# COMMONWEALTH EDISON COMPANY
# CALCULATION REVISION PAGE

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| **CALCULATION NO.** 9389-64-DQ | **PAGE NO.:** 0.3.11 |
| **REV:** 0 **STATUS:** Approved **QA SERIAL NO. OR CHRON NO.** | **DATE:** |
| **PREPARED BY:** T. J. Behringer | **DATE:** 9/9/96 |

**REVISION SUMMARY:** Documentation of the structural margin assessment for the evaluation of the Dresden Unit-3 Core Shroud Flaws at the H5 weld for a 20.5-months hot operating cycle.

Added DCS page 0.3.11
Added pages 31.0, 31.1-31.6
Added " For Reference Only " pages 31.A.1-31.A.16

DO ANY ASSUMPTIONS IN THIS CALCULATION REQUIRE LATER VERIFICATION? YES ___ NO X

| | |
|---|---|
| **REVIEWED BY:** D. F. Mott | **DATE:** 9/9/96 |
| **REVIEW METHOD:** Detailed | **COMMENTS (C OR NC):** NC |
| **APPROVED BY:** T. J. Behringer | **DATE:** 9/12/96 |

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|---|---|
| **REV:** 0 **STATUS:** Approved **QA SERIAL NO. OR CHRON NO.** | **DATE:** |
| **PREPARED BY:** D. F. Mott | **DATE:** 9/9/96 |

**REVISION SUMMARY:** Documentation of the structural margin assessment for the evaluation of the Dresden Unit-3 Core Shroud Flaws at the H5 weld for a 20.5-months hot operating cycle.

Revised DCS page 0.3.11
Added pages 31.7-31.34

DO ANY ASSUMPTIONS IN THIS CALCULATION REQUIRE LATER VERIFICATION? YES ___ NO X

| | |
|---|---|
| **REVIEWED BY:** T. J Behringer | **DATE:** 9/9/96 |
| **REVIEW METHOD:** Detailed | **COMMENTS (C OR NC):** NC |
| **APPROVED BY:** [signature] | **DATE:** 9/12/96 |

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# COMMONWEALTH EDISON COMPANY

| CALCULATION NO. 9389-64-DQ | | PROJECT NO. 10014-011 | PAGE NO.31.1 |
|---|---|---|---|
| REVISION NO. 0 | DLL Analysis Supporting D3 H5 20.5 Month Flaw Evaluation | | Safety Related |
| Prepared By: T. J. Behringer | Date: 09-09-96 | Reviewed By: T. F. Martel | Date: 09-09-96 |

## 1.0 PURPOSE AND OBJECTIVE

The purpose of this calculation is to document the Structural Margin Assessment for the Evaluation of the Dresden Unit 3 Core Shroud Flaws at the H5 Weld for a 20.5-month hot operating cycle. The evaluation report was updated from Reference 1 to reflect the change in hot operating duration from 18.5 to 20.5 months. The results are documented in the attached report (Attachment A).

## 2.0 DESIGN INPUT DATA

2.1 Uncrack ligament locations and dimensions.

The uncrack ligament starting and ending azimuth angles listed in Table 4.2 of this report are from the UT Examination Summary Sheet R-S01 (Attachment 1 of Section 29 of this calculation).

2.2 BWR IGSCC Crack Growth Rate

The conservative IGSCC crack growth rate of 5*E-05 inch/hr per the BWRVIP "BWR Core Shroud Inspection and Evaluation Guidelines", Reference 2 is applied for both crack growth in length and depth.

2.3 UT Near surface crack depth uncertainty

Per the UT inspection results, no UT indication was found in the noted uncracked ligaments. However, per the discussion documented in the report, an initial crack depth

of 0.3" at the shroud outside surface is postulated to account for near surface crack depth uncertainty of the UT technique.

2.4 UT crack length uncertainty

Per the BWR-VIP Core Shroud NDE Uncertainty & Procedure Standard, a 0.4" flaw length is to be added to the length at each end of the indication of UT inspection results. In addition, the lengths of the unflawed ligaments were reduced by 0.4" to account for this inspection uncertainty.

2.5 Load Definition

See Table 3.1 of Report SL-4971, Rev. 1 for detailed load definition. Design basis loading conditions used in this calculation are listed below:

| | Primary Membrane Tensile Stress (psi) | Primary Bending Stress (psi) |
|---|---|---|
| OBE | 0 | 1229 |
| SSE | 0 | 2457 |
| MSLOCA | 61 | 0 |
| RRLOCA | 0 | 86 |
| MSLOCA & SSE | 86 | 2457 |
| RSLOCA & SEE | 0 | 2453 |

2.6 Thickness

The shroud thickness at the H5 weld is 2" and the mean radius is 102.56". These dimensions are used in the analyses. The 3/4" thick fillet weld was conservatively neglected for this analysis.

## 3.0 ASSUMPTIONS

See Section 4 of the report (Attachment A).

## 4.0 METHODOLOGY

Two approaches were originally used for the structural margin assessment for the Dresden Unit 3 Core Shroud Weld H5 Evaluation and were documented in Report SL-4971, "Rev. 1. This calculation uses the UT flaw detection approach based on the methodology provided in the BWRVIP "BWR Core Shroud Inspection and Evaluation Guidelines", Reference 2. See Sections 1 and 4 of this report (Attachment A) for a detailed explanation of the methodology.

In this approach, the uninspected weld sectors and the flawed weld sectors are assumed to be through-wall circumferential cracks. The remaining uncracked ligaments are assumed to have a part through-wall crack with a crack depth of 0.3" to account for UT examination uncertainty. The limit load formulation for multiple distributed uncracked ligaments was performed using the DLL computer program, which is the same as the formulation in the BWRVIP guidelines, Reference 2. The program manual and source code are documented in Reference 4.

The starting and ending azimuth angles of each ligament and the remaining thickness are calculated for several evaluation periods after subtracting the above-mentioned UT inspection uncertainty in depth and length. IGSCC crack growth for the evaluation period are considered for both crack depth and length at the two ends of the uncrack ligaments.

The safety factor used is SF=2.77 for OBE loading condition and SF=1.39 for all other conditions. The predicted life time of the cracked weld was determined by iteration until the above safety factors are satisfied.

## 5.0 CALCULATION

The results of the verification run are documented by comparison to the example 2 output in Reference 4 (Reference 5). The difference between the two outputs is less than the round-off of the last digit. The difference has no significant impact on the analysis results.

The uncracked ligament thicknesses, starting and ending azimuth angles for several operating time periods are listed in the Table provided as part of this calculation.

The results of the DLL analysis are included in the subsequent pages of this calculation.

## 6.0 REFERENCES


1. SL-4971, "Final Evaluation of the Core Shroud Flaws at the H5 Horizontal Weld for Dresden Unit 3", Rev. 1.

2. General Electric Company Report GENE-523-0894, Rev. 0, DRF 137-0010-07, BWRVIP

Core Shroud Inspection and Flaw Evaluation Guidelines", dated September 1994.

3. BWR-VIP "Core Shroud NDE Uncertainty and Procedure Standard", November 21, 1994.

4. GE–NE-523-113-0894, Supplement 1, DRF 137-0010-07, "BWR Core Shroud Distributed Ligament Length Computer Program", September 1994.

5. Sargent & Lundy Calculation NO. 9389–64-DQ, Section 29.


## 7.0 SUMMARY AND CONCLUSIONS

This evaluation uses a limit load analysis of the portion of the weld that was demonstrated by UT to be free of flaws. This approach is conservative as all uninspected areas were assumed to have through-wall flaws. This UT Flaw Detection Approach is consistent with the BWRVIP criteria (Reference 13 of Attachment 1) and thus represents the most current information regarding flaw assessment. Using the bounding conservative crack growth rate of $5 \times 10^{-5}$ inches per hour and without consideration of the fillet weld, a minimum of 20.5 months of operating margin exists considering all design basis and beyond design basis load combinations.

The methodology used to determine the remaining ligament size using the UT Flaw Detection Approach provides the most accurate assessment of the actual conditions. The conservative approach taken to account for near field limitations of the UT examination results and the inspection uncertainty provides a significant margin of safety on the sizing of the ligament. With consideration of this information, and the knowledge that a portion of the weld area was not inspected (i.e., assumed to be fully cracked), the UT Flaw Detection Approach is an accurate method to define the remaining structural margin. Table 4.3 of Attachment 1 provides a

summary of the structural margin assessment for the governing design basis and beyond design basis loading cases.

For Design Basis Load combinations, a safety factor of 1.89 (versus the 1.39 ASME Code requirement) exists for a 20.5 month operating cycle. For beyond design basis loading conditions, a 1.83 safety factor exists. Considering these results for the conservative lower bound limits using the most limiting input parameters and analysis approaches, ComEd concludes that safe operation of Dresden Unit 3 for 20.5 months can be achieved while maintaining a significant margin of safety.

## 8.0 ATTACHMENTS

A. September 12, 1996 Report titled "Evaluation of the Core Shroud Flaws at the H5 Horizontal Weld for Dresden Unit 3 for 20.5 Months of Hot Operation".

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Table: Remaining Ligament Thickness and Azimuthal Angle

| TIME | | Remaining Thickness | Region 1 (deg.) | | Region 2 (deg.) | | Region 3 (deg.) | | Region 4 (deg.) | | Region 5 (deg.) | | Region 6 (deg.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Months** | **Hours** | **(in)** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** |
| **0.0** | 0 | 1.70 | 31.00 | 52.50 | 113.50 | 128.93 | 143.77 | 150.11 | 157.96 | 170.50 | 214.50 | 225.11 | 297.50 | 310.41 |
| 20.50 | 14965 | 0.952 | 31.635 | 51.865 | 114.135 | 128.295 | 144.405 | 149.475 | 158.595 | 169.865 | 215.135 | 224.475 | 298.135 | 309.775 |
| 21.00 | 15330 | 0.934 | 31.645 | 51.855 | 114.145 | 128.285 | 144.415 | 149.465 | 158.605 | 169.855 | 215.145 | 224.465 | 298.145 | 309.765 |
| 22.00 | 16060 | 0.897 | 31.666 | 51.834 | 114.166 | 128.264 | 144.436 | 149.444 | 158.626 | 169.834 | 215.166 | 224.444 | 298.166 | 309.744 |
| 23.00 | 16790 | 0.861 | 31.686 | 51.814 | 114.186 | 128.244 | 144.456 | 149.424 | 158.646 | 169.814 | 215.186 | 224.424 | 298.186 | 309.724 |
| 24.00 | 17520 | 0.824 | 31.706 | 51.794 | 114.206 | 128.224 | 144.476 | 149.404 | 158.666 | 169.794 | 215.206 | 224.404 | 298.206 | 309.704 |
| 24.25 | 17703 | 0.815 | 31.711 | 51.789 | 114.211 | 128.219 | 144.481 | 149.399 | 158.671 | 169.789 | 215.211 | 224.399 | 298.211 | 309.699 |
| 24.50 | 17885 | 0.806 | 31.716 | 51.784 | 114.216 | 128.214 | 144.486 | 149.394 | 158.676 | 169.784 | 215.216 | 224.394 | 298.216 | 309.694 |
| 24.75 | 18068 | 0.797 | 31.721 | 51.779 | 114.221 | 128.209 | 144.491 | 149.389 | 158.681 | 169.779 | 215.221 | 224.389 | 298.221 | 309.689 |
| 25.00 | 18250 | 0.788 | 31.726 | 51.774 | 114.226 | 128.204 | 144.496 | 149.384 | 158.686 | 169.774 | 215.226 | 224.384 | 298.226 | 309.684 |
| 25.25 | 18433 | 0.778 | 31.731 | 51.769 | 114.231 | 128.199 | 144.501 | 149.379 | 158.691 | 169.769 | 215.231 | 224.379 | 298.231 | 309.679 |
| 25.50 | 18615 | 0.769 | 31.736 | 51.764 | 114.236 | 128.194 | 144.506 | 149.374 | 158.696 | 169.764 | 215.236 | 224.374 | 298.236 | 309.674 |
| 25.75 | 18798 | 0.760 | 31.741 | 51.759 | 114.241 | 128.189 | 144.511 | 149.369 | 158.701 | 169.759 | 215.241 | 224.369 | 298.241 | 309.669 |
| 26.00 | 18980 | 0.751 | 31.746 | 51.754 | 114.246 | 128.184 | 144.516 | 149.364 | 158.706 | 169.754 | 215.246 | 224.364 | 298.246 | 309.664 |
| 26.25 | 19163 | 0.742 | 31.751 | 51.749 | 114.251 | 128.179 | 144.521 | 149.359 | 158.711 | 169.749 | 215.251 | 224.359 | 298.251 | 309.659 |
| 26.50 | 19345 | 0.733 | 31.756 | 51.744 | 114.256 | 128.174 | 144.526 | 149.354 | 158.716 | 169.744 | 215.256 | 224.354 | 298.256 | 309.654 |
| 26.75 | 19528 | 0.724 | 31.761 | 51.739 | 114.261 | 128.169 | 144.531 | 149.349 | 158.721 | 169.739 | 215.261 | 224.349 | 298.261 | 309.649 |
| 27.00 | 19710 | 0.715 | 31.767 | 51.733 | 114.267 | 128.163 | 144.537 | 149.343 | 158.727 | 169.733 | 215.267 | 224.343 | 298.267 | 309.643 |
| 27.25 | 19893 | 0.705 | 31.772 | 51.728 | 114.272 | 128.158 | 144.542 | 149.338 | 158.732 | 169.728 | 215.272 | 224.338 | 298.272 | 309.638 |
| 27.50 | 20075 | 0.696 | 31.777 | 51.723 | 114.277 | 128.153 | 144.547 | 149.333 | 158.737 | 169.723 | 215.277 | 224.333 | 298.277 | 309.633 |
| 27.75 | 20258 | 0.687 | 31.782 | 51.718 | 114.282 | 128.148 | 144.552 | 149.328 | 158.742 | 169.718 | 215.282 | 224.328 | 298.282 | 309.628 |
| 28.00 | 20440 | 0.678 | 31.787 | 51.713 | 114.287 | 128.143 | 144.557 | 149.323 | 158.747 | 169.713 | 215.287 | 224.323 | 298.287 | 309.623 |
| 28.25 | 20623 | 0.669 | 31.792 | 51.708 | 114.292 | 128.138 | 144.562 | 149.318 | 158.752 | 169.708 | 215.292 | 224.318 | 298.292 | 309.618 |
| 28.50 | 20805 | 0.660 | 31.797 | 51.703 | 114.297 | 128.133 | 144.567 | 149.313 | 158.757 | 169.703 | 215.297 | 224.313 | 298.297 | 309.613 |
| 28.75 | 20988 | 0.651 | 31.802 | 51.698 | 114.302 | 128.128 | 144.572 | 149.308 | 158.762 | 169.698 | 215.302 | 224.308 | 298.302 | 309.608 |
| 29.00 | 21170 | 0.642 | 31.807 | 51.693 | 114.307 | 128.123 | 144.577 | 149.303 | 158.767 | 169.693 | 215.307 | 224.303 | 298.307 | 309.603 |
| 29.25 | 21353 | 0.632 | 31.812 | 51.688 | 114.312 | 128.118 | 144.582 | 149.298 | 158.772 | 169.688 | 215.312 | 224.298 | 298.312 | 309.598 |
| 29.50 | 21535 | 0.623 | 31.817 | 51.683 | 114.317 | 128.113 | 144.587 | 149.293 | 158.777 | 169.683 | 215.317 | 224.293 | 298.317 | 309.593 |
| 29.75 | 21718 | 0.614 | 31.822 | 51.678 | 114.322 | 128.108 | 144.592 | 149.288 | 158.782 | 169.678 | 215.322 | 224.288 | 298.322 | 309.588 |
| 30.00 | 21900 | 0.605 | 31.827 | 51.673 | 114.327 | 128.103 | 144.597 | 149.283 | 158.787 | 169.673 | 215.327 | 224.283 | 298.327 | 309.583 |

