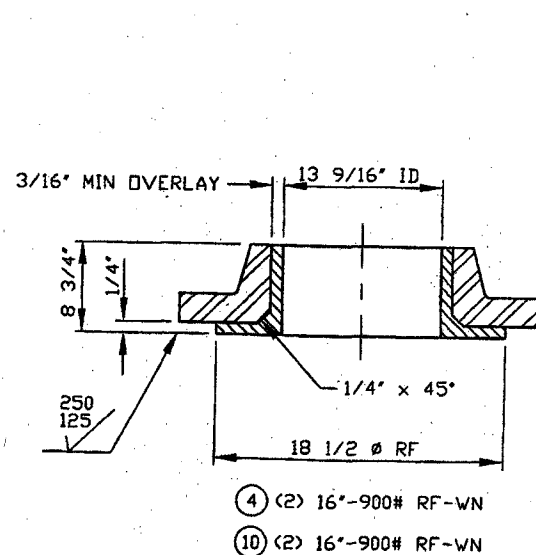
HTE HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

Rev	Date	Description	By
△	11/15/05	REV CLAD TO CLAD JOINTS NOTE, TITLE, NOZ CORNER RADIUS & NOTES 7 & 8 DEL. TCR-PAB WELDING ADDED GEN NOTE 8	JR
△			
△			

OVERLAY DETAILS

DWN	JR	CHK	BM	APP	DG	REV
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05				△

05-5659-F-2B



NOTES:

1. MACHINE FACES OFF AS SHOWN
2. OVERLAY PROCEDURES: ASA-4-90.1 (309L/347) & SMA-4-90.1 (309L/347)
3. CHEMICAL ANALYSIS REQUIRED ON OVERLAY AT A DEPTH OF 1/16\"/>
4. FERRITE CONTENT ANALYSIS REQUIRED ON OVERLAY AT A DEPTH OF 1/16\"/>
5. LIQUID PENETRANT INSPECT OVERLAY PRIOR TO MACHINING FLANGE FACES
6. LIQUID PENETRANT INSPECT OVERLAY AFTER PWHT

Sunoco Ultra Low Sulphur Diesel Project
 Cont: ACPULF Doc No. 44S01-01-024-0006-2
 10/12/2006

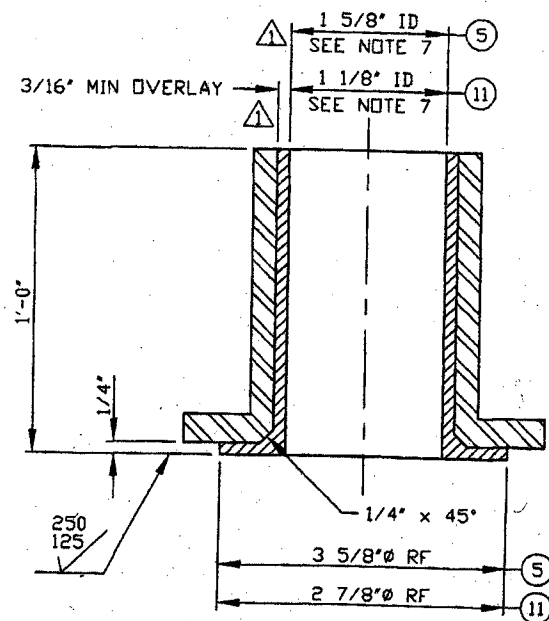
A - PROCEED FLUOR DANIEL
 AUTHORIZATION TO PROCEED DOES NOT RELIEVE
 CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR
 LIABILITY UNDER THE CONTRACT/PURCHASE
 ORDER.

ITEM NO: SUNOCO, INC (R & M)
 25-246C
 EMPAC NO:
 TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
 PLANT: HTU-3 HYDROTREATER UNIT NO. 3
 P.O. NO: AOXF-44S01-01/AXF 400002
 W.D. NO:
 SUN DVG NO: 8-9-1/68003D SHT 058

HTE HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

Rev	Date	Description	By
1	11/15/05	REV NOTES 3, 4 & TITLE	JR
2			
3			

NOZZLE OVERLAY				REV
DWN	JR	CHK	BM	APP
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05	DATE 10-6-05	DATE 10-6-05
05-5659-F-2C				REV



(5) (1) 2"-900# RF-LWN
(11) (1) 1 1/2"-900# RF-LWN

NOTES:

1. MACHINE FACES OFF AS SHOWN
2. OVERLAY BY UNIVERSAL WELD OVERLAYS (UWO) IN ACCORDANCE W/ APPROVED PROCEDURES
3. PARTIAL DATA REPORT REQUIRED
4. CHEMICAL ANALYSIS REQUIRED ON OVERLAY AT A DEPTH OF 1/16" MEASURED AT INTERVALS NOT EXCEEDING 12". VERIFY %C (MAX) = 0.08; %Cr (MIN) = 17.0, (MAX) = 25.0; %Ni (MIN) = 9.0, (MAX) = 12.0; %Cb (Nb) = 10xC, MIN TO 1.0 MAX
5. FERRITE CONTENT ANALYSIS REQUIRED ON OVERLAY AT A DEPTH OF 1/16" MEASURED AT INTERVALS NOT EXCEEDING 12". FERRITE CONTENT TO BE FROM 5FN TO 11FN
6. LIQUID PENETRANT INSPECT OVERLAY AFTER MACHINING (BY UWO) AND AFTER PWHT (BY HTE)
7. FINISHED ID ON 2" NOZZLES SHALL BE 1 1/2" MIN. SHOP TO VERIFY BY PASSING A 1 1/2" STN STL ROD THROUGH NOZZLES
8. A DEHYDROGENATION HEAT TREATMENT (DHT) BY THE ELECTRIC RESISTANCE METHOD IS REQUIRED ON ALL OVERLAY INCLUDING THE INITIAL LAYERS. UNIFORMLY HEAT TO 800°F, SOAK FOR 1/2 HOUR MINIMUM AND SLOW COOL TO ROOM TEMPERATURE UNDER AN INSULATION BLANKET

Sunoco Ultra Low Sulphur Diesel Project 15-122005
Cont. AOXFULF Doc No. 44S01-01-024-0007-2
Exhib. 7a 2E-246C

A - PROCEED FLUOR DANIEL
AUTORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR OF ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACTOR'S OBLIGATIONS

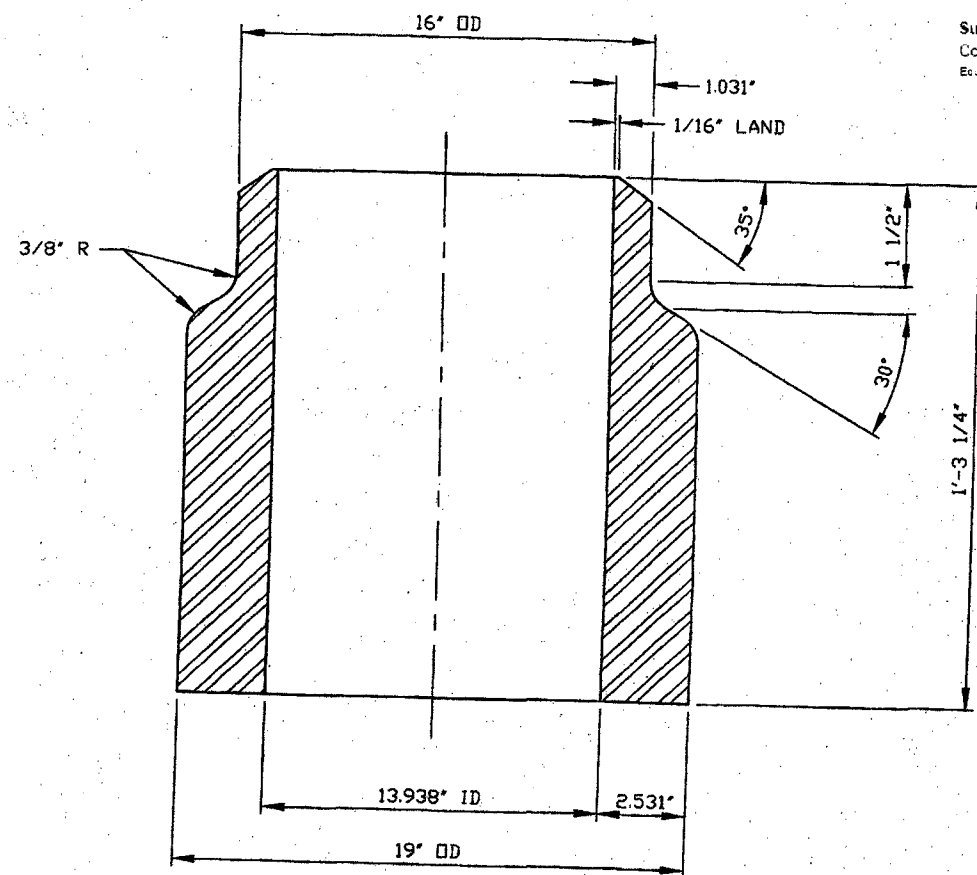
SUNOCO, INC (R & M)
ITEM NO: 2E-246C
EMPAC NO:
TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT: HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO: AOXF-44S01-01/AOXF 400002
V.O. NO:
SUN DWG NO: 8-9-1/68003D SHT 059



HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

Rev	Date	Description	By
1	11/15/05	ADDED NOTES 7 & 8. REV NOTES 2, 4, 5, 6 & TITLE	JR
2			
3			

1 1/2" & 2" NOZZLE OVERLAY			
DWN	JR	CHK	BM
DATE 9/19/05	DATE 10-5-05	APP	DG
05-5659-F-2D			
REV			



Sunoco Ultra Low Sulphur Diesel Project 15/12/2005
 Cont: AOXFULF Doc No. 44S01-01-024-0008.2
 Equip Tag 25-241C

A - PROCEED FLUOR DANIEL
 AUTHORIZATION TO PROCEED DOES NOT RELIEVE
 CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR
 LIABILITY UNDER THE CONTRACT PURCHASE
 ORDER.

