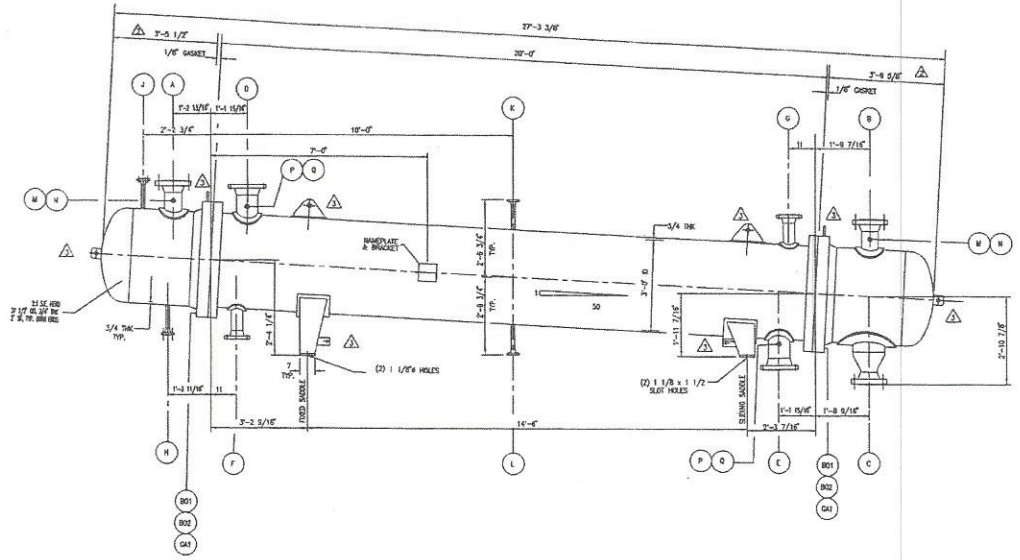
E-201



DESIGN CONDITIONS		
	SHELL SIDE	TUBE SIDE
DESIGN PRESS.(PSIG)	430	638
ANSRO TEST PRESS.(PSIG)	846	957
DESIGN TEMP.(T)	210	200
MDMT (PSIG@C)	-20 @ 430	-20 @ 638
PASSES PER SHELL	1	1
CORROSION ALLOW.	1/8"	0"
RADIOGRAPHY (SPOT)	SPOT	FULL
STRESS RELIEVE	NO	NO
EFFICIENCY	85%	100%
MEDIUM	COOLING WATER	PROPYLENE VAPOUR
INSULATION	-	-
MAG. PART. INSP.	-	-
IMPACT TESTING	Exempt per UG-20(f), UHA-51(d)	
Code: ASME SECT. VIII DIV. 1 1995 EDITION AND DEC 31/1995 ADDENDA		
TEMA Class: C		
SIZE: 36-240	TYPE: BEM	POS: HORIZ.
SURFACE/SHELL:	4147 SQ. FT.	

MATERIAL SPECIFICATIONS		
Mark	SHELL SIDE	TUBE SIDE
CYLINDER	SA 516-70	SA 240-304
HEAD	-	SA-240-304
GIRTH FLGS	-	SA-182-F304
NOZZ. FLGS	SA-105	SA-182-F304
NOZZ. NECKS	SA-106B	SA-312-TP304
REPADS	SA-516-70	SA-240-304
COUPLINGS	SA-105	SA-182-F304
SUPPTS/LUGS	SA-516-70/SA-36	N/A
STUDS	SA-193-B7	SA-193-B7
NUTS	SA-194-2H	SA-194-2H
GASKETS	C.S. (U)	304 S.S. (U)
TUBES		SA-249-TP304
TUBESHEET		SA-240-TP304
BAFFLES	SA-36	
TIE RODS	SA-36	
SPACERS	SA-214	
IMP. PLT.	SA-516-70	

NOZZLES & CONNECTIONS				
Mark	SIZE	FLG.	NECK	SERVICE
A	6"-600#	RF WN	SCH. 80	INLET-T/S
B	6"-600#	RF WN	SCH. 80	OUTLET-T/S
C	6"-600#	RF WN	SCH. 80-12/6 WELL	OUTLET-T/S
D	6"-300#	RF WN	SCH. 80	OUTLET-S/S
E	6"-300#	RF WN	SCH. 80	INLET-S/S
F	4"-300#	RF WN	SCH. 120	CHEM. CLEAN
G	4"-300#	RF WN	SCH. 120	CHEM. CLEAN
H	1"-600#	RF WN	SCH. 160	DRAIN-T/S
J	1"-600#	RF WN	SCH. 160	VENT-T/S
K	1"-300#	RF WN	XX-STG	VENT-S/S
L	1"-300#	RF WN	XX-STG	DRAIN-S/S
M	3/4"-6000#	SW'OLET	-	TEMP. CONN.-T/S
N	3/4"-6000#	SW'OLET	-	PRESS. CONN.-T/S
P	3/4"-6000#	SW'OLET	-	TEMP. CONN.-S/S
Q	3/4"-6000#	SW'OLET	-	PRESS. CONN.-S/S

NAT'L BRD NO. 25
DR: -
SERIAL NO. 5457A
Engineer's Stamp

NO. OF SHELLS: 1
WEIGHTS (EACH)
BUNDLE: 118800 LBS.
SHIPPING: 30800 LBS.
FLOODED: 208600 LBS.

