ASME Code Data Report for the CC Cryostat

Engineering Note # 3740.214-EN-265

Issued: November 6, 1990

Originator: Rick Luther

Fermilab

Fermi National Accelerator Laboratory
P.O. Box 500 • Batavia, Illinois • 60510

November 11, 1987

Mr. Joe R. Sloan
CBI Na-Con, Incorporated
24137 111th Street
Plainfield, Illinois 60544

SUBJECT: ASME Code Documentation
CC Cryostat Head Removal and Replacement
CBI Na-Con Contract C70708
Fermilab Contract 938570

Dear Joe:

Attached per your request are the ASME Code Data Reports for the CC Cryostat. Included are:

- Form U-1 for the inner vessel of the Cryostat.
- Rubbings of the Code nameplate and the duplicate nameplate located on the top of the outer vessel.
- Forms U-2 for the heads for both vessels (inner and outer).

If you need any additional documentation please let me know.

Very truly yours,

Richard D. Luther
DØ Cryogenics Engineering
Mail Station 357
(312) 840-2322

RDL/hs

cc: Mulholland
Luther/File: CC Head Removal/Replacement

30093

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

1. Manufactured and certified by Richmond-Lox Equipment Company, Hwy 25 South, Delphi, IN 46923
(Name and address of manufacturer)

2. Manufactured for Fermi National Accelerator Lab, P.O. Box 500, Batavia, IL 60510
(Name and address of purchaser)

3. Location of installation Same
(Name and address)

4. Type Horiz.Jackt.Torus (Horiz. or vert., tank) 30093 (Mfgr's serial No.) (CRN) D87-0058 (Drawing) 3688 (Nat'l Bd. No.) 1987 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME Boiler and Pressure Vessel Code. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 Winter, 1986
Year

Winter 1986 (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, or sheets of heat exchangers

6. Shell: Non-Code (Matl. (Spec. No., Grade)) Nom. Thk. (in.) Corr. Allow. (in.) Diam. I.D. (ft & in.) Length (Overall) (ft & in.)

7. Seams: Long. (Dbl., Sngl.) R.T. (Spot or Full) Eff. (%) H.T. Temp. (°F)

Time Girth (Dbl., Sngl.) R.T. (Spot, Partial, or Full) No. of Courses

8. Heads: (a) Matl. (Spec. No., Grade) (b) Matl. (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)										
(b)										

If removable, bolts used (describe other fastenings) (Matl., Spec. No., Gr., Size, No.)

9. Type of Jacket Proof Test

10. Jacket Closure (Describe as ogee & weld, bar, etc.) If bar, give dimensions If bolted, describe or sketch.

11. MAWP psi at max. temp. °F. Min. temp. (when less than -20°F) °F.
Hydro., pneu., or comb. tes press. psi.

Items 12 and 13 to be completed for tube sections

12. Tubesheets: Stationary Matl. (Spec. No., Gr.) Diam. (in.) (Subject to pressure) Nom. Thk. (in.) Corr. Allow. (in.) Attach. (Welded, Bolted)

Floating Matl. (Spec. No., Gr.) Diam. (in.) Nom. Thk. (in.) Corr. Allow. (in.) Attach.

13. Tubes: Matl. (Spec. No., Gr.) O.D. (in.) Nom. Thk. (in. or Gauge) Number Type (Straight or U)

Items 14-17 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers

14. Shell: SA240 304 (Matl. (Spec. No., Grade)) .625 (Nom. Thk. (in.)) 0 (Corr. Allow. (in.)) 16' ¼" (Diam. I.D. (ft & in.)) 6' 7/8" (Length (Overall) (ft & in.))

15. Seams: Dbl Butt (Long. (Dbl., Sngl.)) None (R.T. (Spot or Full)) 70% (Eff. (%)) H.T. Temp. (°F)

Time Sngl Butt (Girth (Dbl., Sngl.)) None (R.T. (Spot, Partial, or Full)) 1 (No. of Courses)

16. Heads: (a) Matl. SA240 304 (Spec. No., Grade) (b) Matl. (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	Ends	Nom 5/8"	-	7' 2 1/8"	1'0" &	3' 7/8"				
(b)										

If removable, bolts used (describe other fastenings) (Matl., Spec. No., Gr., Size, No.)