SUNOCO, INC (R & M)
 ITEM NO: 2E-246C
 EMPAC NO:
 TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
 PLANT: HTU-3 HYDROTREATER UNIT NO. 3
 P.O. NO: AOXF-44S01-01/AOXF400002
 V.D. NO:
 SUN DWG NO: 8-9-1/68003D SHT 060

MATL: SA-182-F11 CL.2

4A (2) REQD

10A (2) REQD



HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

FORGED NOZZLE NECK

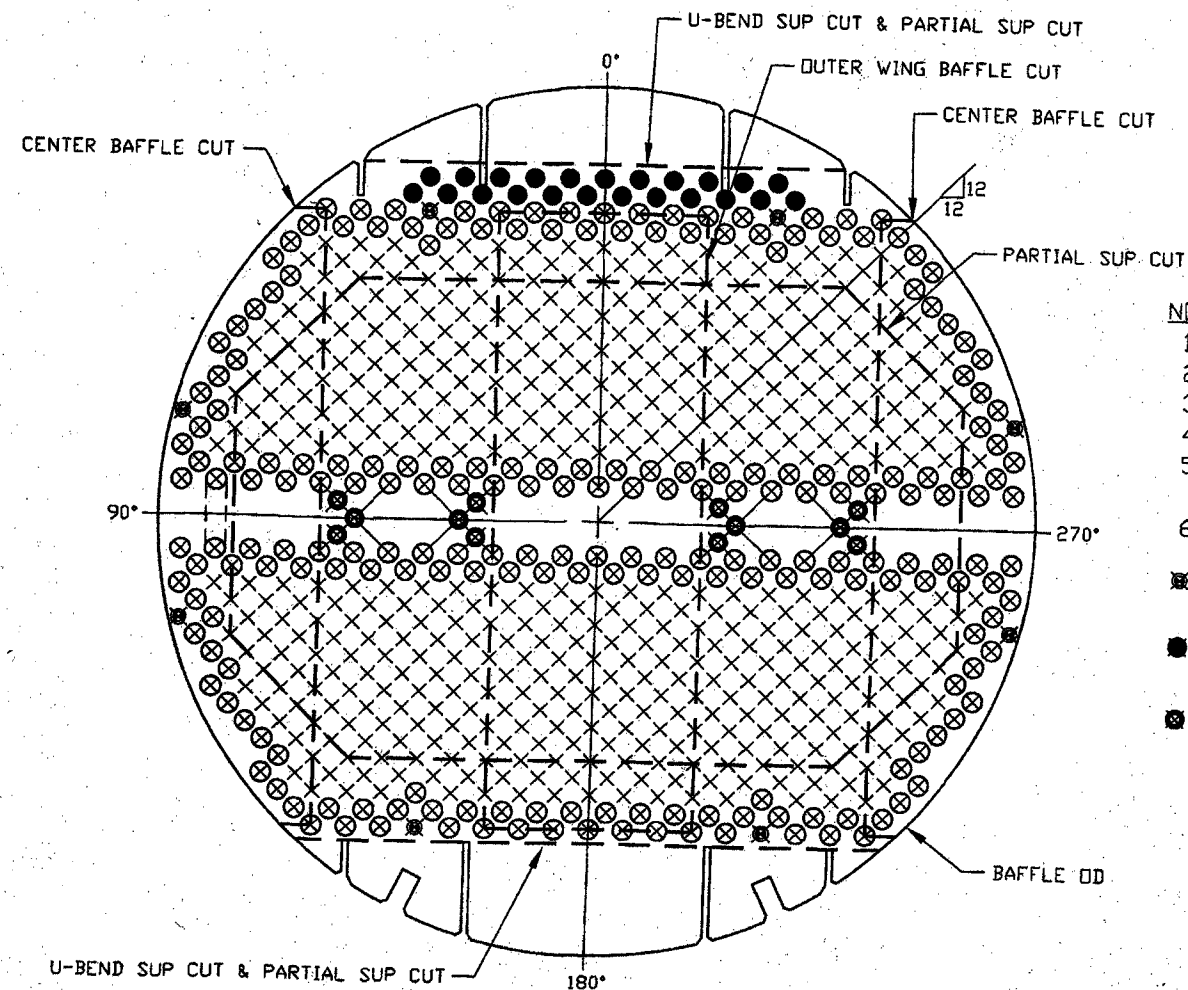
Rev	Date	Description	By
△	11/15/05	REV. TITLE	JR
△			PM
△			
△			

DWN	JR	CHK	BM	APP	DG
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05			

05-5659-F-2E

REV





NO. OF HOLES PER PASS

NOTES

- 1) 367 - 1" O.D. U-TUBES (734 - HOLES)
- 2) TUBE PITCH - 1 1/4" 45°
- 3) 44 1/16" OUTER TUBE LINE
- 4) 2 - PASS
- 5) SEE DWG. -5 FOR TUBE HOLE DRILLING, REAMING & RING GROOVING
- 6) SEE DWG. -4A FOR BEND SCHEDULE

■ DENOTES 8 - 1/2" Ø TIE RODS W/ 3/4" OD SPACERS

■ DENOTES 23 - 1" Ø IMP RODS ON 1 1/4" 45° PITCH

■ DENOTES 12 - 1" Ø DUMMY TUBES (IN BAFFLES ONLY)

ITEM NO.	SUNOCO, INC (R & M)
EMPAC NO.	RE-246C
TITLE	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT	HTU-3 HYDROTREATER UNIT NO. 3
P.D. NO.	ADXF-44S01-01/ADXF400002
W.D. NO.	
SUN DWG. NO.	8-9-1/68003D SHT 062

HTE HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

VIEW LOOKING AT SHELL SIDE
OF #7 TUBESHEET

Rev	Date	Description	By
1	11/15/05	REV TITLE	JR
2			
3			

TUBE LAYOUT

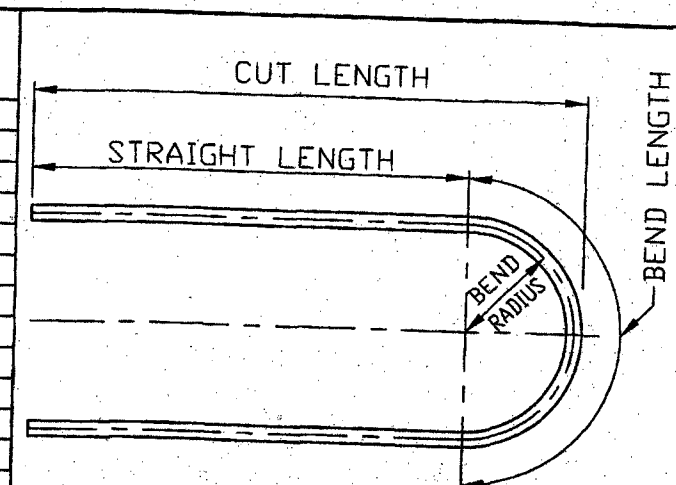
DWN	JR	CHK	BM	APP	DG	05-5659-F-4	REV
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05					

A - PROCEED FLUOR DANIEL
AUTHORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/PURCHASE ORDER

Sunoco Ultra Low Sulphur Diesel Project
Cont: ADXFULF Doc No. 44S01-01-024-0010-2
Ecd: Tg 2E-2490 16/12/2005

ROW NO.	NO. OF TUBES	BEND RADIUS	BEND DIA	BEND LGTH	STR LGTH	CUT LGTH	DEV LGTH
A	25	1 3/4"	3 1/2"	5 1/2"	24'-0"	24'-2 1/4"	48'-5 1/2"
B	24	2 5/8"	5 1/4"	8 1/4"	24'-0"	24'-3 1/8"	48'-8 1/4"
C	25	3 9/16"	7 1/8"	11 3/16"	24'-0"	24'-4 1/16"	48'-11 3/16"
D	24	4 7/16"	8 7/8"	13 15/16"	24'-0"	24'-4 15/16"	49'-1 15/16"
E	23	5 5/16"	10 5/8"	16 11/16"	24'-0"	24'-5 13/16"	49'-4 11/16"
F	24	6 3/16"	12 3/8"	19 7/16"	24'-0"	24'-6 11/16"	49'-7 7/16"
G	23	7 1/16"	14 1/8"	22 3/16"	24'-0"	24'-7 9/16"	49'-10 3/16"
H	22	7 15/16"	15 7/8"	24 15/16"	24'-0"	24'-8 7/16"	50'-0 15/16"
J	23	8 13/16"	17 5/8"	27 11/16"	24'-0"	24'-9 5/16"	50'-3 11/16"
K	22	9 3/4"	19 1/2"	30 5/8"	24'-0"	24'-10 1/4"	50'-6 5/8"
L	21	10 5/8"	21 1/4"	33 3/8"	24'-0"	24'-11 1/8"	50'-9 3/8"
M	20	11 1/2"	23"	36 1/8"	24'-0"	25'-0"	51'-0 1/8"
N	19	12 3/8"	24 3/4"	38 7/8"	24'-0"	25'-0 7/8"	51'-2 7/8"
O	20	13 1/4"	26 1/2"	41 5/8"	24'-0"	25'-1 3/4"	51'-5 5/8"
P	19	14 1/8"	28 1/4"	44 3/8"	24'-0"	25'-2 5/8"	51'-8 3/8"
Q	18	15"	30"	47 1/8"	24'-0"	25'-3 1/2"	51'-11 1/8"
R	15	15 15/16"	31 7/8"	50 1/16"	24'-0"	25'-4 7/16"	52'-2 1/16"

TOTAL: 367



367 - 1" O.D. x 16 BWG (AVG.) U-TUBES

MAT'L - SA-249-TP347

NOTE

MAX OUT OF ROUNDNESS OF U-BENDS NOT TO EXCEED 10%.

