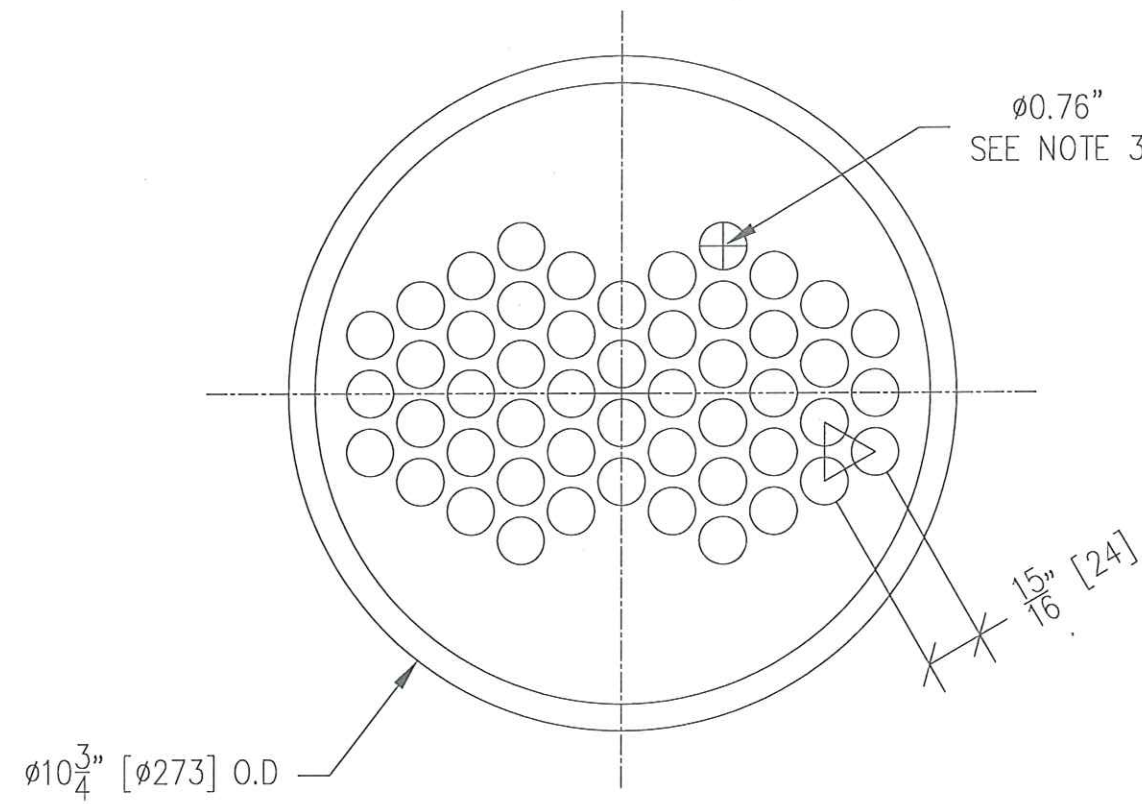
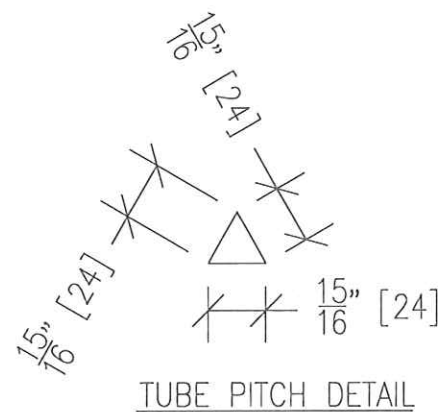
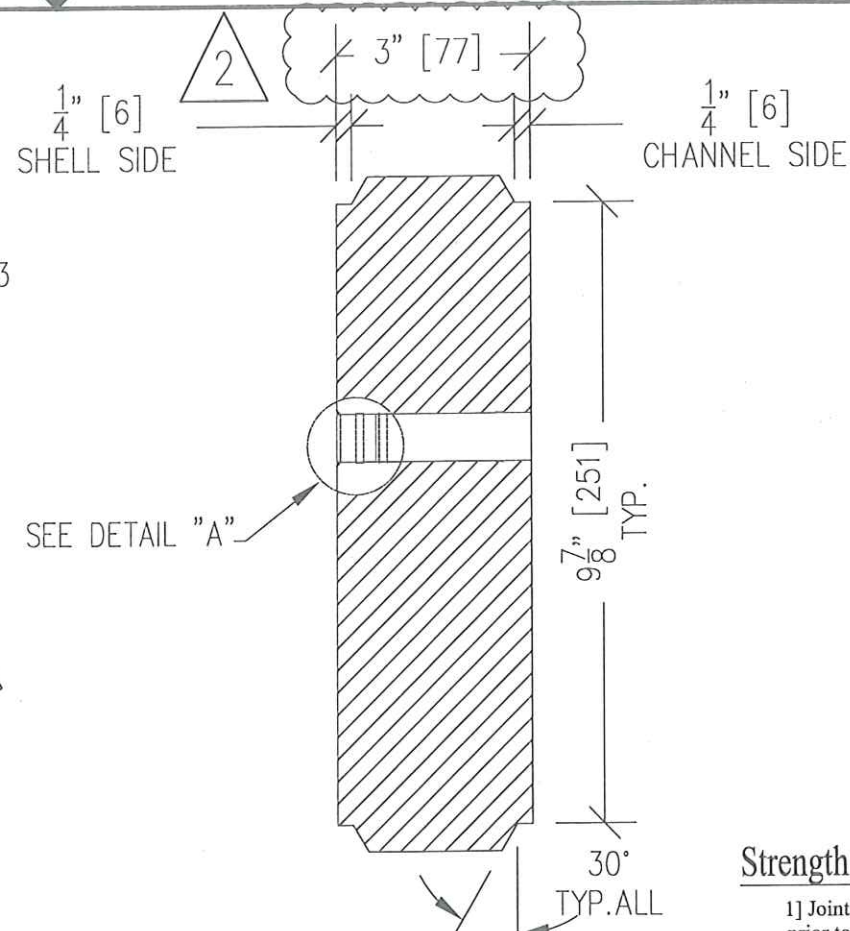




