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ASEA BROWN BOVERI

August 31, 1992
LD-92-095

Docket No. 52-002

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: System 80+™ Distribution Systems Design Detail

Reference: ABB-CE Letter LD-92-038, CESSAR-DC Submittal Schedule Update, March 25, 1992

Dear Sir:

Based on meetings held with your staff on November 26, 1991, and February 26, 1992, ABB-CE committed (Reference) to providing a greater level of detail for the design of System 80+ distribution systems (piping, HVAC duct work, and electrical cable trays). This information is provided by Enclosures I, II, and III.

Enclosure I is an engineering report containing sample analyses for piping, HVAC duct work, electrical cable tray and pipe break and LBB evaluations for preliminary designs of piping systems. Enclosure II is a sample System 80+ piping analysis specification, to which the sample piping analyses of Enclosure I is compared. Enclosure III consists of piping Design Acceptance Criteria along with supporting documentation, namely the piping portions of the previously-transmitted draft Distribution Systems Design Guide and preliminary/sample piping analyses of the Enclosure I report.

The Design Acceptance Criteria will be resubmitted in a modified form when ABB-CE provides the complete System 80+ ITAAC package. This will allow us to take into account NRC comments on the pilot ITAAC package submitted August 10, 1992.

The LBB evaluations for the main coolant loop and main steam line are complete and are presented in Enclosures I and III. The LBB methodology for the surge line, shutdown cooling line

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and direct vessel injection line are also presented, but results are not expected until October 1992. ABB-CE requests a meeting with NRC staff for the last week of October to discuss those results as well as the analyses currently being transmitted.

If you have any questions or comments on the enclosed material, please contact me or Stan Ritterbusch at (203) 285-5206.

Very truly yours,

COMBUSTION ENGINEERING, INC.

C. B. Brinkman
Acting Director
Nuclear Systems Licensing

/lw

Enclosures: As Stated

cc: T. Wambach (NRC)
J. Trotter (EPRI)

ABSTRACT

This report provides detailed analyses and results of specific distribution systems (piping, HVAC ductwork and electric cable tray/conduit) applicable to the System 80+ design. Some analyses are for sample distribution systems; piping analyses and evaluations associated with leak-before-break (LBB) are for detailed preliminary piping routing and design. This report is intended to provide additional level of detail regarding distribution systems in order to demonstrate that the final distribution system designs will be in compliance with design acceptance criteria.

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PURPOSE

The purpose of this report is to provide detailed information pertaining to analysis and evaluation of System 80+ distribution systems (piping, HVAC ductwork and electrical cable tray) to demonstrate that the final distribution system designs will be in compliance with design acceptance criteria.

SCOPE

Detailed preliminary analyses and LBB evaluations of all System 80+ piping systems incorporating LBB are presented. Sample analyses and results for ASME Class 1 and Class 2/3 piping systems, postulated pipe breaks, HVAC ductwork and electrical cable trays are presented.

BACKGROUND

Following submittal of CESSAR-DC, the the NRC staff indicated that a greater level of detail pertaining to piping design was necessary for them to complete their certification review. The staff indicated that this level of detail was particularly necessary for leak-before-break (LBB) evaluations, which the staff was required by GDC-4 to review on a case-by-case basis.

Following initial review and comment of the CESSAR-DC submittal, meetings between the NRC staff and ABB-CE were held November 26, 1991 and February 26, 1992 to discuss level of detail for piping design and the use of design acceptance criteria (DAC). The meetings resulted in a committment by ABB-CE to provide the following additional level of detail to support the System 80+ certification effort:

- A Distribution Systems Design Guide.
- Design Acceptance Critaria (DAC) for piping design.
- Preliminary detailed routing, design and LBB evaluation of each System 80+ piping system incorporating LBB.
- A sample piping analysis specification for ASME Class 1 and Class 2/3 piping systems.
- Sample analyses demonstrating compliance with the guidelines of the design guide for ASME Class 1 and 2/3 piping, HVAC ductwork and electrical cable tray.
- A sample postulated pipe break analysis.

This report contains the preliminary detailed routing and design and LBB evaluations of the piping systems incorporating LBB and the

sample analyses of Class 1 and 2/3 piping, HVAC ductwork, electrical cable tray, and postulated pipe break. The Distribution Systems Design Guide and DAC are provided in separate documents.

DESCRIPTIONS

The sample analyses and LBB evaluations are contained in the appendices of this report. A brief description of these analyses and evaluations follow.

LEAK-BEFORE-BREAK EVALUATIONS

The System 80+ design incorporates leak-before-break LBB technology for five piping systems inside containment in order to eliminate the dynamic effects of postulated pipe break in those systems from the design basis. The five piping systems are:

1. Main Coolant Loop (hot leg and cold leg pipes)
2. Main Steam Line (main run inside containment)
3. Surge Line
4. Shutdown Cooling Line (main run inside containment)
5. Direct Vessel Injection (main run inside containment)

LBB evaluations have historically been performed on as-built piping systems, for which final detailed information on design, routing, components and material is available. The type of detail necessary to perform final LBB evaluations is not available at the design certification stage. In order to support the NRC staff's safety evaluation, an LBB evaluation is presented for the preliminary design of each piping system listed above. The evaluations utilize best presently available information and use methodologies described in the Distribution Systems Design Guide. The Design Guide, which is currently under review by the NRC staff, has been presented as a separate document.

Each LBB evaluation is performed on the preliminary routing and design of a specific piping system. To accomplish these piping-specific LBB evaluations, a range of acceptable piping design parameters is established for LBB for each piping system using methods described in the Design Guide, and response loads from preliminary piping analyses described below are compared to those acceptance criteria.

LBB acceptance criteria are established for each piping system in terms of curves for leakage crack length "a" and length "2a", relating the normal operation load which determines the leakage crack length to a corresponding maximum design load (eg., pipe load due to SSE or thermal stratification) necessary to maintain crack stability. By comparison of final calculated piping loads to the acceptance criteria, the final design of each piping system listed above is qualified for LBB. LBB methods generic to all piping systems incoroporating LBB are presented in Appendix E.

Routing, design and seismic analysis of the main coolant loop has previously been performed as part of the CESSAR-DC submittals, and this work is used to support the LBB of that piping system. Preliminary routing, design and analysis of the other four piping systems are presented in accordance with the guidelines and methodologies of the Design Guide. Specifically, the preliminary piping analyses and associated LBB evaluations presented are as follows:

Main Coolant Loop (MCL)

The System 80+ MCL has been designed and seismically analyzed for CESSAR-DC. Seismic piping loads on the MCL hot leg and cold leg piping are extracted from the seismic analysis results, and maximized Safe Shutdown Earthquake (SSE) loads are established for use in the LBB evaluation. Normal operation loads for the preliminary LBB evaluation of the System 80+ MCL are conservatively established from loads from prior ABB-CE reactor coolant system designs. The LBB evaluation of the MCL is presented in Appendix F.

Surge Line (SL)

Thermal and seismic interface movements and seismic response spectra at the hot leg and pressurizer surge nozzles and building supports are established from System 80+ analyses of the RCS, pressurizer and reactor building. The anchors are the hot leg and pressurizer nozzles.

Design parameters affecting critical thermal stratification are established. Routing and support definition of the surge line are presented in Appendix A. Gravity, thermal, seimsic and normal operation and critical thermal stratification analysis results are also presented in Appendix A. The LBB evaluation of the surge line is presented in Appendix G.

Main Steam Line (MSL)

Thermal and seismic interface movements and seismic response spectra at the steam generator nozzle and reactor building supports and penetration are established from System 80+ analyses of the RCS and reactor building. Routing and support definition of the MSL inside containment are presented in Appendix B. Gravity, thermal and seismic analysis results are presented in Appendix B, which also contains steam hammer analysis results. The LBB evaluation of the MSL is presented in Appendix H.

Shutdown Cooling Line (SC)

Thermal and seismic interface movements at the hot leg nozzle and reactor building anchors and supports are established from System 80+ analyses of the RCS and reactor building. Routing and support definition of the shutdown cooling line inside containment, from the hot leg nozzle to the first anchor, are presented in Appendix C. Gravity, thermal and seismic analyses results are also presented in Appendix C. LBB evaluation is not performed beyond the second normally closed valve of the shutdown cooling line, because that portion of the line is not pressurized and pipe breaks are not required to be postulated there. The LBB evaluation of the shutdown cooling line is presented in Appendix I.

Direct Vessel Injection (DVI)

Thermal and seismic interface movements and seismic response spectra at the reactor vessel nozzle and reactor building supports and anchors are established from System 80+ analyses of the RCS and building. Routing and support definition of the DVI line inside containment, from the reactor vessel nozzle to the first anchor, are presented in Appendix D. Gravity, thermal and seismic analyses results are also presented in Appendix D. The LBB evaluation of the DVI line is presented in Appendix J.

SAMPLE CALCULATIONS

SAMPLE ASME CLASS 1 PIPING ANALYSIS

For a selected Class 1 piping system, the results of a full piping analysis is presented in Appendix K, including analyses due to

gravity and thermal loads, seismic excitations and vibratory motion due to a pipe break in another piping system. The Class 1 piping system selected for the sample analysis is the System 80+ preliminary shutdown cooling line. Sample RCS response motions due to a feedwater economizer break from a prior ABB-CE design are used as input to this analysis. Demonstration of compliance of analytical results to sample analysis specification is presented. Sample analysis specifications for the Class 1 piping system are provided in a separate document.

SAMPLE ASME CLASS 2/3 PIPING ANALYSIS AND SAMPLE PIPE BREAK ANALYSIS

For a selected Class 2/3 piping system, the results of a full piping analysis is presented in Appendix L, including analyses due to gravity and thermal loads, seismic excitations and vibratory motion due to a pipe break. The Class 2/3 piping system selected for the sample analysis is the System 80+ preliminary feedwater economizer line.

Thermal and seismic interface movements and seismic response spectra at the steam generator nozzle and reactor building supports and anchors are established from System 80+ analyses of the RCS and reactor building. Routing, support definition and results of the gravity, thermal and seismic analyses of the feedwater economizer line are presented in Appendix L. Demonstration of compliance of analytical results to sample analysis specification is presented. A sample analysis specification for the Class 2/3 piping system is provided in a separate document.

In order to demonstrate how the System 80+ design mitigates the dynamic effects of postulated pipe breaks for piping systems where LBB is not incorporated, a sample pipe break analysis for pipe breaks in the feedwater economizer line is presented in Appendix L. Results of a postulated pipe break location analysis and the design criteria for possible jet shields and pipe whip restraints are also presented in Appendix L.

SAMPLE HVAC DUCTWORK ANALYSIS

A sample routing of HVAC ductwork, established using guidelines of the Distribution Systems Design Guide, is presented in Appendix M. Results of the sample gravity and seismic analyses are also presented in Appendix M. Appropriate thermal and seismic inputs to the analysis from System 80+ containment design analyses are utilized.

SAMPLE CABLE TRAY ANALYSIS

A sample routing of electrical cable tray, established using guidelines of the Distribution Systems Design Guide, is presented in Appendix N. Results of the sample gravity and seismic analyses are also presented in Appendix N. Appropriate thermal and seismic inputs to the analysis from System 80+ containment design analyses are utilized.

APPENDIX A

SURGE LINE

PRELIMINARY ROUTING AND LOADS ANALYSIS

APPENDIX A

SURGE LINE - PRELIMINARY ROUTING AND LOADS ANALYSIS

Purpose

This appendix reports the results of a preliminary stress analysis of the System 80+ surge line in the Reactor Building to provide applicable forces and moments for the Leak-Before-Break (LBB) evaluation. The piping included in the model is represented in the isometric sketch that follows. The analysis model originates at the hot leg nozzle and terminates at the Pressurizer nozzle. Anchors are modelled at these locations. All applicable design conditions, loadings, codes, and regulatory requirements are defined in the System 80+ Certification Program Draft Distribution Systems Design Guide, Reference 2.

The types of analysis results required for the LBB evaluation are shown on the following page. Other results in the detailed analysis include pipe displacements, stresses, support/restraint loads, and nozzle loads (anchor loads). Since the analysis is preliminary and design information is not available for allowable nozzle loads, it is not within the scope of the calculation to evaluate those loads.

A code compliance check is performed to verify that pipe stresses are within the ASME allowables for the pipe as modelled. As additional design information becomes available, it will be included in a final analysis.

Method

The piping is modelled as a three dimensional framework for analysis. Static analysis is performed by the Direct Stiffness Method and a simple Lumped Mass Idealization is used to determine mode shapes and frequencies for the dynamic analysis. This piping is analyzed using the SUPERPIPE computer program.

References and Design Inputs

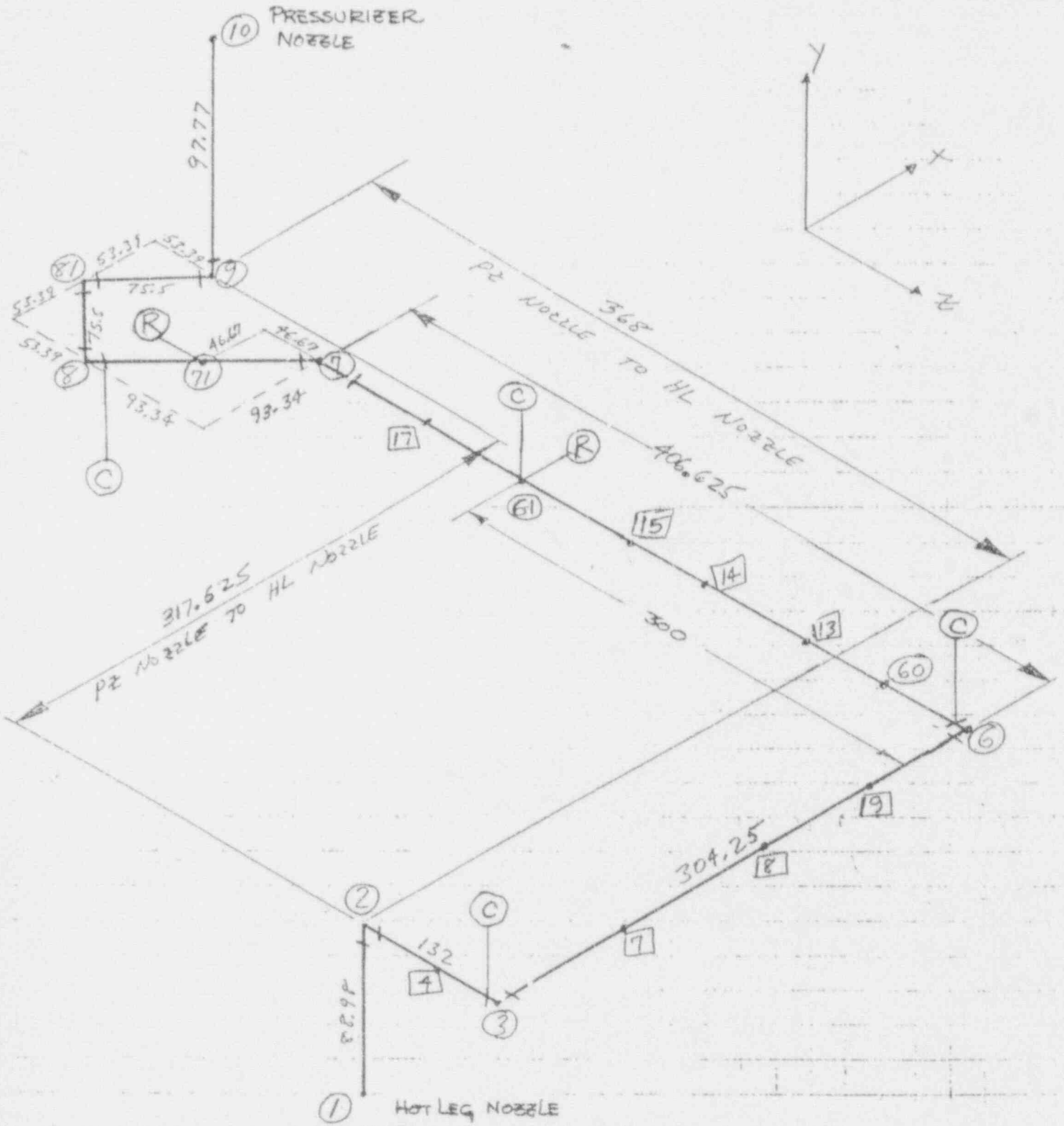
1. ASME Boiler and Pressure Vessel Code, Section III, 1989.
2. Draft Distribution Systems Design Guide.
3. ABB-CE Letter dated 4/21/92 to R.W. Bonsall enclosing Preliminary Thermal Movements and SSE Seismic Anchor Movements.
4. ABB-Impell memo dated 5/21/92 to ABB-CE, Attn: R.A. Matzie enclosing System 80+ N-411 Spectra and SAM.
5. System 80+ Nuclear Island Detailed Arrangement Drawings.
6. System 80+ Reactor Coolant System Piping and Instrumentation Diagram.

Results

Forces and moments results for the load cases listed below are provided for the Leak-Before-Break evaluation shown in Appendix G.

1. Gravity - Fluid-filled
2. Thermal Expansion - Uniform Temperature
3. Thermal Expansion - Stratified Flow (653°F top, 293°F bottom)
4. Thermal Expansion - Stratified Flow (480°F top, 120°F bottom)
5. Thermal Expansion - Stratified Flow (653°F top, 621°F bottom)
6. Gravity + Thermal - Uniform (1+2)
7. Gravity + Thermal - Stratified (1+3)
8. Gravity + Thermal - Stratified (1+4)
9. Gravity + Thermal - Stratified (1+5)
10. Seismic Inertia - SSE
11. Seismic Anchor Movement - SSE
12. Seismic Inertia + Seismic Anchor Movement

SYS80+ SURGE LINE



○ ___ DCP #

□ ___ SOP #

SUPPORT CODE: (C) CONSTANT-FORCE SPRING HANGER

(R) RIGID SWAY STRUT

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 1 (GRA1), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	2339.85	34.52	12.53	4180.22	-5449.33	-53847.95
	2L	2A	975.23	34.52	12.53	4180.22	-4558.51	-56301.67
	2R	2A	975.23	12.53	-34.52	4180.22	-56301.68	4558.51
	3	2B	-10.27	434.23	-34.52	56940.88	3265.30	-8285.59
	4		-15.08	-488.28	-34.52	56940.88	1606.52	-6987.08
	5L	3A	-19.89	-1410.79	-34.52	56940.88	-52.28	38636.10
	5R	3A	4.12	-51.17	-3195.69	56940.88	38635.85	-149.00
	6L	3B	48.34	1.29	-2652.84	14001.05	4305.15	697.89
	6R	3B	48.34	2652.81	-12.53	14001.05	-675.44	4308.73
	7		41.64	1365.21	-12.53	14001.05	-1515.99	-130422.77
	8		34.93	77.61	-12.53	14001.05	-2356.55	-178803.20
	9		28.22	-1210.00	-12.53	14001.05	-3197.10	-140831.86
	10L	6A	21.51	-2497.61	-12.53	14001.05	-4037.66	-16508.04
	10R	6A	21.51	0.49	2497.65	14001.05	-16486.76	4123.67
	11L	6B	-3.32	18.68	3049.49	-33354.70	63843.79	3727.65
	11R	6B	-20.46	2461.76	34.52	-33285.71	-4015.36	63862.35
	12L	60	-18.66	2327.35	34.52	-33285.71	-3773.65	47097.19
	12R	60	25.75	2327.28	34.52	-33351.66	-3137.79	47097.19
	13		18.26	1007.29	34.52	-33351.66	-764.26	-67530.05
	14		10.76	-312.71	34.52	-33351.66	1609.28	-91406.41
	15		3.26	-1632.71	34.52	-33351.66	3982.81	-24531.33
	16L	61	-4.24	-2952.72	34.52	-33351.66	6356.36	133095.97
	16R	61	25.15	2410.97	-24.23	-33354.49	6341.51	133095.97
	17		20.17	1458.95	-24.23	-33354.49	5139.83	37150.53
	18L	7A	15.19	506.92	-24.23	-33354.49	3938.14	-11588.58
	18R	7A	15.18	-25.34	-506.86	-33354.57	-11597.13	-3912.18
	19L	7B	27.23	-7.77	-235.44	-13428.51	-36509.41	-3669.72
	19R	73	27.23	235.42	-8.27	-13428.51	3591.36	-36517.20
	20L	71	21.35	-888.66	-8.27	-13428.51	3106.95	-17394.90
	20R	71	158.08	-889.37	128.45	-13428.51	3106.95	-17394.90
	21L	8A	153.26	-1811.01	128.45	-13428.51	9273.03	47417.96
	21R	8A	169.67	-135.31	1328.21	-13428.51	-47465.23	9027.99
	22L	8B	132.52	166.83	785.37	28443.15	5592.44	8409.91
	22R	8B	132.52	786.23	-152.73	28443.15	8439.02	-5548.40
	23L	81A	128.60	27.71	-162.73	28443.15	2010.25	-21626.48
	23R	81A	128.60	162.58	28.55	28443.15	21615.81	2121.93
	24L	81B	-165.38	125.80	-514.29	-17243.46	24072.02	-3119.21
	24R	81B	-165.38	-513.64	-128.45	-17243.46	-2994.84	-24087.81
	25L	9A	-169.31	-1273.93	-128.45	-17243.46	-8081.45	11305.22
	25R	9A	-169.31	1273.93	128.45	-17243.46	8081.45	-11305.22
	26L	9B	-1815.87	-162.73	128.45	-10470.61	-14889.37	-36048.43

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 1 (GRA1), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26R	9B	-1815.87	-24.23	205.89	-10470.61	-36018.47	-14961.72
	27		-2582.57	-24.23	205.89	-10470.61	-27796.64	-13993.97
	28	10	-3349.27	-24.23	205.89	-10470.61	-19574.79	-13026.23

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 2 (THMN). FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	516.14	7067.10	3998.82	1059415.25	-364544.44	574455.00
	2L	2A	516.14	7067.10	3998.82	1059415.25	-43870.22	7728.37
	2R	2A	516.14	3998.82	-7067.10	1059415.38	7728.39	43870.22
	3L	2B	-3996.07	536.98	-7067.10	140573.86	915914.75	-47770.09
	3R	2B	-3996.07	536.98	-7067.10	140573.84	915914.75	-47770.09
	4		-3996.07	536.98	-7067.10	140573.84	532790.75	-76880.87
	5L	3A	-3996.07	536.98	-7067.10	140573.84	149665.76	-105991.76
	5R	3A	-3996.07	-7069.80	-500.15	140573.84	-106769.99	-149111.17
	6L	3B	7069.69	-3996.26	-500.15	116931.37	130413.10	75627.72
	6R	3B	7069.69	479.32	-3998.82	116931.37	-74946.98	130805.51
	7		7069.69	479.32	-3998.82	116931.37	-377528.28	94536.53
	8		7069.69	479.32	-3998.82	116931.37	-680110.88	58267.39
	9		7069.69	479.32	-3998.82	116931.35	-982693.44	21998.26
	10L	6A	7069.69	479.32	-3998.82	116931.37	-1285277.25	-14271.02
	10R	6A	7069.69	-4001.26	-458.46	116931.37	-7570.03	1285334.25
	11L	6B	4001.45	7069.58	-458.46	16884.09	107620.01	1223020.00
	11R	6B	3991.54	569.69	7067.10	39638.52	-1221916.62	113989.74
	12L	60	3991.54	569.69	7067.10	39638.52	-1166009.25	109489.37
	12R	60	4001.68	493.42	7067.10	17379.35	-1166633.25	109489.37
	13		4001.68	493.42	7067.10	17379.35	-618427.62	71213.98
	14		4001.68	493.42	7067.10	17379.35	-70219.83	32938.43
	15		4001.68	493.42	7067.10	17379.35	477988.09	-5337.13
	16L	61	4001.68	493.42	7067.10	17379.35	1026197.75	-43612.81
	16R	61	4001.46	495.20	-5139.79	16922.46	1026205.44	-43612.81
	17		4001.46	495.20	-5139.79	16922.46	738649.56	-71317.91
	18L	7A	4001.46	495.20	-5139.79	16922.46	451092.66	-99023.11
	18R	7A	4001.45	-5140.85	-484.09	16912.94	-100005.69	-450876.19
	19L	7B	6464.58	-805.75	-484.09	85552.77	-65708.21	-400851.63
	19R	7B	6464.58	482.36	-806.79	85552.77	400709.69	-66568.30
	20L	71	6464.58	482.36	-806.79	85552.77	147414.88	-98431.88
	20R	71	6278.69	483.33	-992.68	85552.77	347414.88	-98431.88
	21L	8A	6278.69	483.33	-992.68	85552.77	293649.78	-124609.69
	21R	8A	6278.69	990.17	488.45	85552.77	123091.30	294289.50
	22L	8B	-990.00	6278.71	488.45	[illegible]8.83	95476.21	146666.86
	22R	8B	-990.00	521.26	-6276.08	[illegible]08.84	147163.91	-94708.27
	23L	81A	-990.00	521.26	-6276.08	-133008.84	-132595.50	-117943.84
	23R	81A	-990.00	6273.30	553.67	-133008.83	118627.12	-131984.55
	24L	81B	-6273.33	-989.84	553.67	-129875.11	-121760.92	-239285.58
	24R	81B	-6273.33	548.55	992.68	-129875.13	-239911.30	120523.38
	25L	9A	-6273.33	548.55	992.68	-129875.13	-195558.66	96014.29
	25R	9A	-6273.33	-548.55	-992.68	-129875.13	195558.66	-96014.29

SPC: SURGE LINE DWT/THER. ANS FOR LBB (1bb2)

LOAD CASE NO. 2 (THMN1), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SCP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	516.14	-6276.08	-992.68	-176170.25	-149023.78	41875.64
	26R	9B	516.14	-5139.79	3735.92	-176170.23	-77765.18	134986.28
	27		516.14	-5139.79	3735.92	-176170.22	92658.93	366562.31
	28	10	516.14	-5139.79	3735.92	-176170.23	260883.79	598139.31

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 3 (STRH), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	S.T MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	1676.80	3754.52	2694.87	574027.50	-1633913.88	1227809.38
	2L	2A	1676.80	3754.52	2694.87	574027.50	-1434207.88	949577.44
	2R	2A	1676.80	2694.87	-3754.52	593872.88	982406.38	1483791.38
	3L	2P	-2686.10	1690.82	-3754.52	-906776.94	526085.31	1399078.00
	3R	2B	-2686.10	1690.82	-3754.52	-906777.00	526085.44	1399078.00
	4		-2686.10	1690.82	-3754.52	-906777.00	331489.78	1311443.25
	5L	3A	-2686.10	1690.82	-3754.52	-906777.00	136893.30	1223808.25
	5R	3A	-2686.10	-3763.27	-1671.24	-906776.94	1223078.50	-143266.73
	6L	3B	3763.20	-2686.20	-1671.24	-1190653.75	-939193.87	-18041.94
	6R	3B	3763.20	1657.21	-2694.87	-1190653.75	13146.63	-939275.12
	7		3763.20	1657.21	-2694.87	-1190653.75	-181806.44	-1059161.62
	8		3763.20	1657.21	-2694.87	-1190653.75	-376760.28	-1179048.50
	9		3763.20	1657.21	-2694.87	-1190653.75	-571714.13	-1298935.38
	10L	6A	3763.20	1657.21	-2694.87	-1190653.75	-766668.75	-1418823.00
	10R	6A	3763.20	-2703.48	-1643.14	-1190653.75	-1414806.75	774055.44
	11L	6B	2703.58	3763.13	-1643.14	1446678.25	-1222596.75	753480.94
	11R	6B	2672.16	1712.77	3754.52	1460572.87	-732776.19	-1218655.00
	12L	60	2672.16	1712.77	3754.52	1460572.87	-704420.44	-1231590.63
	12R	60	2704.35	1661.46	3754.52	1446864.75	-732163.63	-1231590.63
	13		2704.35	1661.46	3754.52	1446864.75	-453719.91	-1354808.50
	14		2704.35	1661.46	3754.52	1446864.75	-175275.13	-1478027.13
	15		2704.35	1661.46	3754.52	1446864.75	103169.74	-1601245.50
	16L	61	2704.35	1661.46	3754.52	1446864.75	381615.47	-1724464.38
	16R	61	2703.61	1662.67	-1255.71	1446694.63	382259.66	-1724464.38
	17		2703.61	1662.67	-1255.71	1446694.63	315094.00	-1813397.50
	18L	7A	2703.61	1662.67	-1255.71	1446694.63	247928.16	-1902330.63
	18R	7A	2703.58	-1259.33	-1659.98	1446689.63	-1902866.13	-243813.62
	19L	7B	2802.21	1021.71	-1659.98	2377930.25	-345383.50	-241898.55
	19R	7B	2802.21	1662.17	1017.64	2377930.25	24,156.78	-345901.75
	20L	71	2802.21	1662.17	1017.64	2377930.25	305425.88	-450875.88
	20R	71	10129.22	1623.87	8344.76	2377930.25	305425.88	-450875.88
	21L	8A	10129.22	1623.87	8344.76	2377930.25	737526.69	-534961.81
	21R	8A	10129.22	-8353.03	1580.75	2377930.25	531145.19	740279.94
	22L	8B	8353.31	10129.00	1580.75	-561773.31	2408637.50	705797.31
	22R	8B	8353.31	1633.67	-10120.60	-561773.31	718377.75	-2404915.50
	23L	81A	8353.31	1633.67	-10120.60	-561773.31	287073.44	-2474536.75
	23R	81A	8353.31	10112.02	1685.92	-561773.25	2473020.75	299850.84
	24L	81B	-10111.80	8353.53	1685.92	-2505770.25	-528972.06	-58682.69
	24R	81B	-10111.80	1729.05	-8344.76	-2505770.25	-61414.09	528661.94
	25L	9A	-10111.80	1729.05	-8344.76	-2505770.25	-417868.72	454803.91
	25R	9A	-10111.80	-1729.05	8344.76	-2505770.50	417868.69	-454803.91

S80+ SURGE LINE DWT/THER,SEIS FOR LBB (1bb2)

LOAD CASE NO. 3 (STRH), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	1676.80	-10120.60	8344.76	-591997.56	-2341552.25	-225906.98
	26R	9B	1676.80	-1255.71	13056.98	-619211.25	-1898923.63	1564756.63
	27		1676.80	-1255.71	13056.98	-619211.19	-1310634.12	1621333.13
	28	10	1676.80	-1255.71	13056.98	-619211.25	-722342.06	1677910.13

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 4 (STRL), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	1539.43	1538.36	1439.87	2588i9.12	-1520214.88	1059396.00
	2L	2A	1539.43	1538.36	1439.87	2588:9.12	-1417149.50	949281.19
	2R	2A	1539.43	1439.87	-1538.36	268369.69	984310.06	1469443.00
	3L	2B	-1431.83	1546.91	-1538.36	-954131.94	244580.08	1413592.00
	3R	2B	-1431.83	1546.91	-1538.36	-954132.00	244580.09	1413592.00
	4		-1431.83	1546.91	-1538.36	-954131.94	167392.31	1335975.13
	5L	3A	-1431.83	1546.91	-1538.36	-954132.00	90204.24	1258358.00
	5R	3A	-1431.83	-1546.40	-1538.88	-954132.06	1257871.13	-96758.30
	6L	3B	1546.36	-1431.87	-1536.88	-1228971.37	-983024.31	-40777.21
	6R	3B	1546.36	1531.39	-1439.87	-1228971.37	35653.15	-983223.38
	7		1546.36	1531.39	-1439.87	-1228971.37	-65185.50	-1090471.50
	8		1546.36	1531.39	-1439.87	-1228971.37	-166024.56	-1197720.25
	9		1546.36	1531.39	-1439.87	-1228971.37	-266863.66	-1304968.75
	10L	6A	1546.36	1531.39	-1439.87	-1228971.37	-367703.09	-1412217.75
	10R	6A	1546.36	-1447.84	-1523.86	-1228971.37	-1410281.50	375060.69
	11L	6B	1447.88	1546.32	-1523.86	1438891.50	-1257653.75	373209.59
	11R	6B	1419.11	1558.59	1538.36	1445711.75	-352903.47	-1255692.63
	12L	60	1419.11	1558.59	1538.36	1445711.75	-341655.94	-1267088.00
	12R	60	1448.59	1531.22	1538.36	1438928.88	-369181.63	-1267088.00
	13		1448.59	1531.22	1538.36	1438929.00	-258734.92	-1377022.50
	14		1448.59	1531.22	1538.36	1438929.00	-148287.81	-1486957.50
	15		1448.59	1531.22	1538.36	1438928.88	-37840.67	-1596892.38
	16L	61	1448.59	1531.22	1538.36	1438928.88	72606.84	-1706827.75
	16R	61	1447.91	1531.87	281.94	1438896.50	73247.44	-1706827.75
	17		1447.91	1531.87	281.94	1438896.50	87846.55	-1786149.25
	18L	7A	1447.91	1531.87	281.94	1438896.50	102445.70	-1865471.25
	18R	7A	1447.88	278.60	-1532.51	1438894.38	-1865690.00	-98411.64
	19L	7B	826.82	1220.80	-1532.51	2345127.75	-322185.69	-110085.76
	19R	7B	826.82	1535.13	1217.50	2345127.50	109394.08	-322421.16
	20L	71	826.82	1535.13	1217.50	2345127.50	183831.05	-416277.22
	20R	71	7885.31	1498.23	8276.09	2345127.50	183831.05	-416277.22
	21L	8A	7885.31	1498.23	8276.09	2345127.50	598697.50	-491381.00
	21R	8A	7885.31	-8283.72	1455.46	2345127.75	486282.00	601227.63
	22L	8B	8283.93	7885.08	1455.46	-515576.34	2372499.25	608720.50
	22R	8B	8283.93	1496.66	-7877.37	-515576.47	621113.25	-2369285.00
	23L	81A	8283.93	1496.66	-7877.37	-515576.47	296123.00	-2431031.50
	23R	81A	8283.93	7869.53	1537.33	-515576.28	2429469.50	308675.50
	24L	81B	-7869.31	8284.14	1537.33	-2458379.50	-486614.50	5042.25
	24R	81B	-7869.31	1580.09	-8276.09	-2458379.75	2528.79	486634.00
	25L	9A	-7869.31	1580.09	-8276.09	-2458379.75	-339708.63	421293.09
	25R	9A	-7869.31	-1580.09	8276.09	-2458379.75	339708.53	-421293.09