NOTES:

1. ALL FLANGE BOLT HOLES STRADDLE ¢ ¢.
2. DIMENSIONAL TOLERANCES ARE ± 1/8" UNLESS OTHERWISE SPECIFIED.
3. ALL DIMENSIONS ARE IN INCHES.
4. ALL FLANGE FACES & SADDLE BASES ARE PARALLEL TO GROUND.
5. NOZZLES F, G, K, J, K & L PROVIDED WITH GASKETS, BLIND FLANGES & BOLTING. OTHER EXPOSED FLANGE FACES SUPPLIED WITH BOLTED OR WOOD BLIND FLANGES FOR SHIPPING.
6. PAINTING: SANDBLAST SSPC-SP-10 & SHOP PRIME EPOXY PRIMER, 2.5 TO 3.5 MILS DFT ON ALL OUTSIDE CARBON STEEL PARTS ONLY. ⚠

Rev.	By	Date	Description	Ck'd	App'd
4	G.R.	97/08/22	CERTIFIED "AS BUILT"		
3	C.Z.	97/3/31	ADDED LIFTING LUGS & GROUND LUGS		
2	C.Z.	97/3/5	REVISED PAINT SPEC. (PAINT WAS INORGANIC ZINC)		
1	G.R.	97/01/27	THIS DWG OBSOLETES & SUPERSEDES DWG 5457-B1	H.R.K.	H.R.K.

TUBE RATE Ltd.
Sarnia, Ontario CANADA

Dwn. By: D.R.
Ck'd By: H.R.K.
App'd By: H.R.K.

For: HUNTSMAN CORPORATION, MARYSVILLE, MICHIGAN

Title: GENERAL ARRANGEMENT
FIRST REACTOR OVERHEAD CONDENSER
ITEM # E-201A

Date: 97/01/10
Scale: 3/4" = 1"

Customer PO No.	Customer Dwg. No.	
961974	-	
Job No.	TUBERATE Dwg. No.	Rev.
5457A	5457-D1	4

TUBERATE Ltd.
763 Chester Street
Sarnia, Ontario, CANADA N7S 5N2
Tel.: (519) 383-1321 Fax: (519) 383-1322

DOCUMENTATION FILE

TUBERATE Ltd. Serial Number: 5457 A

Customer: HUNTSMAN CORPORATION

Customer P.O. # 970094 T

Customer Item # E - 201

End User: HUNTSMAN CORPORATION

Plant Location: MARYSVILLE, MICHIGAN

CONTENTS:

One (1) set of Certified Design Calculations
One (1) set of Certified "As-Built" Drawings
Inspection Hold Points Check List
Material Control & Identification Sheet - Bill of Material
Mill Test Reports for Materials
Quality Control Inspection Report - Acceptance Record
Weld Procedures and Welder Qualifications
Weld Map
Tube Expansion Data Sheet
Hardness Reports
Radiography Map and Results
Certified Hydrostatic Test Reports
Nameplate Stamping
Form U-1 Manufacturer's Data Report
Inspection Check Sheet
Signed Packing Slip

HUNTSMAN, MARYSVILLE
W.O. # / CER. # ____ / ____
P.O. # ____
DOC. # 21-AG-E0201-01

12-1-97

NOTE:

THIS DOCUMENTATION FILE REMAINS IN THE CUSTODY OF TUBERATE Ltd.
A COPY IS MADE AVAILABLE TO THE CUSTOMER UPON REQUEST.