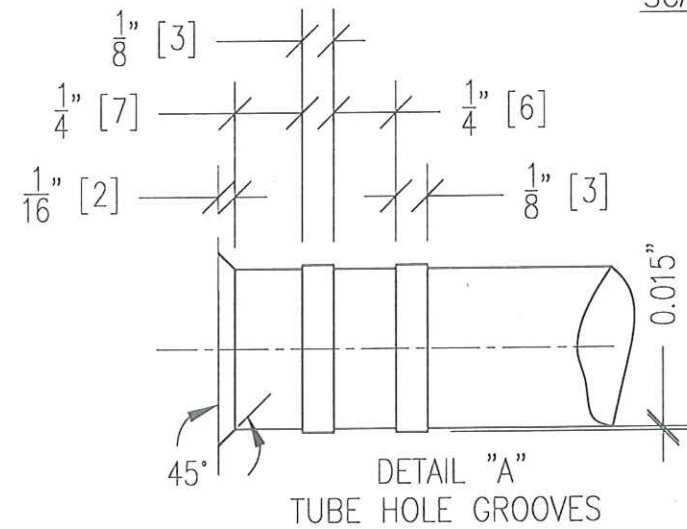
SCALE 3" = 1'-0"



TUBE PITCH DETAIL



SCALE 3" = 1'-0"



DETAIL "A"
TUBE HOLE GROOVES

Strength Weld Notes:

- 1] Joint components shall be meticulously cleaned prior to welding.
- 2] Each tube end shall be welded individually without stopping.
- 3] Preheat tubesheet to a minimum of 150°F (65°C) for CS during welding.
- 4] All tube joint welds shall be proven using a soap test (with minimum 15 psi air) prior to rolling.
- 5] Do all tube rolling after completion of welding.
- 6] The tubes shall be rolled for the entire tubesheet thickness. Stop shall be used on tube roller that assures expansion is within limits given.
- 7] Tube to tubesheet joints shall be welded with a minimum of two passes. The first pass shall be 100% examined by dye penetrant or magnetic particle method. Remaining passes shall be welded without interruption.
- 8] A helium leak test shall be performed in accordance with ASME code, Section v, article 10. The shell side shall be pressurized with helium while the exchanger is inclined to provide a good flow of helium to a single collection point on the tubeside. Any leakage in excess of 1 X 10⁻⁴ std. cc/sec warrants repair.
- 9] The tubes shall be rolled after completion of the leak test. The final welds shall be 100% dye penetrant or mag. particle examined.

General Notes:

- 1] Material: SB-407 Alloy 800H (UNS N08810)
- 2] Surface Finish: OD to be machined to 250-500 Ra.
- 3] Tube Hole Detail: Drill, Double Groove & Ream 50 tube holes as shown.
 Tube Hole 0.76" ±0.002" Dia.
 Chamfer Shell side 1/32" x 45° to help tube insertion.
 Chamfer Tube side 1/16" x 45°.
 Provide (2) 1/8" wide x 0.015" deep grooves 1/4" apart as shown.
- 4] Tubesheet dimensions and details must meet TEMA para. RCB 7.4

FILE LOCATION:

G:\

CERTIFIED FOR CONSTRUCTION

DRAWN BY:	DATE	CHK'D BY:	DATE	APP'D BY:	DATE
ZL	04/23/09	TC	04/23/09	JW	04/23/09

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TOLERANCE LINEAR ± 1/8"
--	----------------------------

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Texas Systems & Controls, Inc.

24310 Tomball Parkway, [SH 249], Tomball, Texas 77375
 Phone: (281) 351-5999 Fax: (281) 351-5996
 www.texascontrols.com

DRAWING TITLE

REAR TUBE SHEET
 E-240B EXCHANGER

REFERENCE DRAWINGS

SCALE
 NTS

SHEET SIZE
 A

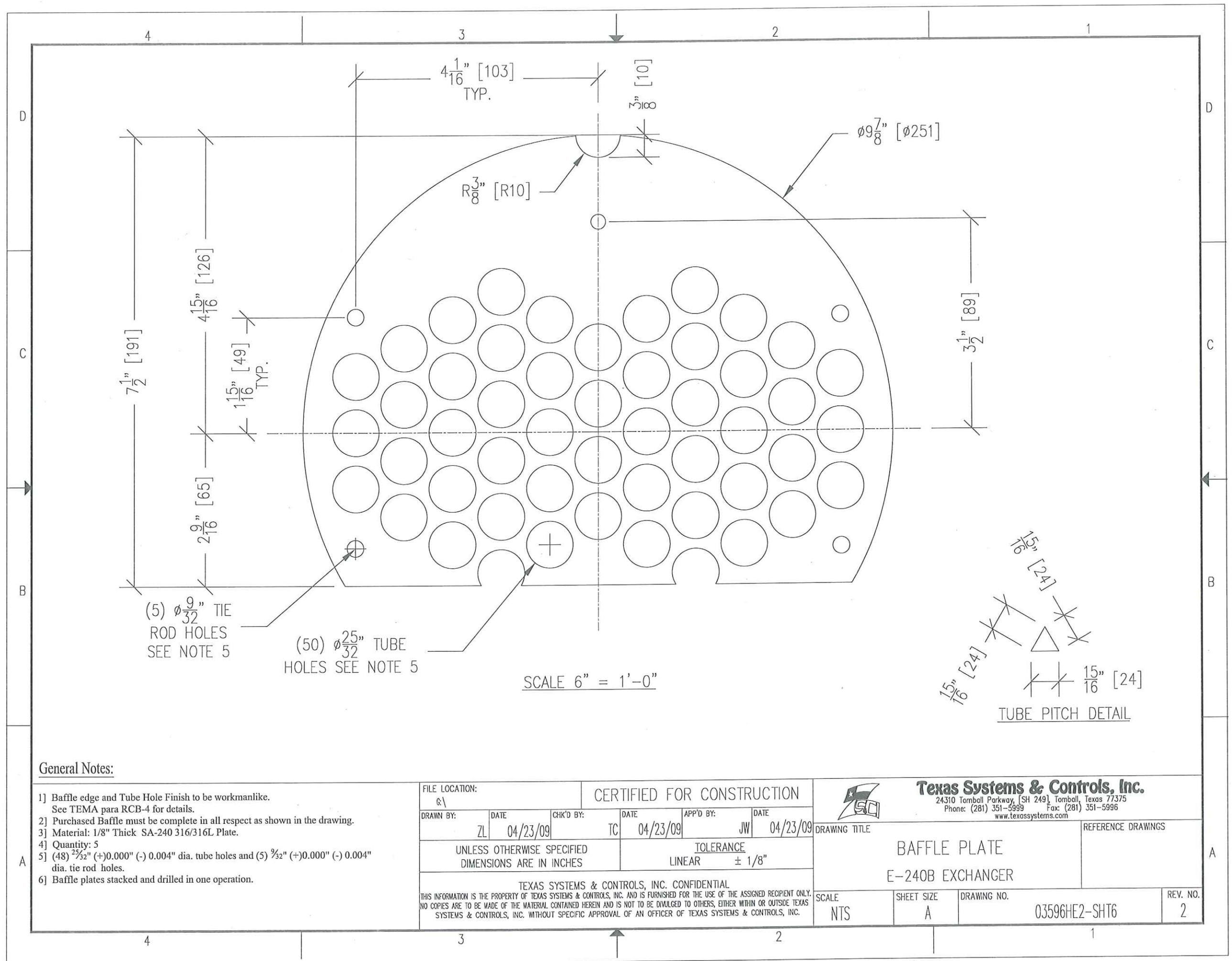
DRAWING NO.

