From Page No.____

Compact Tension Stress Corrosion Crack Test

Objective: Determine the effect of potential and environment on the propagation of stress corrosion cracking of container materials

Test: C2207B
Test Specimen: C2207 Alloy 22 Heat 2277-8-3175
Test Information: Simulated concentrated water without nitrate with cyclic loading

Solution: Simulated Concentrated Water without Nitrate

Solution #1 2000 mL
- 12.977 g KCl lot 005573
- 10.863 g NaCl lot 034103
- 41.39 g Na_2SO_4 lot 025157
- 192.69 g $NaHCO_3$ lot 028924
- 6.190 g NaF lot 991559

pH: 7.698

Solution #2 2000 mL
- 12.975 g KCl lot 005573
- 10.869 g NaCl lot 034103
- 41.42 g Na_2SO_4 lot 025157
- 192.71 g $NaHCO_3$ lot 028924
- 6.194 g NaF lot 991559

pH: 7.678

Reagents measured with: Sartorius SN 38080106 **Cal:** 7/22/03 **Cal Due:** 1/22/04
Gas: None

pH measured with: Fisher Accumet 950 **Cal:** 8/11/03 **Cal Due:** 8/11/04
pH electrode: Fisher 13-620-296 sn2291257P6

Test temperature: 95 °C
measured with Hg Thermometer: C96-637 **Cal:** 7/16/03 **Cal Due:** 1/16/04

E_{corr}: -54 mV SCE
E_{Pt}: Not Recorded
$E_{applied}$: +380 mV SCE

Electrometer: HP 34401 SN US 36081499
Cal: 9/11/03 **Cal Due:** 9/11/04
Reference: Fisher SCE 13-620-52 SN 0249119

Loading Conditions
- **Test Frame:** 4
- **Max Load:** 3000 lbs
- **Min/Max Load Ratio:** 0.6, 0.7, 0.8, 0.9 and static

Test Started: 10/20/03

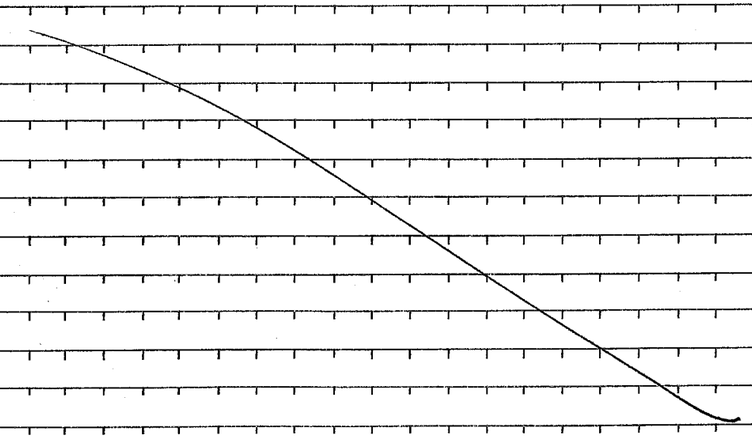
Test Stopped: 3/3/04

To Page No.____

Witnessed & Understood by me, | Date | Invented by | Date
Recorded by [signature] 8/16/04

From Page No.____

C2207B time hours	Cyclic R ratio	C2207B compliance in/lb	C2207B compliance in/lb R=0.8	C2207B compliance m/N R=0.8	C2207B normalized compliance R=0.8
23.36	0.6	0.0001762	0.0001692	8.65E-08	1.00E+00
89.88	0.6	0.0001764	0.0001692	8.65E-08	1.00E+00
162.89	0.6	0.0001767	0.0001688	8.63E-08	9.98E-01
258.93	0.6	0.0001768	0.0001701	8.70E-08	1.01E+00
330.89	0.6	0.0001763	0.0001697	8.68E-08	1.00E+00
378.91	0.6	0.0001786	0.0001696	8.68E-08	1.00E+00
428.28	0.6	0.0001779	0.000171	8.75E-08	1.01E+00
500.44	0.6	0.0001777	0.0001709	8.74E-08	1.01E+00
547.13	0.6	0.0001781	0.0001708	8.74E-08	1.01E+00
594.92	0.6	0.0001805	0.0001714	8.77E-08	1.01E+00
666.92	0.6	0.0001799	0.0001736	8.88E-08	1.03E+00
715.38	0.6	0.0001789	0.0001722	8.81E-08	1.02E+00
762.91	0.6	0.0001822	0.0001716	8.78E-08	1.01E+00
834.94	0.6	0.0001791	0.0001755	8.98E-08	1.04E+00
882.77	0.6	0.0001805	0.0001728	8.84E-08	1.02E+00
1004.18	0.6	0.0001816	0.0001735	8.87E-08	1.03E+00
1051.31	0.7	0.0001761	0.0001743	8.92E-08	1.03E+00
1074.91	0.7	0.0001754	0.0001732	8.86E-08	1.02E+00
1098.68	0.7	0.0001798	0.0001717	8.78E-08	1.01E+00
1170.9	0.8	0.0001726	0.0001756	8.98E-08	1.04E+00
1218.8	0.9	0.000173 N/A	N/A	N/A	
1266.93	1	0.0001769	0.0001769	9.05E-08	1.05E+00
1843.61	1	0.0001697	0.0001697	8.68E-08	1.00E+00
1938.75	1	0.0001693	0.0001693	8.66E-08	1.00E+00
2011.54	1	0.0001687	0.0001687	8.63E-08	9.97E-01
2108.84	1	0.0001739	0.0001739	8.90E-08	1.03E+00
2179.2	1	0.0001742	0.0001742	8.91E-08	1.03E+00
2275.38	1	0.0001705	0.0001705	8.72E-08	1.01E+00
2347.42	1	0.000172	0.000172	8.80E-08	1.02E+00
2445.04	1	0.000172	0.000172	8.80E-08	1.02E+00
2613.25	1	0.00017	0.00017	8.70E-08	1.00E+00
2709.26	1	0.0001734	0.0001734	8.87E-08	1.02E+00
2780.83	1	0.0001733	0.0001733	8.86E-08	1.02E+00
2875.56	1	0.0001722	0.0001722	8.81E-08	1.02E+00
3020.09	1	0.0001714	0.0001714	8.77E-08	1.01E+00
3236.15	1	0.0001735	0.0001735	8.87E-08	1.03E+00

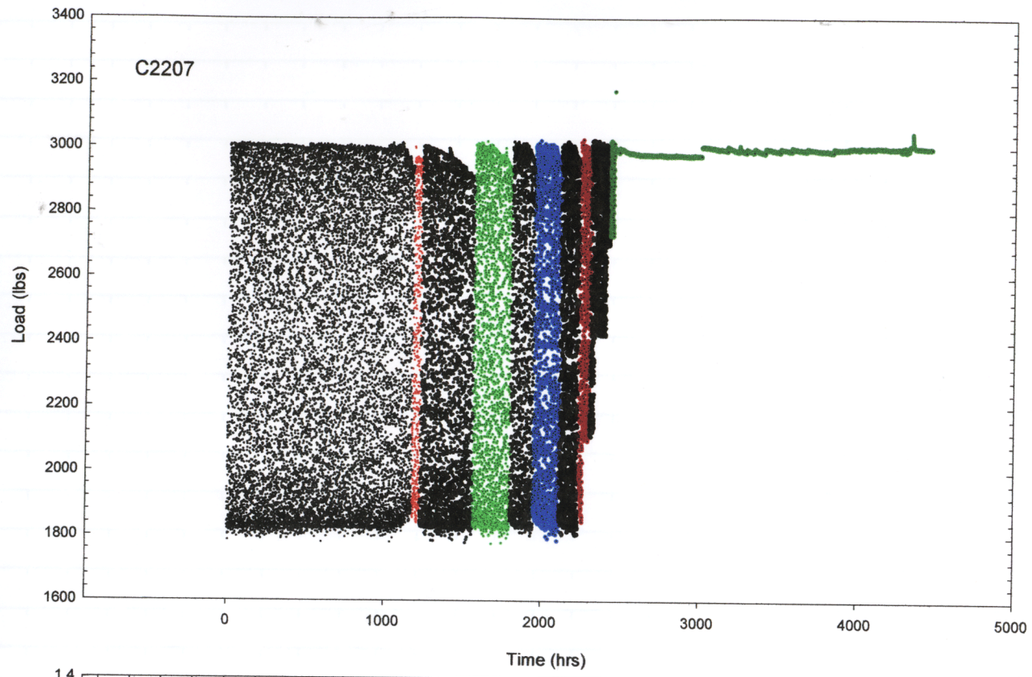


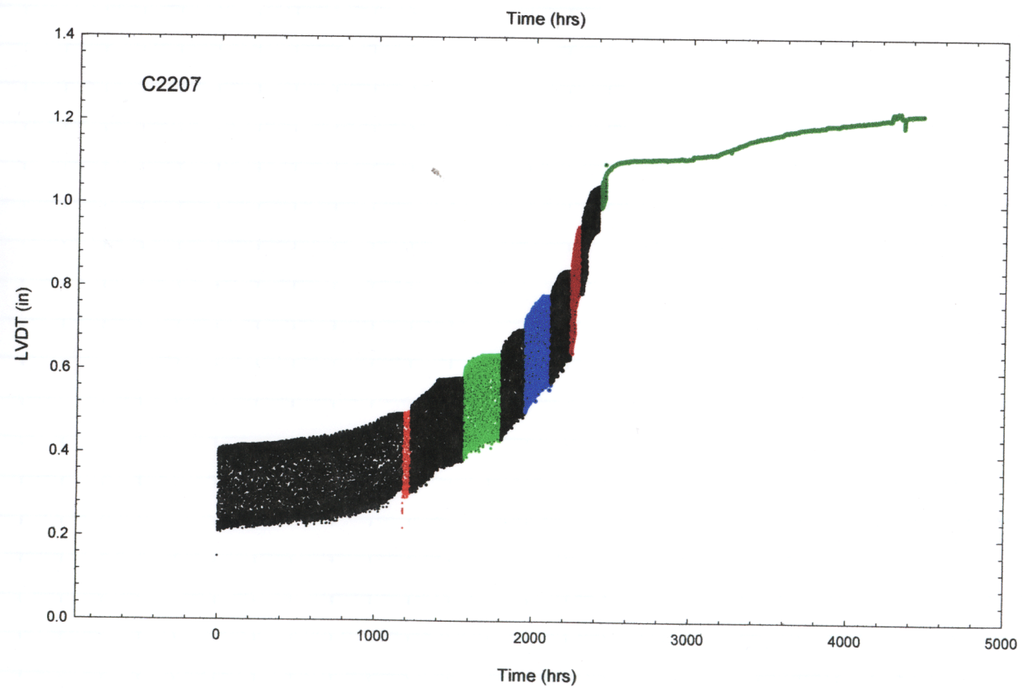
To Page No.____

Witnessed & Understood by me, | Date | Invented by | Date
Recorded by [signature] 5/16/04

Project No.
Book No.
TITLE C2207

From Page No.