TUBE RATE Ltd.
Sarnia, Ontario CANADA

SHEET 1 OF 37
REVISION: 1
JOB NUMBER: 5457
BY: CZ
DATE: 1/8/97

DESIGN CALCULATIONS

CLIENT:	HUNTSMAN, MARYSVILLE, MI
PROJECT:	POLYPROPYLENE DEBOTTLENECKING PROJECT
PURCHASE ORDER NO.:	961974
DESCRIPTION:	FIRST REACTOR OVHD CONDENSER
ITEM NUMBER:	E-201
TEMA TYPE: BEM	SIZE: 36-240 PASSES: SS 1/TS 1 TEMA CLASS: "C"

CODES AND STANDARDS: ASME SECTION VIII DIV. 1, 1995 EDITION AND DEC.31,1995 ADDENDA
TEMA 7th. EDITION 1988

DESIGN DATA	SHELL SIDE	TUBE SIDE
DESIGN PRESSURE (Psig)	430	638
DESIGN TEMPERATURE (°F)	210	200
CORROSION ALLOWANCE (in.)	1/8	0
RADIOGRAPHY	SPOT	FULL
P.W.H.T.	NO	NO
HYDROSTATIC TEST PRESS. (Psig)	645	957
MDMT (°F @ Psig)	-20 @ 430	-20 @ 638
IMPACT TEST	EXEMPT PER UG-20(f)	EXEMPT PER UHA-51(d)

MATERIAL	SHELL SIDE	TUBE SIDE
CYLINDER	SA 516-70	SA 240-304
HEAD/COVER	-	SA 240-304
NOZZLE NECKS	SA 106 Gr.B	SA 312-TP304
NOZZLE FLANGES	SA 105	SA 182-F304
REINFORCING PADS	SA 516-70	SA 240-304
GIRTH FLANGES	-	SA 182-F304
TUBESHEET	SA 240-304	
TUBES	SA 249-TP304	
SADDLES	SA 516 70 / SA 36	
BOLTS/NUTS	SA 193 B7 / SA 194 2H	

NOTE: SHELL MEAN METAL TEMP. = 93.5 °F
TUBE MEAN METAL TEMP. = 98.0 °F

STAMP

REV	BY	DATE	DESCRIPTION	APP'D
1	CZ	1/8/97	REVISED PAGE 4, CHANNEL CAL'S ADDED NOZZLE MARKS IN REPORT	HRK
0	GSV/CZ	12/10/96	FOR REVIEW AND APPROVAL	HRK

FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

Owner Item# E-201

1. Manufactured and certified by TUBERATE Ltd. 763 Chester St. Sarnia, Ont. N7S-5N2 Canada
(Name and address of Manufacturer)

2. Manufactured for Huntsman Corporation 2701 S.Range Road Marysville, Michigan 48040 U.S.A.
(Name and address of Purchaser)

3. Location of installation Huntsman Corporation 2701 S.Range Road Marysville, Michigan 48040 U.S.A.
(Name and address)

4. Type: Horizontal (Horiz., vert., or sphere) | Reactor Overhead Condenser 5457A (Tank, separator, jkt. vessel, heat exh., etc.) | --- (Mfg's serial No.) | --- (CRN) | 5457-D1 R3 (Drawing No.) | 25 (Nat'l. Bd. No.) | 1997 (Year built)

5. ASME Code, Section VIII, Div. 1 | 95 Ed and 95 Add. (Edition and Addenda (date)) | --- (Code Case No.) | --- (Special Service per UG-120(d))

Items 6 - 11 incl. to be completed for single wall vessels, jackets of jacketed vessels, shell of heat exchangers, or chamber of multi-chamber vessels.

6. Shell (a) No. of course(s): 2 (b) Overall length (ft & in.): 20'-0" TSA to TSB

Course(s)			Material	Thickness		Long Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter, in.	Length (ft & in.)	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	3'-0" ID	10"-0"	SA 516-70	3/4"	1/8"	1	Spot	0.85	1	Spot	0.85	None	
2	3'-0"	9'-4 5/8"	SA 516-70	3/4"	1/8"	1	Spot	0.85	1	Spot	0.85	None	

7. Heads: (a) None (Mat'l Spec. No., Grade or Type) H.T. - Time & Temp (b) None (Mat'l Spec. No., Grade or Type) H.T. - Time & Temp

	Location (Top, Bottom, Ends)	Thickness Min.	Thickness Corr.	Radius Crown	Radius Knuckle	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure Convex	Side to Pressure Concave	Category A Type	Category A Full, Spot, None	Category A Eff.
(a)	N/A													
(b)														

If removable, bolts used (describe other fastening) None (Mat'l Spec. No., Grade, size, No.)

8. Type of jacket None Jacket closure N/A (Describe as ogee & weld, bar, etc.)

If bar, g dimensions N/A If bolted, describe or sketch.

9. MAWP 430 (internal) ---- (external) psi at max. temp. 210 (internal) ---- (external) °F Min. design metal temp. -20 °F at 430 psi.

10. Impact test Exempt per UG-20 (f) (Indicate yes or no and the component(s) impact tested)

11. Hydro., pneu., or comb. test press. Hydro-645 psig Proof test N/A

Items 12 and 13 to be completed for tube sections.

