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 BYRAM, R.G.      Pennsylvania Power & Light Co.  
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SUBJECT: Provides addl info requested by NRC re PP&L core shroud weld insps & evaluation techniques, per GL 94-03.

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 TITLE: GL 94-03 Intergranular Stress Corrosion Cracking of Core Shrouds in B

NOTES: 05000387

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Two North Ninth Street • Allentown, PA 18101-1179 • 610/774-5151

Robert G. Byram  
Senior Vice President—Nuclear  
610/774-7502  
Fax: 610/774-5019

MAY 01 1995

U.S. Nuclear Regulatory Commission  
Attn.: Document Control Desk  
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SUSQUEHANNA STEAM ELECTRIC STATION  
GENERIC LETTER 94-03  
ADDITIONAL INSPECTION INFORMATION  
PLA-4314 FILE R41-2

Docket No. 50-387

References: *PLA-4310 from R.G. Byram to USNRC, "Generic Letter 94-03 Interim Inspection Report," dated April 21, 1995.*

*PLA-4233 from R.G. Byram to USNRC, "Interim Response to Generic Letter 94-03," dated December 19, 1995.*

This letter provides the additional information requested by NRC's Mr. Chester Poslusny, Jr. concerning PP&L's core shroud weld inspections and evaluation techniques. This letter also provides minor revisions to the above referenced PLA-4310. The additional information and revisions have been previously discussed with Mr. Poslusny.

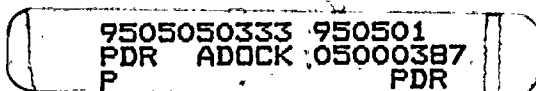
**Additional Information Requested**

**NRC Request 1**

Provide a table showing the extent of inspection of each weld length.

**PP&L Reply**

Attachment 1 to this letter "Susquehanna 1 - Shroud Rollout Actual UT Exam Coverage" provides the percentage of inspection coverage for welds H1, H2, H3, H4, H5, H6A, H6B, and H7 that PP&L committed to inspect in the referenced PLA-4233 during the Unit 1-8RIO.



ADIB/11

# 81001.0

*NRC Request 2*

Are the faulted loading conditions the most extreme?

*PP&L Reply*

The highest stress levels were for the faulted loading condition. These loadings were higher than the upset loading conditions. The upset loading conditions are included along with the faulted loading conditions in Attachment 2 to this letter.

*NRC Request 3*

Did PP&L include the 2CG factor in the table on defects for crack length?

*PP&L Reply*

The actual ISI data were adjusted in the spreadsheets to include 2CG + 4t prior to performing the Distributed Ligament Length (DLL) program calculations.

*NRC Request 4*

Did PP&L obtain crack depth data for welds H1 and H2?

*PP&L Reply*

For weld H1 the largest crack depths were two cracks at 0.2 inches and one crack at 0.15 inches. Crack depths on weld H2 were not measured since the inspection setup could take either crack depth or length, but not both. PP&L chose the setup for crack length rather than for crack depth. Any H2 length cracks found were assumed to be 2 inches in depth for purposes of the DLL program calculations.

*NRC Request 5*

Provide the inputs to loading conditions, such as membrane stresses, bending stresses, for both the upset and faulted conditions.

*PP&L Reply*

Attachment 3 to this letter provides the requested information.

Revisions to PLA-4310

Revision No. 1

See page 2 of PLA-4310. The table of safety factors for the weld, upset, and faulted factors has been revised as follows:

WELD	UPSET	FAULTED
H2	12.91	6.97
H4	4.31*	2.41*
H5	2.92	1.87
H6B	5.38	3.57
* revised		

Note that the above safety factors are found in the data for each weld at the end of the "Limit Load Results" in Attachment 2 to this letter.


Revision No. 2

In the Attachment to PLA-4310 page 1 of 9, the VT-3 ISI Type inspections referenced for the H8 and H9 welds should be VT-1. Attachment 4 to this letter provides the corrected table.

PP&L will advise NRC of the results of the independent review of our draft calculation as referenced in PLA-4310 during the week of May 1, 1995. We plan to submit our 30 day report covering the final inspection results for the Unit 1 shroud during the week of May 22, 1995.

If you have any questions please call our Mr. James B. Wesner at 610-774-4023.

Very truly yours,



R. G. Byram

Attachments

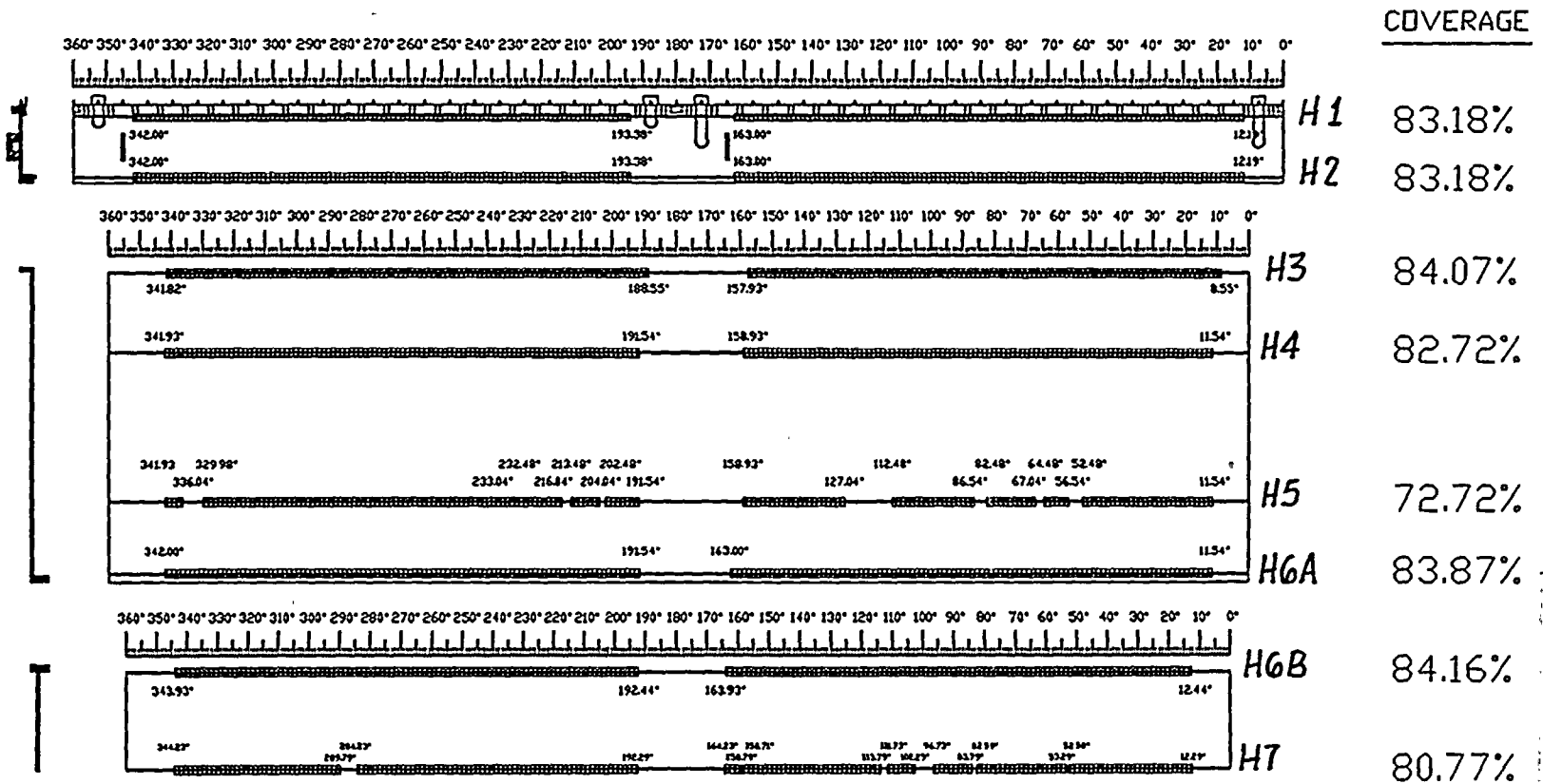
copy: NRC Region I  
Ms. M. Banerjee - NRC Sr. Resident Inspector  
Mr. C. Poslusny - NRR Sr. Project Manager

# SUSQUEHANNA 1 - SHROUD ROLLOUT

## ACTUAL UT EXAM COVERAGE

REV	DATE	PREPARED	REVIEWED	INIT.	APPROVED	INIT.	PURPOSE
0	02/28/95	JIM COLLINS	XXXXX		XXXXX		SHROUD ROLLOUT
1	04/19/95	JIM COLLINS	XXXXX		XXXXX		SHROUD ROLLOUT
2	04/21/95	JIM COLLINS	XXXXX		XXXXX		SHROUD ROLLOUT

SKETCH RELEASE RECORD



ATTACHMENT 1  
TO PLA-4314



NOTE: THIS SKETCH IS FOR ISI PROGRAM USE ONLY AND SHALL NOT BE USED FOR FABRICATION/INSTALLATION.