STRESS RELIEVE U-BENDS PLUS 1'-0" BEYOND TANGENT AT 1925°F ± 25°F BY ELECTRIC RESISTANCE METHOD, FOLLOWED BY A WATER QUENCH OR RAPID AIR COOL

A - PROCEED FLUOR DANIEL
 AUTHORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT PURCHASE ORDER.

Sunoco Ultra Low Sulphur Diesel Project 15/12/2005
 Cont.: AOXFUL Doc No. 44S01-01-024-0011-2
 Equip: 3g 2B-246C

SUNOCO, INC (R & M)
 ITEM NO.: 2E-246C
 EMPAC NO.:
 TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
 PLANT: HTU-3 HYDROTREATER UNIT NO. 3
 P.O. NO.: AOXF-44S01-01/AXF400002
 V.O. NO.:
 SUN DWG NO.: 8-9-1/68003D SHT 063



HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

Rev	Date	Description	By
1	11/15/05	REV TITLE	JR
2			BN
3			

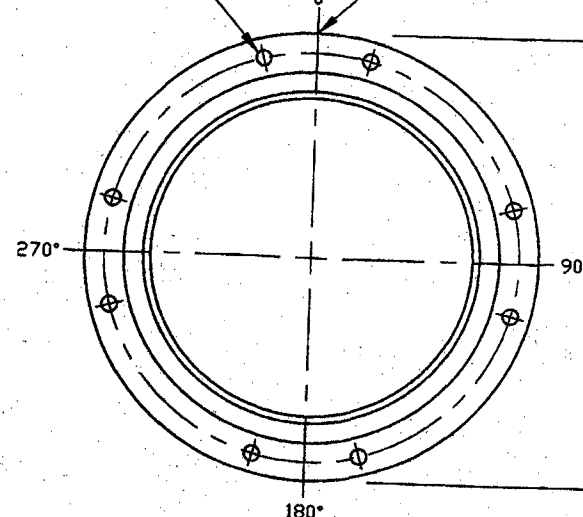
BEND SCHEDULE

DWN	PC	CHK	DG	APP	DG	REV
DATE 6/3/05	DATE 6/16/05	DATE 10-6-05				

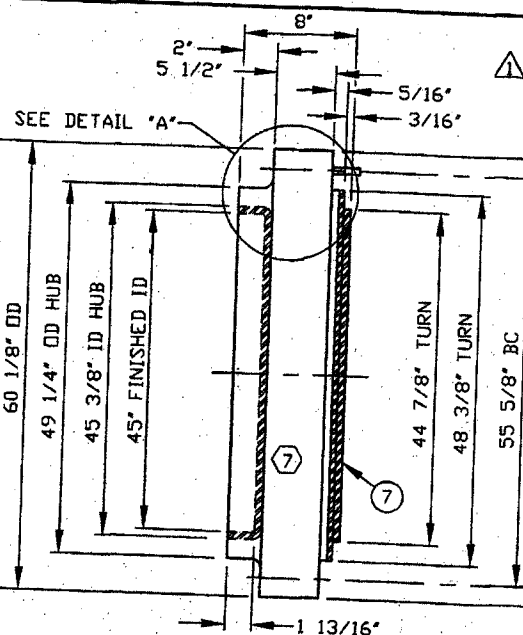
05-5659-F-4A

DRILL (32) 2 1/2" Ø HOLES
TO STRADDLE CENTERLINES
(CHORD = 5.4522")

STAMP "2E-246C"



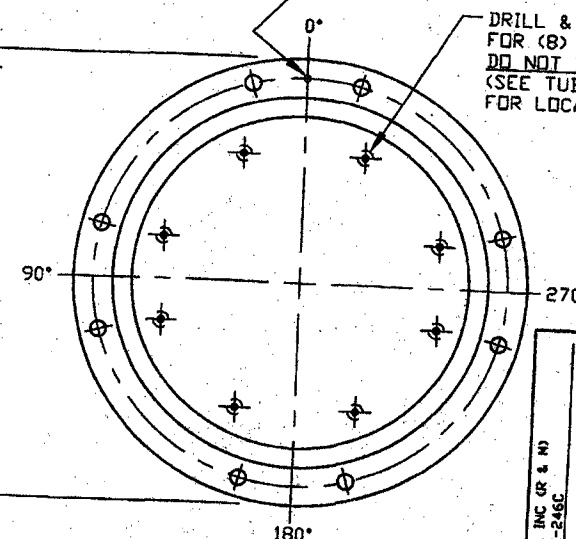
TUBE SIDE



STATIONARY TUBESHEET DETAIL

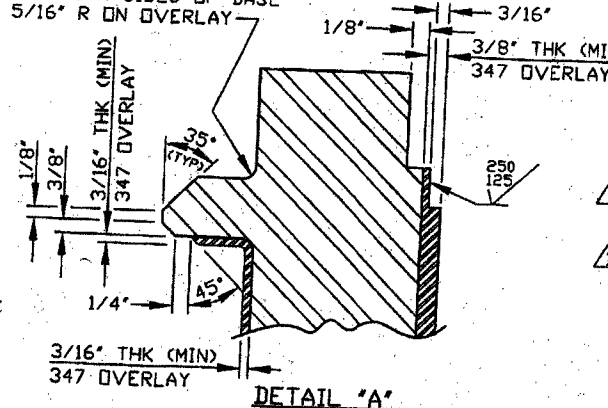
DRILL 1/4" Ø x 3/8" DEEP.
DRIVE FIT DOWEL PIN #63

DRILL & TAP 3/4" DP
FOR (8) 1/2" Ø TIE RODS
DO NOT DRILL THRU
(SEE TUBE LAYOUT DWG
FOR LOCATIONS)



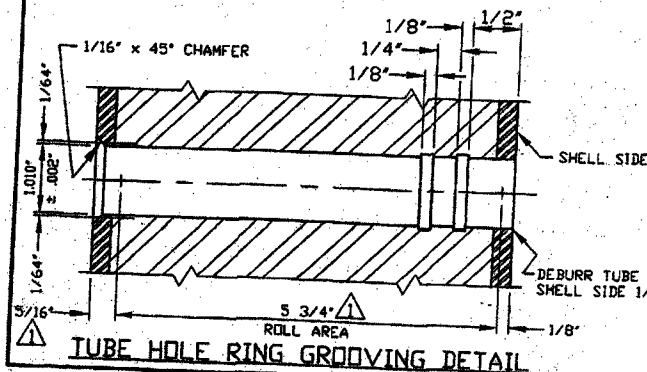
SHELL SIDE

1/2" R (TYP BOTH SIDES OF BASE
METAL), 5/16" R ON OVERLAY



DETAIL 'A'

- NOTES:
1. OVERLAY SHELL SIDE PRIOR TO MACHINING HUB
 2. OVERLAY PROCEDURES: ASA-4-90.1 (309L/347) & SMA-4-90.1 (309L/347)
 3. LIQUID PENETRANT INSPECT OVERLAY BEFORE MACHINING & AFTER PWHT
 4. LIQUID PENETRANT INSPECT HOG-OUT AFTER MACHINING
 5. FINISH MACHINE AFTER PWHT
 6. CHEMICAL ANALYSIS REQUIRED ON OVERLAY AT A DEPTH OF 1/16" MEASURED AT INTERVALS NOT EXCEEDING 12". VERIFY %C (MAX) = 0.08; %C (MIN) = 17.0; (MAX) = 25.0; %Ni (MIN) = 9.0, (MAX) = 12.0; %Cb (Nb) = 10xC, MIN TO 1.0 MAX
 7. FERRITE CONTENT ANALYSIS IS REQUIRED ON OVERLAY AT A DEPTH OF 1/16" MEASURED AT INTERVALS NOT EXCEEDING 12". FERRITE CONTENT TO BE FROM 5FN TO 11FN BEFORE PWHT



TUBE HOLE RING GROOVING DETAIL

HTE HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

TUBESHEET DETAILS

Rev	Date	Description	By
1	11/16/05	REV ROLL AREA, TITLE & NOTES 6 & 7, ADDED DOWEL PIN	JR
2			
3			