12. Tubesheet: SA-240-TP304 (Stationary (Mat'l Spec. No.)) | 44 1/2" OD (Dia., in. (subject to press.)) | 3 3/4" (Nom. thk., in.) | 0 (Corr. Allow., in.) | Welded (Attachment (welded or bolted))

SA 240-TP-304 (Floating (Mat'l Spec. No.)) | 44 1/2" (Dia., in.) | 3 3/4" (Nom. thk., in.) | 0 (Corr. Allow., in.) | Welded (Attachment)

13. Tubes: SA-249 TP-304 (Mat'l Spec. No., Grade or Type) | 3/4" (O.D., in.) | 14 BWG (Nom. thk., in. or gauge) | 1056 (Number) | Straight (Type (Straight or U))

Items 14 - 18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers.

14. Shell (a) No. of course(s): 2 (b) Overall length (ft & in.): TSA End- 3'-9 5/8" TSB End- 3'-5 1/2"

Course(s)			Material	Thickness		Long Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter, in.	Length (ft & in.)	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	36"ID	1'-11 3/8"	SA-240 TP304	3/4"	0	1	Full	1.0	1	Full	1.0	None	
2	36"ID	2'-3 1/2"	SA-240 TP304	3/4"	0	1	Full	1.0	1	Full	1.0	None	

15. Heads: (a) SA-240 TP-304 (Mat'l Spec. No., Grade or Type) H.T. - Time & Temp (b) SA-240 TP-304 (Mat'l Spec. No., Grade or Type) H.T. - Time & Temp

	Location (Top, Bottom, Ends)	Thickness Min.	Thickness Corr.	Radius Crown	Radius Knuckle	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure Convex	Side to Pressure Concave	Category A Type	Category A Full, Spot, None	Category A Eff.
(a)	TSA-End	0.656"	0			2:1					X	1	Full	1.0
(b)	TSB-End	0.656"	0			2:1					X	1	Full	1.0

If removable, bolts used (describe other fastening) SA-193 Gr.B7 1 3/8" ø 36 per Channel - 72 Total (Mat'l Spec. No., Grade, Size, No.)

7. MAWP 638 (internal) --- (external) psi at max. temp. 200 (internal) --- (external) °F Min. design metal temp. -20 °F at 638 psi.

8. Impact test Exempt per UHA-51 (d)
(Indicate yes or no and the component(s) impact tested)

9. Hydro., pneu., or comb. test press. Hydro-957psig Proof test N/A

10. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Flange Type	Material: Nozzle	Material: Flange	Nozzle Thickness: Nom.	Nozzle Thickness: Corr.	Reinforcement Material	How Attached: Nozzle	How Attached: Flange	Location (Insp. Open.)
S Inlet/Outlet	2	6"	600#WN	*	**	Sch.80	0	SA-240 TP304	UW-16.1q	***	
S Outlet	1	6"	600#WN	*	**	Sch.80	0	SA-240 TP304	UW-16.1q	***	
S Inlet/Outlet	2	8"	300#WN	SA-106B	SA-105	Sch.80	1/8"	SA-516-70	UW-16.1q	***	
hem. Clean	2	4"	300#WN	SA-106B	SA-105	Sch.120	1/8"	SA-516-70	UW-16.1q	***	
S/SS Drain/Vent	4	1"	Note 1	Note 2	Note 3	Note 4	Note 5	None	UW-16.1a	***	
S/SS Temp.Conn	2	3/4"	6000#CPLG	---	Note 7	---	Note 5	None	UW-16.1u	---	
S/SS Press.Conn	2	3/4"	6000#CPLG	---	Note 3	---	Note 5	None	UW-16.1u	---	

10. Supports: Skirt No (Yes or No) Lugs None (No.) Legs None (No.) Others 2-Saddles (Describe) Attached Welded to Shell (Where and How)

11 Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report:
(List the name of part, item number, mfg's. name and identifying number)

12. Remarks:
Note 1: SS-300#WN TS-600#WN Note 2: SS-SA-106B TS-SA-312 TP304
Note 3: SS-SA-105 TS-SA-182 F304 Note 4: SS-XXS TS-Sch.160
Note 5: SS-0.125" TS-0 * - SA-312 TP 304
** - SA-182 F304 *** - UW-16.1 butt weld NOTE: No Inspection Openings Refer to UG-46 (a)

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1,
U Certificate of Authorization No. 28,487 Expires July 28, 19 98

Date 97-04-24 Name TUBERATE Ltd. (Manufacturer) Signed (Representative)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and the State or Province of ONT and employed by M.C.C.R. of Ontario have inspected the pressure vessel described in this Manufacturer's Data Report on April 24, 19 97, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 97 04 24 Signed (Authorized Inspector) Commissions 11396 BN ONTARIO*46. (Nat'l Board incl. endorsement, State, Province and No.)

