Remaining Life--Jacket

ATTN J. LESSARD

Pressure Vessel Inspection Report

National Board Inspection Code Requirement Section RB-3235

Merck Designation	I-Number	Equip No.
54RE214	**61932**	[redacted]

Remaining Life and Inspection Interval Calculations

Remaining Life Calculation

$$\text{Remaining Life (years)} = \frac{\text{Actual Thickness - Required Thickness}}{\text{Corrosion Rate}}$$

$$\text{Corrosion Rate} = \frac{\text{Original thickness - Actual thickness}}{\text{Years in Service}}$$

$$\text{Corrosion Rate} = \frac{0.422 - 0.211}{16}$$

$$\text{Remaining Life (years)} = \frac{0.211 - 0.2452}{0.013175}$$

Remaining Life (years) = **UNSATISFACTORY, BELOW MINIMUM THICKNESS FOR DESIGN PRESSURE**

Summary and Conclusion

Additional areas of the jacket on the north side were measured for thickness around the .211 reading for verification. The current safety valve set pressure of 75 psi is below the calculated allowable working pressure of 77 psi. The jacket is safe for operation for the brine and tower water service. The thickness readings should be taken again during shut down next year, and if warranted an internal (boroscope) inspection of the jacket is advisable to determine the actual condition for evaluation of possible repair.

Signed

Lyle Phelps,
Chief Mechanical Inspector

National Board Commission OU798
N. J. Certification of Competency # 1030

Date 9/29/2004

6019-3
1-3

SA 60 - 1000 Gallons

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 De Dietrich, 1 rue d'Offwiller, 67110 Zinswiller, France (Name and address of manufacturer)

2. Manufactured for ______ (Name and address of purchaser)

3. Location of installation Merck & Company, Inc. Rahway, New Jersey (Name and address)

4. Type Vertical (Horiz. or vert. tank) 33044 (Mfg's serial No.) N/A (CRN) SA 1000 A (Drawing No.) 3973 (Nat'l Bd. No.) 1986 (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 1983 (Year)

Winter 83 (Addenda Date) N/A (Code Case No.) N/A (Special service per UG-120(d))

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

6. Shell: SA 285 B (Mat'l Spec. No. Grade) 27/64" (Nom. Thk. (in.)) N/A (Corr. Allow. (in.)) 5 ft. 6-15/16" O.D. (Diam. I.D. (ft & in.)) 6 ft. 1/8" (Length (overall) (ft & in.))

7. Seams: Welded, Dbl. Butt (Long. (Welded, Dbl., Sngl., Lap, Butt)) Spot (R.T. (Spot or Full)) 85 (Eff. (%)) N/A (H.T. Temp. (°F))

N/A (Time (hr)) Welded, Dbl.Butt (Girth (Welded, Dbl., Sngl., Lap, Butt)) Partial (R.T. (Spot, Partial, or Full)) 1 (No. of Courses)

8. Heads: (a) Mat'l. SA 285 B (Spec. No. Grade) (b) Mat'l N/A (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)	Bottom	15/32"	N/A	66-15/16"	6-11/16"	N/A	N/A	N/A	N/A	Concave
(b)										

If removable, bolts used (describe other fastenings) N/A (Mat'l Spec. No. Gr. Size No.)

9. Type of Jacket Type 2, per Fig. 9.2 Proof Test N/A

10. Jacket Closure Fig. 9.5 (b-2)&Fig.9.6 (e-1) (Describe as ogee & weld, bar, etc.) If bar, give dimensions N/A If bolted, describe or sketch.

11. MAWP 90 or 90 & F.V. psi at max. temp. 300 °F. Min. temp. (when less than -20° F) N/A

Hydro., pneu., or comb. test press. 135 psi

Items 12 and 13 to be completed for tube sections

12. Tubesheets: N/A (Stationary Mat'l (Spec. No. Gr.)) ______ (Diam. (in.) (Subject to pressure)) ______ (Nom. Thk. (in.)) ______ (Corr. Allow. (in.)) ______ (Attach. (Welded, Bolted))

______ (Floating Mat'l (Spec. No. Gr.)) ______ (Diam. (in.)) ______ (Nom. Thk. (in.)) ______ (Corr. Allow. (in.)) ______ (Attach.)