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Table: Remaining Ligament Thickness and Azimuthal Angle

| TIME | | Remaining Thickness | Region 1 (deg.) | | Region 2 (deg.) | | Region 3 (deg.) | | Region 4 (deg.) | | Region 5 (deg.) | | Region 6 (deg.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Months** | **Hours** | **(in)** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** |
| 30.25 | 22083 | 0.596 | 31.832 | 51.668 | 114.332 | 128.098 | 144.602 | 149.278 | 158.792 | 169.668 | 215.332 | 224.278 | 298.332 | 309.578 |
| 30.50 | 22265 | 0.587 | 31.837 | 51.663 | 114.337 | 128.093 | 144.607 | 149.273 | 158.797 | 169.663 | 215.337 | 224.273 | 298.337 | 309.573 |
| 30.75 | 22448 | 0.578 | 31.842 | 51.658 | 114.342 | 128.088 | 144.612 | 149.268 | 158.802 | 169.658 | 215.342 | 224.268 | 298.342 | 309.568 |
| 31.00 | 22630 | 0.569 | 31.847 | 51.653 | 114.347 | 128.083 | 144.617 | 149.263 | 158.807 | 169.653 | 215.347 | 224.263 | 298.347 | 309.563 |
| 32.00 | 23360 | 0.532 | 31.868 | 51.632 | 114.368 | 128.062 | 144.638 | 149.242 | 158.828 | 169.632 | 215.368 | 224.242 | 298.368 | 309.542 |
| 32.25 | 23543 | 0.523 | 31.873 | 51.627 | 114.373 | 128.057 | 144.643 | 149.237 | 158.833 | 169.627 | 215.373 | 224.237 | 298.373 | 309.537 |
| 32.50 | 23725 | 0.514 | 31.878 | 51.622 | 114.378 | 128.052 | 144.648 | 149.232 | 158.838 | 169.622 | 215.378 | 224.232 | 298.378 | 309.532 |
| 32.75 | 23908 | 0.505 | 31.883 | 51.617 | 114.383 | 128.047 | 144.653 | 149.227 | 158.843 | 169.617 | 215.383 | 224.227 | 298.383 | 309.527 |
| 33.00 | 24090 | 0.496 | 31.888 | 51.612 | 114.388 | 128.042 | 144.658 | 149.222 | 158.848 | 169.612 | 215.388 | 224.222 | 298.388 | 309.522 |
| 33.25 | 24273 | 0.486 | 31.893 | 51.607 | 114.393 | 128.037 | 144.663 | 149.217 | 158.853 | 169.607 | 215.393 | 224.217 | 298.393 | 309.517 |
| 33.50 | 24455 | 0.477 | 31.898 | 51.602 | 114.398 | 128.032 | 144.668 | 149.212 | 158.858 | 169.602 | 215.398 | 224.212 | 298.398 | 309.512 |
| 33.75 | 24638 | 0.468 | 31.903 | 51.597 | 114.403 | 128.027 | 144.673 | 149.207 | 158.863 | 169.597 | 215.403 | 224.207 | 298.403 | 309.507 |
| 34.00 | 24820 | 0.459 | 31.908 | 51.592 | 114.408 | 128.022 | 144.678 | 149.202 | 158.868 | 169.592 | 215.408 | 224.202 | 298.408 | 309.502 |
| 34.25 | 25003 | 0.450 | 31.913 | 51.587 | 114.413 | 128.017 | 144.683 | 149.197 | 158.873 | 169.587 | 215.413 | 224.197 | 298.413 | 309.497 |
| 34.50 | 25185 | 0.441 | 31.918 | 51.582 | 114.418 | 128.012 | 144.688 | 149.192 | 158.878 | 169.582 | 215.418 | 224.192 | 298.418 | 309.492 |
| 34.75 | 25368 | 0.432 | 31.923 | 51.577 | 114.423 | 128.007 | 144.693 | 149.187 | 158.883 | 169.577 | 215.423 | 224.187 | 298.423 | 309.487 |
| 35.00 | 25550 | 0.423 | 31.928 | 51.572 | 114.428 | 128.002 | 144.698 | 149.182 | 158.888 | 169.572 | 215.428 | 224.182 | 298.428 | 309.482 |
| 35.25 | 25733 | 0.413 | 31.933 | 51.567 | 114.433 | 127.997 | 144.703 | 149.177 | 158.893 | 169.567 | 215.433 | 224.177 | 298.433 | 309.477 |
| 35.50 | 25915 | 0.404 | 31.938 | 51.562 | 114.438 | 127.992 | 144.708 | 149.172 | 158.898 | 169.562 | 215.438 | 224.172 | 298.438 | 309.472 |
| 35.75 | 26098 | 0.395 | 31.943 | 51.557 | 114.443 | 127.987 | 144.713 | 149.167 | 158.903 | 169.557 | 215.443 | 224.167 | 298.443 | 309.467 |
| 36.00 | 26280 | 0.386 | 31.948 | 51.552 | 114.448 | 127.982 | 144.718 | 149.162 | 158.908 | 169.552 | 215.448 | 224.162 | 298.448 | 309.462 |
| 36.25 | 26463 | 0.377 | 31.953 | 51.547 | 114.453 | 127.977 | 144.723 | 149.157 | 158.913 | 169.547 | 215.453 | 224.157 | 298.453 | 309.457 |
| 36.50 | 26645 | 0.368 | 31.958 | 51.542 | 114.458 | 127.972 | 144.728 | 149.152 | 158.918 | 169.542 | 215.458 | 224.152 | 298.458 | 309.452 |
| 36.75 | 26828 | 0.359 | 31.963 | 51.537 | 114.463 | 127.967 | 144.733 | 149.147 | 158.923 | 169.537 | 215.463 | 224.147 | 298.463 | 309.447 |
| 37.00 | 27010 | 0.350 | 31.968 | 51.532 | 114.468 | 127.962 | 144.738 | 149.142 | 158.928 | 169.532 | 215.468 | 224.142 | 298.468 | 309.442 |
| 37.25 | 27193 | 0.340 | 31.974 | 51.526 | 114.474 | 127.956 | 144.744 | 149.136 | 158.934 | 169.526 | 215.474 | 224.136 | 298.474 | 309.436 |
| 37.50 | 27375 | 0.331 | 31.979 | 51.521 | 114.479 | 127.951 | 144.749 | 149.131 | 158.939 | 169.521 | 215.479 | 224.131 | 298.479 | 309.431 |
| 37.75 | 27558 | 0.322 | 31.984 | 51.516 | 114.484 | 127.946 | 144.754 | 149.126 | 158.944 | 169.516 | 215.484 | 224.126 | 298.484 | 309.426 |

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Table: Remaining Ligament Thickness and Azimuthal Angle

| TIME | | Remaining Thickness | Region 1 (deg.) | | Region 2 (deg.) | | Region 3 (deg.) | | Region 4 (deg.) | | Region 5 (deg.) | | Region 6 (deg.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Months | Hours | (in) | Start | End | Start | End | Start | End | Start | End | Start | End | Start | End |
| 38.00 | 27740 | 0.313 | 31.989 | 51.511 | 114.489 | 127.941 | 144.759 | 149.121 | 158.949 | 169.511 | 215.489 | 224.121 | 298.489 | 309.421 |
| 38.25 | 27923 | 0.304 | 31.994 | 51.506 | 114.494 | 127.936 | 144.764 | 149.116 | 158.954 | 169.506 | 215.494 | 224.116 | 298.494 | 309.416 |
| 38.50 | 28105 | 0.295 | 31.999 | 51.501 | 114.499 | 127.931 | 144.769 | 149.111 | 158.959 | 169.501 | 215.499 | 224.111 | 298.499 | 309.411 |
| 38.75 | 28288 | 0.286 | 32.004 | 51.496 | 114.504 | 127.926 | 144.774 | 149.106 | 158.964 | 169.496 | 215.504 | 224.106 | 298.504 | 309.406 |
| 39.00 | 28470 | 0.277 | 32.009 | 51.491 | 114.509 | 127.921 | 144.779 | 149.101 | 158.969 | 169.491 | 215.509 | 224.101 | 298.509 | 309.401 |
| 39.25 | 28653 | 0.267 | 32.014 | 51.486 | 114.514 | 127.916 | 144.784 | 149.096 | 158.974 | 169.486 | 215.514 | 224.096 | 298.514 | 309.396 |
| 39.50 | 28835 | 0.258 | 32.019 | 51.481 | 114.519 | 127.911 | 144.789 | 149.091 | 158.979 | 169.481 | 215.519 | 224.091 | 298.519 | 309.391 |
| 39.75 | 29018 | 0.249 | 32.024 | 51.476 | 114.524 | 127.906 | 144.794 | 149.086 | 158.984 | 169.476 | 215.524 | 224.086 | 298.524 | 309.386 |
| 40.00 | 29200 | 0.240 | 32.029 | 51.471 | 114.529 | 127.901 | 144.799 | 149.081 | 158.989 | 169.471 | 215.529 | 224.081 | 298.529 | 309.381 |
| 40.25 | 29383 | 0.231 | 32.034 | 51.466 | 114.534 | 127.896 | 144.804 | 149.076 | 158.994 | 169.466 | 215.534 | 224.076 | 298.534 | 309.376 |
| 40.50 | 29565 | 0.222 | 32.039 | 51.461 | 114.539 | 127.891 | 144.809 | 149.071 | 158.999 | 169.461 | 215.539 | 224.071 | 298.539 | 309.371 |
| 40.75 | 29748 | 0.213 | 32.044 | 51.456 | 114.544 | 127.886 | 144.814 | 149.066 | 159.004 | 169.456 | 215.544 | 224.066 | 298.544 | 309.366 |
| 41.00 | 29930 | 0.204 | 32.049 | 51.451 | 114.549 | 127.881 | 144.819 | 149.061 | 159.009 | 169.451 | 215.549 | 224.061 | 298.549 | 309.361 |
| 41.25 | 30113 | 0.194 | 32.054 | 51.446 | 114.554 | 127.876 | 144.824 | 149.056 | 159.014 | 169.446 | 215.554 | 224.056 | 298.554 | 309.356 |
| 41.50 | 30295 | 0.185 | 32.059 | 51.441 | 114.559 | 127.871 | 144.829 | 149.051 | 159.019 | 169.441 | 215.559 | 224.051 | 298.559 | 309.351 |
| 41.75 | 30478 | 0.176 | 32.064 | 51.436 | 114.564 | 127.866 | 144.834 | 149.046 | 159.024 | 169.436 | 215.564 | 224.046 | 298.564 | 309.346 |
| 42.00 | 30660 | 0.167 | 32.069 | 51.431 | 114.569 | 127.861 | 144.839 | 149.041 | 159.029 | 169.431 | 215.569 | 224.041 | 298.569 | 309.341 |
| 42.25 | 30843 | 0.158 | 32.075 | 51.425 | 114.575 | 127.855 | 144.845 | 149.035 | 159.035 | 169.425 | 215.575 | 224.035 | 298.575 | 309.335 |
| 42.50 | 31025 | 0.149 | 32.080 | 51.420 | 114.580 | 127.850 | 144.850 | 149.030 | 159.040 | 169.420 | 215.580 | 224.030 | 298.580 | 309.330 |
| 42.75 | 31208 | 0.140 | 32.085 | 51.415 | 114.585 | 127.845 | 144.855 | 149.025 | 159.045 | 169.415 | 215.585 | 224.025 | 298.585 | 309.325 |
| 43.00 | 31390 | 0.131 | 32.090 | 51.410 | 114.590 | 127.840 | 144.860 | 149.020 | 159.050 | 169.410 | 215.590 | 224.020 | 298.590 | 309.320 |
| 43.25 | 31573 | 0.121 | 32.095 | 51.405 | 114.595 | 127.835 | 144.865 | 149.015 | 159.055 | 169.405 | 215.595 | 224.015 | 298.595 | 309.315 |
| 43.50 | 31755 | 0.112 | 32.100 | 51.400 | 114.600 | 127.830 | 144.870 | 149.010 | 159.060 | 169.400 | 215.600 | 224.010 | 298.600 | 309.310 |
| 43.75 | 31938 | 0.103 | 32.105 | 51.395 | 114.605 | 127.825 | 144.875 | 149.005 | 159.065 | 169.395 | 215.605 | 224.005 | 298.605 | 309.305 |
| 44.00 | 32120 | 0.094 | 32.110 | 51.390 | 114.610 | 127.820 | 144.880 | 149.000 | 159.070 | 169.390 | 215.610 | 224.000 | 298.610 | 309.300 |
| 44.25 | 32303 | 0.085 | 32.115 | 51.385 | 114.615 | 127.815 | 144.885 | 148.995 | 159.075 | 169.385 | 215.615 | 223.995 | 298.615 | 309.295 |
| 44.50 | 32485 | 0.076 | 32.120 | 51.380 | 114.620 | 127.810 | 144.890 | 148.990 | 159.080 | 169.380 | 215.620 | 223.990 | 298.620 | 309.290 |
| 44.75 | 32668 | 0.067 | 32.125 | 51.375 | 114.625 | 127.805 | 144.895 | 148.985 | 159.085 | 169.375 | 215.625 | 223.985 | 298.625 | 309.285 |

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.9 OF

Table: Remaining Ligament Thickness and Azimuthal Angle

| TIME | | Remaining Thickness | Region 1 (deg.) | | Region 2 (deg.) | | Region 3 (deg.) | | Region 4 (deg.) | | Region 5 (deg.) | | Region 6 (deg.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Months** | **Hours** | **(in)** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** | **Start** | **End** |
| 45.00 | 32850 | 0.057 | 32.130 | 51.370 | 114.630 | 127.800 | 144.900 | 148.980 | 159.090 | 169.370 | 215.630 | 223.980 | 298.630 | 309.280 |
| 45.25 | 33033 | 0.048 | 32.135 | 51.365 | 114.635 | 127.795 | 144.905 | 148.975 | 159.095 | 169.365 | 215.635 | 223.975 | 298.635 | 309.275 |
| 45.50 | 33215 | 0.039 | 32.140 | 51.360 | 114.640 | 127.790 | 144.910 | 148.970 | 159.100 | 169.360 | 215.640 | 223.970 | 298.640 | 309.270 |
| 45.75 | 33398 | 0.030 | 32.145 | 51.355 | 114.645 | 127.785 | 144.915 | 148.965 | 159.105 | 169.355 | 215.645 | 223.965 | 298.645 | 309.265 |
| 46.00 | 33580 | 0.021 | 32.150 | 51.350 | 114.650 | 127.780 | 144.920 | 148.960 | 159.110 | 169.350 | 215.650 | 223.960 | 298.650 | 309.260 |
| 46.25 | 33763 | 0.012 | 32.155 | 51.345 | 114.655 | 127.775 | 144.925 | 148.955 | 159.115 | 169.345 | 215.655 | 223.955 | 298.655 | 309.255 |
| 46.50 | 33945 | 0.003 | 32.160 | 51.340 | 114.660 | 127.770 | 144.930 | 148.950 | 159.120 | 169.340 | 215.660 | 223.950 | 298.660 | 309.250 |
| 46.75 | 34128 | -0.006 | 32.165 | 51.335 | 114.665 | 127.765 | 144.935 | 148.945 | 159.125 | 169.335 | 215.665 | 223.945 | 298.665 | 309.245 |

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31-10 OF

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/09/1996

OBE: 20.5 month S.F. calc.

