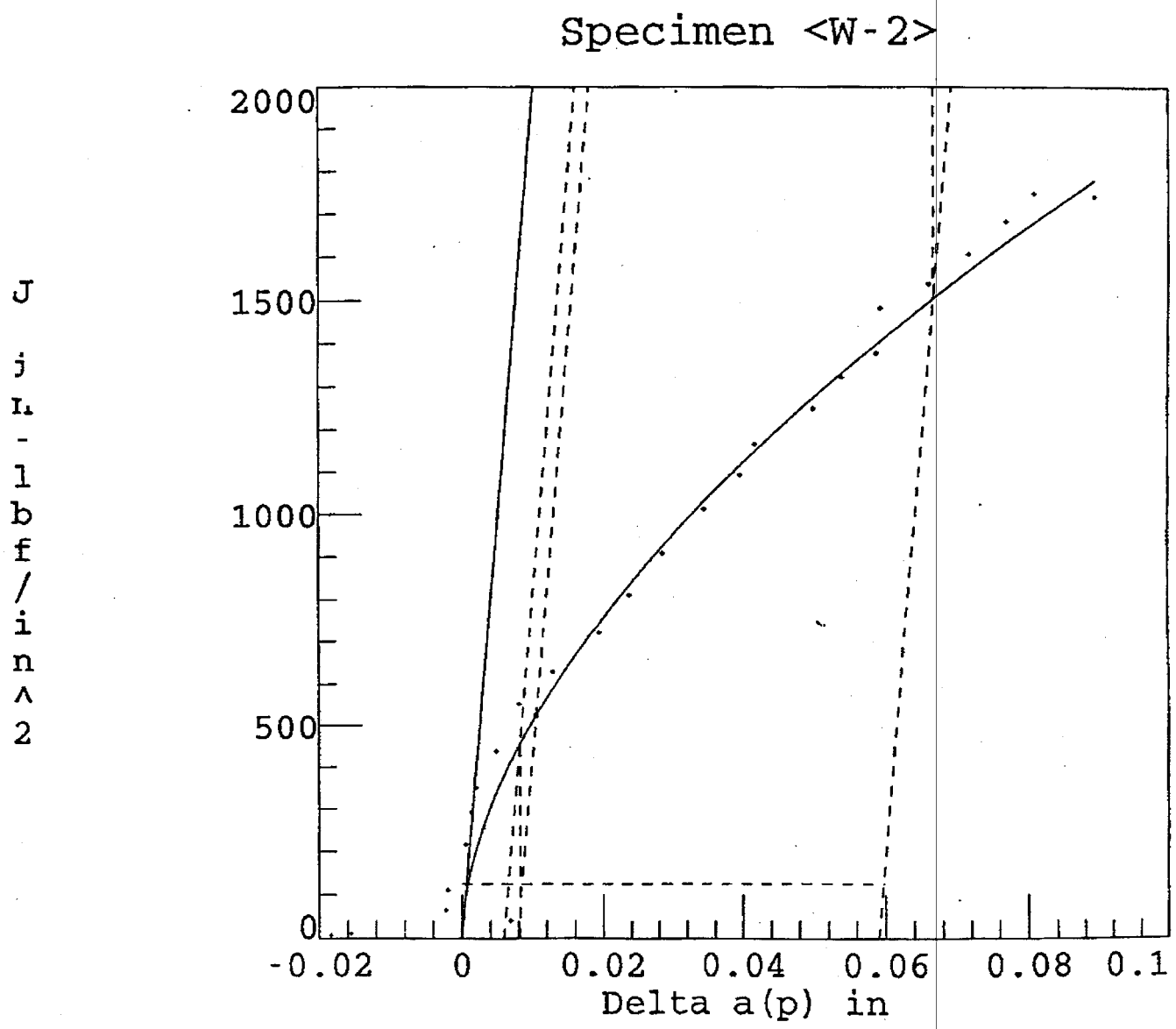
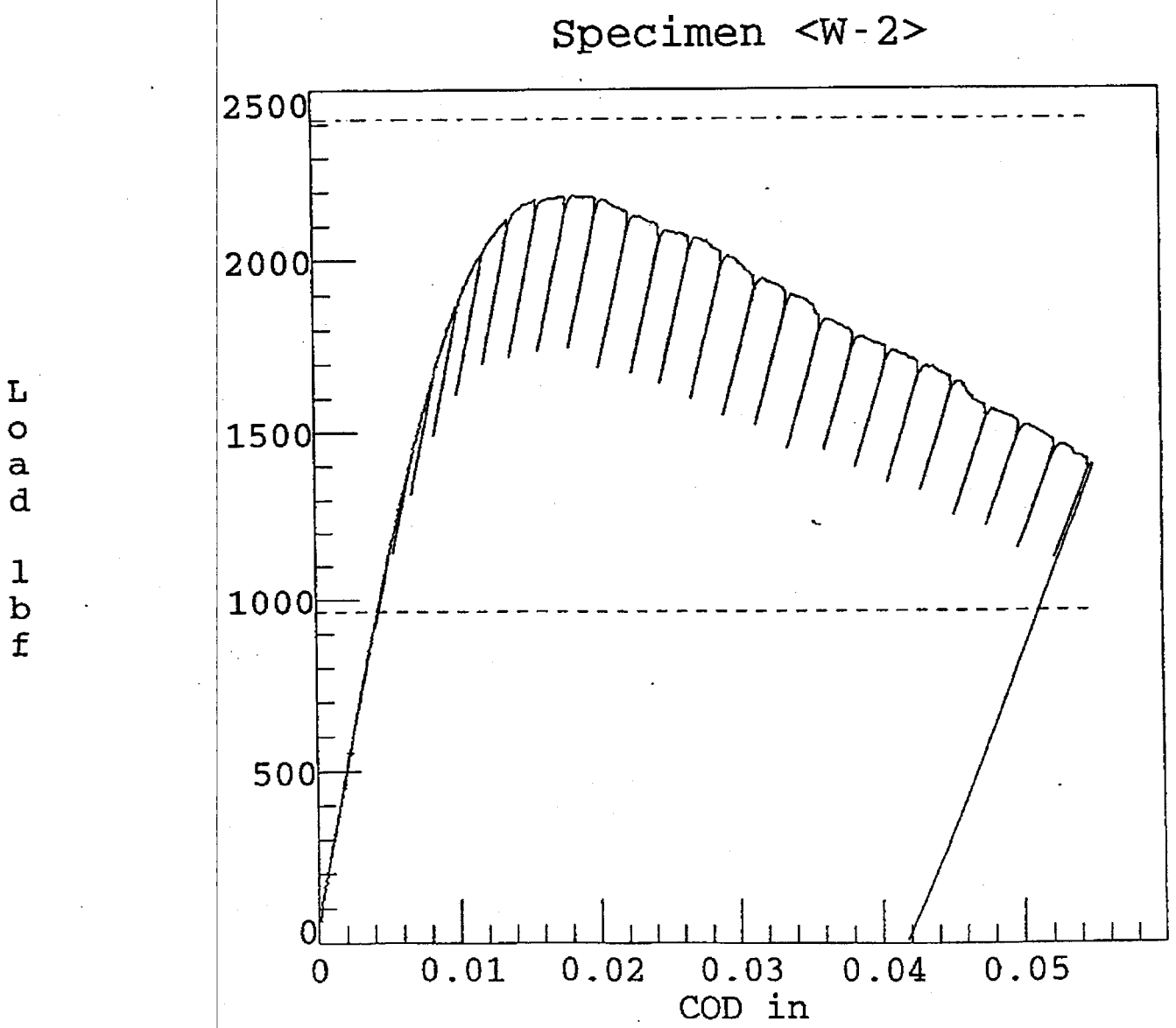