17. MAWP 30 psi at max. temp. 100 °F. Min. temp. (when less than -20°F) -320 °F
~~Hydro.~~, pneu., or ~~XXXXX~~ test press 50 psi

(12/82) This form (E00108) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 1001

FORM U-4 MANUFACTURER'S DATA REPORT SUPPLEMENTARY SHEET

As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured and certified by Richmond-Lox Equipment Company, Hwy 25 South, Delphi, IN 46923
(Name and address of manufacturer)

2. Manufactured for Fermi National Accelerator Lab, P.O. Box 500, Batavia, IL 60510
(Name and address of purchaser)

3. Location of installation Same
(Name and address)

4. Type Horiz.Jackt.Torus (Horiz., vert., tank, etc.) 30093 (Mfg's. serial No.) (CRN) D87-0058 (Dwg) 3688 (Nat'l. Bd. No.) 1987 (Year built)

Data Report Item Number	Remarks
14	Inner shell description (During operation, this shell will be subjected to external pressure.)
	SA240 304 .375 0 5' - 4 3/8" 8' - 8½"
15	Inner Shell

Date July 24, 1987 Co. name Richmond-Lox Equipment Co. Signed C. E. Whitaker
Date July 24, 1987 Signed Orval Greene Certificate No. N.B. 7917, IND.911

NAT'L B.D. NO. 3688 MFRS. SER. NO. 30093

RICHMOND-LOX
EQUIPMENT COMPANY
Delphi, Indiana

DIV. 1

U

W

RT-4

Richmond-Lox Equipment Company/Delphi Division

VESSEL D.P. 15 P.S.I. AT 100 °F

JACKET D.P. P.S.I. AT °F

SHELL T. .625/.375 JKT. SHELL T.

HEAD T. .625 JKT. HEAD T.

YEAR BUILT 1987 MOD. NO. 30093

U

DIV. 1

W

RT-4

DUPLICATE

NAT'L BD. NO. 3688

CERTIFIED BY

Richmond Lox Equipment Company

Delphi, Indiana UHA 51

VESSEL D.P. 15 P.S.I. AT -298 +100 °F

JACKET D.P. P.S.I. AT °F

MFR. SER. NO. 30093 YEAR BUILT 1987

SHELL THICK. .625 .375 JKT. SHELL THICK.

HEAD THICK. .625 JKT. HEAD THICK.

checked 4-14-87
CEW

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. Manufactured and certified by The Stacey Mfg. Co., 259 Township Ave., Cincinnati, Ohio 45216 (Name and address of manufacturer)

2. Manufactured for Richmond-Lox Equipment Co., Delphi, Indiana 46923 (Name and address of purchaser)

3. Location of installation Not known (Name and address)

4. Type Horizontal Tank (Horiz. or vert., tank) | 6309A (Mfgr's serial No. of Part) | (CRN) | 0-44-A53 Rev.2 (Drawing No.) | - (Nat'l. Bd. No.) | 1987 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1986 (Year).

December 31, 1986 (Addenda (Date)) | - (Code Case No.) | - (Special service per UG-120(d))

6. (a) Drawing prepared by The Stacey Mfg. Co. (b) Description of part inspected 16'1-1/2" OD Half Torus*

7. Postweld heat treatment: Temp. - °F Time -

Items 8-13 incl. to be completed for single wall vessels, jackets of jacketed vessels, or shells of heat exchangers

8. Shell: - (Matl. (Spec. No., Grade)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Diam. I.D. (ft & in.)) | - (Length (overall) (ft & in.))

9. Seams: - (Long. (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot or Full)) | - (Eff. (%)) | - (H.T. Temp. (°F)) | - (Time) | - (Girth (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot, Partial, or Full)) | - (No. of Courses)

10. Heads: (a) Matl. - (Spec. No., Grade) (b) Matl. - (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	-	-	-	-	-	-	-	-	-	-
(b)	-	-	-	-	-	-	-	-	-	-

If removable, bolts used (describe other fastenings) - (Matl., Spec. No., Gr., Size, No.)

11. Type of Jacket - Proof Test -

12. Jacket Closure - (Describe as ogee & weld, bar, etc.) If bar, give dimensions -

If bolted, describe or sketch.

13. MAWP - psi at max. temp. - °F. Min. temp. (when less than -20° F) - °F.

Hydro., pneu., or comb. test press. - psi.