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 0. psi
Bending Stress, Pb = 1229. psi
Safety Factor, SF = 2.77
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10019-011
CALC. No. 9389-64-DQ
REV. 0 DATE
PAGE 31.11 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.6 | 51.9 | .952 |
| 2 | 114.1 | 128.3 | .952 |
| 3 | 144.4 | 149.5 | .952 |
| 4 | 158.6 | 169.9 | .952 |
| 5 | 215.1 | 224.5 | .952 |
| 6 | 298.1 | 309.8 | .952 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 3.251E+08 | 4919. | 4.00 | ACCEPTABLE |
| 5.0 | 3.156E+08 | 4775. | 3.88 | ACCEPTABLE |
| 10.0 | 3.068E+08 | 4642. | 3.78 | ACCEPTABLE |
| 15.0 | 3.092E+08 | 4678. | 3.81 | ACCEPTABLE |
| 20.0 | 3.220E+08 | 4872. | 3.96 | ACCEPTABLE |
| 25.0 | 3.352E+08 | 5071. | 4.13 | ACCEPTABLE |
| 30.0 | 3.458E+08 | 5233. | 4.26 | ACCEPTABLE |
| 35.0 | 3.538E+08 | 5354. | 4.36 | ACCEPTABLE |
| 40.0 | 3.592E+08 | 5434. | 4.42 | ACCEPTABLE |
| 45.0 | 3.671E+08 | 5555. | 4.52 | ACCEPTABLE |
| 50.0 | 3.824E+08 | 5786. | 4.71 | ACCEPTABLE |
| 55.0 | 3.951E+08 | 5979. | 4.86 | ACCEPTABLE |
| 60.0 | 4.048E+08 | 6126. | 4.98 | ACCEPTABLE |
| 65.0 | 4.115E+08 | 6226. | 5.07 | ACCEPTABLE |
| 70.0 | 4.150E+08 | 6279. | 5.11 | ACCEPTABLE |
| 75.0 | 4.153E+08 | 6284. | 5.11 | ACCEPTABLE |
| 80.0 | 4.134E+08 | 6255. | 5.09 | ACCEPTABLE |
| 85.0 | 4.172E+08 | 6313. | 5.14 | ACCEPTABLE |
| 90.0 | 4.183E+08 | 6330. | 5.15 | ACCEPTABLE |
| 95.0 | 4.163E+08 | 6299. | 5.13 | ACCEPTABLE |
| 100.0 | 4.110E+08 | 6219. | 5.06 | ACCEPTABLE |
| 105.0 | 4.027E+08 | 6093. | 4.96 | ACCEPTABLE |
| 110.0 | 3.913E+08 | 5920. | 4.82 | ACCEPTABLE |
| 115.0 | 3.768E+08 | 5702. | 4.64 | ACCEPTABLE |
| 120.0 | 3.606E+08 | 5456. | 4.44 | ACCEPTABLE |
| 125.0 | 3.538E+08 | 5354. | 4.36 | ACCEPTABLE |
| 130.0 | 3.588E+08 | 5429. | 4.42 | ACCEPTABLE |
| 135.0 | 3.641E+08 | 5510. | 4.48 | ACCEPTABLE |
| 140.0 | 3.696E+08 | 5592. | 4.55 | ACCEPTABLE |
| 145.0 | 3.742E+08 | 5662. | 4.61 | ACCEPTABLE |
| 150.0 | 3.757E+08 | 5685. | 4.63 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 3.743E+08 | 5664. | 4.61 | ACCEPTABLE |
| 160.0 | 3.701E+08 | 5600. | 4.56 | ACCEPTABLE |
| 165.0 | 3.630E+08 | 5493. | 4.47 | ACCEPTABLE |
| 170.0 | 3.532E+08 | 5345. | 4.35 | ACCEPTABLE |
| 175.0 | 3.407E+08 | 5155. | 4.19 | ACCEPTABLE |
| 180.0 | 3.270E+08 | 4948. | 4.03 | ACCEPTABLE |
| 185.0 | 3.173E+08 | 4802. | 3.91 | ACCEPTABLE |
| 190.0 | 3.085E+08 | 4668. | 3.80 | ACCEPTABLE |
| 195.0 | 3.109E+08 | 4704. | 3.83 | ACCEPTABLE |
| 200.0 | 3.243E+08 | 4908. | 3.99 | ACCEPTABLE |
| 205.0 | 3.371E+08 | 5101. | 4.15 | ACCEPTABLE |
| 210.0 | 3.473E+08 | 5255. | 4.28 | ACCEPTABLE |
| 215.0 | 3.549E+08 | 5370. | 4.37 | ACCEPTABLE |
| 220.0 | 3.598E+08 | 5444. | 4.43 | ACCEPTABLE |
| 225.0 | 3.674E+08 | 5560. | 4.52 | ACCEPTABLE |
| 230.0 | 3.830E+08 | 5795. | 4.72 | ACCEPTABLE |
| 235.0 | 3.960E+08 | 5992. | 4.88 | ACCEPTABLE |
| 240.0 | 4.060E+08 | 6144. | 5.00 | ACCEPTABLE |
| 245.0 | 4.130E+08 | 6248. | 5.08 | ACCEPTABLE |
| 250.0 | 4.167E+08 | 6306. | 5.13 | ACCEPTABLE |
| 255.0 | 4.173E+08 | 6315. | 5.14 | ACCEPTABLE |
| 260.0 | 4.155E+08 | 6287. | 5.12 | ACCEPTABLE |
| 265.0 | 4.192E+08 | 6342. | 5.16 | ACCEPTABLE |
| 270.0 | 4.200E+08 | 6355. | 5.17 | ACCEPTABLE |
| 275.0 | 4.177E+08 | 6320. | 5.14 | ACCEPTABLE |
| 280.0 | 4.122E+08 | 6236. | 5.07 | ACCEPTABLE |
| 285.0 | 4.035E+08 | 6105. | 4.97 | ACCEPTABLE |
| 290.0 | 3.918E+08 | 5928. | 4.82 | ACCEPTABLE |
| 295.0 | 3.770E+08 | 5705. | 4.64 | ACCEPTABLE |
| 300.0 | 3.606E+08 | 5456. | 4.44 | ACCEPTABLE |
| 305.0 | 3.538E+08 | 5354. | 4.36 | ACCEPTABLE |
| 310.0 | 3.589E+08 | 5430. | 4.42 | ACCEPTABLE |
| 315.0 | 3.644E+08 | 5513. | 4.49 | ACCEPTABLE |
| 320.0 | 3.699E+08 | 5597. | 4.55 | ACCEPTABLE |
| 325.0 | 3.743E+08 | 5663. | 4.61 | ACCEPTABLE |
| 330.0 | 3.756E+08 | 5683. | 4.62 | ACCEPTABLE |
| 335.0 | 3.741E+08 | 5660. | 4.61 | ACCEPTABLE |
| 340.0 | 3.697E+08 | 5593. | 4.55 | ACCEPTABLE |
| 345.0 | 3.625E+08 | 5484. | 4.46 | ACCEPTABLE |
| 350.0 | 3.525E+08 | 5334. | 4.34 | ACCEPTABLE |
| 355.0 | 3.399E+08 | 5142. | 4.18 | ACCEPTABLE |

ACCEPTABLE! MINIMUM SAFETY FACTOR = 3.78 AT 10.0 DEGREES.

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.12 OF

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/09/1996

RRLOCA + SSE: 20.5 month S.F. calc.

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 0. psi
Bending Stress, Pb = 2543. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.13 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.6 | 51.9 | .952 |
| 2 | 114.1 | 128.3 | .952 |
| 3 | 144.4 | 149.5 | .952 |
| 4 | 158.6 | 169.9 | .952 |
| 5 | 215.1 | 224.5 | .952 |
| 6 | 298.1 | 309.8 | .952 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 3.251E+08 | 4919. | 1.93 | ACCEPTABLE |
| 5.0 | 3.156E+08 | 4775. | 1.88 | ACCEPTABLE |
| 10.0 | 3.068E+08 | 4642. | 1.83 | ACCEPTABLE |
| 15.0 | 3.092E+08 | 4678. | 1.84 | ACCEPTABLE |
| 20.0 | 3.220E+08 | 4872. | 1.92 | ACCEPTABLE |
| 25.0 | 3.352E+08 | 5071. | 1.99 | ACCEPTABLE |
| 30.0 | 3.458E+08 | 5233. | 2.06 | ACCEPTABLE |
| 35.0 | 3.538E+08 | 5354. | 2.11 | ACCEPTABLE |
| 40.0 | 3.592E+08 | 5434. | 2.14 | ACCEPTABLE |
| 45.0 | 3.671E+08 | 5555. | 2.18 | ACCEPTABLE |
| 50.0 | 3.824E+08 | 5786. | 2.28 | ACCEPTABLE |
| 55.0 | 3.951E+08 | 5979. | 2.35 | ACCEPTABLE |
| 60.0 | 4.048E+08 | 6126. | 2.41 | ACCEPTABLE |
| 65.0 | 4.115E+08 | 6226. | 2.45 | ACCEPTABLE |
| 70.0 | 4.150E+08 | 6279. | 2.47 | ACCEPTABLE |
| 75.0 | 4.153E+08 | 6284. | 2.47 | ACCEPTABLE |
| 80.0 | 4.134E+08 | 6255. | 2.46 | ACCEPTABLE |
| 85.0 | 4.172E+08 | 6313. | 2.48 | ACCEPTABLE |
| 90.0 | 4.183E+08 | 6330. | 2.49 | ACCEPTABLE |
| 95.0 | 4.163E+08 | 6299. | 2.48 | ACCEPTABLE |
| 100.0 | 4.110E+08 | 6219. | 2.45 | ACCEPTABLE |
| 105.0 | 4.027E+08 | 6093. | 2.40 | ACCEPTABLE |
| 110.0 | 3.913E+08 | 5920. | 2.33 | ACCEPTABLE |
| 115.0 | 3.768E+08 | 5702. | 2.24 | ACCEPTABLE |
| 120.0 | 3.606E+08 | 5456. | 2.15 | ACCEPTABLE |
| 125.0 | 3.538E+08 | 5354. | 2.11 | ACCEPTABLE |
| 130.0 | 3.588E+08 | 5429. | 2.13 | ACCEPTABLE |
| 135.0 | 3.641E+08 | 5510. | 2.17 | ACCEPTABLE |
| 140.0 | 3.696E+08 | 5592. | 2.20 | ACCEPTABLE |
| 145.0 | 3.742E+08 | 5662. | 2.23 | ACCEPTABLE |
| 150.0 | 3.757E+08 | 5685. | 2.24 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 3.743E+08 | 5664. | 2.23 | ACCEPTABLE |
| 160.0 | 3.701E+08 | 5600. | 2.20 | ACCEPTABLE |
| 165.0 | 3.630E+08 | 5493. | 2.16 | ACCEPTABLE |
| 170.0 | 3.532E+08 | 5345. | 2.10 | ACCEPTABLE |
| 175.0 | 3.407E+08 | 5155. | 2.03 | ACCEPTABLE |
| 180.0 | 3.270E+08 | 4948. | 1.95 | ACCEPTABLE |
| 185.0 | 3.173E+08 | 4802. | 1.89 | ACCEPTABLE |
| 190.0 | 3.085E+08 | 4668. | 1.84 | ACCEPTABLE |
| 195.0 | 3.109E+08 | 4704. | 1.85 | ACCEPTABLE |
| 200.0 | 3.243E+08 | 4908. | 1.93 | ACCEPTABLE |
| 205.0 | 3.371E+08 | 5101. | 2.01 | ACCEPTABLE |
| 210.0 | 3.473E+08 | 5255. | 2.07 | ACCEPTABLE |
| 215.0 | 3.549E+08 | 5370. | 2.11 | ACCEPTABLE |
| 220.0 | 3.598E+08 | 5444. | 2.14 | ACCEPTABLE |
| 225.0 | 3.674E+08 | 5560. | 2.19 | ACCEPTABLE |
| 230.0 | 3.830E+08 | 5795. | 2.28 | ACCEPTABLE |
| 235.0 | 3.960E+08 | 5992. | 2.36 | ACCEPTABLE |
| 240.0 | 4.060E+08 | 6144. | 2.42 | ACCEPTABLE |
| 245.0 | 4.130E+08 | 6248. | 2.46 | ACCEPTABLE |
| 250.0 | 4.167E+08 | 6306. | 2.48 | ACCEPTABLE |
| 255.0 | 4.173E+08 | 6315. | 2.48 | ACCEPTABLE |
| 260.0 | 4.155E+08 | 6287. | 2.47 | ACCEPTABLE |
| 265.0 | 4.192E+08 | 6342. | 2.49 | ACCEPTABLE |
| 270.0 | 4.200E+08 | 6355. | 2.50 | ACCEPTABLE |
| 275.0 | 4.177E+08 | 6320. | 2.48 | ACCEPTABLE |
| 280.0 | 4.122E+08 | 6236. | 2.45 | ACCEPTABLE |
| 285.0 | 4.035E+08 | 6105. | 2.40 | ACCEPTABLE |
| 290.0 | 3.918E+08 | 5928. | 2.33 | ACCEPTABLE |
| 295.0 | 3.770E+08 | 5705. | 2.24 | ACCEPTABLE |
| 300.0 | 3.606E+08 | 5456. | 2.15 | ACCEPTABLE |
| 305.0 | 3.538E+08 | 5354. | 2.11 | ACCEPTABLE |
| 310.0 | 3.589E+08 | 5430. | 2.14 | ACCEPTABLE |
| 315.0 | 3.644E+08 | 5513. | 2.17 | ACCEPTABLE |
| 320.0 | 3.699E+08 | 5597. | 2.20 | ACCEPTABLE |
| 325.0 | 3.743E+08 | 5663. | 2.23 | ACCEPTABLE |
| 330.0 | 3.756E+08 | 5683. | 2.23 | ACCEPTABLE |
| 335.0 | 3.741E+08 | 5660. | 2.23 | ACCEPTABLE |
| 340.0 | 3.697E+08 | 5593. | 2.20 | ACCEPTABLE |
| 345.0 | 3.625E+08 | 5484. | 2.16 | ACCEPTABLE |
| 350.0 | 3.525E+08 | 5334. | 2.10 | ACCEPTABLE |
| 355.0 | 3.399E+08 | 5142. | 2.02 | ACCEPTABLE |

ACCEPTABLE! MINIMUM SAFETY FACTOR = 1.83 AT 10.0 DEGREES.