S80+ SURCE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 4 (STRL), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	1539.43	-7877.37	8276.09	-507164.50	-2301028.25	-244436.58
	26R	9B	1539.43	281.94	11422.22	-524586.31	-1861744.75	1504184.50
	27		1539.43	281.94	11422.22	524586.31	-1369070.50	1492023.50
	28	10	1539.43	281.94	11422.22	-524586.31	-876394.25	1479862.63

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 5 (ST32), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	632.49	7009.73	4002.10	1053015.37	-493644.84	656482.06
	2L	2A	632.49	7009.73	4002.10	1053015.37	-172709.64	94320.65
	2R	2A	632.49	4002.10	-7009.73	1053015.50	94320.68	172709.64
	3L	2B	-3998.75	653.34	-7009.73	52799.23	911122.38	78670.52
	3R	2B	-3998.75	653.34	-7009.73	52799.22	911122.38	78670.52
	4		-3998.75	653.34	-7009.73	52799.22	531084.62	43299.53
	5L	3A	-3998.75	653.34	-7009.73	52799.22	151045.42	7928.42
	5R	3A	-3998.75	-7015.04	-616.81	52799.23	7141.46	-151084.69
	6L	3B	7012.93	-3998.94	-616.81	5368.71	40290.34	72564.14
	6R	3B	7012.93	595.96	-4002.10	5368.70	-72353.16	40668.01
	7		7012.93	595.96	-4002.10	5368.70	-375180.75	-4359.90
	8		7012.93	595.96	-4002.10	5368.70	-678009.63	-49388.00
	9		7012.93	595.96	-4002.10	5368	980838.44	-94416.10
	10L	6A	7012.93	595.96	-4002.10	5368	283658.52	-139444.37
	10R	6A	7012.93	-4005.15	-575.09	5368	-132750.08	1284378.13
	11L	6B	4005.34	7012.83	-575.09	144411.56	-6296.59	1223286.25
	11R	6B	3993.26	686.07	7009.73	167159.91	-1220402.00	76.07
	12L	60	3993.26	686.07	7009.73	167159.91	-1165024.38	-5336.65
	12R	60	4005.63	609.74	7009.73	145874.00	-1168012.63	-6215.65
	13		4005.63	609.74	7009.73	145874.00	-624256.63	-53514.45
	14		4005.63	609.74	7009.74	145874.00	-80498.72	-100813.43
	15		4005.63	609.74	7009.73	145874.00	463259.37	-148112.39
	16L	61	4005.63	609.74	7009.73	145874.00	1007019.19	-195411.55
	16R	61	4005.35	611.53	-4974.58	145425.64	1007084.06	-195411.55
	17		4005.35	611.53	-4974.58	145425.64	728771.13	-229624.72
	18L	7A	4005.35	611.53	-4974.58	145425.64	450457.25	-263837.97
	18R	7A	4005.34	-4975.90	-600.77	145416.11	-264818.72	-449884.44
	19L	7B	6350.69	-686.36	-600.77	293652.50	-93061.23	-402251.88
	19R	7B	6350.69	599.30	-687.65	293652.50	402051.22	-93924.25
	20L	71	6350.69	599.30	-687.65	293652.50	356626.56	-133512.70
	20R	71	6840.92	596.74	-197.41	293652.50	356626.56	-133512.70
	21L	8A	6840.92	596.74	-197.41	293652.50	345934.72	-165832.80
	21R	8A	6840.92	194.32	597.75	293652.47	164043.80	346786.69
	22L	8B	-194.14	6840.93	597.75	-176175.42	305796.81	203908.94
	22R	8B	-194.14	633.50	-6837.71	-176175.45	205504.56	-304726.78
	23L	81A	-194.14	633.50	-6837.71	-176175.45	-99290.01	-332965.28
	23R	81A	-194.14	6834.35	668.81	-176175.42	333473.63	-97568.89
	24L	81B	-6834.35	-193.95	668.81	-347061.03	-162583.47	-232427.58
	24R	81B	-6834.35	667.80	197.41	-347061.03	-233264.23	161380.81
	25L	9A	-6834.35	667.80	197.41	-347061.03	-224444.22	131543.97
	25R	9A	-6834.35	-667.80	-197.41	-347061.06	224444.20	-131543.97

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 5 (ST32), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	632.49	-6937.71	-197.41	-222245.36	-349906.25	20102.93
	26R	9B	632.49	-1974.58	4695.40	-222245.33	-233206.17	261636.02
	27		632.49	-4974.58	4695.40	-222245.31	-21652.14	485768.44
	28	10	632.49	-4974.58	4695.40	-222245.33	189902.83	709901.87

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 6 (THDW), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	2855.99	7101.62	4011.35	1063595.50	-369993.78	520607.06
	2L	2A	1491.38	7101.62	4011.35	1063595.50	-48428.73	-48573.30
	2R	2A	1491.38	4011.35	-7101.62	1063595.63	-48573.28	48428.73
	3L	2B	-4006.34	971.20	-7101.62	197514.73	919180.06	-56055.69
	3R	2B	-4006.34	971.20	-7101.62	197514.70	919180.06	-56055.69
	4		-4011.15	48.70	-7101.62	197514.70	534397.25	-83867.95
	5L	3A	-4015.96	-873.81	-7101.62	197514.70	149613.08	-67355.66
	5R	3A	-3991.95	-7120.97	-3695.84	197514.70	-68134.14	-149260.17
	6L	3B	7118.04	-3994.97	-3153.00	130932.42	134718.25	76325.61
	6R	3B	7118.04	3132.13	-4011.35	130932.42	-75622.41	135114.25
	7		7111.33	1844.53	-4011.35	130932.42	-379044.28	-35886.25
	8		7104.62	556.93	-4011.35	130932.42	-682467.44	-120535.81
	9		7097.91	-730.68	-4011.35	130932.41	-985890.50	-118833.60
	10L	6A	7091.20	-2018.29	-4011.35	130932.42	-1289314.88	-30779.06
	10R	6A	7091.20	-4000.77	2039.18	130932.42	-24056.79	1 9457.88
	11L	6B	3998.14	7088.27	2582.02	-16470.61	171463.81	1 46747.63
	11R	6B	3971.08	3031.46	7101.62	6352.81	-1225932.00	177852.09
	12L	60	3972.88	2897.04	7101.62	6352.81	-1169862.88	156586.56
	12R	60	4027.44	2820.70	7101.62	-15972.32	-1169771.13	156586.56
	13		4019.94	1500.71	7101.62	-15972.32	-619191.88	3683.93
	14		4012.44	180.71	7101.62	-15972.32	-68610.55	-58467.99
	15		4004.94	-1139.29	7101.62	-15972.32	481970.91	-29868.46
	16L	61	3997.45	-2459.30	7101.62	-15 [illegible] 2.32	1032554.06	89483.16
	16R	61	4026.62	2906.17	-5164.02	-1 [illegible] .02	1032547.00	89483.16
	17		4021.64	1954.15	-5164.02	-16432.03	743789.38	-34167.39
	18L	7A	4016.65	1002.12	-5164.02	-16432.02	455030.78	-110611.69
	18R	7A	4016.63	-5166.19	-990.95	-16441.63	-111602.77	-454788.38
	19L	7B	6491.81	-813.52	-719.53	72124.27	-102210.63	-404521.34
	19R	7B	6491.81	717.78	-815.06	72124.27	404301.06	-103085.50
	20L	71	6485.93	-406.30	-815.06	72124.27	350521.84	-115826.77
	20R	71	6436.77	-406.04	-864.23	72124.27	350521.84	-115826.77
	21L	8A	6431.95	-1327.68	-864.23	72124.27	302922.81	-77191.73
	21R	8A	6448.36	854.86	1816.69	72124.25	75626.07	303317.47
	22L	8B	-857.49	6445.55	1273.82	-104565.69	101068.65	155076.77
	22R	8B	-857.49	1307.49	-6438.80	-104565.70	155602.94	-100256.67
	23L	81A	-861.41	548.97	-6438.80	-104565.70	-130585.25	-139570.31
	23R	81A	-861.41	6435.88	582.22	-104565.69	140242.92	-129862.61
	24L	81B	-6438.71	-864.04	39.38	-147118.56	-97688.91	-242404.80
	24R	81B	-6438.71	34.91	864.23	-147118.58	-242906.14	96435.58
	25L	9A	-6442.63	-725.38	864.23	-147118.58	-203640.11	107319.50
	25R	9A	-6442.63	725.38	-864.23	-147118.58	203640.11	-107319.50

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 6 (THDW), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	-1299.73	-6438.80	-864.23	-186640.86	-163913.16	5827.20
	26R	9B	-1299.73	-5164.02	3941.82	-186640.84	-111783.65	120024.57
	27		-2066.47	-5164.02	3941.82	-186640.83	64762.29	352568.34
	28	10	-2833.13	-5164.02	3941.82	-186640.84	241309.00	585113.12

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 7 (SHDW), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	4016.64	3789.04	2707.41	578207.75	-1639363.13	1173961.37
	2L	2A	2652.03	3789.04	2707.41	578207.75	-1438766.38	893275.75
	2R	2A	2652.03	2707.41	-3789.04	598053.13	926104.69	1488349.88
	3L	2B	-2696.37	2125.05	-3789.04	-849836.06	529350.63	1190792.38
	3R	2B	-2696.37	2125.05	-3789.04	-849836.13	529350.75	1190792.38
	4		-2701.18	1202.54	-3789.04	-849836.13	333096.25	1304456.13
	5L	3A	-2705.98	280.03	-3789.04	-849836.13	136841.02	1262444.38
	5R	3A	-2681.97	-3814.15	-4866.92	-849836.06	1261714.38	-143415.73
	6L	3B	3811.54	-2684.91	-4324.08	-1176652.75	-934888.69	-17344.05
	6R	3B	3811.54	4310.03	-2707.41	-1176652.75	12471.19	-934966.44
	7		3804.84	3022.43	-2707.41	-1176652.75	-183322.44	-1189584.38
	8		3798.13	1734.82	-2707.41	-1176652.75	-379116.81	-1357851.63
	9		3791.42	447.21	-2707.41	-1176652.75	-574911.19	-1439767.38
	10L	6A	3784.71	-840.40	-2707.41	-1176652.75	-770706.44	-1435331.00
	10R	6A	3784.71	-2702.99	854.50	-1176652.75	-1431293.63	778179.06
	11L	6B	2700.26	3781.81	1397.35	1413323.50	-1158753.00	757208.62
	11R	6B	2651.69	4174.53	3789.04	1427287.13	-736791.56	-1154792.75
	12L	60	2653.49	4040.12	3789.04	1427287.13	-708194.00	-1184493.38
	12R	60	2730.11	3998.74	3789.04	1413513.00	-735301.38	-1184493.38
	13		2722.61	2628.75	3789.04	1413513.00	-454484.16	-1422338.50
	14		2715.11	1348.75	3789.04	1413513.00	-173665.84	-1569433.50
	15		2707.61	28.75	3789.04	1413513.00	107152.55	-1625776.88
	16L	61	2700.12	-1291.26	3789.04	1413513.00	387971.84	-1591368.38
	16R	61	2728.77	4073.64	-1279.94	1413340.13	388601.16	-1591368.38
	17		2723.79	3121.61	-1279.94	1413340.13	320233.81	-1776247.00
	18L	7A	2718.80	2169.58	-1279.94	1413340.13	251866.30	-1913919.25
	18R	7A	2718.76	-1284.67	-2166.85	1413335.00	-1914463.25	-247725.81
	19L	7B	2829.44	1013.44	-1895.42	2364501.75	-381892.94	-245568.27
	19R	7B	2829.44	1897.59	1009.37	2364501.75	244748.14	-382418.97
	20L	71	2823.56	773.52	1009.37	2364501.75	308532.84	-468270.78
	20R	71	10287.30	734.50	8473.21	2364501.75	308532.84	-468270.78
	21L	8A	10282.49	-187.14	8473.21	2364501.75	746799.69	-487543.81
	21R	8A	10298.90	-8488.35	2908.96	2364501.75	483680.00	749308.00
	22L	8B	8485.82	10295.83	2366.12	-533330.12	2414230.00	714207.19
	22R	8B	8485.82	2419.90	-10283.32	-533330.12	726816.75	-2410463.75
	23L	81A	8481.90	1661.38	-10283.32	-533330.12	289083.69	-2496163.25
	23R	81A	8481.91	10274.60	1714.47	-533330.06	2494636.50	301972.75
	24L	81B	-10277.18	8479.38	1171.63	-2523013.75	-504900.03	-51801.90
	24R	81B	-10277.18	1215.41	-8473.21	-2523013.75	-664408.93	504574.12
	25L	9A	-10281.11	455.12	-8473.21	-2523013.75	-425950.16	466109.09
	25R	9A	-10281.11	-455.12	8473.21	-2523014.00	-425950.13	-466109.09

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 7 (SHOW), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
(CONTD.)								
	26L	9B	-139.07	-10283.32	8473.21	-602469.13	-2356441.75	-261955.41
	26R	9B	-139.07	-1279.94	13262.87	-629681.81	-1934942.00	1549794.88
	27		-905.77	-1279.94	13262.87	-629681.75	-1338430.75	1607339.13
	28	10	-1672.48	-1279.94	13262.87	-629681.81	-741916.81	1664883.88

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1b62)

LOAD CASE NO. 8 (SLDW), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	3879.27	1572.88	1452.41	262999.34	-1525664.13	1005548.06
	2L	2A	2514.66	1572.88	1452.41	262999.34	-1421708.00	892979.50
	2R	2A	2514.66	1452.41	-1572.88	272549.91	925008.38	1474001.50
	3L	2B	-1442.10	1981.14	-1572.88	-897191.12	247845.37	1405306.38
	3R	2B	-1442.10	1981.14	-1572.88	-897191.19	247845.39	1405306.38
	4		-1446.91	1058.63	-1572.88	-897191.12	168998.84	1328988.00
	5L	3A	-1451.72	136.12	-1572.88	-897191.19	90151.96	1296994.13
	5R	3A	-1427.70	-1597.57	-4734.56	-897191.25	1296507.02	-96907.29
	6L	3B	1594.70	-1430.58	-4191.72	-1214970.38	-978719.13	-49079.32
	6R	3B	1594.70	4184.21	-1452.41	-1214970.25	34977.71	-978914.69
	7		1587.93	2896.60	-1452.41	-1214970.25	-66701.49	-1220894.25
	8		1581.29	2609.00	-1452.41	-1214970.25	-368381.12	-1376523.38
	9		1574.58	321.39	-1452.41	-1214970.25	-270060.75	-1445900.63
	10L	6A	1567.87	-966.22	-1452.41	-1214970.25	-371740.75	-1428725.88
	10R	6A	1567.87	-1447.35	973.78	-1214970.38	-1426768.25	279184.34
	11L	6B	1444.56	1565.00	1516.62	1405536.75	-1193810.00	376937.25
	11R	6B	1398.64	4020.35	1572.88	1412426.00	-356918.81	-1191830.38
	12L	60	1400.45	3885.94	1572.88	1412426.00	-345429.59	-1219990.88
	12R	60	1474.34	3858.51	1572.88	1405577.13	-372319.41	-1219990.88
	13		1466.85	2538.51	1572.88	1405577.25	-259499.17	-1444552.50
	14		1459.35	1218.51	1572.88	1405577.25	-146678.53	-1578363.88
	15		1451.85	-101.49	1572.88	1405577.13	-33857.85	-1621423.75
	16L	61	1444.35	-1421.49	1572.88	1405577.13	78963.20	-1573731.75
	16R	61	1473.06	3942.84	257.70	1405542.00	29558.95	-1573731.75
	17		1468.08	2990.81	257.70	1405542.00	92986.38	-1748998.75
	18L	7A	1463.10	2038.79	257.70	1405542.00	106382.84	-1877059.88
	18R	7A	1463.05	253.26	-2039.37	1405539.75	-1877287.13	-102323.82
	19L	7B	854.05	1213.03	-1767.95	2331699.25	-338695.13	-113755.47
	19R	7B	854.05	1770.55	1209.23	2331699.00	112985.45	-358938.34
	20L	71	848.17	646.47	1209.23	2331699.00	186938.00	-433672.13
	20R	71	8063.39	608.86	8404.54	2331699.00	186938.00	-433672.13
	21L	8A	8038.57	-312.78	8404.54	2331699.00	607970.50	-443963.03
	21R	8A	8054.98	-8419.03	2783.66	2331699.25	2408816.78	610255.63
	22L	8B	8416.45	8051.92	2240.83	-487133.22	2378091.75	617130.44
	22R	8B	8416.45	2282.89	-8040.09	-487133.34	629552.31	-2374833.25
	23L	81A	8412.53	1524.37	-8040.09	-487133.34	298133.25	-2452658.00
	23R	81A	8412.53	8032.11	1565.88	-487133.16	2451085.25	310797.44
	24L	81B	-8034.69	8409.94	1023.03	-2475622.75	-462542.47	1923.04
	24R	81B	-8034.69	1066.46	-8404.54	-2475623.00	-466.05	462546.22
	25L	9A	-8038.62	306.16	-8404.54	-2475623.00	-347790.06	432598.31
	25R	9A	-8038.62	-306.16	8404.54	-2475623.00	347789.97	-432599.31

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (1bb2)

LOAD CASE NO. 8 (SLDW), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	-276.44	-8040.09	8404.54	-517635.06	-2315917.75	-280485.03
	26R	9B	-276.44	257.70	11628.11	-535056.87	-1897763.13	1489222.75
	27		-1043.14	257.70	11628.11	-535056.87	-1396867.12	1478029.50
	28	10	-1809.85	257.70	11628.11	-535056.87	-895969.00	1466836.38

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD E NO. 9 (32DW), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	2972.33	7044.26	4014.63	1057195.50	-499094.19	602634.13
	2L	2A	1607.72	7044.26	4014.63	1057195.50	-177268.16	38018.98
	2R	2A	1607.72	4014.63	-7044.26	1057195.63	38019.00	177269.16
	3L	2B	-4009.02	1087.56	-7044.26	109740.10	914387.69	70384.92
	3R	2B	-4009.02	1087.56	-7044.26	109740.09	914387.69	70384.92
	4		-4013.82	165.06	-7044.26	109740.09	532691.13	36312.45
	5L	3A	-4018.63	-757.45	-7044.26	109740.09	150993.16	46564.52
	5R	3A	-3994.62	-7064.22	-3912.50	109740.10	45777.30	-151233.69
	6L	3B	7061.28	-3997.64	-3269.66	19369.76	44595.49	73262.03
	6R	3B	7061.28	3249.77	-4014.63	19369.75	-73028.60	44976.73
	7		7054.57	1954.17	-4014.63	19369.75	-376696.75	-134782.69
	8		7047.86	673.57	-4014.63	19369.75	-600366.19	-228191.20
	9		7041.16	-614.04	-4014.63	19369.73	-984035.50	-235247.95
	10L	6A	7034.45	-1901.65	-4014.63	19369.75	-1287706.13	-155952.42
	10R	6A	7034.45	-4004.66	1922.56	19369.75	-149236.84	1288501.88
	11L	6B	4002.02	7031.51	2465.40	111056.87	57547.21	1227013.88
	11R	6B	3972.80	3147.83	7044.26	133874.20	-1224417.38	63938.42
	12L	60	3974.60	3013.42	7044.26	133874.20	-1168799.13	41760.53
	12R	60	4031.38	2937.03	7044.26	112522.33	-1171150.38	40881.54
	13		4023.88	1617.03	7044.26	112522.33	-625020.94	-121044.49
	14		4016.38	297.03	7044.26	112522.33	-78889.45	-192219.84
	15		4008.89	-1022.97	7044.26	112522.33	467242.19	-172643.72
	16L	61	4001.39	-2342.97	7044.26	112522.33	1013375.56	-62315.58
	16R	61	4030.51	3022.50	-4998.81	112071.15	1013425.56	-62315.58
	17		4025.52	2070.47	-4998.81	112071.15	733910.94	-192474.20
	18L	7A	4020.54	1118.45	-4998.81	112071.15	454395.38	-275426.56
	18R	7A	4020.52	-5001.24	-1107.64	112061.53	-276415.87	-453796.59
	19L	7B	6377.92	-654.13	-836.21	280224.00	-129570.65	-405921.56
	19R	7B	6377.92	834.72	-695.92	280224.00	405642.56	-130441.45
	20L	71	6372.04	-289.36	-695.92	280224.00	359733.53	-150907.61
	20R	71	6999.00	-292.63	-68.95	280224.00	359733.53	-150907.61
	21L	8A	6994.18	-1214.27	-68.95	280224.00	355207.75	-118414.84
	21R	8A	7010.60	59.01	1925.96	280223.97	116578.57	355814.66
	22L	8B	-61.62	7007.76	1383.12	-147732.27	311389.25	212318.84
	22R	8B	-61.62	1419.73	-7000.44	-147732.30	213943.59	-310275.19
	23L	81A	-65.54	661.21	-7000.44	-147732.30	-97279.77	-354591.75
	23R	81A	-65.54	6996.93	697.36	-147732.27	355089.44	-95446.97
	24L	81B	-6999.73	-68.16	154.51	-364304.50	-138511.44	-235546.80
	24R	81B	-6999.73	154.16	68.95	-364304.50	-236259.08	137293.00
	25L	9A	-7003.66	-606.13	68.95	-364304.50	-232525.67	142849.20
	25R	9A	-7003.66	606.13	-68.95	-364304.53	234525.66	-142949.20

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 9 (32DW), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	-1183.38	-7000.44	-68.95	-232715.97	-364795.63	-15945.51
	26R	9B	-1183.38	-4998.81	4901.30	-232715.94	-269224.63	246674.30
	27		-1950.08	-4998.81	4901.30	-232715.92	-49468.78	471774.44
	28	10	-2716.79	-4998.81	4901.30	-232715.94	170328.05	696875.63

LOAD CASE NO. 10 (EQSI), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	17550.01	31297.49	24974.03	1778811.13	2369006.00	2471061.50
	2L	2A	17412.60	31139.75	24466.19	1778811.13	1821226.50	797998.06
	2R	2A	17332.72	23164.66	30721.71	1778811.13	797998.06	1821226.50
	3L	2B	23178.28	17315.45	30721.71	900455.00	1241216.50	1599864.13
	3R	2B	21278.15	16990.86	29760.21	900455.00	1241216.50	1599864.13
	4		21278.15	16990.86	29760.21	900454.94	375137.06	838672.19
	5L	3A	19045.29	15143.71	27330.54	900455.00	1557091.75	375202.19
	5R	3A	17450.53	24535.76	12434.03	900455.00	379308.53	1556863.88
	6L	3B	24536.04	17450.12	12434.03	403343.56	833945.81	1773333.13
	6R	3B	21312.03	9788.40	15670.02	403343.56	1771264.88	838316.00
	7		17149.22	6731.68	12178.99	403343.56	1272290.75	723619.06
	8		13129.11	4684.98	9916.68	403343.56	995352.63	748526.75
	9		9421.23	5317.94	11968.46	403343.53	675733.44	580008.75
	10L	6A	6577.10	7240.23	15539.09	403343.56	860741.69	299747.19
	10R	6A	5844.31	17088.67	7999.25	403343.56	301245.41	860466.50
	11L	6B	17088.64	5844.43	7999.25	289055.41	427179.72	1107262.25
	11R	6B	17639.68	8239.58	5886.04	284986.72	1108377.63	426352.06
	12L	60	17639.68	8239.58	5886.04	284986.72	1106776.50	444867.97
	12R	60	18666.27	8728.28	6453.82	289106.63	1104553.13	444867.97
	13		20726.76	8017.46	7159.12	289106.63	973190.56	796104.63
	14		22929.18	6646.33	9374.96	289106.63	773764.19	1155820.63
	15		25252.00	5961.03	12348.11	289106.63	7531.50	1347102.25
	16L	61	27785.62	6266.46	14477.63	289106.63	948.25	1346697.63
	16R	61	30368.95	6692.69	12421.68	289206.09	2020.38	1346697.63
	17		30368.95	6692.69	12421.68	289206.09	967428.25	1213566.75
	18L	7A	32864.47	7800.24	11348.07	289206.09	743198.69	963304.19
	18R	7A	34481.00	10948.89	9233.21	289206.09	963822.44	743312.62
	19L	7B	30933.68	18557.00	9231.21	585459.63	714796.63	659466.25
	19R	7B	32426.54	11569.06	19605.89	585459.63	659483.06	715213.00
	20L	71	32426.54	11569.06	19605.89	585459.63	878025.44	536323.06
	20R	71	11550.26	14558.96	9865.33	585459.63	878025.44	536323.06
	21L	8A	11550.28	14558.96	9865.33	585459.63	556109.44	953523.94
	21R	8A	13176.34	9968.31	16834.24	585459.63	953126.13	557051.75
	22L	8B	9968.06	13176.53	16834.24	1201089.38	290162.44	316657.59
	22R	8B	10342.73	19329.16	14610.99	1201089.38	316054.13	290991.84
	23L	81A	10342.73	19329.16	14610.99	1201089.38	480346.31	519742.56
	23R	81A	11148.50	15471.68	20924.77	1201089.38	518078.44	481448.81
	24L	81B	15471.96	11148.12	20924.77	890958.56	944102.44	549994.62
	24R	81B	16349.53	21958.28	12284.33	890958.56	550500.06	944820.19
	25L	9A	16349.53	21958.28	12284.33	890958.56	167830.22	858296.63
	25R	9A	17435.22	22227.05	13421.17	890958.56	167830.22	858296.63

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 10 (EQSI), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	22251.95	17419.51	13421.17	273002.34	797506.44	1029725.44
	26R	9B	22304.72	22743.24	6241.50	273002.34	538984.88	1186104.63
	27		22410.61	23258.53	6742.81	273002.31	497984.19	1514602.50
	28	10	22410.61	23258.53	6742.81	273002.34	582724.00	2214749.00

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 11 (STOT). FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	48.35	688.43	426.62	107082.54	41035.59	68340.48
	2L	2A	48.35	688.43	426.62	107082.54	12353.53	19591.96
	2R	2A	48.35	426.62	688.43	107082.54	19591.96	12353.53
	3	2B	426.61	50.08	688.43	16632.80	94806.09	7520.73
	4		426.61	50.08	688.43	16632.80	61848.74	8983.00
	5L	3A	426.61	50.08	688.43	16632.81	59443.72	10540.77
	5R	3A	426.61	688.40	47.86	16632.80	10681.08	59434.71
	6L	3B	688.38	426.63	47.86	11443.31	15833.45	62981.41
	6R	3B	688.38	46.20	426.62	11443.31	63017.84	15787.81
	7		688.38	46.20	426.62	11443.31	52058.46	12926.63
	8		688.38	46.20	426.62	11443.31	52832.92	10065.43
	9		688.38	46.20	426.62	11443.31	76963.51	7982.60
	10L	6A	688.38	46.20	426.62	11443.31	105574.67	8057.59
	10R	6A	688.38	426.61	44.54	11443.31	8525.95	105575.77
	11L	6B	426.63	688.37	44.54	8595.80	10748.28	100908.37
	11R	6B	426.56	52.78	688.43	7688.89	100899.64	11170.94
	12L	60	426.56	52.78	688.43	7688.89	96097.39	10867.34
	12R	60	426.63	46.48	688.43	8561.71	96113.22	10867.34
	13		426.63	46.48	688.43	8561.71	53130.67	9009.48
	14		426.63	46.48	688.43	8561.71	42977.21	7181.40
	15		426.63	46.48	688.43	8561.71	75335.93	6218.91
	16L	61	426.63	46.48	688.43	8561.71	107758.43	7877.10
	16R	61	426.63	46.62	633.90	8593.14	107758.88	7877.10
	17		426.63	46.62	633.90	8593.14	80159.73	9206.06
	18L	7A	426.63	46.62	633.90	8593.14	53737.86	10767.74
	18R	7A	426.63	633.84	46.12	8593.60	10828.08	53737.38
	19L	7B	746.61	463.11	46.12	9818.56	10764.30	46876.30
	19R	7B	746.61	46.27	463.04	9818.56	46878.59	10817.19
	20L	71	746.61	46.27	463.04	9818.56	30355.16	12909.39
	20R	71	735.74	45.63	912.76	9818.56	30355.16	12909.39
	21L	8A	735.74	45.63	912.76	9818.56	41433.90	14615.21
	21R	8A	735.74	912.88	44.98	9818.56	14497.64	41502.56
	22L	8B	912.89	735.74	44.98	15136.88	10152.55	46995.00
	22R	8B	912.89	47.90	735.70	15136.88	47035.96	9972.26
	23L	81A	912.89	47.90	735.70	15136.88	45628.81	10695.04
	23R	81A	912.89	735.65	51.02	15136.88	10500.51	45672.37
	24L	81B	735.65	912.89	51.02	10958.81	14384.72	30960.06
	24R	81B	735.65	51.22	912.76	10958.81	30956.06	14267.72
	25	9A	735.65	51.22	912.76	10958.81	29733.67	12612.71
	26L	9B	48.35	735.70	912.76	32877.81	14999.96	15867.44
	26R	9B	48.35	613.90	674.84	32877.81	16130.84	12515.26

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 11 (STOT). FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	27		48.35	633.90	674.84	32877.81	38989.33	36958.50
	29	10	48.35	633.90	674.84	32877.81	61939.52	62203.78

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 12 (EQSE), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1								
	1	1	17598.37	31985.91	25400.65	1885893.63	2410941.75	2539402.00
	2L	2A	17460.95	31828.17	24892.81	1885893.63	1833580.00	817590.00
	2R	2A	17381.07	23591.28	31410.13	1885893.63	817590.00	1833580.00
	3L	2B	23604.89	17365.53	31410.13	917087.81	1336022.75	1607384.88
	3R	2B	21704.76	17040.94	30448.64	917087.81	1336022.75	1607384.88
	4		21704.76	17040.94	30448.63	917087.75	436985.78	847855.19
	5L	3A	19471.90	15193.39	28018.95	917087.81	1616535.50	386742.94
	5R	3A	17877.14	25224.15	12481.89	917087.81	389989.63	1616298.63
	6L	3B	25224.43	17876.75	12481.89	414786.87	849779.25	1836314.63
	6R	3B	22000.42	9834.60	16096.64	414786.87	1834282.75	854103.75
	7		17837.52	5777.88	12605.61	414786.87	1324349.25	736545.69
	8		13617.49	4731.18	10343.30	414786.87	1048185.56	758592.19
	9		10109.61	5364.15	12395.09	414786.87	752696.94	587991.31
	10L	6A	7265.48	7286.43	15965.72	414786.87	966316.38	307804.78
	10R	6A	6532.70	17515.28	8043.79	414786.87	309771.34	966042.45
	11L	6B	17515.26	6532.80	8043.79	297651.22	437928.00	1208170.50
	11R	6B	18066.24	8292.36	6574.46	292675.59	1209477.38	437522.97
	12L	60	18066.24	8292.36	6574.46	292675.59	1201873.87	455735.31
	12R	60	19092.90	8774.75	7142.25	297668.34	1200666.25	455735.31
	13		21153.39	8065.94	7847.54	297668.34	1026321.19	805114.06
	14		23355.80	6692.81	10063.39	297668.34	716741.38	1163002.12
	15		25678.63	6007.51	13036.54	297668.34	662867.44	1353321.13
	16L	61	28212.25	6312.94	15166.05	297668.34	1349806.63	1354574.75
	16R	61	30795.59	6739.31	13055.59	297799.22	1349779.25	1354574.75
	17		30795.58	6739.31	13055.59	297799.22	947587.94	1222772.87
	18L	7A	33291.10	7846.37	11981.97	297799.22	796936.50	974071.94
	18R	7A	34907.63	11582.74	9277.33	297799.59	974650.50	797050.00
	19L	7B	31680.29	19020.11	9277.33	595278.13	725560.94	706342.50
	19R	7B	33173.15	11615.33	20068.94	595278.13	706361.69	726030.19
	20L	71	33173.15	11615.33	20068.94	595278.13	908380.63	549232.44
	20R	71	12286.02	14604.59	10778.09	595278.13	908380.63	549232.44
	21L	8A	12286.02	14604.59	10778.09	595278.13	597543.31	968139.19
	21R	9A	13912.08	10881.20	16879.22	595278.13	967623.69	598554.31
	22L	8B	10880.95	13912.27	16879.22	1216226.25	300315.00	363652.59
	22R	8B	11255.61	19377.06	15346.70	1216226.25	363090.09	300964.13
	23L	81A	11255.61	19377.06	15346.70	1216226.25	525975.12	530437.56
	23R	81A	12061.38	16207.33	20975.79	1216226.25	528578.94	527121.19
	24L	81B	16207.60	12061.00	20975.79	901917.38	958487.13	580954.69
	24R	81B	17085.18	22009.50	13197.09	901917.38	581456.13	959087.87
	25L	9A	17085.18	22009.50	13197.09	901917.38	197563.89	870909.38
	25R	9A	18170.87	22278.27	14333.94	901917.38	197563.89	870909.36

S80+ SURGE LINE DWT/THER/SEIS FOR LBB (lbb2)

LOAD CASE NO. 12 (EQSE), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.IN)	YY MOMENT (LB.IN)	ZZ MOMENT (LB.IN)
PRN1 (CONTD.)								
	26L	9B	22300.30	18155.21	14333.94	305880.16	812506.38	1045592.88
	26R	9B	22353.09	23377.15	6916.34	305880.16	555115.75	1198619.88
	27		22458.96	23892.43	7417.66	305880.13	536972.56	1551561.00
	28	10	22458.96	23892.43	7417.66	305880.16	644663.50	2276953.00

APPENDIX B

MAIN STEAM LINE

PRELIMINARY ROUTING AND LOADS ANALYSIS

APPENDIX B

MAIN STEAM LINE - PRELIMINARY ROUTING AND LOADS ANALYSIS

Purpose

This appendix reports the results of a preliminary stress analysis of a System 80+ Main Steam line in the Reactor Building to provide applicable forces and moments for the Leak-Before-Break (LBB) evaluation. The piping included in the model is represented in the isometric sketch that follows. The analysis model originates at the Steam Generator nozzle and terminates at the Reactor Building penetration. Anchors are modelled at these locations. The model also includes additional piping in the Main Steam Valve House, but only to evaluate thermal flexibility between effective anchors at the valve house walls. All applicable design conditions, loadings, codes, and regulatory requirements are defined in the System 80+ Certification Program Draft Distribution Systems Design Guide, Reference 2.

