ASME Code Data Report for the CC Cryostat

Engineering Note # 3740.214-EN-265

Issued: November 6, 1990

Originator: Rick Luther
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
DC/ Cryogenics Engineering
Mail Station 357
(312) 840-2322

RDL/hs

cc: Mulholland
Luther/File: CC Head Removal/Replacement
1. Manufactured and certified by Richmond-Lox Equipment Company, Hwy 25 South, Delphi, IN 46923
2. Manufactured for Fermi National Accelerator Lab, P.O. Box 500, Batavia, IL 60510
3. Location of installation: Same

4. Type Horiz. Jackt. Torus 30093
   (Name and address of manufacturer) National Accelerator Lab, P.O. Box 500, Batavia, IL 60510
   (Name and address of purchaser)

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.

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

   (Spec No, Grade) (Nom. Thrk in.) Corr. Allow. in.) Diam. (ID & OD) (Length (Overwall & 4:

7. Seams:
   Long (Obs. Surf.) RT (Spec or Fails) Eff (%) H.T. Temp. F
   Short (Obs. Surf.) 

   (b) Matl. (Spec No, Grade)

9. Type of Jacket
   Proof Test

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

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

Items 12 and 13 to be completed for tube sections.

12. Tubesheets:
    Stationary Matl (Spec No, Grade) Diam. in. (Subject to pressure) Nom. Thrk in. Corr. Allow. in.) Attach (Welding, Solder)

13. Tubes:
    Matl. (Spec No, Grade) O.D. in. Nom. Thrk in. or Gauge Number
    From Supplier or U.L.

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

14. Shell: SA240 304 .625 0 16 1/4 6' 7/8
    Matl. (Spec No, Grade) (Nom. Thrk in.) Corr. Allow. in.) Diam. (ID & OD) (Length (Overwall & 4:

15. Seams:
    Dbl Butt
    Long (Obs. Surf.) RT (Spec or Fails) Eff (%) H.T. Temp. F
    Short (Obs. Surf.) 

    (b) Matl. (Spec No, Grade)

17. MAWP 30 psi at max. temp. psi
    Hydro., pneu., or comb. test press.

This form (E.00108) may be obtained from the Under Dept., ASME, 345 E 47th St., New York, N.Y. 10017

(12/82)
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

2. Manufactured for Fermi National Accelerator Lab, P.O. Box 500, Batavia, IL 60510

3. Location of installation Same


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<th>Remarks</th>
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<tr>
<td>14</td>
<td>Inner shell description (During operation, this shell will be subjected to external pressure.)</td>
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<td>SA240 304 .375 0 5' - 4 3/8&quot; 8' - 81/2&quot;</td>
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<tr>
<td>15</td>
<td>Inner Shell</td>
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</table>

July 24, 1987 Richmond-Lox Equipment Co.
July 24, 1987 N.B. 7917, IND. 911
NAT'L BD. NO. 3688

CERTIFIED BY
Richmond Lox Equipment Company
Delphi, Indiana UHA 51

VESSEL D.P. 15 P.S.I. AT -298°F

JACKET D.P. - P.S.I. AT °F

MFR. SER. NO. 30093 YEAR BUILT 1987

SHELL THICK. .375 JKT. SHELL THICK.

HEAD THICK. .625 JKT. HEAD THICK.

DUPLICATE
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 6309A 0-44-A53 Rev. 2 1987
   (Tank, No. of Parts) (Mfg's serial No. of Part) (CRN) (Drawing No.) (Manuf. No.) (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

   December 31, 1986
   Addenda (Dist) Code Case No. Special service per UG-120(a)

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:

   (b) Diameter: _______________ Length (Overall) __________

9. Seams:

   (a) Long. Weld: ___________ R. T. (Heat or Full) __________
   (b) Eff. Flt.: ___________ H. T. Temp. __________
   (c) Time: ___________

10. Heads: (a) Matl.: _______________ Nom. Thk. __________

    (b) Matl.: _______________ Nom. Thk. __________

   Items 6-18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers

11. Type of Jacket: _______________

12. Jacket Closure: _______________

   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 pres.: ___________ psi.