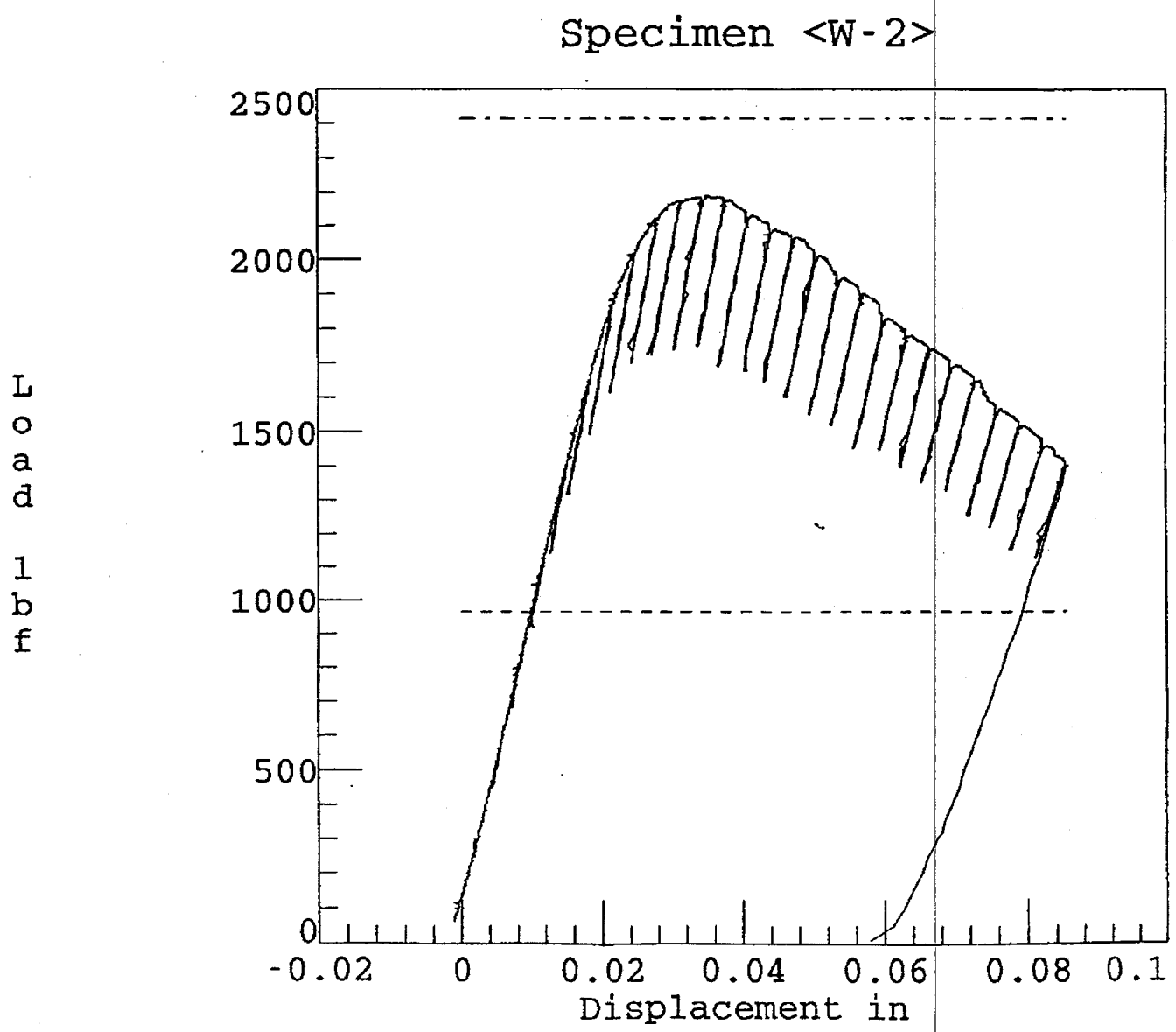