Items 14 and 15 to be completed for tube sections

14. Tubesheets: - (Stationary Matl. (Spec. No., Gr.)) | - (Diam. (in.) (Subject to pressure)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Attach. (Wld., Bolted))

- (Floating Matl. (Spec. No., Gr.)) | - (Diam. (in.)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Attach)

15. Tubes: - (Matl. (Spec. No., Grade)) | - (O.D. (in.)) | - (Nom. Thk. (in. or gauge)) | - (No.) | - (Type (straight or "U"))

Items 16-18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers

16. Shell: - (Matl. (Spec. No., Gr.)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Diam. I.D. (ft & in.)) | - (Length (overall) (ft & in.))

17. Seams: - (Long. (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot or Full)) | - (Eff. (%)) | - (H.T. Temp. (°F)) | - (Time) | - (Girth (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot, Partial or Full)) | - (No. of Courses)

18. Heads: (a) Matl. SA240-304* (Spec. No., Grade) (b) Matl. - (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	End	Nom. 5/8"	-	7'2-1/8"	1'0" & 3-7/8"*	-	-	-	-	-
(b)	-	-	-	-	-	-	-	-	-	-

If removable, bolts used (describe other fastenings) - (Matl., Spec. No., Grade, Size, No.)

Form U-2 (Back)

19. MAWP – psi at max. temp. – °F. Min. temp. (when less than -20° F) – °F.

Hydro., pneu., or comb. test press. – psi.

Items below to be completed for all vessels where applicable

20. Nozzles, Inspection and Safety Valve Openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diam. or Size	Type	Matl.	Nom. Thk.	Reinforcement Matl.	How Attached	Location
–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–
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21. Supports: Skirt – (Yes or no) Lugs – (No.) Legs – (No.) Other – (Describe) Attached – (Where and how)

Remarks: Neither design nor hydrostatic testing were performed by The Stacey Mfg. Co. *This half section of 16'1-1/2" OD X 5'11-3/4" ID Torus is a ten-piece construction and consists of one (1) latitudinal double butt-welded joint at reverse 0'3-7/8" IKR tangent point jointing 7'2-1/8" IR donut portion, four (4) meridinal double butt-welded joints at 5'11-3/4" ID reverse 0'3-7/8" inside knuckle portion & twelve (12) meridinal double butt-welded joints at 7'2-1/8" IR donut with 1'0" IKR portion. All welding - Full R.T.

CERTIFICATE OF SHOP COMPLIANCE

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

"U" Certificate of Authorization No. 1830 expires March 30, 19 88

Date 3 31 87 Co. name The Stacey Mfg. Co. (Manufacturer) Signed Sammy H.C. Ling (Representative)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of Ohio and employed by H.S.B.I. & I Co. of Hartford, Conn. have inspected the pressure vessel described in this Manufacturer's Partial Data Report on 3-31, 19 87, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this part in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the part described in this Manufacturers' Partial 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 3 31 87 Signed [illegible] (Authorized Inspector) Commissions NB-3643 Ohio Comm (Nat'l Board (incl. endorsements) State)

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. Manufactured and certified by The Stacey Mfg. Co., 259 Township Ave., Cincinnati, Ohio 45216 (Name and address of manufacturer)

2. Manufactured for Richmond-Lox Equipment Co., Delphi, Indiana 46923 (Name and address of purchaser)

3. Location of installation Not known (Name and address)

4. Type Horizontal Tank (Horiz. or vert. tank) | 6309B (Mfgr's serial No. of Part) | (CRN) | 0-44-A53 Rev. 2 (Drawing No.) | - (Nat'l Bd. No.) | 1987 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1986 (Year)

December 31, 1986 (Addenda (Date)) | - (Code Case No.) | - (Special service per UG 120(d))

6. (a) Drawing prepared by The Stacey Mfg. Co. (b) Description of part inspected 16'1-1/2" OD Half Torus*

7. Postweld heat treatment: Temp. - °F Time -

Items 8-13 incl. to be completed for single wall vessels, jackets of jacketed vessels, or shells of heat exchangers

8. Shell: - (Matl. (Spec. No., Grade)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Diam. I.D. (ft & in.)) | - (Length (overall) (ft & in.))