   Items 14 and 15 to be completed for tubesheets

14. Tubessheets:

   (a) Stationary Matl. (Spec. No., Gr.) __________
   (b) Diam. (In.) (Subcut to pressure) __________
   (c) Nom. Thk. (In.) __________
   (d) Corr. Allow. (In.) __________
   (e) Attach. (Weld, Bolted) __________

15. Tubes:

   Matl. (Spec. No., Grade) __________ D.O. (In.) __________
   Nom. Thk. (In. or gauged) __________
   Type (straight or V) __________

   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. __________
   Corr. Allow. __________
   Diam. (OD) __________
   Length (Overall) __________

17. Seams:

   (a) Long. Weld: ___________ R. T. (Heat or Full) __________
   (b) Eff. Flt.: ___________ H. T. Temp. __________
   (c) Time: ___________


    (b) Matl. __________

   Items 6-18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers

   (a) Location (Top, Bottom End): __________
   (b) Minimum Thickness: __________
   (c) Corrosion Allowance: __________
   (d) Crown Radius: __________
   (e) Knuckle Radius: __________
   (f) Elliptical Ratio: __________
   (g) Conical Atrix Angle: __________
   (h) Hemispherical Radius: __________
   (i) Flatt Diameter: __________

   Side to Pressure (Cover or Concave)

   If removable, bolts used (describe other fastenings)
Form U-2 (Back)

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

Items below to be completed for all vessels where applicable

20. Nozzles, Inspection and Safety Valve Openings:

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<th>Purpose</th>
<th>No.</th>
<th>Date or Size</th>
<th>Type</th>
<th>Matl.</th>
<th>Num. Thk.</th>
<th>Reinforcement Matl.</th>
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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. expires March 30, 1988

Date Co. name The Stacey Mfg. Co. Signed

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 5/27/87, 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 Manufacturer's 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 Signed
**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. **The Stacey Mfg. Co., 259 Township Ave., Cincinnati, Ohio 45216**
   
2. **Richmond-Lox Equipment Co., Delphi, Indiana 46923**
   
3. **Location of installation**: Not known
   
4. **Type**: Horizontal Tank
   **Model No.** 63098
   **Drawing No.** 0-44-A53 Rev. 2
   **Year Built**: 1987

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.

**December 31, 1986**

   (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**: (a) **Material**: Spec. No. Grade
   (b) **Nom. Thk. (in.)**: __________
   **Core Allowance**: __________
   **Diam. (in.)* 2i	__________

9. **Seams**: (a) **Material**: Spec. No. Grade
   **Nom. Thk. (in.)**: __________
   **Core Allowance**: __________
   **Diam. (in.)* 2i	__________
   **H.T. Temp. (°F)**: __________
   **Time**: __________

10. **Heads**: (a) **Material**: Spec. No. Grade
    (b) **Nom. Thk. (in.)**: __________
    **Core Allowance**: __________
    **Diam. (in.)* 2i	__________

   If removable, bolts used (describe other fastenings)

11. **Type of Jacket**: __________
    **Proof Test**: __________

12. **Jacket Closure**: (a) **Material**: Spec. No. Grade
    (b) **Nom. Thk. (in.)**: __________
    **Core Allowance**: __________
    **Diam. (in.)* 2i	__________

13. **M.A.W.P.**: __________ psi at max. temp.
    **F. Min. temp.** (when less than -20 °F): __________ psi.
    If bolted, describe or sketch.

14. **Items 14 and 15 to be completed for tube sections**

15. **Tubes**:
    (a) **Stationary Mat.**: Spec. No. Grade
        **Diam. (in.)**: __________
        **Nom. Thk. (in.)**: __________
        **Core Allowance**: __________
        **Attach**: __________
    (b) **Floating Mat.**: Spec. No. Grade
        **Diam. (in.)**: __________
        **Nom. Thk. (in.)**: __________
        **Core Allowance**: __________
        **Attach**: __________

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

17. **Heads**: (a) **Material**: Spec. No. Grade
    (b) **Nom. Thk. (in.)**: __________
    **H.T. Temp. (°F)**: __________
    **Time**: __________