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the statements on this report are correct and that the field assembly construction of all parts of this vessel conforms with the requirements of ASME Code, Section VIII, Division 1,
U Certificate of Authorization No. Expires , 19

Date Name (Assembler) Signed (Representative)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and the State or Province of and employed by of have compared the statements in this Manufacturer's Data Report with the described pressure vessel and state that parts referred to as data items , not included in the certificate of shop inspection, have been inspected by me and to the best of my knowledge and belief, the Manufacturer has constructed and assembled this pressure vessel in accordance with ASME Code, Section VIII, Division 1. The described ves was inspected and subjected to a hydrostatic test of psi. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Signed (Authorized Inspector) Commissions (Nat'l Board incl. endorsement, State, Province and No.)

Owner Item # E - 201

FORM U-2 MANUFACTURER'S PARTIAL DATA REPORT
A Part of a Pressure Vessel Fabricated by One Manufacturer for Another Manufacturer
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. ufactured and certified by TUBERATE Ltd. 763 Chester Street Sarnia, Ontario N7S 5N2 Canada
(Name and address of Manufacturer)

2. Manufactured for Huntsman Corporation 2701 S. Range Road Marysville, Michigan 48040 U.S.A.
(Name and address of Purchaser)

3. Location of installation Huntsman Corporation 2701 S. Range Road Marysville, Michigan 48040 U.S.A.
(Name and address)

4. Type: Horizontal Overhead Condenser | 5457B | ----
(Description of vessel part (shell, two-piece head, tube bundle)) | (Mfg's serial No.) | (CRN)

26 | 5457- D1 R.3 | TUBERATE Ltd. | 1997
(Nat'l. Bd. No.) | (Drawing No.) | (Drawing prepared by) | (Year built)

5. ASME Code, Section VIII, Div. 1 95 ED. & 95 ADD. | ---- | ----
Edition and Addenda (date) | Code Case No. | Special Service per UG-120(d)

Items 6 - 11 incl. to be completed for single wall vessels, jackets of jacketed vessels, shell of heat exchangers, or chamber of multi-chamber vessels.

6. Shell (a) No. of course(s): 2 (b) Overall length ft & in.: 20' - 0" TSA to TSB

Course(s)			Material	Thickness		Long Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter, in.	Length ft & in.	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	3'-0"ID	10'-0"	SA-516-70	3/4"	1/8"	1	Spot	0.85	1	Spot	0.85	None	
2	3'-0"ID	9'-4 5/8"	SA-516-70	3/4"	1/8"	1	Spot	0.85	1	Spot	0.85	None	

7. Heads: (a) None (b) None
(Mat'l Spec. No., Grade or Type) H.T. - Time & Temp | (Mat'l Spec. No., Grade or Type) H.T. - Time & Temp

	Location (Top, Bottom, Ends)	Thickness Min.	Thickness Corr.	Radius Crown	Radius Knuckle	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure Convex	Side to Pressure Concave	Category A Type	Category A Full, Spot, None	Category A Eff.
(a)	N/A													

If removable, bolts used (describe other fastening) None

8. Type of jacket N/A (Mat'l Spec. No., Grade, Size, No.) Jacket closure N/A
(Describe as ogee & weld, bar, etc.)

If bar, give dimensions N/A

9. MAWP 430 (internal) ---- (external) psi at max. temp. 210 (internal) ---- (external) °F Min. design metal temp. -20 °F at 430 ps
If bolted, describe or sketch

10. Impact test Exempt per UG - 20 (f)
(Indicate yes or no and the component(s) impact tested)

11. Hydro., pneu., or comb. test press. Hydro-645 psiG Proof test N/A

Items 12 and 13 to be completed for tube sections.

12. Tubesheet: SA-240-TP 304 | 44 1/2" OD | 3 3/4" | 0 | Welded
Stationary (Mat'l Spec. No.) | Dia., in. (subject to press.) | Nom. thk., in. | Corr. Allow., in. | Attachment (welded or bolted)

SA-240- TP 304 | 44 1/2" OD | 3 3/4" | 0 | Welded
Floating (Mat'l Spec. No.) | Dia., in. | Nom. thk., in. | Corr. Allow., in. | Attachment

13. Tubes: SA-249- TP 304 | 3/4" | 14 Bwg. | 1056 | Straight
Mat'l Spec. No., Grade or Type | O.D., in. | Nom. thk., in. or gauge | Number | Type (Straight or U)

Items 14 - 18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers.