The types of analysis results required for the LBB evaluation are shown on the following page. Other results in the detailed analysis include pipe displacements, stresses, support/restraint loads, and nozzle loads (anchor loads). Since the analysis is preliminary and design information is not available for allowable nozzle or penetration loads, it is not within the scope of the calculation to evaluate those loads.

A code compliance check is performed to verify that pipe stresses are within the ASME allowables for the pipe as modelled. As additional design information becomes available, it will be included in a final analysis.

Method

The piping is modelled as a three dimensional framework for analysis. Static analysis is performed by the Direct Stiffness Method and a simple Lumped Mass Idealization is used to determine mode shapes and frequencies for the dynamic analysis. This piping is analyzed using the SUPERPIPE computer program.

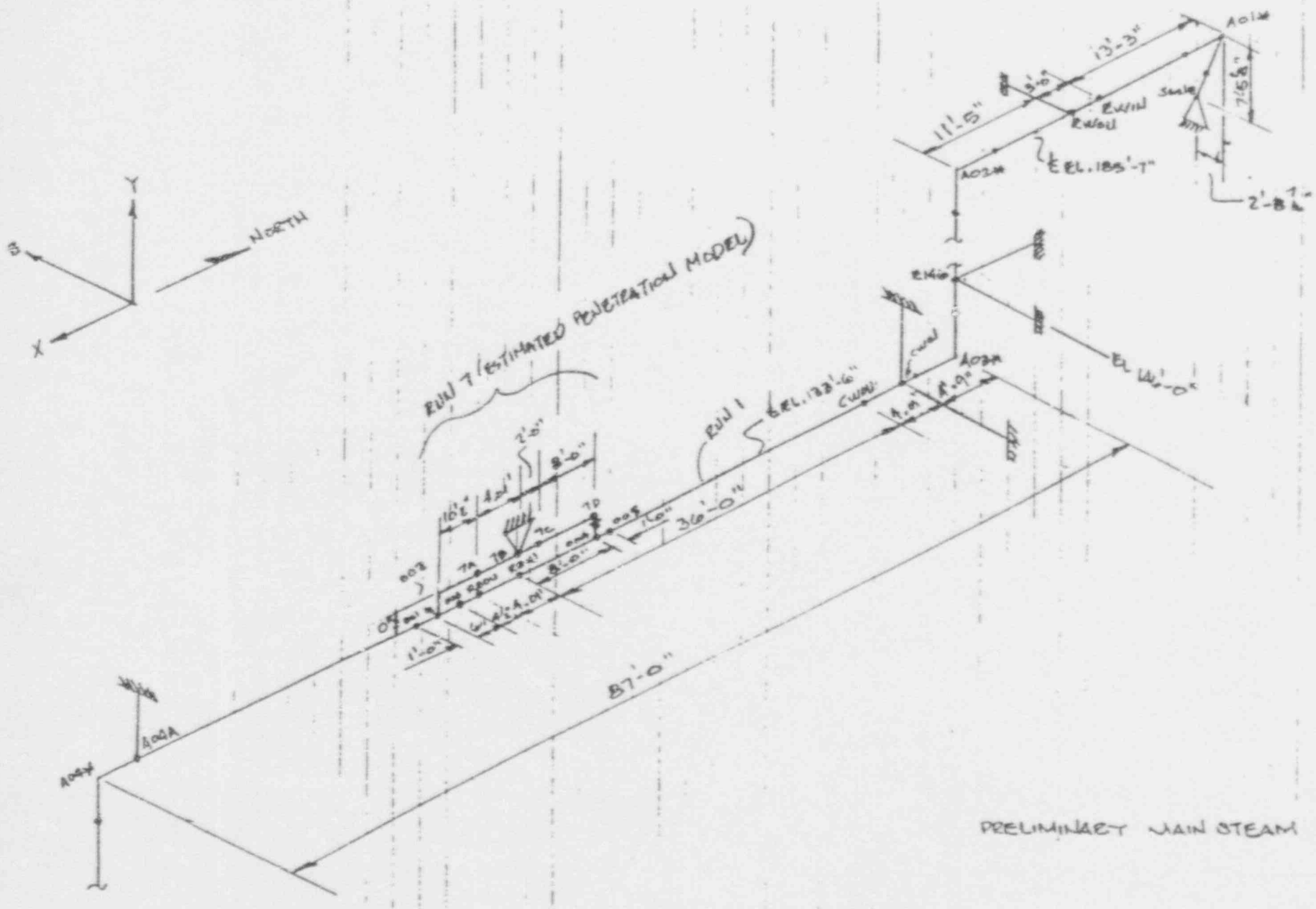
References and Design Inputs

1. ASME Boiler and Pressure Vessel Code, Section III, 1989.
2. Draft Distribution Systems Design Guide.
3. Consolidated Valve Drawing 3NC-046.
4. CESSAR Design Certification, Tables 10.1-1 and 10.3.2-1.
5. ABB-CE Letter dated 4/21/92 to R.W. Bonsall enclosing Preliminary Thermal Movements and SSE Seismic Anchor Movements.
6. ABB-Impell memo dated 5/21/92 to ABB-CE, Attn: R.A. Matzie enclosing System 80+ N-411 Spectra and SAM.
7. System 80+ Main Steam System Piping and Instrumentation Diagram.
8. System 80+ Nuclear Island Detailed Arrangement Drawings.

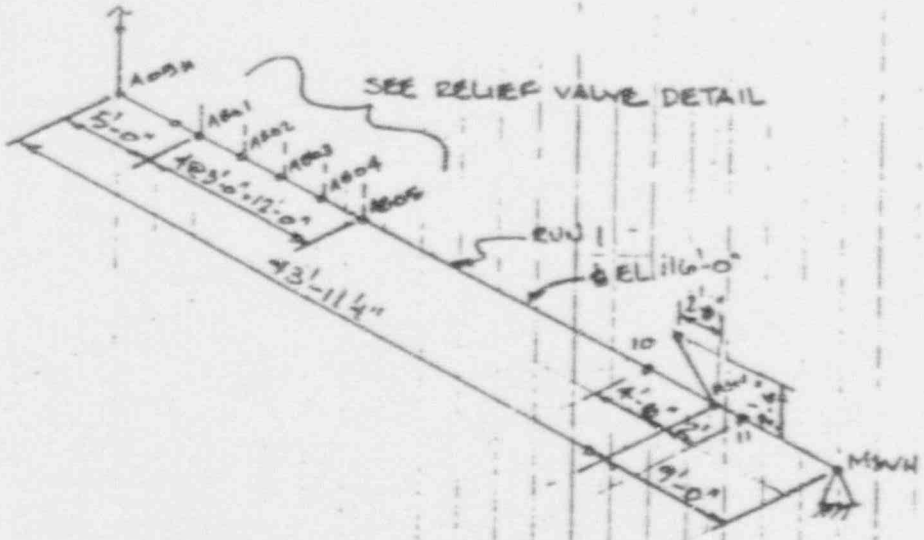
Results

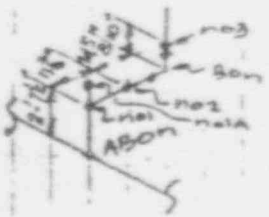
Forces and moments results for the load cases listed below are provided for the Leak-Before-Break evaluation shown in Appendix H.

1. Gravity - Fluid-filled for Hydrostatic Testing
2. Gravity - St am-filled
3. Thermal Expansion
4. Gravity Steam + Thermal (Normal Operation)
5. Seismic Inertia - SSE
6. Seismic Anchor Movement - SSE
7. Steam Hammer
8. Seismic Inertia + Seismic Anchor Movement



PRELIMINARY MAIN STEAM ANALYSIS





RELIEF VALVE DETAIL

RUNS 2-6 SIMILAR
(RUN n+1, n=1→5)

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

GRAVITY-HYDRO

:TATIC ANALYSIS NO. 1 (GR-H). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS

RUN NAME	SCP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)	B2M/Z (PSI)
RUN1												
	1H	SGNZ	AMTT	15334.27	5521.11	198.03	-11561.72	28468.98	30498.01	531.12	849.47	531.12
	1	SGNZ	STRP	15334.27	5521.11	198.03	-11561.72	28468.98	30498.01	531.12	531.12	531.12
	2L	A01A	STRP	12283.21	4410.70	198.03	-11561.72	29291.53	9871.76	404.87	404.87	404.87
	2H	A01A	AHBH	12283.21	4410.70	198.03	-11561.72	29291.53	9871.76	404.87	404.87	404.87
	2R	A01A	BELB	12283.21	-198.03	4410.70	-11561.72	-9871.77	29291.53	404.87	795.08	1148.44
	3L	A01B	BELB	198.03	7956.29	2835.95	-3715.70	2025.74	-7914.91	110.11	216.23	312.33
	3H	A01B	AHBH	198.03	7956.29	2835.95	-3715.70	2025.74	-7914.91	110.11	110.11	110.11
	3R	A01B	STRP	198.03	8446.42	-56.08	-3715.69	-803.29	-8130.45	110.11	110.11	110.11
	4	EHIN	STRP	198.03	1020.30	-56.08	-3715.69	-1336.09	-5397.34	653.20	653.20	653.20
	5L	EHOU	STRP	198.03	-1324.79	-56.08	-3715.69	-1504.35	-52640.61	647.67	647.67	647.67
	5R	EHOU	STRP	198.03	-1324.79	135.52	-3715.69	-1504.35	-52640.61	647.67	647.67	647.67
	6L	A02A	STRP	198.03	-7320.41	135.52	-3715.69	-464.95	-19486.27	243.43	243.43	243.43
	6H	A02A	AHBH	198.03	-7320.41	135.52	-3715.69	-464.95	-19486.27	243.43	243.43	243.43
	6R	A02A	BELB	198.03	-7320.41	135.52	-3715.70	-464.95	-19486.27	243.43	478.05	690.52
	7L	A02B	BELB	11924.98	198.03	135.52	-43.24	-3207	15856.22	198.47	389.75	562.96
	7H	A02B	AHBH	11924.98	198.03	135.52	-43.24	-320.	15856.22	198.47	198.47	198.47
	7R	A02B	STRP	11924.98	198.03	135.52	-43.24	-3207.51	15856.22	198.47	198.47	198.47
	8L	E146	STRP	39933.17	198.03	135.52	-43.24	1647.99	8760.74	109.36	109.36	109.36
	8R	E146	STRP	39933.17	8450.14	-83.20	-43.24	1647.99	8760.74	109.36	109.36	109.36
	9L	A03A	STRP	46773.03	8450.14	-83.20	-43.24	919.99	-65177.97	799.68	799.68	799.68
	9H	A03A	AHBH	46773.03	8450.14	-83.20	-43.24	919.99	-65177.97	799.68	799.68	799.68
	9R	A03A	BELB	46773.02	-8450.12	83.20	-43.24	-919.99	65177.97	799.68	1570.42	68.38
	10L	A03B	BELB	8450.15	51377.60	83.20	608.00	268.76	-87166.46	1069.39	2100.07	2033.43
	10H	A03B	AHBH	8450.15	51377.60	83.20	608.00	268.76	-87166.46	1069.39	1069.39	1069.39
	10R	A03B	STRP	8450.14	-51377.60	-83.20	608.00	-268.76	87166.46	1069.39	1069.39	1069.39
	11L	CHIN	STRP	8450.14	-52159.29	-83.20	608.00	-351.96	138934.92	1704.48	1704.48	1704.48
	11R	CHIN	STRP	8450.14	16336.66	-0.37	608.00	-351.96	138934.92	1704.48	1704.48	1704.48
	12	CHOU	STRP	8450.14	13202.05	-0.37	608.00	-353.45	79709.79	977.92	977.92	977.92
	13L	005	STRP	8450.14	-7903.76	-0.37	608.00	-363.48	8182.88	100.76	100.76	100.76
	13H	005	AHBH	8450.14	-7903.76	-0.37	608.00	-363.48	8182.88	100.76	100.76	100.76
	13R	005	STRP	8450.14	-7903.76	-0.37	608.00	-363.48	8182.88	100.76	100.76	100.76
	14L	004	STRP	8450.14	-8685.46	-0.37	608.00	-363.85	16477.50	202.33	202.33	202.33
	14R	004	STRP	8450.14	3266.85	-1328.72	608.00	-357.21	16537.26	203.06	203.06	203.06
	15	RBIN	STRP	8450.14	-2986.72	-1328.72	608.00	-10986.98	15416.73	232.37	232.37	232.37
	16	RBOU	STRP	8450.14	-6121.33	-1328.72	608.00	-16315.16	33678.37	459.16	459.16	459.16
	17L	003	STRP	8450.14	-6414.46	-1328.72	608.00	-16813.43	36028.81	487.82	487.82	487.82
	17H	003	AHBH	8450.14	-6414.46	-1328.72	608.00	-16813.43	36028.81	487.82	487.82	487.82
	17R	003	STRP	8450.14	-6414.46	-1328.72	608.00	-16813.43	36028.81	487.82	487.82	487.82
	18L	002	STRP	8450.14	-6805.31	-1328.72	608.00	-17477.79	39333.77	528.09	528.09	528.09

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

STATIC ANALYSIS NO. 1 (GR-N). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)	B2M/Z (PSI)
RUN1 (CONTD.)												
	18R	002	STRP	-1074.20	11133.90	2634.42	21576.95	-74499.97	45163.52	1101.09	1101.09	1101.09
	19L	001	STRP	-1074.20	10352.20	2634.42	21576.95	-71865.53	34420.46	1012.76	1012.76	1012.76
	19M	001	AMBM	-1074.20	10352.20	2634.42	21576.95	-71865.53	34420.46	1012.76	1012.76	1012.76
	19R	001	STRP	-1074.20	10352.20	2634.42	21576.95	-71865.53	34420.46	1012.76	1012.76	1012.76
	20L	A04A	STRP	-1074.20	-15135.02	2634.42	21576.95	14029.88	112392.41	1414.52	1414.52	1414.52
	20M	A04A	AMBM	-1074.20	-15135.02	2634.42	21576.95	14029.88	112392.41	1414.52	1414.52	1414.52
	20R	A04A	BELB	-1074.21	39632.35	2634.42	21576.94	14029.87	112392.41	1414.52	2777.84	4012.42
	21L	A04B	BELB	-35027.78	-1074.20	2634.42	-23908.96	31456.04	-23567.12	564.40	1108.37	1600.97
	21M	A04B	AMBM	-35027.78	-1074.20	2634.42	-23908.96	31456.04	-23567.12	564.40	564.40	564.40
	21R	A04B	STRP	-35027.77	-1074.20	2634.42	-23908.96	31456.04	-23567.12	564.40	564.40	564.40
	22L	A05A	STRP	-27210.65	-1074.20	2634.42	-23908.96	57800.85	-12824.93	783.34	783.34	783.34
	22M	A05A	AMBM	-27210.65	-1074.20	2634.42	-23908.96	57800.85	-12824.93	783.34	783.34	783.34
	22R	A05A	BELB	-27210.64	2634.41	1074.20	-23908.96	-12824.93	-57800.85	783.34	1538.32	2222.00
	23L	A05B	BELB	-2635.71	-22606.09	1074.20	8795.55	-19881.46	25721.44	413.17	811.38	1171.98
	23M	A05B	AMBM	-2635.71	-22606.09	1074.20	8795.55	-19881.46	25721.44	413.17	413.17	413.17
	23R	A05B	STRP	-2630.58	22606.68	-1074.20	8800.06	19879.46	-25721.44	413.17	413.17	413.17
	24L	AB01	STRP	-2630.75	21629.40	-1074.20	8800.06	18536.49	-53373.69	701.51	701.51	701.51
	24R	AB01	STRP	-2634.42	19715.06	-1074.20	8454.54	18537.99	-53373.69	700.88	700.88	700.88
	25L	AB02	STRP	-2634.42	17369.97	-1074.20	8454.54	15315.39	-109001.28	1354.34	1354.34	1354.34
	25R	AB02	STRP	-2634.42	15456.09	-1074.20	8112.17	15715.39	-109001.28	1354.03	1354.03	1354.03
	26L	AB03	STRP	-2634.42	13111.00	-1074.20	8112.17	12092.80	-151551.91	1871.47	1871.47	1871.47
	26R	AB03	STRP	-2634.42	11197.12	-1074.20	7769.80	12092.80	-151851.91	1871.25	1871.25	1871.25
	27L	AB04	STRP	-2634.42	8852.02	-1074.20	7769.80	8870.21	-181925.62	2236.55	2236.55	2236.55
	27R	AB0	STRP	-2634.42	6938.14	-1074.20	7427.43	8870.21	-181925.62	2236.37	2236.37	2236.37
	28L	AB05	STRP	-2634.42	4593.05	-1074.20	7427.43	5647.61	-199222.40	2446.74	2446.74	2446.74
	28R	AB05	STRP	-2634.78	2678.81	-1074.20	7084.50	5648.56	-199222.40	2446.59	2446.59	2446.59
	29L	10	STRP	-2632.44	-14860.12	-1074.20	7084.30	-18453.21	-62566.31	804.96	804.96	804.96
	29M	10	AMTT	-2632.44	-14860.12	-1074.20	7084.30	-18453.21	-62566.31	804.96	1287.45	804.96
	29R	10	VALV	-2634.42	-14859.77	-1074.20	7081.83	-18454.16	-62566.31	N/A		
	30	MSIV	VALV	-2634.42	-16790.25	-1074.20	7081.83	-23288.65	8646.25	N/A		
	[illegible]	11	VALV	-2634.42	-46415.00	-1074.20	7081.83	-25436.43	170639.19	N/A		
	[illegible]	11	AMTT	-2634.42	-46415.00	-1074.20	7081.83	-25436.43	170639.19	2118.32	3388.04	2118.32
	31R	11	STRP	-2634.42	-46415.00	-1074.20	7081.83	-25436.43	170639.19	2118.32	2118.32	2118.32
	32	MSVH	STRP	-2634.42	-51886.87	-1074.20	7081.83	-32955.82	514695.71	6327.82	6327.82	6327.82

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

GRAVITY - STEAM

TATIC ANALYSIS NO. 2 (GR-S). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)	B.M/Z (PSI)
RUN1												
	1M	SGNZ	AHTT	1009[illegible] 68	3536.79	131.67	-7608.82	18732.98	20088.78	349.67	559.26	349.67
	1	SGNZ	STRP	10095.68	3636.29	131.67	-7608.82	18732.98	20088.78	349.67	349.67	349.67
	2L	A01A	STRP	8039.97	2904.87	131.67	-7608.82	19279.89	6504.18	266.50	266.50	266.50
	2M	A01A	AHBM	8089.97	2904.87	131.67	-7608.82	19279.89	6504.18	266.50	266.50	266.50
	2R	A01A	BELB	8089.97	-131.67	2904.87	-7608.82	-6504.19	19279.89	266.50	523.36	755.97
	3L	A01B	BELB	131.67	5239.86	1867.59	-2444.18	1339.54	-5219.77	72.59	142.55	205.92
	3M	A01B	AHBM	131.67	5239.86	1867.59	-2444.18	1339.54	-5219.77	72.59	72.59	72.59
	3R	A01B	STRP	131.67	5562.61	-37.04	-2444.18	-526.38	-5363.14	72.59	72.59	72.59
	4	CHIN	STRP	131.67	671.08	-37.04	-2444.18	-878.23	-34973.15	430.23	430.23	430.23
	5L	CHOU	STRP	131.67	-873.61	-37.04	-2444.18	-989.34	-34669.36	426.55	426.55	426.55
	5R	CHOU	STRP	131.67	-873.61	89.64	-2444.18	-989.34	-34669.36	426.55	426.55	426.55
	6L	A02A	STRP	131.67	-4822.88	88.64	-2444.18	-309.46	-12823.29	160.19	160.19	160.19
	6M	A02A	AHBM	131.67	-4822.88	88.64	-2444.18	-309.46	-12823.29	160.19	160.19	160.19
	6R	A02A	BELB	131.67	-4822.88	88.64	-2444.18	-309.46	-12823.29	160.19	314.59	454.40
	7L	A02B	BELB	7855.88	131.67	88.64	-22.94	-2111.77	10455.61	130.86	256.98	371.20
	7M	A02B	AHBM	7855.88	131.67	88.64	-22.94	-2111.77	10455.61	130.86	130.86	130.86
	7R	A02B	STRP	7855.88	131.67	88.64	-22.94	-2111.77	10455.61	130.86	130.86	130.86
	8L	E146	STRP	26304.67	131.67	88.64	-22.94	1064.25	5737.79	71.59	71.59	71.59
	8R	E146	STRP	26304.67	5553.26	-45.91	-22.94	1064.25	5737.79	71.59	71.59	71.59
	9L	A03A	STRP	30810.03	5553.26	-45.91	-22.94	662.51	-42853.24	525.79	525.79	525.79
	9M	A03A	AHBM	30810.03	5553.26	-45.91	-22.94	662.51	-42853.24	525.79	525.79	525.79
	9R	A03A	BELB	30810.02	-5553.26	45.91	-22.94	-662.51	42853.24	525.79	1032.54	1491.44
	10L	A03B	BELB	5553.27	33843.02	45.91	490.33	149.23	-57546.52	706.01	1386.46	2002.66
	10M	A03B	AHBM	5553.27	33843.02	45.91	490.33	149.23	-57546.52	706.01	706.01	706.01
	10R	A03B	STRP	5553.26	-33843.02	-45.91	490.33	-149.23	57546.52	706.01	706.01	706.01
	11L	CHIN	STRP	5553.26	-34357.93	-45.91	490.33	-195.14	91647.01	1124.35	1124.35	1124.35
	11R	CHIN	STRP	5553.26	10782.41	-3.75	490.33	-195.14	91647.01	1124.35	1124.35	1124.35
	12	CHOU	STRP	5553.26	8717.67	-3.75	490.33	-210.19	52549.34	644.71	644.71	644.71
	13L	005	STRP	5553.26	-5184.58	-3.75	490.33	-311.48	4852.62	59.96	59.96	59.96
	13M	005	AHBM	5553.26	-5184.58	-3.75	490.33	-311.48	4852.62	59.96	59.96	59.96
	13R	005	STRP	5553.26	-5184.58	-3.75	490.33	-311.48	4852.62	59.96	59.96	59.96
	14L	004	STRP	5553.26	-5699.47	-3.75	490.33	-315.23	10294.65	126.50	126.50	126.50
	14R	004	STRP	5553.26	2099.80	-1057.02	490.33	-309.96	10333.64	126.97	126.97	126.97
	15	RBIN	STRP	5553.26	-2019.39	-1057.02	490.33	-8766.12	10012.00	163.37	163.37	163.37
	16	RBOU	STRP	5553.26	-4084.13	-1057.02	490.33	-13004.77	22249.54	316.22	316.22	316.22
	17L	003	STRP	5553.26	-4277.21	-1057.02	490.33	-13401.16	23817.28	335.32	335.32	335.32
	17M	003	AHBM	5553.26	-4277.21	-1057.02	490.33	-13401.16	23817.28	335.32	335.32	335.32
	17R	003	STRP	5553.26	-4277.21	-1057.02	490.33	-13401.16	23817.28	335.32	335.32	335.32
	18L	002	STRP	5553.26	-4534.66	-1057.02	490.33	-13929.67	26020.25	362.13	362.13	362.13

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

TATIC ANALYSIS NO. 2 (GR-S). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)	B2M/Z (PSI)
RUN1 (CONTD.)												
	18R	002	STRP	-841.78	6970.08	2095.83	17246.74	-59392.53	26152.39	823.77	823.77	823.77
	19L	001	STRP	-841.78	6455.18	2095.83	17246.74	-57296.68	19919.76	771.84	771.84	771.84
	19M	001	AMBM	-841.78	6455.18	2095.83	17246.74	-57296.68	19919.76	771.84	771.84	771.84
	19R	001	STRP	-841.78	6455.18	2095.83	17246.74	-57296.68	19439.76	771.84	771.84	771.84
	20L	A04A	STRP	-841.78	-10333.06	2095.83	17246.74	11037.77	82658.85	1044.71	1044.71	1044.71
	20M	A04A	AMBM	-841.78	-10333.06	2095.83	17246.74	11037.77	82658.85	1044.71	1044.71	1044.71
	20R	A04A	BELB	-841.80	29340.28	2095.83	17246.74	11037.78	82658.86	1044.71	2051.61	2963.42
	21L	A04B	BELB	-26307.27	-841.78	2095.83	-18897.12	25106.10	-18523.68	447.50	878.79	1269.36
	21M	A04B	AMBM	-26307.27	-841.78	2095.83	-18897.12	25106.10	-18523.68	447.50	447.50	447.50
	21R	A04B	STRP	-26307.28	-841.78	2095.83	-18897.13	25106.08	-18523.69	447.50	447.50	447.50
	22L	A05A	STRP	-21158.20	-841.78	2095.83	-18897.13	46064.81	-10105.67	623.28	623.28	623.28
	22M	A05A	AMBM	-21158.20	-841.78	2095.83	-18897.13	46064.81	-10105.67	623.28	623.28	623.28
	22R	A05A	BELB	-21158.20	2095.81	841.78	-18897.12	-10105.68	-46064.83	623.28	1224.00	1748.00
	23L	A05B	BELB	-2096.86	-18125.20	841.78	6948.08	-15741.02	19728.85	321.15	630.67	910.96
	23M	A05B	AMBM	-2096.86	-18125.20	841.78	6948.08	-15741.02	19728.85	321.15	321.15	321.15
	23R	A05B	STRP	-2092.75	18125.66	-841.78	6951.66	15739.44	-19728.75	321.15	321.15	321.15
	24L	AB01	STRP	-2092.86	17481.93	-841.78	6951.66	11687.03	-41986.78	552.32	552.32	552.32
	24R	AB01	STRP	-2095.83	15567.73	-841.78	6606.86	14688.21	-41986.79	551.69	551.69	551.69
	25L	AB02	STRP	-2095.83	14023.04	-841.78	6606.86	12162.86	-86372.94	1073.14	1073.14	1073.14
	25R	AB02	STRP	-2095.83	12109.19	-841.78	6264.57	12162.86	-86372.94	1072.84	1072.84	1072.84
	26L	AB03	STRP	-2095.83	10564.49	-841.78	5264.57	9657.51	-120383.46	1483.58	1483.58	1483.58
	26R	AB03	STRP	-2095.83	8650.64	-841.78	5922.27	9637.51	-120383.46	1483.37	1483.37	1483.37
	27L	AB04	STRP	-2095.83	7105.95	-841.78	5922.27	7112.16	-144018.33	1770.46	1770.46	1770.46
	27R	AB04	STRP	-2095.83	5192.09	-841.78	5579.97	7112.16	-144018.33	1770.30	1770.30	1770.30
	28L	AB05	STRP	-2096.83	3647.40	-841.78	5579.97	4586.81	-157277.57	1931.52	1931.52	1931.52
	28R	AB05	STRP	-2096.06	1733.27	-841.78	5237.06	4587.51	-157277.57	1931.37	1931.37	1931.37
	29L	10	STRP	-2094.51	-9819.50	-841.78	5237.06	-14299.58	-66562.18	837.68	837.68	837.68
	29M	10	AMTT	-2094.51	-9819.50	-841.78	5237.06	-14299.58	-66562.18	837.68	1339.79	827.68
	29R	10	VALV	-2095.83	-9819.22	-841.78	5235.15	-14300.28	-66562.18	N/A		
	30	MSIV	VALV	-2095.83	-11749.71	-841.78	5235.15	-18088.31	-18032.10	N/A		
	31L	11	VALV	-2095.83	-41374.44	-841.78	5235.15	-19771.88	133879.72	N/A		
	31M	11	AMTT	-2095.83	-41374.44	-841.78	5235.15	-19771.88	133879.72	1661.49	2657.39	1661.49
	31R	11	STRP	-2095.83	-41374.44	-841.78	5235.15	-19771.88	133879.72	1661.49	1661.49	1661.49
	32	MSVH	STRP	-2095.83	-44978.72	-841.78	5235.15	-25664.35	934115.62	5359.91	5359.91	5359.91

WELL CORPORATED
UNIPIPE VERSION 22E 05/31/90; SYSTEM: IBM-VM/MVS

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

THERMAL EXPANSION

STATIC ANALYSIS NO. 3 (TH-1). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1											
	1M	SGNZ	ANTT	4250.26	-9202.49	-25010.74	71046.09	347193.41	-74132.58	4874.67	7796.55
	1	SGNZ	STRP	4250.26	-9202.49	-25010.74	71046.09	347193.41	-74132.58	4874.67	4874.67
	2L	A01A	STRP	4250.26	-9202.49	-25010.74	71046.09	243309.59	-35909.31	3446.74	3446.74
	2W	A01A	AMBW	4250.26	-9202.49	-25010.74	71046.09	243309.5	-35909.31	3446.74	3446.74
	2R	A01A	BELB	4250.25	25010.74	-9202.49	71046.10	35909.32	243309.59	3446.74	6768.72
	3L	A01B	BELB	-25010.74	4250.26	-9202.49	-1399.95	36536.75	133580.81	1864.66	3661.82
	3W	A01B	AMBW	-25010.74	4250.26	-9202.49	-1399.95	36536.75	133580.81	1864.66	1864.66
	3R	A01B	STRP	-25010.74	846.75	-10101.17	-1399.95	80017.85	113030.55	1864.66	1864.66
	4	EMIN	STRP	-25010.74	846.75	-10101.17	-1399.95	-15943.04	104986.47	1429.84	1429.84
	5L	EMOU	STRP	-25010.74	846.75	-10101.17	-1399.95	-46246.73	102446.22	1513.46	1513.46
	5R	EMOU	STRP	-25010.74	846.75	1137.30	-1399.95	-46246.73	102446.22	1513.46	1513.46
	6L	A02A	STRP	-25010.74	846.75	1137.30	-1399.95	-37523.63	95951.65	1387.27	1387.27
	6W	A02A	AMBW	-25010.74	846.75	1137.30	-1399.95	-37523.63	95951.65	1387.27	1387.27
	6R	A02A	BELB	-25010.73	846.74	1137.30	-1399.95	-37523.64	95951.65	1387.27	2724.33
	7L	A02B	BELB	-846.75	-25010.73	1137.30	33258.75	2864.92	186566.66	2551.78	4011.20
	7W	A02B	AMBW	-846.75	-25010.73	1137.30	33258.75	2864.92	186566.66	2551.78	2551.78
	7R	A02B	STRP	-846.75	-25010.74	1137.30	33258.75	2864.94	186566.66	2551.78	2551.78
	8L	E146	STRP	-846.75	-25010.74	1137.30	33258.75	43614.55	1082701.66	14595.94	14595.94
	8R	E146	STRP	-846.75	172633.14	-2637.03	33258.75	43614.55	1082701.66	14595.94	14595.94
	9L	A03A	STRP	-846.75	172633.14	-2637.03	33258.75	20540.58	-427838.28	5784.31	5784.31
	9W	A03A	AMBW	-846.75	172633.14	-2637.03	33258.75	20540.58	-427838.28	5784.31	5784.31
	9R	A03A	BELB	-846.72	-172633.14	2637.02	33258.75	-20540.61	427838.28	5784.31	11359.24
	10L	A03B	BELB	172633.14	-846.77	2637.01	10651.84	43147.53	1078387.85	14531.49	28536.97
	10W	A03B	AMBW	172633.14	-846.77	2637.01	10651.84	43147.53	1078387.85	14531.49	14531.49
	10R	A03B	STRP	172633.14	846.75	-2637.01	10651.83	-43147.55	-1078387.85	14531.49	14531.49
	11L	CMIN	STRP	172633.14	846.75	-2637.01	10651.83	-45784.55	-1079234.53	14544.34	14544.34
	11R	CMIN	STRP	172633.13	-43801.27	2048.65	10651.83	-45784.55	-1079234.53	14544.34	14544.34
	12	CMOU	STRP	172633.13	-43801.27	2048.65	10651.83	-37569.46	-903591.28	12177.10	12177.10
	13L	005	STRP	172633.13	-43801.27	2048.65	10651.83	17744.13	279042.95	3767.29	3767.29
	13W	005	AMBW	172633.13	-43801.27	2048.65	10651.83	17744.13	279042.95	3767.29	3767.29
	13R	005	STRP	172633.13	-43801.27	2048.65	10651.83	17744.13	279042.95	3767.29	3767.29
	14L	004	STRP	172633.13	-43801.27	2048.65	10651.83	19792.78	322844.24	4357.22	4357.22
	14R	004	STRP	172633.13	28635.27	14981.84	10651.83	19728.12	323206.43	4362.03	4362.03
	15	RBIN	STRP	172633.13	28635.27	14981.84	10651.83	139582.87	94124.14	2271.20	2271.20
	16	RBOU	STRP	172633.13	28635.27	14981.84	10651.83	199660.06	-20703.34	2706.39	2706.39
	17L	003	STRP	172633.13	28635.27	14981.84	10651.83	205278.25	-31441.57	2799.73	2799.73
	17W	003	AMBW	172633.13	28635.27	14981.84	10651.83	205278.25	-31441.57	2799.73	2799.73
	17R	003	STRP	172633.13	28635.27	14981.84	10651.83	205278.25	-31441.57	2799.73	2799.73
	18L	002	STRP	172633.13	28635.27	14981.84	10651.83	212769.18	-45759.20	2933.68	2933.68