CC ORF NO.

PROJECT  
SSEC-1

TITLE

SHROUD UT INSPECTION

SKETCH NO.

SSEC-01-ROLL

WELD H2 Upset Conditions, DLL program results: FILE H2UPSET.TXT

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)  
 DATE OF THIS ANALYSIS: 04/20/1995

SUMMARY OF INPUTS:

-----  
 Angle increment = .1 deg. (FINE)  
 Membrane Stress, Pm = 282. psi  
 Bending Stress, Pb = 797. psi  
 Safety Factor, SF = 2.80  
 Mean Radius, Rm = 109.00 inches  
 Wall Thickness, t = 2.000 inches  
 Material = 304L SS  
 Stress Intensity, Sm = 14400. psi  
 Fluence = 0.0E+00 n/cm<sup>2</sup>  
 (Thus, LEFM evaluation not applicable)

REGION	THETA1 [deg.]	THETA2 [deg.]	THICKNESS [inches]
1	14.9	41.9	2.000
2	57.8	61.0	2.000
3	68.9	102.3	2.000
4	108.4	120.1	2.000
5	206.5	211.6	2.000
6	217.7	222.9	2.000
7	233.6	239.9	2.000
8	261.5	263.9	2.000
9	280.0	314.8	2.000
10	321.1	325.1	2.000
11	336.0	339.3	2.000

LIMIT LOAD RESULTS:

ALPHA [deg.]	MOMENT [in-lbs]	Pb [psi]	SAFETY FACTOR	RESULT
.0	1.806E+09	24195.	22.69	ACCEPTABLE
5.0	1.804E+09	24167.	22.66	ACCEPTABLE
10.0	1.788E+09	23955.	22.46	ACCEPTABLE
15.0	1.759E+09	23560.	22.10	ACCEPTABLE
20.0	1.716E+09	22986.	21.56	ACCEPTABLE
25.0	1.660E+09	22233.	20.87	ACCEPTABLE
30.0	1.607E+09	21530.	20.22	ACCEPTABLE
35.0	1.560E+09	20895.	19.63	ACCEPTABLE
40.0	1.525E+09	20423.	19.19	ACCEPTABLE
45.0	1.485E+09	19892.	18.70	ACCEPTABLE
50.0	1.457E+09	19518.	18.35	ACCEPTABLE
55.0	1.432E+09	19181.	18.04	ACCEPTABLE
60.0	1.395E+09	18681.	17.57	ACCEPTABLE
65.0	1.358E+09	18186.	17.12	ACCEPTABLE
70.0	1.313E+09	17595.	16.57	ACCEPTABLE
75.0	1.260E+09	16883.	15.91	ACCEPTABLE
80.0	1.197E+09	16035.	15.12	ACCEPTABLE
85.0	1.142E+09	15296.	14.44	ACCEPTABLE
90.0	1.088E+09	14575.	13.77	ACCEPTABLE
95.0	1.056E+09	14150.	13.38	ACCEPTABLE
100.0	1.046E+09	14017.	13.25	ACCEPTABLE
105.0	1.058E+09	14178.	13.40	ACCEPTABLE
110.0	1.092E+09	14631.	13.82	ACCEPTABLE
115.0	1.148E+09	15373.	14.51	ACCEPTABLE
120.0	1.222E+09	16370.	15.43	ACCEPTABLE
125.0	1.297E+09	17370.	16.36	ACCEPTABLE
130.0	1.373E+09	18390.	17.31	ACCEPTABLE
135.0	1.446E+09	19372.	18.21	ACCEPTABLE
140.0	1.526E+09	20439.	19.20	ACCEPTABLE
145.0	1.594E+09	21353.	20.05	ACCEPTABLE
150.0	1.650E+09	22104.	20.75	ACCEPTABLE

155.0	1.694E+09	22688.	21.29	ACCEPTABLE
160.0	1.739E+09	23292.	21.85	ACCEPTABLE
165.0	1.785E+09	23906.	22.42	ACCEPTABLE
170.0	1.817E+09	24339.	22.82	ACCEPTABLE
175.0	1.835E+09	24587.	23.05	ACCEPTABLE
180.0	1.840E+09	24648.	23.10	ACCEPTABLE
185.0	1.830E+09	24521.	22.99	ACCEPTABLE
190.0	1.807E+09	24207.	22.70	ACCEPTABLE
195.0	1.770E+09	23709.	22.23	ACCEPTABLE
200.0	1.719E+09	23031.	21.61	ACCEPTABLE
205.0	1.656E+09	22190.	20.83	ACCEPTABLE
210.0	1.603E+09	21470.	20.16	ACCEPTABLE
215.0	1.551E+09	20774.	19.51	ACCEPTABLE
220.0	1.512E+09	20254.	19.03	ACCEPTABLE
225.0	1.468E+09	19670.	18.49	ACCEPTABLE
230.0	1.439E+09	19278.	18.13	ACCEPTABLE
235.0	1.406E+09	18839.	17.72	ACCEPTABLE
240.0	1.363E+09	18260.	17.18	ACCEPTABLE
245.0	1.321E+09	17702.	16.67	ACCEPTABLE
250.0	1.270E+09	17008.	16.02	ACCEPTABLE
255.0	1.220E+09	16346.	15.41	ACCEPTABLE
260.0	1.164E+09	15592.	14.71	ACCEPTABLE
265.0	1.112E+09	14900.	14.07	ACCEPTABLE
270.0	1.061E+09	14208.	13.43	ACCEPTABLE
275.0	1.029E+09	13784.	13.04	ACCEPTABLE
280.0	1.019E+09	13651.	12.91	ACCEPTABLE
285.0	1.031E+09	13812.	13.06	ACCEPTABLE
290.0	1.065E+09	14265.	13.48	ACCEPTABLE
295.0	1.120E+09	15007.	14.17	ACCEPTABLE
300.0	1.189E+09	15930.	15.03	ACCEPTABLE
305.0	1.267E+09	16978.	16.00	ACCEPTABLE
310.0	1.342E+09	17982.	16.93	ACCEPTABLE
315.0	1.411E+09	18897.	17.78	ACCEPTABLE
320.0	1.483E+09	19867.	18.67	ACCEPTABLE
325.0	1.544E+09	20686.	19.43	ACCEPTABLE
330.0	1.594E+09	21347.	20.05	ACCEPTABLE
335.0	1.632E+09	21868.	20.53	ACCEPTABLE
340.0	1.678E+09	22472.	21.09	ACCEPTABLE
345.0	1.728E+09	23152.	21.72	ACCEPTABLE
350.0	1.767E+09	23674.	22.20	ACCEPTABLE
355.0	1.793E+09	24017.	22.52	ACCEPTABLE

ACCEPTABLE! MINIMUM SAFETY FACTOR = 12.91 AT 280.0 DEGREES.