To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	3/16/04

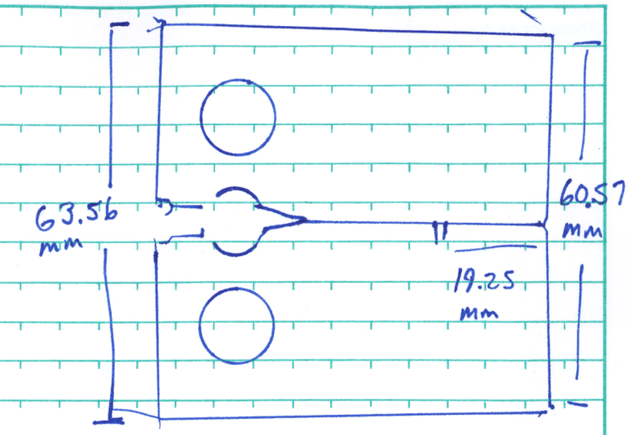
TITLE C2207
Project No.
Book No.

From Page No.

STARRET MODEL 721
SN 03031512
CAL 3/10/04 DUE 3/10/05

SIGNIFICANT CRACK PROPAGATION

50.8 - 19.25 = 31.55 mm
FINAL a/w = 0.621



To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	3/16/04

From Page No.

Specimen: C2208 compact tension specimen
Material: Heat 2277-8-3175

Date: 03/13/02

Fatigue Precracking performed on

Load frame model number: MTS 810

Load frame serial number: Frame # 17

Load measurements performed using

Load cell model number: MTS 661.21A-02

Load cell serial number: 5930

Date of last calibration: 12/07/01

Next calibration due: 12/07/02

Displacement measurements performed using

Model Number MTS 632.033.30 Clip gauge

Serial Number 594

Date of last calibration: 03/12/02

Next calibration due: N/A Calibrated prior to use

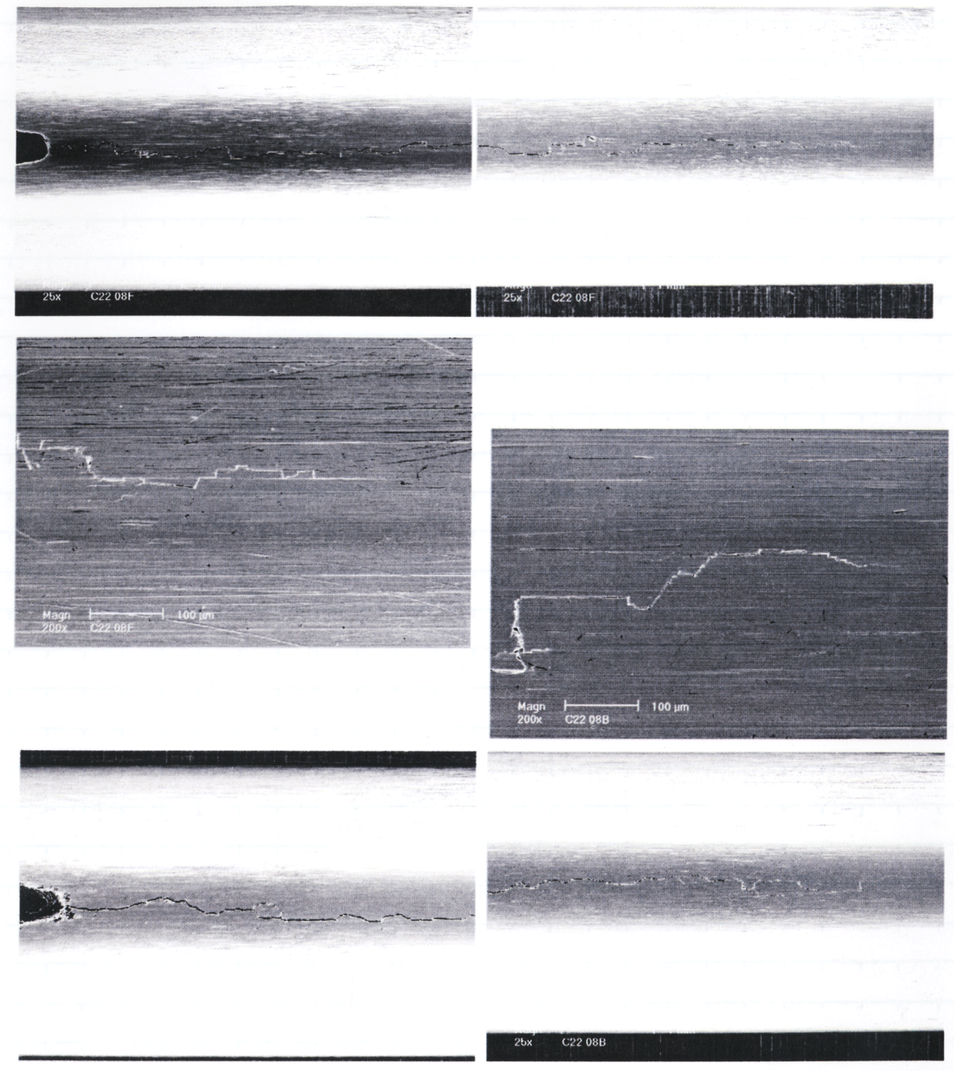
Additional Information B=0.5" B(notch) 0.3365" B(net) = 0.4102" W= 2.0008"

Minimum Load (lbs)	Maximum Load (lbs)	Number of cycles	Crack length/width (a/W) Front	Crack length/width (a/W) Rear	Average (a/W)
264	2640	52983	0.2959	0.2929	0.294
240	2400	42319	0.3429	0.3474	0.345
218	2180	43537	0.3920	0.3863	0.394
198	1980	20832	0.4278	0.4253	0.4266
180	1800	20437	0.4493	0.4518	0.4518

To Page No.

Witnessed & Understood by me, Date Invented by Recorded by Date 3/15/04

From Page No.



INITIAL PHOTOS
PRIOR TO TESTING

To Page No.

Witnessed & Understood by me, Date Invented by Recorded by Date 3/13/04

From Page No.____

Compact Tension Stress Corrosion Crack Test

Objective: Determine the effect of potential and environment on the propagation of stress corrosion cracking of container materials

Test: C2208
Test Specimen: C2208 Alloy 22 Heat 2277-8-3175
Test Information: Simulated concentrated water with cyclic loading at open circuit

Solution: Simulated Concentrated Water

Solution #1 2000 mL
- 12.979 g KCl lot 005573
- 10.866 g NaCl lot 034103
- 41.45 g Na_2SO_4 lot 025157
- 192.81 g $NaHCO_3$ lot 028924
- 6.189 g NaF lot 991559
- 17.517 g $NaNO_3$ lot 020809

pH: 7.670

Solution #2 2000 mL
- 12.965 g KCl lot 005573
- 10.868 g NaCl lot 034103
- 41.41 g Na_2SO_4 lot 025157
- 192.71 g $NaHCO_3$ lot 028924
- 6.190 g NaF lot 991559
- 17.509 g $NaNO_3$ lot 020809

pH: 7.724

Reagents measured with: Sartorius SN 38080106 **Cal:** 7/22/03 **Cal Due:** 1/22/04
Gas:

pH measured with: Fisher Accumet 950 **Cal:** 8/11/03 **Cal Due:** 8/11/04
pH electrode: Fisher 13-620-296 sn2291257P6

Test temperature: 95 °C
measured with Hg Thermometer: C96-833 **Cal:** 7/16/03 **Cal Due:** 1/16/04

E_{corr}: 32 mV SCE
E_{Pt}: Not Recorded
$E_{applied}$: Open Circuit

Electrometer: Keithley 614 SN 0704934 **Cal:** 6/9/03 **Cal Due:** 6/9/04
Reference: Fisher SCE 13-620-52 SN 0249089

Loading Conditions
- **Test Frame:** 3
- **Max Load:** 3000 lbs
- **Min/Max Load Ratio:** 0.6, 0.7, 0.8, 0.9 and static

Test Started: 10/20/03

Test Stopped: 3/3/04

To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by [signature]	3/15/04

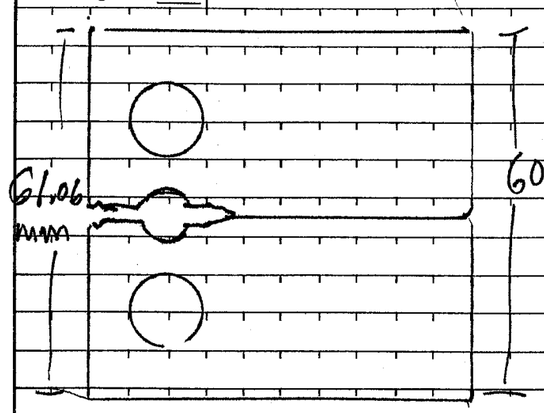
From Page No.____

C2208 time hours	Cyclic R ratio	C2208 compliance in/lb	C2208 compliance in/lb R=0.8	C2208 compliance m/N R=0.8	C2208 normalized compliance R=0.8
22.22	0.6	0.0001657	0.0001585	8.11E-08	1.00E+00
88.74	0.6	0.0001649	0.0001585	8.11E-08	1.00E+00
161.75	0.6	0.0001648	0.0001581	8.09E-08	9.97E-01
257.8	0.6	0.0001647	0.0001576	8.06E-08	9.94E-01
329.73	0.6	0.000165	0.0001586	8.11E-08	1.00E+00
377.71	0.6	0.0001648	0.0001578	8.07E-08	9.96E-01
426.75	0.6	0.0001651	0.0001578	8.07E-08	9.96E-01
497.8	0.6	0.000165	0.0001585	8.11E-08	1.00E+00
545.98	0.6	0.0001651	0.000158	8.08E-08	9.97E-01
593.8	0.6	0.0001651	0.0001578	8.07E-08	9.96E-01
665.78	0.6	0.0001654	0.0001581	8.09E-08	9.97E-01
714.24	0.6	0.0001652	0.0001584	8.10E-08	9.99E-01
761.77	0.6	0.000165	0.000158	8.08E-08	9.97E-01
833.8	0.6	0.000165	0.000158	8.08E-08	9.97E-01
1003.65	0.6	0.0001656	0.0001582	8.09E-08	9.98E-01
1050.16	0.7	0.000162	0.0001582	8.09E-08	9.98E-01
1098.15	0.7	0.0001623	0.0001575	8.06E-08	9.94E-01
1170.37	0.8	0.0001557	0.0001588	8.12E-08	1.00E+00
1218.26	0.9	0.0001469	N/A	N/A	N/A
1256.58	1	0.0001573	0.0001573	8.05E-08	9.92E-01
1842.58	1	0.0001572	0.0001572	8.04E-08	9.92E-01
1938.48	1	0.0001574	0.0001574	8.05E-08	9.93E-01
2010.88	1	0.0001574	0.0001574	8.05E-08	9.93E-01
2108.18	1	0.0001571	0.0001571	8.04E-08	9.91E-01
2178.17	1	0.0001572	0.0001572	8.04E-08	9.92E-01
2274.72	1	0.0001571	0.0001571	8.04E-08	9.91E-01
2346.26	1	0.0001565	0.0001565	8.01E-08	9.87E-01
2443.98	1	0.000157	0.000157	8.03E-08	9.91E-01
2611.77	1	0.0001573	0.0001573	8.05E-08	9.92E-01
2708.24	1	0.0001571	0.0001571	8.04E-08	9.91E-01
2780.17	1	0.0001574	0.0001574	8.05E-08	9.93E-01
2874.53	1	0.0001568	0.0001568	8.02E-08	9.89E-01
3019.42	1	0.0001574	0.0001574	8.05E-08	9.93E-01
3235.02	1	0.0001569	0.0001569	8.03E-08	9.90E-01

To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by [signature]	3/15/04

From Page No.