03596HE2-SHT5

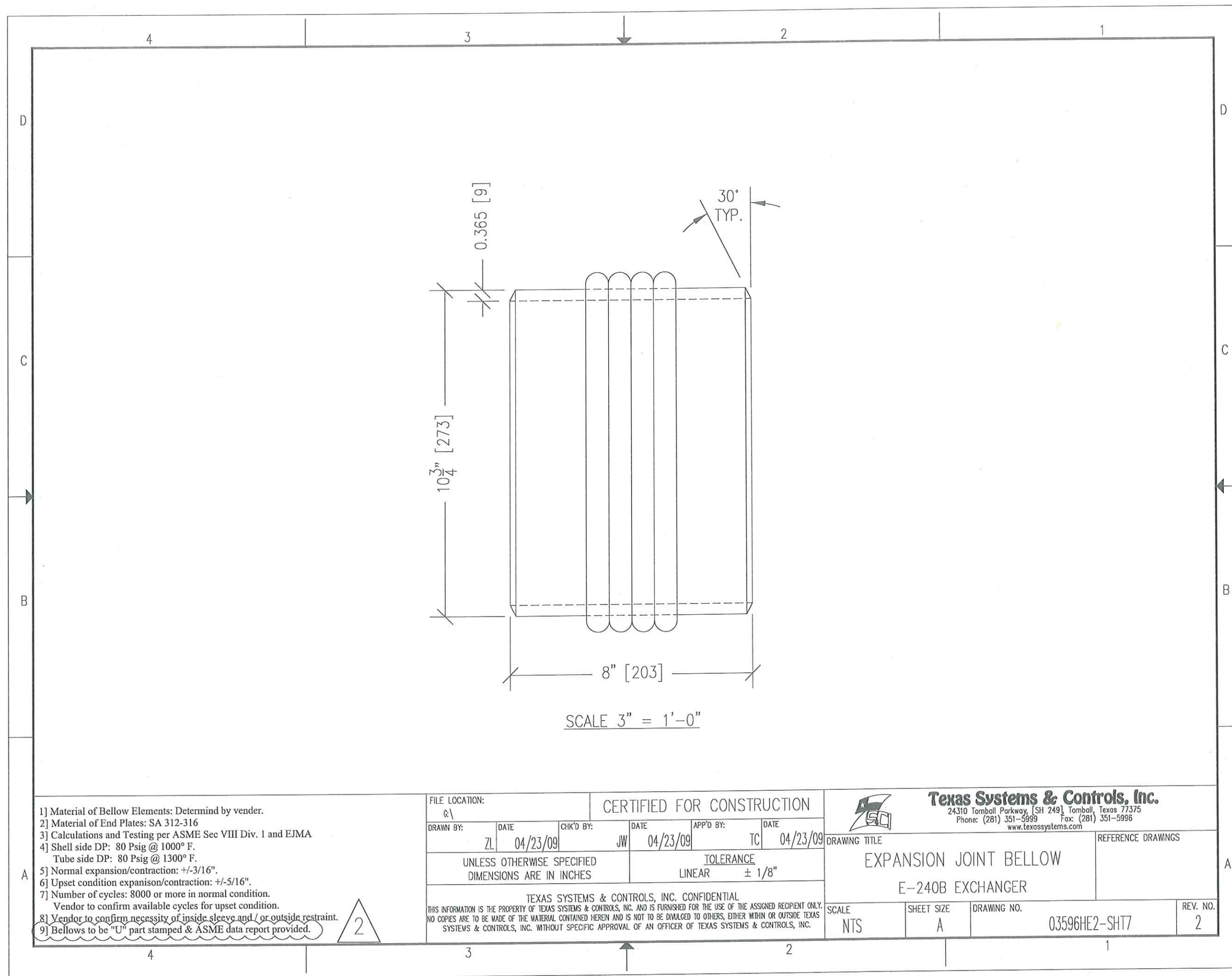
REV. NO.

2

#110545
 #110546



#110545
#110546



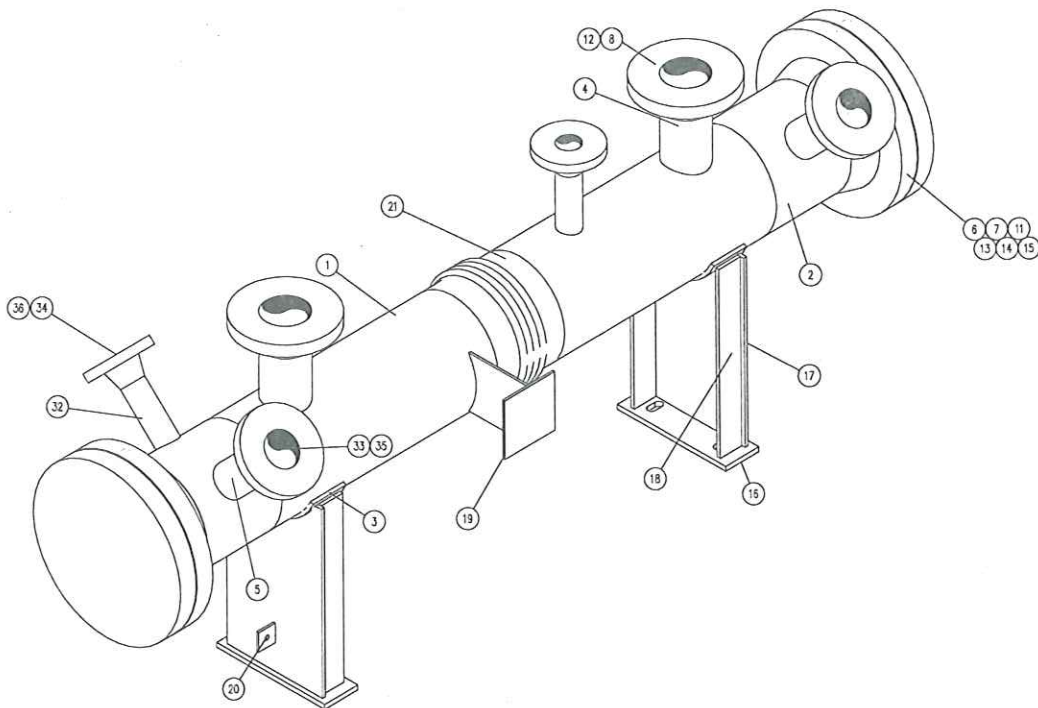
- 1] Material of Bellow Elements: Determined by vender.
- 2] Material of End Plates: SA 312-316
- 3] Calculations and Testing per ASME Sec VIII Div. 1 and EJMA
- 4] Shell side DP: 80 Psig @ 1000° F.
Tube side DP: 80 Psig @ 1300° F.
- 5] Normal expansion/contraction: +/-3/16".
- 6] Upset condition expansion/contraction: +/-5/16".
- 7] Number of cycles: 8000 or more in normal condition.
Vendor to confirm available cycles for upset condition.
- 8] Vendor to confirm necessity of inside sleeve and/or outside restraint.
- 9] Bellows to be "U" part stamped & ASME data report provided.