JQ = 524.688 in-lbf/in^2

Delta a(Q) = 0.0105442 in


Specimen <W-2>
2500
2000
1500
1000
500
0
Load lbf
0
0.01
0.02
0.03
0.04
0.05
COD in


Specimen <W-2>
2500
2000
1500
1000
500
0
Load lbf
-0.02
0
0.02
0.04
0.06
0.08
0.1
Displacement in

Report: atr1jtest
Operator: BJ
Date: Thu Jan 05 14:47:04 1995
T ›late: JIC Fracture Toughness
Pı.ocedure: SE(B)
Batch: ATRsm1bend1

J-Delta a(p) Data Tables : <w-2jic>

Specimen <W-2>

Step	J (in-lbf/in^2)	Delta a(p) (in)	Load (lbf)	COD (in)
1	7.17993	-0.018378	304.010	0.001064
2	11.4656	-0.015540	560.745	0.002304
3	39.9530	0.006858	838.501	0.003683
4	64.8098	-0.002294	1123.84	0.005095
5	110.434	-0.002008	1400.22	0.006629
6	154.182	0.001035	1637.31	0.008231
7	216.488	0.000530	1850.28	0.010041
8	291.833	0.001300	1992.26	0.011815
9	350.219	0.002010	2090.12	0.013728
10	438.292	0.004870	2136.65	0.015795
11	552.103	0.008096	2146.64	0.017898
12	628.160	0.012907	2143.19	0.019931
13	720.500	0.019422	2094.26	0.022240
14	811.259	0.023714	2051.87	0.024514
15	909.357	0.028467	2032.92	0.026668
16	1013.87	0.034461	1981.57	0.028942
17	1093.53	0.039583	1914.37	0.031217
18	1167.35	0.041645	1868.20	0.033474
19	1249.76	0.049893	1800.31	0.035869
20	1322.47	0.053820	1752.06	0.038126
21	1377.81	0.058646	1711.40	0.040504
22	1483.88	0.059311	1667.29	0.042813
23	1539.35	0.066094	1626.28	0.045104
24	1606.11	0.071679	1541.16	0.047534
25	1681.92	0.076978	1500.15	0.049843
26	1748.07	0.080865	1446.39	0.052427
27	1739.40	0.089390	1387.81	0.054684

Report: atr1jtest
Operator: BJ
Date: Thu Jan 05 14:47:04 1995
T plate: JIC Fracture Toughness
Procedure: SE(B)
Batch: ATRsm1bend1

J-Delta a(p) Data Tables : <w-2jic>

Specimen <W-2>

Step	Displ. (in)	J Exclusion	Delta a(p) Max/Min	Displ. for J calc. (in)
1	0.002263	Invalid	Invalid	0.000417
2	0.005365	Invalid	Invalid	0.001960
3	0.008810	Invalid	Invalid	0.003719
4	0.011912	Invalid	Invalid	0.005088
5	0.015013	Invalid	Invalid	0.006511
6	0.017942	Invalid	Invalid	0.008001
7	0.021388	Invalid	Invalid	0.010154
8	0.024489	Invalid	Invalid	0.012393
9	0.027935	Invalid	Invalid	0.015245
10	0.031036	Invalid	Invalid	0.018063
11	0.034138	Invalid	Invalid	0.021104
12	0.037239	Valid	Valid	0.024226
13	0.040513	Valid	Valid	0.027797
14	0.043786	Valid	Valid	0.031328
15	0.046888	Valid	Valid	0.034544
16	0.049989	Valid	Valid	0.037957
17	0.053435	Valid	Valid	0.041811
18	0.056708	Valid	Valid	0.045365
19	0.059637	Valid	Valid	0.048706
20	0.062911	Valid	Valid	0.052273
21	0.066012	Valid	Valid	0.055621
22	0.069286	Valid	Valid	0.059163
23	0.072732	Valid	Valid	0.062857
24	0.075661	Invalid	Invalid	0.066303
25	0.078934	Invalid	Invalid	0.069826
26	0.082380	Invalid	Invalid	0.073598
27	0.085309	Invalid	Invalid	0.076883

Report: atrljtest
Operator: BJ
Date: Thu Jan 05 14:47:04 1995
T ›late: JIC Fracture Toughness
P.ocedure: SE(B)
Batch: ATRsmlbend1

J-Delta a(p) Data Tables : <w-2jic>

Specimen <W-2>

Step	Normalized Compliance ((none))	Energy for J calc. (in-lbf)
1	-8.01342	0.294304
2	87.5273	0.957207
3	56.8635	2.22531
4	55.7354	3.64149
5	41.3299	5.47643
6	43.5249	7.75448
7	44.6477	11.5292
8	40.7420	15.8927
9	56.1250	21.8035
10	55.1160	27.8780
11	44.0128	34.4946
12	53.0289	41.3016
13	58.8956	49.0006
14	64.3932	56.4640
15	61.3268	63.1479
16	55.1736	70.1369
17	67.3950	77.7801
18	80.1381	84.6229
19	77.4499	90.9010
20	87.8835	97.3627
21	104.447	103.270
22	94.5416	109.366
23	111.052	115.556
24	113.824	121.109
25	109.537	126.562
26	119.401	132.201
27	169.838	136.920

Report: atr1jtest
Operator: BJ
Date: Thu Jan 05 14:49:03 1995
Template: JIC Fracture Toughness
Procedure: SE(B)
Batch: ATRsmlbend1