9. Seams: - (Long. (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot or Full)) | - (Eff. (%)) | - (H.T. Temp. (°F)) | - (Time) | - (Girth (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot, Partial, or Full)) | - (No. of Courses)

10. Heads: (a) Matl. - (Spec. No., Grade) (b) Matl. - (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	-	-	-	-	-	-	-	-	-	-
(b)	-	-	-	-	-	-	-	-	-	-

If removable, bolts used (describe other fastenings) - (Matl., Spec. No., Gr., Size, No.)

11. Type of Jacket - Proof Test -

12. Jacket Closure - (Describe as ogee & weld, bar, etc.) If bar, give dimensions -

If bolted, describe or sketch.

13. MAWP - psi at max. temp. - °F. Min. temp. (when less than -20°F) - °F.

Hydro., pneu., or comb. test press. - psi.

Items 14 and 15 to be completed for tube sections

14. Tubesheets: - (Stationary Matl. (Spec. No., Gr.)) | - (Diam. (in.) (Subject to pressure)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Attach. (Wld., Bolted))

- (Floating Matl. (Spec. No., Gr.)) | - (Diam. (in.)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Attach.)

15. Tubes: - (Matl. (Spec. No., Grade)) | - (O.D. (in.)) | - (Nom. Thk. (in. or gauge)) | - (No.) | - (Type (straight or "U"))

Items 16-18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers

16. Shell: - (Matl. (Spec. No., Gr.)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Diam. I.D. (ft & in.)) | - (Length (overall) (ft & in.))

17. Seams: - (Long. (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot or Full)) | - (Eff. (%)) | - (H.T. Temp. (°F)) | - (Time) | - (Girth (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot, Partial, or Full)) | - (No. of Courses)

18. Heads: (a) Matl. SA240-304* (Spec. No., Grade) (b) Matl. - (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	End	Nom. 5/8"	-	7'2-1/8"	1'0"&3-7/8"*	-	-	-	-	-
(b)	-	-	-	-	-	-	-	-	-	-

If removable, bolts used (describe other fastenings) -

P.O. Box 1
Baltimore, land 21203

EASTERN STAINL SS STEEL COMPANY

DIVISION OF Eastmet CORPORATION

THINK FIRST . . . THINK EASTERN

CUS ER COPY

CERTIFIED MATERIAL TEST REPORT

We certify that all of the test results and the statements of performed operations recorded here are in compliance with the ordered material specifications and the applicable material requirements.

J E Bonarski
QUALITY CONTROL DEPARTMENT

MANIFEST 6877

DATE 19 01/XX 7

CUST. NO. 9648

SHIP TO: STACEY MFG
259 TOWNSHIP AVE
CINCINNATI OH 45216

MAIL TO: DIRECT
WILLIAMS AND COMPANY INC.
901 PENNSYLVANIA AVENUE
PITTSBURGH PA 15233

MILL ORDER	CUSTOMER ORDER NO.	LOC.	SHIPPED VIA	SHIP MODE	B/L NUMBER	CAR NUMBER		RLS-DT
B6364	M316810306	NP	UNIVERSAL AM-CAN	T	2698		COLLECT ☐	01/26/87

ITEM		T NO.	COIL NO.	M.P.O. NO.	GAUGE	SIZE	FINISH CODE	DESCRIPTION	COUPON	W-LOC	BNDL CODE	PLATES COILS SHEETS	GROSS	TARE	NET	PK	GP	FA	WS
01	F	648		92027	0.6250	77.5000 X 267.5000	17	304 HRAP				1	3863		3863		011687		Y
01	F	648		92028	0.6250	77.5000 X 267.5000	17	304 HRAP				1	3863		3863		011687		Y
01	F	648		92029	0.6250	77.5000 X 267.5000	17	304 HRAP				1	3863		3863		011687		Y
01	F	648		92030	0.6250	77.5000 X 267.5000	17	304 HRAP				1	3863		3863		011687		Y
												4	15452	0	15452				

Q16036-6309
1/29/87
6309

ECS ASTM A240-84A ASME SA240 SECT II S85 ADD

EE FR KNOWN CONTACT WITH MERCURY

MINIMUM SOLUTION ANNEALING TEMPERATURE 1900 F

AT NO.	C %	MN %	P %	S %	SI %	CR %	NI %	CU %	TI %	CB+TA %	MO %	CO %	N %
0648	.048	1.68	.029	.007	.51	18.16	8.11	.36			.27	.14	.078
0648	.048	1.68	.029	.007	.51	18.16	8.11	.36			.27	.14	.078
0648	.048	1.68	.029	.007	.51	18.16	8.11	.36			.27	.14	.078
0648	.048	1.68	.029	.007	.51	18.16	8.11	.36			.27	.14	.078