WELD H2 Faulted Conditions, DLL Program results: FILE H2FAULT.TXT

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)  
DATE OF THIS ANALYSIS: 04/20/1995

SUMMARY OF INPUTS:

-----  
Angle increment = .1 deg. (FINE)  
Membrane Stress, Pm = 740. psi  
Bending Stress, Pb = 1281. psi  
Safety Factor, SF = 1.40  
Mean Radius, Rm = 109.00 inches  
Wall Thickness, t = 2.000 inches  
Material = 304L SS  
Stress Intensity, Sm = 14400. psi  
Fluence = 0.0E+00 n/cm^2  
(Thus, LEFM evaluation not applicable)

REGION	THETA1 [deg.]	THETA2 [deg.]	THICKNESS [inches]
1	14.9	41.9	2.000
2	57.8	61.0	2.000
3	68.9	102.3	2.000
4	108.4	120.1	2.000
5	206.5	211.6	2.000
6	217.7	222.9	2.000
7	233.6	239.9	2.000
8	261.5	263.9	2.000
9	280.0	314.8	2.000
10	321.1	325.1	2.000
11	336.0	339.3	2.000

LIMIT LOAD RESULTS:

ALPHA [deg]	MOMENT [in-lbs]	Pb [psi]	SAFETY FACTOR	RESULT
.0	1.778E+09	23819.	12.15	ACCEPTABLE
5.0	1.782E+09	23865.	12.17	ACCEPTABLE
10.0	1.770E+09	23716.	12.10	ACCEPTABLE
15.0	1.747E+09	23403.	11.95	ACCEPTABLE
20.0	1.710E+09	22913.	11.70	ACCEPTABLE
25.0	1.661E+09	22248.	11.37	ACCEPTABLE
30.0	1.609E+09	21549.	11.03	ACCEPTABLE
35.0	1.565E+09	20965.	10.74	ACCEPTABLE
40.0	1.531E+09	20512.	10.52	ACCEPTABLE
45.0	1.496E+09	20037.	10.28	ACCEPTABLE
50.0	1.468E+09	19663.	10.10	ACCEPTABLE
55.0	1.448E+09	19396.	9.96	ACCEPTABLE
60.0	1.418E+09	19000.	9.77	ACCEPTABLE
65.0	1.378E+09	18464.	9.50	ACCEPTABLE
70.0	1.328E+09	17786.	9.17	ACCEPTABLE
75.0	1.279E+09	17135.	8.84	ACCEPTABLE
80.0	1.222E+09	16372.	8.47	ACCEPTABLE
85.0	1.162E+09	15563.	8.07	ACCEPTABLE
90.0	1.109E+09	14850.	7.71	ACCEPTABLE
95.0	1.077E+09	14425.	7.50	ACCEPTABLE
100.0	1.067E+09	14293.	7.44	ACCEPTABLE
105.0	1.079E+09	14453.	7.52	ACCEPTABLE
110.0	1.113E+09	14907.	7.74	ACCEPTABLE
115.0	1.168E+09	15648.	8.11	ACCEPTABLE
120.0	1.243E+09	16651.	8.61	ACCEPTABLE
125.0	1.315E+09	17621.	9.09	ACCEPTABLE
130.0	1.395E+09	18693.	9.62	ACCEPTABLE
135.0	1.473E+09	19734.	10.13	ACCEPTABLE
140.0	1.555E+09	20825.	10.67	ACCEPTABLE
145.0	1.628E+09	21809.	11.16	ACCEPTABLE



150.0	1.687E+09	22600.	11.55	ACCEPTABLE
155.0	1.735E+09	23243.	11.87	ACCEPTABLE
160.0	1.780E+09	23847.	12.17	ACCEPTABLE
165.0	1.822E+09	24402.	12.44	ACCEPTABLE
170.0	1.849E+09	24771.	12.62	ACCEPTABLE
175.0	1.863E+09	24952.	12.71	ACCEPTABLE
180.0	1.862E+09	24943.	12.71	ACCEPTABLE
185.0	1.847E+09	24744.	12.61	ACCEPTABLE
190.0	1.818E+09	24357.	12.42	ACCEPTABLE
195.0	1.776E+09	23785.	12.13	ACCEPTABLE
200.0	1.719E+09	23030.	11.76	ACCEPTABLE
205.0	1.653E+09	22137.	11.32	ACCEPTABLE
210.0	1.597E+09	21388.	10.95	ACCEPTABLE
215.0	1.544E+09	20687.	10.60	ACCEPTABLE
220.0	1.501E+09	20104.	10.31	ACCEPTABLE
225.0	1.454E+09	19484.	10.01	ACCEPTABLE
230.0	1.423E+09	19061.	9.80	ACCEPTABLE
235.0	1.384E+09	18546.	9.54	ACCEPTABLE
240.0	1.336E+09	17891.	9.22	ACCEPTABLE
245.0	1.291E+09	17297.	8.92	ACCEPTABLE
250.0	1.237E+09	16567.	8.56	ACCEPTABLE
255.0	1.190E+09	15936.	8.25	ACCEPTABLE
260.0	1.138E+09	15250.	7.91	ACCEPTABLE
265.0	1.087E+09	14567.	7.57	ACCEPTABLE
270.0	1.037E+09	13897.	7.24	ACCEPTABLE
275.0	1.006E+09	13473.	7.03	ACCEPTABLE
280.0	9.959E+08	13340.	6.97	ACCEPTABLE
285.0	1.008E+09	13501.	7.05	ACCEPTABLE
290.0	1.042E+09	13954.	7.27	ACCEPTABLE
295.0	1.097E+09	14696.	7.64	ACCEPTABLE
300.0	1.162E+09	15570.	8.07	ACCEPTABLE
305.0	1.240E+09	16609.	8.58	ACCEPTABLE
310.0	1.310E+09	17546.	9.05	ACCEPTABLE
315.0	1.384E+09	18538.	9.54	ACCEPTABLE
320.0	1.451E+09	19441.	9.99	ACCEPTABLE
325.0	1.508E+09	20196.	10.36	ACCEPTABLE
330.0	1.553E+09	20798.	10.66	ACCEPTABLE
335.0	1.589E+09	21287.	10.90	ACCEPTABLE
340.0	1.634E+09	21892.	11.20	ACCEPTABLE
345.0	1.687E+09	22603.	11.55	ACCEPTABLE
350.0	1.731E+09	23186.	11.84	ACCEPTABLE
355.0	1.761E+09	23592.	12.04	ACCEPTABLE

ACCEPTABLE! MINIMUM SAFETY FACTOR = 6.97 AT 280.0 DEGREES.

H4 Upset Conditions, DLL Program Results: FILE H4UPSET.TXT

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)  
 DATE OF THIS ANALYSIS: 04/27/1995

SUMMARY OF INPUTS:

-----  
 Angle increment = .1 deg. (FINE)  
 Membrane Stress, Pm = 265. psi  
 Bending Stress, Pb = 1385. psi  
 Safety Factor, SF = 2.80  
 Mean Radius, Rm = 102.56 inches  
 Wall Thickness, t = 2.000 inches  
 Material = 304L SS  
 Stress Intensity, Sm = 14400. psi  
 Fluence = 2.9E+20 n/cm<sup>2</sup>  
 (Thus, LEFM evaluation not applicable)

REGION	THETA1 [deg.]	THETA2 [deg.]	THICKNESS [inches]
1	87.2	92.0	2.000
2	122.8	128.6	2.000
3	145.4	148.9	2.000
4	234.4	238.8	2.000
5	251.3	288.5	2.000
6	301.0	327.8	2.000

LIMIT LOAD RESULTS:

ALPHA [deg]	MOMENT [in-lbs]	Pb' [psi]	SAFETY FACTOR	RESULT
.0	5.388E+08	8152.	5.10	ACCEPTABLE
5.0	5.317E+08	8045.	5.04	ACCEPTABLE
10.0	5.203E+08	7872.	4.93	ACCEPTABLE
15.0	5.142E+08	7780.	4.88	ACCEPTABLE
20.0	5.170E+08	7823.	4.90	ACCEPTABLE
25.0	5.286E+08	7998.	5.01	ACCEPTABLE
30.0	5.490E+08	8306.	5.19	ACCEPTABLE
35.0	5.721E+08	8657.	5.41	ACCEPTABLE
40.0	5.909E+08	8942.	5.58	ACCEPTABLE
45.0	6.053E+08	9158.	5.71	ACCEPTABLE
50.0	6.150E+08	9305.	5.80	ACCEPTABLE
55.0	6.200E+08	9382.	5.85	ACCEPTABLE
60.0	6.204E+08	9387.	5.85	ACCEPTABLE
65.0	6.160E+08	9320.	5.81	ACCEPTABLE
70.0	6.069E+08	9182.	5.73	ACCEPTABLE
75.0	5.932E+08	8975.	5.60	ACCEPTABLE
80.0	5.749E+08	8699.	5.43	ACCEPTABLE
85.0	5.523E+08	8358.	5.23	ACCEPTABLE
90.0	5.255E+08	7952.	4.98	ACCEPTABLE
95.0	5.088E+08	7699.	4.83	ACCEPTABLE
100.0	5.011E+08	7582.	4.76	ACCEPTABLE
105.0	4.894E+08	7405.	4.65	ACCEPTABLE
110.0	4.740E+08	7172.	4.51	ACCEPTABLE
115.0	4.667E+08	7062.	4.44	ACCEPTABLE
120.0	4.756E+08	7197.	4.52	ACCEPTABLE
125.0	4.787E+08	7243.	4.55	ACCEPTABLE
130.0	4.966E+08	7513.	4.71	ACCEPTABLE
135.0	5.129E+08	7760.	4.86	ACCEPTABLE
140.0	5.252E+08	7947.	4.98	ACCEPTABLE
145.0	5.336E+08	8074.	5.05	ACCEPTABLE
150.0	5.380E+08	8140.	5.09	ACCEPTABLE
155.0	5.382E+08	8143.	5.10	ACCEPTABLE
160.0	5.343E+08	8085.	5.06	ACCEPTABLE
165.0	5.264E+08	7965.	4.99	ACCEPTABLE
170.0	5.145E+08	7784.	4.88	ACCEPTABLE
175.0	5.011E+08	7582.	4.76	ACCEPTABLE

180.0	4.856E+08	7348.	4.61	ACCEPTABLE
185.0	4.740E+08	7173.	4.51	ACCEPTABLE
190.0	4.580E+08	6930.	4.36	ACCEPTABLE
195.0	4.520E+08	6839.	4.31	ACCEPTABLE
200.0	4.548E+08	6881.	4.33	ACCEPTABLE
205.0	4.664E+08	7057.	4.44	ACCEPTABLE
210.0	4.867E+08	7364.	4.62	ACCEPTABLE
215.0	5.151E+08	7794.	4.88	ACCEPTABLE
220.0	5.372E+08	8128.	5.09	ACCEPTABLE
225.0	5.551E+08	8399.	5.25	ACCEPTABLE
230.0	5.688E+08	8607.	5.38	ACCEPTABLE
235.0	5.782E+08	8749.	5.46	ACCEPTABLE
240.0	5.833E+08	8825.	5.51	ACCEPTABLE
245.0	5.838E+08	8834.	5.51	ACCEPTABLE
250.0	5.799E+08	8775.	5.48	ACCEPTABLE
255.0	5.716E+08	8649.	5.40	ACCEPTABLE
260.0	5.590E+08	8458.	5.29	ACCEPTABLE
265.0	5.421E+08	8202.	5.13	ACCEPTABLE
270.0	5.211E+08	7884.	4.94	ACCEPTABLE
275.0	5.049E+08	7640.	4.79	ACCEPTABLE
280.0	5.027E+08	7606.	4.77	ACCEPTABLE
285.0	4.968E+08	7517.	4.72	ACCEPTABLE
290.0	4.871E+08	7371.	4.63	ACCEPTABLE
295.0	4.807E+08	7274.	4.57	ACCEPTABLE
300.0	4.935E+08	7467.	4.69	ACCEPTABLE
305.0	5.042E+08	7628.	4.78	ACCEPTABLE
310.0	5.205E+08	7875.	4.93	ACCEPTABLE
315.0	5.363E+08	8114.	5.08	ACCEPTABLE
320.0	5.561E+08	8414.	5.26	ACCEPTABLE
325.0	5.694E+08	8616.	5.38	ACCEPTABLE
330.0	5.785E+08	8753.	5.47	ACCEPTABLE
335.0	5.831E+08	8823.	5.51	ACCEPTABLE
340.0	5.833E+08	8826.	5.51	ACCEPTABLE
345.0	5.791E+08	8762.	5.47	ACCEPTABLE
350.0	5.704E+08	8631.	5.39	ACCEPTABLE
355.0	5.575E+08	8435.	5.27	ACCEPTABLE

ACCEPTABLE! MINIMUM SAFETY FACTOR = 4.31 AT 195.0 DEGREES.

WELD H4 Faulted Conditions, DLL Program results: FILE H4FAULT.TXT

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)  
 DATE OF THIS ANALYSIS: 04/27/1995

SUMMARY OF INPUTS:

-----  
 Angle increment = .1 deg. (FINE)  
 Membrane Stress, Pm = 696. psi  
 Bending Stress, Pb = 2113. psi  
 Safety Factor, SF = 1.40  
 Mean Radius, Rm = 102.56 inches  
 Wall Thickness, t = 2.000 inches  
 Material = 304L SS  
 Stress Intensity, Sm = 14400. psi  
 Fluence = 2.9E+20 n/cm<sup>2</sup>  
 (Thus, LEFM evaluation not applicable)

REGION	THETA1 [deg.]	THETA2 [deg.]	THICKNESS [inches]
1	87.2	92.0	2.000
2	122.8	128.6	2.000
3	145.4	148.9	2.000
4	234.4	238.8	2.000
5	251.3	288.5	2.000
6	301.0	327.8	2.000

LIMIT LOAD RESULTS:

ALPHA [deg]	MOMENT [in-lbs]	Pb' [psi]	SAFETY FACTOR	RESULT
.0	5.887E+08	8907.	3.42	ACCEPTABLE
5.0	5.801E+08	8778.	3.37	ACCEPTABLE
10.0	5.679E+08	8593.	3.31	ACCEPTABLE
15.0	5.619E+08	8502.	3.27	ACCEPTABLE
20.0	5.647E+08	8544.	3.29	ACCEPTABLE
25.0	5.763E+08	8720.	3.35	ACCEPTABLE
30.0	5.993E+08	9068.	3.48	ACCEPTABLE
35.0	6.200E+08	9380.	3.59	ACCEPTABLE
40.0	6.359E+08	9621.	3.67	ACCEPTABLE
45.0	6.470E+08	9789.	3.73	ACCEPTABLE
50.0	6.531E+08	9882.	3.77	ACCEPTABLE
55.0	6.543E+08	9900.	3.77	ACCEPTABLE
60.0	6.505E+08	9843.	3.75	ACCEPTABLE
65.0	6.418E+08	9711.	3.70	ACCEPTABLE
70.0	6.282E+08	9505.	3.63	ACCEPTABLE
75.0	6.098E+08	9226.	3.53	ACCEPTABLE
80.0	5.867E+08	8878.	3.41	ACCEPTABLE
85.0	5.592E+08	8461.	3.26	ACCEPTABLE
90.0	5.279E+08	7988.	3.09	ACCEPTABLE
95.0	5.106E+08	7726.	3.00	ACCEPTABLE
100.0	4.978E+08	7532.	2.93	ACCEPTABLE
105.0	4.812E+08	7281.	2.84	ACCEPTABLE
110.0	4.604E+08	6966.	2.73	ACCEPTABLE
115.0	4.538E+08	6866.	2.69	ACCEPTABLE
120.0	4.585E+08	6937.	2.72	ACCEPTABLE
125.0	4.602E+08	6963.	2.73	ACCEPTABLE
130.0	4.734E+08	7163.	2.80	ACCEPTABLE
135.0	4.853E+08	7342.	2.86	ACCEPTABLE
140.0	4.934E+08	7465.	2.91	ACCEPTABLE
145.0	4.978E+08	7532.	2.93	ACCEPTABLE
150.0	4.984E+08	7541.	2.93	ACCEPTABLE
155.0	4.952E+08	7492.	2.91	ACCEPTABLE
160.0	4.882E+08	7387.	2.88	ACCEPTABLE
165.0	4.775E+08	7225.	2.82	ACCEPTABLE
170.0	4.603E+08	6965.	2.73	ACCEPTABLE
175.0	4.508E+08	6821.	2.68	ACCEPTABLE