Test Summaries : <w-2jic>

	O
-- Identification: --	O
Template:	OJIC Fracture Toughness
Procedure:	OSE(B)
General Information:	O
This Test is designed to run SE(B)	style specimens.■The test will be run u
Batch:	OATRsmlbend1
Comments:	O
Specimen Name:	OW-2
Comments:	O
	O
-- Geometry: --	O
Specimen Geometry:	OSE(B)
Width	O0.999 Oin
Notch Length	O0.5 Oin
Thickness	O0.503 Oin
Net Thickness	O0.4 Oin
Span	O4 Oin
Modulus of Elasticity	O3.2e+07 Olbf/in^2
Yield Strength	O89900 Olbf/in^2
Ultimate Tensile Strength	O106600 Olbf/in^2
Poisson's Ratio	O0.3 O(none)
Crack Plane Orientation	O
Test Temperature	O125 Odeg_F
Compliance Calibration File:	OC:\ts2\79050\SE(B).CPL
K-Calibration File:	OC:\ts2\79050\SE(B).KCL
	O
-- Precrack Parameters: --	O
Final Kmax	O20000 Olbf/in^1.5
Load Ratio, R (min/max)	O0.1 O(none)
Test Frequency	O10 OHz
Final Crack Length	O0.645 Oin
Cycle Limited	OOff
Maximum Number of Cycles	O10000
Manual measurement	OOff
Compliance measurement	OOn
Upper LSF data range	O90 O%
Lower LSF data range	O10 O%
Automatic Inspection Hold	OOff
Inspection Interval (cycles)	O10000
	O
-- Precrack Results: --	O
Precrack Cycles	O0
Precrack Kmax	O0 Olbf/in^1.5
Precrack Final K	O0 Olbf/in^1.5

Report: atr1jtest
Operator: BJ
Date: Thu Jan 05 14:49:03 1995
Template: JIC Fracture Toughness
Procedure: SE(B)
Batch: ATRsmlbend1

Test Summaries : <w-2jic>

Precrack Pmax	O0 Olbf
Precrack Final P	O-900 Olbf
Precrack crack length	O0.5929 Oin
Precrack user comment	Oonly precrack length is valid
	O
-- Precrack Setup: --	O
Load Sensor:	OForce 1
Load Range:	O10000 Olbf
COD Sensor:	OLength 2
COD Range:	O0.5 Oin
	O
-- JIC Execution Parameters: --	O
Precycle Load	O-500 Olbf
Test Control	ODisplacement
Ramp Rate	O-0.0002 Oin/Sec
UnLoad on Load Step	OOff
Load Step	O300 Olbf
UnLoad on COD Step	OOff
COD Step	O0.001 Oin
UnLoad on Displacement Step	OOn
Displacement Step	O0.004 Oin
Unload Pct of Current Load	OOn
Percent Unload	O20 O%
Unload Absolute	OOff
Absolute Unload	O300 Olbf
Number of Unloads	O2
Crack Propagation Hold Time	O2 OSec
Unload Rate	O300 Olbf/Sec
Reload Rate	O300 Olbf/Sec
Ramp To Initial Load	OOn
Pct Of Final Precrack Load	O100 O%
Load Ramp Rate	O-100 Olbf/Sec
	O
-- JIC Test Setup: --	O
Load Sensor:	OForce 1
Load Range:	O10000 Olbf
COD Sensor:	OLength 2
COD Range:	O0.5 Oin
Displacement Sensor:	OLength 1
Displacement Range:	O5 Oin
Frame Stiffness:	O164700 Olbf/in
	O
-- JIC Data Storage: --	O
Event Log Filename:	Oelog.txt
Raw Data Filename:	Ojbu.000

Report: atr1jtest
Operator: BJ
Date: Thu Jan 05 14:49:03 1995
Template: JIC Fracture Toughness
Procedure: SE(B)
Batch: ATRsmlbend1

Test Summaries : <w-2jic>

	O
-- JIC Test Termination: --	O
End on maximum load	OOff
Maximum Load	O5000 Olbf
End on maximum COD	OOff
Maximum COD	O0.1 Oin
End on maximum displ.	OOff
Maximum Displacement	O-0.245 Oin
End on maximum Crack Length	OOff
Maximum Crack Length	O1 Oin
End on maximum Crack Extension	OOff
Maximum Crack Length Extension	O1 Oin
Termination Type	OControlled
Hydraulic Shutdown	OOn
	O
-- Final Precrack Lengths: --	O
Precrack length 1	O0.6173 Oin
Precrack length 2	O0.6269 Oin
Precrack length 3	O0.6261 Oin
Precrack length 4	O0.6289 Oin
Precrack length 5	O0.6264 Oin
Precrack length 6	O0.6237 Oin
Precrack length 7	O0.6221 Oin
Precrack length 8	O0.6201 Oin
Precrack length 9	O0.6185 Oin
Average Precrack:	O0.624013 Oin
	O
-- Final JIC Crack Lengths: --	O
Final crack length 1	O0.7604 Oin
Final crack length 2	O0.7457 Oin
Final crack length 3	O0.7303 Oin
Final crack length 4	O0.7223 Oin
Final crack length 5	O0.7083 Oin
Final crack length 6	O0.7154 Oin
Final crack length 7	O0.7102 Oin
Final crack length 8	O0.7138 Oin
Final crack length 9	O0.7133 Oin
Average Physical Crack:	O0.722856 Oin
	O
-- Calculated Crack Lengths: --	O
Pre Test Normalized Compliance:	O71.75 O(none)
Calculated Pre Test Crack Length:	O0.616239 Oin
Test Termination Normalized Compliance:	O139.889 O(none)
Calculated Test Term. Crack Length:	O0.709129 Oin
	O

Report: atr1jtest
Operator: BJ
Date: Thu Jan 05 14:49:03 1995
Template: JIC Fracture Toughness
P ·edure: SE(B)
B··h: ATRsmlbend1