CORROSION TEST CODES

A. ASTM A262 - 'A'
B. ASTM A262 - 'B'
C. ASTM A262 - 'C'
D. ASTM A262 - 'E'
E. QQS-766 (CUS04)

	TRANSVERSE OR FRONT						LONGITUDINAL OR BACK								CORROSION TEST		MAG. PERM.	SOLUTION ANNEAL	
AT NO.	TENSILE PSI	YIELD PSI	ELONG %	HARDNESS	BEND	R/A %	TENSILE PSI	YIELD PSI	ELONG %	HARDNESS	BEND	R/A %	GR	C	CODE	RESULT	TEST	TIME MINUTES	TEMP. °F
0648	27 91.6	44.8	58	HB167		64													
0648	28 92.0	45.5	58	HB170	G	64													
0648	29 92.0	45.5	58	HB170	G	64													
0648	30 92.0	45.5	58	HB170	G	64													

CAUTION: PROCESSING THAT MAKES FUMES, DUST OR SOLUTIONS MAY

STACEY MFG. QUALITY CONTROL DEPARTMENT:

Material on this MTR was ordered from:

WILLIAMS & Co. on

P.O. # Q16036-6309 Item # 1

This material applies to Stacey MFG.

S.O. # 6309

MK. # 1-1

This MTR. has been checked against

ASME. spec. SA 240 T304

By: D Hicks Date: 1/22/87

JESSOP STEEL COMPANY

Washington, Pennsylvania 15301

A ATHLONE COMPANY

CERTIFICATE OF TEST

OUR ORDER NO. [illegible]
YOUR ORDER NO. 71611-99-S -06
MEMO NO. 42534
DATE 10/06/86
SALESMAN NO. Salesman no. 080

AUTHORIZED SIGNATURE

DECLARED TO UNDER OATH BEFORE ME

THIS _____ DAY OF _____

JESSOP STEEL COMPANY

BY

BILL TO / SHIP TO

Ship to:
WILLIAMS & CO
7640 REINHOLD DR
CINCINNATI OH 45237

Bill to:
WILLIAMS & COMPANY INC
901 PENNSYLVANIA AVE
PITTSBURGH PA 15233

ATTN U C CLERK

JESSO T 304 STAINLESS HRAP
ASME -240-86 AMS 5513D ASTM A240-85a ASTM A167-84a
COMP ASTM A312-85 COMPOSITION & MECHANICAL PROPERTIES TO ASTM A276-85a
QQ-S- 6C AMEND 6 COND A

Heat	Slip	Size	Pcs	Weight
15647	71108	.6250 x 96.0000 x 270.0000	1	4830
15640	71109	.6250 x 96.0000 x 259.0000	1	4633
15648	71110	.6250 x 96.0000 x 253.0000	1	4526

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
15647	.061	1.75	.027	.003	.57	8.30	18.40	.39	.13	.24	.079
15648	.060	1.75	.030	.011	.49	8.15	18.18	.44	.12	.25	.084

Heat	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grai Siz
15647	.6250	43.4 KSI	87.8 KSI	62.8	72.3	BHN170	OK	OK	
15648 1-3	.6250	43.0 KSI	87.4 KSI	62.1	71.6	BHN179	OK	OK	

MAGNE C PERMEABILITY-LESS THAN 1.02
MATER L WAS PRODUCED WITHOUT KNOWN CONTACT WITH MERCURY OR LOW MELTING POINT CONTAMINANTS

STACEY MFG. QUALITY CONTROL DEPARTMENT:

Material on this MTR was ordered from:

Williams & Co on

P.O. # Q160316-6309 Item # 1, 2

This material applies to Stacey MFG.,

S.O. # 6309

MK. # 1-3

This MTR. has been checked against

ASME. spec. SA 240 T304

By: [illegible] Date: 1/13/87

Q.A. APPROVED
OCT 10 '86

Abmessung (mm, Zoll) Size (mm, inch) Dimensions (mm)	Menge Quantity Quantité	Nettogewicht (kg) Net weight (kgs) poids net (kg)	Charge Nr. Heat No. Coulée no.	Serie Nr. Series No. Série No.	Kolli Nr. Parcel No. Colis No.
			99108,99082	-87314	