180.0	4.346E+08	6575.	2.59	ACCEPTABLE
185.0	4.237E+08	6410.	2.53	ACCEPTABLE
190.0	4.067E+08	6153.	2.44	ACCEPTABLE
195.0	4.006E+08	6061.	2.41	ACCEPTABLE
200.0	4.034E+08	6104.	2.42	ACCEPTABLE
205.0	4.150E+08	6279.	2.48	ACCEPTABLE
210.0	4.354E+08	6587.	2.59	ACCEPTABLE
215.0	4.653E+08	7040.	2.75	ACCEPTABLE
220.0	4.899E+08	7413.	2.89	ACCEPTABLE
225.0	5.109E+08	7730.	3.00	ACCEPTABLE
230.0	5.279E+08	7988.	3.09	ACCEPTABLE
235.0	5.409E+08	8185.	3.16	ACCEPTABLE
240.0	5.499E+08	8320.	3.21	ACCEPTABLE
245.0	5.546E+08	8391.	3.24	ACCEPTABLE
250.0	5.551E+08	8399.	3.24	ACCEPTABLE
255.0	5.514E+08	8343.	3.22	ACCEPTABLE
260.0	5.435E+08	8223.	3.18	ACCEPTABLE
265.0	5.314E+08	8041.	3.11	ACCEPTABLE
270.0	5.153E+08	7797.	3.02	ACCEPTABLE
275.0	5.001E+08	7566.	2.94	ACCEPTABLE
280.0	5.020E+08	7596.	2.95	ACCEPTABLE
285.0	5.012E+08	7583.	2.95	ACCEPTABLE
290.0	4.965E+08	7512.	2.92	ACCEPTABLE
295.0	4.912E+08	7432.	2.89	ACCEPTABLE
300.0	5.062E+08	7660.	2.97	ACCEPTABLE
305.0	5.214E+08	7889.	3.06	ACCEPTABLE
310.0	5.375E+08	8132.	3.14	ACCEPTABLE
315.0	5.508E+08	8334.	3.21	ACCEPTABLE
320.0	5.731E+08	8672.	3.34	ACCEPTABLE
325.0	5.912E+08	8945.	3.43	ACCEPTABLE
330.0	6.048E+08	9151.	3.51	ACCEPTABLE
335.0	6.137E+08	9286.	3.55	ACCEPTABLE
340.0	6.180E+08	9351.	3.58	ACCEPTABLE
345.0	6.176E+08	9345.	3.57	ACCEPTABLE
350.0	6.125E+08	9267.	3.55	ACCEPTABLE
355.0	6.027E+08	9119.	3.49	ACCEPTABLE

ACCEPTABLE! MINIMUM SAFETY FACTOR = 2.41 AT 195.0 DEGREES.

WELD H5 Upset Conditions, DLL program Results: FILE H5UPSET.TXT

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)  
 DATE OF THIS ANALYSIS: 04/27/1995

SUMMARY OF INPUTS:

Angle increment = .1 deg. (FINE)  
 Membrane Stress, Pm = 265. psi  
 Bending Stress, Pb = 2426. psi  
 Safety Factor, SF = 2.80  
 Mean Radius, Rm = 102.56 inches  
 Wall Thickness, t = 2.000 inches  
 Material = 304L SS  
 Stress Intensity, Sm = 14400. psi  
 Fluence = 2.9E+20 n/cm<sup>2</sup>  
 (Thus, LEFM evaluation not applicable)

REGION	THETA1 [deg.]	THETA2 [deg.]	THICKNESS [inches]
1	22.4	29.1	2.000
2	99.3	108.8	2.000
3	148.3	151.3	2.000
4	194.4	199.6	2.000
5	218.9	229.6	2.000
6	260.6	277.0	2.000
7	315.2	327.1	2.000

LIMIT LOAD RESULTS:

ALPHA [deg.]	MOMENT [in-lbs]	Pb [psi]	SAFETY FACTOR	RESULT
.0	5.687E+08	8606.	3.30	ACCEPTABLE
5.0	5.709E+08	8638.	3.31	ACCEPTABLE
10.0	5.835E+08	8829.	3.38	ACCEPTABLE
15.0	5.922E+08	8960.	3.43	ACCEPTABLE
20.0	5.963E+08	9023.	3.45	ACCEPTABLE
25.0	5.959E+08	9017.	3.45	ACCEPTABLE
30.0	5.910E+08	8942.	3.42	ACCEPTABLE
35.0	5.818E+08	8802.	3.37	ACCEPTABLE
40.0	5.863E+08	8871.	3.39	ACCEPTABLE
45.0	5.915E+08	8951.	3.42	ACCEPTABLE
50.0	5.923E+08	8962.	3.43	ACCEPTABLE
55.0	5.910E+08	8942.	3.42	ACCEPTABLE
60.0	5.939E+08	8986.	3.44	ACCEPTABLE
65.0	5.927E+08	8969.	3.43	ACCEPTABLE
70.0	5.871E+08	8883.	3.40	ACCEPTABLE
75.0	5.769E+08	8729.	3.34	ACCEPTABLE
80.0	5.624E+08	8510.	3.26	ACCEPTABLE
85.0	5.435E+08	8223.	3.15	ACCEPTABLE
90.0	5.203E+08	7872.	3.02	ACCEPTABLE
95.0	5.014E+08	7586.	2.92	ACCEPTABLE
100.0	5.060E+08	7656.	2.94	ACCEPTABLE
105.0	5.230E+08	7913.	3.04	ACCEPTABLE
110.0	5.356E+08	8104.	3.11	ACCEPTABLE
115.0	5.441E+08	8233.	3.16	ACCEPTABLE
120.0	5.486E+08	8300.	3.18	ACCEPTABLE
125.0	5.585E+08	8450.	3.24	ACCEPTABLE
130.0	5.691E+08	8611.	3.30	ACCEPTABLE
135.0	5.754E+08	8707.	3.33	ACCEPTABLE
140.0	5.773E+08	8736.	3.34	ACCEPTABLE
145.0	5.749E+08	8699.	3.33	ACCEPTABLE
150.0	5.736E+08	8680.	3.32	ACCEPTABLE
155.0	5.689E+08	8608.	3.30	ACCEPTABLE
160.0	5.598E+08	8470.	3.25	ACCEPTABLE
165.0	5.464E+08	8268.	3.17	ACCEPTABLE
170.0	5.373E+08	8129.	3.12	ACCEPTABLE



175.0	5.314E+08	8041.	3.09	ACCEPTABLE
180.0	5.202E+08	7870.	3.02	ACCEPTABLE
185.0	5.223E+08	7903.	3.04	ACCEPTABLE
190.0	5.385E+08	8147.	3.13	ACCEPTABLE
195.0	5.526E+08	8362.	3.21	ACCEPTABLE
200.0	5.626E+08	8512.	3.26	ACCEPTABLE
205.0	5.683E+08	8598.	3.29	ACCEPTABLE
210.0	5.696E+08	8619.	3.30	ACCEPTABLE
215.0	5.666E+08	8573.	3.28	ACCEPTABLE
220.0	5.681E+08	8595.	3.29	ACCEPTABLE
225.0	5.673E+08	8583.	3.29	ACCEPTABLE
230.0	5.621E+08	8505.	3.26	ACCEPTABLE
235.0	5.559E+08	8411.	3.22	ACCEPTABLE
240.0	5.643E+08	8538.	3.27	ACCEPTABLE
245.0	5.690E+08	8610.	3.30	ACCEPTABLE
250.0	5.695E+08	8617.	3.30	ACCEPTABLE
255.0	5.656E+08	8558.	3.28	ACCEPTABLE
260.0	5.574E+08	8434.	3.23	ACCEPTABLE
265.0	5.449E+08	8245.	3.16	ACCEPTABLE
270.0	5.281E+08	7990.	3.07	ACCEPTABLE
275.0	5.108E+08	7730.	2.97	ACCEPTABLE
280.0	5.154E+08	7799.	3.00	ACCEPTABLE
285.0	5.378E+08	8138.	3.12	ACCEPTABLE
290.0	5.566E+08	8422.	3.23	ACCEPTABLE
295.0	5.712E+08	8643.	3.31	ACCEPTABLE
300.0	5.814E+08	8797.	3.37	ACCEPTABLE
305.0	5.931E+08	8974.	3.43	ACCEPTABLE
310.0	6.067E+08	9180.	3.51	ACCEPTABLE
315.0	6.157E+08	9317.	3.56	ACCEPTABLE
320.0	6.200E+08	9382.	3.58	ACCEPTABLE
325.0	6.206E+08	9390.	3.59	ACCEPTABLE
330.0	6.182E+08	9354.	3.57	ACCEPTABLE
335.0	6.111E+08	9247.	3.53	ACCEPTABLE
340.0	5.994E+08	9069.	3.47	ACCEPTABLE
345.0	5.831E+08	8822.	3.38	ACCEPTABLE
350.0	5.726E+08	8664.	3.32	ACCEPTABLE
355.0	5.718E+08	8652.	3.31	ACCEPTABLE