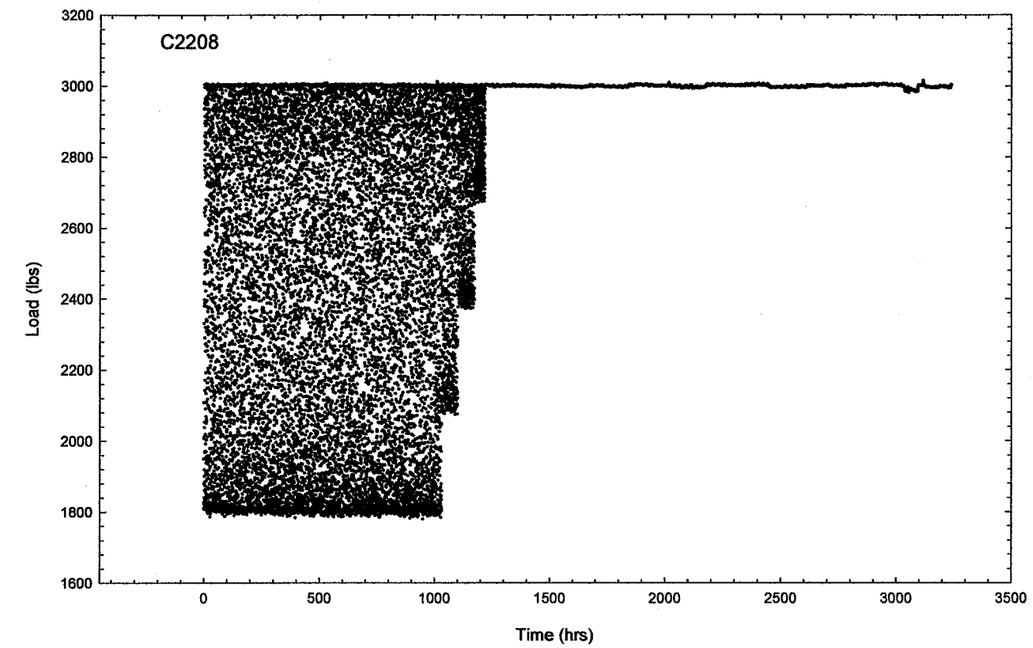
STARRETT MODEL 721
SN 0303 1512
CAL 3/10/04 DUE 3/10/05

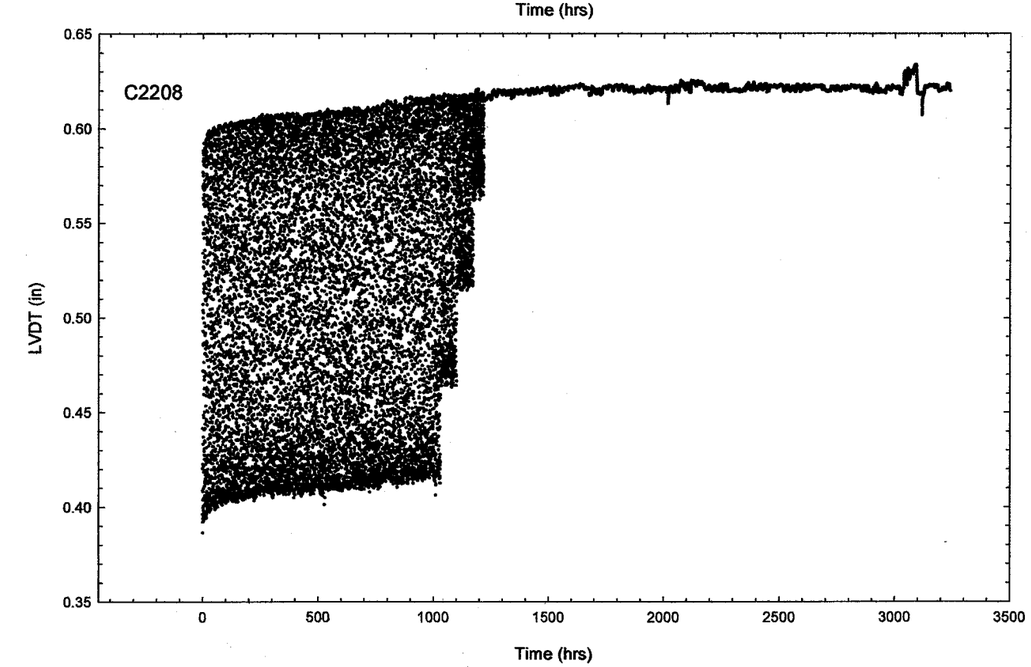
No significant crack propagation based on comparison to photos on page 49

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	3/17/04

From Page No.





To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	3/17/04

DD 2/3/05

From Page No.

Compact Tension Stress Corrosion Crack Test

Objective: Determine the effect of potential and environment on the propagation of stress corrosion cracking of container materials

Test: C2206F
Test Specimen: C2206 Alloy 22 Heat 2277-8-3175 Thermally treated (notebook 288 p. 262)

Test Information: Continuation of C2206E documented in Notebook 599 p. 40

Solution: 4M NaCl
700.76 g NaCl lot 035421 Fisher
+ Deionized water to a total volume of 3000 mL
pH = 6.448

Reagents measured with: Ohaus SN2883 **Cal:** 2/2/04 **Cal Due:** 8/2/04

pH measured with: Orion EA 940 **Cal:** 6/15/03 **Cal Due:** 6/15/04
pH electrode: Fisher 13-620-296 sn2336482P

Gas: None

Test temperature: 95 °C
measured with Hg Thermometer (to 6/2/03): 115858
Cal: 4/29/04 **Cal Due:** 4/30/05

E_{corr}: 226 mV vs SCE
E_{Pt}: 226 mV vs SCE
$E_{applied}$: -220 mV SCE

Electrometer: Hewlett Packard 34401A SN US 36081499
Cal: 9/11/03 **Cal Due:** 9/11/04

Reference: Fisher SCE sn 0249119

Loading Conditions
Test Frame: 1
Max Load: 3000 lbs
Min/Max Load Ratio: Static

Test Started: 6/03/04

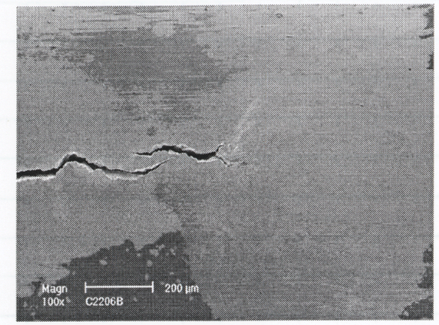
Test Stopped: 9/07/04

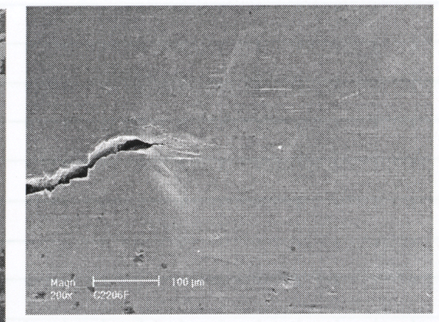
To Page No.

Witnessed & Understood by me, | Date | Invented by | Date
Recorded by | 2/3/05

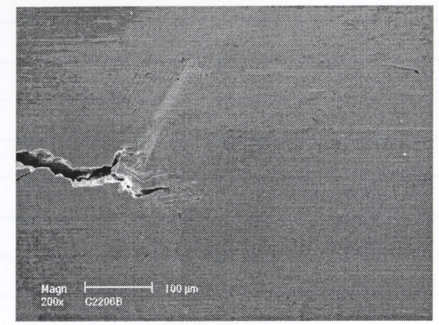
From Page No.

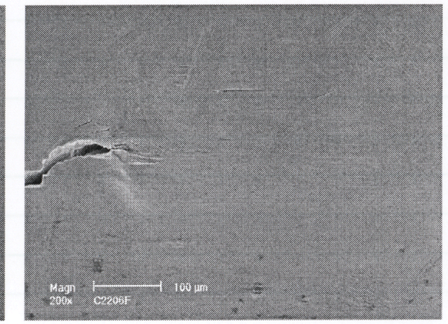
13,576 hr

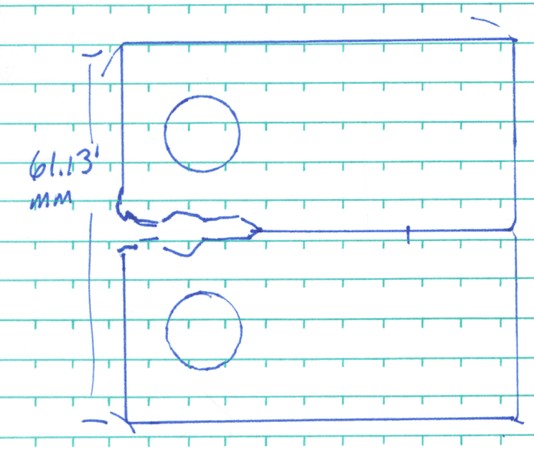




4,023 hr







STARRET MODEL 721
SN 0503/5/2
CAL 3/10/04
DUE 3/10/05

CRACK ENDS 28.28 mm

50.8 - 28.28 = 22.52

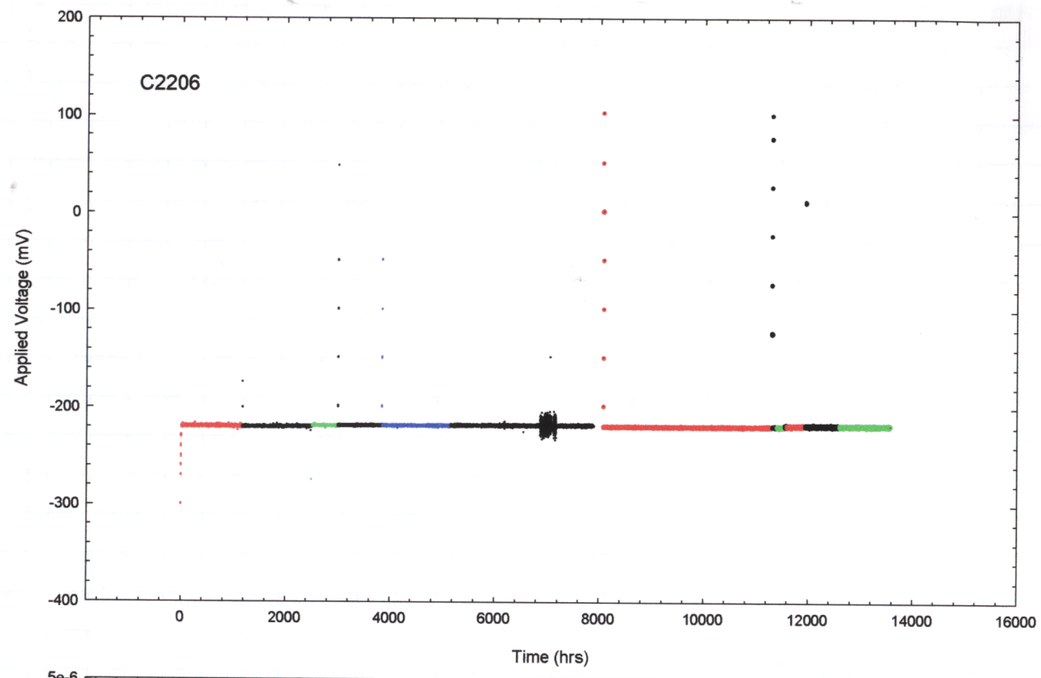
NO INDICATION OF CRACK PROPAGATION
PHOTOS PRIOR TO TESTING ON P 18.