DWN	JR	CHK	BN	APP	DG
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05			

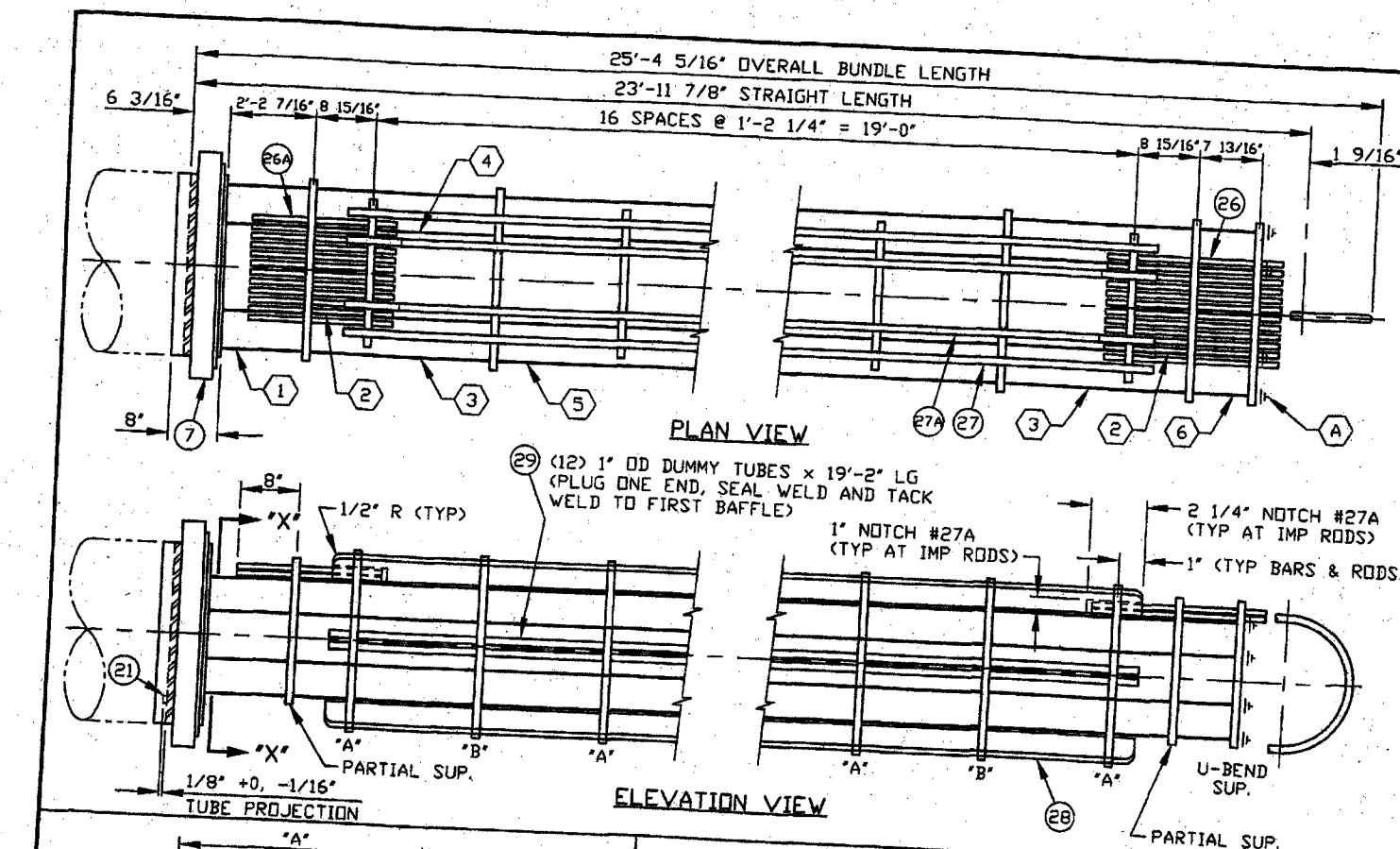
05-5659-F-5

REV

Sunoco Ultra Low Sulphur Diesel Project
Cont: ASXFULF Doc No. 44501-01-024-0012-2
Ecl: 10/2/05

A - PROCEED FLUOR DANIEL
AUTHORIZATION TO PROCEED DOES NOT RELIEVE
CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR
LIABILITY UNDER THIS CONTRACT/PURCHASE
ORDER

SUNOCO, INC OR & NO
2E-246C
ITEM NO:
EMPAC NO:
TITLE: CHARGE/REAFFICIENT EXCHANGER
PLANT: HTU-3 HYDROTREATER UNIT NO. 3
P.D. NO: ADF-44501-01/002/00002
V.D. NO:
SUN DWG NO. 8-9-1/68003D SHT 064



- NOTES**
1. SEE DWG NO. 6A FOR BAFFLE DETAILS
 2. PLUG SHELL FOR DIA AFTER PWHT W/ TWO DISKS, THE SAME DIA AS BAFFLES, SPACED 12\"
 3. SEE DWG NO. 6B FOR TUBE TO TUBESHEET STRENGTH WELDS
 4. SEAL WELD TIE RODS TO TUBESHEET

- (26) (23) 1\"
- (26A) (23) 1\"
- (27) (4) 1 3/4\"
- (27A) (4) 5\"
- (28) (2) 2\"

ITEM NO.: SUNOCO, INC (R & M)
2E-246C

EMPAC NO.:

TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER

PLANT: HTU-3 HYDROTREATER UNIT NO. 3

P.O. NO.: AOXF-44SD1-01/AOXF 400002

V.O. NO.:

SUN DWG NO. 8-9-1/68003D SHT 065

Rev	Date	Description	By
1	11/16/05	REV WELDING NOTES & TITLE	JR



HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

BUNDLE DETAILS

DWN	JR	CHK	BM	APP	DG	05-5659-F-6	REV
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05					

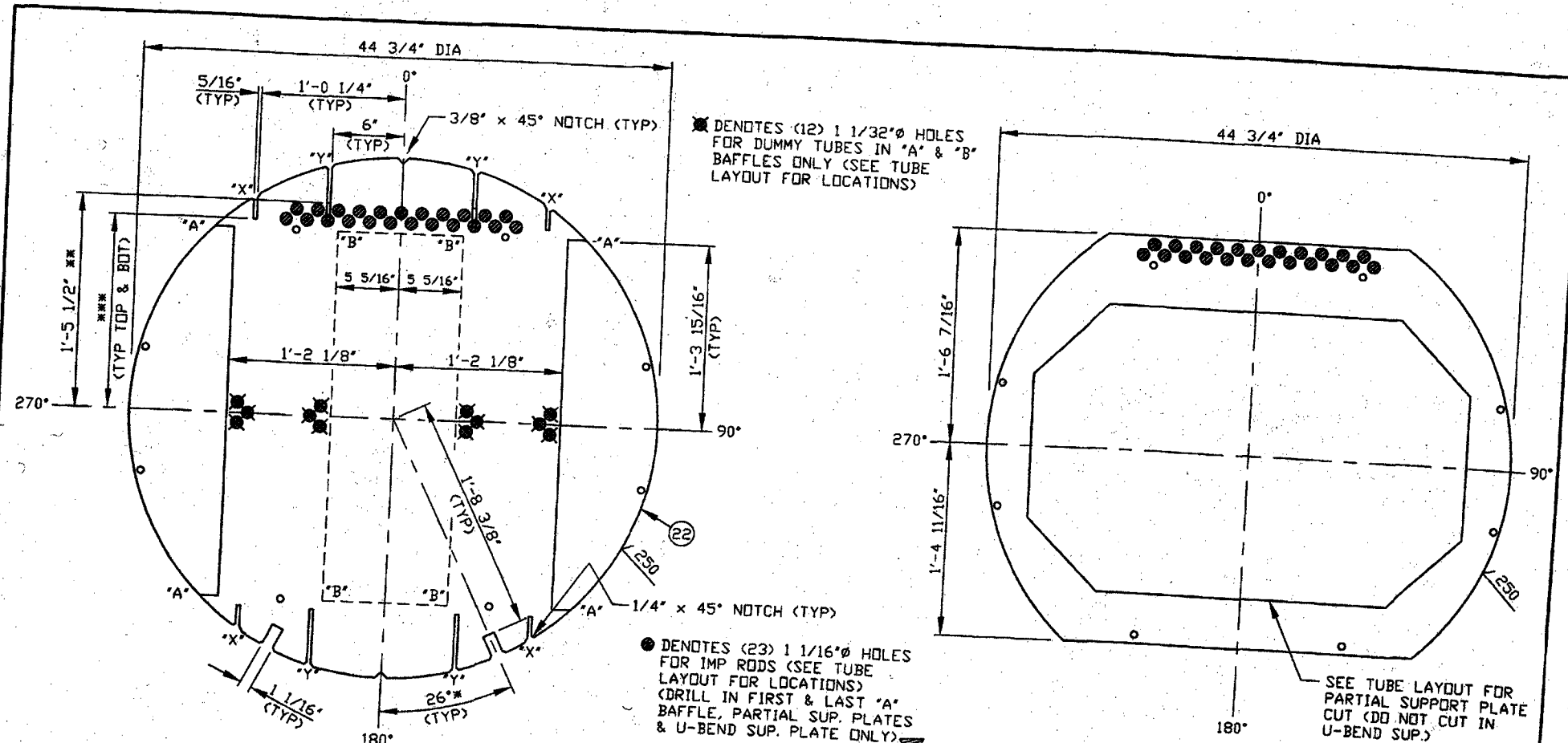
REQD	"A"	REQD	"A"	REQD	"B"	REQD	"B"
8	23'-6 5/8"			8	1	2'-2 1/4"	
				8	2	8 9/16"	
				8	3	1'-10 13/16"	
				64	4	1'-1 7/8"	
				28	5	2'-4 1/8"	
				8	6	7 1/4"	

Sunoco Ultra Low Sulphur Diesel Project
Cont.: AOXFULF
Equip: 2E-246C

Doc No. 44S01-01-024-0013-2

15/12/2005

A - PROCEED FLUOR DANIEL
AUTHORIZATION TO PROCEED DOES NOT RELIEVE
CONTRACTOR OF ITS RESPONSIBILITY OR
LIABILITY UNDER THE CONTRACT TERMS



VIEW "X-X" OF BAFFLES

(9) REQD CUTS "A"
(8) REQD CUTS "B"
3/8" THK

* 10 1/8" STRAP ON OD
** FIRST & LAST "A" BAFFLES ONLY
*** 1'-4 11/16" (SLOTS "X"), 1'-4 3/8" (SLOTS "Y")