13. Tubes: N/A (Mat'l (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: SA 285 B (Mat'l (Spec. No. Grade)) 45/64" (Nom. Thk. (in.)) N/A (Corr. Allow. (in.)) 5 ft. 3" O.D. (Diam. I.D. (ft & in.)) 5 ft. 4-7/16" (Length (overall) (ft & in.))

15. Seams: Welded, Dbl. Butt (Long. (Welded, Dbl., Sngl., Lap, Butt)) Spot (R.T. (Spot or Full)) 85 (Eff. (%)) - (H.T. Temp. (°F))

- (Time (hr)) Welded, Dbl. Butt (Girth (Welded, Dbl., Sngl., Lap, Butt)) Partial (R.T. (Spot, Partial, or Full)) 1 (No. of Courses)

16. Heads: (a) Mat'l. SA 285 B (Spec. No. Grade) (b) Mat'l. SA 285 B (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)	Top	25/32"	N/A	90-3/8"	9-5/8"	N/A	N/A	N/A	N/A	Concave
(b)	Bottom	25/32"	N/A	90-3/8"	9-5/8"	N/A	N/A	N/A	N/A	Both

If removable, bolts used (describe other fastenings) N/A (Mat'l Spec. No., Gr., Size, No.)

17. MAWP 100 & F.V. psi at max. temp. 300 °F. Min. temp. (when less than -20° F) N/A

Hydro., pneu., or comb. test press. 150 psi.

This form (E00106) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017

(12/81) 429,361

P.O.#Y062506A

SA 60 - 1000 Gallons

2-3

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 De Dietrich, 1 rue d'Offwiller, 67110 Zinswiller, France (Name and address of manufacturer)

2. Manufactured for Merck & Company, Inc. (Name and address of purchaser)

3. Location of installation Rahway, New Jersey (Name and address)

4. Type Vertical (Horiz., vert., tank, etc.) 33044 (Mfg's serial No.) N/A (CRN) SA 1000 A (Dwg) 3973 (Nat'l Bd. No.) 1985 (Year built)

Data Report Item Number	Remarks
20 Remarks	*Vessel H.T. at high temperature for extended period of time due to glass lining process.
	30" dia. inlet cover contains one 14" x 18" dia. oval manhole (with cover containing 4" dia. sight glass) one 4-3/8" dia. nozzle and two 2" dia. nozzles.
	Inner vessel design pressure of 100 psig and F.V. at 650°F is limited to 500°F max. allowable working temperature due to glass lining process.
	Safety relief valve to be supplied by customer.
	Glass lined steel vessel for chemical use.

Date May 12, 1986 Co. name De Dietrich Signed [signature] Martin KOENIG

Signed [signature] Walter R. Q.C. Manager

Date May 15, 1986 Signed [signature] Commission N.B. 9354 (Nat. Board incl. endorsements, State, Prov. and No.)

(12/88) 425.361

P.O.#Y062506A

As required by the provisions of the ...

1. Work done by De Dietrich (USA), Inc., 2333 U.S. Hwy. #22, Union, N. J. (name and address of repair or alteration organization) 7540 (serial no.)

2. Owner (name and address of owner) Merck & Company, Inc. Rahway, New Jersey

3. Location of Installation (name and address)

4. Unit identification Jktd. Pressure Vessel (boiler, pressure vessel) Name of manufacturer De Dietrich & Cie

5. Identifying nos. 33044 (mfgr. serial no.) 3973 (National Board no.) - (jurisdiction) - (other) 1986 (year built)

6. Description of work: (use back, separate sheet, or sketch if necessary) Fillet welded two insulation rings on the jacket per Dwg. No. D-6109. Welder #18.