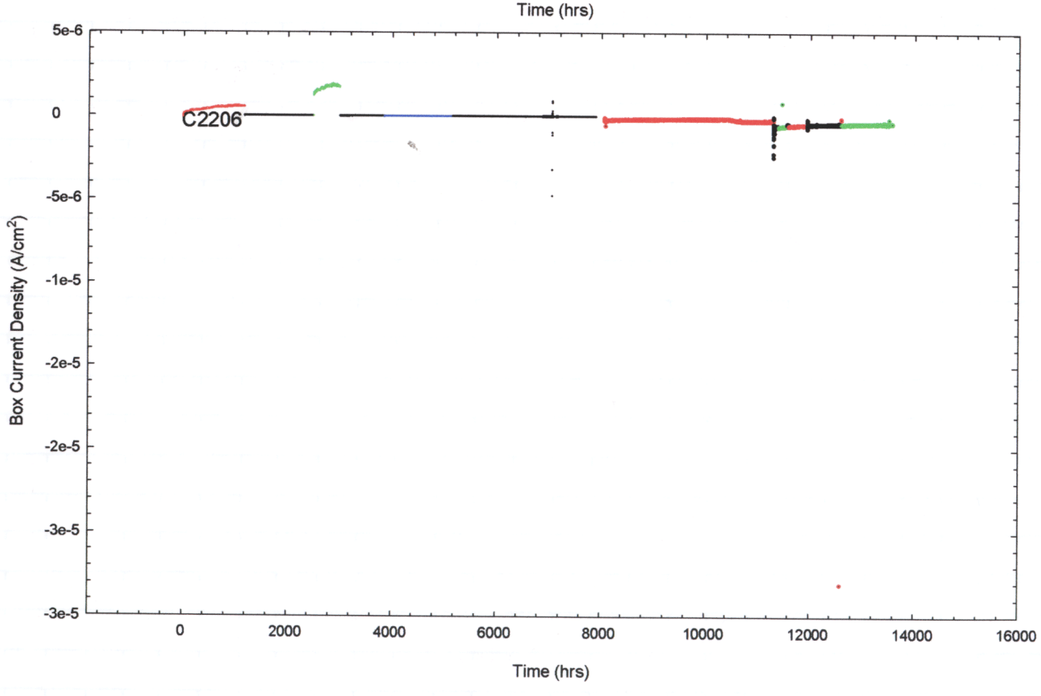
To Page No.

Witnessed & Understood by me, | Date | Invented by | Date
Recorded by | 2/3/05

Project No.
Book No.
TITLE C2206

From Page No.



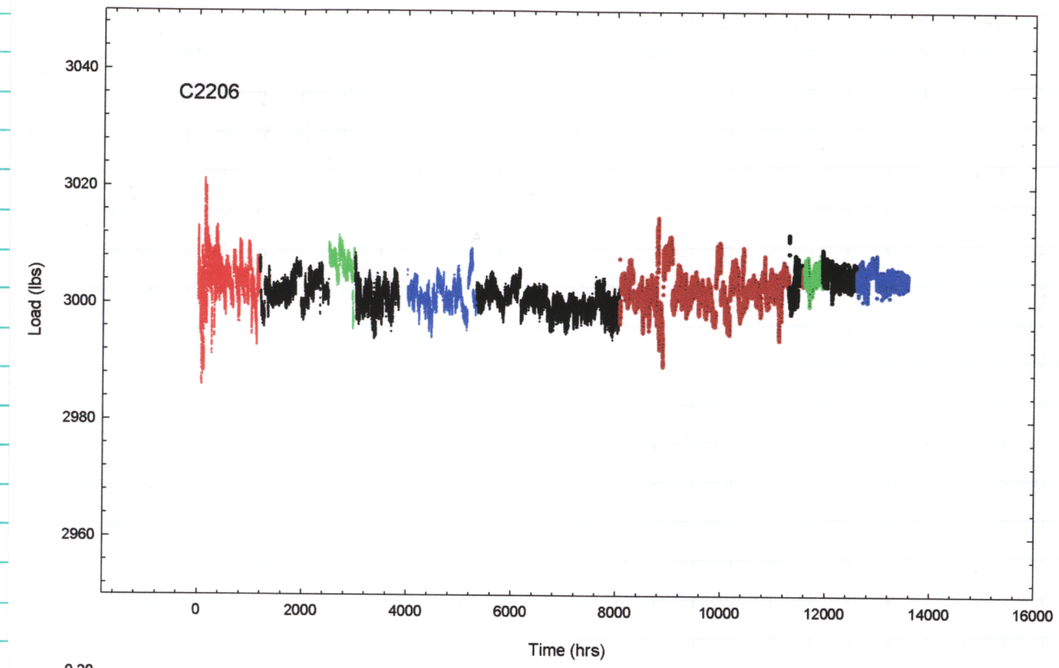


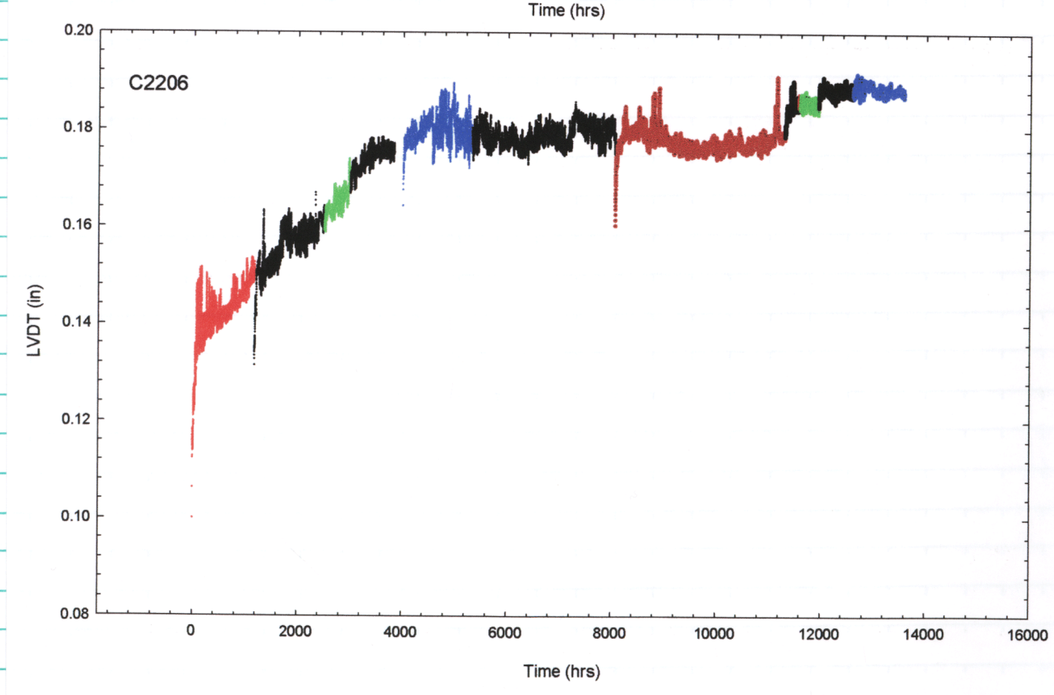
To Page No.

Witnessed & Understood by me, | Date | Invented by | Date
Recorded by | 2/3/05

TITLE C2206
Project No.
Book No.

From Page No.





To Page No.

Witnessed & Understood by me, | Date | Invented by | Date
Recorded by | 2/3/05

Compact Tension Stress Corrosion Crack Test

Objective: Determine the effect of potential and environment on the propagation of stress corrosion cracking of container materials

Test: C2208A
Test Specimen: C2208 Alloy 22 Heat 2277-8-3175
Test Information: Simulated concentrated water with cyclic loading at open circuit
Continuation of Test C2208 in Notebook 599 P. 48

Solution: Simulated Concentrated Water

Solution #1 2000 mL
- 12.963 g KCl lot 005573
- 10.864 g NaCl lot 035421
- 41.38 g Na_2SO_4 lot 035451
- 192.68 g $NaHCO_3$ lot 028924
- 6.190 g NaF lot 991559
- 17.507 g $NaNO_3$ lot 020809

pH: 7.840

Solution #2 1000 mL
- 6.485 g KCl lot 005573
- 5.434 g NaCl lot 035421
- 20.692 g Na_2SO_4 lot 035451
- 96.34 g $NaHCO_3$ lot 028924
- 3.094 g NaF lot 991559
- 8.752 g $NaNO_3$ lot 020809

pH: 7.724

Reagents measured with: Ohaus sn 2883 **Cal:** 2/2/04 **Cal Due:** 8/2/04
Gas:

pH measured with: Orion AE 940 sn 2330 **Cal:** 6/15/03 **Cal Due:** 6/15/04
pH electrode: Fisher sn 2336482P

Test temperature: 95 °C
measured with Hg Thermometer: H98-162 **Cal:** 4/28/04 **Cal Due:** 4/28/05

E_{corr}: 178 mV SCE
E_{Pt}: 255 mV SCE
$E_{applied}$: Open Circuit

Electrometer: Keithley 614 SN 0704934 **Cal:** 6/9/03 **Cal Due:** 6/9/04
Reference: Fisher SCE sn 3230057P

Loading Conditions
- **Test Frame:** 3
- **Max Load:** 3000 lbs
- **Min/Max Load Ratio:** 0.6