NOTES

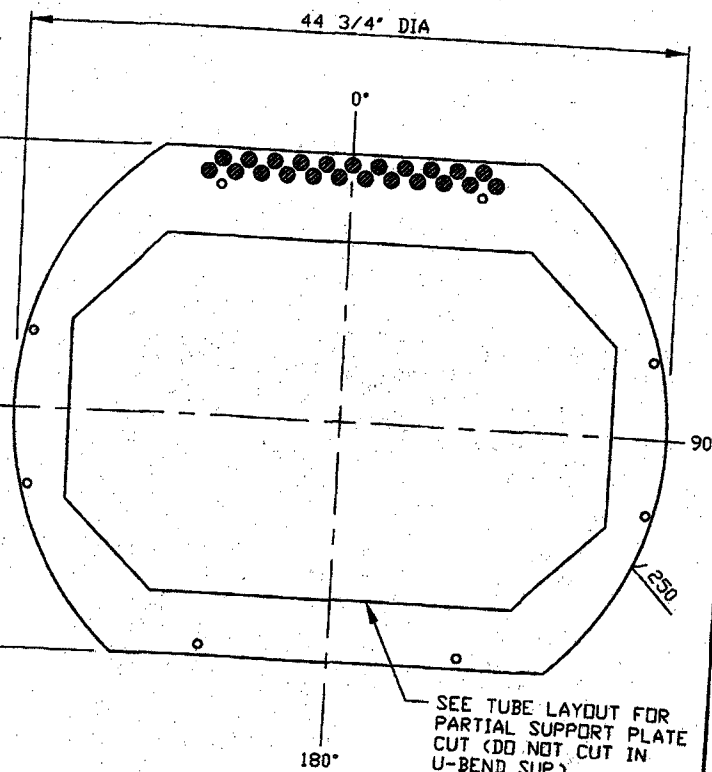
- 1) DRILL TUBE HOLES IN BAFFLES 1 1/32" DIA & DEBURR
- 2) DRILL TIE ROD HOLES 9/16" DIA
- 3) RADIUS ALL CORNERS ON BAFFLE CUTS

● DENOTES (12) 1 1/32" Ø HOLES FOR DUMMY TUBES IN "A" & "B" BAFFLES ONLY (SEE TUBE LAYOUT FOR LOCATIONS)

● DENOTES (23) 1 1/16" Ø HOLES FOR IMP RODS (SEE TUBE LAYOUT FOR LOCATIONS) (DRILL IN FIRST & LAST "A" BAFFLE, PARTIAL SUP. PLATES & U-BEND SUP. PLATE ONLY)

ITEM NO.	SUNOCO, INC (R & M)
EMPAC NO.	2E-246C
TITLE	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT	HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO.	ADXF-44501-01/ADXF400002
V.O. NO.	
SUN DWG NO.	8-9-1/68003D SHT 066

Rev	Date	Description	By
1	11/16/05	VERIFIED SEAL BAR SLOTS & REV TITLE	JR



VIEW "X-X" OF SUP. PLATES

(22) (2) PARTIAL SUP. PLATES REQD @ 3/8" THK
(22A) (1) U-BEND SUP. PLATE REQD @ 3/4" THK

SEE TUBE LAYOUT FOR PARTIAL SUPPORT PLATE CUT (DO NOT CUT IN U-BEND SUP.)



HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

BAFFLE DETAILS

DWN	JR	CHK	BM	APP	DG
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05			

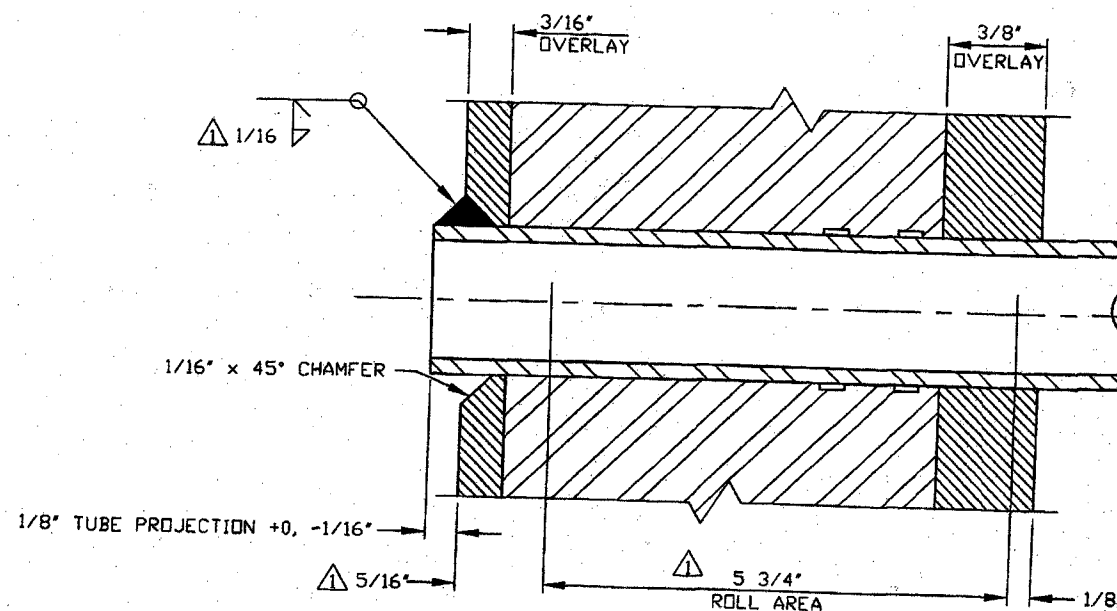
05-5659-F-6A

REV

A - PROCEED FLUOR DANIEL
AUTHORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/PURCHASE ORDER.

Sunoco Ultra Low Sulphur Diesel Project
Cont. ADXFULF
Rev 9/19/05 2E-246C
15/12/2005
Doc No. 44501.01-024.0014 2

STRENGTH WELDED TUBES
SA-249-TP347 TUBES TO 347 STN STL OVERLAID TUBESHEET
USE PROCEDURE: TWS-8.8 (347)



1. CLEAN FACE OF TUBESHEET, ALL TUBE HOLES AND TUBES FOR 1'-0" MIN. FROM END(S) BY STEAM CLEANING WITH HOT WATER ONLY.
2. SET TUBES TO PROJECT 1/8" +0, -1/16" FROM FACE OF TUBESHEET
3. TIG WELD FIRST PASS WITH FILLER METAL
4. LIQUID PENETRANT EXAMINE ALL WELDS AND CLEAN WITH HOT WATER ONLY. REPAIR ANY DEFECTIVE WELDS AND RECHECK.
5. TIG WELD SECOND PASS WITH FILLER METAL
6. REPEAT STEP 4 FOR SECOND PASS
7. LEAK TEST TUBE WELDS WITH SOAP SUDS SOLUTION WHILE MAINTAINING 20 PSI AIR PRESSURE ON SHELL SIDE OF TUBESHEET
8. ROLL TUBES
9. FINAL LIQUID PENETRANT EXAMINE
10. HYDROTEST SHELL SIDE AT 520 PSI MAX

Sunoco Ultra Low Sulphur Diesel Project 15/12/2005
 Cont: AOXFULF Doc No. 44S01-01-024-0015-2
 Equ: 15/12/05 2E-246C

A - PROCEED FLUOR DANIEL
 AUTHORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/PURCHASE ORDER.

SUNOCO, INC (R & D)
 ITEM NO: 2E-246C
 EMPAC NO:
 TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
 PLANT: HTU-3 HYDROTREATER UNIT NO. 3
 P.O. NO: AOXF-44S01-01/AOXF400002
 W.D. NO:
 SUN DWG NO: 8-9-1/68003D SHT 067

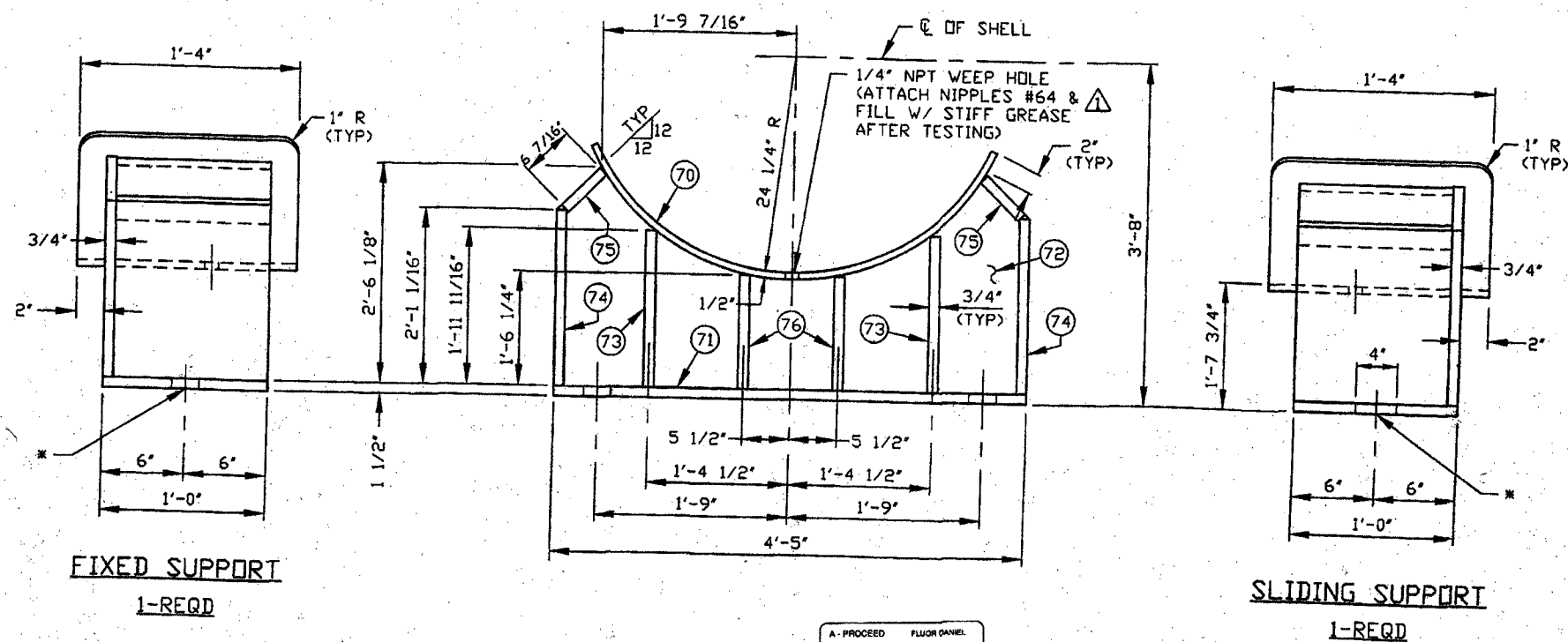
HTE HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