14. Shell (a) No. of course(s): None (b) Overall length (ft & in.): None

Course(s)			Material	Thickness		Long Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter, in.	Length ft & in.	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
	N/A												

Form U-2 (Back)

15. Heads: (a) None (Mat'l Spec. No., Grade or Type) H.T. - Time & Temp (b) None (Mat'l Spec. No., Grade or Type) H.T. - Time & Temp

	Location (Top, Bottom, Ends)	Thickness Min.	Thickness Corr.	Radius Crown	Radius Knuckle	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure Convex	Side to Pressure Concave	Category A Type	Category A Full, Spot, None	Eff.
(a)	N/A													
(b)														

If removable, bolts used (describe other fastening) None

16. MAWP 638 (internal) ---- (external) psi at max. temp. 200 (internal) ---- (external) °F Min. design metal temp. -20 °F at 638 (Mat'l Spec. No., Grade, Size, No.) p

17. Impact test Exempt per UHA - 51 (d)
(Indicate yes or no and the component(s) impact tested)

18. Hydro., pneu., or comb. test press. Hydro - 957 psiG Proof test N/A

19. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Flange Type	Material Nozzle	Material Flange	Nozzle Thickness Nom.	Nozzle Thickness Corr.	Reinforcement Material	How Attached Nozzle	How Attached Flange	Location (Insp. Open.)
SS Inlet	1	8"	300#WN	SA-106B	SA-105	SCH.80	1/8"	SA-516-70	Welded	Welded	
SS Outlet	1	8"	300#WN	SA-106B	SA-105	SCH.80	1/8"	SA-516-70	Welded	Welded	
Chem Clean	2	4"	300#WN	SA-106B	SA-105	SCH.120	1/8"	SA-516-70	Welded	Welded	
SS Drain	1	1"	300#WN	SA-106B	SA-105	XXS	1/8"	None	Welded	Welded	
SS Vent	1	1"	300#WN	SA-106B	SA-105	XXS	1/8"	None	Welded	Welded	
Temp. Conn.	1	3/4"	6000#CPLG	----	SA-105	----	1/8"	None	----	Welded	
Press. Conn.	1	3/4"	6000#CPLG	----	SA-105	----	1/8"	None	----	Welded	

. Supports: Skirt No (Yes or No) Lugs None (No.) Legs None (No.) Others 2-Saddles (Describe) Attached Welded to sh 1 (Where and How)

21. Remarks:

This is a spare unit for Item #E-201 "A" Nat'l Board Serial #25

Note: No inspection openings refer to UG - 46 (a)

CERTIFICATE OF SHOP/FIELD COMPLIANCE

We certify that the statements made in this report are correct and that all details of material, construction, and workmanship of this presure vessel part conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.

U Certificate of Authorization No. 28,487 Expires July 28 , 1998

Date 97.05.08 Name TUBERATE Ltd. (Manufacturer) Signed (Representative)

CERTIFICATE OF SHOP/FIELD INSPECTION

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and the State or Province of Ont. and employed by M.C.C.A.R. T.S.S.A. of Ontario have inspected the pressure vessel part described in this Manufacturer's Data Report on May 08 , 1997 , and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel part in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel part described in this Manufacturer's Data Report. Furthermore, neither the inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 97 05 08 Signed (Authorized Inspector) Commissions 11396 B.N. ONT #46. (Nat'l Board incl. endorsement, State, Province and No.)

ITEM: E-201 DATE: 12/04/96
Channel Flanges CFA/CFB REF : 176A1HFL

*** TAPERED HUB TYPE FLANGE, ASME SECTION V111, DIV 1 ***

DESIGN PRESSURE (psi)	DESIGN TEMPERATURE (degr F)
638	200

FLANGE : Forging SA182 F304
BOLTING: Studbolts SA193 B7
GASKET : Flat Metal Jckt Asb Filled Stnls St
FACING : Confined & 1/8" wide single nubbin
BARREL : Plate SA240 TP304

CORR ALL: 0.0000

ALLOWABLE STRESS psi

FLANGE (DES)	Sfo =	15700
FLANGE (ATM)	Sfa =	18800
BOLT (DES)	Sb =	25000
BOLT (ATM)	Sa =	25000

GASKET DETAILS:

O.D.	=	39.875 "	N	=	0.500
bo	=	0.2031 "	y	=	9000
b	=	0.2031 "	m	=	3.75
G	=	39.469 "			

BOLTING CALCULATIONS lbs

Wm2=b*Pi*G*y	=	226678	Am	= Wm2/Sa or Wm1/Sb =	36.044
Hp =2*Pi*b*G*p*m=		120517	Ab	= Bolts * Area =	41.580
H =Pi/4*G*G*p	=	780580	W	= 0.5*(Am+Ab)*Sa =	970298
Wm1=Hp+H	=	901097	Nmin	= Ab*Sa/(2*Pi*y*G) =	0.466