Test Summaries : <w-2jic>

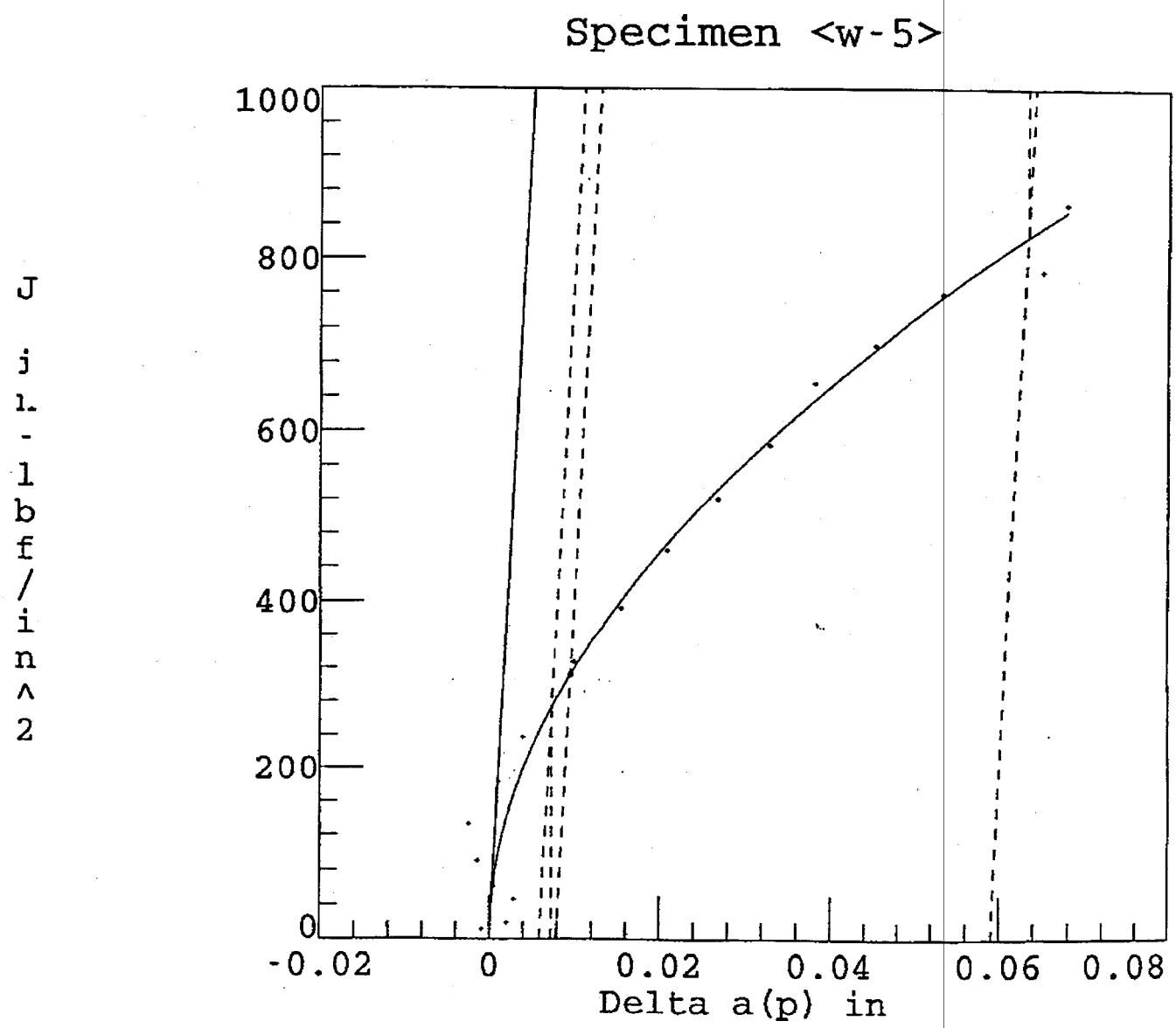
-- Run-Time Report: --	O
Test Duration:	O745.657 OSec
Maximum Load:	O2093.85 Olbf
Maximum COD:	O0.0544478 Oin
Maximum Displacement:	O0.0863195 Oin
Run Time Parm Mods	OYes
Test Termination:	O
	O
-- JIC Analysis Inputs ASTM E 813: --	O
Upper LSF data range:	O15 O%
Lower LSF data range:	O85 O%
Blunting Factor M:	O2 O(none)
Minimum J value:	O125 Olbf/in
Modulus Factor Lambda:	O1 O(none)
Delta a(p) offset:	O-0.0035 Oin
	O
-- JIC Analysis Calculations: --	O
Effective Yield Strength	OAvg. of Yield & Ultimate
Unload/Reload Compliance	OUnload & Reload
Rotational Correction	OASTM E813-89
J ·lculation	OASTM E813-89
J-·elta a(p) Curve Fit	OASTM E813-89
JIC Test Validity	OASTM E813-89
	O
-- JIC Test Results ASTM E 813: --	O
Number of Data Points:	O27
Number of Valid Data Points:	O12
Delta a(p) Min Limit Line:	O0.00822533 Oin
Delta a(p) Max Limit Line:	O0.0667182 Oin
Regression Slope dJQ/da at delta-aQ:	O28416.5 Olbf/in^2
J-Delta a(p) Equation:	O
J (in-lbf/in^2) =	O
c1 * (Delta a(p) (in)) ^^ c2	O
c1	O7042
c2	O0.5701
JQ	O524.688 Oin-lbf/in^2
Delta a(Q)	O0.0105442 Oin
Kj Value:	O129576 Olbf/in^1.5
	O
-- Validation Criteria ASTM E 813-89: --	O
ASTM E813-89 Section 8.4.2:	O
tp = 81.29 Sec	O
Is tp b/w 6 Sec	O
and 600 Sec?	OYes
ASTM E813-89 Section 7.1.1:	O

```
Report:     atr1jtest
Operator:   BJ
Date:       Thu Jan 05 14:49:03 1995
Template:   JIC Fracture Toughness
Procedure:  SE(B)
Batch:      ATRsm1bend1


Test Summaries : <w-2jic>

   25 JQ/SFS = 0.1335 in                O
   Is b0 > 25 JQ/SFS?                   OYes
   Is B > 25 JQ/SFS?                    OYes
ASTM E813-89 Section 7.2.2:             O
   a0/W = 0.6246                        O
   Is a0/W b/w 0.5 & 0.75?              OYes
ASTM E813-89 Section 7.5:               O
   Side grooving = 20.48 pct.           O
   Is side grooving <= 25 pct.?         OYes
ASTM E813-89 Section 7.6.4:             O
   Precrack extension = 0.124 in        O
   Is precrack extension >= 0.05a0      O
      and >= 0.05118 in?                OYes
ASTM E813-89 Section 7.6.1:             O
   PL = 2413 lbf                        O
ASTM E813-89 Section 8.4.3.6:           O
   Is the load range of all compliance  O
      unloads <= 0.2PL or 0.5 times     O
      the current load?                 OYes
ASTM E813-89 Section 9.3.1:             O
   Do all points used for regression lieO
      b/w Delta a(p) min & max?         OYes
ASTM E813-89 Section 9.2.2:             O
   Does at least one data point lie b/w O
      the 0.005906 in & 0.01969 in excl.OYes
   Does at least one data point lie b/w O
      the 0.03937 in & 0.05906 in excl. OYes
ASTM E813-89 Section 9.3.2:             O
   Were at least 4 data points used for O
      the J-Delta a(p) regression?      OYes
ASTM E813-89 Section 9.4.1.3:           O
   Is the slope of the regression curve O
      at JQ less than SFS?              OYes
ASTM E813-89 Section 9.4.1.5:           O
   Are all precrack lengths within      O
      7 pct. of the average?            OYes
ASTM E813-89 Section 9.4.1.5:           O
   Are all final crack lengths within   O
      7 pct. of the average?            OYes
ASTM E813-89 Section 9.4.1.6:           O
   Are both near surface crack          O
      extensions within 0.02W of the    O
      extension at the center?          OYes
ASTM E813-89 Section 9.4.1.7:           O
   Is the difference between the crack  O
```