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

TATIC ANALYSIS NO. 3 (TH-1). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SCP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1 (CONTD.)											
	18R	002	STRP	19519.18	-5987.67	-35365.01	210342.74	908880.02	-54184.11	12581.55	12581.55
	19L	001	STRP	19519.18	-5987.67	-35365.01	210342.74	873514.78	-48196.42	12114.36	12114.36
	19M	001	AMBM	19519.18	-5987.67	-35365.01	210342.74	873514.78	-48196.42	12114.36	12114.36
	19R	001	STRP	19519.18	-5987.67	-35365.01	210342.74	873514.78	-48196.42	12114.36	12114.36
	20L	A04A	STRP	19519.18	-5987.67	-35365.01	210342.74	-279561.34	147031.68	5109.44	5109.44
	20M	A04A	AMBM	19519.18	-5987.67	-35365.01	210342.74	-279561.34	147031.68	5109.44	5109.44
	20R	A04A	BELB	19519.18	-16553.80	-35365.01	210342.75	-279561.26	147031.68	5109.44	10033.93
	21L	A04B	BELB	16553.81	19519.17	-35365.01	412180.11	77723.83	135911.54	5936.37	11657.85
	21M	A04B	AMBM	16553.81	19519.17	-35365.01	412180.11	77723.83	135911.54	5936.37	5936.37
	21R	A04B	STRP	16553.80	19519.17	-35365.01	412180.07	77723.95	135911.52	5936.37	5936.37
	22L	A05A	STRP	16553.80	19519.17	-35365.01	412180.07	-275933.74	-59284.43	6725.78	6725.78
	22M	A05A	AMBM	16553.80	19519.17	-35365.01	412180.07	-275933.74	-59284.43	6725.78	6725.78
	22R	A05A	BELB	16553.82	-35365.00	-19519.18	412180.18	-59284.29	275933.74	6725.78	13208.09
	23L	A05B	BELB	35365.95	16551.78	-19519.18	132500.77	338979.79	346479.22	6765.62	13286.33
	23M	A05B	AMBM	35365.95	16551.78	-19519.18	132500.77	338979.79	346479.22	6765.62	6765.62
	23R	A05B	STRP	35362.20	-16559.82	19519.18	132423.79	-339009.88	-346479.22	6765.62	6765.62
	24L	AB01	STRP	35362.20	-16559.82	19519.18	132423.79	-314406.74	-325775.99	6352.89	6352.89
	24R	AB01	STRP	35365.01	-16553.80	19519.18	132477.25	-314584.23	-325775.99	6352.89	6352.89
	25	AB02	STRP	35365.01	-16553.80	19519.18	132477.25	-256026.67	-276114.54	5374.37	5374.37
	26	AB03	STRP	35365.01	-16553.80	19519.18	132477.25	-197469.12	-226453.12	4421.07	4421.07
	27	AB04	STRP	35365.01	-16553.80	19519.18	132477.25	-138911.56	-176791.67	3513.55	3513.55
	28L	AB05	STRP	35365.01	-16553.80	19519.18	132477.25	-80354.00	-127130.25	2698.44	2698.44
	28R	AB05	STRP	35367.22	-16549.07	19519.18	132488.00	-80336.30	-127130.25	2698.44	2698.04
	29L	10	STRP	35367.22	-16549.07	19519.18	132488.00	357615.61	244181.53	6096.97	6096.97
	29M	10	AMTT	35367.22	-16549.07	19519.18	132488.00	357615.61	244181.53	6096.97	9751.50
	29R	10	VALV	35365.01	-16553.80	19519.18	132535.81	357597.71	244181.53	N/A	
	30	MSIV	VALV	35365.01	-16553.80	19519.18	132535.81	445433.98	318673.67	N/A	
	31L	11	VALV	35365.01	-16553.80	19519.18	132535.81	484472.40	351781.30	N/A	
	31M	11	AMTT	35365.01	-16553.80	19519.18	132535.81	484472.40	351781.30	8256.15	13204.89
	31R	11	STRP	35365.01	-16553.80	19519.18	132535.81	484472.40	351781.30	8256.15	8256.15
	32	MSVH	STRP	35365.01	-16553.80	19519.18	132535.81	621106.86	467657.95	10618.83	10618.84
RUN2											
	33	AB01	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	34	101	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	35L	102	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	35R	102	NONS	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	36L	B01A	NONS	0.00	0.00	0.00	0.00	0.00	0.00	N/A	

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

NORMAL OPERATION (GRAV. STM+THRM)

JAD CASE NO. 4B (HOT1). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1											
	1M	SGNZ	AMTT	14349.93	-5566.20	-24879.06	70362.06	399766.62	-61269.44	5036.13	8054.79
	1	SGNZ	STRP	14349.93	-5566.20	-24879.06	70362.06	399766.62	-61269.44	5036.13	5036.13
	2L	A01A	STRP	12340.23	-6297.62	-24879.06	70362.06	286304.62	-32905.15	3639.36	3639.36
	2M	A01A	AMBM	12340.23	-6297.62	-24879.06	70362.06	286304.62	-32905.15	3639.36	3639.36
	2R	A01A	BELB	12340.21	24879.04	-6297.62	70362.00	32905.18	286304.62	3639.36	7146.98
	3L	A01B	BELB	-24879.04	9490.11	-7334.90	-3980.58	41437.46	141381.06	1808.09	3550.72
	3M	A01B	AMBM	-24879.04	9490.11	-7334.90	-3980.58	41437.46	141381.06	1808.09	1808.09
	3R	A01B	STRP	-24879.06	6409.36	-10138.20	-3980.59	87290.69	118684.37	1808.69	1808.09
	4	EMIN	STRP	-24879.06	1517.83	-10138.20	-3980.59	-18375.45	80246.25	1011.12	1011.12
	5L	EMOU	STRP	-24879.06	-26.87	-10138.20	-3980.59	-51743.70	77762.19	1146.93	1146.93
	5R	EMOU	STRP	-24879.06	-26.87	1225.94	-3980.59	-51743.70	77762.19	1146.93	1146.93
	6L	A02A	STRP	-24879.06	-3976.13	1225.94	-3980.59	-41490.46	92480.62	1244.46	1244.46
	6M	A02A	AMBM	-24879.06	-3976.13	1225.94	-3980.59	-41490.46	92480.62	1244.46	1244.46
	6R	A02A	BELB	-24879.04	-3976.14	1225.94	-3980.57	-41490.44	92480.62	1244.46	2443.87
	7L	A02B	BELB	7009.13	-24879.04	1225.94	36477.48	1032.39	215206.75	2677.85	5258.76
	7M	A02B	AMBM	7009.13	-24879.04	1225.94	36477.48	1032.39	215206.75	2677.85	2677.85
	7R	A02B	STRP	7009.13	-24879.06	1225.94	36477.50	1032.41	215206.75	2677.85	2677.85
	8L	E146	STRP	25457.92	-24879.06	1225.94	36477.50	48929.87	1193969.00	14666.75	14666.75
	8R	E146	STRP	25457.92	178186.37	-2682.94	36477.50	48929.87	1193969.00	14666.75	14666.75
	9L	A03A	STRP	29963.27	178186.37	-2682.94	36477.50	23205.14	-512392.31	6308.37	6308.37
	9M	A03A	AMBM	29963.27	178186.37	-2682.94	36477.50	23205.14	-512392.31	6308.37	6308.37
	9R	A03A	BELB	29963.29	-178186.31	2682.92	36477.48	-23205.16	512392.31	6308.37	12388.39
	10L	A03B	BELB	178186.31	32996.23	2682.92	12180.40	47502.26	1125951.00	13826.28	27152.07
	10M	A03B	AMBM	178186.31	32996.23	2682.92	12180.40	47502.26	1125951.00	13826.28	13826.28
	10R	A03B	STRP	178186.37	-32996.26	-2682.92	12180.39	-47502.30	-1125951.00	13826.28	13826.28
	11L	CMIN	STRP	178186.37	-33511.17	-2682.92	12180.39	-50442.27	-1092779.00	13421.34	13421.34
	11R	CMIN	STRP	178186.37	-33018.86	2044.90	12180.39	-50442.27	-1092779.00	13421.34	13421.34
	12	CMOU	STRP	178186.37	-35083.59	2044.90	12180.39	-41441.51	-939114.06	11533.24	11533.24
	13L	005	STRP	178186.37	-48985.84	2044.90	12180.39	19162.16	311093.69	3826.65	3826.65
	13M	005	AMBM	178186.37	-48985.84	2044.90	12180.39	19162.16	311093.69	3826.65	3826.65
	13R	005	STRP	178186.37	-48985.84	2044.90	12180.39	19162.16	311093.69	3826.65	3826.65
	14L	004	STRP	178186.37	-49500.73	2044.90	12180.39	21406.74	364606.12	4483.18	4483.18
	14R	004	STRP	178186.37	30735.06	13924.82	12180.39	21341.02	365042.31	4488.48	4488.48
	15	RBIN	STRP	178186.37	26615.87	13924.82	12180.39	144421.75	113310.31	2256.96	2256.96
	16	RBOU	STRP	178186.37	24551.13	13924.82	12180.39	206115.94	-471.74	2533.05	2533.05
	17L	003	STRP	178186.37	24358.05	13924.82	12180.39	211885.37	-10688.86	2607.00	2607.00
	17M	003	AMBM	178186.37	24358.05	13924.82	12180.39	211885.37	-10688.86	2607.00	2607.00
	17R	003	STRP	178186.37	24358.05	13924.82	12180.39	211885.37	-10688.86	2607.00	2607.00
	18L	002	STRP	178186.37	24100.60	13924.82	12180.39	219577.94	-24199.06	2714.21	2714.21

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

LOAD CASE NO. 4 (HOT1). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SUP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1 (CONTD.)											
	18R	002	STRP	18677.38	982.41	-33269.16	248091.37	938075.31	-33312.99	11911.00	11911.00
	19L	001	STRP	18677.38	467.51	-33269.16	248091.37	901358.50	-33454.31	11476.43	11476.43
	19M	001	AMBM	18677.38	467.51	-33269.16	248091.37	901358.50	-33454.31	11476.43	11476.43
	19R	001	STRP	18677.38	467.51	-33269.16	248091.37	901358.50	-33454.31	11476.43	11476.43
	20L	A04A	STRP	18677.38	-16320.72	-33269.16	248091.37	-295772.19	244021.56	5602.83	5602.83
	20M	A04A	AMBM	18677.38	-16320.72	-33269.16	248091.37	-295772.19	244021.56	5602.83	5602.83
	20R	A04A	BELB	18677.38	12786.48	-33269.16	248091.31	-295771.94	244021.56	5602.83	11002.84
	21L	A04B	BELB	-9753.48	18677.38	-33269.16	433457.69	110405.44	130635.00	5716.69	11226.44
	21M	A04B	AMBM	-9753.48	18677.38	-33269.16	433457.69	110405.44	130635.00	5716.69	5716.69
	21R	A04B	STRP	-9753.48	18677.37	-33269.16	433457.69	110405.69	130635.00	5716.69	5716.69
	22L	A05A	STRP	-4604.40	18677.37	-33269.16	433457.69	-256763.94	-75168.50	6249.03	6249.03
	22M	A05A	AMBM	-4604.40	18677.37	-33269.16	433457.69	-256763.94	-75168.50	6249.03	6249.03
	22R	A05A	BELB	-4604.38	-33269.16	-18677.38	433457.69	-75168.19	256763.94	6249.03	12271.85
	23L	A05B	BELB	33269.06	-1573.43	-18677.38	152363.44	356278.31	399978.19	6831.98	13416.67
	23M	A05B	AMBM	33269.06	-1573.43	-18677.38	152363.49	356278.31	399978.19	6831.98	6831.98
	23R	A05B	STRP	33269.44	1565.84	18677.38	152282.62	-356313.19	-399978.19	6831.99	6831.99
	24L	AB01	STRP	33269.33	922.12	18677.38	152282.62	-330584.19	-399515.62	6630.27	6630.27
	24R	AB01	STRP	33269.16	-986.07	18677.38	151996.56	-330558.25	-399515.62	6629.09	6629.09
	25L	AB02	STRP	33269.16	-2530.77	18677.38	151996.56	-268818.50	-389400.06	6097.07	6097.07
	25R	AB02	STRP	33269.16	-4444.62	18677.38	151654.25	-268818.50	-389400.06	6095.79	6095.79
	26L	AB03	STRP	33269.16	-5989.31	18677.38	151654.25	-207078.75	-368908.56	5513.43	5513.43
	26R	AB03	STRP	33269.16	-7993.16	18677.38	151311.94	-207078.75	-368908.56	5512.02	5512.02
	27L	AB04	STRP	33269.16	-9447.86	18677.38	151311.94	-145339.00	-338041.75	4880.92	4880.92
	27R	AB04	STRP	33269.16	-11361.71	18677.38	150969.62	-145339.00	-338041.75	4879.33	4879.33
	28L	AB05	STRP	33269.16	-12906.40	18677.38	150969.62	-83599.19	-296799.06	4211.88	4211.88
	28R	AB05	STRP	33271.15	-14815.80	18677.38	150638.50	-83579.06	-296799.06	4210.04	4210.04
	29L	10	STRP	33272.69	-26368.56	18677.38	150638.50	378172.25	201419.50	5571.83	5571.83
	29M	10	AMTT	33272.69	-26368.56	18677.38	150638.50	378172.25	201419.50	5571.83	8911.59
	29R	10	VALV	33269.16	-26373.02	18677.38	150689.06	378151.69	201419.50	N/A	
	30	MSIV	VALV	33269.16	-28303.50	18677.38	150689.06	470761.44	331702.31	N/A	
	31L	11	VALV	33269.16	-57928.24	18677.38	150689.06	511921.25	519948.62	N/A	
	31M	11	AMTT	33269.16	-57928.24	18677.38	150689.06	511921.25	519948.62	9140.43	14619.20
	31R	11	STRP	33269.16	-57928.24	18677.38	150689.06	511921.25	519948.62	9140.43	9140.43
	32	MSVH	STRP	33269.16	-61532.52	18677.38	150689.06	655981.19	949355.56	14276.80	14276.80

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

SEISMIC INERTIA (SSE)

LOAD CASE NO.5 (SSEA). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1											
	1M	SGNZ	AMTT	30571.56	37291.18	120621.62	72601.75	851262.12	300532.37	11110.77	17770.55
	1	SGNZ	STRP	30571.56	37291.18	120621.62	72601.75	851262.12	300532.37	11110.77	11110.77
	2L	A01A	STRP	30571.56	37291.18	120621.62	72601.75	352546.25	148113.44	4775.04	4775.04
	2M	A01A	AMBM	30571.56	37291.18	120621.62	72601.75	352546.25	148113.44	4775.04	4775.04
	2R	A01A	BELB	29835.28	117660.50	36027.01	72601.75	148113.44	352546.25	4775.04	9377.23
	3L	A01B	BELB	117660.50	29835.28	36027.01	29126.65	89229.94	187977.94	2577.63	5061.95
	3M	A01B	AMBM	117660.50	29835.28	36027.01	29126.65	89229.94	187977.94	2577.63	2577.63
	3R	A01B	STRP	104306.81	21431.15	33096.14	29126.65	108013.44	173588.06	2533.52	2533.52
	4L	EMIN	STRP	104306.81	21431.15	33096.14	29126.65	405980.50	366342.12	6718.07	6718.07
	4R	EMIN	STRP	93295.50	5188.62	31877.81	29126.65	405980.50	366342.12	6718.07	6718.07
	5L	EMOU	STRP	93295.50	5188.62	31877.81	29126.65	499453.81	373955.75	7662.80	7662.80
	5R	EMOU	STRP	83960.62	14596.23	50967.50	29126.65	499453.81	373955.75	7662.80	7662.80
	6L	A02A	STRP	83960.62	14596.23	50967.50	29126.65	110684.06	270208.06	3600.02	3600.02
	6M	A02A	AMBM	83960.62	14596.23	50967.50	29126.65	110684.06	270208.06	3600.02	3600.02
	6R	A02A	BELB	72152.12	31412.63	40728.97	29126.65	110684.06	270208.06	3600.02	7069.73
	7L	A02B	BELB	31412.63	72152.12	40728.97	44708.83	137022.37	114307.25	2256.79	4431.88
	7M	A02B	AMBM	31412.63	72152.12	40728.97	44708.83	137022.37	114307.25	2256.79	2256.79
	7R	A02B	STRP	42677.55	49899.66	22053.13	44708.83	137022.37	114307.25	2256.79	2256.79
	8L	E146	STRP	91090.12	75959.00	40691.16	44708.83	333491.69	557875.06	7992.49	7992.49
	8R	E146	STRP	108310.44	51434.37	25462.83	44708.83	333491.69	557875.06	7992.49	7992.49
	9L	A03A	STRP	108310.44	51434.37	25462.83	44708.83	113378.19	328935.37	4303.46	4303.46
	9M	A03A	AMBM	108310.44	51434.37	25462.83	44708.83	113378.19	328935.37	4303.46	4303.46
	9R	A03A	BELB	122059.00	48891.89	29029.82	44708.83	113378.19	328935.37	4303.46	8451.15
	10L	A03B	BELB	48891.89	122059.00	29029.82	10020.87	149481.69	174518.62	2821.69	5541.25
	10M	A03B	AMBM	48891.89	122059.00	29029.82	10020.87	149481.69	174518.62	2821.69	2821.69
	10R	A03B	STRP	49961.79	123643.44	29853.26	10020.87	149481.69	174518.62	2821.69	2821.69
	11L	CMIN	STRP	49961.79	123643.44	29853.26	10020.87	178597.81	281030.75	4086.85	4086.85
	11R	CMIN	STRP	50907.73	26980.50	17749.05	10020.87	178597.81	281030.75	4086.85	4086.85
	12L	CMOU	STRP	50907.73	26980.50	17749.05	10020.87	167518.06	281036.37	4015.67	4015.67
	12R	CMOU	STRP	53903.75	22240.84	12970.66	10020.87	167518.06	281036.37	4015.67	4015.67
	13L	005	STRP	65079.04	44640.02	23500.59	10020.87	101882.87	196440.31	2717.56	2717.56
	13M	005	AMBM	65079.04	44640.02	23500.59	10020.87	101882.87	196440.31	2717.56	2717.56
	13R	005	STRP	68682.56	48992.68	26045.87	10020.87	101882.87	196440.31	2717.56	2717.56
	14L	004	STRP	68682.56	48992.68	26045.87	10020.87	127311.12	244911.31	3388.51	3388.51
	14R	004	STRP	72118.50	23058.26	16620.15	10020.87	127495.31	245275.19	3393.51	3393.51
	15L	RBIN	STRP	72110.50	23058.26	16620.15	10020.87	124210.31	119804.00	2120.69	2120.69
	15R	RBIN	STRP	76810.75	23948.76	17223.23	10020.87	124210.31	119804.00	2120.69	2120.69
	16L	RBOU	STRP	76810.75	23948.76	17223.23	10020.87	171205.62	155291.37	2838.32	2838.32
	16R	RBOU	STRP	78563.81	24755.81	17750.88	10020.87	171205.62	155291.37	2838.32	2838.32

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

LOAD CASE NO.S[illegible] (SSEA). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1 (CONTD.)											
	17L	003	STRP	78563.81	24755.81	17750.88	10020.87	176443.62	159866.94	2923.55	2923.55
	17M	003	AMBM	78563.81	24755.81	17750.88	10020.87	176443.62	159866.94	2923.55	2923.55
	17R	003	STRP	78917.12	24935.11	17869.32	10020.87	176443.62	159866.94	2923.55	2923.55
	18L	002	STRP	78917.12	24935.11	17869.32	10020.87	183642.69	166045.00	3039.79	3039.79
	18R	002	STRP	144978.25	67310.69	42790.83	243194.69	757615.00	645560.31	12570.21	12570.21
	19L	001	STRP	144978.25	67310.69	42790.83	243194.69	716050.50	578351.62	11679.52	11679.52
	19M	001	AMBM	144978.25	67310.69	42790.83	243194.69	716050.50	578351.62	11679.52	11679.52
	19R	001	STRP	144274.00	66987.44	41905.72	243194.69	716050.50	578351.62	11679.52	11679.52
	20L	A04A	STRP	142384.62	59381.84	12392.99	243194.69	190876.19	1484027.00	18596.92	18596.92
	20M	A04A	AMBM	142384.62	59381.84	12392.99	243194.69	190876.19	1484027.00	18596.92	18596.92
	20R	A04A	BELB	141953.87	104202.94	28220.09	243194.69	190876.19	1484027.00	18596.92	36520.68
	21L	A04B	BELB	104202.94	141953.87	28220.09	170828.56	178347.62	862960.37	11011.80	21625.00
	21M	A04B	AMBM	104202.94	141953.87	28220.09	170828.56	178347.62	862960.37	11011.80	11011.80
	21R	A04B	STRP	96681.62	134892.69	47383.04	170828.56	178347.62	862960.37	11011.80	11011.80
	22L	A05A	STRP	96681.62	134892.69	47383.04	170828.56	403591.50	487517.94	8042.26	8042.26
	22M	A05A	AMBM	96681.62	134892.69	47383.04	170828.56	403591.50	487517.94	8042.26	8042.26
	22R	A05A	BELB	89898.94	49743.64	103644.19	170828.56	487517.94	403591.50	8042.26	15793.41
	23L	A05B	BELB	49747.10	89897.06	103644.19	874369.87	400180.37	406151.75	12805.98	25148.42
	23M	A05B	AMBM	49747.10	89897.06	103644.19	874369.87	400180.37	406151.75	12805.98	12805.98
	23R	A05B	STRP	50175.74	85119.37	86704.81	874459.75	399983.44	406151.75	12805.98	12805.98
	24L	AB01	STRP	50175.74	85119.37	86704.81	874459.75	506289.12	403277.37	13347.02	13347.02
	24R	AB01	STRP	49778.34	76292.94	62305.41	826967.19	506401.44	404440.12	12889.52	12889.52
	25L	AB02	STRP	49778.34	76292.94	62305.41	826967.19	687299.25	433834.69	14224.91	14224.91
	25R	AB02	STRP	50780.93	62726.58	50636.83	781151.44	687266.37	436134.12	13840.29	13840.29
	26L	AB03	STRP	50780.93	62726.58	50636.83	781151.44	785551.19	490710.31	14864.48	14864.48
	26R	AB03	STRP	53089.50	47723.18	47590.15	737311.94	785518.62	493393.94	14536.98	14536.98
	27L	AB04	STRP	53089.50	47723.18	47590.15	737311.94	805196.37	571823.31	15119.80	15119.80
	27R	AB04	STRP	56180.85	35470.66	43853.95	695976.94	805164.50	574103.25	14835.01	14835.01
	28L	AB05	STRP	56180.85	35470.66	43853.95	695976.94	751053.81	619087.31	14679.30	14679.30
	28R	AB05	STRP	62087.22	40340.12	61382.05	657674.87	751107.19	619633.19	14415.01	14415.01
	29L	10	STRP	68045.62	44931.54	87623.94	657674.87	951795.00	551551.81	15723.45	15723.45
	29M	10	AMTT	68045.62	44931.54	87623.94	657674.87	951795.00	551551.81	15723.45	25148.09
	29R	10	VALV	71982.00	47128.63	95470.56	657550.50	951880.94	551551.81	N/A	
	30	MSIV	VALV	71982.00	47128.63	95470.56	657550.50	1363794.00	609381.87	N/A	
	31L	11	VALV	120422.12	151668.56	194714.81	582919.31	1715624.00	485723.69	N/A	
	31M	11	AMTT	120422.12	151668.56	194714.81	582919.31	1715624.00	485723.69	23013.84	368[illegible]
	31R	11	STRP	122982.00	156911.37	199628.56	582919.31	1715624.00	485723.69	23013.84	2301[illegible]
	32	MSVH	STRP	122982.00	156911.37	199628.56	582919.31	2718845.00	1467581.00	38572.53	38572.53

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

SEISMIC ANCHOR MOVEMENT (SSE)

LOAD CASE NO.6 (SAMF). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1											
	1M	SGNZ	ANTT	14098.06	36842.91	11846.74	463057.31	188617.44	290737.69	7095.61	11348.71
	1	SGNZ	STRP	14098.06	36842.91	11846.74	463057.31	188617.44	290737.69	7095.61	7095.61
	2L	A01A	STRP	14098.06	36842.91	11846.74	463057.31	164547.06	138520.50	6263.73	6263.73
	2M	A01A	AMBM	14098.06	36842.91	11846.74	463057.31	164547.06	138520.50	6263.73	6263.73
	2R	A01A	BELB	14098.05	11846.74	36842.91	463057.31	138520.62	164547.06	6263.73	12300.72
	3L	A01B	BELB	11846.74	14098.06	36842.91	17343.97	325261.31	109337.75	4215.10	8277.62
	3M	A01B	AMBM	11846.74	14098.06	36842.91	17343.97	325261.31	109337.75	4215.10	4215.10
	3R	A01B	STRP	11846.74	7379.16	38252.67	17343.98	329532.25	57791.39	4109.91	4109.91
	4	EMIN	STRP	11846.74	7379.16	38252.67	17343.98	35986.05	80582.19	1103.39	1103.39
	5L	EMOU	STRP	11846.74	7379.16	38252.67	17343.98	149756.44	92780.12	2171.68	2171.68
	5R	EMOU	STRP	11846.74	7379.16	4899.79	17343.98	149756.44	92780.12	2171.68	2171.68
	6L	A02A	STRP	11846.74	7379.16	4899.79	17343.98	112233.50	135065.56	2164.87	2164.87
	6M	A02A	AMBM	11846.74	7379.16	4899.79	17343.98	112233.50	135065.56	2164.87	2164.87
	6R	A02A	BELB	11846.74	7379.16	4899.79	17343.97	112233.44	135065.56	2164.87	4251.38
	7L	A02B	BELB	7379.16	11846.74	4899.79	93960.56	23752.14	117723.06	1870.68	3673.64
	7M	A02B	AMBM	7379.16	11846.74	4899.79	93960.56	23752.14	117723.06	1870.68	1870.68
	7R	A02B	STRP	7379.16	11846.74	4899.79	93960.62	23752.18	117723.06	1870.68	1870.68
	8L	E146	STRP	7379.16	11846.74	4899.79	93960.62	191585.31	307514.06	4591.88	4591.88
	8R	E146	STRP	7379.16	25765.86	14342.66	93960.62	191585.31	307514.06	4591.88	4591.88
	9L	A03A	STRP	7379.16	25765.86	14342.66	93960.62	66964.69	82177.87	1737.82	1737.82
	9M	A03A	AMBM	7379.16	25765.86	14342.66	93960.62	66964.69	82177.87	1737.82	1737.82
	9R	A03A	BELB	7379.15	25765.86	14342.66	93960.56	66964.62	82177.87	1737.82	3412.74
	10L	A03B	BELB	25765.84	7379.16	14342.66	13584.89	147400.56	41228.82	1885.10	3701.96
	10M	A03B	AMBM	25765.84	7379.16	14342.66	13584.89	147400.56	41228.82	1885.10	1885.10
	10R	A03B	STRP	25765.86	7379.16	14342.66	13584.88	147400.62	41228.82	1885.10	1885.10
	11L	CMIN	STRP	25765.86	7379.16	14342.66	13584.88	161734.94	48453.82	2077.99	2077.99
	11R	CMIN	STRP	25765.86	1967.15	6553.69	13584.88	161734.94	48453.82	2077.99	2077.99
	12	CMOU	STRP	25765.86	1967.15	6553.69	13584.88	135570.62	40569.26	1744.04	1744.04
	13L	005	STRP	25765.86	1967.15	6553.69	13584.88	41699.47	12550.77	559.63	559.63
	13M	005	AMBM	25765.86	1967.15	6553.69	13584.88	41699.47	12550.77	559.63	559.63
	13R	005	STRP	25765.86	1967.15	6553.69	13584.88	41699.47	12550.77	559.63	559.63
	14L	004	STRP	25765.86	1967.15	6553.69	13584.88	48253.14	14517.86	640.25	640.25
	14R	004	STRP	25765.86	1785.82	8057.63	13584.88	48309.25	14533.52	640.94	640.94
	15	RBIN	STRP	25765.86	1785.82	8057.63	13584.88	26062.61	7148.23	371.08	371.08
	16	RBOU	STRP	25765.86	1785.82	8057.63	13584.88	49611.36	8044.23	638.71	638.71
	17L	003	STRP	25765.86	1785.82	8057.63	13584.88	52632.02	8678.99	675.30	675.30
	17M	003	AMBM	25765.86	1785.82	8057.63	13584.88	52632.02	8678.99	675.30	675.30
	17R	003	STRP	25765.86	1785.82	8057.63	13584.88	52632.02	8678.99	675.30	675.30
	18L	002	STRP	25765.86	1785.82	8057.63	13584.88	56659.82	9531.77	724.30	724.30

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

LOAD CASE NO. 6.. (SAMF). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SUP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1 (CONTD.)											
	18R	002	STRP	4620.60	2163.16	7874.94	56289.74	222067.19	34765.28	2842.66	2842.66
	19L	001	STRP	4620.60	2163.16	7874.94	56289.74	214311.19	32882.18	2748.12	2748.12
	19W	001	AMBW	4620.60	2163.16	7874.94	56289.74	214311.19	32882.18	2748.12	2748.12
	19R	001	STRP	4620.60	2163.16	7874.94	56289.74	214311.19	32882.18	2748.12	2748.12
	20L	A04A	STRP	4620.60	2163.16	7874.94	56289.74	59351.77	45368.09	1147.53	1147.53
	20W	A04A	AMBW	4620.60	2163.16	7874.94	56289.74	59351.77	45368.09	1147.53	1147.53
	20R	A04A	BELB	4620.60	2461.61	7874.94	56289.72	59351.75	45368.09	1147.53	2253.52
	21L	A04B	BFLB	2461.61	4620.60	7874.94	84267.56	26796.06	32524.66	1155.86	2269.88
	21W	A04B	AMBW	2461.61	4620.60	7874.94	84267.56	26796.06	32524.66	1155.86	1155.86
	21R	A04B	STRP	2461.61	4620.60	7874.94	84267.62	26796.08	32524.66	1155.86	1155.86
	22L	A05A	STRP	2461.61	4620.60	7874.94	84267.62	52133.16	14510.65	1228.61	1228.61
	22W	A05A	AMBW	2461.61	4620.60	7874.94	84267.62	52133.16	14510.65	1228.61	1228.61
	22R	A05A	BELB	2461.61	7874.94	4620.60	84267.56	14510.61	52133.16	1228.61	2412.74
	23L	A05B	BELB	7875.08	2461.16	4620.60	31528.83	69580.81	72365.06	1290.90	2535.07
	23W	A05B	AMBW	7875.08	2461.16	4620.60	31528.83	69580.81	72365.06	1290.90	1290.90
	23R	A05B	STRP	7874.52	2462.95	4620.60	31515.75	69586.75	72365.06	1290.90	1290.90
	24L	AB01	STRP	7874.52	2462.95	4620.60	31515.75	64990.48	69289.62	1227.83	1227.83
	24R	AB01	STRP	7874.94	2461.61	4620.60	31524.58	64976.16	69289.62	1227.83	1227.83
	25	AB02	STRP	7874.94	2461.61	4620.60	31524.58	54835.86	61915.27	1085.86	1085.86
	26	AB03	STRP	7874.94	2461.61	4620.60	31524.58	46654.36	54543.71	961.73	961.73
	27	AB04	STRP	7874.94	2461.61	4620.60	31524.58	41606.51	47176.36	863.18	863.18
	28L	AB05	STRP	7874.94	2461.61	4620.60	31524.58	40869.41	39815.47	799.72	799.72
	28R	AB05	STRP	7875.27	2460.56	4620.60	31524.17	40869.73	39815.47	799.72	799.72
	29L	10	STRP	7875.27	2460.56	4620.60	31524.17	115720.44	15928.10	1484.31	1484.31
	29W	10	AWTT	7875.27	2460.56	4620.60	31524.17	115720.44	15928.10	1484.31	2374.01
	29R	10	VALV	7874.94	2461.61	4620.60	31538.31	115716.62	15928.10	N/A	
	30	MSIV	VALV	7874.94	2461.61	4620.60	31538.31	135382.56	26648.19	N/A	
	31L	11	VALV	7874.94	2461.61	4620.60	31538.31	144224.75	31736.41	N/A	
	31W	11	AWTT	7874.94	2461.61	4620.60	31538.31	144224.75	31736.41	1852.54	2962.95
	31R	11	STRP	7874.94	2461.61	4620.60	31538.31	144224.75	31736.41	1852.54	1852.54
	32	MSVH	STRP	7874.94	2461.61	4620.60	31538.31	175496.81	48900.46	2268.26	2268.26
RUN2											
	33	AB01	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	34	101	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	35L	102	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	35R	102	NONS	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	36L	B01A	NONS	0.00	0.00	0.00	0.00	0.00	0.00	N/A	

ABB COMBUSTION ENGINEERING
SYSTEM 80+
P[illegible]NARY MAINSTEAM ANALYSIS
[illegible]NGINEERING & SERVICES, INC.