Rev	Date	Description	By
1	11/16/05	REV NOTES, ROLL AREA & TITLE ADDED WELD SIZE	JR
2			
3			

TUBE TO TUBESHEET STRENGTH WELD PROCEDURES					
DWN	JR	CHK	BM	APP	DG
DATE 10/5/05	DATE 10/5/05	DATE 10/5/05	DATE 10/5/05	DATE 10/6/05	DATE 10/6/05

05-5659-F-6B

REV



WELDING PROCEDURES: Δ
 C STL TO C STL SMA-1-1.1
 C STL TO 1 1/4" Cr-1/2Mo SMA-4-1.1

* 1 REQD W/ (3) 2" ϕ HOLES
 * 1 REQD W/ (3) 2" x 4" SLOTS

NOTE: SEAL WELD ALL PARTS BOTH SIDES (WHERE POSSIBLE),
 WITH 3/8" FILLETS UNLESS OTHERWISE NOTED.
 WHERE FILLET WELDS ARE NOT POSSIBLE, SEAL
 WELD WITH BEAD WELDS Δ

A - PROCEED FLUOR DANIEL
 AUTHORIZATION TO PROCEED DOES NOT RELIEVE
 CONTRACTOR OF ITS RESPONSIBILITY OR
 LIABILITY UNDER THE CONTRACT SPECIFICATIONS

ITEM NO.: SUNOCO, INC (R & M)
 2E-246C
 EMPAC NO.:
 TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
 PLANT: HTU-3 HYDROTREATER UNIT NO. 3
 P.O. NO.: AOXF-44S01-01/AOXF400002
 W.D. NO.:
 SUN DWG NO.: 8-9-1/68003D SHT 068

Sunoco Ultra Low Sulphur Diesel Project 15/12/2005
 Cont.: AOXFULF Doc No. 44S01-01-024-0016-2
 EquipTag 2E-246C



HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

SUPPORT DETAIL

Rev	Date	Description	By
Δ	11/16/05	REV WELD NOTE & TITLE, ADDED NIPPLES & WELDING PROCEDURES	JR
Δ			
Δ			

DWN	JR	CHK	BM	APP	DG
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05			

05-5659-F-7

REV Δ

5 1/4" HIGH x
6 1/4" WIDE x
1/16" THK



U W RT 1 HT	CERTIFIED BY HEAT TRANSFER EQUIPMENT CO. TULSA, OKLAHOMA	
	M.A.W.P. TUBES	1450 P.S.I. AT 775 °F
	M.A.W.P. SHELL	1210 P.S.I. AT 810 °F
	MIN. DESIGN TUBES	-10 °F AT 1450 P.S.I.
	METAL TEMP. SHELL	-10 °F AT 1210 P.S.I.
	SERIAL NO.	05-5659-F YEAR 2006
	TEST TUBES	1885 P.S.I. SHELL 1573 P.S.I.
	SURF. SQ. FT.	4473 EFF SIZE 45-288
	ITEM NO.	2E-246C TYPE CEU
	P.O. NO.	A0XF-44S01-01/A0XF400002
SERVICE CHARGE/REACTOR EFFLUENT EXCHANGER		
DESIGNED & BUILT PER SUN 0601, 0801, 0903, 1101,		
API-660; TEMA R; ASME SECT VIII, DIV 1, 2004 ED.		
0-XX-X-13001D-2, FAB & M.04.003		
SHOP TEST: TUBES = 1885 PSI SHELL = 1573 PSI		

63 NAMEPLATE DETAIL

THIS HEAT EXCHANGER WAS BUILT IN
ACCORDANCE WITH THE
TEMA STANDARDS



BY A TUBULAR EXCHANGER
MANUFACTURERS ASSOCIATION, INC.
MEMBER COMPANY

www.tema.org

5 1/4" WIDE x
4 1/2" HIGH x
1/16" THK

63 TEMA NAMEPLATE DETAIL

SEAL WELD
TO BRACKET

6" WIDE x 3" HIGH
x 1/16" THK

63 CUSTOMER BLANK PLATE
(USE BACK SIDE OF AN HTE CAUTION PLATE)

A - PROCEED FLUOR DANIEL
AUTHORIZATION TO PROCEED DOES NOT RELIEVE
CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR
LIABILITY UNDER THE CONTRACT PURCHASE
ORDER.

SEE DWG NO. 8A FOR NAMEPLATE BRACKET & CAUTION PLATE

Sunoco Ultra Low Sulphur Diesel Project 15/12/2005
Cont.: A0XFULF Doc No. 44S01-01-024-0017-2
Equip Tag 2E-246C

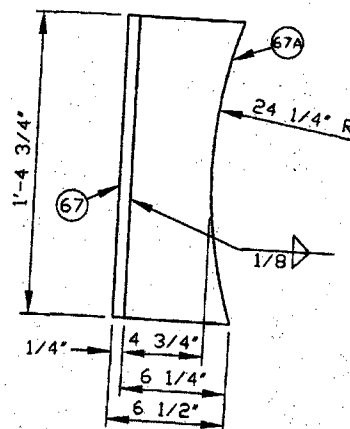
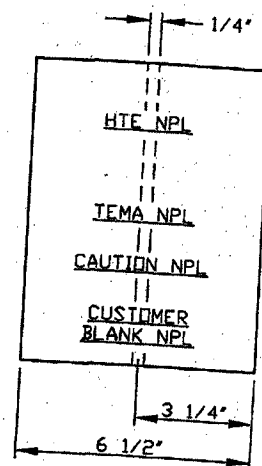
ITEM NO.	SUNOCO, INC (R & M)
EMPAC NO.	2E-246C
TITLE	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT	HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO.	A0XF-44S01-01/A0XF400002
V.O. NO.	
SUN DWG NO.	8-9-1/68003D SHT 069

Rev	Date	Description	By
1	11/16/05	REV SERVICE & TITLE. ADDED DIMENSIONS	JR
2			
3			

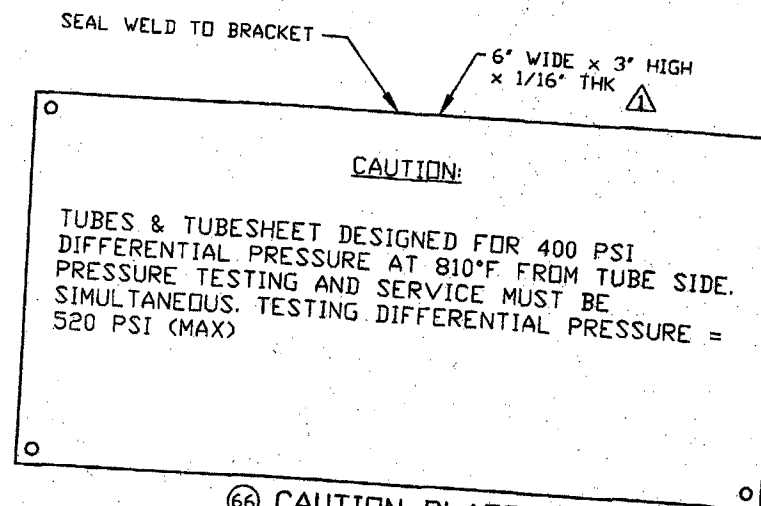
HTE HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

NAMEPLATE DETAIL

DWN	JR	CHK	BM	APP	DG	05-5659-F-8	REV
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05					



NAMEPLATE BRACKET DETAIL



CAUTION PLATE
(USE BACK SIDE OF AN HTE CAUTION PLATE)

SEE DWG NO. 8 FOR NAMEPLATE, TEMA PLATE & CUSTOMER BLANK PLATE

A - PROCEED FLUOR DANIEL
AUTHORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/PURCHASE ORDER.