2

FILE LOCATION: G:\		CERTIFIED FOR CONSTRUCTION			
DRAWN BY: ZL	DATE 04/23/09	CHK'D BY: JW	DATE 04/23/09	APP'D BY: TC	DATE 04/23/09
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			TOLERANCE LINEAR ± 1/8"		
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 Texas Systems & Controls, Inc. 24310 Tomball Parkway, [SH 249], Tomball, Texas 77375 Phone: (281) 351-5999 Fax: (281) 351-5996 www.texasystems.com		REFERENCE DRAWINGS	
DRAWING TITLE EXPANSION JOINT BELLOW E-240B EXCHANGER			
SCALE NTS	SHEET SIZE A	DRAWING NO. 03596HE2-SHT7	REV. NO. 2

#110545
#110546



BILL OF MATERIALS

MARK	QTY	DESCRIPTION	MATERIAL
SHOP MATERIAL			
1	1	PIPE 10" SCH/STD 0.365" WALL SMLS 4'-0" LG. (SHELL)	SA-312 316/316L
2	2	PIPE 10" SCH/STD 0.365" WALL SMLS 9" LG. (CHANNEL)	SA-312 316
3	0'-4"	PIPE 10" SCH/STD 0.365" WALL SMLS (REPAD)	SA-312 316/316L
4	1'-6"	PIPE 4" SCH/STD 0.237" WALL SMLS 8" LG. (N3 N4)	SA-312 316/316L
5	1'-6"	PIPE 3" SCH/STD 0.216" WALL SMLS LG. (N1 N2)	SA-312 316
6	2	FLANGE 10" 300# RFWN SCH/STD	SA-182 316
7	2	FLANGE 10" 300# RFBL	SA-182 316
8	2	FLANGE 4" 300# RFWN SCH/STD (N3 N4)	SA-182 316/316L
9	1	TUBESHEET 10 3/4" OD x 3" THK. (SHT 4)	SB-409 ALLOY 800H
10	1	TUBESHEET 10 3/4" OD x 3" THK. (SHT 5)	SB-409 ALLOY 800H
11	2	GASKET 10" 300# 304 SS WINDING NON ASBESTOS "C" G" CS OUTER RING (HYDRO)	SA-312 316
12	2	GASKET 4" 300# 304 SS WINDING NON ASBESTOS "C" G" CS OUTER RING (HYDRO)	SA-312 316
13	2	GASKET 10" 300# RF 316SS SPIRAL WOUND "CG" TYPE, THERMICULITE 835 FILLER	SA-312 316
14	32	STUD BOLT 1"-8 x 6 1/2" LG.	SA-193 B8M
15	64	HEAVY NUT 1"	SA-194 B8M
16	2	PLATE 1/2" THK. 4" x 13" (BASE PLATE)	SA-240 316/316L
17	2	PLATE 3/8" THK. 1'-7 7/16" x 11 7/16" (WEB PLATE)	SA-240 316/316L
18	1'-0"	PLATE 3/8" THK. 1'-7 7/16" x 2 5/8" (RIB PLATE)	SA-240 316/316L
19	4	FB6 x 1/4" (1) 6" x 6" (1) 6" x 7" (NAME BRACKET)	SA-240 316/316L
20	1	EB2x1/4" x 2" (GROUNDING LUG)	SA-240 316/316L
21	1	EXPANSION BELLOW 10 3/4" OD x 0.365" THK. (SHT 7)	SA-312 316
22	5	BAFFLE PLATE 1/8" THK x 9 7/8" OD. (SEE SHT 5)	SA-240 316/316L
23	50+5	TUBE 3/4" x 0.049" THK. x 60" + 0.25" LG.	SB-515 ALLOY 800H
24	5	SPACER TUBE 3/8" x 0.035" THK x 7 7/8" LG.	SA-249 316/316L
25	1	SPACER TUBE 3/8" x 0.035" THK x 17 1/2" LG.	SA-249 316/316L
26	3	SPACER TUBE 3/8" x 0.035" THK x 19 1/8" LG.	SA-249 316/316L
27	32	SPACER TUBE 3/8" x 0.035" THK x 9 1/2" LG.	SA-249 316/316L
28	1	TIE ROD 1/4" -20 x 3'-3 5/16" 2.5" TBE	316/316L SS
29	5	TIE ROD 1/4" -20 x 4'-0 7/16" 2.5" TBE	316/316L SS
30	12	NUT 1/4"-20 UNC HEX	316 SS
31	6	LOCK WASHER 1/4"	316 SS
32	1'-6"	PIPE 2" SCH/XS 0.218" WALL SMLS LG. (N5 N6)	SA-312 316
33	2	FLANGE 3" 300# RFWN SCH/STD (N1 N2)	SA-182 316
34	2	FLANGE 2" 300# RFWN SCH/XS (N5 N6)	SA-182 316
35	2	GASKET 3" 300# 304 SS WINDING NON ASBESTOS "C" G" CS OUTER RING (HYDRO)	SA-312 316
36	2	GASKET 2" 300# 304 SS WINDING NON ASBESTOS "C" G" CS OUTER RING (HYDRO)	SA-312 316
37			

MARK 22-31 SEE SHT 3
1. MTRS REQUIRED FOR EACH HEAT NO.
2. MATERIALS MARKED WITH HEAT NO.
3. CARBON CONTENT OF 316 SS TO BE 0.04% OR HIGHER.