ACCEPTABLE! MINIMUM SAFETY FACTOR = 2.92 AT 95.0 DEGREES.

WELD H5 Faulted conditions, DLL program results: FILE H5FAULT.TXT

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)  
 DATE OF THIS ANALYSIS: 04/27/1995

SUMMARY OF INPUTS:

-----  
 Angle increment = .1 deg. (FINE)  
 Membrane Stress, Pm = 696. psi  
 Bending Stress, Pb = 3587. psi  
 Safety Factor, SF = 1.40  
 Mean Radius, Rm = 102.56 inches  
 Wall Thickness, t = 2.000 inches  
 Material = 304L SS  
 Stress Intensity, Sm = 14400. psi  
 Fluence = 2.9E+20 n/cm<sup>2</sup>  
 (Thus, LEFM evaluation not applicable)

REGION	THETA1 [deg.]	THETA2 [deg.]	THICKNESS [inches]
1	22.4	29.1	2.000
2	99.3	108.8	2.000
3	148.3	151.3	2.000
4	194.4	199.6	2.000
5	218.9	229.6	2.000
6	260.6	277.0	2.000
7	315.2	327.1	2.000

LIMIT LOAD RESULTS:

ALPHA [deg.]	MOMENT [in-lbs]	Pb [psi]	SAFETY FACTOR	RESULT
.0	6.041E+08	9141.	2.30	ACCEPTABLE
5.0	6.046E+08	9148.	2.30	ACCEPTABLE
10.0	6.156E+08	9315.	2.34	ACCEPTABLE
15.0	6.200E+08	9382.	2.35	ACCEPTABLE
20.0	6.197E+08	9377.	2.35	ACCEPTABLE
25.0	6.147E+08	9301.	2.33	ACCEPTABLE
30.0	6.050E+08	9154.	2.30	ACCEPTABLE
35.0	5.932E+08	8975.	2.26	ACCEPTABLE
40.0	5.985E+08	9056.	2.28	ACCEPTABLE
45.0	6.095E+08	9223.	2.32	ACCEPTABLE
50.0	6.152E+08	9309.	2.34	ACCEPTABLE
55.0	6.164E+08	9326.	2.34	ACCEPTABLE
60.0	6.152E+08	9308.	2.34	ACCEPTABLE
65.0	6.093E+08	9220.	2.32	ACCEPTABLE
70.0	5.988E+08	9061.	2.28	ACCEPTABLE
75.0	5.838E+08	8833.	2.22	ACCEPTABLE
80.0	5.643E+08	8538.	2.16	ACCEPTABLE
85.0	5.403E+08	8175.	2.07	ACCEPTABLE
90.0	5.121E+08	7749.	1.97	ACCEPTABLE
95.0	4.931E+08	7462.	1.90	ACCEPTABLE
100.0	4.976E+08	7529.	1.92	ACCEPTABLE
105.0	5.093E+08	7707.	1.96	ACCEPTABLE
110.0	5.172E+08	7826.	1.99	ACCEPTABLE
115.0	5.211E+08	7885.	2.00	ACCEPTABLE
120.0	5.198E+08	7864.	2.00	ACCEPTABLE
125.0	5.292E+08	8008.	2.03	ACCEPTABLE
130.0	5.357E+08	8106.	2.06	ACCEPTABLE
135.0	5.381E+08	8142.	2.06	ACCEPTABLE
140.0	5.364E+08	8116.	2.06	ACCEPTABLE
145.0	5.311E+08	8036.	2.04	ACCEPTABLE
150.0	5.318E+08	8047.	2.04	ACCEPTABLE
155.0	5.306E+08	8028.	2.04	ACCEPTABLE
160.0	5.253E+08	7949.	2.02	ACCEPTABLE
165.0	5.161E+08	7809.	1.99	ACCEPTABLE
170.0	5.067E+08	7666.	1.95	ACCEPTABLE



175.0	4.967E+08	7516.	1.92	ACCEPTABLE
180.0	4.829E+08	7307.	1.87	ACCEPTABLE
185.0	4.851E+08	7340.	1.88	ACCEPTABLE
190.0	5.050E+08	7641.	1.95	ACCEPTABLE
195.0	5.230E+08	7913.	2.01	ACCEPTABLE
200.0	5.370E+08	8125.	2.06	ACCEPTABLE
205.0	5.469E+08	8275.	2.09	ACCEPTABLE
210.0	5.526E+08	8362.	2.11	ACCEPTABLE
215.0	5.542E+08	8385.	2.12	ACCEPTABLE
220.0	5.528E+08	8364.	2.12	ACCEPTABLE
225.0	5.475E+08	8285.	2.10	ACCEPTABLE
230.0	5.381E+08	8142.	2.06	ACCEPTABLE
235.0	5.302E+08	8022.	2.04	ACCEPTABLE
240.0	5.392E+08	8159.	2.07	ACCEPTABLE
245.0	5.486E+08	8301.	2.10	ACCEPTABLE
250.0	5.537E+08	8379.	2.12	ACCEPTABLE
255.0	5.547E+08	8393.	2.12	ACCEPTABLE
260.0	5.514E+08	8343.	2.11	ACCEPTABLE
265.0	5.439E+08	8230.	2.08	ACCEPTABLE
270.0	5.320E+08	8049.	2.04	ACCEPTABLE
275.0	5.183E+08	7842.	1.99	ACCEPTABLE
280.0	5.229E+08	7912.	2.01	ACCEPTABLE
285.0	5.474E+08	8283.	2.10	ACCEPTABLE
290.0	5.711E+08	8641.	2.18	ACCEPTABLE
295.0	5.904E+08	8934.	2.25	ACCEPTABLE
300.0	6.053E+08	9158.	2.30	ACCEPTABLE
305.0	6.172E+08	9338.	2.34	ACCEPTABLE
310.0	6.262E+08	9475.	2.37	ACCEPTABLE
315.0	6.304E+08	9539.	2.39	ACCEPTABLE
320.0	6.299E+08	9530.	2.39	ACCEPTABLE
325.0	6.289E+08	9516.	2.38	ACCEPTABLE
330.0	6.314E+08	9554.	2.39	ACCEPTABLE
335.0	6.291E+08	9519.	2.39	ACCEPTABLE
340.0	6.220E+08	9412.	2.36	ACCEPTABLE
345.0	6.102E+08	9233.	2.32	ACCEPTABLE
350.0	6.017E+08	9105.	2.29	ACCEPTABLE
355.0	6.050E+08	9154.	2.30	ACCEPTABLE

ACCEPTABLE! MINIMUM SAFETY FACTOR = 1.87 AT 180.0 DEGREES.