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.14 OF

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/09/1996

MSLOCA: 20.5 month S.F. calc.

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 61. psi
Bending Stress, Pb = 0. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.15 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.6 | 51.9 | .952 |
| 2 | 114.1 | 128.3 | .952 |
| 3 | 144.4 | 149.5 | .952 |
| 4 | 158.6 | 169.9 | .952 |
| 5 | 215.1 | 224.5 | .952 |
| 6 | 298.1 | 309.8 | .952 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 3.193E+08 | 4831. | 80.32 | ACCEPTABLE |
| 5.0 | 3.110E+08 | 4706. | 78.27 | ACCEPTABLE |
| 10.0 | 3.017E+08 | 4565. | 75.95 | ACCEPTABLE |
| 15.0 | 3.041E+08 | 4601. | 76.54 | ACCEPTABLE |
| 20.0 | 3.180E+08 | 4811. | 79.98 | ACCEPTABLE |
| 25.0 | 3.319E+08 | 5021. | 83.44 | ACCEPTABLE |
| 30.0 | 3.432E+08 | 5193. | 86.26 | ACCEPTABLE |
| 35.0 | 3.520E+08 | 5326. | 88.44 | ACCEPTABLE |
| 40.0 | 3.581E+08 | 5418. | 89.95 | ACCEPTABLE |
| 45.0 | 3.660E+08 | 5538. | 91.92 | ACCEPTABLE |
| 50.0 | 3.809E+08 | 5763. | 95.61 | ACCEPTABLE |
| 55.0 | 3.928E+08 | 5944. | 98.59 | ACCEPTABLE |
| 60.0 | 4.018E+08 | 6080. | 100.82 | ACCEPTABLE |
| 65.0 | 4.077E+08 | 6169. | 102.29 | ACCEPTABLE |
| 70.0 | 4.106E+08 | 6212. | 102.99 | ACCEPTABLE |
| 75.0 | 4.103E+08 | 6207. | 102.91 | ACCEPTABLE |
| 80.0 | 4.091E+08 | 6190. | 102.63 | ACCEPTABLE |
| 85.0 | 4.123E+08 | 6239. | 103.43 | ACCEPTABLE |
| 90.0 | 4.141E+08 | 6266. | 103.87 | ACCEPTABLE |
| 95.0 | 4.127E+08 | 6245. | 103.53 | ACCEPTABLE |
| 100.0 | 4.082E+08 | 6177. | 102.41 | ACCEPTABLE |
| 105.0 | 4.006E+08 | 6062. | 100.52 | ACCEPTABLE |
| 110.0 | 3.899E+08 | 5900. | 97.87 | ACCEPTABLE |
| 115.0 | 3.763E+08 | 5694. | 94.48 | ACCEPTABLE |
| 120.0 | 3.605E+08 | 5455. | 90.56 | ACCEPTABLE |
| 125.0 | 3.538E+08 | 5353. | 88.89 | ACCEPTABLE |
| 130.0 | 3.585E+08 | 5424. | 90.05 | ACCEPTABLE |
| 135.0 | 3.630E+08 | 5493. | 91.18 | ACCEPTABLE |
| 140.0 | 3.686E+08 | 5577. | 92.57 | ACCEPTABLE |
| 145.0 | 3.740E+08 | 5659. | 93.91 | ACCEPTABLE |
| 150.0 | 3.763E+08 | 5694. | 94.49 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 3.757E+08 | 5685. | 94.33 | ACCEPTABLE |
| 160.0 | 3.722E+08 | 5632. | 93.47 | ACCEPTABLE |
| 165.0 | 3.659E+08 | 5537. | 91.90 | ACCEPTABLE |
| 170.0 | 3.568E+08 | 5399. | 89.64 | ACCEPTABLE |
| 175.0 | 3.450E+08 | 5220. | 86.70 | ACCEPTABLE |
| 180.0 | 3.309E+08 | 5006. | 83.19 | ACCEPTABLE |
| 185.0 | 3.217E+08 | 4868. | 80.93 | ACCEPTABLE |
| 190.0 | 3.119E+08 | 4719. | 78.47 | ACCEPTABLE |
| 195.0 | 3.142E+08 | 4755. | 79.06 | ACCEPTABLE |
| 200.0 | 3.282E+08 | 4967. | 82.54 | ACCEPTABLE |
| 205.0 | 3.403E+08 | 5149. | 85.54 | ACCEPTABLE |
| 210.0 | 3.498E+08 | 5293. | 87.89 | ACCEPTABLE |
| 215.0 | 3.566E+08 | 5396. | 89.59 | ACCEPTABLE |
| 220.0 | 3.607E+08 | 5458. | 90.61 | ACCEPTABLE |
| 225.0 | 3.681E+08 | 5570. | 92.45 | ACCEPTABLE |
| 230.0 | 3.844E+08 | 5816. | 96.49 | ACCEPTABLE |
| 235.0 | 3.982E+08 | 6025. | 99.92 | ACCEPTABLE |
| 240.0 | 4.089E+08 | 6188. | 102.59 | ACCEPTABLE |
| 245.0 | 4.166E+08 | 6303. | 104.49 | ACCEPTABLE |
| 250.0 | 4.211E+08 | 6371. | 105.60 | ACCEPTABLE |
| 255.0 | 4.223E+08 | 6390. | 105.91 | ACCEPTABLE |
| 260.0 | 4.198E+08 | 6351. | 105.27 | ACCEPTABLE |
| 265.0 | 4.240E+08 | 6415. | 106.32 | ACCEPTABLE |
| 270.0 | 4.242E+08 | 6418. | 106.37 | ACCEPTABLE |
| 275.0 | 4.211E+08 | 6372. | 105.61 | ACCEPTABLE |
| 280.0 | 4.149E+08 | 6277. | 104.06 | ACCEPTABLE |
| 285.0 | 4.055E+08 | 6135. | 101.72 | ACCEPTABLE |
| 290.0 | 3.930E+08 | 5946. | 98.62 | ACCEPTABLE |
| 295.0 | 3.775E+08 | 5712. | 94.77 | ACCEPTABLE |
| 300.0 | 3.605E+08 | 5455. | 90.56 | ACCEPTABLE |
| 305.0 | 3.538E+08 | 5353. | 88.89 | ACCEPTABLE |
| 310.0 | 3.591E+08 | 5434. | 90.21 | ACCEPTABLE |
| 315.0 | 3.654E+08 | 5528. | 91.76 | ACCEPTABLE |
| 320.0 | 3.708E+08 | 5610. | 93.11 | ACCEPTABLE |
| 325.0 | 3.743E+08 | 5664. | 93.99 | ACCEPTABLE |
| 330.0 | 3.749E+08 | 5672. | 94.13 | ACCEPTABLE |
| 335.0 | 3.726E+08 | 5637. | 93.55 | ACCEPTABLE |
| 340.0 | 3.674E+08 | 5560. | 92.28 | ACCEPTABLE |
| 345.0 | 3.595E+08 | 5439. | 90.30 | ACCEPTABLE |
| 350.0 | 3.488E+08 | 5278. | 87.65 | ACCEPTABLE |
| 355.0 | 3.355E+08 | 5076. | 84.34 | ACCEPTABLE |

ACCEPTABLE! MINIMUM SAFETY FACTOR = 75.95 AT 10.0 DEGREES.

PROJECT No. 10014-011
CALC. No. 9389-69-DQ
REV 0 DATE
PAGE 31.16 OF

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/09/1996

RRLOCA: 20.5 month S.F. calc.

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.17 OF

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 0. psi
Bending Stress, Pb = 86. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.6 | 51.9 | .952 |
| 2 | 114.1 | 128.3 | .952 |
| 3 | 144.4 | 149.5 | .952 |
| 4 | 158.6 | 169.9 | .952 |
| 5 | 215.1 | 224.5 | .952 |
| 6 | 298.1 | 309.8 | .952 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 3.251E+08 | 4919. | 57.08 | ACCEPTABLE |
| 5.0 | 3.156E+08 | 4775. | 55.41 | ACCEPTABLE |
| 10.0 | 3.068E+08 | 4642. | 53.87 | ACCEPTABLE |
| 15.0 | 3.092E+08 | 4678. | 54.29 | ACCEPTABLE |
| 20.0 | 3.220E+08 | 4872. | 56.54 | ACCEPTABLE |
| 25.0 | 3.352E+08 | 5071. | 58.85 | ACCEPTABLE |
| 30.0 | 3.458E+08 | 5233. | 60.72 | ACCEPTABLE |
| 35.0 | 3.538E+08 | 5354. | 62.13 | ACCEPTABLE |
| 40.0 | 3.592E+08 | 5434. | 63.07 | ACCEPTABLE |
| 45.0 | 3.671E+08 | 5555. | 64.46 | ACCEPTABLE |
| 50.0 | 3.824E+08 | 5786. | 67.15 | ACCEPTABLE |
| 55.0 | 3.951E+08 | 5979. | 69.38 | ACCEPTABLE |
| 60.0 | 4.048E+08 | 6126. | 71.09 | ACCEPTABLE |
| 65.0 | 4.115E+08 | 6226. | 72.25 | ACCEPTABLE |
| 70.0 | 4.150E+08 | 6279. | 72.87 | ACCEPTABLE |
| 75.0 | 4.153E+08 | 6284. | 72.93 | ACCEPTABLE |
| 80.0 | 4.134E+08 | 6255. | 72.59 | ACCEPTABLE |
| 85.0 | 4.172E+08 | 6313. | 73.26 | ACCEPTABLE |
| 90.0 | 4.183E+08 | 6330. | 73.46 | ACCEPTABLE |
| 95.0 | 4.163E+08 | 6299. | 73.10 | ACCEPTABLE |
| 100.0 | 4.110E+08 | 6219. | 72.18 | ACCEPTABLE |
| 105.0 | 4.027E+08 | 6093. | 70.71 | ACCEPTABLE |
| 110.0 | 3.913E+08 | 5920. | 68.70 | ACCEPTABLE |
| 115.0 | 3.768E+08 | 5702. | 66.17 | ACCEPTABLE |
| 120.0 | 3.606E+08 | 5456. | 63.31 | ACCEPTABLE |
| 125.0 | 3.538E+08 | 5354. | 62.13 | ACCEPTABLE |
| 130.0 | 3.588E+08 | 5429. | 63.01 | ACCEPTABLE |
| 135.0 | 3.641E+08 | 5510. | 63.94 | ACCEPTABLE |
| 140.0 | 3.696E+08 | 5592. | 64.89 | ACCEPTABLE |
| 145.0 | 3.742E+08 | 5662. | 65.71 | ACCEPTABLE |
| 150.0 | 3.757E+08 | 5685. | 65.97 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 3.743E+08 | 5664. | 65.73 | ACCEPTABLE |
| 160.0 | 3.701E+08 | 5600. | 64.99 | ACCEPTABLE |
| 165.0 | 3.630E+08 | 5493. | 63.75 | ACCEPTABLE |
| 170.0 | 3.532E+08 | 5345. | 62.02 | ACCEPTABLE |
| 175.0 | 3.407E+08 | 5155. | 59.83 | ACCEPTABLE |
| 180.0 | 3.270E+08 | 4948. | 57.42 | ACCEPTABLE |
| 185.0 | 3.173E+08 | 4802. | 55.72 | ACCEPTABLE |
| 190.0 | 3.085E+08 | 4668. | 54.17 | ACCEPTABLE |
| 195.0 | 3.109E+08 | 4704. | 54.59 | ACCEPTABLE |
| 200.0 | 3.243E+08 | 4908. | 56.95 | ACCEPTABLE |
| 205.0 | 3.371E+08 | 5101. | 59.20 | ACCEPTABLE |
| 210.0 | 3.473E+08 | 5255. | 60.99 | ACCEPTABLE |
| 215.0 | 3.549E+08 | 5370. | 62.32 | ACCEPTABLE |
| 220.0 | 3.598E+08 | 5444. | 63.17 | ACCEPTABLE |
| 225.0 | 3.674E+08 | 5560. | 64.52 | ACCEPTABLE |
| 230.0 | 3.830E+08 | 5795. | 67.25 | ACCEPTABLE |
| 235.0 | 3.960E+08 | 5992. | 69.54 | ACCEPTABLE |
| 240.0 | 4.060E+08 | 6144. | 71.30 | ACCEPTABLE |
| 245.0 | 4.130E+08 | 6248. | 72.51 | ACCEPTABLE |
| 250.0 | 4.167E+08 | 6306. | 73.18 | ACCEPTABLE |
| 255.0 | 4.173E+08 | 6315. | 73.28 | ACCEPTABLE |
| 260.0 | 4.155E+08 | 6287. | 72.96 | ACCEPTABLE |
| 265.0 | 4.192E+08 | 6342. | 73.60 | ACCEPTABLE |
| 270.0 | 4.200E+08 | 6355. | 73.75 | ACCEPTABLE |
| 275.0 | 4.177E+08 | 6320. | 73.34 | ACCEPTABLE |
| 280.0 | 4.122E+08 | 6236. | 72.37 | ACCEPTABLE |
| 285.0 | 4.035E+08 | 6105. | 70.85 | ACCEPTABLE |
| 290.0 | 3.918E+08 | 5928. | 68.79 | ACCEPTABLE |
| 295.0 | 3.770E+08 | 5705. | 66.21 | ACCEPTABLE |
| 300.0 | 3.606E+08 | 5456. | 63.31 | ACCEPTABLE |
| 305.0 | 3.538E+08 | 5354. | 62.13 | ACCEPTABLE |
| 310.0 | 3.589E+08 | 5430. | 63.02 | ACCEPTABLE |
| 315.0 | 3.644E+08 | 5513. | 63.98 | ACCEPTABLE |
| 320.0 | 3.699E+08 | 5597. | 64.96 | ACCEPTABLE |
| 325.0 | 3.743E+08 | 5663. | 65.72 | ACCEPTABLE |
| 330.0 | 3.756E+08 | 5683. | 65.95 | ACCEPTABLE |
| 335.0 | 3.741E+08 | 5660. | 65.68 | ACCEPTABLE |
| 340.0 | 3.697E+08 | 5593. | 64.91 | ACCEPTABLE |
| 345.0 | 3.625E+08 | 5484. | 63.65 | ACCEPTABLE |
| 350.0 | 3.525E+08 | 5334. | 61.90 | ACCEPTABLE |
| 355.0 | 3.399E+08 | 5142. | 59.68 | ACCEPTABLE |

ACCEPTABLE! MINIMUM SAFETY FACTOR = 53.87 AT 10.0 DEGREES.