Certified By:

TBD

TEXAS SYSTEMS & CONTROLS INC.

24310 Tomball Pkwy.
Tomball, Texas 77375
(281) 351-5999 WWW.TexasSystems.com

W
RT-3

MAWP SHELL SIDE 80/-15 PSI AT 1000 °F
TUBE SIDE 80/-15 PSI AT 1450 °F

MDMT SHELL SIDE -20 °F AT 80 PSI
TUBE SIDE -20 °F AT 80 PSI

SERIAL NO.

TBD

HYDROSTATIC TEST SHELL SIDE 120 PSIG
TUBE SIDE 120 PSIG

CORROSION ALLOWANCE

NONE

 YR. BUILT

2009

SERVICE

LFG/SYNGAS PREHEATER

MFG. FOR

WM GTL, INC.

P.O. NO.

7000000159

TAG NO.

E-240B/HE2

NDE, TESTING & OTHER REQUIREMENTS	SHELL SIDE	TUBE SIDE
RADIOGRAPH	RT-3	RT-3
ULTRASONIC	NONE	NONE
MAGNETIC PARTICLE	NONE	NONE
LIQUID PENETRANT	NONE	TUBE ONLY
IMPACT TEST EXEMP.	UHA-51	UHA-51
PHWT REQ'D.	NONE	YES, NOTE 1
PICKLING	NONE	NONE

SURFACE PREP. & COATING	SHELL SIDE	TUBE SIDE
SURF. PREP.	SEE 03596 PAINT SPEC	SEE 03596 PAINT SPEC
PRIMER COAT	SEE 03596 PAINT SPEC	SEE 03596 PAINT SPEC
INTERMEDIATE COAT	SEE 03596 PAINT SPEC	SEE 03596 PAINT SPEC
FINAL COAT	SEE 03596 PAINT SPEC	SEE 03596 PAINT SPEC

WEIGHTS:

WT-LBS CAPACITY-GALLONS

EMPTY:

TBD

 H₂O:

TBD

BUNDLE:

TBD

 VESSEL + BUNDLE:

TBD

CAPACITY:

TBD

 VESSEL + BUNDLE + H₂O:

TBD

INSULATION:

INSULATION REQUIRED:

YRS

 INSULATION THICKNESS:

2"

INSULATION TYPE:

TBD

 SHELL SIDE:

TBD

JACKET TYPE:

TBD

 TUBE SIDE:

TBD

VESSEL DESIGN CODES & STANDARDS:

ASME CODE STAMP: SEC.VII DIV. 1 07 EDITION A-08 REQ'D.

YES

NATIONAL BOARD REGISTRATION REQ.

YES

TEMA STANDARD

C

NOZZLE	QTY.	SIZE	ORIENTATION	TYPE	RATING	MAT'L	SCH.	MAT'L	FACING	TYPE	RATING	MAT'L	DESCRIPTION	REPAD MATERIAL	TYPE	NOZZLE I.D.	WALL THK.	EXT. PROJ.	INT. PROJ.	REPAD THK.	REPAD O.D.	REPAD I.D.	
N5	1	2"	45°				XS	SA-312 316	RF	WN	300#	SA-182 316	PSV-244			1	1.939"	0.218"	8.625"	0"			
N5	1	2"	0°				XS	SA-312 316	RF	WN	300#	SA-182 316	PSV-243			1	1.939"	0.218"	8.625"	0"			
N4	1	4"	0°				STD	SA-312 316	RF	WN	300#	SA-182 316	SHELL OUT			1	4.026"	0.237"	8.625"	FLUSH			
N3	1	4"	0°				STD	SA-312 316	RF	WN	300#	SA-182 316	SHELL IN			1	4.026"	0.237"	8.625"	FLUSH			
N2	1	3"	315°				STD	SA-312 316	RF	WN	300#	SA-182 316	CHANNEL OUT			1	3.058"	0.216"	8.625"	0"			
N1	1	3"	315°				STD	SA-312 316	RF	WN	300#	SA-182 316	CHANNEL IN			1	3.058"	0.216"	8.625"	0"			
SYMBOL	QTY.	SIZE	ORIENTATION	TYPE	RATING	MAT'L	SCH.	MAT'L	FACING	TYPE	RATING	MAT'L	DESCRIPTION	REPAD MATERIAL	TYPE	NOZZLE I.D.	WALL THK.	EXT. PROJ.	INT. PROJ.	REPAD THK.	REPAD O.D.	REPAD I.D.	
NOZZLE				FITTING				NECK				FLANGE				SERVICE				NOZZLE TYPE/DETAILS			

TEXAS SYSTEMS & CONTROLS, INC. CONFIDENTIAL

NOTES:
1. PHWT ALLOY 800H PRESSURE BOUNDARY WELDS ACCORDING TO UNF-56(e)(1), 1,650°F FOR 1 1/2 HR FOR THICKNESSES UP TO 1 IN., AND FOR 1 1/2 HR + 1 HR/IN. OF THICKNESS FOR THICKNESSES IN EXCESS OF 1 IN.

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REVISIONS

NO.	DATE	DESCRIPTION	DESIGN ENGR.	DATE	DRWN	DATE	CHECKED	DATE	QC	DATE
1	04/22/09	REVISED TUBE AND TUBESHEET MAT'L/THK	TC	04/22/09	ZL	04/22/09	TC	04/22/09		
2	04/22/09	CARBON CONTENT MAT'L RES. FOR SHELL SK	TC	04/22/09	ZL	04/22/09	TC	04/22/09		
3	04/22/09	DEFINITE FOR CONSTRUCTION	TC	04/22/09	ZL	04/22/09	TC	04/22/09		
4	04/22/09	FOR APPROVAL	TC	04/22/09	ZL	04/22/09	TC	04/22/09		

DRAWING STATUS

CERTIFIED FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCE
LINEAR ± 1/8"

SCALE

NONE

SHEET SIZE

D

CUSTOMER

WM GTL, INC.

DESIGNER/ENG.

TC

DATE

04/22/09

PROJECT NAME/TITLE

LANDFILL GAS TO LIQUID PLANT

PROJECT TAG NUMBER

N/A

DRAWN BY

ZL

DATE

04/22/09

CUSTOMER P.O. NO.

7000000159

APPROVED BY

JW

DATE

04/22/09

TEXAS SYSTEMS JOB NO.

03596

QC'D BY

DATE

TEXAS SYSTEMS & CONTROLS, INC.