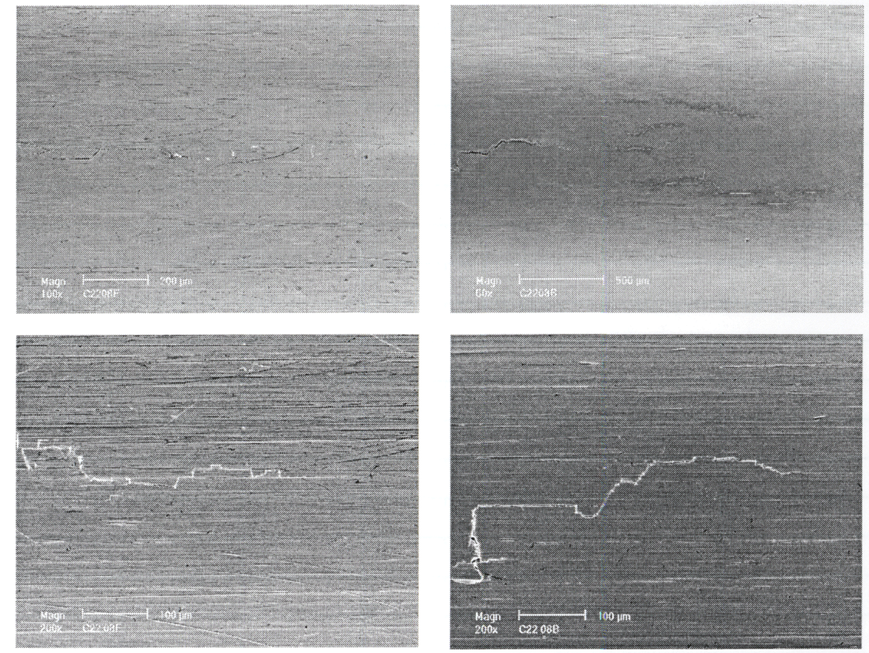
Test Started: 6/4/04

Test Stopped: 9/7/04

FINAL 5,498 hr CRACKS SIMILLAR TO INITIAL

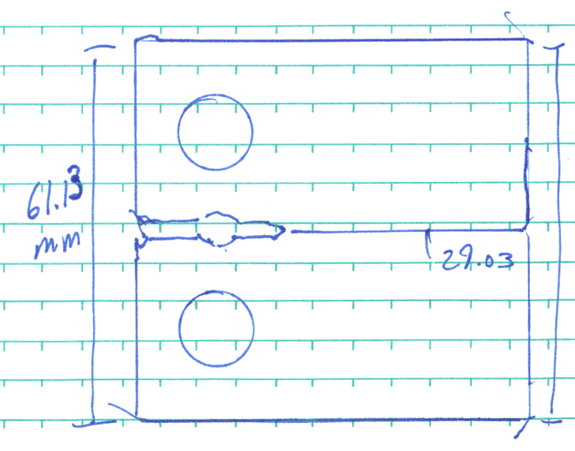
5,498 hours

Initial Prior to testing



STARRETT MODEL 721
SN 0303151 2

CAL 3/10/04
DUE 3/10/05



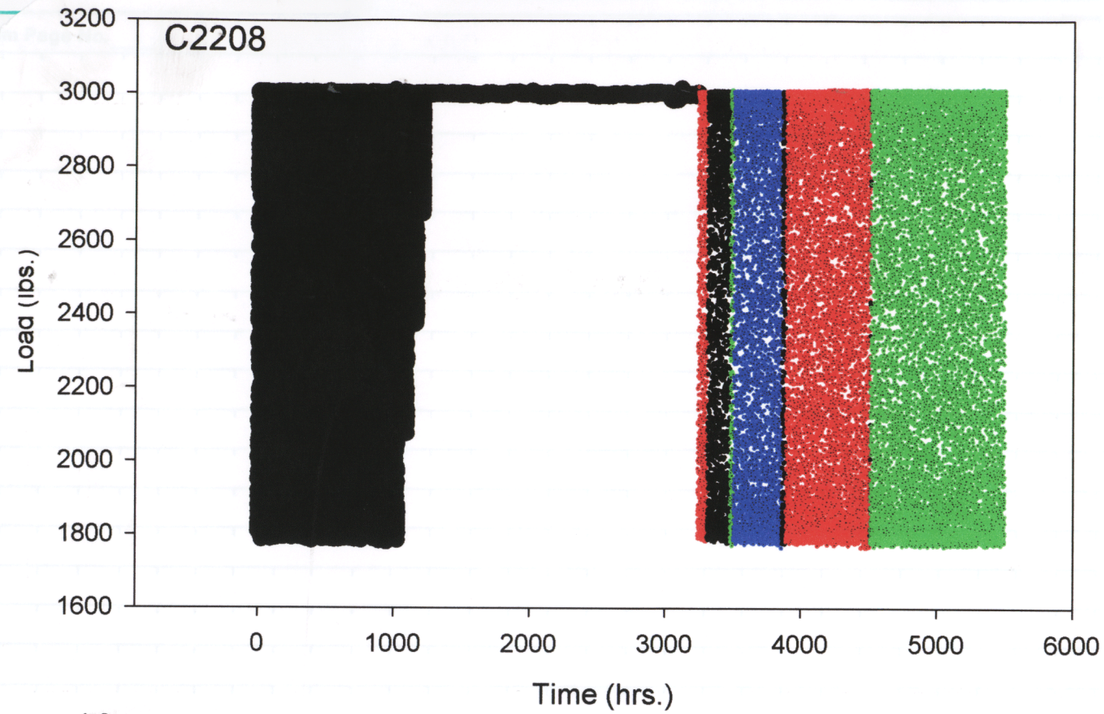
61.00 mm

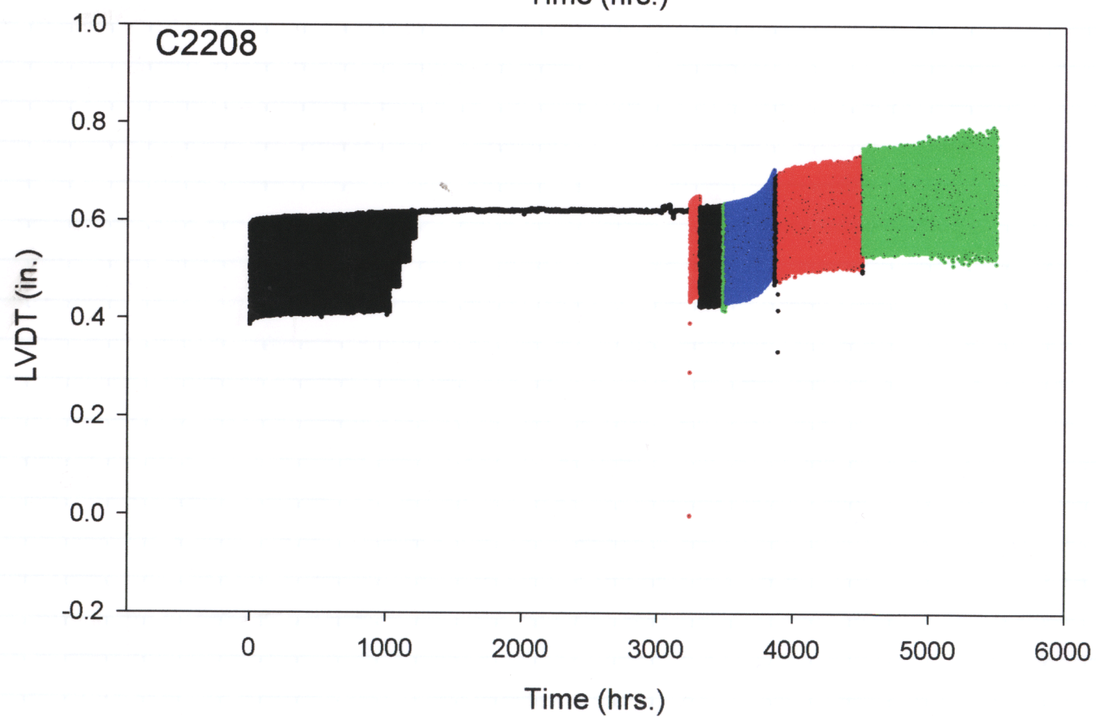
50-8 - 29.03 =

21.77 mm

NO INDICATION OF CRACK PROPAGATION

Project No. C2208





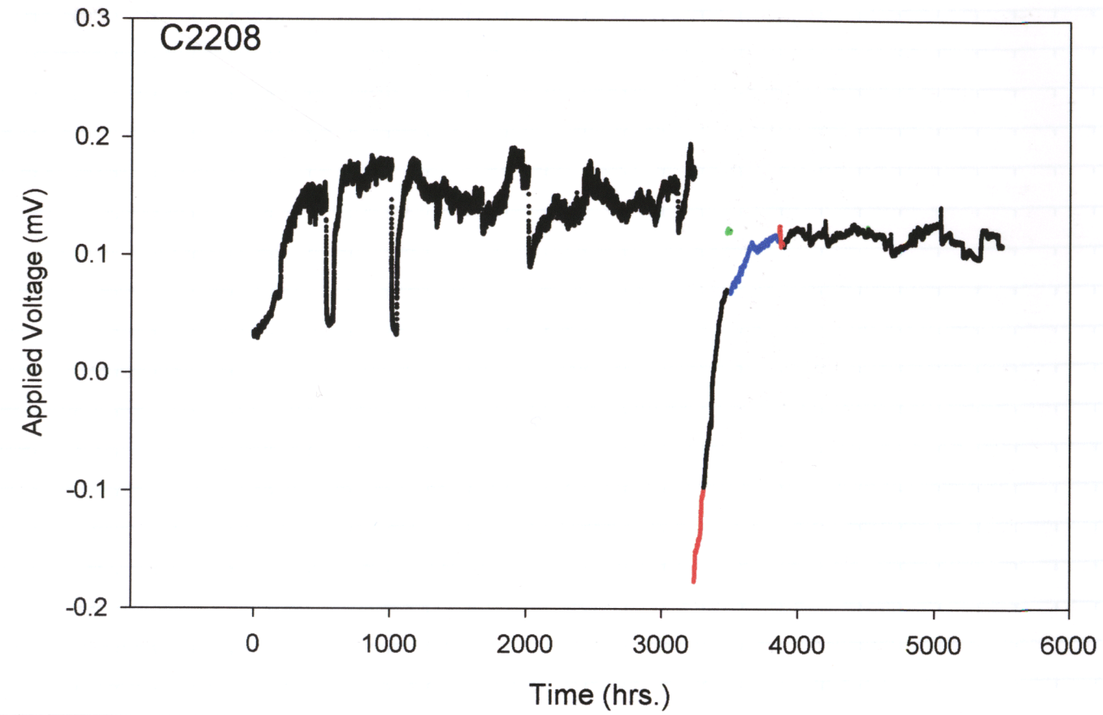
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	2/3/05

TITLE C2208

Project No.

Book No.

From Page No.



To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	2/3/05

From Page No.