Chemische Analyse - Chemical Analysis - Analyse chimique

Charge Heat Coulee	Serie Serie Série	C %	Si %	Mn %	P %	S %	Cr %	Mo %	Ni %	Cu %		Nb %
99108		0,016	0,65	0,78	0,024	0,014	20,06	0,33	10,20	0,090		
99082		0,018	0,69	0,79	0,024	0,011	20,28	0,04	9,91	0,060		
87314		0,028	0,73	0,74	0,027	0,011	19.91	0,26	10,22	0,18		

Mechanische Gütewerte - Mechanical Properties - Propriétées mécaniques

Charge Heat Coulée No.	Serie Serie Série No.	Wärmebehandl. Heat Treatm. Traite ment thermique	Streckgrenze Yield point Limite élastique N/mm²	Zugfestigkeit Tensile strength Resistance à la traction N/mm²	Dehnung Elongation Allongement (L=5.65 √A) %	Einschnürung Reduction Striction %	Härte Hardness Durete	Kerbschlagarbeit Impact strength Résilience Charpy-V Joule
99108)				✓	✓			
99082)		u		min.520	min.35			
~~87314)~~								

u = unbehandelt – as welded – non traité
a = angelassen – tempered – revenu
s = spannungsarmgegluht – stress relieved – recuit de détente

VEREINIGTE EDELSTAHLWERKE
AKTIENGESELLSCHAFT (VEW)
Werksgruppe Kapfenberg
Schweißversuchsanstalt
Kontrolle und Abnahme

STACEY MFG. QUALITY CONTROL DEPARTMENT:

Material on this MTR was ordered from:
AGA on
P.O. # 16118-Bunker Item # 1 & 2
This material applies to Stacey MFG.
S.O. # 6308 - 6309
MK. # WELDING MATERIALS
ASME. spec. SFA 5.4 - 308L-16
By: D Adams Date: 4/6/87

THE STACEY MFG. CO.
RECEIVED
APR-6 1987

NO.	INITL	DATE
	DH	4/6/87

131.266 c VEW – DVR 0055107 – Schmerzeck, Bruck/

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. Manufactured and certified by The Stacey Mfg. Co., 259 Township Ave., Cincinnati, Ohio 45216 (Name and address of manufacturer)

2. Manufactured for Richmond-Lox Equipment Co., Delphi, Indiana 46923 (Name and address of purchaser)

3. Location of installation Not known (Name and address)

4. Type Horizontal Tank (Horiz. or vert., tank) | 6308A (Mfgr's serial No. of Part) | (CRN) | 0-43A53 R.2 (Drawing No.) | - (Nat'l. Bd. No.) | 1987 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1986 (Year)

December 31, 1986 (Addenda (Date)) | - (Code Case No.) | - (Special service per UG-120(d))

6. (a) Drawing prepared by The Stacey Mfg. Co. (b) Description of part inspected 16'11-3/4" OD Half Torus*

7. Postweld heat treatment: Temp. - °F Time -

Items 8-13 incl. to be completed for single wall vessels, jackets of jacketed vessels, or shells of heat exchangers

8. Shell: - (Matl. (Spec. No., Grade)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Diam. I.D. (ft & in.)) | - (Length (overall) (ft & in.))

9. Seams: - (Long. (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot or Full)) | - (Eff. (%)) | - (H.T. Temp. (°F)) | - (Time) | - (Girth (Wld., Dbl., Sngl., Lap, Butt)) | - (R. T. (Spot, Partial, or Full)) | - (No. of Courses)

10. Heads: (a) Matl. SA240-304* (Spec. No., Grade) (b) Matl. (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
)	End	Nom. 1/2"	-	7'3-7/8"	1'1-9/16"	&5-9/16"*	-	-	-	Concave
.)	-	-	-	-	-	-	-	-	-	-

If removable, bolts used (describe other fastenings) - (Matl., Spec. No., Gr., Size, No.)

11. Type of Jacket - Proof Test -

12. Jacket Closure - (Describe as ogee & weld, bar, etc.) If bar, give dimensions -

If bolted, describe or sketch.