Report: atr1jtest
Operator: BJ
Date: Thu Jan 05 14:49:03 1995
Template: JIC Fracture Toughness
Procedure: SE(B)
Batch: ATRsmlbend1

Test Summaries : <w-2jic>

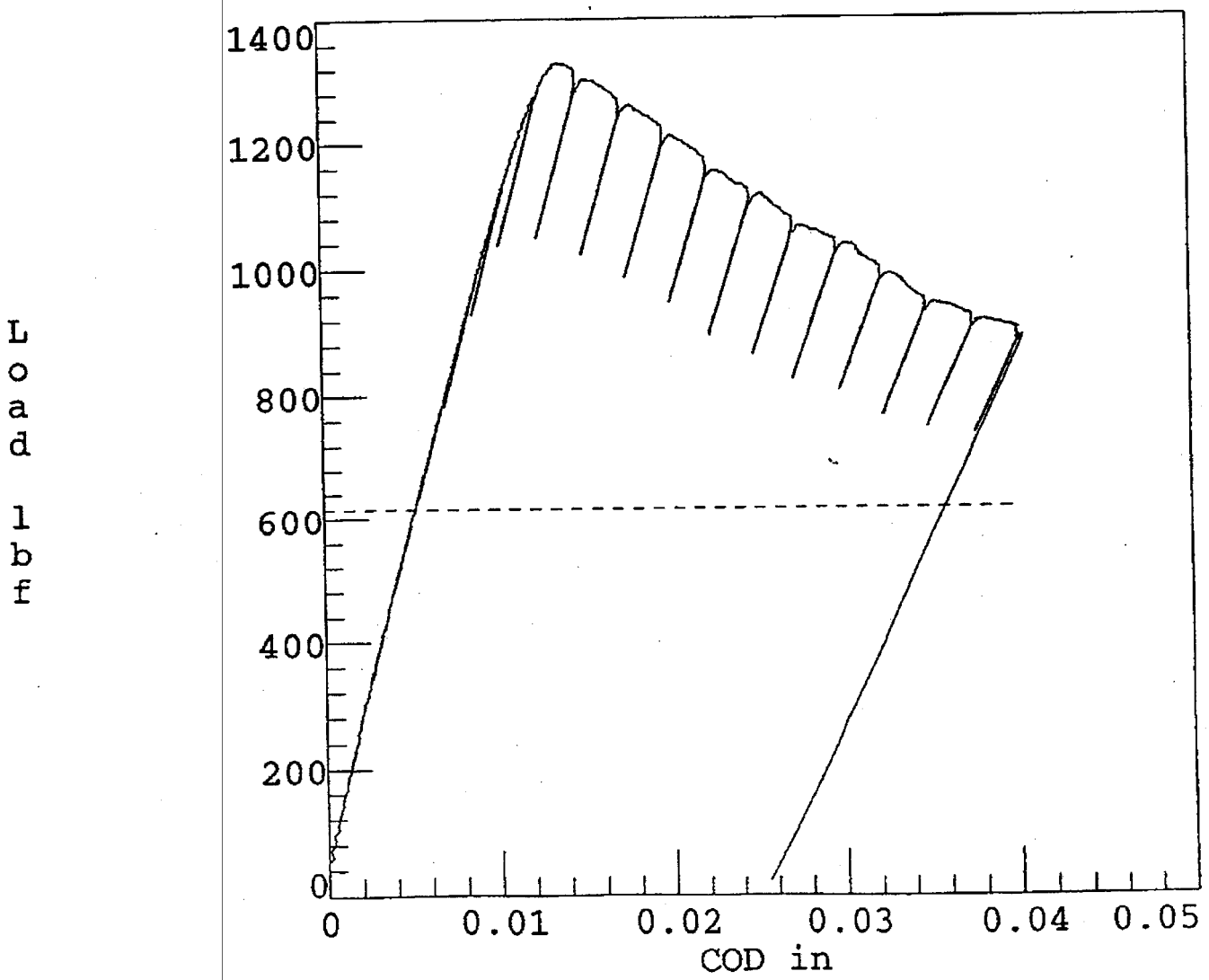
extensions found from compliance	O
and the 9-point averages within	O
15 pct. of either of the 9-point	O
average or Delta a(p) max?	OYes
ASTM E813-89 Section 9.4.1.7:	O
EM from 9-point precrack front	O
average = 3.367e+07 lbf/in^2	O
Is EM within 10 pct. of nominal E?	OYes
Were the J values and curve fit	O
calculated per ASTM E813-89?	OYes
Is JQ = JIC per ASTM E813-89?	OYes
JIC Value (ASTM E813-89):	O524.688 Oin-lbf/in^2