Specimen: C2209 compact tension specimen
Material: Heat 2277-8-3175

Date: 03/13/02

Fatigue Precracking performed on

Load frame model number: MTS 810

Load frame serial number: Frame # 17

Load measurements performed using

Load cell model number: MTS 661.21A-02

Load cell serial number: 5930

Date of last calibration: 12/07/01

Next calibration due: 12/07/02

Displacement measurements performed using

Model Number MTS 632.033.30 Clip gauge

Serial Number 594

Date of last calibration: 03/12/02

Next calibration due: N/A Calibrated prior to use

Additional Information B=0.4995" B(notch) 0.335" B(net) = 0.4091" W= 2.0003"

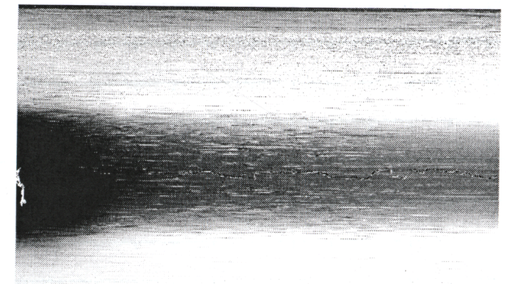
Minimum Load (lbs)	Maximum Load (lbs)	Number of cycles	Crack length/width (a/W) Front	Crack length/width (a/W) Rear	Average (a/W)
264	2640	56305	0.295	0.287	0.291
240	2400	66088	0.348	0.351	0.350
218	2180	43478	0.397	0.398	0.398
198	1980	24349	0.4264	0.4260	0.4262
180	1800	26805	0.4534	0.4519	0.4527

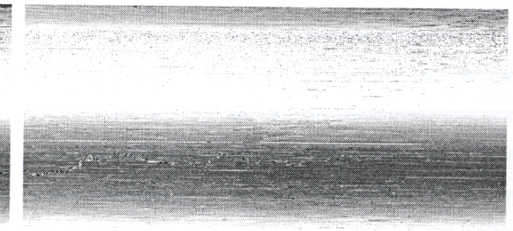
To Page No.

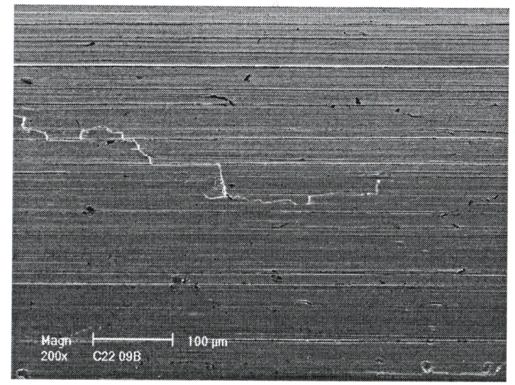
Witnessed & Understood by me, Date Invented by Date

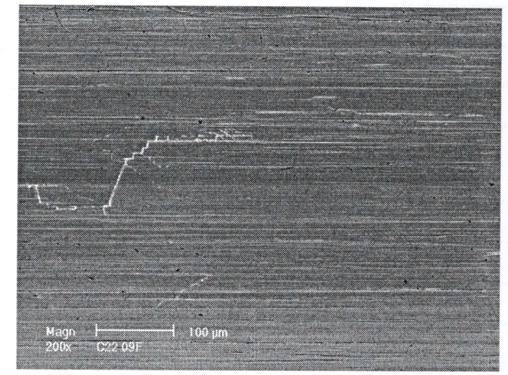
Recorded by Daniel Dunn 2/3/05

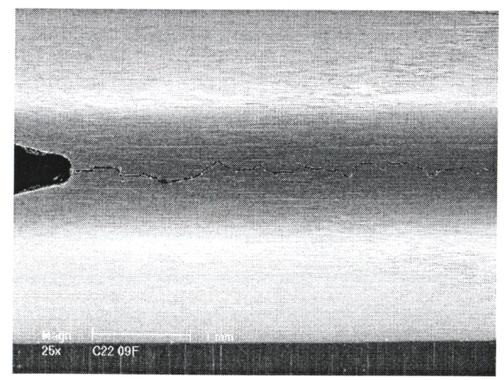
From Pag

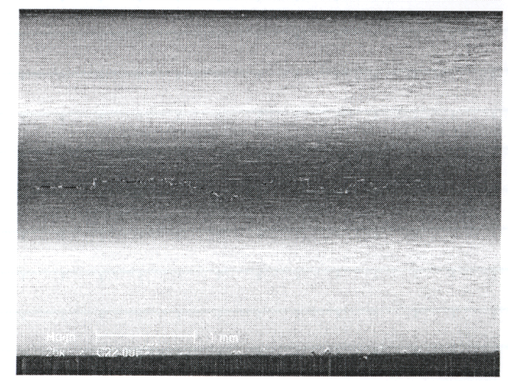












To Page No.

Witnessed & Understood by me, Date Invented by Date

Recorded by Daniel Dunn 2/3/05

From Page No.

Compact Tension Stress Corrosion Crack Test

Objective: Determine the effect of potential and environment on the propagation of stress corrosion cracking of container materials

Test: C2209
Test Specimen: C2209 Alloy 22 Heat 2277-8-3175
Test Information: Simulated concentrated water without nitrate with cyclic loading open circuit

Solution: Simulated Concentrated Water without Nitrate

Solution #1 2000 mL
12.965 g KCl lot 005573
10.862 g NaCl lot 035451
41.38 g Na_2SO_4 lot 035451
192.68 g $NaHCO_3$ lot 028924
6.190 g NaF lot 991559
pH: 7.883

Solution #2 1000 mL
6.484 g KCl lot 005573
5.435 g NaCl lot 035451
20.696 g Na_2SO_4 lot 035451
96.34 g $NaHCO_3$ lot 028924
3.095 g NaF lot 991559
pH: 7.919

Reagents measured with: Ohaus sn 2883 **Cal:** 2/2/04 **Cal Due:** 8/2/04

pH measured with: Orion EA 940 sn 2330 **Cal:** 6/15/03 **Cal Due:** 6/15/04
pH electrode: Fisher 2336482P

Test temperature: 95 C
measured with Hg Thermometer: H98-170 **Cal:** 4/29/04 **Cal Due:** 4/29/05

Gas: None

E_{corr}: -188
E_{Pt}: -89
$E_{applied}$: Open Circuit

Electrometer: Keithley 614 sn 0704934 **Cal:** 6/9/03 **Cal Due:** 6/9/04
Reference: Fisher SCE sn 7079122

Loading Conditions
Test Frame: 4
Max Load: 3000 lbs
Min/Max Load Ratio: 0.6

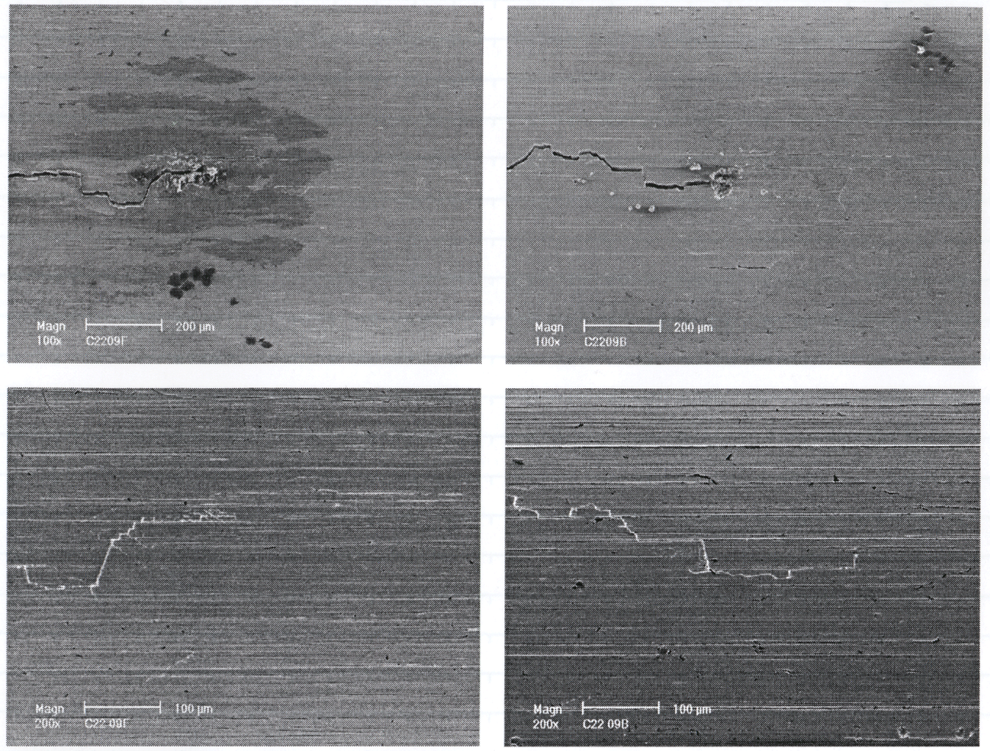
Test Started: 6/3/04

Test Stopped: 9/7/04

To Page No._____

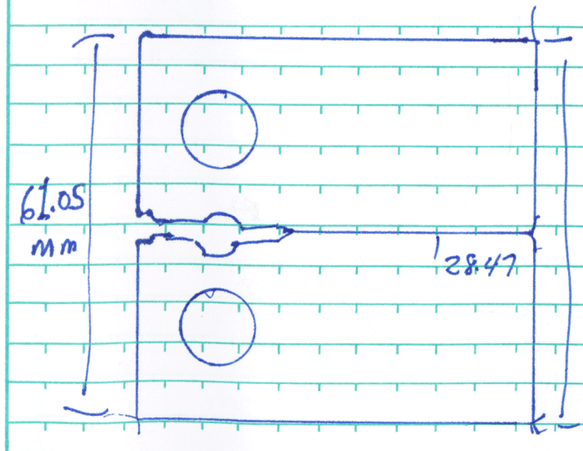
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by [signature]	2/3/05