24310 Tomball Parkway, SH 249, Tomball, Texas 77375
Phone: (281) 351-5999 Fax: (281) 351-5995
www.texasystems.com

DRAWING TITLE

E-240B EXCHANGER
LFG/SYNGAS PREHEATER

REFERENCE DRAWINGS

03596M2
03596P2

DRAWING NO.

03596HE2

SHT

1 OF 7

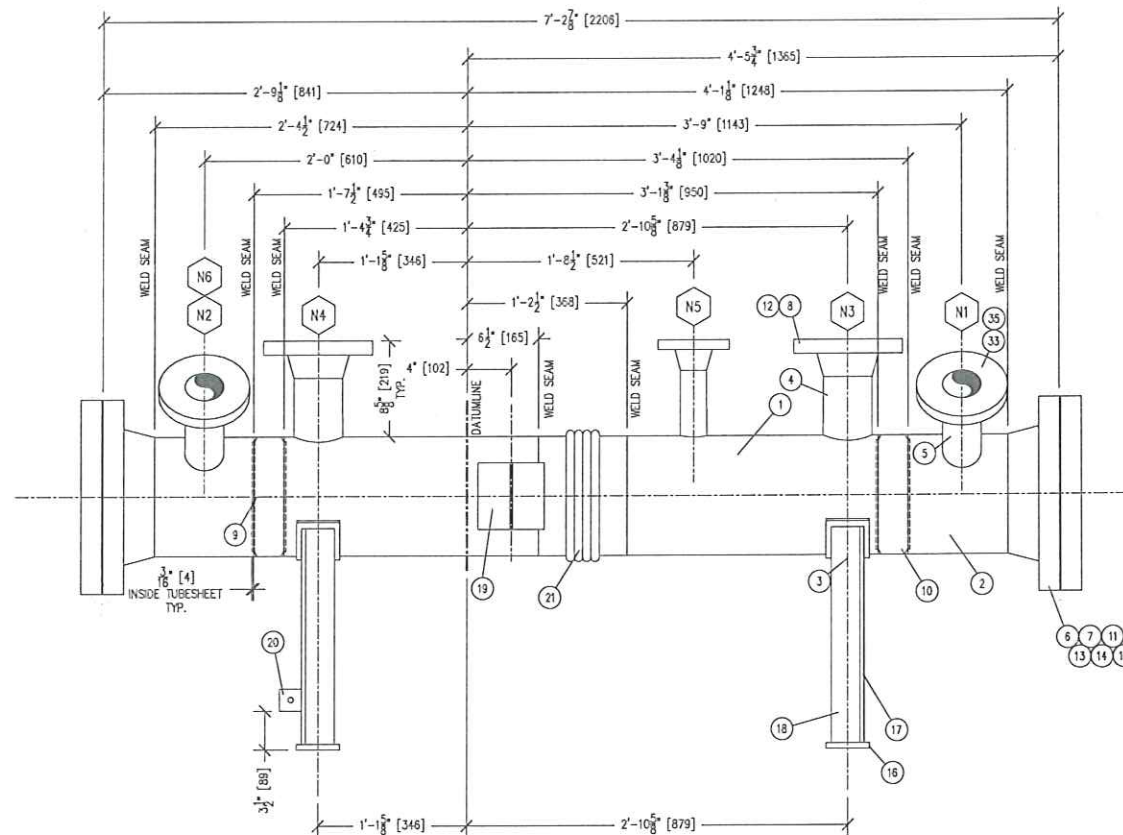
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03596BHE2

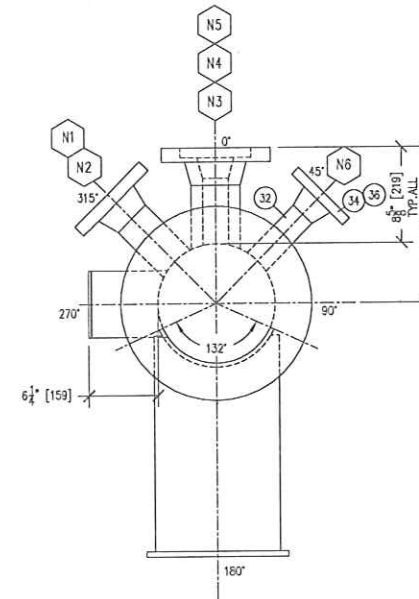
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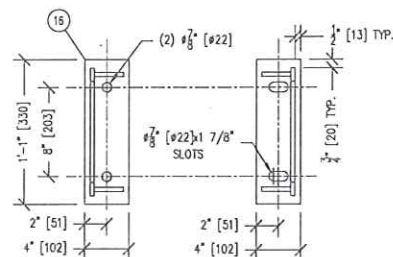
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#110540



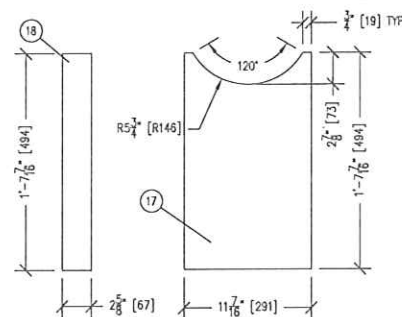
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SCALE 1 1/2"=1'-0"



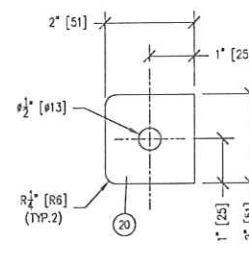
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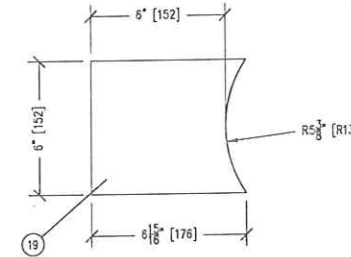
BASE PLATE
SCALE 1 1/2"=1'-0"



SADDLE
SCALE 1 1/2"=1'-0"



GROUNDING LUG
SCALE 6"=1'-0"



NAME BRACKET
SCALE 3"=1'-0"

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2		REVISED TANK AND TANK-SHEET W/1/2"	TC	07/01/09	DL	07/01/09	TC	07/01/09		
1		CARBON CONTENT MAT. RES. FOR SHELL SIDE	TC	06/09/09	DL	06/09/09	TC	06/09/09		
0		DEFINED FOR CONSTRUCTION	TC	06/02/09	DL	06/02/09	TC	06/02/09		
A		FOR APPROVAL	TC	04/02/09	DL	04/02/09	TC	04/02/09		
NO.	ZONE	DESCRIPTION	DESIGN ENG.	DATE	DESIGN	DATE	CHECKED	DATE	C.C.	DATE

DRAWING STATUS
CERTIFIED FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES

TOLERANCE
LINEAR ± 1/8"

SCALE AS NOTED

DESIGNER/ENG. TC

DRAWN BY ZL

APPROVED BY JW

QC'D BY

SHEET SIZE D

DATE 04/22/09

DATE 04/22/09

DATE 04/22/09

DATE

CUSTOMER

WM GTL, INC.