STEAM HAMMER

LOAD CASE NO. 7 (STHH): FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1											
	1W	SGNZ	AMTT	4450.00	444.17	12376.98	2649.66	78626.19	2675.46	965.69	1544.53
	1	SGNZ	STRP	4450.00	444.17	12376.98	2649.66	78626.19	2675.46	965.69	965.69
	2L	A01A	STRP	4450.00	444.17	12376.98	2649.66	27217.41	864.98	335.65	335.65
	2H	A01A	AHBH	4450.00	444.17	12376.98	2649.66	27217.41	864.98	335.65	335.65
	2R	A01A	BELB	1260.27	12376.98	324.92	2649.66	864.98	27217.41	335.65	659.15
	3L	A01B	BELB	12376.98	1260.27	324.92	379.77	1513.87	19527.92	240.33	471.97
	3H	A01B	AHBH	12376.98	1260.27	324.92	379.77	1513.87	19527.92	240.33	240.33
	3R	A01B	STRP	12376.98	1169.10	562.95	379.77	6819.71	18687.28	244.09	244.09
	4	EHIN	STRP	12376.98	1169.10	562.95	379.77	1478.63	9271.97	115.28	115.28
	5L	EHOU	STRP	12376.98	1169.10	562.95	379.77	342.39	7480.23	91.98	91.98
	5R	EHOU	STRP	12376.98	1169.10	12.16	379.77	342.39	7480.23	91.98	91.98
	6L	A02A	STRP	12376.98	1169.10	12.16	379.77	251.83	5980.10	73.58	73.58
	6H	A02A	AHBH	12376.98	1169.10	12.16	379.77	251.83	5980.10	73.58	73.58
	6R	A02A	BELB	842.99	1169.10	12.16	379.77	251.83	5980.10	73.58	144.49
	7L	A02B	BELB	1109.10	842.99	12.16	268.76	358.43	7203.00	88.54	373.87
	7H	A02B	AHBH	1169.10	842.99	12.16	268.76	358.43	7203.00	88.54	88.54
	7R	A02B	STRP	1169.10	842.99	12.16	268.76	358.43	7203.00	88.54	88.54
	8L	E146	STRP	1169.10	842.99	12.16	268.76	340.70	23001.46	282.23	282.23
	8R	E146	STRP	1169.10	6385.37	24.78	268.76	340.70	23001.46	282.23	282.23
	9L	A03A	STRP	1169.10	6385.37	24.78	268.76	123.85	37850.47	464.36	464.36
	9H	A03A	AHBH	1169.10	6385.37	24.78	268.76	123.85	37850.47	464.36	464.36
	9R	A03A	BELB	23124.75	6385.36	24.78	268.76	123.85	37850.47	464.36	911.92
	10L	A03B	BELB	6385.37	23124.75	24.78	43.16	308.24	33937.62	416.36	817.66
	10H	A03B	AHBH	6385.37	23124.75	24.78	43.16	308.24	33937.62	416.36	416.36
	10R	A03B	STRP	42253.66	23124.75	24.78	43.16	308.24	33937.62	416.36	416.36
	11L	CHIN	STRP	42253.66	23124.75	24.78	43.16	321.24	57062.41	700.05	700.05
	11R	CHIN	STRP	42253.66	2317.25	13.05	43.16	321.24	57062.41	700.05	700.05
	12	CHOU	STRP	42253.66	2317.25	13.05	43.16	288.91	47770.25	586.06	586.06
	13L	005	STRP	42253.66	2317.25	13.05	43.16	83.45	14795.38	181.51	181.51
	13H	005	AHBH	42253.66	2317.25	13.05	43.16	83.45	14795.38	181.51	181.51
	13R	005	STRP	42253.66	2317.25	13.05	43.16	83.45	14795.38	181.51	181.51
	14L	004	STRP	42253.66	2317.25	13.05	43.16	96.50	17112.63	209.94	209.94
	14R	004	STRP	42253.65	1453.43	8.15	43.16	96.61	17131.48	210.17	210.17
	15	RBIN	STRP	42253.65	1453.43	8.15	43.16	32.10	5503.39	67.53	67.53
	16	RBOU	STRP	42253.65	1453.43	8.15	43.16	3.62	324.28	4.01	4.01
	17L	003	STRP	42253.65	1453.43	8.15	43.16	6.68	869.32	10.68	10.68
	17H	003	AHBH	42253.65	1453.43	8.15	43.16	6.68	869.32	10.68	10.68
	17R	003	STRP	42253.65	1453.43	8.15	43.16	6.68	869.32	10.68	10.68
	18L	002	STRP	42253.65	1453.43	8.15	43.16	10.75	1596.04	19.59	19.59

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

LOAD CASE NO. 7 (STMH). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1 (CONTD.)											
	18R	002	STRP	4.07	12.55	1.50	14.90	10.05	357.18	4.39	4.39
	19L	001	STRP	4.07	12.55	1.50	14.90	9.14	344.63	4.23	4.23
	19H	001	AMBH	4.07	12.55	1.50	14.90	9.14	344.63	4.23	4.23
	19R	001	STRP	4.07	12.55	1.50	14.90	9.14	344.63	4.23	4.23
	20L	A04A	STRP	4.07	12.55	1.50	14.90	42.89	64.53	0.97	0.97
	20H	A04A	AMBH	4.07	12.55	1.50	14.90	42.89	64.53	0.97	0.97
	20R	A04A	BELB	4.07	0.50	1.50	14.90	42.89	64.53	0.97	1.90
	21L	A04B	BELB	0.50	4.07	1.50	48.52	9.27	57.04	0.86	1.69
	21H	A04B	AMBH	0.50	4.07	1.50	48.52	9.27	56.04	0.86	0.86
	21R	A04B	STRP	0.50	4.07	1.50	48.52	9.27	56.04	0.86	0.86
	22L	A05A	STRP	0.50	4.07	1.50	48.52	6.72	23.60	0.67	0.67
	22H	A05A	AMBH	0.50	4.07	1.50	48.52	6.72	23.60	0.67	0.67
	22R	A05A	BELB	0.50	1.50	4.07	48.52	23.60	6.72	0.67	1.31
	23L	A05B	BELB	1.50	0.50	4.07	30.12	33.33	10.53	0.57	1.11
	23H	A05B	AMBH	1.50	0.50	4.07	30.12	33.33	10.53	0.57	0.57
	23R	A05B	STRP	1.50	0.50	4.07	30.11	33.33	10.53	0.57	0.57
	24	AB01	STRP	1.50	0.50	4.07	30.11	28.26	10.24	0.52	0.52
	25	AB02	STRP	1.50	0.50	4.07	30.12	16.11	9.58	0.44	0.44
	26	AB03	STRP	1.50	0.50	4.07	30.12	4.65	8.95	0.39	0.39
	27	AB04	STRP	1.50	0.50	4.07	30.12	9.01	8.33	0.40	0.40
	28	AB05	STRP	1.50	0.50	4.07	30.12	21.22	7.70	0.46	0.46
	29L	10	STRP	1.50	0.50	4.07	30.12	112.53	9.81	1.43	1.43
	29H	10	AMTT	1.50	0.50	4.07	30.12	112.53	9.81	1.43	2.29
	29R	10	VALV	1.50	0.50	4.07	30.12	112.53	9.81	N/A	
	30	MSIV	VALV	1.50	0.50	4.07	30.12	130.84	12.04	N/A	
	31L	11	VALV	1.50	0.50	4.07	30.12	138.98	13.04	N/A	
	31H	11	AMTT	1.50	0.50	4.07	30.12	138.98	13.04	1.75	2.80
	31R	11	STRP	1.50	0.50	4.07	30.12	138.98	13.04	1.75	1.75
	32	MSVH	STRP	1.50	0.50	4.07	30.12	167.47	16.51	2.10	2.10
RUN2											
	33	AB01	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	34	101	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	35L	102	VALV	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	35R	102	NOMS	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	36L	B01A	NOMS	0.00	0.00	0.00	0.00	0.00	0.00	N/A	
	36R	B01A	BELB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	37L	B01B	BELB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ABO [illegible] BUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

SSE + SAMS

LOAD CASE NO. 83 (SAMI). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1											
	1M	SGNZ	AHTT	44669.62	74134.06	132468.37	535658.87	1039879.37	591269.94	16079.42	25717.42
	1	SGNZ	STRP	44669.62	74134.06	132468.37	535658.87	1039879.37	591269.94	16079.42	16079.42
	2L	A01A	STRP	44669.62	74134.06	132468.37	535658.87	517093.12	286633.94	9787.34	9787.34
	2M	A01A	AMBH	44669.62	74134.06	132468.37	535658.87	517093.12	286633.94	9787.34	9787.34
	2R	A01A	BELB	43933.34	129507.19	72869.87	535658.87	286634.06	517093.12	9787.34	19220.40
	3L	A01B	BELB	129507.19	43933.34	72869.87	46470.61	414491.25	297315.75	6283.80	12340.14
	3M	A01B	AMBH	129507.19	43933.34	72869.87	46470.61	414491.25	297315.75	6283.80	6283.80
	3R	A01B	STRP	116153.56	28810.30	71348.81	46470.62	437545.62	231379.44	6098.94	6098.84
	4L	EHIN	STRP	116153.56	28810.30	71348.81	46470.62	441966.50	446924.19	7732.11	7732.11
	4R	EHIN	STRP	105142.25	12567.79	70130.44	46470.62	441966.50	446924.19	7732.11	7732.11
	5L	EHOU	STRP	105142.25	12567.79	70130.44	46470.62	649210.00	466735.69	9825.71	9825.71
	5R	EHOU	STRP	95807.37	21975.39	55867.28	46470.62	649210.00	466735.69	9825.71	9825.71
	6L	A02A	STRP	95807.37	21975.39	55867.28	46470.62	222917.56	405273.44	5702.95	5702.95
	6M	A02A	AMBH	95807.37	21975.39	55867.28	46470.62	222917.56	405273.44	5702.95	5702.95
	6R	A02A	BELB	83998.87	38791.78	45628.75	46470.61	222917.50	405273.44	5702.95	11199.47
	7L	A02B	BELB	38791.78	83998.87	45628.75	138669.37	160774.50	232030.31	3858.40	7577.12
	7M	A02B	AMBH	38791.78	83998.87	45628.75	138669.37	160774.50	232030.31	3858.40	3858.40
	7R	A02B	STRP	50056.70	61746.40	26952.91	138669.44	160774.50	232030.31	3858.40	3858.40
	8L	E146	STRP	98469.25	87805.75	45590.95	138669.44	525076.87	865389.06	12534.00	12534.00
	8R	E146	STRP	115689.56	77200.19	39805.48	133669.44	525076.37	865389.06	12534.00	12534.00
	9L	A03A	STRP	115689.56	77200.19	39805.48	138669.44	180342.94	411113.00	5764.22	5764.22
	9M	A03A	AMBH	115689.56	77200.19	39805.48	138669.44	180342.94	411113.00	5764.22	5764.22
	9R	A03A	BELB	129438.12	74657.75	43372.47	138669.37	180342.87	411113.00	5764.22	11319.79
	10L	A03B	BELB	74657.69	129438.12	43372.47	23605.75	296882.25	215747.44	4511.61	8859.91
	10M	A03B	AMBH	74657.69	129438.12	43372.47	23605.75	296882.25	215747.44	4511.61	4511.61
	10R	A03B	STRP	75727.62	131022.56	44195.91	23605.73	296882.31	215747.44	4511.61	4511.61
	11L	CHIN	STRP	75727.62	131022.56	44195.91	23605.73	340332.81	329484.56	5818.50	5818.50
	11R	CHIN	STRP	76673.56	28947.65	24302.73	23605.73	340332.81	329484.56	5818.50	5818.50
	12L	CHOU	STRP	76673.56	28947.65	24302.73	23605.73	303086.75	321605.62	5429.20	5429.20
	12R	CHOU	STRP	79669.56	24207.99	19524.34	23605.73	303088.75	321605.62	5429.20	5429.20
	13L	005	STRP	90844.87	46607.16	30054.28	23605.73	143582.37	208991.06	3124.14	3124.14
	13M	005	AMBH	90844.87	46607.16	30054.28	23605.73	143582.37	208991.06	3124.14	3124.14
	13R	005	STRP	94448.44	50959.82	32599.55	23605.73	143582.37	208991.06	3124.14	3124.14
	14L	004	STRP	94448.44	50959.82	32599.55	23605.73	175564.25	259429.12	3853.87	3853.87
	14R	004	STRP	97884.37	24844.07	24677.77	23605.73	175804.56	259808.75	3859.36	3859.36
	15L	RBIN	STRP	97884.37	24844.07	24677.77	23605.73	150272.87	126952.19	2430.68	2430.68
	15R	RBIN	STRP	102576.56	25734.57	25280.85	23605.73	150272.87	126952.19	2430.68	2430.68
	16L	RBOU	STRP	102576.56	25734.57	25280.85	23605.73	220817.00	163335.56	3381.97	3381.97
	16R	RBOU	STRP	104329.69	26541.62	25808.50	23605.73	220817.00	163335.56	3381.97	3381.97

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

LOAD CASE NO. 88 (SAMI). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SCP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN1 (CONTD.)											
	17L	003	STRP	104329.69	26541.62	25808.50	23605.73	229075.62	168545.94	3501.02	3501.02
	17M	003	AMBM	104329.69	26541.62	25808.50	23605.73	229075.62	168545.94	3501.02	3501.02
	17R	003	STRP	104683.00	26720.92	25926.94	23605.73	229075.62	168545.94	3501.02	3501.02
	18L	002	STRP	104683.00	26720.92	25926.94	23605.73	240302.50	175576.75	3662.57	3662.57
	18R	002	STRP	149598.87	69473.87	50665.77	299484.44	979682.06	680325.25	15086.71	15086.71
	19L	001	STRP	149598.87	69473.87	50665.77	299484.44	930361.44	611233.81	14142.15	14142.15
	19M	001	AMBM	149598.87	69473.87	50665.77	299484.44	930361.44	611233.81	14142.15	14142.15
	19P	001	STRP	148894.62	69150.62	49778.66	299484.44	930361.44	611233.81	14142.15	14142.15
	20L	A04A	STRP	147005.19	61545.00	20267.93	299484.44	250227.94	1529395.00	19363.84	19363.84
	20M	A04A	AMBM	147005.19	61545.00	20267.93	299484.44	250227.94	1529395.00	19363.84	19363.84
	20R	A04A	BELB	146574.44	106664.56	36095.03	299484.44	250227.94	1529395.00	19363.84	38026.75
	21L	A04B	BELB	106664.56	146574.44	36095.03	255096.19	205143.69	895484.81	11696.83	22970.26
	21M	A04B	AMBM	106664.56	146574.44	36095.03	255096.19	205143.69	895484.81	11696.83	11696.83
	21R	A04B	STRP	99143.19	139513.31	55257.98	255096.19	205143.69	895484.81	11696.83	11696.83
	22L	A05A	STRP	99143.19	139513.31	55257.98	255096.19	455724.62	502028.37	8887.25	8887.25
	22M	A05A	AMBM	99143.19	139513.31	55257.98	255096.19	455724.62	502028.37	8887.25	8887.25
	22R	A05A	BELB	92360.56	57618.58	108264.75	255096.19	502028.37	455724.62	8887.25	17452.80
	23L	A05B	BELB	57622.18	92358.19	108264.75	905898.56	469761.12	478516.62	13827.01	27153.50
	23M	A05B	AMBM	57622.18	92358.19	108264.75	905898.56	469761.12	478516.62	13827.01	13827.01
	23R	A05B	STRP	58050.25	87582.31	91325.44	905975.37	469570.00	478516.62	13826.79	13826.79
	24L	AB01	STRP	58050.25	87582.31	91325.44	905975.37	571269.56	472566.75	14361.75	14361.75
	24R	AB01	STRP	57653.28	78754.56	66925.94	858491.62	571377.31	473729.50	13922.43	13922.43
	25L	AB02	STRP	57653.28	78754.56	66925.94	858491.62	742134.81	495749.69	15192.24	15192.24
	25R	AB02	STRP	58655.87	65188.19	55257.42	812675.87	742101.94	498049.19	14819.48	14819.48
	26L	AB03	STRP	58655.87	65188.19	55257.42	812675.87	832205.50	545753.94	15760.02	15760.02
	26R	AB03	STRP	60964.43	50184.79	52210.74	768836.37	832172.94	547937.56	15439.46	15439.46
	27L	AB04	STRP	60964.43	50184.79	52210.74	768836.37	846802.81	618999.44	15954.76	15954.76
	27R	AB04	STRP	64055.79	37932.27	48474.54	727501.37	846770.94	621279.37	15573.64	15573.64
	28L	AB05	STRP	64055.79	37932.27	48474.54	727501.37	791922.94	658902.75	15472.07	15472.07
	28R	AB05	STRP	69962.44	42800.68	66002.62	689198.94	791976.62	659448.62	15209.84	15209.84
	29L	10	STRP	75920.87	47392.09	92244.56	689198.94	1067515.00	567479.87	17072.45	17072.45
	29M	10	AMTT	75920.87	47392.09	92244.56	689198.94	1067515.00	567479.87	17072.45	27305.36
	29R	10	VALV	79856.94	49590.24	100091.12	689088.62	1067597.00	567479.87	N/A	
	30	MSIV	VALV	79856.94	49590.24	100091.12	689088.62	1499176.00	636229.87	N/A	
	31L	11	VALV	128297.06	154130.19	199335.44	614457.44	1859848.00	517460.00	N/A	
	31M	11	AMTT	128297.06	154130.19	199335.44	614457.44	1859848.00	517460.00	24854.02	39751.51
	31R	11	STRP	130856.94	159373.00	204249.19	614457.44	1859848.00	517460.00	24854.02	24854.02
	32	MSVH	STRP	130856.94	159373.00	204249.19	614457.44	2894341.00	1516481.00	40789.05	40789.05

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

LOAD CASE NO. 88 (SAMI). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN2											
	33	AB01	VALV	7977.45	14777.39	4832.15	911.77	15854.88	48395.05	N/A	
	34	101	VALV	7977.45	14777.39	4832.15	911.77	3147.42	9539.66	N/A	
	35L	102	VALV	1662.23	897.71	516.98	93.93	215.21	398.07	N/A	
	35R	102	NONS	960.08	524.79	315.00	93.93	215.21	398.07	N/A	
	36L	B01A	NONS	960.08	524.79	315.00	93.93	93.93	250.36	N/A	
	36R	B01A	BELB	283.11	161.84	112.76	93.93	93.93	250.36	113.73	278.65
	37L	B01B	BELB	161.84	283.11	112.76	0.00	0.00	0.00	0.00	0.00
	37R	B01B	STRP	0.09	0.16	0.07	0.00	0.00	0.00	0.00	0.00
	38	103	STRP	0.09	0.16	0.07	0.00	0.00	0.00	0.00	0.00
RUN3											
	39	AB02	VALV	9740.95	14091.42	5226.49	960.35	17218.[illegible]	46150.84	N/A	
	40	201	VALV	9740.95	14091.42	5226.49	960.35	3473.71	9103.11	N/A	
	41L	202	VALV	1583.35	1091.93	534.18	105.88	231.37	425.19	N/A	
	41R	202	NONS	914.72	637.53	326.16	105.88	231.37	425.19	N/A	
	42L	C01A	NONS	914.72	637.53	326.16	105.88	105.88	230.50	N/A	
	42R	C01A	BELB	270.09	195.99	127.10	105.88	105.88	238.50	113.00	276.86
	43L	C01B	BELB	195.99	270.09	127.10	0.00	0.00	0.00	0.00	0.00
	43R	C01B	STRP	0.11	0.16	0.07	0.00	0.00	0.00	0.00	0.00
	44	203	STRP	0.11	0.16	0.07	0.00	0.00	0.00	0.00	0.00
RUN4											
	45	AB03	VALV	11133.00	13431.39	5938.40	1085.65	19568.49	43997.75	N/A	
	46	301	VALV	11133.00	13431.39	5938.40	1085.65	3951.13	8692.34	N/A	
	47L	302	VALV	1506.59	1247.50	587.30	118.99	260.08	467.58	N/A	
	47R	302	NONS	870.69	728.20	365.91	118.99	260.08	467.58	N/A	
	48L	D01A	NONS	870.69	728.20	365.91	118.99	118.99	231.17	N/A	
	48R	D01A	BELB	257.64	223.73	142.84	118.99	118.99	231.17	114.74	281.11
	49L	D01B	BELB	223.73	257.64	142.84	0.00	0.00	0.00	0.00	0.00
	49R	D01B	STRP	0.13	0.15	0.08	0.00	0.00	0.00	0.00	0.00
	50	303	STRP	0.13	0.15	0.08	0.00	0.00	0.00	0.00	0.00
RUN5											
	51	AB04	VALV	11853.22	12791.48	6227.31	1136.86	20521.26	41907.37	N/A	
	5[illegible]	401	VALV	11853.22	12791.48	6227.31	1136.86	4143.98	8295.43	N/A	
	53L	402	VALV	1431.24	1329.15	613.45	124.21	271.38	504.65	N/A	
	53R	402	NONS	827.59	776.01	381.70	124.21	271.38	504.65	N/A	
	54L	E01A	NONS	827.59	776.01	381.70	[illegible]24.21	124.21	239.98	N/A	
	54R	E01A	BELB	245.65	238.54	149.12	[illegible]24.21	124.21	239.98	119.34	292.39

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

LOAD CASE NO. 88 (SAMI). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN5 (CONTD.)											
	55L	E01B	BELB	238.54	245.65	149.12	0.00	0.00	0.00	0.00	0.00
	55R	E01B	STRP	0.14	0.14	0.09	0.00	0.00	0.00	0.00	0.00
	S6	403	STRP	0.14	0.14	0.09	0.00	0.00	0.00	0.00	0.00
RUN6											
	57	AB05	VALV	12068.81	12150.03	5883.27	1074.81	19387.71	39803.82	N/A	
	58	501	VALV	12068.81	12150.03	5883.27	1074.81	3915.30	7995.62	N/A	
	59L	502	VALV	1354.96	1350.09	580.11	117.49	256.66	524.00	N/A	
	59R	502	NONS	784.04	787.74	360.97	117.49	256.66	524.00	N/A	
	60L	F01A	NONS	784.04	787.74	360.97	117.49	117.49	267.26	N/A	
	60R	F01A	BELB	235.39	241.81	141.05	117.49	117.49	267.26	126.28	309.40
	61L	F01B	BELB	241.81	235.39	141.05	0.00	0.00	0.00	0.00	0.00
	61R	F01B	STRP	0.14	0.14	0.08	0.00	0.00	0.00	0.00	0.00
	62	503	STRP	0.14	0.14	0.08	0.00	0.00	0.00	0.00	0.00
RUN7											
	63	002	STRP	194715.69	84025.12	74308.37	304013.37	743786.87	507158.87	5815.21	5815.21
	64L	07A	STRP	194715.69	84025.12	74308.37	304013.37	803881.94	578433.62	6340.22	6340.22
	64R	07A	STRP	196735.37	84231.00	74907.56	304013.37	803881.94	578433.62	6340.22	6340.22
	65L	07B	STRP	196735.37	84231.00	74907.56	304013.37	1093235.00	912711.06	8912.29	8912.29
	65R	07B	STRP	11126.10	81393.69	57357.90	0.00	450780.00	644094.12	4811.41	4811.41
	66L	07C	STRP	11126.10	81393.69	57357.90	0.00	336388.94	481565.12	3595.06	3595.06
	66R	07C	STRP	4646.15	80330.31	56113.21	0.00	336388.94	481565.12	3595.06	3595.06
	67L	07D	STRP	4646.15	80330.31	56113.21	0.00	271.05	386.74	2.89	2.89
	67R	07D	FLXC	0.01	77348.37	54209.75	0.00	271.05	386.74	N/A	
	68	004	FLXC	0.01	77348.37	54209.75	0.00	271.05	386.74	N/A	

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY MAINSTEAM ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

LOAD CASE NO. 88 (SAMI). FORCES, MOMENTS AND STRESSES ALONG PIPE RUNS (CONTD.)

RUN NAME	SEQ NO.	DCP NAME	COMP TYPE	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	TORS MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	M/Z (PSI)	IM/Z (PSI)
RUN5 (CONTD.)											
	55L	E01B	BELB	238.54	245.65	149.12	0.00	0.00	0.00	0.00	0.00
	55R	E01B	STRP	0.14	0.14	0.09	0.00	0.00	0.00	0.00	0.00
	56	403	STRP	0.14	0.14	0.09	0.00	0.00	0.00	0.00	0.00
RUN6											
	57	AB05	VALV	12068.81	12150.03	5883.27	1074.81	19387.71	39803.82	N/A	
	58	501	VALV	12068.81	12150.03	5883.27	1074.81	3915.30	7995.62	N/A	
	59L	502	VALV	1354.96	1350.09	580.11	117.49	256.66	524.00	N/A	
	59R	502	MONS	784.04	787.74	360.97	117.49	256.66	524.00	N/A	
	60L	F01A	MONS	784.04	787.74	360.97	117.49	117.49	267.26	N/A	
	60R	F01A	BELB	235.39	241.81	141.05	117.49	117.49	267.26	126.28	309.40
	61L	F01B	BELB	241.81	235.39	141.05	0.00	0.00	0.00	0.00	0.00
	61R	F01B	STRP	0.14	0.14	0.08	0.00	0.00	0.00	0.00	0.00
	62	503	STRP	0.14	0.14	0.08	0.00	0.00	0.00	0.00	0.00
RUN7											
	63	002	STRP	194715.69	84025.12	74308.37	304013.37	743786.87	597158.87	5815.21	5815.21
	64L	07A	STRP	194715.69	84025.12	74308.37	304013.37	803881.94	578433.62	6340.22	6340.22
	64R	07A	STRP	196735.37	84231.00	74907.56	304013.37	803881.94	578433.62	6340.22	6340.22
	65L	07B	STRP	196735.37	84231.00	74907.56	304013.37	1093235.00	912711.06	8912.29	8912.29
	65R	07B	STRP	11126.10	81393.69	57357.90	0.00	450780.00	644094.12	4811.41	4811.41
	66L	07C	STRP	11126.10	81393.69	57357.90	0.00	336388.94	481565.12	3595.06	3595.06
	66R	07C	STRP	4646.15	80330.31	56113.21	0.00	336388.94	481565.12	3595.06	3595.06
	67L	07D	STRP	4646.15	80330.31	56113.21	0.00	271.05	386.74	2.89	2.89
	67R	07D	FLXC	0.01	77348.37	54209.75	0.00	271.05	386.74	N/A	
	68	004	FLXC	0.01	77348.37	54209.75	0.00	271.05	386.74	N/A	

APPENDIX C

SHUTDOWN COOLING LINE

PRELIMINARY ROUTING AND LOADS ANALYSIS

APPENDIX C

SHUTDOWN COOLING LINE - PRELIMINARY ROUTING AND LOADS ANALYSIS

Purpose

This appendix reports the results of a preliminary stress analysis of a System 80+ Shutdown Cooling line in the Reactor Building to provide applicable forces and moments for the Leak-Before-Break (LBB) evaluation. The piping included in the model is represented in the isometric sketch that follows. The analysis model originates at the hot leg nozzle and terminates at the Reactor Building penetration. Anchors are modelled at these locations. The model also includes additional piping for the relief valve discharge to the holdup volume. All applicable design conditions, loadings, codes, and regulatory requirements are defined in the System 80+ Certification Program Draft Distribution Systems Design Guide, Reference 2.

The types of analysis results required for the LBB evaluation are shown on the following page. Other results in the detailed analysis include pipe displacements, stresses, support/restraint loads, and nozzle loads (anchor loads). Since the analysis is preliminary and design information is not available for allowable nozzle or penetration loads, it is not within the scope of the calculation to evaluate those loads.

A code compliance check is performed to verify that pipe stresses are within the ASME allowables for the pipe as modelled. As additional design information becomes available, it will be included in a final analysis.

Method

The piping is modelled as a three dimensional framework for analysis. Static analysis is performed by the Direct Stiffness Method and a simple Lumped Mass Idealization is used to determine mode shapes and frequencies for the dynamic analysis. This piping is analyzed using the SUPERPIPE computer program.

References and Design Inputs

1. ASME Boiler and Pressure Vessel Code Section III, 1989.

2. Draft Distribution Systems Design Guide.

3. ABB-CE Letter dated 4/21/92 to R.W. Bonsall enclosing Preliminary Thermal Movements and SSE Seismic Anchor Movements.

4. ABB-Impell memo dated 5/21/92 to ABB-CE, Attn: R.A. Matzie enclosing System 80+ N-411 Spectra and SAM.

5. System 80+ Shutdown Cooling System Piping and Instrumentation Diagram.

6. System 80+ Nuclear Island Detailed Arrangement Drawings.

Results

Forces and moments results for the load cases listed below are provided for the Leak-Before-Break evaluation shown in Appendix I.

1. Gravity - Fluid-filled for Hydrostatic Testing

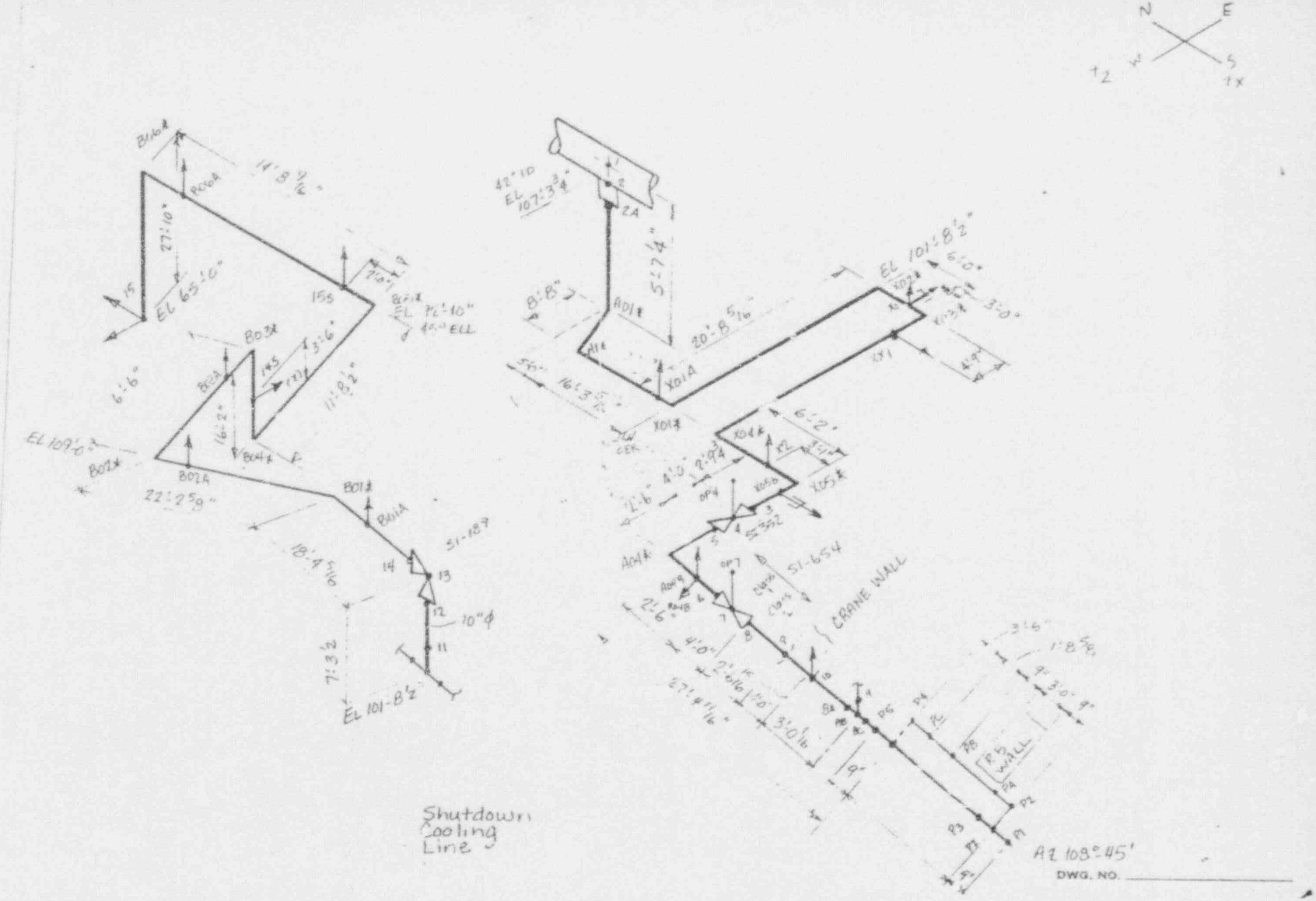
2. Thermal Expansion

3. Gravity + Thermal (Normal Operation)

4. Seismic Inertia - SSE

5. Seismic Anchor Movement - SSE

6. Seismic Inertia + Seismic Anchor Movement



N
E
S
W
+Z
+X
42" 10
EL 107'-3¾"
CRANE WALL
51-654
51-189
51-352
10"φ
EL 101'-8½"
EL 65'-0"
EL 109'-0"
Az 109°-45'
Shutdown Cooling Line
DWG. NO.