13. MAWP - psi at max. temp. - °F. Min. temp. (when less than -20° F) - °F.

Hydro., pneu., or comb. test press. - psi.

Items 14 and 15 to be completed for tube sections

14. Tubesheets: - (Stationary Matl. (Spec. No., Gr.)) | - (Diam. (in.)(Subject to pressure)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Attach. (Wld., Bolted))

- (Floating Matl. (Spec. No., Gr.)) | - (Diam. (in.)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Attach.)

15. Tubes: - (Matl. (Spec. No., Grade)) | - (O.D. (in.)) | - (Nom. Thk. (in. or gauge)) | - (No.) | - (Type (straight or "U"))

Items 16-18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers

16. Shell: - (Matl. (Spec. No., Gr.)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Diam. I.D. (ft & in.)) | - (Length (overall) (ft & in.))

17. Seams: - (Long. (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot or Full)) | - (Eff. (%)) | - (H.T. Temp. (°F)) | - (Time) | - (Girth (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot, Partial, or Full)) | - (No. of Courses)

18. Heads: (a) Matl. - (Spec. No., Grade) (b) Matl. - (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-

If removable, bolts used (describe other fastenings) -

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. Manufactured and certified by The Stacey Mfg. Co., 259 Township Ave., Cincinnati, Ohio 45216 (Name and address of manufacturer)

2. Manufactured for Richmond-Lox Equipment Co., Delphi, Indiana 46923 (Name and address of purchaser)

3. Location of installation Not known (Name and address)

4. Type Horizontal Tank (Horiz. or vert. tank) | 6308B (Mfgr's serial No. of Part) | (CRN) | 0-43A53 R.2 (Drawing No.) | - (Nat'l. Bd. No.) | 1987 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1986 (Year)

December 31, 1986 (Addenda (Date)) | - (Code Case No.) | - (Special service per UG-120(d))

6. (a) Drawing prepared by The Stacey Mfg. Co. (b) Description of part inspected 16'11-3/4" OD Half Torus*

7. Postweld heat treatment: Temp. - °F Time -

Items 8-13 incl. to be completed for single wall vessels, jackets of jacketed vessels, or shells of heat exchangers

8. Shell: - (Matl. (Spec. No., Grade)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Diam. I.D. (ft & in.)) | - (Length (overall) (ft & in.))

9. Seams: - (Long. (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot or Full)) | - (Eff. (%)) | - (H.T. Temp. (°F)) | - (Time) | - (Girth (Wld., Dbl., Sngl., Lap, Butt)) | - (R. T. (Spot, Partial, or Full)) | - (No. of Courses)

10. Heads: (a) Matl. SA240-304* (Spec. No., Grade) (b) Matl. - (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	End	Nom. 1/2"		7'3-7/8"	1'1-9/16"	&5-9/16"*				Concave
(b)										

If removable, bolts used (describe other fastenings) - (Matl., Spec. No., Gr., Size, No.)

11. Type of Jacket - Proof Test -

12. Jacket Closure - (Describe as ogee & weld, bar, etc.) If bar, give dimensions -

If bolted, describe or sketch.

13. MAWP - psi at max. temp. - °F. Min. temp. (when less than -20°F) - °F.

Hydro., pneu., or comb. test press. - psi.

Items 14 and 15 to be completed for tube sections

14. Tubesheets: - (Stationary Matl. (Spec. No., Gr.)) | - (Diam. (in.)(Subject to pressure)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Attach. (Wld., Bolted))

- (Floating Matl. (Spec. No., Gr.)) | - (Diam. (in.)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Attach.)

15. Tubes: - (Matl. (Spec. No., Grade)) | - (O.D. (in.)) | - (Nom. Thk. (in. or gauge)) | - (No.) | - (Type (straight or "U"))

Items 16-18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers

16. Shell: - (Matl. (Spec. No., Gr.)) | - (Nom. Thk. (in.)) | - (Corr. Allow. (in.)) | - (Diam. I.D. (ft & in.)) | - (Length (overall) (ft & in.))