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31-18 OF

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/09/1996

MSLOCA + SSE: 20.5 month S.F. calc.

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 86. psi
Bending Stress, Pb = 2457. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV. 0 DATE .....
PAGE 31.19 OF .....

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.6 | 51.9 | .952 |
| 2 | 114.1 | 128.3 | .952 |
| 3 | 144.4 | 149.5 | .952 |
| 4 | 158.6 | 169.9 | .952 |
| 5 | 215.1 | 224.5 | .952 |
| 6 | 298.1 | 309.8 | .952 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 3.193E+08 | 4831. | 1.93 | ACCEPTABLE |
| 5.0 | 3.101E+08 | 4693. | 1.88 | ACCEPTABLE |
| 10.0 | 3.017E+08 | 4565. | 1.83 | ACCEPTABLE |
| 15.0 | 3.041E+08 | 4601. | 1.84 | ACCEPTABLE |
| 20.0 | 3.180E+08 | 4811. | 1.93 | ACCEPTABLE |
| 25.0 | 3.319E+08 | 5021. | 2.01 | ACCEPTABLE |
| 30.0 | 3.432E+08 | 5193. | 2.08 | ACCEPTABLE |
| 35.0 | 3.520E+08 | 5326. | 2.13 | ACCEPTABLE |
| 40.0 | 3.581E+08 | 5418. | 2.16 | ACCEPTABLE |
| 45.0 | 3.660E+08 | 5538. | 2.21 | ACCEPTABLE |
| 50.0 | 3.805E+08 | 5758. | 2.30 | ACCEPTABLE |
| 55.0 | 3.924E+08 | 5937. | 2.37 | ACCEPTABLE |
| 60.0 | 4.012E+08 | 6071. | 2.42 | ACCEPTABLE |
| 65.0 | 4.070E+08 | 6158. | 2.46 | ACCEPTABLE |
| 70.0 | 4.097E+08 | 6199. | 2.47 | ACCEPTABLE |
| 75.0 | 4.092E+08 | 6192. | 2.47 | ACCEPTABLE |
| 80.0 | 4.080E+08 | 6174. | 2.46 | ACCEPTABLE |
| 85.0 | 4.123E+08 | 6239. | 2.49 | ACCEPTABLE |
| 90.0 | 4.141E+08 | 6266. | 2.50 | ACCEPTABLE |
| 95.0 | 4.127E+08 | 6245. | 2.49 | ACCEPTABLE |
| 100.0 | 4.082E+08 | 6177. | 2.46 | ACCEPTABLE |
| 105.0 | 4.006E+08 | 6062. | 2.42 | ACCEPTABLE |
| 110.0 | 3.899E+08 | 5900. | 2.35 | ACCEPTABLE |
| 115.0 | 3.763E+08 | 5694. | 2.27 | ACCEPTABLE |
| 120.0 | 3.605E+08 | 5455. | 2.18 | ACCEPTABLE |
| 125.0 | 3.538E+08 | 5353. | 2.14 | ACCEPTABLE |
| 130.0 | 3.584E+08 | 5423. | 2.17 | ACCEPTABLE |
| 135.0 | 3.628E+08 | 5490. | 2.19 | ACCEPTABLE |
| 140.0 | 3.684E+08 | 5574. | 2.23 | ACCEPTABLE |
| 145.0 | 3.740E+08 | 5658. | 2.26 | ACCEPTABLE |
| 150.0 | 3.766E+08 | 5698. | 2.27 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 3.762E+08 | 5693. | 2.27 | ACCEPTABLE |
| 160.0 | 3.731E+08 | 5645. | 2.25 | ACCEPTABLE |
| 165.0 | 3.671E+08 | 5554. | 2.22 | ACCEPTABLE |
| 170.0 | 3.582E+08 | 5420. | 2.17 | ACCEPTABLE |
| 175.0 | 3.467E+08 | 5246. | 2.10 | ACCEPTABLE |
| 180.0 | 3.309E+08 | 5006. | 2.00 | ACCEPTABLE |
| 185.0 | 3.217E+08 | 4868. | 1.95 | ACCEPTABLE |
| 190.0 | 3.119E+08 | 4719. | 1.89 | ACCEPTABLE |
| 195.0 | 3.142E+08 | 4755. | 1.90 | ACCEPTABLE |
| 200.0 | 3.290E+08 | 4978. | 1.99 | ACCEPTABLE |
| 205.0 | 3.409E+08 | 5159. | 2.06 | ACCEPTABLE |
| 210.0 | 3.503E+08 | 5300. | 2.12 | ACCEPTABLE |
| 215.0 | 3.569E+08 | 5401. | 2.16 | ACCEPTABLE |
| 220.0 | 3.609E+08 | 5461. | 2.18 | ACCEPTABLE |
| 225.0 | 3.685E+08 | 5575. | 2.23 | ACCEPTABLE |
| 230.0 | 3.847E+08 | 5821. | 2.32 | ACCEPTABLE |
| 235.0 | 3.986E+08 | 6032. | 2.41 | ACCEPTABLE |
| 240.0 | 4.095E+08 | 6196. | 2.47 | ACCEPTABLE |
| 245.0 | 4.173E+08 | 6314. | 2.52 | ACCEPTABLE |
| 250.0 | 4.219E+08 | 6384. | 2.54 | ACCEPTABLE |
| 255.0 | 4.233E+08 | 6405. | 2.55 | ACCEPTABLE |
| 260.0 | 4.198E+08 | 6351. | 2.53 | ACCEPTABLE |
| 265.0 | 4.259E+08 | 6444. | 2.57 | ACCEPTABLE |
| 270.0 | 4.258E+08 | 6443. | 2.57 | ACCEPTABLE |
| 275.0 | 4.225E+08 | 6392. | 2.55 | ACCEPTABLE |
| 280.0 | 4.159E+08 | 6293. | 2.51 | ACCEPTABLE |
| 285.0 | 4.062E+08 | 6147. | 2.45 | ACCEPTABLE |
| 290.0 | 3.934E+08 | 5953. | 2.37 | ACCEPTABLE |
| 295.0 | 3.776E+08 | 5714. | 2.28 | ACCEPTABLE |
| 300.0 | 3.605E+08 | 5455. | 2.18 | ACCEPTABLE |
| 305.0 | 3.538E+08 | 5353. | 2.14 | ACCEPTABLE |
| 310.0 | 3.592E+08 | 5435. | 2.17 | ACCEPTABLE |
| 315.0 | 3.657E+08 | 5534. | 2.21 | ACCEPTABLE |
| 320.0 | 3.710E+08 | 5613. | 2.24 | ACCEPTABLE |
| 325.0 | 3.743E+08 | 5664. | 2.26 | ACCEPTABLE |
| 330.0 | 3.746E+08 | 5668. | 2.26 | ACCEPTABLE |
| 335.0 | 3.720E+08 | 5628. | 2.25 | ACCEPTABLE |
| 340.0 | 3.665E+08 | 5546. | 2.21 | ACCEPTABLE |
| 345.0 | 3.583E+08 | 5421. | 2.17 | ACCEPTABLE |
| 350.0 | 3.473E+08 | 5255. | 2.10 | ACCEPTABLE |
| 355.0 | 3.337E+08 | 5049. | 2.02 | ACCEPTABLE |

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31, 20 OF

ACCEPTABLE! MINIMUM SAFETY FACTOR = 1.83 AT 10.0 DEGREES.

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/09/1996

SSE: 20.5 month S.F. calc.

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 0. psi
Bending Stress, Pb = 2457. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV. 0 DATE
PAGE 31, 21 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.6 | 51.9 | .952 |
| 2 | 114.1 | 128.3 | .952 |
| 3 | 144.4 | 149.5 | .952 |
| 4 | 158.6 | 169.9 | .952 |
| 5 | 215.1 | 224.5 | .952 |
| 6 | 298.1 | 309.8 | .952 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 3.251E+08 | 4919. | 2.00 | ACCEPTABLE |
| 5.0 | 3.156E+08 | 4775. | 1.94 | ACCEPTABLE |
| 10.0 | 3.068E+08 | 4642. | 1.89 | ACCEPTABLE |
| 15.0 | 3.092E+08 | 4678. | 1.90 | ACCEPTABLE |
| 20.0 | 3.220E+08 | 4872. | 1.98 | ACCEPTABLE |
| 25.0 | 3.352E+08 | 5071. | 2.06 | ACCEPTABLE |
| 30.0 | 3.458E+08 | 5233. | 2.13 | ACCEPTABLE |
| 35.0 | 3.538E+08 | 5354. | 2.18 | ACCEPTABLE |
| 40.0 | 3.592E+08 | 5434. | 2.21 | ACCEPTABLE |
| 45.0 | 3.671E+08 | 5555. | 2.26 | ACCEPTABLE |
| 50.0 | 3.824E+08 | 5786. | 2.35 | ACCEPTABLE |
| 55.0 | 3.951E+08 | 5979. | 2.43 | ACCEPTABLE |
| 60.0 | 4.048E+08 | 6126. | 2.49 | ACCEPTABLE |
| 65.0 | 4.115E+08 | 6226. | 2.53 | ACCEPTABLE |
| 70.0 | 4.150E+08 | 6279. | 2.56 | ACCEPTABLE |
| 75.0 | 4.153E+08 | 6284. | 2.56 | ACCEPTABLE |
| 80.0 | 4.134E+08 | 6255. | 2.55 | ACCEPTABLE |
| 85.0 | 4.172E+08 | 6313. | 2.57 | ACCEPTABLE |
| 90.0 | 4.183E+08 | 6330. | 2.58 | ACCEPTABLE |
| 95.0 | 4.163E+08 | 6299. | 2.56 | ACCEPTABLE |
| 100.0 | 4.110E+08 | 6219. | 2.53 | ACCEPTABLE |
| 105.0 | 4.027E+08 | 6093. | 2.48 | ACCEPTABLE |
| 110.0 | 3.913E+08 | 5920. | 2.41 | ACCEPTABLE |
| 115.0 | 3.768E+08 | 5702. | 2.32 | ACCEPTABLE |
| 120.0 | 3.606E+08 | 5456. | 2.22 | ACCEPTABLE |
| 125.0 | 3.538E+08 | 5354. | 2.18 | ACCEPTABLE |
| 130.0 | 3.588E+08 | 5429. | 2.21 | ACCEPTABLE |
| 135.0 | 3.641E+08 | 5510. | 2.24 | ACCEPTABLE |
| 140.0 | 3.696E+08 | 5592. | 2.28 | ACCEPTABLE |
| 145.0 | 3.742E+08 | 5662. | 2.30 | ACCEPTABLE |
| 150.0 | 3.757E+08 | 5685. | 2.31 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 3.743E+08 | 5664. | 2.31 | ACCEPTABLE |
| 160.0 | 3.701E+08 | 5600. | 2.28 | ACCEPTABLE |
| 165.0 | 3.630E+08 | 5493. | 2.24 | ACCEPTABLE |
| 170.0 | 3.532E+08 | 5345. | 2.18 | ACCEPTABLE |
| 175.0 | 3.407E+08 | 5155. | 2.10 | ACCEPTABLE |
| 180.0 | 3.270E+08 | 4948. | 2.01 | ACCEPTABLE |
| 185.0 | 3.173E+08 | 4802. | 1.95 | ACCEPTABLE |
| 190.0 | 3.085E+08 | 4668. | 1.90 | ACCEPTABLE |
| 195.0 | 3.109E+08 | 4704. | 1.91 | ACCEPTABLE |
| 200.0 | 3.243E+08 | 4908. | 2.00 | ACCEPTABLE |
| 205.0 | 3.371E+08 | 5101. | 2.08 | ACCEPTABLE |
| 210.0 | 3.473E+08 | 5255. | 2.14 | ACCEPTABLE |
| 215.0 | 3.549E+08 | 5370. | 2.19 | ACCEPTABLE |
| 220.0 | 3.598E+08 | 5444. | 2.22 | ACCEPTABLE |
| 225.0 | 3.674E+08 | 5560. | 2.26 | ACCEPTABLE |
| 230.0 | 3.830E+08 | 5795. | 2.36 | ACCEPTABLE |
| 235.0 | 3.960E+08 | 5992. | 2.44 | ACCEPTABLE |
| 240.0 | 4.060E+08 | 6144. | 2.50 | ACCEPTABLE |
| 245.0 | 4.130E+08 | 6248. | 2.54 | ACCEPTABLE |
| 250.0 | 4.167E+08 | 6306. | 2.57 | ACCEPTABLE |
| 255.0 | 4.173E+08 | 6315. | 2.57 | ACCEPTABLE |
| 260.0 | 4.155E+08 | 6287. | 2.56 | ACCEPTABLE |
| 265.0 | 4.192E+08 | 6342. | 2.58 | ACCEPTABLE |
| 270.0 | 4.200E+08 | 6355. | 2.59 | ACCEPTABLE |
| 275.0 | 4.177E+08 | 6320. | 2.57 | ACCEPTABLE |
| 280.0 | 4.122E+08 | 6236. | 2.54 | ACCEPTABLE |
| 285.0 | 4.035E+08 | 6105. | 2.48 | ACCEPTABLE |
| 290.0 | 3.918E+08 | 5928. | 2.41 | ACCEPTABLE |
| 295.0 | 3.770E+08 | 5705. | 2.32 | ACCEPTABLE |
| 300.0 | 3.606E+08 | 5456. | 2.22 | ACCEPTABLE |
| 305.0 | 3.538E+08 | 5354. | 2.18 | ACCEPTABLE |
| 310.0 | 3.589E+08 | 5430. | 2.21 | ACCEPTABLE |
| 315.0 | 3.644E+08 | 5513. | 2.24 | ACCEPTABLE |
| 320.0 | 3.699E+08 | 5597. | 2.28 | ACCEPTABLE |
| 325.0 | 3.743E+08 | 5663. | 2.30 | ACCEPTABLE |
| 330.0 | 3.756E+08 | 5683. | 2.31 | ACCEPTABLE |
| 335.0 | 3.741E+08 | 5660. | 2.30 | ACCEPTABLE |
| 340.0 | 3.697E+08 | 5593. | 2.28 | ACCEPTABLE |
| 345.0 | 3.625E+08 | 5484. | 2.23 | ACCEPTABLE |
| 350.0 | 3.525E+08 | 5334. | 2.17 | ACCEPTABLE |
| 355.0 | 3.399E+08 | 5142. | 2.09 | ACCEPTABLE |

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.22 OF

ACCEPTABLE! MINIMUM SAFETY FACTOR = 1.89 AT 10.0 DEGREES.