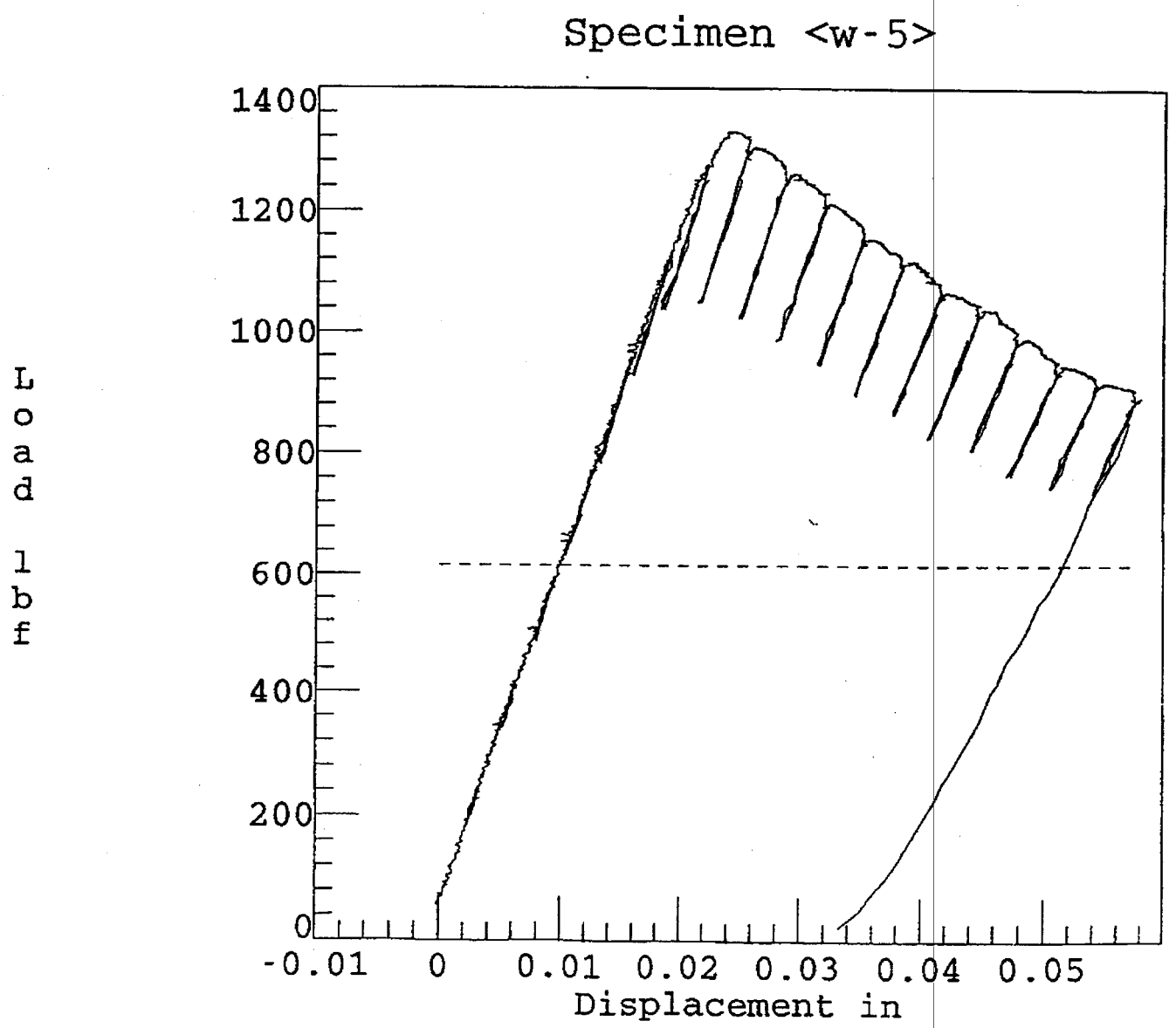


JQ = 312.206 in-lbf/in^2

Delta a(Q) = 0.00946285 in

Specimen <w-5>


1400
1200
1000
800
600
400
200
0
Load lbf
0
0.01
0.02
0.03
0.04
0.05
COD in


Specimen <w-5>
1400
1200
1000
800
600
400
200
0
Load lbf
-0.01
0
0.01
0.02
0.03
0.04
0.05
Displacement in

Report: atr2jtest
Operator: BJ
Date: Fri Jan 06 13:36:09 1995
T plate: JIC Fracture Toughness
I cedure: SE(B)
Batch: ATRsmlbend2

J-Delta a(p) Data Tables : <w-5jq>

Specimen <w-5>

Step	J	Delta a(p)	Load	COD
	(in-lbf/in^2)	(in)	(lbf)	(in)
1	12.3792	-0.000889	231.642	0.001580
2	18.8527	0.002049	411.529	0.003252
3	46.3494	0.002814	594.861	0.004958
4	61.2708	0.000453	773.714	0.006698
5	90.9402	-0.001445	957.391	0.008593
6	132.736	-0.002472	1126.59	0.010368
7	182.900	0.001043	1269.95	0.012367
8	236.981	0.003877	1288.91	0.014727
9	327.761	0.009796	1245.83	0.017226
10	392.050	0.015403	1200.34	0.019672
11	459.727	0.020855	1150.03	0.022240
12	521.176	0.026800	1103.85	0.024721
13	584.167	0.032802	1057.67	0.027185
14	656.133	0.038072	1025.28	0.029683
15	699.895	0.045240	981.514	0.032199
16	758.837	0.053236	935.681	0.034801
17	785.318	0.064942	905.700	0.037471
18	863.450	0.067746	882.955	0.040176

Report: atr2jtest
Operator: BJ
Date: Fri Jan 06 13:36:09 1995
T plate: JIC Fracture Toughness
Procedure: SE(B)
Batch: ATRsmlbend2