Pressure test, if applied N/A psi

7. Remarks: Attached are Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors for the following items of this report:

(name of part, item number, mfgr's name, and identifying stamp)

CERTIFICATE OF COMPLIANCE

The undersigned certifies that the statements made in this report are correct and that all design, material, construction, and workmanship on this alteration (repair, alteration) conform to the National Board Inspection Code. Certificate of Authorization no. 14722 to use the U symbol expires July 25, 19 87

Date 10.14.86 Signed De Dietrich (USA), Inc. (repair, alteration organization) by Daniel Brotea (authorized representative)

CERTIFICATE OF INSPECTION

The undersigned, holding a valid Commission issued by the National Board of Boiler and Pressure Vessel Inspectors and certificate of competency issued by the state or province of New Jersey and employed by Royal Ins. Co. of New York has inspected the work described in this data report on 10-17 19 86 and state that to the best of my knowledge and belief this work has been done in accordance with the National Board Inspection Code. By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury or property damage or loss of any kind arising from or connected with this inspection, except such liability as may be provided in a policy of insurance which the undersigned's insurance company may issue upon said object and then only in accordance with the terms of said policy.

Signed [signature] (inspector) Date 10-17 19 86 Commissions NJ 6185 (National Board, state or province, and no.)

This form may be obtained from the National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, Ohio

Form U-1 (Back)

18. Nozzles, Inspection and Safety Valve Openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diam. or Size	Type	Material	Nom. Thk.	Reinforcement Material	Nozzle Attached	Location
Inlet	1	30"	Dbl.Butt Birth	SA 181-60	25/32"	None	Welded	on top head
Manhole	1	14"x18"	Dbl.Butt Girth	SA 181-60	25/32"	None	Welded	on cover
Inlet	1	8"	Dbl.Butt Girth	SA 181-60	5/8"	None	Welded	N/A
Inlet	4	4"	Dbl.Butt Girth	SA 181-60	5/8"	None	Welded	N/A
Outlet	1	4"	Dbl.Butt Girth	SA 181-60	5/8"	None	Welded	N/A
Jacket	2	5-3/4"	Sit through	SA 516-60	2-1/8"	None	Welded	shell&head
Jacket	2	3"	Sit through	SA 105	Standerd	None	Welded	N/A
Jacket	2	2"	Sit through	SA 105	Standerd	None	Welded	N/A
Jacket	6	1-1/2"	Sit through	SA 105	Standerd	None	Welded	N/A
Jacket	1	3/4"	Sit on	SA 105	Standerd	None	Welded	N/A
Jacket	1	1/2"	Sit through	SA 105	Standerd	None	Welded	N/A

19. Supports: Skirt NO (Yes or no) Lugs ____ (No.) Legs ____ (No.) Other 6liftings 4-3" cplg. (Describe) N/A Attached Welded on top head and jacket shell and head (Where and how)

20. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: N/A (Name of part, item number, mfg.'s name and identifying stamp)

see attached form U-4

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. 11718 expires April 16, 19 88

Date May 12, 1986 Co. name De Dietrich Signed WAGNER R. O.C. Manager

CERTIFICATE OF SHOP INSPECTION

Vessel constructed by De Dietrich at Zinswiller, France

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 New York and employed by The Royal Indemnity Company of New York, N.Y. have inspected the pressure vessel described in this Manufacturer's Data Report on April 29, 19 86, 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 the 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 May 15, 1986 Signed [signature] (Authorized Inspector) Martin KOENIG Commissions N.B. 9354 (Nat'l Board, State, Province and No.)

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the field assembly construction of all parts of this vessel conforms with the requirements of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

"U" Certificate of Authorization No. ____ expires ____, 19____

Date ____ Co. name ____ (Organization that constructed field assembly) Signed ____ (By, 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/or 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 that, 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 vessel 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 (and endorsements), State, Prov., and No.)

(12/82)