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/03/1996

MSLOCA + SSE: 26.25 months (19,163 hrs)

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 86. psi
Bending Stress, Pb = 2457. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.23 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.8 | 51.7 | .742 |
| 2 | 114.3 | 128.2 | .742 |
| 3 | 144.5 | 149.4 | .742 |
| 4 | 158.7 | 169.7 | .742 |
| 5 | 215.3 | 224.4 | .742 |
| 6 | 298.3 | 309.7 | .742 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 2.430E+08 | 3677. | 1.48 | ACCEPTABLE |
| 5.0 | 2.361E+08 | 3573. | 1.44 | ACCEPTABLE |
| 10.0 | 2.303E+08 | 3485. | 1.40 | ACCEPTABLE |
| 15.0 | 2.321E+08 | 3511. | 1.41 | ACCEPTABLE |
| 20.0 | 2.421E+08 | 3663. | 1.47 | ACCEPTABLE |
| 25.0 | 2.528E+08 | 3825. | 1.54 | ACCEPTABLE |
| 30.0 | 2.616E+08 | 3958. | 1.59 | ACCEPTABLE |
| 35.0 | 2.683E+08 | 4060. | 1.63 | ACCEPTABLE |
| 40.0 | 2.731E+08 | 4132. | 1.66 | ACCEPTABLE |
| 45.0 | 2.791E+08 | 4222. | 1.69 | ACCEPTABLE |
| 50.0 | 2.904E+08 | 4394. | 1.76 | ACCEPTABLE |
| 55.0 | 2.995E+08 | 4532. | 1.82 | ACCEPTABLE |
| 60.0 | 3.063E+08 | 4635. | 1.86 | ACCEPTABLE |
| 65.0 | 3.108E+08 | 4703. | 1.88 | ACCEPTABLE |
| 70.0 | 3.130E+08 | 4736. | 1.90 | ACCEPTABLE |
| 75.0 | 3.127E+08 | 4732. | 1.89 | ACCEPTABLE |
| 80.0 | 3.102E+08 | 4694. | 1.88 | ACCEPTABLE |
| 85.0 | 3.152E+08 | 4770. | 1.91 | ACCEPTABLE |
| 90.0 | 3.167E+08 | 4791. | 1.92 | ACCEPTABLE |
| 95.0 | 3.157E+08 | 4776. | 1.91 | ACCEPTABLE |
| 100.0 | 3.123E+08 | 4725. | 1.89 | ACCEPTABLE |
| 105.0 | 3.065E+08 | 4638. | 1.86 | ACCEPTABLE |
| 110.0 | 2.984E+08 | 4515. | 1.81 | ACCEPTABLE |
| 115.0 | 2.880E+08 | 4358. | 1.75 | ACCEPTABLE |
| 120.0 | 2.760E+08 | 4176. | 1.68 | ACCEPTABLE |
| 125.0 | 2.710E+08 | 4100. | 1.65 | ACCEPTABLE |
| 130.0 | 2.748E+08 | 4157. | 1.67 | ACCEPTABLE |
| 135.0 | 2.784E+08 | 4212. | 1.69 | ACCEPTABLE |
| 140.0 | 2.828E+08 | 4279. | 1.72 | ACCEPTABLE |
| 145.0 | 2.871E+08 | 4344. | 1.74 | ACCEPTABLE |
| 150.0 | 2.891E+08 | 4375. | 1.75 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 2.890E+08 | 4372. | 1.75 | ACCEPTABLE |
| 160.0 | 2.866E+08 | 4336. | 1.74 | ACCEPTABLE |
| 165.0 | 2.820E+08 | 4267. | 1.71 | ACCEPTABLE |
| 170.0 | 2.753E+08 | 4165. | 1.67 | ACCEPTABLE |
| 175.0 | 2.665E+08 | 4032. | 1.62 | ACCEPTABLE |
| 180.0 | 2.551E+08 | 3860. | 1.55 | ACCEPTABLE |
| 185.0 | 2.473E+08 | 3742. | 1.51 | ACCEPTABLE |
| 190.0 | 2.408E+08 | 3644. | 1.47 | ACCEPTABLE |
| 195.0 | 2.426E+08 | 3670. | 1.48 | ACCEPTABLE |
| 200.0 | 2.519E+08 | 3812. | 1.53 | ACCEPTABLE |
| 205.0 | 2.608E+08 | 3947. | 1.59 | ACCEPTABLE |
| 210.0 | 2.678E+08 | 4052. | 1.63 | ACCEPTABLE |
| 215.0 | 2.727E+08 | 4126. | 1.66 | ACCEPTABLE |
| 220.0 | 2.755E+08 | 4169. | 1.67 | ACCEPTABLE |
| 225.0 | 2.815E+08 | 4259. | 1.71 | ACCEPTABLE |
| 230.0 | 2.940E+08 | 4449. | 1.78 | ACCEPTABLE |
| 235.0 | 3.050E+08 | 4616. | 1.85 | ACCEPTABLE |
| 240.0 | 3.137E+08 | 4747. | 1.90 | ACCEPTABLE |
| 245.0 | 3.200E+08 | 4842. | 1.94 | ACCEPTABLE |
| 250.0 | 3.239E+08 | 4900. | 1.96 | ACCEPTABLE |
| 255.0 | 3.252E+08 | 4921. | 1.97 | ACCEPTABLE |
| 260.0 | 3.251E+08 | 4920. | 1.97 | ACCEPTABLE |
| 265.0 | 3.280E+08 | 4963. | 1.99 | ACCEPTABLE |
| 270.0 | 3.277E+08 | 4958. | 1.98 | ACCEPTABLE |
| 275.0 | 3.248E+08 | 4915. | 1.97 | ACCEPTABLE |
| 280.0 | 3.195E+08 | 4834. | 1.93 | ACCEPTABLE |
| 285.0 | 3.118E+08 | 4717. | 1.89 | ACCEPTABLE |
| 290.0 | 3.017E+08 | 4564. | 1.83 | ACCEPTABLE |
| 295.0 | 2.892E+08 | 4376. | 1.75 | ACCEPTABLE |
| 300.0 | 2.759E+08 | 4175. | 1.68 | ACCEPTABLE |
| 305.0 | 2.709E+08 | 4099. | 1.65 | ACCEPTABLE |
| 310.0 | 2.754E+08 | 4168. | 1.67 | ACCEPTABLE |
| 315.0 | 2.811E+08 | 4253. | 1.71 | ACCEPTABLE |
| 320.0 | 2.851E+08 | 4314. | 1.73 | ACCEPTABLE |
| 325.0 | 2.874E+08 | 4349. | 1.74 | ACCEPTABLE |
| 330.0 | 2.874E+08 | 4348. | 1.74 | ACCEPTABLE |
| 335.0 | 2.851E+08 | 4315. | 1.73 | ACCEPTABLE |
| 340.0 | 2.808E+08 | 4248. | 1.70 | ACCEPTABLE |
| 345.0 | 2.742E+08 | 4149. | 1.67 | ACCEPTABLE |
| 350.0 | 2.656E+08 | 4019. | 1.61 | ACCEPTABLE |
| 355.0 | 2.550E+08 | 3858. | 1.55 | ACCEPTABLE |

ACCEPTABLE! MINIMUM SAFETY FACTOR = 1.40 AT 10.0 DEGREES.

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31-24 OF

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/03/1996

RRLOCA + SSE: 26.25 months (19,163 hrs)

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 0. psi
Bending Stress, Pb = 2543. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.25 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.8 | 51.7 | .742 |
| 2 | 114.3 | 128.2 | .742 |
| 3 | 144.5 | 149.4 | .742 |
| 4 | 158.7 | 169.7 | .742 |
| 5 | 215.3 | 224.4 | .742 |
| 6 | 298.3 | 309.7 | .742 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 2.491E+08 | 3769. | 1.48 | ACCEPTABLE |
| 5.0 | 2.418E+08 | 3658. | 1.44 | ACCEPTABLE |
| 10.0 | 2.356E+08 | 3565. | 1.40 | ACCEPTABLE |
| 15.0 | 2.373E+08 | 3591. | 1.41 | ACCEPTABLE |
| 20.0 | 2.471E+08 | 3738. | 1.47 | ACCEPTABLE |
| 25.0 | 2.569E+08 | 3887. | 1.53 | ACCEPTABLE |
| 30.0 | 2.647E+08 | 4006. | 1.58 | ACCEPTABLE |
| 35.0 | 2.706E+08 | 4094. | 1.61 | ACCEPTABLE |
| 40.0 | 2.744E+08 | 4152. | 1.63 | ACCEPTABLE |
| 45.0 | 2.803E+08 | 4241. | 1.67 | ACCEPTABLE |
| 50.0 | 2.923E+08 | 4423. | 1.74 | ACCEPTABLE |
| 55.0 | 3.024E+08 | 4575. | 1.80 | ACCEPTABLE |
| 60.0 | 3.101E+08 | 4692. | 1.84 | ACCEPTABLE |
| 65.0 | 3.155E+08 | 4774. | 1.88 | ACCEPTABLE |
| 70.0 | 3.185E+08 | 4819. | 1.89 | ACCEPTABLE |
| 75.0 | 3.190E+08 | 4827. | 1.90 | ACCEPTABLE |
| 80.0 | 3.185E+08 | 4820. | 1.90 | ACCEPTABLE |
| 85.0 | 3.213E+08 | 4862. | 1.91 | ACCEPTABLE |
| 90.0 | 3.219E+08 | 4871. | 1.92 | ACCEPTABLE |
| 95.0 | 3.201E+08 | 4843. | 1.90 | ACCEPTABLE |
| 100.0 | 3.158E+08 | 4778. | 1.88 | ACCEPTABLE |
| 105.0 | 3.091E+08 | 4676. | 1.84 | ACCEPTABLE |
| 110.0 | 3.000E+08 | 4540. | 1.78 | ACCEPTABLE |
| 115.0 | 2.887E+08 | 4368. | 1.72 | ACCEPTABLE |
| 120.0 | 2.760E+08 | 4176. | 1.64 | ACCEPTABLE |
| 125.0 | 2.710E+08 | 4100. | 1.61 | ACCEPTABLE |
| 130.0 | 2.752E+08 | 4164. | 1.64 | ACCEPTABLE |
| 135.0 | 2.797E+08 | 4232. | 1.66 | ACCEPTABLE |
| 140.0 | 2.840E+08 | 4297. | 1.69 | ACCEPTABLE |
| 145.0 | 2.873E+08 | 4347. | 1.71 | ACCEPTABLE |
| 150.0 | 2.884E+08 | 4364. | 1.72 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 2.873E+08 | 4346. | 1.71 | ACCEPTABLE |
| 160.0 | 2.839E+08 | 4296. | 1.69 | ACCEPTABLE |
| 165.0 | 2.784E+08 | 4213. | 1.66 | ACCEPTABLE |
| 170.0 | 2.708E+08 | 4098. | 1.61 | ACCEPTABLE |
| 175.0 | 2.612E+08 | 3951. | 1.55 | ACCEPTABLE |
| 180.0 | 2.476E+08 | 3746. | 1.47 | ACCEPTABLE |
| 185.0 | 2.425E+08 | 3669. | 1.44 | ACCEPTABLE |
| 190.0 | 2.356E+08 | 3565. | 1.40 | ACCEPTABLE |
| 195.0 | 2.373E+08 | 3591. | 1.41 | ACCEPTABLE |
| 200.0 | 2.477E+08 | 3748. | 1.47 | ACCEPTABLE |
| 205.0 | 2.574E+08 | 3894. | 1.53 | ACCEPTABLE |
| 210.0 | 2.651E+08 | 4012. | 1.58 | ACCEPTABLE |
| 215.0 | 2.709E+08 | 4098. | 1.61 | ACCEPTABLE |
| 220.0 | 2.745E+08 | 4154. | 1.63 | ACCEPTABLE |
| 225.0 | 2.802E+08 | 4239. | 1.67 | ACCEPTABLE |
| 230.0 | 2.925E+08 | 4426. | 1.74 | ACCEPTABLE |
| 235.0 | 3.027E+08 | 4580. | 1.80 | ACCEPTABLE |
| 240.0 | 3.106E+08 | 4699. | 1.85 | ACCEPTABLE |
| 245.0 | 3.161E+08 | 4782. | 1.88 | ACCEPTABLE |
| 250.0 | 3.192E+08 | 4829. | 1.90 | ACCEPTABLE |
| 255.0 | 3.198E+08 | 4839. | 1.90 | ACCEPTABLE |
| 260.0 | 3.185E+08 | 4820. | 1.90 | ACCEPTABLE |
| 265.0 | 3.221E+08 | 4873. | 1.92 | ACCEPTABLE |
| 270.0 | 3.226E+08 | 4881. | 1.92 | ACCEPTABLE |
| 275.0 | 3.206E+08 | 4851. | 1.91 | ACCEPTABLE |
| 280.0 | 3.162E+08 | 4784. | 1.88 | ACCEPTABLE |
| 285.0 | 3.094E+08 | 4681. | 1.84 | ACCEPTABLE |
| 290.0 | 3.002E+08 | 4542. | 1.79 | ACCEPTABLE |
| 295.0 | 2.888E+08 | 4369. | 1.72 | ACCEPTABLE |
| 300.0 | 2.760E+08 | 4176. | 1.64 | ACCEPTABLE |
| 305.0 | 2.710E+08 | 4100. | 1.61 | ACCEPTABLE |
| 310.0 | 2.752E+08 | 4164. | 1.64 | ACCEPTABLE |
| 315.0 | 2.799E+08 | 4235. | 1.67 | ACCEPTABLE |
| 320.0 | 2.841E+08 | 4299. | 1.69 | ACCEPTABLE |
| 325.0 | 2.873E+08 | 4348. | 1.71 | ACCEPTABLE |
| 330.0 | 2.882E+08 | 4360. | 1.71 | ACCEPTABLE |
| 335.0 | 2.868E+08 | 4340. | 1.71 | ACCEPTABLE |
| 340.0 | 2.832E+08 | 4286. | 1.69 | ACCEPTABLE |
| 345.0 | 2.775E+08 | 4199. | 1.65 | ACCEPTABLE |
| 350.0 | 2.697E+08 | 4080. | 1.60 | ACCEPTABLE |
| 355.0 | 2.598E+08 | 3931. | 1.55 | ACCEPTABLE |

PROJECT No. 10014-011
CALC. No. 9339-64-DQ
REV 0 DATE
PAGE 31.26 OF

ACCEPTABLE! MINIMUM SAFETY FACTOR = 1.40 AT 190.0 DEGREES.