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	1	-5092.86	11.19	-30.01	-530.91	-15165.10	5932.72
	2	2	-5092.85	11.19	-30.01	-530.91	-15225.12	5910.35
	3	2A	-4676.64	11.19	-30.01	-530.91	-15265.13	5895.43
	4L	A01A	-4591.96	11.19	-30.01	-530.91	-15273.27	5892.40
	4R	A01A	-4591.96	20.40	24.69	-530.91	2533.63	-16173.25
	5		-2914.63	-2885.77	24.69	-2181.42	1451.06	-13554.27
	6L	A01B	-20.40	-3611.03	24.69	-2583.02	-481.52	-8011.65
	6R	A01B	-20.40	3611.03	-24.69	-2583.02	481.52	8011.05
	7		-20.40	3076.29	-24.69	-2583.02	439.23	2284.61
	8		-20.40	2541.53	-24.69	-2583.02	396.94	-2526.03
	9		-20.40	2006.78	-24.69	-2583.02	354.65	-6420.83
	10L	A1A	-20.40	1472.03	-24.69	-2583.02	312.36	-9399.81
	10R	A1A	-20.40	-24.69	-1472.03	-2583.02	-9399.81	-312.36
	11		-5.32	-31.59	-1145.06	2769.78	-10740.52	-282.20
	12L	A1B	11.19	-30.01	-818.08	7994.04	-8920.15	-249.19
	12R	A1B	11.19	818.08	-30.01	7994.04	249.19	-8920.14
	13		11.19	232.80	-30.01	7994.04	192.93	-9905.06
	14		11.19	-352.48	-30.01	7994.04	136.67	-9792.89
	15		11.19	-937.76	-30.01	7994.04	80.41	-8483.62
	16		11.19	-1523.05	-30.01	7994.04	24.15	-6277.26
	17		11.19	-2108.33	-30.01	7994.04	-32.11	-2873.81
	18		11.19	-2693.61	-30.01	7994.04	-80.37	1626.74
	19L	X01A	11.19	-3278.90	-30.01	7994.04	-144.63	7224.42
	19R	X01A	11.19	-30.01	-4040.84	7994.03	7224.43	144.63
	20		29.13	-13.31	-3550.38	2623.96	5393.27	180.52
	21L	X01B	30.01	11.19	-3059.91	-123.67	893.28	182.29
	21R	X01B	30.01	3059.91	11.19	-123.67	-182.29	893.28
	22		30.01	2480.80	11.19	-123.67	-161.54	-4244.98
	23		30.01	1901.67	11.19	-123.67	-140.79	-9309.16
	24		30.01	1322.55	11.19	-123.67	-120.05	-11299.21
	25		30.01	743.43	11.19	-123.67	-99.30	-13215.14
	26		30.01	164.30	11.19	-123.67	-78.56	-14056.95
	27		30.01	-414.82	11.19	-123.67	-57.81	-13824.62
	28		30.01	-993.94	11.19	-123.67	-37.06	-12518.18
	29		30.01	-1573.07	11.19	-123.67	-16.32	-10137.60
	30L	X02A	30.01	-2152.19	11.19	-123.67	4.43	-6682.88
	30R	X02A	30.01	-11.19	-2152.19	-123.67	6682.88	4.43
	31		29.13	13.31	-2642.66	-3264.92	1247.59	2.67
	32L	X02B	11.19	30.01	-3133.12	-1397.57	-5408.98	-33.23
	32R	X02B	11.19	-3133.12	-30.01	-1397.56	-33.23	5408.98
	33L	X1	11.19	-3445.36	-30.01	-1397.56	-63.24	8698.22

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X059
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	33R	X1	11.19	3632.21	-30.01	-1397.56	-63.24	8698.22
	34L	X03A	11.19	3319.97	-30.01	-1397.56	-93.25	5222.13
	34R	X03A	11.19	30.01	3319.97	-1397.56	-5222.13	-93.25
	35		-13.31	29.13	2829.51	1046.89	-332.49	-142.25
	36L	X03B	-30.01	11.19	2339.05	-436.89	4261.46	-175.65
	36R	X03B	-30.01	2339.05	-11.19	-436.89	-175.65	-4261.46
	37L	XX1	-30.01	2182.93	-11.19	-436.89	-181.25	-5391.95
	37R	XX1	-30.01	2182.93	13.39	-436.89	-181.25	-5391.95
	38		-30.01	1621.15	13.39	-436.89	-157.15	-8814.06
	39		-30.01	1059.38	13.39	-436.89	-133.06	-11225.45
	40		-30.01	497.60	13.39	-436.89	-108.96	-12626.10
	41		-30.01	-64.18	13.39	-436.89	-84.87	-13016.01
	42		-30.01	-625.95	13.39	-436.89	-60.77	-12395.17
	43		-30.01	-1187.73	13.39	-436.89	-36.68	-10763.59
	44		-30.01	-1749.51	13.39	-436.89	-12.58	-8121.27
	45		-30.01	-2311.28	13.39	-436.89	11.51	-4468.21
	46L	X04A	-30.01	-2873.06	13.39	-436.89	35.61	195.62
	46R	X04A	-30.01	13.39	2873.06	-436.89	195.62	-35.61
	47		-30.69	-11.75	3363.53	-2417.56	4239.53	-36.96
	48L	X04B	-13.39	-30.01	3853.99	-6922.67	6290.16	-2.36
	48R	X04B	-13.39	-3853.99	-30.01	-6922.67	2.36	6290.16
	49L	X2	-13.39	-4192.24	-30.01	-6922.67	-30.15	10648.40
	49R	X2	-13.39	4282.03	-30.01	-6922.67	-30.15	10648.40
	50L	X05A	-13.39	3943.75	-30.01	-6922.67	-62.67	6192.49
	50R	X05A	-13.39	30.01	3943.75	-6922.67	-6192.50	-62.67
	51		-30.69	11.75	3453.28	-2539.20	-4043.34	-97.27
	52L	X05B	-30.01	-13.39	2962.82	-714.07	-16.10	-95.91
	52R	X05B	-30.01	2962.82	13.39	-714.07	-95.91	16.10
	53L	3	-30.01	2709.12	13.39	-714.07	-85.03	-2288.12
	53R	3	-30.01	1959.13	13.39	-714.07	-85.03	-2288.12
	54L	4	-30.01	1781.93	13.39	-714.07	-58.25	-6029.17
	54R	4	-30.01	-718.07	13.39	-714.07	-58.25	-6029.17
	55L	5	-30.01	-895.27	13.39	-714.07	-31.46	-4415.83
	55R	5	-30.01	-1615.27	13.39	-714.07	-31.46	-4415.83
	56L	A04A	-30.01	-1978.37	13.39	-714.07	-17.18	-2482.94
	56R	A04A	-30.01	13.39	1978.37	-714.07	-2482.94	17.18
	57		-32.20	-6.60	2366.66	-20.03	96.71	12.81
	58L	A04B	-22.33	-24.12	2754.94	-1090.20	3007.83	32.54
	58R	A04B	-22.33	3510.08	23.87	-1090.21	-32.54	3007.83
	59L	6	-22.33	3176.98	23.87	-1090.21	-7.08	-559.12

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X058
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN1 (CONTD.)									
	59R	6	-22.33	2426.98	23.87	-1090.21	-7.08	-559.12	
	60L	7	-22.33	2249.78	23.87	-1090.21	40.65	-5235.88	
	60R	7	-22.33	-250.22	23.87	-1090.21	40.65	-5235.88	
	61	8	-22.33	-427.42	23.87	-1090.21	88.39	-4558.25	
RUN2									
	62	8	-22.33	-1177.42	23.87	-1090.21	88.39	-4558.25	
	63		-22.33	-1579.91	23.87	-1090.21	119.16	-2781.09	
	64	9	-22.33	-1982.40	23.87	-1090.21	149.92	-485.09	
	65		-22.33	-2606.88	23.87	-1090.21	197.66	4104.18	
	66L	10	-22.33	-3231.35	23.87	-1090.21	245.39	9942.42	
	66R	10	-22.33	4774.43	23.87	-1090.21	245.39	9942.42	
	67		-22.33	4461.40	23.87	-1090.21	269.32	5312.49	
	68	8A	-22.33	4148.35	23.87	-1090.21	293.25	996.41	
	69L	8B	-22.33	3836.11	23.87	-1090.21	317.12	-2995.82	
						-1090.21	317.12	-2995.82	BRANCH AXES
	69R	8B	-55.87	1595.99	18.85	302.06	-217.63	-479.53	
						-302.06	217.63	479.53	BRANCH AXES
	70	8C	-55.87	1283.75	18.85	302.06	-198.78	-1919.40	
	71		-55.87	676.51	18.85	302.06	-162.13	-3825.55	
	72		-55.87	69.27	18.85	302.06	-125.47	-4550.74	
	73		-55.87	-537.97	18.85	302.06	-88.82	-4094.97	
	74		-55.87	-1145.22	18.85	302.06	-52.17	-2458.23	
	75	P5	-55.87	-1752.46	18.85	302.06	-15.51	359.48	
	76L	P4	-55 87	-1934.59	18.85	302.06	-4.52	1434.81	
	76R	P4	-55.87	1044.25	1.70	302.06	-4.52	1434.81	
	77		-55.87	530.81	1.70	302.06	-1.48	22.18	
	78		-55.87	17.36	1.70	302.06	1.57	-469.46	
	79		-55.87	-496.08	1.70	302.06	4.61	-40.10	
	80		-55.87	-1009.53	1.70	302.06	7.65	1310.25	
	81	P3	-55.87	-1522.97	1.70	302.06	10.69	3581.61	
	82L	P2	-55.87	-1737.65	1.70	302.06	11.97	4804.34	
	82R	P2	0.00	214.68	0.00	0.00	0.00	80.50	
	83	P1	0.00	0.00	0.00	0.00	0.00	0.00	
RUN3									
	84	8B	2240.12	30.14	-15.53	534.75	-509.54	2830.27	
						1392.26	-534.75	2516.28	BRANCH AXES
	85	11	2108.26	30.14	-15.53	534.75	-523.95	2802.33	
	86		1853.93	30.14	-15.53	534.75	-551.72	2748.43	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	87		1599.60	30.14	-15.53	534.75	-579.50	2694.53
	89	12	1345.26	30.14	-15.53	534.75	-607.28	2640.63
	89L	13	1307.16	30.14	-15.53	534.75	-622.82	2610.48
	89R	13	-33.54	1107.16	-5.02	1428.87	534.75	2271.75
	90	14	-33.54	1069.06	-5.02	1428.87	529.73	1183.64
	91		-33.54	807.01	-5.02	1428.87	520.48	-544.64
	92		-33.54	544.96	-5.02	1428.87	511.23	-1790.11
	93		-33.54	282.91	-5.02	1428.87	501.98	-2552.77
	94		-33.54	20.86	-5.02	1428.87	492.72	-2832.61
	95		-33.54	-241.19	-5.02	1428.87	483.47	-2629.63
	96		-33.54	-503.25	-5.02	1428.87	474.22	-1943.83
	97		-33.54	-765.30	-5.02	1428.87	464.97	-775.21
	98		-33.54	-1027.35	-5.02	1428.87	455.72	876.22
	99L	B01A	-33.54	-1289.40	-5.02	1428.87	446.47	3010.49
	99R	B01A	-33.54	-5.02	-1652.42	1428.87	3010.50	-446.47
	100L	B01B	-10.33	-32.30	-1454.61	-985.04	871.39	-417.46
	100R	B01B	-10.33	1454.61	-32.30	-985.04	417.46	871.39
	101		-10.33	1193.54	-32.30	-985.04	358.17	-1559.05
	102		-10.33	932.46	-32.30	-985.04	298.89	-3510.28
	103		-10.33	671.39	-32.30	-985.04	239.60	-4982.29
	104		-10.33	410.31	-32.30	-985.04	180.31	-5975.06
	105		-10.33	149.24	-32.30	-985.04	121.03	-6488.62
	106		-10.33	-111.84	-32.30	-985.04	61.74	-6522.94
	107		-10.33	-372.91	-32.30	-985.04	2.45	-6078.04
	108		-10.33	-633.99	-32.30	-985.04	-56.83	-5153.91
	109		-10.33	-895.06	-32.30	-985.04	-116.12	-3750.56
	110		-10.33	-1156.14	-32.30	-985.04	-175.41	-1867.97
	111L	B02A	-10.33	-1417.21	-32.30	-985.04	-234.69	493.86
	111R	B02A	-10.33	32.30	96.15	-985.04	-493.86	-234.69
	112L	B02B	-32.30	-10.33	-183.12	548.22	-1039.40	-262.16
	112R	B02B	-32.30	-183.12	10.33	548.22	-262.16	1039.40
	113		-32.30	-467.58	10.33	548.22	-241.50	3690.09
	114L	B03A	-32.30	-752.04	10.33	548.22	-220.84	2909.71
	114R	B03A	-32.30	3072.43	10.33	548.22	-220.84	2909.71
	115L	B03B	-2793.16	-32.30	10.33	207.93	561.13	-715.91
	115R	B03B	-2793.16	30.14	15.53	207.92	-903.01	109.45
	116		-2522.53	30.14	15.53	207.92	-873.45	52.10
	117		-2251.90	30.14	15.53	207.92	-843.89	-5.26
	118		-1981.27	30.14	15.53	207.92	-814.33	-62.61
	119		-1710.64	30.14	15.53	207.92	-784.77	-119.97

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SUP NUB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	120		-1440.01	30.14	15.53	207.92	-755.21	-177.32
	121L	14S	-1169.37	30.14	15.53	207.92	-725.65	-234.68
	121R	14S	-1169.37	30.14	1.81	207.92	-725.65	-234.68
	122		-1009.36	30.14	1.81	207.92	-723.62	-268.59
	123L	B04A	-849.36	30.14	1.81	207.92	-721.58	-302.50
	123R	B04A	-849.36	22.59	-20.03	207.93	-724.13	296.34
	124L	B04B	-22.59	-570.09	-20.03	749.18	182.88	1155.25
	124R	B04B	-22.59	570.09	20.03	749.18	-182.88	-1155.25
	125		-22.59	287.32	20.03	749.18	-143.05	-2007.56
	126		-22.59	4.56	20.03	749.18	-103.22	-2297.70
	127		-22.59	-278.21	20.03	749.18	-63.39	-2025.67
	128		-22.59	-560.98	20.03	749.18	-23.56	-1191.48
	129L	B05A	-22.59	-843.75	20.03	749.18	16.26	204.90
	129R	B05A	-22.59	20.03	843.75	749.18	204.90	-16.26
	130L	B05B	-30.14	-1.81	983.38	50.39	1482.12	-25.70
	130R	B05B	-30.14	-983.38	-1.81	50.39	25.70	1482.12
	131L	15S	-30.14	-1194.20	-1.81	50.39	23.02	3095.96
	131R	15S	-30.14	730.98	-1.81	50.39	23.02	3095.96
	132		-30.14	459.24	-1.81	50.39	19.56	1958.96
	133		-30.14	187.49	-1.81	50.39	16.10	1341.15
	134		-30.14	-84.25	-1.81	50.39	12.64	1242.51
	135		-30.14	-355.99	-1.81	50.39	9.18	1663.07
	136		-30.14	-627.73	-1.81	50.39	5.72	2602.80
	137L	B06A	-30.14	-899.47	-1.81	50.39	2.26	4061.73
	137R	B06A	-30.15	4060.19	-1.81	50.39	2.26	4061.73
	138L	B06B	-3780.93	-30.14	-1.81	0.00	48.13	-801.29
	138R	B06B	-3780.93	30.14	1.81	0.00	-48.13	801.29
	139		-3510.86	30.14	1.81	0.00	-44.69	744.06
	140		-3240.80	30.14	1.81	0.00	-41.25	686.82
	141		-2970.73	30.14	1.81	0.00	-37.81	629.59
	142		-2700.67	30.14	1.81	0.00	-34.38	572.35
	143		-2430.60	30.14	1.81	0.00	-30.94	515.12
	144		-2160.53	30.14	1.81	0.00	-27.50	457.88
	145		-1890.47	30.14	1.81	0.00	-24.06	400.65
	146		-1620.40	30.14	1.81	0.00	-20.63	343.41
	147		-1350.33	30.14	1.81	0.00	-17.19	286.18
	148		-1080.27	30.14	1.81	0.00	-13.75	228.94
	149		-810.20	30.14	1.81	0.00	-10.31	171.71
	150		-540.14	30.14	1.81	0.00	-6.88	114.47
	151		-270.07	30.14	1.81	0.00	-3.44	57.24

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X058
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	152	15	0.00	30.14	1.81	0.00	0.00	0.00
MMBS								
	15	P4	0.00	-3252.84	17.15	0.00	0.00	0.00
		PC	0.00	-4663.33	17.15	0.00	60.03	13853.30
	16	PC	0.00	-4937.33	17.15	0.00	60.03	13853.30
		PB	0.00	-5630.90	17.15	0.00	89.51	22934.86
	17	PB	55.87	4239.75	-12.81	-302.06	37.34	9919.25
		PA	55.87	2728.51	-12.81	-302.06	-10.69	-3146.24
	18	PA	55.87	2254.58	-1.70	-302.06	-10.69	-3146.24
		P2	55.87	1952.33	-1.70	-302.06	-11.97	-4723.84
	19	4	1000.00	0.00	0.00	0.00	0.00	0.00
		OP4	1000.00	0.00	0.00	0.00	0.00	0.00
	20	7	1000.00	0.00	0.00	0.00	0.00	0.00
		OP7	1000.00	0.00	0.00	0.00	0.00	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMP), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	1	846.39	13783.31	4562.01	64977.12	31235.66	72969.37
	2	2	846.39	13783.31	4562.01	64977.12	21842.51	41826.34
	3	2A	846.39	13783.31	4562.01	64977.12	15581.97	21069.47
	4L	A01A	846.39	13783.31	4562.01	64977.12	14308.26	19679.24
	4R	A01A	846.40	534.57	12927.74	64977.08	0.00	6055.17
	5		8265.25	0.00	12927.74	49385.23	51542.95	9664.56
	6L	A01B	10942.45	846.39	12927.74	5892.02	86793.94	12970.29
	6R	A01B	10842.45	785.84	0.00	5892.04	43207.20	10127.83
	7		10842.45	785.84	0.00	5892.04	26987.59	8791.48
	8		10842.45	785.84	0.00	5892.04	17828.32	7455.13
	9		10842.45	785.84	0.00	5892.04	8669.00	6118.78
	10L	A1A	10842.45	785.84	0.00	5892.04	0.00	4782.42
	10R	A1A	10842.45	0.00	846.39	5892.04	4782.43	161522.62
	11		14217.70	0.00	846.39	2920.51	6307.43	169148.87
	12L	A1B	13783.31	4562.01	846.39	1039.10	6142.37	168167.44
	12R	A1B	13783.31	785.84	4562.01	1039.11	0.00	6142.37
	13		13783.31	785.84	4562.01	1039.11	0.00	4679.74
	14		13783.31	785.84	4562.01	1039.11	0.00	3217.12
	15		13783.31	785.84	4562.01	1039.11	0.00	1754.48
	16		13783.31	785.84	4562.01	1039.11	0.00	291.86
	17		13783.31	785.84	4562.01	1039.11	0.00	552.88
	18		13783.31	785.84	4562.01	1039.11	0.00	2345.25
	19L	X01A	13783.31	785.84	4562.01	1039.11	0.00	4137.64
	19R	X01A	13783.30	4562.02	181.80	1039.10	4137.64	132718.12
	20		11810.27	12972.10	181.80	2496.86	3145.23	131225.56
	21L	X01B	4198.71	13783.31	181.80	3735.01	875.26	114838.56
	21R	X01B	4198.71	148.35	13783.31	3735.02	0.00	875.26
	22		4198.70	148.35	13783.31	3735.02	0.00	723.31
	23		4198.70	148.35	13783.31	3735.02	9947.30	615.24
	24		4198.70	148.35	13783.31	3735.02	27552.61	950.04
	25		4198.70	148.35	13783.31	3735.02	56433.89	1284.85
	26		4198.70	148.35	13783.31	3735.02	85315.12	1619.66
	27		4198.70	148.35	13783.31	3735.02	114196.31	1954.46
	28		4198.70	148.35	13783.31	3735.02	143077.56	2289.27
	29		4198.70	148.35	13783.31	3735.02	171958.87	2624.08
	30L	X02A	4198.71	148.35	13783.31	3735.02	200840.37	2958.89
	30R	X02A	4198.71	0.00	148.35	3735.02	2487.29	200840.37
	31		11810.27	0.00	148.35	4839.05	293.52	225880.87
	32L	X02B	13783.30	4198.70	148.35	3319.92	3375.98	242291.25

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMP), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	32R	X02B	13783.31	148.35	4562.01	3319.92	242291.25	3467.25
	33L	X1	13783.31	148.35	4562.01	3319.92	247445.12	3299.65
	33R	X1	13783.31	177.75	4562.01	3319.92	247445.12	3299.65
	34L	X03A	13783.31	177.75	4562.01	3319.92	252599.00	3098.84
	34R	X03A	13783.31	4198.71	177.75	3319.91	7961.74	252599.00
	35		12972.10	11810.27	177.75	589.02	4114.08	250766.06
	36L	X03B	4562.02	13783.30	177.75	2697.22	2856.45	231763.69
	36R	X03B	4562.01	177.75	0.00	2697.22	231763.69	2420.87
	37L	XX1	4562.01	177.75	0.00	2697.22	223977.94	2320.46
	37R	XX1	4562.01	177.75	726.60	2697.22	223977.94	2320.46
	38		4562.01	177.75	726.60	2697.22	197276.94	1959.17
	39		4562.01	177.75	726.60	2697.22	170575.81	1597.87
	40		4562.01	177.75	726.60	2697.22	143874.69	1236.58
	41		4562.01	177.75	726.60	2697.22	117173.50	875.28
	42		4562.01	177.75	726.60	2697.22	90472.37	513.99
	43		4562.01	177.75	726.60	2697.22	6[illegible]771.27	152.69
	44		4562.01	177.75	726.60	2697.22	3[illegible]70.13	177.94
	45		4562.01	177.75	726.60	2697.22	30[illegible]20.27	594.87
	46L	X04A	4562.01	177.75	726.60	2697.22	25416.81	1011.81
	46R	X04A	4562.02	726.59	233.38	2697.22	1011.80	16332.29
	47		12514.63	0.00	233.38	2685.31	964.78	34301.01
	48L	X04B	13136.35	4562.00	233.38	1332.82	2295.60	35705.79
	48R	X04B	13136.34	177.75	4562.01	1332.82	11256.39	2295.60
	49L	X2	13136.34	177.75	4562.01	1332.82	6659.20	2078.06
	49R	X2	13136.34	227.38	4562.01	1332.82	6659.20	2078.06
	50L	X05A	13136.34	227.38	4562.01	1332.82	3028.57	1884.34
	50R	X05A	13136.35	4198.71	227.38	1332.82	1958.79	3028.57
	51		12514.63	6062.96	227.38	2170.13	570.37	0.00
	52L	X05B	4562.02	13136.34	227.38	1548.34	1690.43	0.00
	52R	X05B	4562.01	227.38	726.60	1548.34	0.00	1152.17
	53	3	4562.01	227.38	726.60	1548.34	0.00	1020.91
	54	4	4562.01	227.38	726.60	1548.34	233.18	697.81
	55	5	4562.01	227.38	726.60	1548.34	1676.10	374.70
	56L	A04A	4562.01	227.38	726.60	1548.34	2445.77	202.36
	56R	A04A	4562.02	726.60	62.92	1548.34	202.36	131165.31
	57		11359.85	0.00	62.92	2904.90	654.00	146524.87
	58L	A04B	13905.61	646.90	62.92	3329.62	1459.28	152277.00
	58R	A04B	13905.61	143.05	7146.79	3329.62	0.00	1459.28

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMP), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN1 (CONTD.)	59	6	13905.61	143.05	7146.79	3329.62	0.00	1305.04	
	60	7	13905.61	143.05	7146.79	3329.62	0.00	1015.87	
	61	8	13905.61	143.05	7146.79	3329.62	0.00	726.71	
RUN2	62	8	13905.61	143.05	7146.79	3147.44	0.00	726.71	
	63		13905.61	143.05	7146.79	3147.44	0.00	540.34	
	64	9	13905.61	143.05	7146.79	3147.44	0.00	353.96	
	65		13905.61	143.05	7146.79	3147.44	0.00	219.70	
	66L	10	13905.61	143.05	7146.79	3147.44	0.00	394.47	
	66R	10	13905.61	965.16	7146.79	3147.44	0.00	394.47	
	67		13905.61	965.16	7146.79	3147.44	0.00	446.93	
	68	8A	13905.61	965.16	7146.79	3147.44	0.00	499.38	
	69L	8B	13905.61	965.16	7146.79	3147.44	0.00	551.69	
			13905.61	965.16	7146.79	3147.44	0.00	551.69	BRANCH AXES
	69R	8B	14890.07	84.71	6594.43	0.00	0.00	854.09	
			14890.07	84.71	6594.43	0.00	0.00	854.09	BRANCH AXES
	70	8C	14890.07	84.71	6594.43	0.00	0.00	764.47	
	71		14890.07	84.71	6594.43	0.00	0.00	590.17	
	72		14890.07	84.71	6594.43	0.00	0.00	415.87	
	73		14890.07	84.71	6594.43	0.00	12976.26	246.90	
	74		14890.07	84.71	6594.43	0.00	26672.20	85.43	
	75	P5	14890.07	84.71	6594.43	0.00	40368.27	92.92	
	76L	P4	14890.07	84.71	6594.43	0.00	44476.06	121.57	
	76R	P4	14890.07	12.99	0.00	0.00	44476.06	121.57	
	77		14890.07	12.99	0.00	0.00	34361.60	96.91	
	78		14890.07	12.99	0.00	0.00	24207.11	72.25	
	79		14890.07	12.99	0.00	0.00	14072.64	47.59	
	80		14890.07	12.99	0.00	0.00	3938.15	22.93	
	81	P3	14890.07	12.99	0.00	0.00	0.00	3.04	
	82L	P2	14890.07	12.99	0.00	0.00	0.00	10.32	
	82R	P2	0.00	0.00	0.00	0.00	0.00	0.00	
	83	P1	0.00	0.00	0.00	0.00	0.00	0.00	
RUN3	84	8B	887.41	97.70	11.48	3022.03	6257.66	1836.60	
			88.83	887.41	42.27	5335.21	3022.03	3750.59	BRANCH AXES
	85	11	887.41	97.70	11.48	3022.03	6053.12	2935.35	

ADVANCED LIGHT WATER REACTOR *** X3 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (TEMP), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SUP NAME	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	86		887.41	97.70	11.48	3022.03	5658.58	5054.62
	87		887.41	97.70	11.48	3022.03	5264.04	7173.89
	88	12	887.41	97.70	11.48	3022.03	4869.51	9293.18
	89L	13	887.41	97.70	11.48	3022.03	4648.87	10478.32
	89R	13	984.46	887.41	42.27	154.34	3022.03	11416.57
	90	14	984.46	887.41	42.27	154.34	2432.15	10468.89
	91		984.46	887.41	42.27	154.34	1345.34	8722.83
	92		984.46	887.41	42.27	154.34	389.19	6976.76
	93		984.46	887.41	42.27	154.34	254.21	5230.70
	94		984.46	887.41	42.27	154.34	331.54	3484.63
	95		984.46	887.41	42.27	154.34	408.87	1738.56
	96		984.46	887.41	42.27	154.34	486.20	12.67
	97		984.46	887.41	42.27	154.34	563.53	153.21
	98		984.46	887.41	42.27	154.34	640.87	301.13
	99L	B01A	984.46	887.41	42.27	154.34	718.20	449.06
	99R	B01A	984.46	42.27	588.89	154.34	449.06	7349.22
	100L	B01B	930.81	638.63	588.89	3808.99	276.74	7277.61
	100R	B01B	930.81	54.17	638.63	3808.99	703.77	276.74
	101		930.81	54.17	638.63	3808.99	592.64	178.01
	102		930.81	54.17	638.63	3808.99	481.52	86.15
	103		930.81	54.17	638.63	3808.99	370.40	920.69
	104		930.81	54.17	638.63	3808.99	259.27	2075.08
	105		930.81	54.17	638.63	3808.99	221.11	3229.47
	106		930.81	54.17	638.63	3808.99	624.84	4383.86
	107		930.81	54.17	638.63	3808.99	1485.66	5538.25
	108		930.81	54.17	638.63	3808.99	2737.56	6692.64
	109		930.81	54.17	638.63	3808.99	3989.46	7847.03
	110		930.81	54.17	638.63	3808.99	5241.35	9001.41
	111L	B02A	930.81	54.17	638.63	3808.99	6493.26	10155.82
	111R	B02A	930.81	60.97	469.44	3809.00	809.28	6493.26
	112L	B02B	638.63	930.81	469.44	9529.16	4435.65	6103.23
	112R	B02B	638.63	469.44	77.20	9529.15	6103.23	348.20
	113		638.63	469.44	77.20	9529.15	4115.16	430.14
	114L	B03A	638.63	469.44	77.20	9529.15	2127.10	544.43
	114R	B03A	638.63	138.77	77.20	9529.15	2127.10	544.43
	115L	B03B	2111.70	638.63	77.20	96.02	8286.61	505.85
	115R	B03B	2111.70	97.70	206.60	96.02	718.22	218.35
	116		2111.70	97.70	206.60	96.02	696.54	33.76

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMP), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	117		2111.70	97.70	206.60	96.02	674.85	1814.61
	118		2111.70	97.70	206.60	96.02	653.17	4069.69
	119		2111.70	97.70	206.60	96.02	631.49	6324.76
	120		2111.70	97.70	206.60	96.02	609.81	8579.83
	121L	14S	2111.70	97.70	206.60	96.02	588.13	10834.92
	121R	14S	2111.70	97.70	30.97	96.02	588.13	10834.92
	122		2111.70	97.70	30.97	96.02	622.73	12168.21
	123L	B04A	2111.70	97.70	30.97	96.02	657.33	13501.49
	123R	B04A	2111.70	90.98	527.64	96.02	4329.80	14764.19
	124L	B04B	1041.81	2111.70	527.64	376.84	37.46	13335.97
	124R	B04B	1041.81	188.77	47.18	376.84	871.31	1126.52
	125		1041.81	188.77	47.18	376.84	486.66	753.88
	126		1041.81	188.77	47.18	376.84	193.50	381.25
	127		1041.81	188.77	47.18	376.84	241.96	114.40
	128		1041.81	188.77	47.18	376.84	335.10	4597.86
	129L	B05A	1041.81	188.77	47.18	376.84	428.24	9081.34
	129R	B05A	1041.81	47.18	2111.70	376.84	9081.34	5420.04
	130L	B05B	1109.76	363.57	2111.70	855.99	4855.08	5511.76
	130R	B05B	1109.76	188.77	363.57	855.99	436.58	4855.07
	131L	15S	1109.76	188.77	363.57	855.99	390.99	8197.72
	131R	15S	1109.76	175.90	363.57	855.99	390.99	8197.72
	132		1109.76	175.90	363.57	855.99	332.23	12329.16
	133		1109.76	175.90	363.57	855.99	273.47	16460.62
	134		1109.76	175.90	363.57	855.99	214.72	20592.09
	135		1109.76	175.90	363.57	855.99	155.96	24723.53
	136		1109.76	175.90	363.57	855.99	97.20	28854.98
	137L	B06A	1109.76	175.90	363.57	855.99	38.44	32986.47
	137R	B06A	1109.76	0.00	363.57	855.99	38.44	32986.47
	138L	B06B	0.00	1109.76	363.57	0.00	817.5[illegible]	31505.05
	138R	B06B	0.00	97.70	30.97	0.00	10321.46	2578.81
	139		0.00	97.70	30.97	0.00	9584.23	2394.61
	140		0.00	97.70	30.97	0.00	8846.98	2210.41
	141		0.00	97.70	30.97	0.00	8109.73	2026.21
	142		0.00	97.70	30.97	0.00	7372.48	1842.01
	143		0.00	97.70	30.97	0.00	6635.24	1657.81
	144		0.00	97.70	30.97	0.00	5897.99	1473.61
	145		0.00	97.70	30.97	0.00	5160.74	1289.41
	146		0.00	97.70	30.97	0.00	4423.49	1105.21

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMP), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	147		0.00	97.70	30.97	0.00	3686.25	921.01
	148		0.00	97.70	30.97	0.00	2949.00	736.81
	149		0.00	97.70	30.97	0.00	2211.75	552.60
	150		0.00	97.70	30.97	0.00	1474.51	368.40
	151		0.00	97.70	30.97	0.00	737.26	184.20
	152	15	0.00	97.70	30.97	0.00	0.00	0.00
MNBS								
	15	P4	0.00	100.42	11884.93	0.00	0.00	0.00
		PC	0.00	100.42	11884.93	0.00	41597.27	207.97
	16	PC	0.00	100.42	11884.93	0.00	41597.27	207.97
		PB	0.00	100.42	11884.93	0.00	62025.09	310.11
	17	PB	1791.33	34.70	0.00	2048.63	25390.61	131.76
		PA	1791.33	34.70	0.00	2048.63	5802.27	13.20
	18	PA	1791.33	15.70	5290.50	2048.63	5802.27	13.20
		P2	1791.33	15.70	5290.50	2048.63	9770.15	11.38
	19	4	0.00	0.00	0.00	0.00	0.00	0.00
		OP4	0.00	0.00	0.00	0.00	0.00	0.00
	20	7	0.00	0.00	0.00	0.00	0.00	0.00
		OP7	0.00	0.00	0.00	0.00	0.00	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMX), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SUP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	1	846.39	13783.31	4562.01	-73819.25	31235.66	72969.37
	2	2	846.39	13783.31	4562.01	-73819.25	21842.51	41826.34
	3	2A	846.39	13783.31	4562.01	-73819.25	15581.97	21069.47
	4L	A01A	846.39	13783.71	4562.01	-73819.25	14308.26	19679.24
	4R	A01A	846.40	-10842.45	12927.74	-73819.25	-18128.77	-10726.78
	5		8265.25	-7068.29	12927.74	49385.28	51542.95	-10920.39
	6L	A01B	10842.45	846.39	12927.74	-10792.67	86793.94	12970.29
	6R	A01B	10842.45	-846.39	-12927.74	-10386.22	-86793.94	-12970.29
	7		10842.45	-846.39	-12927.74	-10386.22	-105476.00	-11332.66
	8		10842.45	-846.39	-12927.74	-10386.22	-124158.19	-9695.04
	9		10842.45	-846.39	-12927.74	-10386.22	-142840.37	-8057.41
	10L	A1A	10842.45	-846.39	-12927.74	-10386.22	-161522.62	-6419.77
	10R	A1A	10842.45	-12927.74	846.39	-10386.22	-6419.78	161522.62
	11		14217.70	-9887.96	846.39	-7337.83	-8561.40	169148.87
	12L	A1B	13783.31	4562.01	846.39	-2788.26	-9381.25	168167.44
	12R	A1B	13783.31	-846.39	4562.01	-2788.26	-168167.44	-9381.25
	13		13783.31	-846.39	4562.01	-2788.26	-158506.69	-7754.82
	14		13783.31	-846.39	4562.01	-2788.26	-148845.87	-6128.38
	15		13783.31	-846.39	4562.01	-2788.26	-139185.00	-4501.94
	16		13783.31	-846.39	4562.01	-2788.26	-129524.25	-2875.50
	17		13783.31	-846.39	4562.01	-2788.26	-119863.44	-1249.06
	18		13783.31	-846.39	4562.01	-2788.26	-124245.94	-2633.40
	19L	X01A	13783.31	-846.39	4562.01	-2788.26	-132718.12	4137.64
	19R	X01A	13783.30	4562.02	181.80	-2788.26	4137.64	132718.12
	20		11810.27	12972.10	181.80	-3416.90	3145.23	131225.56
	21L	X01B	-4562.00	13783.31	181.80	-3802.44	-2691.36	114838.56
	21R	X01B	-4562.01	-181.80	13783.31	-3802.45	-107825.25	-2527.00
	22		-4562.01	-181.80	13783.31	-3802.44	-84386.06	-2442.62
	23		-4562.01	-181.80	13783.31	-3802.44	-60946.77	-2358.24
	24		-4562.01	-181.80	13783.31	-3802.44	-37507.43	-2273.87
	25		-4562.01	-181.80	13783.31	-3802.44	56433.89	-2189.50
	26		-4562.01	-181.80	13783.31	-3802.44	85315.12	-2105.12
	27		-4562.01	-181.80	13783.31	-3802.44	114196.31	-2020.75
	28		-4562.01	-181.80	13783.31	-3802.44	143077.56	2289.27
	29		-4562.01	-181.80	13783.31	-3802.44	171958.87	2624.08
	30L	X02A	-4562.01	-181.80	13783.31	-3802.45	200840.37	2958.89
	30R	X02A	-4562.00	-13783.31	-181.80	-3802.45	-2958.89	200840.37
	31		11810.27	-12972.11	-181.80	4839.05	-6[illegible]2.93	225880.87
	32L	X02B	13783.30	-4562.02	-181.80	3319.92	-3467.24	242291.25