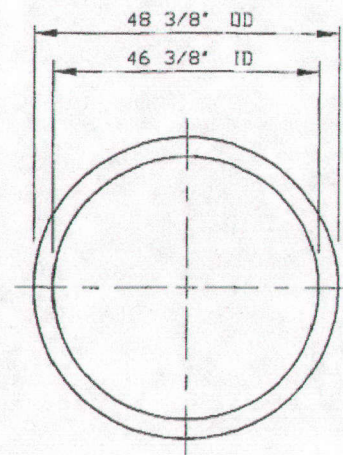
Sunoco Ultra Low Sulphur Diesel Project
Cont.: ACXFULF Doc No. 44S01-01-024.0018-2
Equip Tag: 2E-246C

10/12/2005

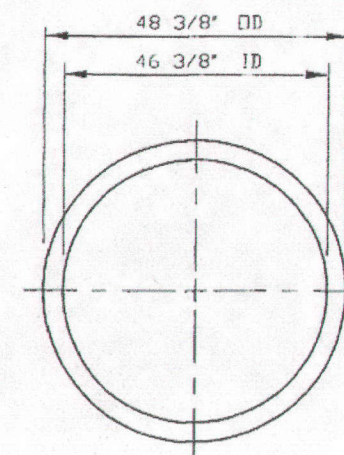
SUNOCO, INC (R & M)
ITEM NO.: 2E-246C
EMPAC NO.:
TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT: HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO.: AOXF-44S01-01/AOXF 400002
W.D. NO.:
SUN DWG NO.: 8-9-1/68003D SHT 070

Rev	Date	Description	By
1	11/16/05	ADDED CAUTION PL DIMS & REV TITLE	JR
2			BM
3			

		HEAT TRANSFER EQUIPMENT CO.	
		Tulsa, Oklahoma	
NAMEPLATE DETAIL			
DWN	JR	CHK	BM
DATE 9/19/05	DATE 10-5-05	DATE 10-6-05	DATE 10-6-05
05-5659-F-8A			REV



CHANNEL COVER GASKET
 ⚠ 1/8" THK 347 STN STL FLEXITALLIC
 FLEXPOR W/ THERMICULITE FACING
 3-REQD



SHELL GASKET
 ⚠ 1/8" THK 347 STN STL FLEXITALLIC
 FLEXPOR W/ THERMICULITE FACING
 3-REQD

ITEM NO:	SUNOCO, INC (R & M)
EMPAC NO:	2E-246C
TITLE:	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT:	HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO:	A0XF-44S01-01/A0XF400002
W.D. NO:	
SUN DWG NO:	8-9-1/68003D SHT 071

NOTES:

- 3-SETS OF GASKETS REQD. USE ONE SET IN EXCHANGER. BOX REMAINDER AND MARK WITH P.O. NO. AND ITEM NO., SHIP WITH UNIT
- SHELL GASKET MATERIAL TO BE SUITABLE FOR 810°F. CHANNEL COVER GASKET MATERIAL TO BE SUITABLE FOR 775°F
- 100% WELD INSPECTION WITH A DEPTH GAUGE IS REQD TO ENSURE FLATNESS IS WITHIN MANUFACTURER'S TOLERANCES



HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

Rev	Date	Description	By	GASKET DETAILS							
⚠	11/16/05	REV TITLE	JR BM								
⚠	2/8/06	REV GASKETS	JR BM	DWN	JR	CHK	BM	APP	BG	05-5659-F-9	R
⚠				DATE 9/19/05	DATE 10-5-05	DATE 10-6-05					

A - PROCEED **FLUOR**

8:08 pm, 3/16/04

AUTHORIZATION TO PROCEED DOES NOT RELIEVE
 CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR
 LIABILITY UNDER THE CONTRACT/PURCHASEORDER

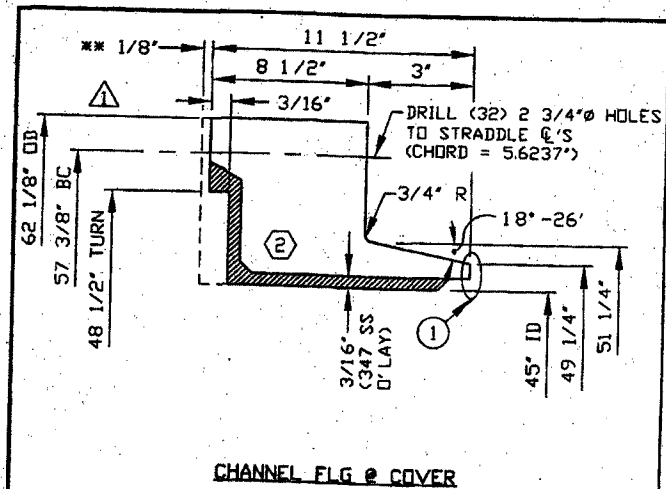
Sunoco ULSD Project

Cont.: A0XFULF

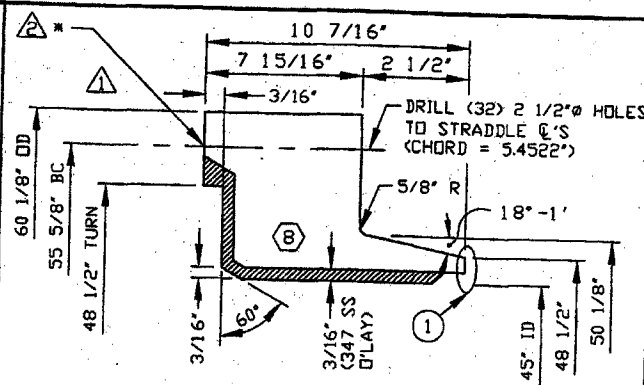
Equip/Tag: 2E-246C

Doc No. 44S01-01-024-0019-3

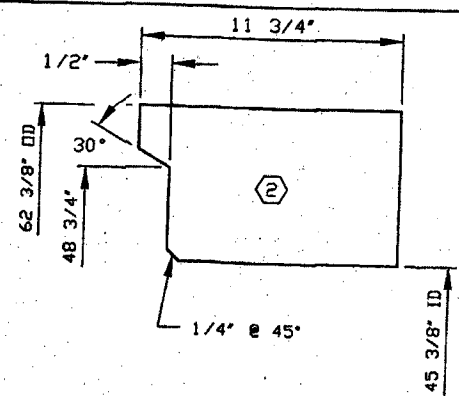
10/02/2006



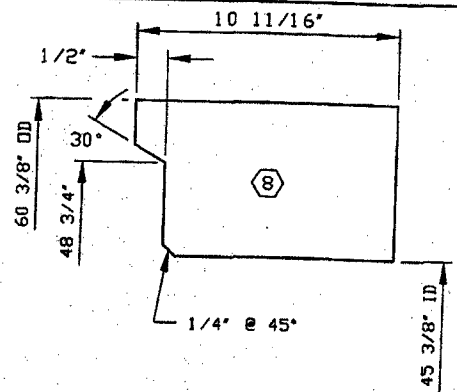
CHANNEL FLG @ COVER



* DRILL 5/16" Ø x 3/8" DEEP AT 0° VERTICAL Q FOR DOWEL PIN
SHELL FLG @ TUBESHEET

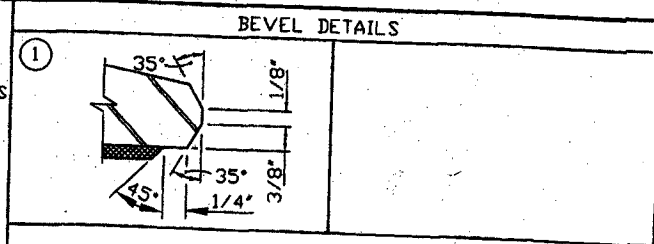


CHANNEL FLG @ COVER
PRE-MACHINE DETAIL



SHELL FLG @ TUBESHEET
PRE-MACHINE DETAIL

- NOTES:
- 1) ONE EACH REQUIRED.
 - 2) GASKET CONTACT SURFACES TO BE 125-250 AARH
 - 3) ALL OTHER SURFACES TO BE 280 AARH
 - 4) ** ALLOW 1/8" EXTRA THICKNESS AT FACE OF FLANGE FOR FINISH MACHINE OF FACE AFTER PWHT



A - PROCEED FLUOR DANIEL
AUTHORIZATION TO PROCEED DOES NOT RELIEVE CONTRACTOR VENDOR OF ITS RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/PURCHASE ORDER.

Sunoco Ultra Low Sulphur Diesel Project
Cont: AOXF-ULF Doc No. 44S01-01-024-0020-2
Equip Tag 2E-246C

ITEM NO:	SUNOCO, INC (R & H)
EMPAC NO:	2E-246C
TITLE:	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT:	HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO:	AOXF-44S01-01/AOXF 400002
V.O. NO:	
SUN DWG NO:	8-9-1/68003D SHT 072