LOADS lbf

OPERATING CONDITION		
HD = Pi/4*B*B*p	=	649405
HG = Wm1-H	=	120517
HT = H-HD	=	131175
GASKET SEATING		
HG = W	=	970298

LEVER ARMS in

OPERATING CONDITION		
hD	= R+0.5*g1	= 2.3750
hG	= 0.5*(C-G)	= 1.1406
hT	= 0.5*(R+g1+hg)	= 2.0078
GASKET SEATING		
hG	= 0.5*(C-G)	= 1.1406

FLANGE MOMENTS lbs*in

MD = HD*hd	=	1542337
MG = HG*hg	=	137465
MT = HT*ht	=	263375
Mop= MD+MG+MT	=	1943176

GASKET SEATING CONDITION lbf*in

Matm = W*hg	=1106747
Mo=max("Matm*Sfo/Sfa"or "Mop")	=1943176
Bolt Spacing Correction: CF	= 1.000
M = Mo * CF / B	= 53977

FLANGE DIMENSIONS in

t =	5.1250	A =	44.500		
h =	1.25	B =	36.000		
E =	1.375	C =	41.750		
R =	1.875	G =	39.469		
BOLTS:	36	g1 =	1.000		
SIZE:	1.375	go =	0.750		
AREA:	41.58	Rise:	0.250		

SHAPE CONSTANTS

K=A/B	=	1.2361	F	=	0.8923
T	=	1.8242	V	=	0.4289
Z	=	4.7881	f	=	1.0541
Y	=	9.2818	e =F/ho	=	0.1717
U	=	10.1998	ALPHA	=	1.8800
g1/go	=	1.3333	BETA	=	2.1734
d	=	69.507	GAMMA	=	1.0306
ho	=	5.1962	DELTA	=	1.9366
h/ho	=	0.2406	LAMBDA	=	2.9673

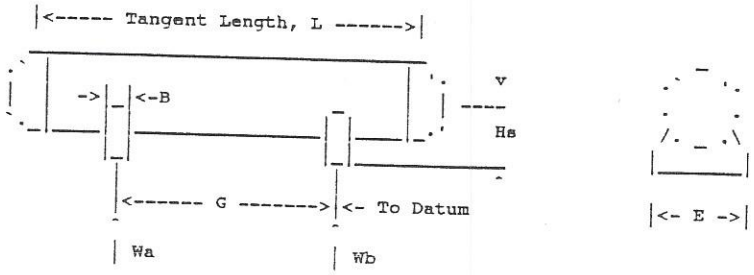
ALLOWABLE STR:	ACTUAL STR:			
1.5Sfo 23550	LONG HUB	SH = f x M / (LAMBDA x g1^2)	=	19176
Sfo 15700	RADIAL	SR = BETA x M /(LAMBDA x t^2)	=	1505
Sfo 15700	TANGENTIAL	ST = (M x Y / t^2) - Z x SR	=	11867
Sfo 15700	GREATER	(SH + SR) / 2 or (SH + ST) /2	=	15522

Gasket Rib Length: 0.000 "
Wm1 copied from a mating flange ? "NO"
Wm2 copied from a mating flange ? "NO"

SADDLE

Saddle material:	SA 36 PLATE / SA 516-70
Saddle allowable stress:	20000 psi
Saddle yield stress:	36000 psi
Saddle distance to datum:	61.5 in
Tangent length:	L = 306.251 in
Vessel radius:	R = 18.75 in
Saddle tangent distance, left:	A = 69.25098 in
Saddle tangent distance, right:	A = 63 in
Distance between saddles:	G = 174 in
Saddle width:	B = 6 in
Saddle height:	Hs = 24 in
Saddle contact angle:	theta = 120 degrees
Wear plate thickness:	tp = 0.5 in
Wear plate width:	Wp = 13 in
Wear plate contact angle:	126 degrees
Saddle construction is:	Web at edge of rib
Web plate thickness:	tw = 0.5 in
Base plate length:	E = 34.5 in
Base plate width:	F = 7 in
Base plate thickness:	tb = 0.5 in
Number of stiffener ribs:	2
Stiffener rib spacing:	32.5 in
Stiffener rib thickness:	tr = 0.5 in

Anchor bolt material:	SA 193 B7
Anchor bolt allowable shear stress:	18000 psi
Anchor bolt size & type:	1 inch, series 8 threads
Number of anchor bolts per saddle:	2
Saddle/foundation coeff of friction:	0.45



Weight on left saddle, op = 25568, test = 26042 lb
Weight on right saddle, op = 24222, test = 24610 lb

Longitudinal bending stress between saddles

Circumferential seam joint efficiency:	Ec = 0.85
Allowable tensile stress:	St = 17500 psi
Allowable compressive stress:	Sc = 17036.4 psi