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMX), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	32R	X02B	13783.31	-181.80	4562.01	3319.92	242291.25	3467.25
	33L	X1	13783.31	-181.80	4562.01	3319.92	247445.12	3299.65
	33R	X1	13783.31	-233.38	4562.01	3319.92	247445.12	3299.65
	34L	X03A	13783.31	-233.38	4562.01	3319.92	252599.00	3098.84
	34R	X03A	13783.31	-4562.00	-233.38	3319.91	-3098.84	252599.00
	35		12972.10	11810.27	-233.38	389.02	4114.08	250766.06
	36L	X03B	4562.02	13783.50	-233.38	2697.22	2856.45	231763.69
	36R	X03B	4562.01	-233.38	-13783.31	2697.22	231763.69	-2856.45
	37L	XX1	4562.01	-233.38	-13783.31	2697.22	223977.94	-2740.58
	37R	XX1	4562.01	-233.38	-13136.34	2697.22	223977.94	-2740.58
	38		4562.01	-233.38	-13136.34	2697.22	197276.94	-2323.65
	39		4562.01	-233.38	-13136.34	2697.22	170575.81	-1906.72
	40		4562.01	-233.38	-13136.34	2697.22	143874.69	-1489.79
	41		4562.01	-233.38	-13136.34	2697.22	117173.50	-1072.86
	42		4562.01	-233.38	-13136.34	2697.22	90472.37	-655.93
	43		4562.01	-233.38	-13136.34	2697.22	63771.27	-238.99
	44		4562.01	-233.38	-13136.34	2697.22	37070.13	208.60
	45		4562.01	-233.38	-13136.34	2697.22	30520.27	594.87
	46L	X04A	4562.01	-233.38	-13136.34	2697.22	25416.81	1011.81
	46R	X04A	4562.02	-13136.34	233.38	2697.22	1011.80	-25416.81
	47		12514.63	-6062.95	233.38	2683.31	964.78	34301.01
	48L	X04B	13136.35	4562.00	233.38	-1475.27	2295.60	35705.79
	48R	X04B	13136.34	-233.38	4562.01	-1475.27	-35705.79	2295.60
	49L	X2	13136.34	-233.38	4562.01	-1475.27	-30122.60	2078.06
	49R	X2	13136.34	227.38	4562.01	-1475.27	-30122.60	2078.06
	50L	X05A	13136.34	227.38	4562.01	-1475.27	-24538.88	-1958.79
	50R	X05A	13136.35	-4562.00	227.38	-1475.27	1958.79	-24538.88
	51		12514.63	6062.96	227.38	-2522.88	570.37	-25943.62
	52L	X05B	4562.02	13136.34	227.38	-2281.90	1690.43	-43912.40
	52R	X05B	4562.01	227.38	-13136.34	-2281.90	-43912.40	-1690.43
	53	3	4562.01	227.38	-13136.34	-2281.90	-55970.43	-1835.72
	54	4	4562.01	227.38	-13136.34	-2281.90	-85651.69	-2193.34
	55	5	4562.01	227.38	-13136.34	-2281.90	-115333.00	-2550.95
	56L	A04A	4562.01	227.38	-13136.34	-2281.90	-131165.31	-2741.71
	56R	A04A	4562.02	-13136.34	-227.38	-2281.90	-2741.71	131165.31
	57		11359.85	-8020.55	-227.38	2904.90	-2086.35	146524.87
	58L	A04B	13905.61	-4877.99	-227.38	3329.62	-2401.71	152277.00
	58R	A04B	13905.61	-241.83	7146.79	3329.62	-152277.00	-2401.71

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMX), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN1 (CONTD.)									
	59	6	13905.61	-241.83	7146.79	3329.62	-143663.44	-2145.54	
	60	7	13905.61	-241.83	7146.79	3329.62	-127515.44	-1665.30	
	61	8	13905 61	-241.83	7146.79	3329.62	-111367.44	-1185.06	
RUN2									
	62	8	13905.61	-241.83	7146.79	3147.44	-105273.84	-1185.06	
	63		13905.61	-241.83	7146.79	3147.44	-95435.44	-875.54	
	64	9	13905.61	-241.83	7146.79	3147.44	-85597.12	-566.01	
	65		13905.61	-241.83	7146.79	3147.44	-70332.69	219.70	
	66L	10	13905.61	-241.83	7146.79	3147.44	-55068.27	394.47	
	66R	10	13905.61	965.16	7146.79	3147.44	-55068.27	394.47	
	67		13905.61	965.16	7146.79	3147.44	-47416.16	-872.14	
	68	8A	13905.61	965.16	7146.79	3147.44	-39764.10	-1905.53	
	69L	8B	13905.61	965.16	7146.79	3147.44	-32131.88	-2936.25	
			13905.61	965.16	7146.79	3147.44	32131.88	2936.25	BRANCH AXES
	69R	8B	14890.07	84.71	6594.43	-2187.78	-35153.89	854.09	
			14890.07	84.71	6594.43	2187.78	35153.89	854.09	BRANCH AXES
	70	8C	14890.07	84.71	6594.43	-2187.78	-28111.55	764.47	
	71		14890.07	84.71	6594.43	-2187.78	-14415.66	590.17	
	72		14890.07	84.71	6594.43	-2187.78	-719.70	415.87	
	73		14890.07	84.71	6594.43	-2187.78	12976.26	246.90	
	74		14890.07	84.71	6594.43	-2187.78	26672.20	85.43	
	75	P5	14890.07	84.71	6594.43	-2187.78	40368.27	-107.03	
	76L	P4	14890.07	84.71	6594.43	-2187.78	44476.06	-159.31	
	76R	P4	14890.07	-15.70	-5290.50	-2187.78	44476.06	-159.31	
	77		14890.07	-15.70	-5290.50	-2187.78	34341.60	-129.51	
	78		14890.07	-15.70	-5290.50	-2187.78	24207.11	-99.71	
	79		14890.07	-15.70	-5290.50	-2187.78	14072.64	-69.91	
	80		14890.07	-15.70	-5290.50	-2187.78	3938.15	-40.11	
	81	P3	14890.07	-15.70	-5290.50	-2187.78	-6196.38	-14.10	
	82L	P2	14890.07	-15.70	-5290.50	-2187.78	-10433.78	-12.04	
	82R	P2	0.00	0.00	0.00	0.00	0.00	0.00	
	83	P1	0.00	0.00	0.00	0.00	0.00	0.00	
RUN3									
	84	8B	887.41	-1109.76	-206.60	3022.03	6257.66	1836.60	
			984.46	887.41	552.36	5335.21	3022.03	3750.59	BRANCH AXES
	85	11	887.41	-1109.76	-206.60	3022.03	6053.12	2935.35	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DES1
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMX), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	86		887.41	-1109.76	-206.60	3022.03	5658.58	5054.62
	87		887.41	-1109.76	-206.60	3022.03	5264.04	7173.89
	88	12	887.41	-1109.76	-206.60	3022.03	4869.51	9293.18
	89L	13	887.41	-1109.76	-206.60	3022.03	4648.87	10478.32
	89R	13	984.46	887.41	-552.36	-1034.02	3022.03	11416.57
	90	14	984.46	887.41	-552.36	-1034.02	2432.15	10468.89
	91		984.46	887.41	-552.36	-1034.02	1345.34	8722.83
	92		984.46	887.41	-552.36	-1034.02	389.19	6976.76
	93		984.46	887.41	-552.36	-1034.02	-1149.10	5230.70
	94		984.46	887.41	-552.36	-1034.02	-2027.36	3484.63
	95		984.46	887.41	-552.36	-1034.02	-3001.93	1738.56
	96		984.46	887.41	-552.36	-1034.02	-4088.76	12.67
	97		984.46	887.41	-552.36	-1034.02	-5175.57	-1753.58
	98		984.46	887.41	-552.36	-1034.02	-6262.39	-3499.65
	99L	B01A	984.46	887.41	-552.36	-1034.02	-7349.22	-5245.73
	99R	B01A	984.46	-552.36	588.89	-1034.02	-5245.73	7349.22
	100L	B01B	930.81	638.63	588.89	3808.99	-2542.47	7277.61
	100R	B01B	930.81	-588.89	638.63	3808.99	-7277.61	-2542.47
	101		930.81	-588.89	638.63	3808.99	-6025.71	-1388.08
	102		930.81	-588.89	638.63	3808.99	-4773.82	-233.70
	103		930.81	-588.89	638.63	3808.99	-3521.92	920.69
	104		930.81	-588.89	638.63	3808.99	-2270.03	2075.08
	105		930.81	-588.89	638.63	3808.99	-1018.13	3229.47
	106		930.81	-588.89	638.63	3808.99	624.84	4383.86
	107		930.81	-588.89	638.63	3808.99	1485.66	5538.25
	108		930.81	-588.89	638.63	3808.99	2737.56	6692.64
	109		930.81	-588.89	638.63	3808.99	3989.46	7847.03
	110		930.81	-588.89	638.63	3808.99	5241.35	9001.41
	111L	B02A	930.81	-588.89	638.63	3808.99	6493.26	10155.82
	111R	B02A	930.81	-638.63	469.44	3809.00	-10155.81	6493.26
	112L	B02B	638.63	930.81	469.44	9529.16	4435.65	6103.23
	112R	B02B	638.63	469.44	-930.81	9529.15	6103.23	-4435.65
	113		638.63	469.44	-930.81	9529.15	4115.16	-5438.31
	114L	B03A	638.63	469.44	-930.81	9529.15	2127.10	-6440.97
	114R	B03A	638.63	-2111.70	-930.81	9529.15	2127.10	-6440.97
	115L	B03B	2111.70	638.63	-930.81	-1113.15	8286.61	-4474.56
	115R	B03B	2111.70	-1109.76	206.60	-1113.15	-9023.51	-2695.52
	116		2111.70	-1109.76	206.60	-1113.15	-8603.70	-993.54

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THNX), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP NAME	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	117		2117.70	-1109.76	206.60	-1118.15	-8183.88	1814.61
	118		2111.70	-1109.76	206.60	-1113.15	-7764.06	4069.69
	119		2111.70	-1109.76	206.60	-1113.15	-7344.25	6324.76
	120		2111.70	-1109.76	206.60	-1113.15	-6924.43	8579.83
	121L	14S	2111.70	-1109.76	206.60	-1113.15	-6504.61	10834.92
	121R	14S	2111.70	-1109.76	-363.57	-1113.15	-6504.61	10834.92
	122		2111.70	-1109.76	-363.57	-1113.15	-6941.41	12168.21
	123L	B04A	2111.70	-1109.76	-363.57	-1113.15	-7378.22	13501.49
	123R	B04A	2111.70	-1041.80	527.64	-1113.15	4329.80	14764.19
	124L	B04B	1041.81	2111.70	527.64	-5034.15	-871.30	13335.97
	124R	B04B	1041.81	-2111.70	-527.64	-5034.15	871.31	-13335.97
	125		1041.81	-2111.70	-527.64	-5034.15	-940.04	-8852.53
	126		1041.81	-2111.70	-527.64	-5034.15	-2060.29	-4369.06
	127		1041.81	-2111.70	-527.64	-5034.15	-3180.54	-480.83
	128		1041.81	-2111.70	-527.64	-5034.15	-4300.79	4597.86
	129L	B05A	1041.81	-2111.70	-527.64	-5034.15	-5421.04	9081.34
	129R	B05A	1041.81	-527.64	2111.70	-5034.15	9081.34	5421.04
	130L	B05B	1109.76	363.57	2111.70	-10806.80	4855.08	5511.76
	130R	B05B	1109.76	-2111.70	363.57	-10806.80	-5511.76	4855.07
	131L	15S	1109.76	-2111.70	363.57	-10806.80	-4936.25	8197.72
	131R	15S	1109.76	-2024.87	363.57	-10806.80	-4936.25	8197.72
	132		1109.76	-2024.87	363.57	-10806.80	-6154.44	12329.16
	133		1109.76	-2024.87	363.57	-10806.80	-3452.62	16460.62
	134		1109.76	-2024.87	363.57	-10806.80	-2710.80	20592.09
	135		1109.76	-2024.87	363.57	-10806.80	-1968.98	24723.53
	136		1109.76	-2024.87	363.57	-10806.80	-1227.16	28854.98
	137L	B06A	1109.76	-2024.87	363.57	-10806.80	-485.34	32986.47
	137R	B06A	1109.76	0.00	363.57	-10806.80	-485.34	32986.47
	138L	B06B	0.00	1109.76	363.57	-0.01	-10321.46	31505.05
	138R	B06B	0.00	-1109.76	-363.57	0.00	10321.46	-31505.05
	139		0.00	-1109.76	-363.57	0.00	9504.23	-29254.70
	140		0.00	-1109.76	-363.57	0.00	8846.98	-27004.36
	141		0.00	-1109.76	-363.57	0.00	8109.73	-24753.97
	142		0.00	-1109.76	-363.57	0.00	7372.48	-22503.62
	143		0.00	-1109.76	-363.57	0.00	6635.23	-20253.28
	144		0.00	-1109.76	-363.57	0.00	5897.99	-18002.92
	145		0.00	-1109.76	-363.57	0.00	5160.74	-15752.56
	146		0.00	-1109.76	-363.57	0.00	4423.49	-13502.20

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB A1 X050
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMX), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	147		0.00	-1109.76	-363.57	0.00	3686.26	-11251.84
	148		0.00	-1109.76	-363.57	0.00	2949.00	-9001.47
	149		0.00	-1109.76	-363.57	0.00	2211.75	-6751.11
	150		0.00	-1109.76	-363.57	0.00	1474.51	-4500.75
	151		0.00	-1109.76	-363.57	0.00	737.26	-2250.39
	152	15	0.00	-1109.76	-363.57	0.00	0.00	0.00
MABS								
	15	P4	0.00	100.42	11884.93	0.00	0.00	0.00
		PC	0.00	100.42	11884.93	0.00	41597.27	-351.46
	16	PC	0.00	100.42	11884.93	0.00	41597.27	-351.46
		PB	0.00	100.42	11884.93	0.00	62025.09	-524.06
	17	PB	-14890.07	-62.04	-5223.56	2048.63	25390.61	-222.92
		PA	-14890.07	-62.04	-5223.56	2048.63	5802.27	13.20
	18	PA	-14890.07	15.70	5290.50	2048.63	5802.27	13.20
		P2	-14890.07	15.70	5290.50	2048.63	9770.15	11.38
	19	4	0.00	0.00	0.00	0.00	0.00	0.00
		CP4	0.00	0.00	0.00	0.00	0.00	0.00
	20	7	0.00	0.00	0.00	0.00	0.00	0.00
		CP7	0.00	0.00	0.00	0.00	0.00	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X058
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMN), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SUP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	1	-785.84	0.00	-4198.71	-73819.25	-19952.50	0.00
	2	2	-785.84	0.00	-4198.71	-73819.25	-10948.31	0.00
	3	2A	-785.84	0.00	-4198.71	-73819.25	-5905.57	0.00
	4L	A01A	-785.84	0.00	-4198.71	-73819.25	-4879.62	0.00
	4R	A01A	-785.84	-10842.45	0.00	-73819.25	-18128.77	-10726.78
	5		-933.67	-7068.29	0.00	-47850.06	-44566.47	-10920.39
	6L	A01B	-534.57	-785.84	0.00	-10792.67	-44897.89	-10127.83
	6R	A01B	-534.57	-846.39	-12927.74	-10386.22	-86793.94	-12970.29
	7		-534.57	-846.39	-12927.74	-10386.22	-105476.00	-11332.66
	8		-534.57	-846.39	-12927.74	-10386.22	-124158.19	-9695.04
	9		-534.57	-846.39	-12927.74	-10386.22	-142840.37	-8057.41
	10L	A1A	-534.57	-846.39	-12927.74	-10386.22	-161522.62	-6419.77
	10R	A1A	-534.57	-12927.74	-785.84	-10386.22	-6419.78	0.00
	11		0.00	-9887.96	-785.84	-7337.83	-8561.40	0.00
	12L	A1B	0.00	-4198.71	-785.84	-2788.26	-9381.25	0.00
	12R	A1B	0.00	-846.39	-4198.71	-2788.26	-168167.44	-9581.25
	13		0.00	-846.39	-4198.70	-2788.26	-158506.69	-7754.82
	14		0.00	-846.39	-4198.70	-2788.26	-148845.87	-6128.38
	15		0.00	-846.39	-4198.70	-2788.26	-139185.00	-4501.94
	16		0.00	-846.39	-4198.70	-2788.26	-129524.25	-2875.50
	17		0.00	-846.39	-4198.70	-2788.26	-119863.44	-1249.06
	18		0.00	-846.39	-4198.70	-2788.26	-124245.94	-2633.40
	19L	X01A	0.00	-846.39	-4198.71	-2788.26	-132718.12	-4096.04
	19R	X01A	0.00	-4198.70	-148.35	-2788.26	-4096.04	0.00
	20		0.00	0.00	-148.35	-3416.90	-2934.79	0.00
	21L	X01B	-4562.00	0.00	-148.35	-3802.44	-2691.36	0.00
	21R	X01B	-4562.01	-181.80	0.00	-3802.45	-107825.25	-2527.00
	22		-4562.01	-181.80	0.00	-3802.44	-88386.06	-2442.62
	23		-4562.01	-181.80	0.00	-3802.44	-68946.77	-2358.24
	24		-4562.01	-181.80	0.00	-3802.44	-37297.43	-2273.87
	25		-4562.01	-181.80	0.00	-3802.44	-16545.06	-2189.50
	26		-4562.01	-181.80	0.00	-3802.44	-8446.90	-2105.12
	27		-4562.01	-181.80	0.00	-3802.44	-348.74	-2020.75
	28		-4562.01	-181.80	0.00	-3802.44	0.00	-1936.37
	29		-4562.01	-181.80	0.00	-3802.44	0.00	-2176.43
	30L	X02A	-4562.01	-181.80	0.00	-3802.45	0.00	-2487.29
	30R	X02A	-4562.00	-13783.31	-181.80	-3802.45	-2958.89	0.00
	31		0.00	-12972.11	-181.80	-4545.69	-692.93	0.00
	32L	X02B	0.00	-4562.02	-181.80	-2822.49	-3467.24	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THRN), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MTB	OCT NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	32R	X02B	0.00	-181.80	-4198.71	-2822.49	0.00	-3373.99
	33L	X1	0.00	-181.80	-4198.71	-2822.49	0.00	-3193.47
	33R	X1	0.00	-233.38	-4198.71	-2822.49	0.00	-3193.47
	34L	X03A	0.00	-233.38	-4198.71	-2822.49	0.00	-2961.74
	34R	X03A	0.00	-4562.00	-233.38	-2822.49	-3098.84	0.00
	35		0.00	0.00	-233.38	77.08	-3903.02	0.00
	36L	X03B	-4198.70	0.00	-233.38	-2498.27	-2420.87	0.00
	36R	X03B	-4198.71	-233.38	-13783.31	-2498.27	0.00	-2856.45
	37L	XX1	-4198.71	-233.38	-13783.31	-2498.27	0.00	-2740.58
	37R	XX1	-4198.71	-233.38	-13136.34	-2498.27	0.00	-2740.58
	38		-4198.70	-233.38	-13136.34	-2498.27	0.00	-2323.65
	39		-4198.70	-233.38	-13136.34	-2498.27	0.00	-1906.72
	40		-4198.70	-233.38	-13136.34	-2498.27	0.00	-1489.79
	41		-4198.70	-233.38	-13136.34	-2498.27	0.00	-1072.86
	42		-4198.70	-233.38	-13136.34	-2498.27	0.00	-655.93
	43		-4198.70	-233.38	-13136.34	-2498.27	0.00	-238.99
	44		-4198.70	-233.38	-13136.34	-2498.27	0.00	-208.60
	45		-4198.70	-233.38	-13136.34	-2498.27	0.00	-569.90
	46L	X04A	-4198.71	-233.38	-13136.34	-2498.27	-16332.29	-931.20
	46R	X04A	-4198.70	-13136.34	-177.75	-2498.27	-931.19	-25416.81
	47		-2745.42	-6062.95	-177.75	-2617.74	-723.37	-18919.46
	48L	X04B	-726.60	-4198.71	-177.75	-1475.27	-2034.80	-11256.39
	48R	X04B	-726.60	-233.38	-4198.71	-1475.27	-35705.79	-2034.81
	49L	X2	-726.60	-233.38	-4198.71	-1475.27	-30122.60	-1783.77
	49R	X2	-726.60	-62.92	-4198.71	-1475.27	-30122.60	-1783.77
	50L	X05A	-726.60	-62.92	-4198.71	-1475.27	-24538.88	-1958.79
	50R	X05A	-726.60	-4562.00	-62.92	-1475.27	-1884.34	-24538.88
	51		-2745.42	0.00	-62.92	-2522.88	-460.47	-25943.62
	52L	X05B	-4198.70	-726.59	-62.92	-2281.90	-1152.17	-43912.40
	52R	X05B	-4198.71	-62.92	-13136.34	-2281.90	-43912.40	-1690.43
	53	3	-4198.71	-62.92	-13136.34	-2281.90	-55970.43	-1835.72
	54	4	-4198.71	-62.92	-13136.34	-2281.90	-85651.69	-2193.34
	55	5	-4198.71	-62.92	-13136.34	-2281.90	-115333.00	-2550.95
	56L	A04A	-4198.71	-62.92	-13136.34	-2281.90	-131105.31	-2741.71
	56R	A04A	-4198.70	-13136.34	-227.38	-2281.90	-2741.71	-2445.77
	57		-2988.58	-8020.55	-227.38	-1912.23	-2086.37	-2113.27
	58L	A04B	-1702.50	-4677.99	-227.38	-705.86	-2401.71	0.00
	58R	A04B	-1702.50	-241.83	0.00	-705.86	-152277.00	-2401.71

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THRN), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN1 (CONTD.)									
	59	6	-1702.50	-241.83	0.00	-705.86	-143663.44	-2145.54	
	60	7	-1702.50	-241.83	0.00	-705.86	-127515.44	-1665.30	
	61	8	-1702.50	-241.83	0.00	-705.86	-111367.44	-1185.06	
RUN2									
	62	8	-1702.50	-241.83	0.00	-705.86	-105273.81	-1185.06	
	63		-1702.50	-241.83	0.00	-705.86	-95435.44	-875.54	
	64	9	-1702.50	-241.83	0.00	-705.86	-85597.12	-566.01	
	65		-1702.50	-241.83	0.00	-705.86	-70332.69	-85.77	
	66L	10	-1702.50	-241.83	0.00	-705.86	-55068.27	-224.37	
	66R	10	-1702.50	-52.69	0.00	-705.86	-55068.27	-224.37	
	67		-1702.50	-52.69	0.00	-705.86	-47416.16	-872.14	
	68	8A	-1702.50	-52.69	0.00	-705.86	-39764.10	-1905.53	
	69L	8B	-1702.50	-52.69	0.00	-705.86	-32131.88	-2936.25	
			1702.50	52.69	0.00	705.86	32131.88	2936.25	BRANCH AXES
	69R	8B	-1791.33	-46.43	0.00	-2187.78	-35153.89	-433.80	
			1791.33	46.43	0.00	2187.78	35153.89	433.80	BRANCH AXES
	70	8C	-1791.33	-46.43	0.00	-2187.78	-28111.55	-384.68	
	71		-1791.33	-46.43	0.00	-2187.78	-14415.66	-289.16	
	72		-1791.33	-46.43	0.00	-2187.78	-719.70	-193.64	
	73		-1791.33	-46.43	0.00	-2187.78	0.00	-98.12	
	74		-1791.33	-46.43	0.00	-2187.78	0.00	-13.30	
	75	P5	-1791.33	-46.43	0.00	-2187.78	0.00	-107.03	
	76L	P4	-1791.33	-46.43	0.00	-2187.78	0.00	-159.31	
	76R	P4	-1791.33	-15.70	-5290.50	-2187.78	0.00	-159.31	
	77		-1791.33	-15.70	-5290.50	-2187.78	0.00	-129.51	
	78		-1791.33	-15.70	-5290.50	-2187.78	0.00	-99.71	
	79		-1791.33	-15.70	-5290.50	-2187.78	0.00	-69.91	
	80		-1791.33	-15.70	-5290.50	-2187.78	0.00	-40.11	
	81	P3	-1791.33	-15.70	-5290.50	-2187.78	-6196.38	-14.10	
	82L	P2	-1791.33	-15.70	-5290.50	-2187.78	-10433.78	-12.04	
	82R	P2	0.00	0.00	0.00	0.00	0.00	0.00	
	83	P1	0.00	0.00	0.00	0.00	0.00	0.00	
RUN3									
	84	8B	-80.86	-1109.76	-206.60	-19.76	-538.64	-710.41	
			904.46	80.86	552.36	281.70	19.76	845.85	BRANCH AXES
	85	11	-80.86	-1109.76	-206.60	-19.76	-528.07	-411.09	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMN), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SCP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	86		-80.86	-1109.76	-206.60	-19.76	-507.70	-417.90
	87		-80.86	-1109.76	-206.60	-19.76	-487.32	-591.37
	88	12	-80.86	-1109.76	-206.60	-19.76	-466.95	-764.85
	89L	13	-80.86	-1109.76	-206.60	-19.76	-455.55	-861.85
	89R	13	-88.83	-80.86	-552.36	-1034.02	-19.76	-962.55
	90	14	-88.83	-80.86	-552.36	-1034.02	0.00	-882.26
	91		-88.83	-80.86	-552.36	-1034.02	0.00	-734.34
	92		-88.83	-80.86	-552.36	-1034.02	-270.83	-586.41
	93		-88.83	-80.86	-552.36	-1034.02	-1149.10	-438.49
	94		-88.83	-80.86	-552.36	-1034.02	-2027.36	-290.56
	95		-88.83	-80.86	-552.36	-1034.02	-3001.93	-142.64
	96		-88.83	-80.86	-552.36	-1034.02	-4088.76	-11.37
	97		-88.83	-80.86	-552.36	-1034.02	-5175.57	-1753.58
	98		-88.83	-80.86	-552.36	-1034.02	-6262.39	-3499.65
	99L	B01A	-88.83	-80.86	-552.36	-1034.02	-7349.22	-5246.73
	99R	B01A	-88.83	-552.36	-54.17	-1034.02	-5245.73	-718.20
	100L	B01B	-77.20	-60.97	-54.17	-296.99	-2542.47	-703.77
	100R	B01B	-77.20	-588.89	-60.97	-296.99	-7277.61	-2542.47
	101		-77.20	-588.89	-60.97	-296.99	-6025.71	-1388.08
	102		-77.20	-588.89	-60.97	-296.99	-4773.82	-233.70
	103		-77.20	-588.89	-60.97	-296.99	-3521.92	-19.45
	104		-77.20	-588.89	-60.97	-296.99	-2270.03	-118.17
	105		-77.20	-588.89	-60.97	-296.99	-1018.13	-216.90
	106		-77.20	-588.89	-60.97	-296.99	0.00	-315.63
	107		-77.20	-588.89	-60.97	-296.99	-74.10	-414.36
	108		-77.20	-588.89	-60.97	-296.99	-185.22	-513.09
	109		-77.20	-588.89	-60.97	-296.99	-[illegible]	-611.82
	110		-77.20	-588.89	-60.97	-296.99	-407.47	-710.55
	111L	B02A	-77.20	-588.89	-60.97	-296.99	-518.59	-809.28
	111R	B02A	-77.20	-638.63	-157.85	-296.99	-10155.81	-518.59
	112L	B02B	-60.97	-77.20	-157.85	-758.07	-348.70	-498.45
	112R	B02B	-60.97	-157.85	-930.81	-758.07	-496.45	-4435.65
	113		-60.97	-157.85	-930.81	-758.07	-345.15	-5438.31
	114L	B03A	-60.97	-157.85	-930.81	-758.07	-191.84	-6440.97
	114R	B03A	-60.97	-2111.70	-930.81	-758.07	-191.84	-6440.97
	115L	B03B	-188.77	-60.97	-930.81	-1113.15	-662.25	-4474.56
	115R	B03B	-188.77	-1109.76	-11.48	-1113.15	-9023.51	-2695.52
	116		-188.77	-1109.76	-11.48	-1113.15	-8603.70	-993.54

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. Z (THMN), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	117		-188.77	-1109.76	-11.48	-1113.15	-8183.88	-223.91
	118		-188.77	-1109.76	-11.48	-1113.15	-7764.06	-335.41
	119		-188.77	-1109.76	-11.48	-1113.15	-7344.25	-520.00
	120		-188.77	-1109.76	-11.48	-1113.15	-6924.43	-704.58
	121L	14S	-188.77	-1109.76	-11.48	-1113.15	-6504.61	-889.17
	121R	14S	-188.77	-1109.76	-363.57	-1113.15	-6504.61	-889.17
	122		-188.77	-1109.76	-363.57	-1113.15	-6941.41	-998.31
	123L	B04A	-188.77	-1109.76	-363.57	-1113.15	-7378.22	-1107.44
	123R	B04A	-188.77	-1041.80	-47.18	-1113.15	-318.28	-1247.88
	124L	B04B	-90.98	-188.77	-47.18	-5034.15	-871.30	-1126.52
	124R	B04B	-90.98	-2111.70	-527.64	-5034.15	-37.46	-13335.97
	125		-90.98	-2111.70	-527.64	-5034.15	-940.04	-8852.53
	126		-90.98	-2111.70	-527.64	-5034.15	-2060.29	-4369.06
	127		-90.98	-2111.70	-527.64	-5034.15	-3180.54	-480.83
	128		-90.98	-2111.70	-527.64	-5034.15	-4300.79	-364.02
	129L	B05A	-90.98	-2111.70	-527.64	-5034.15	-5421.04	-736.66
	129R	B05A	-90.98	-527.64	-188.77	-5034.15	-736.66	-428.24
	130L	B05B	-97.70	-30.97	-188.77	-10806.80	-488.10	-436.58
	130R	B05B	-97.70	-2111.70	-30.97	-10806.80	-5511.76	-488.10
	131L	15S	-97.70	-2111.70	-30.97	-10806.80	-4936.25	-697.92
	131R	15S	-97.70	-2024.87	-30.97	-10806.80	-4936.25	-697.92
	132		-97.70	-2024.87	-30.97	-10806.80	-4194.44	-1031.61
	133		-97.70	-2024.87	-30.97	-10806.80	-3452.62	-1365.30
	134		-97.70	-2024.87	-30.97	-10806.80	-2710.80	-1698.99
	135		-97.70	-2024.87	-30.97	-10806.80	-1968.98	-2032.68
	136		-97.70	-2024.87	-30.97	-10806.80	-1227.16	-2366.37
	137L	B06A	-97.70	-2024.87	-30.97	-10806.80	-485.34	-2700.07
	137R	B06A	-97.70	0.00	-30.97	-10806.80	-485.34	-2700.07
	138L	B06B	0.00	-97.70	-30.97	-0.01	-10321.46	-2578.81
	138R	B06B	0.00	-1109.76	-363.57	0.00	-817.54	-31505.05
	139		0.00	-1109.76	-363.57	0.00	-759.15	-29254.70
	140		0.00	-1109.76	-363.57	0.00	-700.75	-27004.36
	141		0.00	-1109.76	-363.57	0.00	-642.36	-24753.97
	142		0.00	-1109.76	-363.57	0.00	-583.96	-22503.62
	143		0.00	-1109.76	-363.57	0.00	-525.56	-20253.28
	144		0.00	-1109.76	-363.57	0.00	-467.17	-18002.92
	145		0.00	-1109.76	-363.57	0.00	-408.77	-15752.56
	146		0.00	-1109.76	-363.57	0.00	-350.38	-13502.20

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X058
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 2 (THMN), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	147		0.00	-1109.76	-363.57	0.00	-291.98	-11251.84
	148		0.00	-1109.76	-363.57	0.00	-233.58	-9001.47
	149		0.00	-1109.76	-363.57	0.00	-175.19	-6751.11
	150		0.00	-1109.76	-363.57	0.00	-116.79	-4500.75
	151		0.00	-1109.76	-363.57	0.00	-58.40	-2250.39
	152	15	0.00	-1109.76	-363.57	0.00	0.00	0.00
MMBS								
	15	P4	0.00	-59.42	0.00	0.00	0.00	0.00
		PC	0.00	-59.42	0.00	0.00	0.00	-351.46
	16	PC	0.00	-59.42	0.00	0.00	0.00	-351.46
		PB	0.00	-59.42	0.00	0.00	0.00	-524.96
	17	PB	-14890.07	-62.04	-5223.56	0.00	0.00	-222.92
		PA	-14890.07	-62.04	-5223.56	0.00	0.00	-3.06
	18	PA	-14890.07	-12.99	0.00	0.00	0.00	-3.06
		P2	-14890.07	-12.99	0.00	0.00	0.00	-10.39
	19	4	0.00	0.00	0.00	0.00	0.00	0.00
		OP4	0.00	0.00	0.00	0.00	0.00	0.00
	20	7	0.00	0.00	0.00	0.00	0.00	0.00
		OP7	0.00	0.00	0.00	0.00	0.00	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	1	-5878.70	13794.50	4532.00	-74350.19	-35117.60	78902.12
	2	2	-5878.70	13794.50	4532.00	-74350.19	-26173.42	47736.68
	3	2A	-5462.48	13794.50	4532.00	-74350.19	-21370.70	26964.89
	4L	A01A	-5377.80	13794.50	4532.00	-74350.19	-20152.89	25571.64
	4R	A01A	-5377.80	-10872.05	12952.44	-74350.12	-15595.14	-26900.01
	5		5350.62	-9954.06	12952.43	-50031.46	52994.00	-24479.65
	6L	A01B	10822.05	-4396.87	12952.44	-13375.69	86312.44	-18138.88
	6R	A01B	10822.05	4396.87	-12952.44	-12969.24	-86312.44	18138.88
	7		10822.05	3862.13	-12952.43	-12969.23	-105036.81	11076.09
	8		10822.05	3327.36	-12952.43	-12969.23	-123761.25	-12221.06
	9		10822.05	2792.63	-12952.43	-12969.23	-142485.75	-14478.23
	10L	A1A	10822.05	2257.87	-12952.44	-12969.24	-161210.25	-15819.58
	10R	A1A	10822.05	-12952.43	-2257.87	-12969.23	-15819.59	161210.25
	11		14212.38	-9919.55	-1930.90	5690.29	-19301.92	168866.69
	12L	A1B	13794.49	4531.99	-1603.92	9033.14	-18301.39	167918.25
	12R	A1B	13794.50	1603.92	4532.00	9033.14	-167918.25	-18301.32
	13		13794.49	1018.64	4532.00	9033.14	-158313.75	-17659.88
	14		13794.49	-1198.88	4532.00	9033.14	-148709.19	-15921.26
	15		13794.49	-1784.16	4532.00	9033.14	-139104.62	-13085.56
	16		13794.49	-2369.44	4532.00	9033.14	-129500.06	-9152.76
	17		13794.49	-2954.72	4532.00	9033.14	-119895.56	-4122.86
	18		13794.49	-3540.00	4532.00	9033.14	-124334.31	3972.00
	19L	X01A	13794.50	-4125.29	4532.00	9033.14	-132862.75	11362.07
	19R	X01A	13794.49	4532.00	-4189.19	9033.13	11362.07	132862.75
	20		11839.41	12958.79	-3690.73	-120.82	8558.50	131406.06
	21L	X01B	-4531.99	13794.50	-3208.27	-5926.11	-1798.08	115020.81
	21R	X01B	-4532.00	3208.27	13794.50	-3926.11	-108007.50	1768.54
	22		-4532.00	2629.15	13794.49	-3926.11	-84547.56	-6687.59
	23		-4532.00	2050.02	13794.49	-3926.11	-61087.55	-10667.39
	24		-4532.00	1470.90	13794.49	-3926.11	-37627.46	-13573.07
	25		-4532.00	891.78	13794.49	-3926.11	56334.58	-15404.63
	26		-4532.00	312.65	13794.49	-3926.11	85236.56	-16162.06
	27		-4532.00	-596.62	13794.49	-3926.11	114138.50	-15845.37
	28		-4532.00	-1175.74	13794.49	-3926.11	143040.50	-14454.54
	29		-4532.00	-1754.86	13794.49	-3926.11	171942.56	-12314.04
	30L	X02A	-4532.00	-2333.99	13794.50	-3926.11	200844.75	-9170.16
	30R	X02A	-4531.99	-13794.50	-2333.99	-3926.12	9170.16	200844.75
	31		11839.40	-12958.79	-2824.45	-7810.61	1541.11	275883.56
	32L	X02B	13794.49	-4532.00	-3314.92	-4220.05	-8876.22	242258.00