From Page No.____



2277 hr

Initial



STARRETT MODEL 721
SN 09031512

CAL 3/10/04
DUE 3/10/05

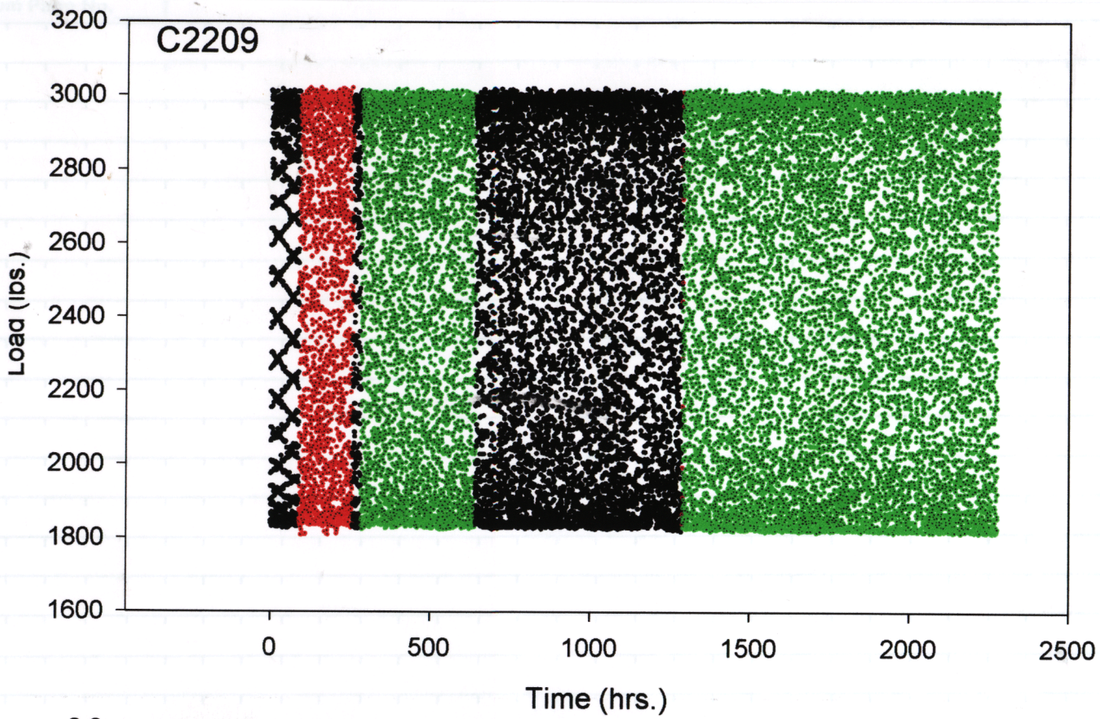
50.8 − 28.47 = 22.33

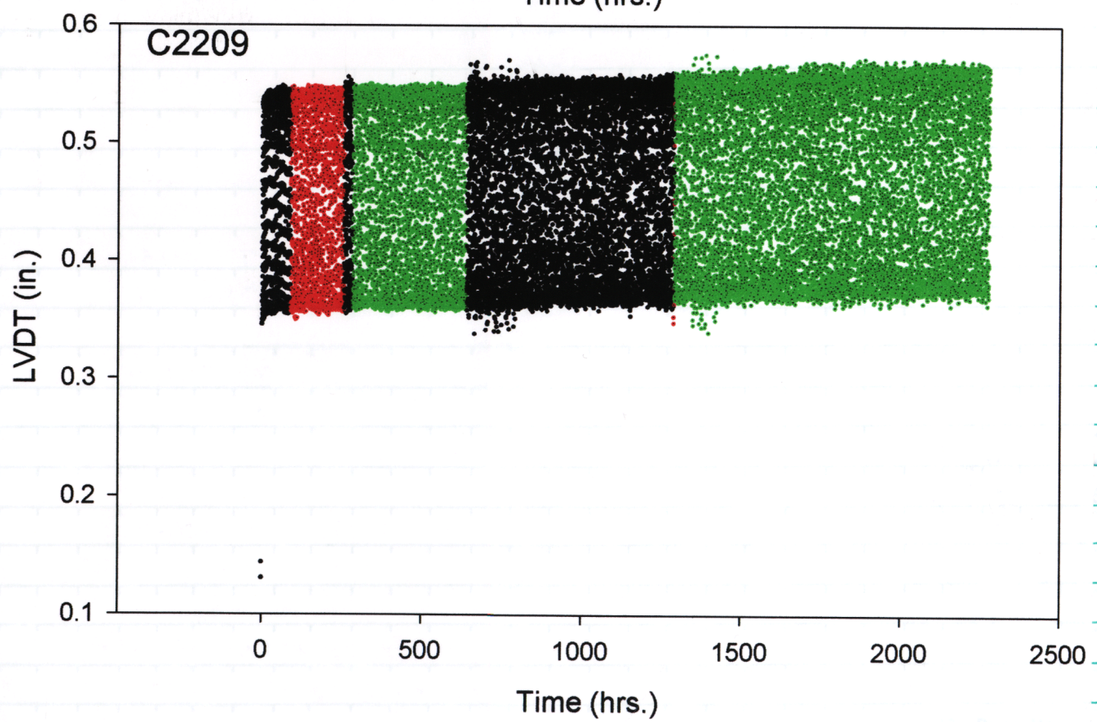
NO INDICATION OF CRACK PROPAGATION

To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by [signature]	2/3/05

Project No.
Book No.
TITLE C2209

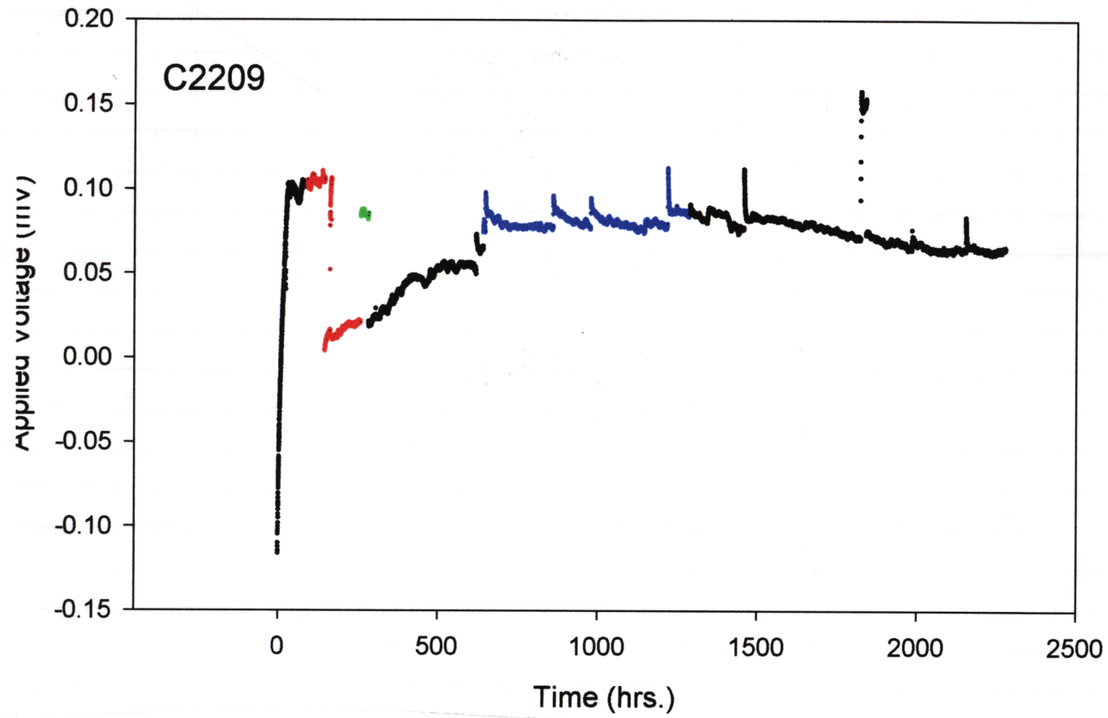




Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	2/3/05

TITLE C2209
Project No.
Book No.

From Page No.



To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	2/3/05

From Page No.

Compact Tension Stress Corrosion Crack Test

Objective: Determine the effect of potential and environment on the propagation of stress corrosion cracking of container materials

Test: C2205D - I
Test Specimen: C2205 Alloy 22 Heat 2277-8-3175
Test Information: Continuation of C2205C documented in Notebook 599 p. 36

Solution: Simulated Concentrated Water without Nitrate Same solution as C2205A documented in Notebook 599 p. 3

Solution #1 2000 mL
12.961 g KCl lot 005573
10.863 g NaCl lot 035421
41.38 g Na_2SO_4 lot 035451
192.68 g $NaHCO_3$ lot 028966
6.190 g NaF lot 991559
pH 7.842

Solution #1 1000 mL
6.483 g KCl lot 005573
5.432 g NaCl lot 034103
20.693 g Na_2SO_4 lot 025157
96.34 g $NaHCO_3$ lot 028924
6.193 g NaF lot 991559
pH 7.840

Reagents measured with: **Cal:** **Cal Due:**
Gas: None

pH measured with: Orion EA940 SN 2330 **Cal:** 6/15/03 **Cal Due:** 6/15/04
pH electrode: Fisher 13-620-296 sn2336482P

Test temperature: 95 °C
measured with Hg Thermometer: C98-106 **Cal:** 3/10/04 **Cal Due:** 3/10/05

E_{corr}: 87 mV SCE
E_{Pt}: Not Recorded
$E_{applied}$: 380 mV vs SCE

Electrometer: Hewlett Packard 34401A **Cal:** 9/11/03 **Cal Due:** 9/1/04
Reference: Fisher SCE sn 0249098

Loading Conditions
Test Frame: 2
Max Load: 3000 lbs
Min/Max Load Ratio: static

Test Started: 6/3/04

Test Stopped: 9/7/04

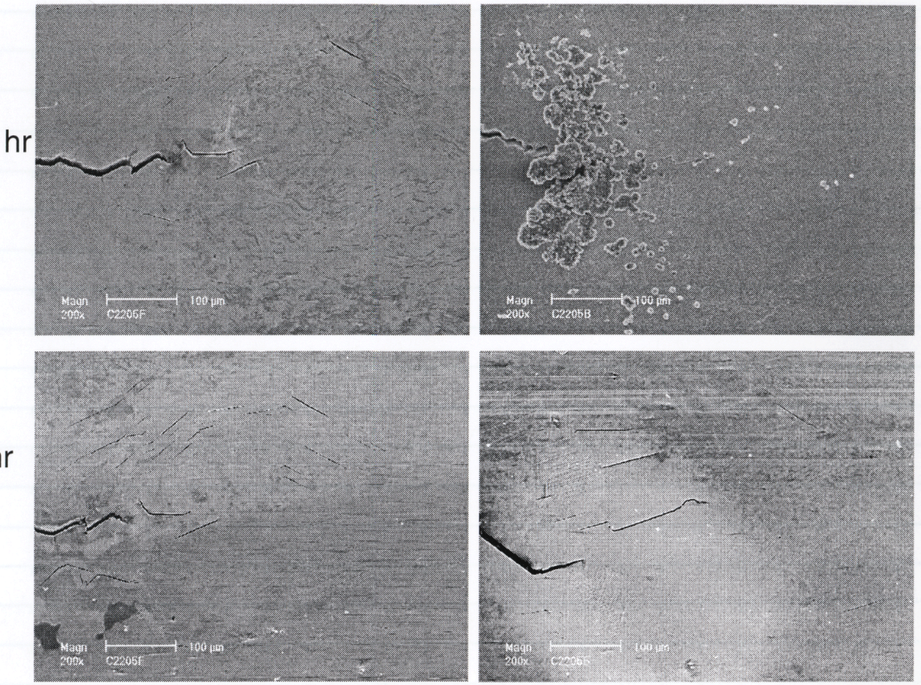
To Page No.

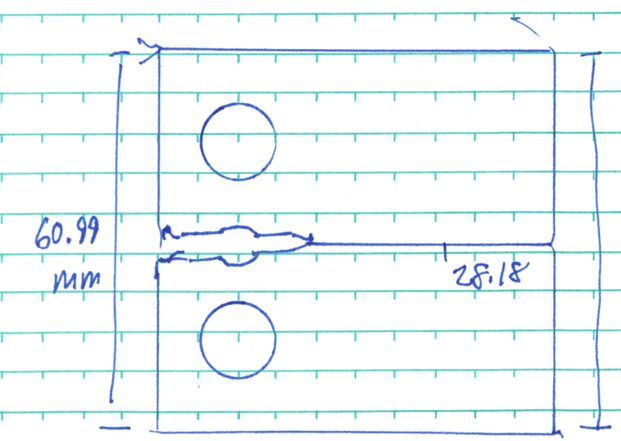
Witnessed & Understood by me, | Date | Invented by | Date
Recorded by | 2/4/05

From Page No.