PROJECT NAME/TITLE

LANDFILL GAS TO LIQUID PLANT

PROJECT TAG NUMBER

N/A

CUSTOMER P.O. NO.

7000000159

TEXAS SYSTEMS JOB NO.

03596



TEXAS SYSTEMS & CONTROLS, INC.
24310 Tomball Parkway, SH 249, Tomball, Texas 77375
Phone: (281) 351-2525 Fax: (281) 351-5998
www.texassystems.com

DRAWING TITLE

E-240B EXCHANGER

LFG/SYNGAS PREHEATER

REFERENCE DRAWINGS

03596M2
03596P2

DRAWING NO.

03596HE2

SHT

2 OF 7

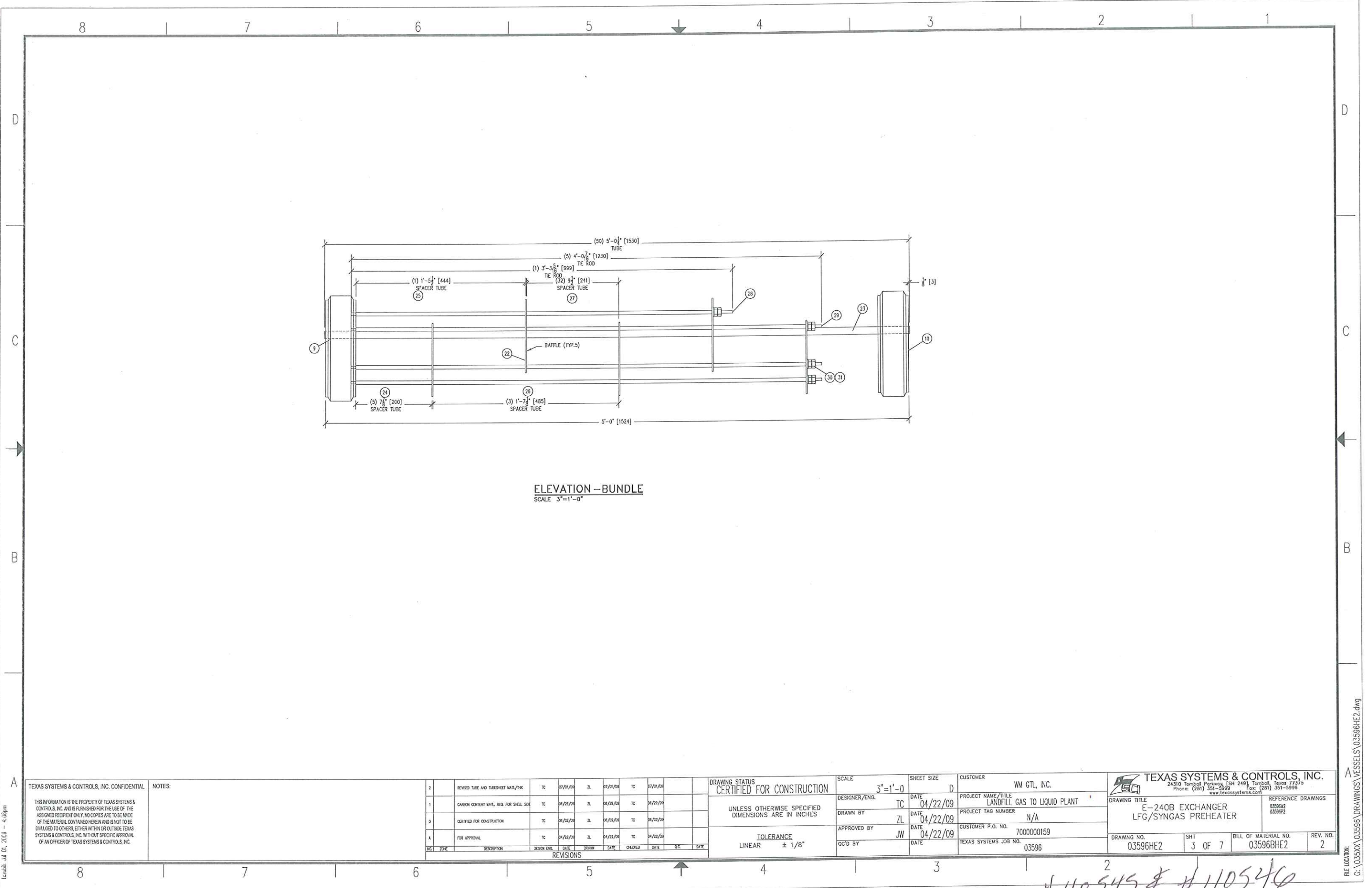
BILL OF MATERIAL NO.

03596BHE2

REV. NO.

2

#110545 & #110546



ELEVATION - BUNDLE
SCALE 3"=1'-0"

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NO.	ZONE	DESCRIPTION	DESIGN ENG.	DATE	DRAWN	DATE	CHECKED	DATE	Q.C.	DATE
1		REVISED TUBE AND TUBESHEET MATL./THK.	TC	07/21/09	ZL	07/21/09	TC	07/21/09		
2		CARBON CONTENT MATL. REQ. FOR SHELL SIDE	TC	04/22/09	ZL	04/22/09	TC	04/22/09		
3		CERTIFIED FOR CONSTRUCTION	TC	04/22/09	ZL	04/22/09	TC	04/22/09		
4		FOR APPROVAL	TC	04/22/09	ZL	04/22/09	TC	04/22/09		

DRAWING STATUS
CERTIFIED FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES

TOLERANCE
LINEAR $\pm 1/8"$

SCALE
3"=1'-0"

SHEET SIZE
D

DESIGNER/ENG.
TC

DRAWN BY
ZL

APPROVED BY
JW

QC'D BY

CUSTOMER
WM GTL, INC.