Operating condition governs bending stress between saddles

S1 = +- 3*K1*Q*(L/12) / (pi*R^2*t)
= 3*0.1433*24222*(306.251/12) / (pi*18.4375^2*0.625)
= 398.1435 psi

Longitudinal pressure stress

Sp = P*R/(2*t)
= 431.701*18.4375/(2*0.625)
= 6367.589 psi

Max tensile stress S1t = S1 + Sp = 6765.733 psi
Max compressive stress S1c = S1 = 398.1435 psi

Tensile stress is acceptable (< = 14875 psi)

SADDLE

Compressive stress is acceptable (< = 17036.4 psi)

Longitudinal bending stress at the saddles

Depth of left head: Hl = 9.375 in
Depth of right head: Hr = 9.375 in

Le = 2*Hl/3 + L + 2*Hr/3
= 2*9.375/3 + 306.251 + 2*9.375/3
= 318.751 in

Operating condition governs, vessel weight Wt = 49790 lb

w = Wt/Le = 156.2034 lb/in

Bending moment at the left saddle (governing):

Mq = w*(2*H*a/3 + a^2/2 - (R^2 - H^2)/4)
= 156.2034*(2*9.375*69.25098/3 + 69.25098^2/2 - (18.75^2 - 9.375^2)/4)
= 431863.4 lb-in

S1 = +- Mq*K1'/ (pi*R^2*t)
= 431863.4*9.3799/ (pi*18.4375^2*0.625)
= 6068.909 psi

Max tensile stress S1t = S1 + Sp = 12436.5 psi
Max compressive stress S1c = S1 = 6068.909 psi

Tensile stress is acceptable (< = 17500 psi)
Compressive stress is acceptable (< = 17036.4 psi)

Tangential shear stress in the shell

Operating condition governs.

Qshear = Q - w*(a + 2*H/3)
= 25568 - 156.2034*(69.25098 + 2*9.375/3)
= 13774.49 lb

S2 = K2.2*Qshear/(R*t)
= 1.1707*13774.49/(18.4375*0.625)
= 1399.391 psi

Tangential shear stress is acceptable (< = .8*17500 psi)

Circumferential stress at saddle horns

Operating condition governs.

S3 = -Q/(4*(t+tp)*(b+1.56*Sqr(Ro*t))) - 3*K3*Q/(2*(t^2+tp^2))
= -25568/(4*(0.625+0)*(6+1.56*Sqr(18.75*0.625))) -
3*0.0529*25568/(2*(0.625^2+0^2))
= -6095.627 psi

Circ stress at saddle horns is acceptable (< = 1.5*17500 psi)

Ring compression in shell over saddle

S5 = K5*Q/((t + tp)*(tw + 1.56*Sqr(Ro*tc)))
= 0.7603*25568/((0.625 + 0.5)*(0.5 + 1.56*Sqr(18.75*1.125)))
= 2254.399 psi

Ring compression in shell is acceptable (< = .5*36000 psi)

Saddle splitting load

Area resisting splitting force = Web area + wear plate area

Ae = Heff*tw + tp*Wp

= 4.25*0.5 + 0.5*13
= 8.625 in^2

S8 = K8*Q / Ae
= 0.2035*26042 / 8.625
= 614.4402 psi

Stress in saddle is acceptable (< = .666*20000 psi)

Shear Stress in anchor bolting, one end slotted

Maximum seismic base shear: 0 lb

Thermal expansion base shear: W*U = 26042 * 0.45 = 11718.9 lb

Bolt shear stress = 11718.9/(.551* 2) = 10634.21 psi

Anchor bolt stress is acceptable (< = 18000 psi)

Saddle plate buckling check (Escoe pg 251)

Allowable compressive stress Sc is the lesser of 20000 or:

Sc = 1.28*pi^2*29000000/(12*(1 - 0.3^2)*(32.5/0.5)^2)
= 7940.693 psi

Allowable compressive load on the saddle

be = di*ts/(di*ts + 2*tw*(b - 1))
= 32.5*0.5/(32.5*0.5 + 2*0.5*(6 - 1))
= .7647059

Fb = n*(As + 2*be*ts)*Sc
= 2*(5.5*0.5 + 2*0.7647059*0.5)*7940.693
= 55818.4 lb

Saddle loading of 26042 is < = Fb; satisfactory.

Saddle base plate check (Bednar pg 182)

tb = Sqr(Qmax*F / (Sa*1.2*E))
= Sqr(26042*7 / (20000*1.2*34.5))
= .4692141 in

Base plate thickness of 0.5 in is adequate.

Foundation bearing check

Sf = Qmax / (F*E)
= 26042 / (7*34.5)
= 107.8344 psi

Concrete bearing stress < 750 psi; satisfactory.