17. Seams: - (Long. (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot or Full)) | - (Eff. (%)) | - (H.T. Temp. (°F)) | - (Time) | - (Girth (Wld., Dbl., Sngl., Lap, Butt)) | - (R.T. (Spot, Partial, or Full)) | - (No. of Courses)

18. Heads: (a) Matl. - (Spec. No., Grade) (b) Matl. - (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	-	-	-	-	-	-	-	-	-	-
(b)	-	-	-	-	-	-	-	-	-	-

If removable, bolts used (describe other fastenings) - (Matl. Spec. No. Grade Size No.)

P.O. Box
Baltimore, Maryland 21203

EASTERN STAINLESS STEEL COMPANY

DIVISION OF Eastmet CORPORATION

THINK FIRST . . . THINK EASTERN

CUSTOMER COPY

CERTIFIED MATERIAL TEST REPORT

We certify that all of the test results and the statements of performed operations recorded here are in compliance with the ordered material specifications and the applicable material requirements.

J E Bonnett
QUALITY CONTROL DEPARTMENT

MANIFEST NO. 6878

DATE 01/13/87

CUST. NO. 9649

SHIP TO: STACEY MFG
259 TOWNSHIP AVE
CINCINNATI OH 45216

MAIL TO: DIRECT
WILLIAMS AND COMPANY INC.
901 PENNSYLVANIA AVENUE
PITTSBURGH PA 15233

MILL ORDER NO.	CUSTOMER ORDER NO.	LOC.	SHIPPED VIA	SHIP MODE	B/L NUMBER	CAR NUMBER		RLS-DT
B636	M316810306	NF	UNIVERSAL AM-CAN	T	2698		COLLECT ☐	01/26/87

ITEM	HEAT NO.	COIL NO.	M.P.O. NO.	GAUGE	SIZE	FINISH CODE	DESCRIPTION	COUPON	W-LOC	BNDL CODE	PLATES COILS SHEETS	GROSS	TARE	NET	PK	GP	FA	WS
S 02	60653		92031	0.5000	85.5000 X 277.5000	17	304 HRAP				1	3569		3569		01158		
S 02	60653		92032	0.5000	85.5000 X 277.5000	17	304 HRAP				1	3569		3569		01158		
S 02	60653		92033	0.5000	85.5000 X 277.5000	17	304 HRAP				1	3569		3569		01158		
S 02	60653		92034	0.5000	85.5000 X 277.5000	17	304 HRAP				1	3569		3569		01158		
											4	14276	0	14276				

Q16035-6308
1/20/87
6308
1-1

SPECS ASTM A240-84A ASME SA240 SECT II S85 ADD

REE FR KNOWN CONTACT WITH MERCURY

MINIMUM SOLUTION ANNEALING TEMPERATURE 1900 F

HEAT NO.	C %	MN %	P %	S %	SI %	CR %	NI %	CU %	TI %	CB+TA %	MO %	CO %	N %
60653	.048	1.78	.031	.006	.50	18.17	8.08	.19			.32	.14	.080
60653	.048	1.78	.031	.006	.50	18.17	8.08	.19			.32	.14	.080
60653	.048	1.78	.031	.006	.50	18.17	8.08	.19			.32	.14	.080
60653	.048	1.78	.031	.006	.50	18.17	8.08	.19			.32	.14	.080

CORROSION TEST CODES

A. ASTM A262 - 'A'
B. ASTM A262 - 'B'
C. ASTM A262 - 'C'
D. ASTM A262 - 'E'
E. QQS-766 (CUS04)

HEAT NO.	TRANSVERSE OR FRONT TENSILE PSI	YIELD PSI	ELONG %	HARDNESS	BEND	R/A %	LONGITUDINAL OR BACK TENSILE PSI	YIELD PSI	ELONG %	HARDNESS	BEND	R/A %	GR	C	CORROSION TEST CODE	RESULT	MAG. PERM. TEST	SOLUTION ANNEAL TIME MINUTES	TEMP. °F
60653	93.8	46.3	56	HB170	G	64	93.6	47.0	56	HB170	G	64	5		AE	SAT			
60653	93.8	46.3	56	HB170	G	64	93.6	47.0	56	HB170	G	64	5		AE	SAT			
60653	93.8	46.3	56	HB170	G	64	93.6	47.0	56	HB170	G	64	5		AE	SAT			
60653	93.8	46.3	56	HB170	G	64	93.6	47.0	56	HB170	G	64	5		AE	SAT			

CAUTION: PROCESSING THAT MAKES FUMES, DUST OR SOLUTIONS MAY