18. **Other Material**: Spec. No. Grade

---

*If removable, bolts used (describe other fastenings)*
**MANIFEST**

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**CUST. ORDER NO.**

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**TRUSVERSE OR FRONT**

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**CORROSION TEST CODES**

A. ASTM A262 - 'A'
B. ASTM A262 - 'B'
C. ASTM A262 - 'C'
D. ASTM A262 - 'E'
E. QQ5-766(CUS04)

**MINIMUM SOLUTION ANNEALING TEMPERATURE 1900 F**

**Known contact with Mercury**
STACEY MFG. QUALITY CONTROL DEPARTMENT:

Material on this WTR was ordered from:

Williams & Co.

on

P.O. # S316-36-03D09 Item: 1

This material applies to Stacey MFG.

S.O. #: 6309

Mk. #: 1-1

This WTR has been checked against

ASME spec. SA240 T304

By: D. Jones Date: 1/22/87
**CEMENTED CARBIDE**

**ASME COMP**

**Heat** | **Slip** | **Size** | **Fcs** | **Weight**
---|---|---|---|---
15647 | 71108 | 6250 x 96.0000 x 270.0000 | 1 | 4830
15647 | 71109 | 6250 x 96.0000 x 259.0000 | 1 | 4633
15648 | 71110 | 6250 x 96.0000 x 253.0000 | 1 | 4526

**Heat** | **C** | **MN** | **F** | **Si** | **NI** | **CR** | **Mo** | **Co** | **Cu** | **N**
---|---|---|---|---|---|---|---|---|---|---
15647 | 0.061 | 1.75 | 0.027 | 0.003 | 0.57 | 0.030 | 19.40 | 0.39 | 0.13 | 0.24 | 0.079
15648 | 0.060 | 1.75 | 0.030 | 0.011 | 0.49 | 0.015 | 18.18 | 0.44 | 0.12 | 0.25 | 0.084

**Yield** | **Tensile** | **Red. of**
---|---|---
15647 | 43.4 KSI | 87.8 KSI | 62.8 | 72.3 | BHIN170 | OK | OK
15648 | 42.3 KSI | 62.1 | 71.6 | BHIN179 | OK | OK

**STACEY MFG. QUALITY CONTROL DEPARTMENT:**

Material on this WTR was ordered from:

**WILLIAMS & CO.**

P.O. # Q16036-6307 Item # 1-2

This material applies to Stacey MFG.

S.O. # 6309

This WTR has been checked against

ASME spec. SA240 1304

By: Date: 1/18/87

**AUDITED DETAIL SHEET**

**STACEY MFG. QUALITY CONTROL DEPARTMENT**

Material on this WTR was ordered from:

**WILLIAMS & CO.**

P.O. # Q16036-6307 Item # 1-2

This material applies to Stacey MFG.

S.O. # 6309

This WTR has been checked against

ASME spec. SA240 1304

By: Date: 1/18/87
### Chemische Analyse - Chemical Analysis - Analyse chimique

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<th>P %</th>
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### Mechanische Gütewerte - Mechanical Properties - Propriétés mécaniques

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<th>Zugfestigkeit</th>
<th>Dehnung</th>
<th>Einschnürung</th>
<th>Härte</th>
<th>Kerbschlagarbeit</th>
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u = unbehandelt – as welded – non traité  
4 = angelassen – tempered – revenu  
s = spannungsarmgeglüht – stress relieved – recuit de détente
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
   (Mfg's serial No. of Part) 6308A
   (CRN) 0-43A53 R.2
   (Mfg's Ed No.) 1987
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

   December 31, 1986
   (Date)

6. (a) Drawing prepared by: The Stacey Mfg. Co. (b) Description of part inspected: 16'11-3/4" OD Half Torus
   (Drawing No.)