PROJECT NAME/TITLE
LANDFILL GAS TO LIQUID PLANT

PROJECT TAG NUMBER
N/A

CUSTOMER P.O. NO.
7000000159

TEXAS SYSTEMS JOB NO.
03596

TEXAS SYSTEMS & CONTROLS, INC.
24310 Tomball Parkway, SH 249, Tomball, Texas 77375
Phone: (281) 351-5999 Fax: (281) 351-5996
www.texascontrols.com

DRAWING TITLE
E-240B EXCHANGER
LFG/SYNGAS PREHEATER

REFERENCE DRAWINGS
03596A2
03596P2

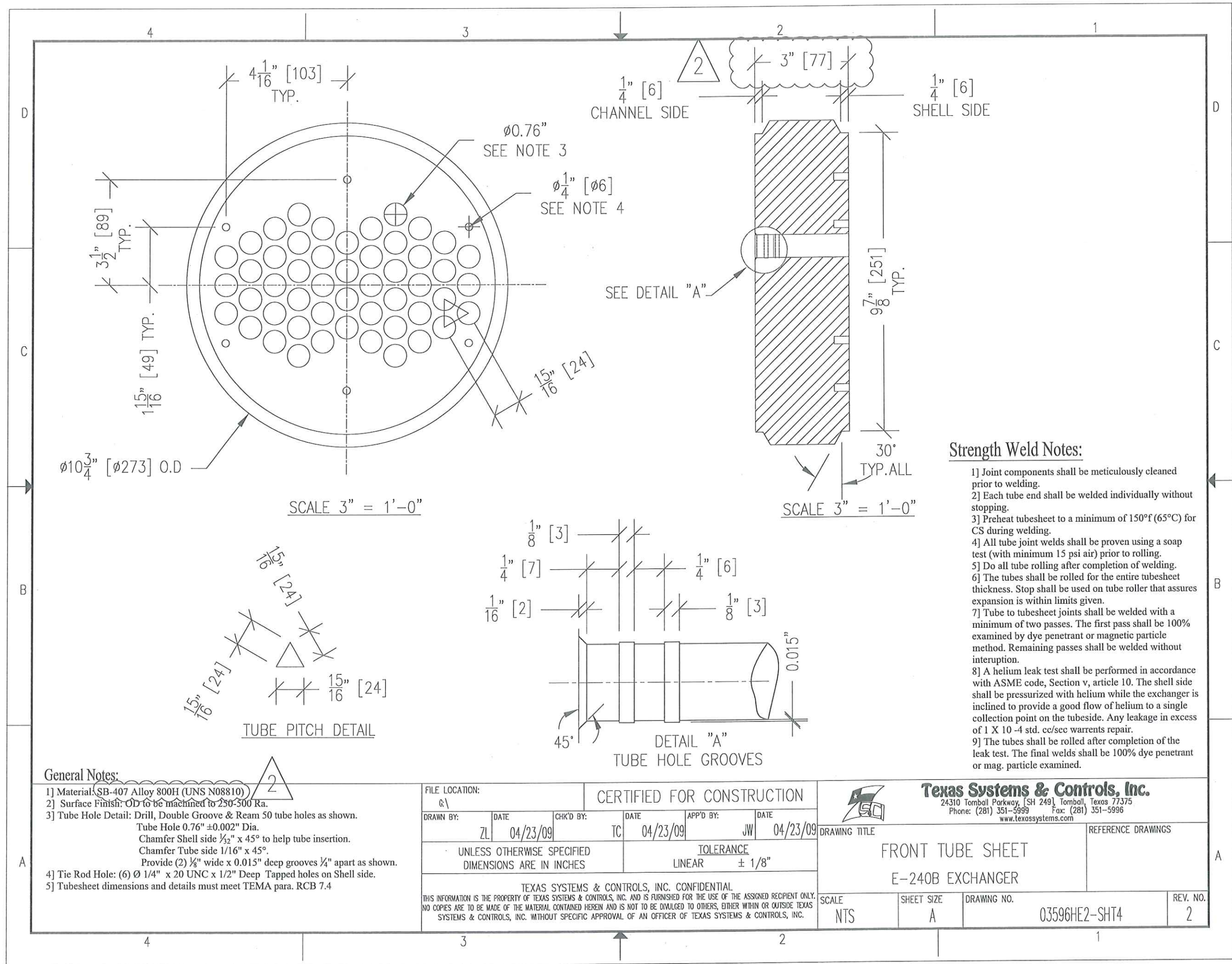
DRAWING NO.
03596HE2

SHT
3 OF 7

BILL OF MATERIAL NO.
03596BHE2

REV. NO.
2

#110545 & #110546



Strength Weld Notes:

- 1] Joint components shall be meticulously cleaned prior to welding.
- 2] Each tube end shall be welded individually without stopping.
- 3] Preheat tubesheet to a minimum of 150°F (65°C) for CS during welding.
- 4] All tube joint welds shall be proven using a soap test (with minimum 15 psi air) prior to rolling.
- 5] Do all tube rolling after completion of welding.
- 6] The tubes shall be rolled for the entire tubesheet thickness. Stop shall be used on tube roller that assures expansion is within limits given.
- 7] Tube to tubesheet joints shall be welded with a minimum of two passes. The first pass shall be 100% examined by dye penetrant or magnetic particle method. Remaining passes shall be welded without interruption.
- 8] A helium leak test shall be performed in accordance with ASME code, Section v, article 10. The shell side shall be pressurized with helium while the exchanger is inclined to provide a good flow of helium to a single collection point on the tubeside. Any leakage in excess of 1 X 10⁻⁴ std. cc/sec warrants repair.
- 9] The tubes shall be rolled after completion of the leak test. The final welds shall be 100% dye penetrant or mag. particle examined.

General Notes:

- 1] Material: SB-407 Alloy 800H (UNS N08810)
- 2] Surface Finish: OD to be machined to 250-500 Ra.
- 3] Tube Hole Detail: Drill, Double Groove & Ream 50 tube holes as shown.
Tube Hole 0.76" ±0.002" Dia.
Chamfer Shell side 1/32" x 45° to help tube insertion.
Chamfer Tube side 1/16" x 45°.
Provide (2) 1/8" wide x 0.015" deep grooves 1/4" apart as shown.
- 4] Tie Rod Hole: (6) Ø 1/4" x 20 UNC x 1/2" Deep Tapped holes on Shell side.
- 5] Tubesheet dimensions and details must meet TEMA para. RCB 7.4

FILE LOCATION: G:\		CERTIFIED FOR CONSTRUCTION			
DRAWN BY: ZL	DATE 04/23/09	CHK'D BY: TC	DATE 04/23/09	APP'D BY: JW	DATE 04/23/09
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			<u>TOLERANCE</u> LINEAR ± 1/8"		
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DRAWING TITLE		REFERENCE DRAWINGS	
FRONT TUBE SHEET E-240B EXCHANGER			
SCALE NTS	SHEET SIZE A	DRAWING NO. 03596HE2-SHT4	REV. NO. 2

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