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/03/1996

OBE: 27.00 months (19,710 hrs)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.27 OF

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 0. psi
Bending Stress, Pb = 1229. psi
Safety Factor, SF = 2.77
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.8 | 51.7 | .715 |
| 2 | 114.3 | 128.2 | .715 |
| 3 | 144.5 | 149.3 | .715 |
| 4 | 158.7 | 169.7 | .715 |
| 5 | 215.3 | 224.3 | .715 |
| 6 | 298.3 | 309.6 | .715 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 2.400E+08 | 3632. | 2.96 | ACCEPTABLE |
| 5.0 | 2.337E+08 | 3535. | 2.88 | ACCEPTABLE |
| 10.0 | 2.270E+08 | 3435. | 2.80 | ACCEPTABLE |
| 15.0 | 2.287E+08 | 3460. | 2.82 | ACCEPTABLE |
| 20.0 | 2.387E+08 | 3611. | 2.94 | ACCEPTABLE |
| 25.0 | 2.480E+08 | 3753. | 3.05 | ACCEPTABLE |
| 30.0 | 2.555E+08 | 3866. | 3.15 | ACCEPTABLE |
| 35.0 | 2.610E+08 | 3949. | 3.21 | ACCEPTABLE |
| 40.0 | 2.645E+08 | 4003. | 3.26 | ACCEPTABLE |
| 45.0 | 2.702E+08 | 4089. | 3.33 | ACCEPTABLE |
| 50.0 | 2.819E+08 | 4265. | 3.47 | ACCEPTABLE |
| 55.0 | 2.917E+08 | 4413. | 3.59 | ACCEPTABLE |
| 60.0 | 2.993E+08 | 4528. | 3.69 | ACCEPTABLE |
| 65.0 | 3.046E+08 | 4608. | 3.75 | ACCEPTABLE |
| 70.0 | 3.075E+08 | 4653. | 3.79 | ACCEPTABLE |
| 75.0 | 3.082E+08 | 4663. | 3.80 | ACCEPTABLE |
| 80.0 | 3.069E+08 | 4644. | 3.78 | ACCEPTABLE |
| 85.0 | 3.104E+08 | 4696. | 3.82 | ACCEPTABLE |
| 90.0 | 3.108E+08 | 4703. | 3.83 | ACCEPTABLE |
| 95.0 | 3.089E+08 | 4674. | 3.80 | ACCEPTABLE |
| 100.0 | 3.047E+08 | 4610. | 3.75 | ACCEPTABLE |
| 105.0 | 2.981E+08 | 4511. | 3.67 | ACCEPTABLE |
| 110.0 | 2.893E+08 | 4377. | 3.56 | ACCEPTABLE |
| 115.0 | 2.783E+08 | 4210. | 3.43 | ACCEPTABLE |
| 120.0 | 2.660E+08 | 4024. | 3.28 | ACCEPTABLE |
| 125.0 | 2.611E+08 | 3951. | 3.22 | ACCEPTABLE |
| 130.0 | 2.652E+08 | 4013. | 3.27 | ACCEPTABLE |
| 135.0 | 2.697E+08 | 4081. | 3.32 | ACCEPTABLE |
| 140.0 | 2.738E+08 | 4142. | 3.37 | ACCEPTABLE |
| 145.0 | 2.769E+08 | 4190. | 3.41 | ACCEPTABLE |
| 150.0 | 2.778E+08 | 4203. | 3.42 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 2.766E+08 | 4185. | 3.41 | ACCEPTABLE |
| 160.0 | 2.733E+08 | 4135. | 3.37 | ACCEPTABLE |
| 165.0 | 2.679E+08 | 4053. | 3.30 | ACCEPTABLE |
| 170.0 | 2.604E+08 | 3940. | 3.21 | ACCEPTABLE |
| 175.0 | 2.510E+08 | 3798. | 3.09 | ACCEPTABLE |
| 180.0 | 2.386E+08 | 3610. | 2.94 | ACCEPTABLE |
| 185.0 | 2.330E+08 | 3525. | 2.87 | ACCEPTABLE |
| 190.0 | 2.270E+08 | 3435. | 2.80 | ACCEPTABLE |
| 195.0 | 2.287E+08 | 3460. | 2.82 | ACCEPTABLE |
| 200.0 | 2.381E+08 | 3602. | 2.93 | ACCEPTABLE |
| 205.0 | 2.475E+08 | 3745. | 3.05 | ACCEPTABLE |
| 210.0 | 2.551E+08 | 3860. | 3.14 | ACCEPTABLE |
| 215.0 | 2.607E+08 | 3945. | 3.21 | ACCEPTABLE |
| 220.0 | 2.644E+08 | 4001. | 3.26 | ACCEPTABLE |
| 225.0 | 2.700E+08 | 4085. | 3.33 | ACCEPTABLE |
| 230.0 | 2.817E+08 | 4262. | 3.47 | ACCEPTABLE |
| 235.0 | 2.914E+08 | 4408. | 3.59 | ACCEPTABLE |
| 240.0 | 2.988E+08 | 4521. | 3.68 | ACCEPTABLE |
| 245.0 | 3.040E+08 | 4600. | 3.74 | ACCEPTABLE |
| 250.0 | 3.069E+08 | 4644. | 3.78 | ACCEPTABLE |
| 255.0 | 3.074E+08 | 4652. | 3.79 | ACCEPTABLE |
| 260.0 | 3.069E+08 | 4644. | 3.78 | ACCEPTABLE |
| 265.0 | 3.089E+08 | 4674. | 3.80 | ACCEPTABLE |
| 270.0 | 3.096E+08 | 4684. | 3.81 | ACCEPTABLE |
| 275.0 | 3.079E+08 | 4659. | 3.79 | ACCEPTABLE |
| 280.0 | 3.039E+08 | 4598. | 3.74 | ACCEPTABLE |
| 285.0 | 2.975E+08 | 4502. | 3.66 | ACCEPTABLE |
| 290.0 | 2.889E+08 | 4372. | 3.56 | ACCEPTABLE |
| 295.0 | 2.781E+08 | 4208. | 3.43 | ACCEPTABLE |
| 300.0 | 2.660E+08 | 4025. | 3.28 | ACCEPTABLE |
| 305.0 | 2.611E+08 | 3951. | 3.22 | ACCEPTABLE |
| 310.0 | 2.651E+08 | 4011. | 3.27 | ACCEPTABLE |
| 315.0 | 2.694E+08 | 4076. | 3.32 | ACCEPTABLE |
| 320.0 | 2.736E+08 | 4140. | 3.37 | ACCEPTABLE |
| 325.0 | 2.769E+08 | 4189. | 3.41 | ACCEPTABLE |
| 330.0 | 2.779E+08 | 4205. | 3.42 | ACCEPTABLE |
| 335.0 | 2.768E+08 | 4188. | 3.41 | ACCEPTABLE |
| 340.0 | 2.736E+08 | 4140. | 3.37 | ACCEPTABLE |
| 345.0 | 2.683E+08 | 4060. | 3.30 | ACCEPTABLE |
| 350.0 | 2.610E+08 | 3949. | 3.21 | ACCEPTABLE |
| 355.0 | 2.516E+08 | 3808. | 3.10 | ACCEPTABLE |

ACCEPTABLE! MINIMUM SAFETY FACTOR = 2.80 AT 190.0 DEGREES.

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV. 0 DATE
PAGE 31.28 OF

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/03/1996

SSE: 27.00 months (19,710 hrs)

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 0. psi
Bending Stress, Pb = 2457. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 7389-64-DQ
REV. 0 DATE
PAGE 31, 29 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 31.8 | 51.7 | .715 |
| 2 | 114.3 | 128.2 | .715 |
| 3 | 144.5 | 149.3 | .715 |
| 4 | 158.7 | 169.7 | .715 |
| 5 | 215.3 | 224.3 | .715 |
| 6 | 298.3 | 309.6 | .715 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 2.400E+08 | 3632. | 1.48 | ACCEPTABLE |
| 5.0 | 2.337E+08 | 3535. | 1.44 | ACCEPTABLE |
| 10.0 | 2.270E+08 | 3435. | 1.40 | ACCEPTABLE |
| 15.0 | 2.287E+08 | 3460. | 1.41 | ACCEPTABLE |
| 20.0 | 2.387E+08 | 3611. | 1.47 | ACCEPTABLE |
| 25.0 | 2.480E+08 | 3753. | 1.53 | ACCEPTABLE |
| 30.0 | 2.555E+08 | 3866. | 1.57 | ACCEPTABLE |
| 35.0 | 2.610E+08 | 3949. | 1.61 | ACCEPTABLE |
| 40.0 | 2.645E+08 | 4003. | 1.63 | ACCEPTABLE |
| 45.0 | 2.702E+08 | 4089. | 1.66 | ACCEPTABLE |
| 50.0 | 2.819E+08 | 4265. | 1.74 | ACCEPTABLE |
| 55.0 | 2.917E+08 | 4413. | 1.80 | ACCEPTABLE |
| 60.0 | 2.993E+08 | 4528. | 1.84 | ACCEPTABLE |
| 65.0 | 3.046E+08 | 4608. | 1.88 | ACCEPTABLE |
| 70.0 | 3.075E+08 | 4653. | 1.89 | ACCEPTABLE |
| 75.0 | 3.082E+08 | 4663. | 1.90 | ACCEPTABLE |
| 80.0 | 3.069E+08 | 4644. | 1.89 | ACCEPTABLE |
| 85.0 | 3.104E+08 | 4696. | 1.91 | ACCEPTABLE |
| 90.0 | 3.108E+08 | 4703. | 1.91 | ACCEPTABLE |
| 95.0 | 3.089E+08 | 4674. | 1.90 | ACCEPTABLE |
| 100.0 | 3.047E+08 | 4610. | 1.88 | ACCEPTABLE |
| 105.0 | 2.981E+08 | 4511. | 1.84 | ACCEPTABLE |
| 110.0 | 2.893E+08 | 4377. | 1.78 | ACCEPTABLE |
| 115.0 | 2.783E+08 | 4210. | 1.71 | ACCEPTABLE |
| 120.0 | 2.660E+08 | 4024. | 1.64 | ACCEPTABLE |
| 125.0 | 2.611E+08 | 3951. | 1.61 | ACCEPTABLE |
| 130.0 | 2.652E+08 | 4013. | 1.63 | ACCEPTABLE |
| 135.0 | 2.697E+08 | 4081. | 1.66 | ACCEPTABLE |
| 140.0 | 2.738E+08 | 4142. | 1.69 | ACCEPTABLE |
| 145.0 | 2.769E+08 | 4190. | 1.71 | ACCEPTABLE |
| 150.0 | 2.778E+08 | 4203. | 1.71 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 2.766E+08 | 4185. | 1.70 | ACCEPTABLE |
| 160.0 | 2.733E+08 | 4135. | 1.68 | ACCEPTABLE |
| 165.0 | 2.679E+08 | 4053. | 1.65 | ACCEPTABLE |
| 170.0 | 2.604E+08 | 3940. | 1.60 | ACCEPTABLE |
| 175.0 | 2.510E+08 | 3798. | 1.55 | ACCEPTABLE |
| 180.0 | 2.386E+08 | 3610. | 1.47 | ACCEPTABLE |
| 185.0 | 2.330E+08 | 3525. | 1.43 | ACCEPTABLE |
| 190.0 | 2.270E+08 | 3435. | 1.40 | ACCEPTABLE |
| 195.0 | 2.287E+08 | 3460. | 1.41 | ACCEPTABLE |
| 200.0 | 2.381E+08 | 3602. | 1.47 | ACCEPTABLE |
| 205.0 | 2.475E+08 | 3745. | 1.52 | ACCEPTABLE |
| 210.0 | 2.551E+08 | 3860. | 1.57 | ACCEPTABLE |
| 215.0 | 2.607E+08 | 3945. | 1.61 | ACCEPTABLE |
| 220.0 | 2.644E+08 | 4001. | 1.63 | ACCEPTABLE |
| 225.0 | 2.700E+08 | 4085. | 1.66 | ACCEPTABLE |
| 230.0 | 2.817E+08 | 4262. | 1.73 | ACCEPTABLE |
| 235.0 | 2.914E+08 | 4408. | 1.79 | ACCEPTABLE |
| 240.0 | 2.988E+08 | 4521. | 1.84 | ACCEPTABLE |
| 245.0 | 3.040E+08 | 4600. | 1.87 | ACCEPTABLE |
| 250.0 | 3.069E+08 | 4644. | 1.89 | ACCEPTABLE |
| 255.0 | 3.074E+08 | 4652. | 1.89 | ACCEPTABLE |
| 260.0 | 3.069E+08 | 4644. | 1.89 | ACCEPTABLE |
| 265.0 | 3.089E+08 | 4674. | 1.90 | ACCEPTABLE |
| 270.0 | 3.096E+08 | 4684. | 1.91 | ACCEPTABLE |
| 275.0 | 3.079E+08 | 4659. | 1.90 | ACCEPTABLE |
| 280.0 | 3.039E+08 | 4598. | 1.87 | ACCEPTABLE |
| 285.0 | 2.975E+08 | 4502. | 1.83 | ACCEPTABLE |
| 290.0 | 2.889E+08 | 4372. | 1.78 | ACCEPTABLE |
| 295.0 | 2.781E+08 | 4208. | 1.71 | ACCEPTABLE |
| 300.0 | 2.660E+08 | 4025. | 1.64 | ACCEPTABLE |
| 305.0 | 2.611E+08 | 3951. | 1.61 | ACCEPTABLE |
| 310.0 | 2.651E+08 | 4011. | 1.63 | ACCEPTABLE |
| 315.0 | 2.694E+08 | 4076. | 1.66 | ACCEPTABLE |
| 320.0 | 2.736E+08 | 4140. | 1.69 | ACCEPTABLE |
| 325.0 | 2.769E+08 | 4189. | 1.71 | ACCEPTABLE |
| 330.0 | 2.779E+08 | 4205. | 1.71 | ACCEPTABLE |
| 335.0 | 2.768E+08 | 4188. | 1.70 | ACCEPTABLE |
| 340.0 | 2.736E+08 | 4140. | 1.68 | ACCEPTABLE |
| 345.0 | 2.683E+08 | 4060. | 1.65 | ACCEPTABLE |
| 350.0 | 2.610E+08 | 3949. | 1.61 | ACCEPTABLE |
| 355.0 | 2.516E+08 | 3808. | 1.55 | ACCEPTABLE |

ACCEPTABLE! MINIMUM SAFETY FACTOR = 1.40 AT 190.0 DEGREES.