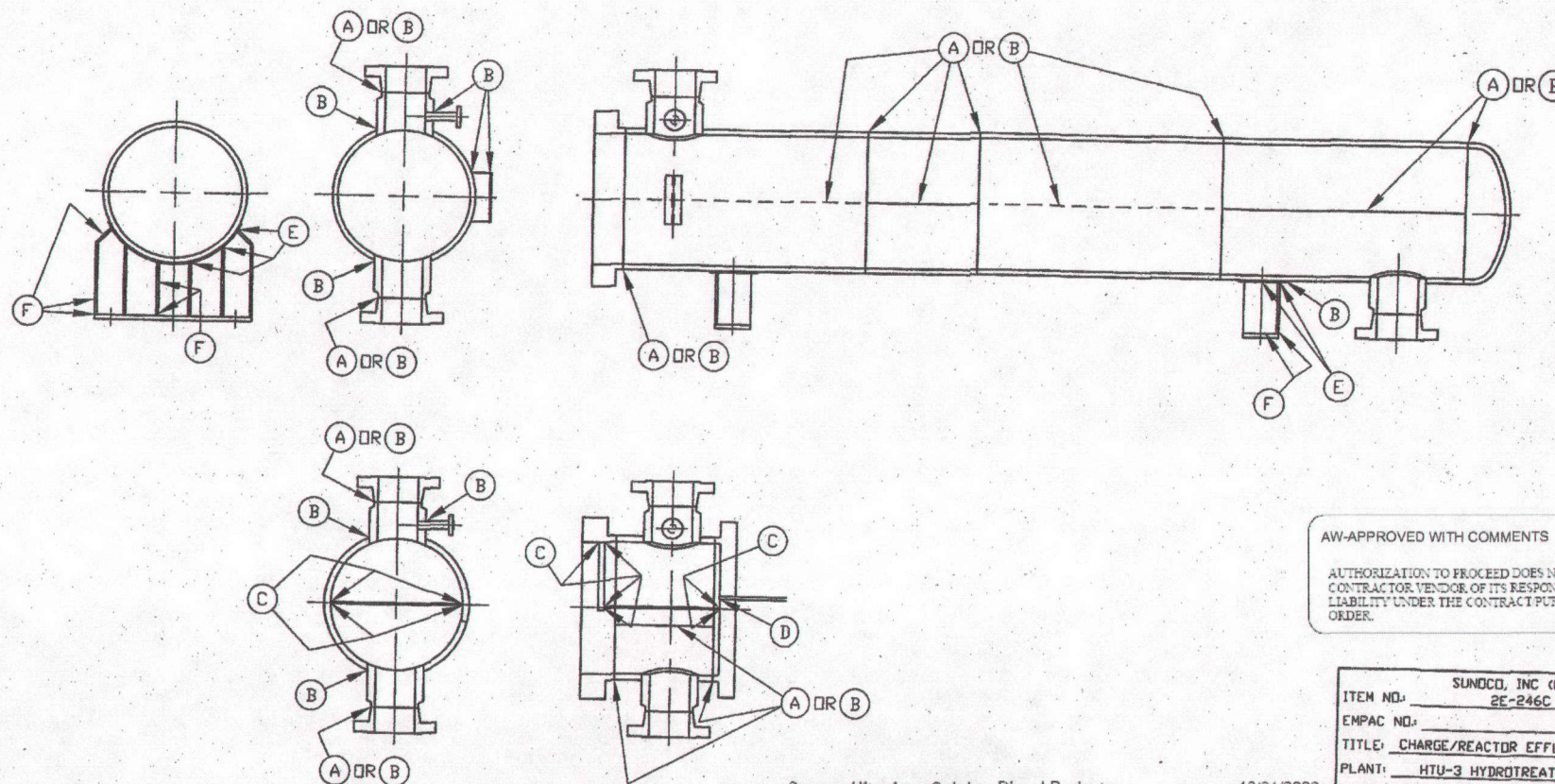
HTE HEAT TRANSFER EQUIPMENT CO.
Tulsa, Oklahoma

Rev	Date	Description	By
1	10/4/05	DEL 5/16" Ø HOLES	JR BM
2	11/16/05	REV TITLE, ADDED DOWEL PIN HOLE IN #8 FLG	JR BM

FLANGE DETAILS

DWN. PC	CK. DG	APP. DG	REV.
DATE 6/3/05	DATE 6/16/05	DATE 10-6-05	

05-5659-F-10



AW-APPROVED WITH COMMENTS FLUOR
 AUTHORIZATION TO PROCEED DOES NOT RELIEVE
 CONTRACTOR/VENDOR OF ITS RESPONSIBILITY OR
 LIABILITY UNDER THE CONTRACT PURCHASE
 ORDER.

ITEM NO.: SUNOCO, INC (R & M)
 2E-246C
 EMPAC NO.:
 TITLE: CHARGE/REACTOR EFFLUENT EXCHANGER
 PLANT: HTU-3 HYDROTREATER UNIT NO. 3
 P.O. NO.: AOXF-44S01-01/AOXF400002
 V.O. NO.:
 SUN DWG NO. 8-9-1/68003D SHT 082

Sunoco Ultra Low Sulphur Diesel Project
 Cont.: AOXFULF Doc No. 44S01-01-024-0027-2
 Equip Tag: 2E-246C

12/01/2006

NOTE: ALL ROOT PASSES ON BUTT WELDS & NOZ INSERTIONS SHALL BE BACK GOUGED & RE-WELDED
 OVERLAY WELDING PROCEDURES: ASA-4-90.1 (309L/347) & SMA-4-90.1 (309L/347)

- | | |
|----------------------|-------------------|
| (A) ASA-4-4.1SiCrMo1 | (D) TWS-8.8 (347) |
| (B) SMA-4-4.1 | (E) SMA-4-1.1 |
| (C) SMA-8-8.0 (347) | (F) SMA-1-1.1 |

Rev	Date	Description	By
1	11/22/05	NEW WELD MAP	JR BM
2	1/3/06	VERIFIED PROCEDURES HAVE BEEN OR WILL BE SUBMITTED	JR BM
3			



HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

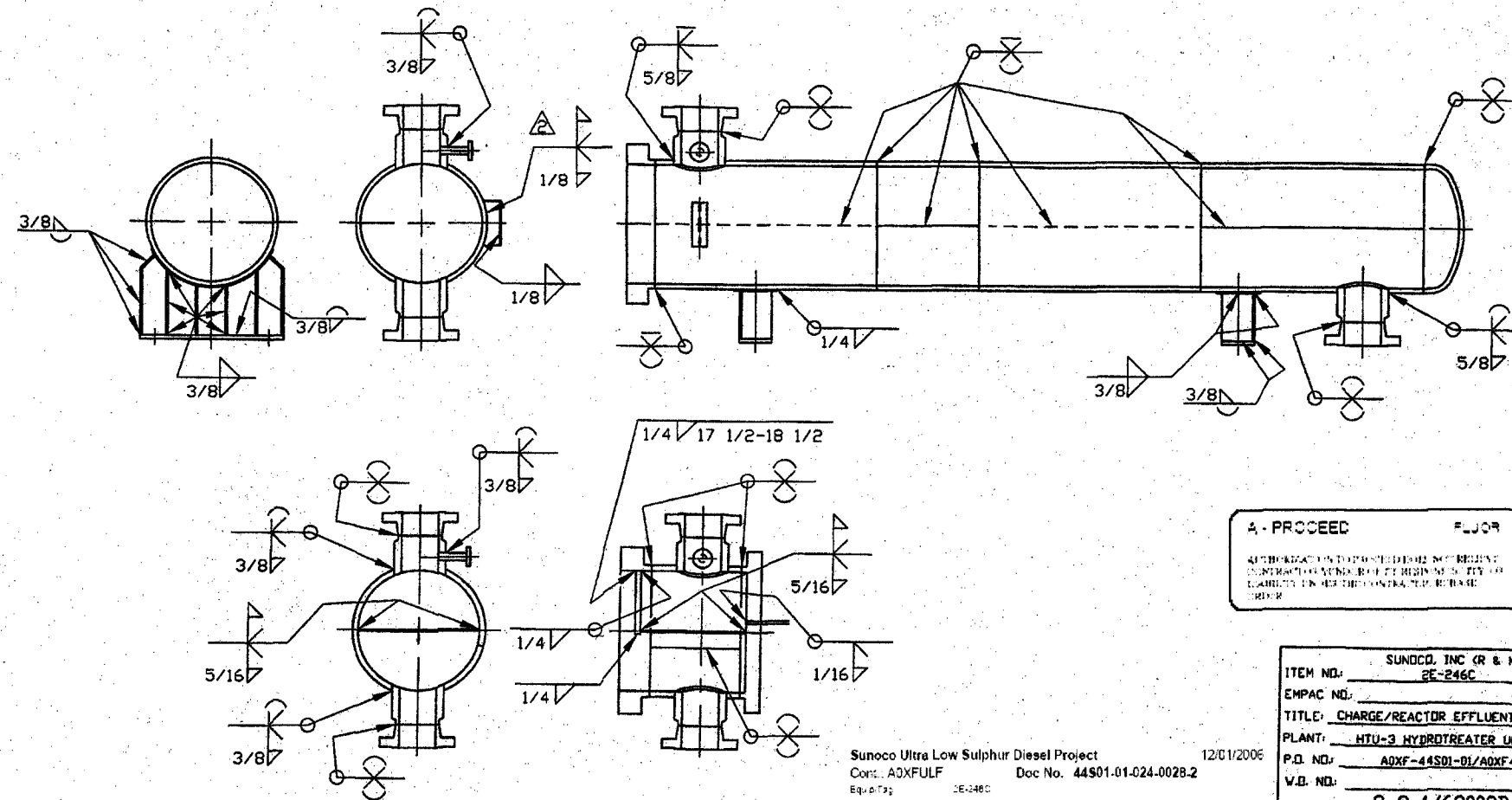
WELD MAP SHT 1 OF 2

DWN	JR	CHK	BM	APP	DG
DATE 11/22/05	DATE 11-22-05	DATE 11-22-05			

05-5659-F-16

REV

APPROVAL OF THIS WELD MAP DOES NOT CONSTITUTE OR IMPLY APPROVAL OF THE WPS'S LISTED ON THE WELD MAP



4 - PROCEED FLJOR
 APPROVED FOR CONSTRUCTION BY THE PROJECT MANAGER
 CONTRACTOR'S RELEASE OF LIABILITY FOR THE CONTRACTOR'S RELEASE

ITEM NO:	SUNOCO, INC (R & M)
EMPAC NO:	2E-246C
TITLE:	CHARGE/REACTOR EFFLUENT EXCHANGER
PLANT:	HTU-3 HYDROTREATER UNIT NO. 3
P.O. NO:	ADXF-44S01-01/ADXF400002
V.B. NO:	
SUN DWG NO:	8-9-1/68003D SHT 083

Sunoco Ultra Low Sulphur Diesel Project
 Cont. ADXFULF Doc No. 44S01-01-024-0028-2
 Equip Tag: 2E-246C 12/01/2006

NOTE: ALL ROOT PASSES ON BUTT WELDS & NOZ INSERTIONS SHALL BE BACK GOUNDED & RE-WELDED

HTE HEAT TRANSFER EQUIPMENT CO.
 Tulsa, Oklahoma

Rev	Date	Description	By	DATE 11/22/05	CHK	BM	APP	DG	REV
1	11/22/05	NEW WELD MAP	JR						
2	12/9/05	REV NAMEPLATE BRACKET WELD	JR						
3									

WELD MAP SHT 2 OF 2

05-5659-F-17