10,575 hr

1,008 hr





STARRETT MODEL 721
SN 03031512

CAL 3/10/04
DUE 3/10/05

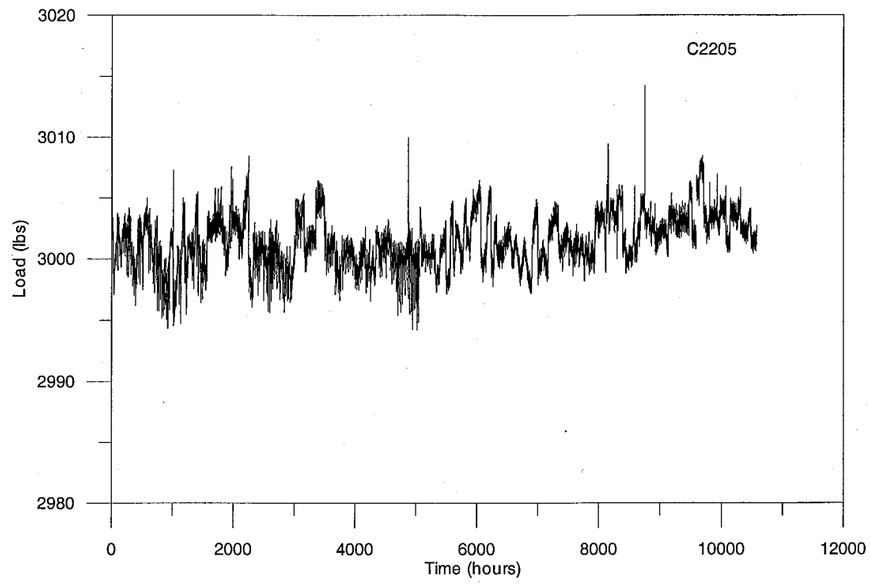
50.8 − 28.18 = 22.62

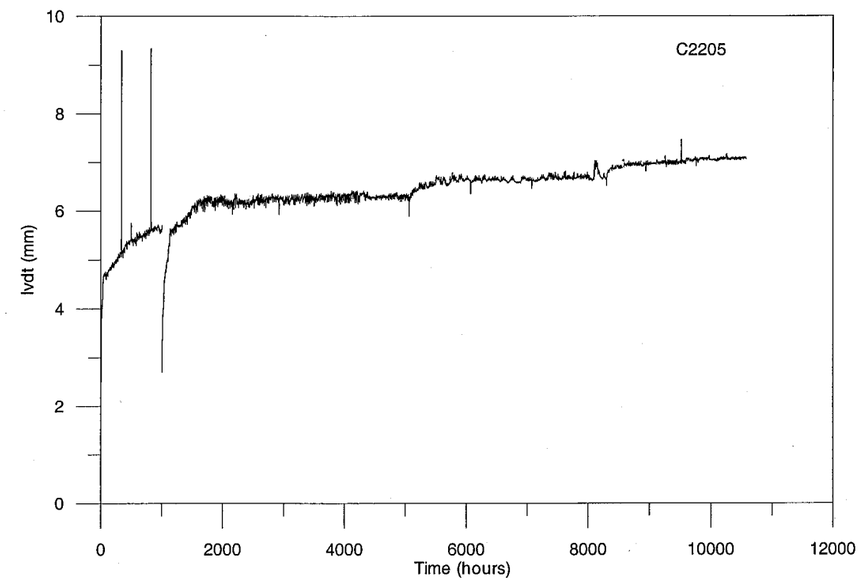
To Page No.

Witnessed & Understood by me, | Date | Invented by | Date
Recorded by | 2/4/05

Project No.
Book No.
TITLE C2205

From Page No.



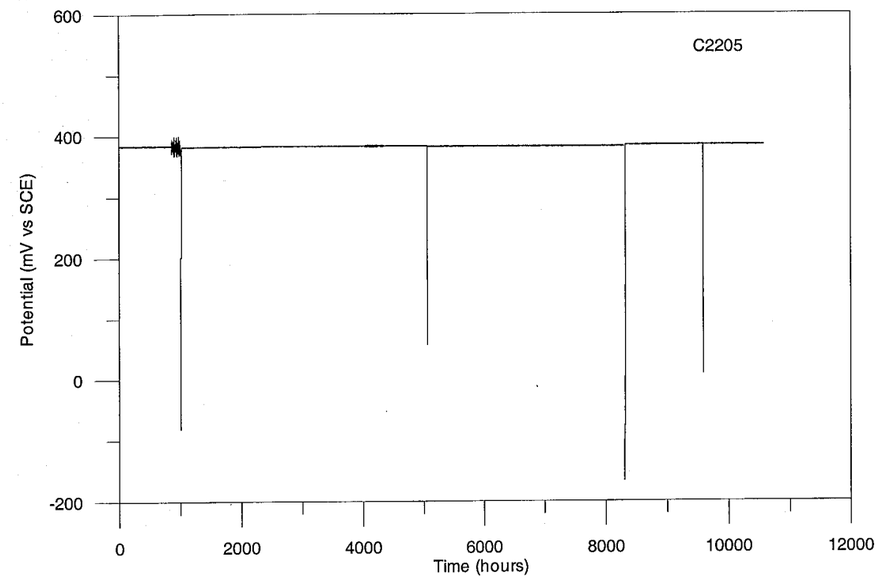


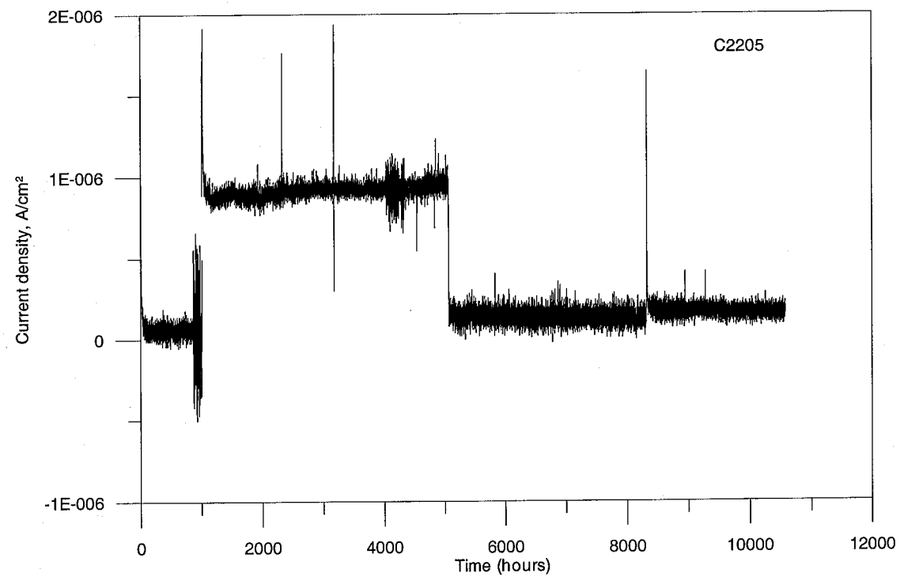
To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	2/4/05

TITLE C2205
Project No.
Book No.

From Page No.



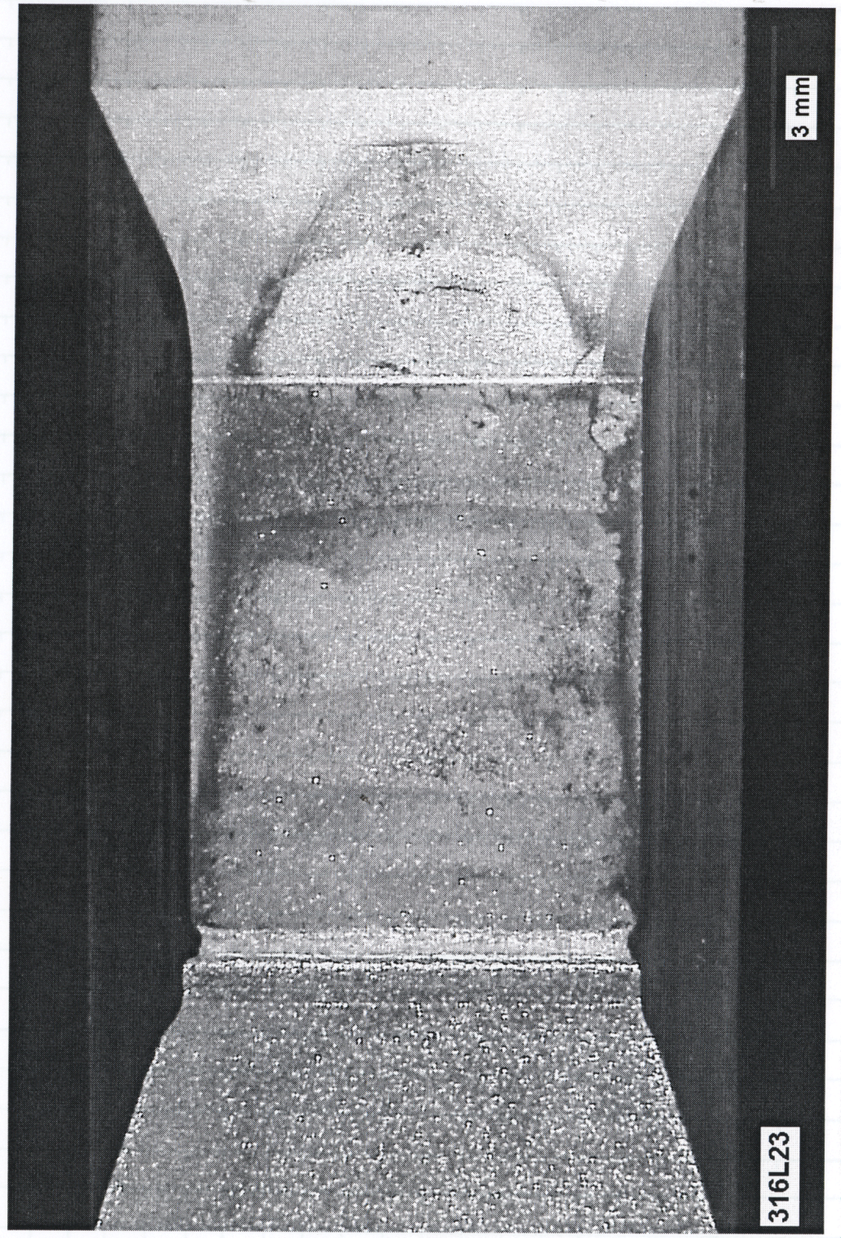


To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	2/4/05

Project No.
Book No.
TITLE

From Page No.



AFTER SPECIMEN FRACTURE

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/05

TITLE

Project No.
Book No.

From Page No.

316L 23 NEAT P80746

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/05