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.30 OF

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/03/1996

RRLOCA: 45.75 months (33,398 hrs)

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 0. psi
Bending Stress, Pb = 86. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV. 0 DATE
PAGE 31.3 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 32.1 | 51.4 | .030 |
| 2 | 114.6 | 127.8 | .030 |
| 3 | 144.9 | 149.0 | .030 |
| 4 | 159.1 | 169.4 | .030 |
| 5 | 215.6 | 224.0 | .030 |
| 6 | 298.6 | 309.3 | .030 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 9.334E+06 | 141. | 1.64 | ACCEPTABLE |
| 5.0 | 9.052E+06 | 137. | 1.59 | ACCEPTABLE |
| 10.0 | 8.801E+06 | 133. | 1.55 | ACCEPTABLE |
| 15.0 | 8.861E+06 | 134. | 1.56 | ACCEPTABLE |
| 20.0 | 9.235E+06 | 140. | 1.62 | ACCEPTABLE |
| 25.0 | 9.599E+06 | 145. | 1.69 | ACCEPTABLE |
| 30.0 | 9.889E+06 | 150. | 1.74 | ACCEPTABLE |
| 35.0 | 1.010E+07 | 153. | 1.77 | ACCEPTABLE |
| 40.0 | 1.024E+07 | 155. | 1.80 | ACCEPTABLE |
| 45.0 | 1.047E+07 | 158. | 1.84 | ACCEPTABLE |
| 50.0 | 1.096E+07 | 166. | 1.92 | ACCEPTABLE |
| 55.0 | 1.137E+07 | 172. | 2.00 | ACCEPTABLE |
| 60.0 | 1.169E+07 | 177. | 2.05 | ACCEPTABLE |
| 65.0 | 1.193E+07 | 181. | 2.09 | ACCEPTABLE |
| 70.0 | 1.208E+07 | 183. | 2.12 | ACCEPTABLE |
| 75.0 | 1.213E+07 | 184. | 2.13 | ACCEPTABLE |
| 80.0 | 1.213E+07 | 184. | 2.13 | ACCEPTABLE |
| 85.0 | 1.223E+07 | 185. | 2.15 | ACCEPTABLE |
| 90.0 | 1.224E+07 | 185. | 2.15 | ACCEPTABLE |
| 95.0 | 1.215E+07 | 184. | 2.13 | ACCEPTABLE |
| 100.0 | 1.198E+07 | 181. | 2.10 | ACCEPTABLE |
| 105.0 | 1.171E+07 | 177. | 2.06 | ACCEPTABLE |
| 110.0 | 1.135E+07 | 172. | 1.99 | ACCEPTABLE |
| 115.0 | 1.091E+07 | 165. | 1.92 | ACCEPTABLE |
| 120.0 | 1.042E+07 | 158. | 1.83 | ACCEPTABLE |
| 125.0 | 1.024E+07 | 155. | 1.80 | ACCEPTABLE |
| 130.0 | 1.044E+07 | 158. | 1.83 | ACCEPTABLE |
| 135.0 | 1.066E+07 | 161. | 1.87 | ACCEPTABLE |
| 140.0 | 1.083E+07 | 164. | 1.90 | ACCEPTABLE |
| 145.0 | 1.094E+07 | 166. | 1.92 | ACCEPTABLE |
| 150.0 | 1.096E+07 | 166. | 1.92 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 1.089E+07 | 165. | 1.91 | ACCEPTABLE |
| 160.0 | 1.074E+07 | 163. | 1.89 | ACCEPTABLE |
| 165.0 | 1.051E+07 | 159. | 1.85 | ACCEPTABLE |
| 170.0 | 1.020E+07 | 154. | 1.79 | ACCEPTABLE |
| 175.0 | 9.814E+06 | 148. | 1.72 | ACCEPTABLE |
| 180.0 | 9.334E+06 | 141. | 1.64 | ACCEPTABLE |
| 185.0 | 9.080E+06 | 137. | 1.59 | ACCEPTABLE |
| 190.0 | 8.801E+06 | 133. | 1.55 | ACCEPTABLE |
| 195.0 | 8.861E+06 | 134. | 1.56 | ACCEPTABLE |
| 200.0 | 9.259E+06 | 140. | 1.63 | ACCEPTABLE |
| 205.0 | 9.619E+06 | 146. | 1.69 | ACCEPTABLE |
| 210.0 | 9.905E+06 | 150. | 1.74 | ACCEPTABLE |
| 215.0 | 1.012E+07 | 153. | 1.78 | ACCEPTABLE |
| 220.0 | 1.025E+07 | 155. | 1.80 | ACCEPTABLE |
| 225.0 | 1.048E+07 | 159. | 1.84 | ACCEPTABLE |
| 230.0 | 1.097E+07 | 166. | 1.93 | ACCEPTABLE |
| 235.0 | 1.138E+07 | 172. | 2.00 | ACCEPTABLE |
| 240.0 | 1.171E+07 | 177. | 2.06 | ACCEPTABLE |
| 245.0 | 1.195E+07 | 181. | 2.10 | ACCEPTABLE |
| 250.0 | 1.210E+07 | 183. | 2.13 | ACCEPTABLE |
| 255.0 | 1.216E+07 | 184. | 2.14 | ACCEPTABLE |
| 260.0 | 1.213E+07 | 184. | 2.13 | ACCEPTABLE |
| 265.0 | 1.223E+07 | 185. | 2.15 | ACCEPTABLE |
| 270.0 | 1.224E+07 | 185. | 2.15 | ACCEPTABLE |
| 275.0 | 1.215E+07 | 184. | 2.13 | ACCEPTABLE |
| 280.0 | 1.198E+07 | 181. | 2.10 | ACCEPTABLE |
| 285.0 | 1.171E+07 | 177. | 2.06 | ACCEPTABLE |
| 290.0 | 1.135E+07 | 172. | 1.99 | ACCEPTABLE |
| 295.0 | 1.091E+07 | 165. | 1.92 | ACCEPTABLE |
| 300.0 | 1.042E+07 | 158. | 1.83 | ACCEPTABLE |
| 305.0 | 1.024E+07 | 155. | 1.80 | ACCEPTABLE |
| 310.0 | 1.044E+07 | 158. | 1.83 | ACCEPTABLE |
| 315.0 | 1.066E+07 | 161. | 1.87 | ACCEPTABLE |
| 320.0 | 1.084E+07 | 164. | 1.90 | ACCEPTABLE |
| 325.0 | 1.094E+07 | 166. | 1.92 | ACCEPTABLE |
| 330.0 | 1.095E+07 | 166. | 1.92 | ACCEPTABLE |
| 335.0 | 1.088E+07 | 165. | 1.91 | ACCEPTABLE |
| 340.0 | 1.073E+07 | 162. | 1.88 | ACCEPTABLE |
| 345.0 | 1.049E+07 | 159. | 1.84 | ACCEPTABLE |
| 350.0 | 1.018E+07 | 154. | 1.79 | ACCEPTABLE |
| 355.0 | 9.786E+06 | 148. | 1.72 | ACCEPTABLE |

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 0 DATE
PAGE 31.32 OF

ACCEPTABLE! MINIMUM SAFETY FACTOR = 1.55 AT 10.0 DEGREES.

DLL: DISTRIBUTED LIGAMENT LENGTH EVALUATION (REVISION: 10/07/94)
DATE OF THIS ANALYSIS: 09/03/1996

MSLOCA: 45.75 months (33,398 hrs)

SUMMARY OF INPUTS:
==========

Angle increment = .1 deg. (FINE)
Membrane Stress, Pm = 61. psi
Bending Stress, Pb = 0. psi
Safety Factor, SF = 1.39
Mean Radius, Rm = 102.56 inches
Wall Thickness, t = 2.000 inches
Material = 304 SS
Stress Intensity, Sm = 16900. psi
Fluence = 3.0E+16 n/cm^2
(Thus, LEFM evaluation not applicable)

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV. 0 DATE
PAGE 31-33 OF

| REGION | THETA1 [deg.] | THETA2 [deg.] | THICKNESS [inches] |
|---|---|---|---|
| 1 | 32.1 | 51.4 | .030 |
| 2 | 114.6 | 127.8 | .030 |
| 3 | 144.9 | 149.0 | .030 |
| 4 | 159.1 | 169.4 | .030 |
| 5 | 215.6 | 224.0 | .030 |
| 6 | 298.6 | 309.3 | .030 |

LIMIT LOAD RESULTS:
==========

| ALPHA [deg] | MOMENT [in-lbs] | Pb' [psi] | SAFETY FACTOR | RESULT |
|---|---|---|---|---|
| .0 | 4.224E+06 | 64. | 2.05 | ACCEPTABLE |
| 5.0 | 4.228E+06 | 64. | 2.05 | ACCEPTABLE |
| 10.0 | 4.341E+06 | 66. | 2.08 | ACCEPTABLE |
| 15.0 | 4.544E+06 | 69. | 2.13 | ACCEPTABLE |
| 20.0 | 4.851E+06 | 73. | 2.20 | ACCEPTABLE |
| 25.0 | 5.092E+06 | 77. | 2.26 | ACCEPTABLE |
| 30.0 | 5.295E+06 | 80. | 2.32 | ACCEPTABLE |
| 35.0 | 5.458E+06 | 83. | 2.36 | ACCEPTABLE |
| 40.0 | 5.578E+06 | 84. | 2.39 | ACCEPTABLE |
| 45.0 | 5.657E+06 | 86. | 2.41 | ACCEPTABLE |
| 50.0 | 5.719E+06 | 87. | 2.42 | ACCEPTABLE |
| 55.0 | 5.905E+06 | 89. | 2.47 | ACCEPTABLE |
| 60.0 | 6.189E+06 | 94. | 2.54 | ACCEPTABLE |
| 65.0 | 6.436E+06 | 97. | 2.60 | ACCEPTABLE |
| 70.0 | 6.633E+06 | 100. | 2.65 | ACCEPTABLE |
| 75.0 | 6.780E+06 | 103. | 2.68 | ACCEPTABLE |
| 80.0 | 6.837E+06 | 103. | 2.70 | ACCEPTABLE |
| 85.0 | 7.101E+06 | 107. | 2.76 | ACCEPTABLE |
| 90.0 | 7.363E+06 | 111. | 2.83 | ACCEPTABLE |
| 95.0 | 7.571E+06 | 115. | 2.88 | ACCEPTABLE |
| 100.0 | 7.991E+06 | 121. | 2.98 | ACCEPTABLE |
| 105.0 | 8.328E+06 | 126. | 3.07 | ACCEPTABLE |
| 110.0 | 8.609E+06 | 130. | 3.14 | ACCEPTABLE |
| 115.0 | 8.824E+06 | 134. | 3.19 | ACCEPTABLE |
| 120.0 | 8.972E+06 | 136. | 3.23 | ACCEPTABLE |
| 125.0 | 9.051E+06 | 137. | 3.25 | ACCEPTABLE |
| 130.0 | 9.062E+06 | 137. | 3.25 | ACCEPTABLE |
| 135.0 | 9.003E+06 | 136. | 3.24 | ACCEPTABLE |
| 140.0 | 8.846E+06 | 134. | 3.20 | ACCEPTABLE |
| 145.0 | 8.966E+06 | 136. | 3.23 | ACCEPTABLE |
| 150.0 | 9.501E+06 | 144. | 3.36 | ACCEPTABLE |

| | | | | |
|---|---|---|---|---|
| 155.0 | 1.006E+07 | 152. | 3.50 | ACCEPTABLE |
| 160.0 | 1.054E+07 | 160. | 3.62 | ACCEPTABLE |
| 165.0 | 1.095E+07 | 166. | 3.72 | ACCEPTABLE |
| 170.0 | 1.126E+07 | 170. | 3.80 | ACCEPTABLE |
| 175.0 | 1.149E+07 | 174. | 3.85 | ACCEPTABLE |
| 180.0 | 1.170E+07 | 177. | 3.91 | ACCEPTABLE |
| 185.0 | 1.181E+07 | 179. | 3.93 | ACCEPTABLE |
| 190.0 | 1.184E+07 | 179. | 3.94 | ACCEPTABLE |
| 195.0 | 1.178E+07 | 178. | 3.93 | ACCEPTABLE |
| 200.0 | 1.162E+07 | 176. | 3.89 | ACCEPTABLE |
| 205.0 | 1.138E+07 | 172. | 3.83 | ACCEPTABLE |
| 210.0 | 1.105E+07 | 167. | 3.75 | ACCEPTABLE |
| 215.0 | 1.065E+07 | 161. | 3.65 | ACCEPTABLE |
| 220.0 | 1.047E+07 | 158. | 3.60 | ACCEPTABLE |
| 225.0 | 1.059E+07 | 160. | 3.63 | ACCEPTABLE |
| 230.0 | 1.066E+07 | 161. | 3.65 | ACCEPTABLE |
| 235.0 | 1.065E+07 | 161. | 3.65 | ACCEPTABLE |
| 240.0 | 1.056E+07 | 160. | 3.62 | ACCEPTABLE |
| 245.0 | 1.039E+07 | 157. | 3.58 | ACCEPTABLE |
| 250.0 | 1.014E+07 | 153. | 3.52 | ACCEPTABLE |
| 255.0 | 9.814E+06 | 148. | 3.44 | ACCEPTABLE |
| 260.0 | 9.383E+06 | 142. | 3.33 | ACCEPTABLE |
| 265.0 | 9.165E+06 | 139. | 3.28 | ACCEPTABLE |
| 270.0 | 9.288E+06 | 141. | 3.31 | ACCEPTABLE |
| 275.0 | 9.470E+06 | 143. | 3.35 | ACCEPTABLE |
| 280.0 | 9.581E+06 | 145. | 3.38 | ACCEPTABLE |
| 285.0 | 9.618E+06 | 146. | 3.39 | ACCEPTABLE |
| 290.0 | 9.583E+06 | 145. | 3.38 | ACCEPTABLE |
| 295.0 | 9.474E+06 | 143. | 3.35 | ACCEPTABLE |
| 300.0 | 9.293E+06 | 141. | 3.31 | ACCEPTABLE |
| 305.0 | 9.042E+06 | 137. | 3.25 | ACCEPTABLE |
| 310.0 | 8.722E+06 | 132. | 3.17 | ACCEPTABLE |
| 315.0 | 8.346E+06 | 126. | 3.07 | ACCEPTABLE |
| 320.0 | 7.913E+06 | 120. | 2.97 | ACCEPTABLE |
| 325.0 | 7.420E+06 | 112. | 2.84 | ACCEPTABLE |
| 330.0 | 6.870E+06 | 104. | 2.71 | ACCEPTABLE |
| 335.0 | 6.267E+06 | 95. | 2.56 | ACCEPTABLE |
| 340.0 | 5.617E+06 | 85. | 2.40 | ACCEPTABLE |
| 345.0 | 4.890E+06 | 74. | 2.21 | ACCEPTABLE |
| 350.0 | 4.388E+06 | 66. | 2.09 | ACCEPTABLE |
| 355.0 | 4.171E+06 | 63. | 2.04 | ACCEPTABLE |

ACCEPTABLE! MINIMUM SAFETY FACTOR = 2.04 AT 355.0 DEGREES.

PROJECT No. 10014-011
CALC. No. 9389-64-DQ
REV 6 DATE
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