WELD H6B Upset conditons, DLL program results: FILE H6BUPSET.TXT

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)  
 DATE OF THIS ANALYSIS: 04/27/1995

SUMMARY OF INPUTS:

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 Angle increment = .1 deg. (FINE)  
 Membrane Stress, Pm = 479. psi  
 Bending Stress, Pb = 3273. psi  
 Safety Factor, SF = 2.80  
 Mean Radius, Rm = 99.38 inches  
 Wall Thickness, t = 2.000 inches  
 Material = 304L SS  
 Stress Intensity, Sm = 14400. psi  
 Fluence = 2.9E+20 n/cm<sup>2</sup>  
 (Thus, LEFM evaluation not applicable)

REGION	THETA1 [deg.]	THETA2 [deg.]	THICKNESS [inches]
1	46.1	81.3	2.000
2	90.8	120.0	2.000
3	132.9	136.9	2.000
4	153.5	160.9	2.000
5	195.4	251.6	2.000
6	268.2	279.5	2.000
7	294.4	301.6	2.000
8	312.2	315.0	2.000
9	323.9	340.9	2.000

LIMIT LOAD RESULTS:

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ALPHA [deg]	MOMENT [in-lbs]	Pb' [psi]	SAFETY FACTOR	RESULT
.0	1.856E+09	29901.	8.10	ACCEPTABLE
5.0	1.845E+09	29725.	8.05	ACCEPTABLE
10.0	1.821E+09	29352.	7.95	ACCEPTABLE
15.0	1.784E+09	28756.	7.79	ACCEPTABLE
20.0	1.734E+09	27941.	7.57	ACCEPTABLE
25.0	1.670E+09	26912.	7.30	ACCEPTABLE
30.0	1.593E+09	25675.	6.97	ACCEPTABLE
35.0	1.505E+09	24245.	6.59	ACCEPTABLE
40.0	1.419E+09	22875.	6.22	ACCEPTABLE
45.0	1.349E+09	21740.	5.92	ACCEPTABLE
50.0	1.294E+09	20850.	5.68	ACCEPTABLE
55.0	1.254E+09	20202.	5.51	ACCEPTABLE
60.0	1.230E+09	19820.	5.41	ACCEPTABLE
65.0	1.222E+09	19697.	5.38	ACCEPTABLE
70.0	1.231E+09	19842.	5.42	ACCEPTABLE
75.0	1.241E+09	20004.	5.46	ACCEPTABLE
80.0	1.257E+09	20263.	5.53	ACCEPTABLE
85.0	1.289E+09	20769.	5.66	ACCEPTABLE
90.0	1.333E+09	21485.	5.85	ACCEPTABLE
95.0	1.372E+09	22108.	6.02	ACCEPTABLE
100.0	1.407E+09	22675.	6.17	ACCEPTABLE
105.0	1.457E+09	23479.	6.39	ACCEPTABLE
110.0	1.519E+09	24474.	6.65	ACCEPTABLE
115.0	1.572E+09	25328.	6.88	ACCEPTABLE
120.0	1.626E+09	26197.	7.11	ACCEPTABLE
125.0	1.677E+09	27018.	7.33	ACCEPTABLE
130.0	1.724E+09	27774.	7.53	ACCEPTABLE
135.0	1.765E+09	28437.	7.71	ACCEPTABLE
140.0	1.797E+09	28966.	7.85	ACCEPTABLE
145.0	1.818E+09	29297.	7.94	ACCEPTABLE
150.0	1.833E+09	29533.	8.00	ACCEPTABLE
155.0	1.848E+09	29788.	8.07	ACCEPTABLE

160.0	1.864E+09	30037.	8.13	ACCEPTABLE
165.0	1.865E+09	30057.	8.14	ACCEPTABLE
170.0	1.852E+09	29849.	8.08	ACCEPTABLE
175.0	1.827E+09	29447.	7.98	ACCEPTABLE
180.0	1.811E+09	29180.	7.90	ACCEPTABLE
185.0	1.804E+09	29068.	7.88	ACCEPTABLE
190.0	1.791E+09	28855.	7.82	ACCEPTABLE
195.0	1.764E+09	28423.	7.70	ACCEPTABLE
200.0	1.724E+09	27774.	7.53	ACCEPTABLE
205.0	1.670E+09	26914.	7.30	ACCEPTABLE
210.0	1.604E+09	25843.	7.02	ACCEPTABLE
215.0	1.525E+09	24573.	6.68	ACCEPTABLE
220.0	1.441E+09	23220.	6.32	ACCEPTABLE
225.0	1.371E+09	22085.	6.01	ACCEPTABLE
230.0	1.315E+09	21196.	5.78	ACCEPTABLE
235.0	1.276E+09	20557.	5.61	ACCEPTABLE
240.0	1.252E+09	20175.	5.50	ACCEPTABLE
245.0	1.244E+09	20052.	5.47	ACCEPTABLE
250.0	1.253E+09	20188.	5.51	ACCEPTABLE
255.0	1.271E+09	20475.	5.58	ACCEPTABLE
260.0	1.287E+09	20747.	5.66	ACCEPTABLE
265.0	1.319E+09	21253.	5.79	ACCEPTABLE
270.0	1.358E+09	21886.	5.96	ACCEPTABLE
275.0	1.386E+09	22342.	6.08	ACCEPTABLE
280.0	1.421E+09	22904.	6.23	ACCEPTABLE
285.0	1.471E+09	23708.	6.45	ACCEPTABLE
290.0	1.526E+09	24593.	6.68	ACCEPTABLE
295.0	1.571E+09	25315.	6.87	ACCEPTABLE
300.0	1.625E+09	26189.	7.11	ACCEPTABLE
305.0	1.681E+09	27095.	7.35	ACCEPTABLE
310.0	1.729E+09	27860.	7.55	ACCEPTABLE
315.0	1.766E+09	28465.	7.71	ACCEPTABLE
320.0	1.798E+09	28982.	7.85	ACCEPTABLE
325.0	1.827E+09	29440.	7.97	ACCEPTABLE
330.0	1.842E+09	29682.	8.04	ACCEPTABLE
335.0	1.858E+09	29937.	8.11	ACCEPTABLE
340.0	1.881E+09	30313.	8.21	ACCEPTABLE
345.0	1.892E+09	30489.	8.25	ACCEPTABLE
350.0	1.889E+09	30434.	8.24	ACCEPTABLE
355.0	1.872E+09	30168.	8.17	ACCEPTABLE

ACCEPTABLE! MINIMUM SAFETY FACTOR = 5.38 AT 65.0 DEGREES.

WELD H6B Faulted conditions, DLL program results: H6BFAULT.TXT

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)  
 DATE OF THIS ANALYSIS: 04/27/1995

SUMMARY OF INPUTS:

-----  
 Angle increment = .1 deg. (FINE)  
 Membrane Stress, Pm = 911. psi  
 Bending Stress, Pb = 4810. psi  
 Safety Factor, SF = 1.40  
 Mean Radius, Rm = 99.38 inches  
 Wall Thickness, t = 2.000 inches  
 Material = 304L SS  
 Stress Intensity, Sm = 14400. psi  
 Fluence = 2.9E+20 n/cm^2  
 (Thus, LEFM evaluation not applicable)

REGION	THETA1 [deg]	THETA2 [deg]	THICKNESS [inches]
1	46.1	81.3	2.000
2	90.8	120.0	2.000
3	132.9	136.9	2.000
4	153.5	160.9	2.000
5	195.4	251.6	2.000
6	268.2	279.5	2.000
7	294.4	301.6	2.000
8	312.2	315.0	2.000
9	323.9	340.9	2.000

LIMIT LOAD RESULTS:

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ALPHA [deg]	MOMENT [in-lbs]	Pb [psi]	SAFETY FACTOR	RESULT
.0	1.873E+09	30188.	5.44	ACCEPTABLE
5.0	1.860E+09	29979.	5.40	ACCEPTABLE
10.0	1.833E+09	29533.	5.32	ACCEPTABLE
15.0	1.791E+09	28863.	5.20	ACCEPTABLE
20.0	1.736E+09	27973.	5.05	ACCEPTABLE
25.0	1.667E+09	26867.	4.86	ACCEPTABLE
30.0	1.586E+09	25555.	4.63	ACCEPTABLE
35.0	1.493E+09	24055.	4.36	ACCEPTABLE
40.0	1.408E+09	22684.	4.12	ACCEPTABLE
45.0	1.337E+09	21550.	3.93	ACCEPTABLE
50.0	1.282E+09	20660.	3.77	ACCEPTABLE
55.0	1.242E+09	20021.	3.66	ACCEPTABLE
60.0	1.219E+09	19639.	3.59	ACCEPTABLE
65.0	1.211E+09	19516.	3.57	ACCEPTABLE
70.0	1.219E+09	19649.	3.59	ACCEPTABLE
75.0	1.224E+09	19725.	3.61	ACCEPTABLE
80.0	1.240E+09	19984.	3.65	ACCEPTABLE
85.0	1.272E+09	20491.	3.74	ACCEPTABLE
90.0	1.319E+09	21259.	3.88	ACCEPTABLE
95.0	1.362E+09	21955.	4.00	ACCEPTABLE
100.0	1.399E+09	22546.	4.10	ACCEPTABLE
105.0	1.449E+09	23350.	4.24	ACCEPTABLE
110.0	1.513E+09	24376.	4.42	ACCEPTABLE
115.0	1.570E+09	25305.	4.58	ACCEPTABLE
120.0	1.624E+09	26162.	4.73	ACCEPTABLE
125.0	1.669E+09	26902.	4.86	ACCEPTABLE
130.0	1.717E+09	27664.	4.99	ACCEPTABLE
135.0	1.758E+09	28335.	5.11	ACCEPTABLE
140.0	1.788E+09	28818.	5.20	ACCEPTABLE
145.0	1.808E+09	29138.	5.25	ACCEPTABLE
150.0	1.827E+09	29438.	5.30	ACCEPTABLE
155.0	1.842E+09	29690.	5.35	ACCEPTABLE

160.0	1.853E+09	29864.	5.38	ACCEPTABLE
165.0	1.850E+09	29812.	5.37	ACCEPTABLE
170.0	1.833E+09	29532.	5.32	ACCEPTABLE
175.0	1.807E+09	29122.	5.25	ACCEPTABLE
180.0	1.791E+09	28855.	5.20	ACCEPTABLE
185.0	1.784E+09	28751.	5.18	ACCEPTABLE
190.0	1.775E+09	28605.	5.16	ACCEPTABLE
195.0	1.753E+09	28241.	5.10	ACCEPTABLE
200.0	1.717E+09	27662.	4.99	ACCEPTABLE
205.0	1.668E+09	26873.	4.86	ACCEPTABLE
210.0	1.606E+09	25878.	4.68	ACCEPTABLE
215.0	1.532E+09	24683.	4.47	ACCEPTABLE
220.0	1.449E+09	23358.	4.24	ACCEPTABLE
225.0	1.379E+09	22224.	4.04	ACCEPTABLE
230.0	1.324E+09	21334.	3.89	ACCEPTABLE
235.0	1.284E+09	20695.	3.78	ACCEPTABLE
240.0	1.261E+09	20313.	3.71	ACCEPTABLE
245.0	1.253E+09	20190.	3.69	ACCEPTABLE
250.0	1.261E+09	20327.	3.71	ACCEPTABLE
255.0	1.283E+09	20669.	3.77	ACCEPTABLE
260.0	1.299E+09	20933.	3.82	ACCEPTABLE
265.0	1.330E+09	21440.	3.91	ACCEPTABLE
270.0	1.367E+09	22028.	4.01	ACCEPTABLE
275.0	1.392E+09	22438.	4.08	ACCEPTABLE
280.0	1.427E+09	23000.	4.18	ACCEPTABLE
285.0	1.477E+09	23803.	4.32	ACCEPTABLE
290.0	1.527E+09	24605.	4.46	ACCEPTABLE
295.0	1.569E+09	25289.	4.58	ACCEPTABLE
300.0	1.623E+09	26159.	4.73	ACCEPTABLE
305.0	1.675E+09	26984.	4.88	ACCEPTABLE
310.0	1.725E+09	27800.	5.02	ACCEPTABLE
315.0	1.765E+09	28447.	5.13	ACCEPTABLE
320.0	1.794E+09	28907.	5.21	ACCEPTABLE
325.0	1.825E+09	29409.	5.30	ACCEPTABLE
330.0	1.845E+09	29736.	5.36	ACCEPTABLE
335.0	1.861E+09	29994.	5.40	ACCEPTABLE
340.0	1.887E+09	30405.	5.47	ACCEPTABLE
345.0	1.903E+09	30661.	5.52	ACCEPTABLE
350.0	1.904E+09	30683.	5.52	ACCEPTABLE
355.0	1.891E+09	30471.	5.49	ACCEPTABLE

ACCEPTABLE! MINIMUM SAFETY FACTOR = 3.57 AT 65.0 DEGREES.



**Table 1**  
**Limiting Seismic Loads for Susquehanna Units 1 and 2**  
**(References 1 to 4)**

Weld	Elevation Above Vessel Zero (in)	Upset		Faulted	
		Shear (kips)	Moment (in-kips)	Shear (kips)	Moment (in-kips)
H1	398.000	489	41943	830	70590
H2	362.375	647	59495	958	95662
H3	359.875	654	61105	967	97898
H4	314.875	767	91570	1099	139681
H5	231.875	934	160336	1435	237110
H6-A	191.250	977	198870	1620	292513
H6-B	186.875	979	203131	1615	298495
H7	131.500	981	257347	1585	374479
H8	121.500	981	267131	1585	388165

**Table 2**  
**Pressure Drop Values for Susquehanna Units 1 and 2**  
**(Reference 5)**

	Upset	Faulted
Shroud Head $\Delta P$ (psi)	10.4	27.4
Core Plate $\Delta P$ (psi)	21.3	23.0

**Table 3**  
**Shroud Stresses for Susquehanna Units 1 and 2<sup>1</sup>**

Weld	Upset $P_m$ (ksi)	Upset $P_b$ (ksi)	Faulted $P_m$ (ksi)	Faulted $P_b$ (ksi)
H1	0.282	0.562	0.740	0.946
H2	0.282	0.797	0.740	1.281
H3	0.265	0.924	0.696	1.481
H4	0.265	1.385	0.696	2.113
H5	0.265	2.426	0.696	3.587
H6-A	0.265	3.009	0.696	4.425
H6-B	0.479	3.273	0.911	4.810
H7	0.479	4.147	0.911	6.035
H8	0.479	4.305	0.911	6.255

<sup>1</sup> See Appendix A for details

**SUMMARY OF SSES UNIT 1 SHROUD DEFECTS**

WELD ID	ISI TYPE	# DEFECTS	LONGEST(ANGLE/LENGTH)	DEEPEST INCHES	TOTAL LENGTH		LIMIT LOAD ANALYSIS	
					DEGREE	INCHES	UPSET	FAULTED
H1	UT	3	1.27DEGREES/2.42INCHES	?	2.58	4.62	TBD	TBD
H2	UT	29	4.8/9.13	TBD	28.6	54.4	PASS	PASS
H3	UT	0	N/A	0"	0	0	N/A	N/A
H4	UT	28	28.19/51.02	0.7"	104.73	187.47	PASS	PASS
H5	UT	27	18.39/32.92	0.65"	106.11	189.94	PASS	PASS
H6A	UT	8	2.7/4.83	0.25"	1.85	2.21	TBD	TBD
H6B	UT	19	7.98/14.28	0.675"	37.68	65.36	PASS	PASS
H7	UT	0	N/A	0"	0	0	N/A	N/A
H8	VT-1	0	N/A	N/A	0	0	N/A	N/A
H9	VT-1	0	N/A	N/A	0	0	N/A	N/A
TO PASS UPSET CONDITION LIMIT LOAD ANALYSIS, THE SAFETY FACTOR CALCULATED WAS >2.8								
TO PASS FAULTED CONDITION LIMIT LOAD ANALYSIS, THE SAFETY FACTOR CALCULATED WAS >1.4								
MAX FLUENCE TO THE END OF THE NEXT FUEL CYCLE, FALL 1996, WAS CALCULATED TO BE <3E20 n/cm^2								

ATTACHMENT 4  
TO PLA-4314