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

8. Shell:
   Matl. (Spec. No., Grade) —
   Nom. Thk. (in.) —
   Corr. Allow. (in.) —
   Diam. I.D. (in & m) —
   Length (overall H & m) —

9. Seams:
   Long. (in., out., or full)
   Eff. (in.)
   H.T. Temp. (°F)
   Time
   Crush (in., out., or full)

10. Heads:
    (a) Matl. SA240-304
        (Spec. No., Grade)
        Location (Top, Bottom, End)
        Minimum Thickness
        Corrosion Allowance
        Crown Radius
        Knuckle Radius
        Elliptical Ratio
        Conical AVE. Angle
        Hemispherical Ratio
        Flat Diameter
        Side to Pressure (Convex or Concave)
    (b) Matl. —

If removable, bolts used (describe other fastenings)

11. Type of Jacket
    —
    Proof Test —

12. Jacket Closure
    —
    If bar, give dimensions

13. MAWP __________________________ psi at max. temp. — °F, Min. temp. (when less than -20 °F) — °F
    Hydro., pneu., or comb. test press. — psi.

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

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

16. Shells:
    Matl. (Spec. No., Gr.)
    Nom. Thk. (in.)
    Corr. Allow. (in.)
    Diam. I.D. (in & m)

17. Seams:
    Long. (in., out., or full)
    Eff. (in.)
    H.T. Temp. (°F)
    Time
    Crush (in., out., or full)

18. Heads:
    (a) Matl. —
        (Spec. No., Grade)
        Location (Top, Bottom, End)
        Minimum Thickness
        Corrosion Allowance
        Crown Radius
        Knuckle Radius
        Elliptical Ratio
        Conical AVE. Angle
        Hemispherical Ratio
        Flat Diameter
        Side to Pressure (Convex or Concave)
    (b) Matl. —
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
   (Specify or vessel tank)
   (Mfr's serial No. of Part)
   (CRN)
   (Drawing No.)
   (No. of Bld. No.)
   (Year Build)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME Boiler and Pressure Vessel Code.

   December 31, 1986
   (Year)

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 include to be completed for single wall vessels, jackets of jacketed vessels, or shells of heat exchangers

8. Shell:
   Mat. (Spec. No., Grade)
   Nom. Tka. (in.)
   Corr. Allow. (in.)
   Diam. (in.) (ith & chl)
   Length (overtake) (ft & in.)

9. Seams:
   Long. (in.)
   (Spec. No., Grade)
   End Nom. 1/2"

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

11. Type of Jacket
    Proof Test

12. Jacket Closure
    (Describe as open & closed, bar, etc.)

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

14. Tube sheets:
    Stationary Mat. (Spec. No., Grade)
    Diam. (in.) Subject to pressure
    Nom. Tka. (in.)
    Corr. Allow. (in.)
    Attach. (at end, Mexico)

15. Tubes:
    Mat. (Spec. No., Grade)
    Diam. (in.)
    Nom. Tka. (in. or gauge)
    No.
    Type (type or U)

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

16. Shell:
    Mat. (Spec. No., Grade)
    Nom. Tka. (in.)
    Corr. Allow. (in.)
    Diam. (in.) (id & chl)
    Length (overtake) (ft & in.)

17. Seams:
    Long. (in.)
    (Spec. No., Grade)
    End Nom. 1/2"

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

If removable, bolts used (describe other fastenings)

(12/82)
**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.

**Customer Order No.:** M316810306  
**Loc.:** Universal AM-CAN  
**Shipped Via:** T  
**B/L Number:** 2698  
**Car Number:**  
**Collect:**  
**RLS-DT:**  

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<th>M.P.O. NO.</th>
<th>GAUGE</th>
<th>SIZE</th>
<th>FINISH CODE</th>
<th>DESCRIPTION</th>
<th>COUPON</th>
<th>W-LOC</th>
<th>BVIL</th>
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<th>BEND</th>
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**Corrosion Test Codes:**
- A. ASTM A262- 'A'
- B. ASTM A262- 'B'
- C. ASTM A262- 'C'
- D. ASTM A262- 'D'
- E. QO3-766(CUS04)

**Material Test:**
- **Material:**  
- **Condition:**
- **Test Condition:**

**Heat No.:**  
**Test Method:**

**CAUTION: PROCESSING THAT MAKES FUMES, DUST OR SOLUTIONS MAY CAUSE INJURY OR SAFETY HAZARDS. PLEASE REFER TO MATERIAL SAFETY DATA SHEET.**