J-Delta a(p) Data Tables : <w-5jq>

Specimen <w-5>

Step	Displ. (in)	J Exclusion	Delta a(p) Max/Min	Displ. for J calc. (in)
1	0.003125	Invalid	Invalid	0.001718
2	0.006054	Invalid	Invalid	0.003555
3	0.009500	Invalid	Invalid	0.005888
4	0.012773	Invalid	Invalid	0.008076
5	0.015875	Invalid	Invalid	0.010062
6	0.019148	Invalid	Invalid	0.012308
7	0.022077	Invalid	Invalid	0.014366
8	0.025351	Invalid	Invalid	0.017525
9	0.028624	Valid	Valid	0.021060
10	0.031898	Valid	Valid	0.024610
11	0.035171	Valid	Valid	0.028189
12	0.038273	Valid	Valid	0.031571
13	0.041546	Valid	Valid	0.035125
14	0.044648	Valid	Valid	0.038423
15	0.047749	Valid	Valid	0.041790
16	0.051195	Valid	Valid	0.045514
17	0.054296	Invalid	Invalid	0.048797
18	0.057570	Invalid	Invalid	0.052209

Report: atr2jtest
Operator: BJ
Date: Fri Jan 06 13:36:09 1995
T plate: JIC Fracture Toughness
Procedure: SE(B)
Batch: ATRsmlbend2

J-Delta a(p) Data Tables : <w-5jq>

Specimen <w-5>

Step	Normalized Compliance ((none))	Energy for J calc. (in-lbf)
1	-87.5415	0.298345
2	100.820	0.884155
3	85.4734	2.03826
4	133.081	3.55011
5	131.173	5.28265
6	127.829	7.63800
7	124.986	10.1280
8	143.197	14.2779
9	135.294	18.8423
10	151.227	23.2611
11	162.106	27.5348
12	172.876	31.3952
13	183.669	35.3024
14	172.320	38.7855
15	196.916	42.2304
16	205.628	45.8486
17	244.641	48.9201
18	220.240	52.0256

Report: atr2jtest
Operator: BJ
Date: Fri Jan 06 13:40:05 1995
Template: JIC Fracture Toughness
P cedure: SE(B)
B..ch: ATRsmlbend2

Test Summaries : <w-5jq>

	O
-- Identification: --	O
Template:	OJIC Fracture Toughness
Procedure:	OSE(B)
General Information:	O
This Test is designed to run SE(B)	style specimens. The test will be run u
Batch:	OATRsmlbend2
Comments:	O
Specimen Name:	Ow-5
Comments:	O
	O
-- Geometry: --	O
Specimen Geometry:	OSE(B)
Width	O0.998 Oin
Notch Length	O0.5 Oin
Thickness	O0.502 Oin
Net Thickness	O0.4 Oin
Span	O4 Oin
Modulus of Elasticity	O2.76e+07 Olbf/in^2
Yield Strength	O89900 Olbf/in^2
U imate Tensile Strength	O106600 Olbf/in^2
Poisson's Ratio	O0.3 O(none)
Crack Plane Orientation	O
Test Temperature	O125 Odeg_F
Compliance Calibration File:	OC:\ts2\79050\SE(B).CPL
K-Calibration File:	OC:\ts2\79050\SE(B).KCL
	O
-- Precrack Parameters: --	O
Final Kmax	O20000 Olbf/in^1.5
Load Ratio, R (min/max)	O0.1 O(none)
Test Frequency	O10 OHz
Final Crack Length	O0.645 Oin
Cycle Limited	OOff
Maximum Number of Cycles	O10000
Manual measurement	OOff
Compliance measurement	OOn
Upper LSF data range	O90 O%
Lower LSF data range	O10 O%
Automatic Inspection Hold	OOff
Inspection Interval (cycles)	O10000
	O
-- Precrack Results: --	O
Precrack Cycles	O0
Precrack Kmax	O0 Olbf/in^1.5
Precrack Final K	O0 Olbf/in^1.5

Report: atr2jtest
Operator: BJ
Date: Fri Jan 06 13:40:05 1995
Template: JIC Fracture Toughness
Procedure: SE(B)
Batch: ATRsmlbend2

Test Summaries : <w-5jq>

Precrack Pmax	O0 Olbf
Precrack Final P	O-900 Olbf
Precrack crack length	O0.6919 Oin
Precrack user comment	Oonly precrack length is valid
	O
-- Precrack Setup: --	O
Load Sensor:	OForce 1
Load Range:	O10000 Olbf
COD Sensor:	OLength 2
COD Range:	O0.5 Oin
	O
-- JIC Execution Parameters: --	O
Precycle Load	O-500 Olbf
Test Control	ODisplacement
Ramp Rate	O-0.0002 Oin/Sec
UnLoad on Load Step	OOff
Load Step	O300 Olbf
UnLoad on COD Step	OOff
COD Step	O0.001 Oin
UnLoad on Displacement Step	OOn
Displacement Step	O0.004 Oin
Unload Pct of Current Load	OOn
Percent Unload	O20 O%
Unload Absolute	OOff
Absolute Unload	O300 Olbf
Number of Unloads	O2
Crack Propagation Hold Time	O2 OSec
Unload Rate	O300 Olbf/Sec
Reload Rate	O300 Olbf/Sec
Ramp To Initial Load	OOn
Pct Of Final Precrack Load	O100 O%
Load Ramp Rate	O-100 Olbf/Sec
	O
-- JIC Test Setup: --	O
Load Sensor:	OForce 1
Load Range:	O10000 Olbf
COD Sensor:	OLength 2
COD Range:	O0.5 Oin
Displacement Sensor:	OLength 1
Displacement Range:	O5 Oin
Frame Stiffness:	O164700 Olbf/in
	O
-- JIC Data Storage: --	O
Event Log Filename:	Oelog.txt
Raw Data Filename:	Oja4.100