IMPELL CORPORATION
SUPERPIPE VERSION 22C 05/31/90; SYSTEM: IBM-VM/MVS

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X0F3
OPTIONAL ROUTING 7 FROM DESI
14" SHUTDOWN COOLING LINE

LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SUP NAME	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	32R	X02B	13794.50	-3314.92	4532.00	-4220.05	242258.00	8876.23
	33L	X1	13794.50	-3627.16	4532.00	-4220.05	247381.87	11997.87
	33R	X1	13794.50	3809.96	4532.00	-4220.05	247381.87	11997.87
	34L	X03A	13794.50	3497.72	4532.00	-4220.05	252505.75	8320.96
	34R	X03A	13794.50	-4531.99	3497.72	-4220.04	-8320.96	252505.75
	35		12958.79	11859.40	3007.26	1435.91	-4235.51	250623.81
	36L	X03B	4532.00	13794.49	2516.79	-2935.16	7117.91	231588.06
	36R	X03B	4532.00	2516.79	-13794.50	-2935.17	231588.06	-7117.91
	37L	XX1	4532.00	2360.67	-13794.50	-2935.17	223796.62	-8132.54
	37R	XX1	4532.00	2360.67	-13122.95	-2935.17	223796.62	-8132.54
	38		4532.00	1798.90	-13122.95	-2935.16	197119.75	-11137.71
	39		4532.00	1237.13	-13122.95	-2935.16	170442.75	-13132.16
	40		4532.00	675.35	-13122.95	-2935.16	143765.69	-14115.88
	41		4532.00	-297.56	-13122.95	-2935.16	117088.62	-14088.85
	42		4532.00	-859.33	-13122.95	-2935.16	90411.56	-13051.09
	43		4532.00	-1421.11	-13122.95	-2935.16	63734.59	-11002.58
	44		4532.00	-1982.89	-13122.95	-2935.16	37057.54	-8329.87
	45		4532.00	-2544.66	-13122.95	-2935.16	30531.76	-5038.11
	46L	X04A	4532.00	-3106.44	-13122.95	-2935.17	25452.41	1207.43
	46R	X04A	4532.00	-13122.95	3106.44	-2935.17	1207.42	-25452.41
	47		12483.94	-6074.71	3596.91	-5035.30	5204.11	34264.04
	48L	X04B	13122.95	4531.99	4087.37	-8397.94	8585.76	35703.41
	48R	X04B	13122.95	-4087.37	4532.00	-8397.94	-35703.41	8585.75
	49L	X2	13122.95	-4425.62	4532.00	-8397.94	-30152.73	12726.45
	49R	X2	13122.95	4509.40	4532.00	-8397.94	-30152.73	12726.45
	50L	X05A	13122.95	4171.12	4532.00	-8397.94	-24601.54	8076.63
	50R	X05A	13122.95	-4531.99	4171.12	-8397.94	-8076.83	-24601.54
	51		12483.94	6074.71	3689.66	-5062.08	-4505.60	-26040.87
	52L	X05B	4532.00	13122.95	3190.20	-2995.97	1674.33	-44008.30
	52R	X05B	4532.00	3190.20	-13122.95	-2995.97	-44008.30	-1674.33
	53L	3	4532.00	2936.50	-13122.95	-2995.97	-56055.45	-4123.84
	53R	3	4532.00	2186.51	-13122.95	-2995.97	-56055.45	-6123.84
	54L	4	4532.00	2009.31	-13122.95	-2995.97	-85709.94	-8222.51
	54R	4	4532.00	-780.99	-13122.95	-2995.97	-85709.94	-8222.51
	55L	5	4532.00	-958.19	-13122.95	-2995.97	-115364.44	-6966.78
	55R	5	4532.00	-1708.19	-13122.95	-2995.97	-115364.44	-6966.78
	56L	A04A	4532.00	-2041.29	-13122.95	-2995.97	-131182.50	-5224.65
	56R	A04A	4532.00	-13122.95	2041.29	-2995.97	-5224.64	131182.50

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN1 (CONTD.)									
	57		11327.65	-8027.15	2429.57	2884.87	-1989.63	146537.69	
	58L	A04B	13883.28	-4902.15	2817.86	2239.42	4467.11	152309.56	
	58R	A04B	13883.28	3653.15	7170.65	2239.42	-152309.56	4467.11	
	59L	6	13883.28	3320.[illegible]	7170.65	2239.42	-143670.56	-2704.66	
	59R	6	13883.28	2570.03	7170.65	2239.42	-143670.56	-2704.66	
	60L	7	13883.28	2392.80	7170.65	2239.42	-127474.75	-6901.18	
	60R	7	13883.28	-492.05	7170.65	2239.42	-127474.75	-6901.18	
	61	8	13883.28	-669.25	7170.65	2239.42	-111279.00	5743.31	
RUN2									
	62	8	13883.28	-141[illegible].24	7170.65	2057.23	-105105.37	-5743.31	
	63		13883.28	-182.[illegible].73	7170.65	2057.23	-95316.31	-3656.62	
	64	9	13883.28	-2224.23	7170.65	2057.23	-85447.25	-1051.10	
	65		13883.28	-2848.70	7170.65	2057.23	-70135.00	4323.87	
	66L	10	13883.28	-3473.18	7170.65	2057.23	-54822.86	10336.89	
	66R	10	13883.28	5739.61	7170.65	2057.23	-54822.86	10336.89	
	67		13883.28	5424.55	7170.65	2057.23	-47146.84	5759.41	
	68	8A	13883.28	5113.50	7170.65	2057.23	-39470.85	1495.79	
	69L	8B	13883.28	4801.27	7170.65	2057.23	-31814.74	-5932.06	
			13883.28	4801.27	7170.65	2057.23	31814.74	5932.06	BRANCH AXES
	69R	8B	14834.21	1680.70	6613.27	-1885.72	-35371.50	-913.33	
			14834.21	1680.70	6613.27	1885.72	35371.50	913.33	BRANCH AXES
	70	8C	14834.21	1368.46	6613.27	-1885.72	-28310.32	-2304.08	
	71		14834.20	761.22	6613.27	-1885.72	-14577.79	-4114.70	
	72		14834.20	153.98	6613.27	-1885.72	-845.17	-4744.37	
	73		14834.20	-584.40	6613.27	-1885.72	12887.44	-4193.08	
	74		14834.20	-1191.64	6613.27	-1885.72	26620.02	-3471.53	
	75	P5	14834.21	-1798.89	6613.27	-1885.72	40352.75	452.40	
	76L	P4	14834.21	-1981.02	6613.27	-1885.72	44471.52	1556.38	
	76R	P4	14834.21	1057.24	-5288.81	-1885.72	44471.52	1556.38	
	77		14834.20	543.80	-5288.80	-1885.72	34340.11	119.10	
	78		14834.20	30.36	-5288.80	-1885.72	24208.66	-569.16	
	79		14834.20	-511.78	-5288.80	-1885.72	14077.25	-110.01	
	80		14834.20	-1025.23	-5288.80	-1885.72	3945.80	1333.18	
	81	P3	14834.21	-1538.68	-5288.81	-1885.72	-6185.69	3584.64	
	82L	P2	14834.21	-1753.35	-5288.81	-1885.72	-10421.81	4814.66	
	82R	P2	0.00	214.68	0.00	0.00	0.00	80.50	
	83	P1	0.00	0.00	0.00	0.00	0.00	0.00	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN3									
	84	8B	3127.53	-1079.62	-222.13	3556.78	5748.12	4666.87	
			950.92	3127.53	557.38	3942.95	3556.78	6266.87	BRANCH AXES
	85	11	2995.67	-1079.62	-222.13	3556.78	5529.17	5737.68	
	86		2741.34	-1079.62	-222.13	3556.78	5106.86	7803.04	
	87		2487.00	-1079.62	-222.13	3556.78	4684.54	9868.42	
	88	12	2232.67	-1079.62	-222.13	3556.78	4262.23	11933.80	
	89L	13	2194.57	-1079.62	-222.13	3556.78	4026.06	13088.80	
	89R	13	950.92	1994.57	-557.38	1583.22	3556.78	13688.32	
	90	14	950.92	1956.47	-557.38	1583.22	2961.86	11652.52	
	91		950.92	1694.42	-557.38	1583.21	1865.82	8178.19	
	92		950.92	1432.37	-557.38	1583.21	900.41	5186.65	
	93		950.92	1170.32	-557.38	1583.21	756.18	-2991.25	
	94		950.92	908.27	-557.38	1583.21	-1534.63	-3123.17	
	95		950.92	646.21	-557.38	1583.21	-2518.46	-2772.27	
	96		950.92	-584.10	-557.38	1583.21	-3614.53	-1955.19	
	97		950.92	-846.15	-557.38	1583.21	-4710.60	-2528.79	
	98		950.92	-1108.20	-557.38	1583.21	-5806.67	-2623.42	
	99L	B01A	950.92	-1370.26	-557.38	1583.22	-6902.75	3459.55	
	99R	B01A	950.92	-557.38	-1706.59	1583.21	3459.55	6902.75	
	100L	B01B	920.48	606.33	-1508.78	2823.95	-1671.07	6860.14	
	100R	B01B	920.48	1508.78	606.34	2823.95	-6860.14	-1671.07	
	101		920.48	1247.70	606.34	2823.95	-5667.54	-2947.13	
	102		920.48	986.63	606.34	2823.95	-4474.93	-3743.97	
	103		920.48	725.56	606.34	2823.95	-3282.32	-5001.73	
	104		920.48	464.48	606.34	2823.95	-2089.71	-6093.23	
	105		920.48	-439.65	606.34	2823.95	-897.10	-6705.52	
	106		920.48	-700.73	606.34	2823.95	686.58	-6838.57	
	107		920.48	-961.80	606.34	2823.95	1488.12	-6492.40	
	108		920.48	-1222.88	606.34	2823.95	2680.73	-5667.00	
	109		920.48	-1483.95	606.34	2823.95	3873.33	-4362.37	
	110		920.48	-1745.03	606.34	2823.95	5065.95	7133.44	
	111L	B02A	920.48	-2006.11	606.34	2823.95	6258.57	10649.67	
	111R	B02A	920.48	-606.33	565.59	2823.96	-10649.67	6258.57	
	112L	B02B	606.34	920.48	-340.96	10077.37	3396.25	5841.08	
	112R	B02B	606.34	-340.96	-920.48	10077.37	5841.08	-3396.26	
	113		606.34	-625.42	-920.48	10077.37	3873.67	-3748.22	
	114L	B03A	606.34	-909.88	-920.48	10077.37	1906.26	-3531.26	
	114R	B03A	606.33	3261.19	-920.48	10077.37	1906.27	-3531.26	
	115L	B03B	-2981.93	606.33	-920.48	-905.22	8847.73	-5190.47	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	115R	B03B	-2981.93	-1079.62	222.13	-905.23	-9926.52	-2586.07
	116		-2711.30	-1079.62	222.13	-905.23	-9477.14	-941.44
	117		-2440.67	-1079.62	222.13	-905.23	-9027.77	1809.36
	118		-2170.03	-1079.62	222.13	-905.23	-8578.39	4007.07
	119		-1899.40	-1079.62	222.13	-905.23	-8129.02	6204.79
	120		-1628.77	-1079.62	222.13	-905.23	-7679.64	8402.51
	121L	14S	-1358.14	-1079.62	222.13	-905.23	-7230.27	10600.24
	121R	14S	-1358.14	-1079.62	-361.76	-905.23	-7230.27	10600.24
	122		-1198.13	-1079.62	-361.76	-905.23	-7665.03	11899.62
	123L	B04A	1262.35	-1079.62	-361.76	-905.23	-8099.80	13199.00
	123R	B04A	1262.35	-1019.21	507.60	-905.23	3605.67	15060.52
	124L	B04B	1019.21	1541.61	507.60	-4284.97	-668.42	14491.22
	124R	B04B	1019.21	-1543.61	-507.60	-4284.97	688.42	-14491.22
	125		1019.21	-1824.38	-507.60	-4284.97	-1083.09	-10860.08
	126		1019.21	-2107.15	-507.60	-4284.97	-2163.51	-6666.77
	127		1019.21	-2389.91	-507.60	-4284.97	-3243.93	-2506.50
	128		1019.21	-2672.68	-507.60	-4284.97	-4324.35	3406.38
	129L	B05A	1019.21	-2955.45	-507.60	-4284.97	-5404.78	9286.24
	129R	B05A	1019.21	-507.60	2955.45	-4284.97	9286.24	5404.78
	130L	B05B	1079.62	361.76	3095.08	-10756.41	6337.19	5486.06
	130R	B05B	1079.62	-3095.08	361.76	-10756.41	-5486.06	6337.19
	131L	15S	1079.62	-3305.90	361.76	-10756.41	-4913.23	11293.68
	131R	15S	1079.62	-1293.89	361.76	-10756.41	-4913.23	11293.68
	132		1079.62	-1565.63	361.76	-10756.41	-4174.88	14288.12
	133		1079.62	-1837.37	361.76	-10756.41	-3436.52	17801.77
	134		1079.62	-2109.12	361.76	-10756.41	-2698.16	21834.60
	135		1079.62	-2380.86	361.76	-10756.41	-1959.80	26386.60
	136		1079.62	-2652.60	361.76	-10756.41	-1221.44	31457.77
	137L	B06A	1079.62	-2924.34	361.76	-10756.41	-483.07	37048.20
	137R	B06A	1079.62	4060.19	361.76	-10756.41	-483.08	37048.20
	138L	B06B	-3780.93	1079.62	361.76	-0.01	-10273.34	30703.76
	138R	B06B	-3780.93	-1079.62	-361.76	0.00	10273.34	-30703.76
	139		-3510.86	-1079.62	-361.76	0.00	9539.54	-28510.64
	140		-3240.80	-1079.62	-361.76	0.00	8805.73	-26317.53
	141		-2970.73	-1079.62	-361.76	0.00	8071.91	-24124.37
	142		-2700.66	-1079.62	-361.76	0.00	7338.11	-21931.25
	143		-2430.60	-1079.62	-361.76	0.00	6604.30	-19738.16
	144		-2160.53	-1079.62	-361.76	0.00	5870.48	-17545.04

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SCP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	145		-1890.47	-1079.62	-361.76	0.00	5136.68	-15351.91
	146		-1620.40	-1079.62	-361.76	0.00	4402.87	-13158.79
	147		-1350.33	-1079.62	-361.76	0.00	3669.06	-10965.66
	148		-1080.27	-1079.62	-361.76	0.00	2935.25	-8772.53
	149		-810.20	-1079.62	-361.76	0.00	2201.44	-6579.41
	150		-540.14	-1079.62	-361.76	0.00	1467.63	-4386.28
	151		-270.07	-1079.62	-361.76	0.00	733.82	-2193.16
	152	15	0.00	-1079.62	-361.76	0.00	0.00	0.00
MMBS								
	15	P4	0.00	-3312.26	11902.09	0.00	0.00	0.00
		PC	0.00	-4722.75	11902.09	0.00	41657.29	14061.27
	16	PC	0.00	-4996.75	11902.09	0.00	41657.29	14061.27
		PC	0.00	-5689.42	11902.09	0.00	62114.59	23244.96
	17	PB	-14834.21	4274.45	-5236.37	1746.57	25427.94	10051.02
		PA	-14834.21	2763.21	-5236.37	1746.57	5791.57	-3149.30
	18	PA	-14834.21	2270.28	5288.81	1746.57	5791.57	-3149.30
		P2	-14834.21	1968.03	5288.81	1746.57	9758.18	-4734.23
	19	4	1000.00	0.00	0.00	0.00	0.00	0.00
		OP4	1000.00	0.00	0.00	0.00	0.00	0.00
	20	7	1000.00	0.00	0.00	0.00	0.00	0.00
		OP7	1000.00	0.00	0.00	0.00	0.00	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM D-SI
16" SHUTDOWN COOLING LINE

4
LOAD CASE NO. [illegible] (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SCP NUMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	1	498.43	5826.17	3499.73	49751.70	19597.77	31899.86
	2	2	498.43	5826.17	3499.73	49751.70	12920.72	21132.38
	3	2A	498.43	5826.17	3499.73	49751.70	8682.28	14355.04
	4L	A01A	498.43	5826.17	3499.73	49751.70	7860.85	13042.93
	4R	A01A	498.43	3562.85	5697.39	49751.70	10913.90	10585.97
	5		2608.38	2562.40	5697.39	33221.44	33593.77	6773.46
	6L	A01B	3562.85	498.43	5697.39	6167.30	39909.71	6646.50
	6R	A01B	3562.85	498.43	5697.39	6167.29	39909.71	6646.50
	7		3562.84	498.43	5697.39	6167.29	34666.36	5815.09
	8		3562.84	498.43	5697.39	6167.29	31263.27	4991.50
	9		3562.84	498.43	5697.39	6167.29	29484.01	4180.64
	10L	A1A	3562.85	498.43	5697.39	6167.29	29966.00	3392.41
	10R	A1A	3562.85	5697.39	498.43	6167.29	3392.41	29966.00
	11		4766.61	4357.72	498.43	4278.97	5166.10	30496.93
	12L	A1B	5826.16	3499.73	498.43	2155.69	5887.03	29624.17
	12R	A1B	5826.17	498.43	3499.73	2155.69	29624.17	5887.03
	13		5826.16	498.43	3499.73	2155.69	27293.21	4972.94
	14		5826.16	498.43	3499.73	2155.69	26141.71	4067.99
	15		5826.16	498.43	3499.73	2155.69	26457.20	3179.97
	16		5826.16	498.43	3499.73	2155.69	27901.94	2328.42
	17		5826.16	498.43	3499.73	2155.69	30195.88	1574.68
	18		5826.16	498.43	3499.73	2155.69	33092.41	1139.75
	19L	X01A	5826.17	498.43	3499.73	2155.69	37118.47	1364.95
	19R	X01A	5826.16	3499.73	132.57	2155.69	1364.95	37118.47
	20		5156.70	4046.19	132.57	1527.17	1913.11	39973.05
	21L	X01B	3499.73	5826.16	132.57	1192.30	1918.34	38791.73
	21R	X01B	3499.73	132.57	5826.17	1192.30	38791.73	1918.34
	22		3499.73	132.57	5826.16	1192.30	35663.60	1707.79
	23		3499.73	132.57	5826.16	1192.30	34039.94	1512.41
	24		3499.73	132.57	5826.16	1192.30	34535.63	1334.55
	25		3499.73	132.57	5826.16	1192.30	37208.20	1177.73
	26		3499.73	132.57	5826.16	1192.30	41788.72	1050.60
	27		3499.73	132.57	5826.16	1192.30	48514.88	965.77
	28		3499.73	132.57	5826.16	1192.30	57238.45	936.50
	29		3499.73	132.57	5826.16	1192.30	66937.56	969.67
	30L	X02A	3499.73	132.57	5826.17	1192.30	77051.56	1060.63
	30R	X02A	3499.73	5826.16	132.57	1192.30	1060.63	77051.56
	31		5156.70	4046.19	132.57	1583.39	212.50	84836.50
	32L	X02B	5826.16	3499.73	132.57	1208.89	1057.30	88063.25

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 4 (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SCP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	32R	X02B	5826.17	132.57	3499.73	1208.89	88063.25	1057.30
	33L	X1	5826.17	132.57	3499.73	1208.89	88245.00	1009.79
	33R	X1	5826.17	76.86	58378.33	1208.89	88245.00	1009.79
	34L	X03A	5826.17	76.86	58378.33	1208.89	29927.41	938.40
	34R	X03A	5826.13	58378.30	76.86	1208.89	938.40	29927.41
	35		38165.62	45078.40	76.86	441.40	1329.17	68450.12
	36L	X03B	58378.30	5826.20	76.86	798.32	1060.76	105607.06
	36R	X03B	58378.33	76.86	5826.17	798.32	105607.06	1060.76
	37L	XX1	58378.33	76.86	5826.17	798.32	107261.94	1023.87
	37R	XX1	58378.33	76.86	11180.72	798.32	107261.94	1023.87
	38		58378.30	76.86	11180.72	798.32	87181.94	891.60
	39		58378.30	76.86	11180.72	798.32	67104.81	760.19
	40		58378.30	76.86	11180.72	798.32	47032.21	629.79
	41		58378.30	76.86	11180.72	798.32	26969.02	500.67
	42		58378.30	76.86	11180.72	798.32	7959.13	373.71
	43		58378.30	76.86	11180.72	798.32	19692.82	254.00
	44		58378.30	76.86	11180.72	798.32	39572.27	200.02
	45		58378.30	76.86	11180.72	798.32	59487.35	243.79
	46L	X04A	58378.33	76.86	11180.72	798.32	79411.37	327.75
	46R	X04A	58378.31	11180.66	76.86	798.32	327.75	79411.37
	47		49110.05	33452.91	76.86	830.30	282.89	60923.94
	48L	X04B	11180.74	58378.30	76.86	471.53	463.65	16875.58
	48R	X04B	11180.72	76.86	58378.33	471.53	16875.58	663.65
	49L	X2	11180.72	76.86	58378.33	471.53	78626.37	594.31
	49R	X2	11180.72	109.93	58378.33	471.53	78626.37	594.31
	50L	X05A	11180.72	109.93	58378.33	471.53	141823.12	649.79
	50R	X05A	11180.74	58378.30	109.93	471.53	649.79	141823.12
	51		49110.05	33452.89	109.93	824.76	254.18	217880.62
	52L	X05B	58378.31	11180.66	109.93	797.00	373.08	236429.62
	52R	X05B	58378.33	109.93	56989.62	797.00	236429.62	373.08
	53	3	58378.33	109.93	56989.62	797.00	190602.25	370.20
	54	4	58378.33	109.93	56989.62	797.00	80209.12	404.89
	55	5	58378.33	109.93	56989.62	797.00	51311.94	456.01
	56L	A04A	58378.33	109.93	56989.62	797.00	105008.56	487.84
	56R	A04A	58378.30	56989.57	109.93	797.00	487.84	105008.56
	57		80431.87	13782.11	109.93	668.57	912.77	149099.62
	58L	A04B	72576.75	37264.51	109.93	620.73	1045.77	137004.62
	58R	A04B	72576.75	941.11	8052.62	620.73	137004.62	1045.77

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 4 (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN1 (CONTD.)									
	59	6	72576.75	941.11	8052.62	620.73	128583.25	1322.32	
	60	7	72576.75	941.11	8052.62	620.73	112864.37	2910.10	
	61	8	72576.75	941.11	8052.62	620.73	97272.00	4552.84	
RUN2									
	62	8	72576.75	941.11	8052.62	620.73	97272.00	4552.84	
	63		72576.75	941.11	8052.61	620.73	87321.06	5615.46	
	64	9	72576.75	941.11	8052.62	620.73	77482.94	6679.23	
	65		72576.75	941.11	8052.61	620.73	62566.47	8330.84	
	66L	10	72576.75	941.11	8052.62	620.73	48418.00	10180.16	
	66R	10	72576.75	1561.00	8052.62	620.73	48418.00	10180.16	
	67		72576.75	1561.00	8052.61	620.73	41861.15	8616.26	
	68	8A	72576.75	1561.00	8052.62	620.73	35927.45	7052.87	
	69L	8B	72576.75	1561.00	8052.62	620.73	30988.20	5494.50	
			72576.69	1561.00	8052.62	620.73	30988.20	5494.50	BRANCH AXES
	69R	8B	72699.12	1505.04	7926.71	577.22	31599.47	6489.79	
			72699.12	1505.04	7926.70	577.22	31599.47	6489.79	BRANCH AXES
	70	8C	72699.12	1505.04	7926.71	577.22	27263.51	4985.87	
	71		72699.06	1505.04	7926.70	577.22	24629.62	2065.76	
	72		72699.06	1505.04	7926.70	577.22	30729.19	954.72	
	73		72699.06	1505.04	7926.70	577.22	41931.81	3834.83	
	74		72699.06	1505.04	7926.70	577.22	55205.68	6730.32	
	75	P5	72699.12	1505.04	7926.71	577.22	69370.75	9656.26	
	76L	P4	72699.12	1505.04	7926.71	577.22	73717.06	10533.96	
	76R	P4	72699.12	1345.60	9594.82	577.22	73717.06	10533.96	
	77		72699.06	1345.59	9594.81	577.22	56508.86	8120.30	
	78		72699.06	1345.59	9594.81	577.22	39302.80	5706.63	
	79		72699.06	1345.59	9594.81	577.22	22104.05	3292.97	
	80		72699.06	1345.59	9594.81	577.22	4989.05	879.37	
	81	P3	72699.12	1345.60	9594.82	577.22	12394.25	1534.48	
	82L	P2	72699.12	1345.60	9594.82	577.22	19572.32	2543.65	
	82R	P2	0.00	0.00	0.00	0.00	0.00	0.00	
	83	P1	0.00	0.00	0.00	0.00	0.00	0.00	
RUN3									
	84	8B	63.14	155.23	106.02	3985.37	836.02	1240.01	
			112.92	63.14	150.29	393.07	3985.37	1442.93	BRANCH AXES
	85	11	63.14	155.23	106.02	3985.37	748.94	1147.14	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 4 (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	86		63.14	155.23	106.02	3985.37	591.25	1002.71
	87		63.14	155.23	106.02	3985.37	459.20	921.51
	88	12	63.14	155.23	106.02	3985.37	381.72	920.47
	89L	13	63.14	155.23	106.02	3985.37	376.59	955.75
	89R	13	139.35	63.14	126.14	92.49	3985.37	1020.52
	90	14	139.35	63.14	126.14	92.49	3870.91	957.96
	91		139.35	63.14	126.14	92.49	3662.02	842.91
	92		139.35	63.14	126.14	92.49	3456.14	728.27
	93		139.35	63.14	126.14	92.49	3253.83	614.27
	94		139.35	63.14	126.14	92.49	3055.80	501.93
	95		139.35	63.14	126.14	92.49	2862.94	392.64
	96		139.35	63.14	126.14	92.49	2676.36	287.60
	97		139.35	63.14	126.14	92.49	2497.46	193.99
	98		139.35	63.14	126.14	92.49	2328.06	138.46
	99L	B01A	139.35	63.14	126.14	92.49	2170.32	167.23
	99R	B01A	139.35	126.14	46.58	92.49	167.23	2170.32
	100L	B01B	152.19	110.36	46.58	141.18	86.68	2043.01
	100R	B01B	152.19	46.58	110.36	141.18	2043.01	86.68
	101		152.19	46.58	110.36	141.18	1896.33	749.69
	102		152.19	46.58	110.36	141.18	1760.76	626.41
	103		152.19	46.58	110.36	141.18	1639.08	306.17
	104		152.19	46.58	110.36	141.18	1534.60	387.01
	105		152.19	46.58	110.36	141.18	1451.03	468.36
	106		152.19	46.58	110.36	141.18	1392.14	549.98
	107		152.19	46.58	110.36	141.18	1361.14	631.78
	108		152.19	46.58	110.36	141.18	1359.92	713.71
	109		152.19	46.58	110.36	141.18	1388.58	795.91
	110		152.19	46.58	110.36	141.18	1445.31	879.98
	111L	B02A	152.19	46.58	110.36	141.18	1527.00	965.19
	111R	B02A	152.19	110.36	177.53	141.18	965.19	1527.00
	112L	B02B	110.36	152.19	177.53	1085.21	165.00	1407.59
	112R	B02B	110.36	177.53	152.19	1085.21	1407.59	165.00
	113		110.36	177.53	152.19	1085.21	1109.89	491.81
	114L	B03A	110.36	177.53	152.19	1085.21	817.28	841.10
	114R	B03A	110.36	93.45	152.19	1085.21	817.28	841.10
	115L	B03B	93.45	110.36	152.19	639.80	895.78	813.44
	115R	B03B	93.45	155.23	106.02	639.80	612.74	1043.07
	116		93.45	155.23	106.02	639.80	425.38	749.13

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 4 (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMD	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	117		93.45	155.23	106.02	639.80	260.47	457.03
	118		93.45	155.23	106.02	639.80	190.14	176.29
	119		93.45	155.23	106.02	639.80	292.91	166.51
	120		93.45	155.23	106.02	639.80	465.63	445.97
	121L	14S	93.45	155.23	106.02	639.80	655.16	737.93
	121R	14S	93.45	155.23	28.30	639.80	655.16	737.93
	122		93.45	155.23	28.30	639.80	638.81	911.59
	123L	B04A	93.45	155.23	28.30	639.80	623.65	1085.56
	123R	B04A	93.45	129.73	89.83	639.80	1042.84	692.57
	124	B04B	129.73	93.45	89.83	1150.84	527.81	715.20
	125		129.73	93.45	89.83	1150.84	350.03	545.89
	126		129.73	93.45	89.83	1150.84	173.68	391.63
	127		129.73	93.45	89.83	1150.84	40.13	278.08
	128		129.73	93.45	89.83	1150.84	193.37	264.84
	129L	B05A	129.73	93.45	89.83	1150.84	370.13	363.45
	129R	B05A	129.73	89.83	93.45	1150.84	363.45	370.13
	130L	B05B	155.23	28.30	93.45	787.73	924.99	401.76
	130R	B05B	155.23	93.45	28.30	787.73	401.76	924.99
	131L	15S	155.23	93.45	28.30	787.73	359.81	925.88
	131R	15S	155.23	438.07	28.30	787.73	359.81	925.88
	132		155.23	438.07	28.30	787.73	305.74	567.55
	133		155.23	438.07	28.30	787.73	251.67	1090.48
	134		155.23	438.07	28.30	787.73	197.60	1859.41
	135		155.23	438.07	28.30	787.73	143.52	2669.57
	136		155.23	438.07	28.30	787.73	89.45	3492.40
	137L	B06A	155.23	438.07	28.30	787.73	35.38	4320.66
	137R	B06A	155.23	0.00	28.30	787.73	35.38	4320.66
	138	B06B	0.00	155.23	28.30	0.00	752.35	4126.62
	139		0.00	155.23	28.30	0.00	698.61	3831.86
	140		0.00	155.23	28.30	0.00	644.88	3537.10
	141		0.00	155.23	28.30	0.00	591.14	3242.35
	142		0.00	155.23	28.30	0.00	537.40	2947.59
	143		0.00	155.23	28.30	0.00	483.66	2652.83
	144		0.00	155.23	28.30	0.00	429.92	2358.07
	145		0.00	155.23	28.30	0.00	376.18	2063.31
	146		0.00	155.23	28.30	0.00	322.44	1768.56
	147		0.00	155.23	28.30	0.00	268.70	1473.80
	148		0.00	155.23	28.30	0.00	214.96	1179.04

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X058
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 4 (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	149		0.00	155.23	28.30	0.00	161.22	884.28
	150		0.00	155.23	28.30	0.00	107.48	589.52
	151		0.00	155.23	28.30	0.00	53.74	294.76
	152	15	0.00	155.23	28.30	0.00	0.00	0.00
MMBS								
	15	P4	0.00	2850.46	17252.99	0.00	0.00	0.00
		PC	0.00	2850.46	17252.99	0.00	60385.46	9976.61
	16	PC	0.00	2850.46	17252.99	0.00	60385.46	9976.61
		PB	0.00	2850.46	17252.99	0.00	90039.87	14875.99
	17	PB	72699.12	1268.96	6642.85	577.22	36724.08	6292.64
		PA	72699.12	1268.96	6642.85	577.22	12394.25	1534.48
	18	PA	72699.12	1345.60	9594.82	577.22	12394.25	1534.48
		P2	72699.12	1345.60	9594.82	577.22	19572.32	2543.65
	19	4	0.00	0.00	0.00	0.00	0.00	0.00
		OP4	0.00	0.00	0.00	0.00	0.00	0.00
	20	7	0.00	0.00	0.00	0.00	0.00	0.00
		OP7	0.00	0.00	0.00	0.00	0.00	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 5 (SSTI), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	1	14476.73	23139.97	9975.21	89805.62	103069.50	120449.44
	2L	2	14476.73	23139.97	9975.21	89805.62	91841.75	75268.25
	2R	2	14383.50	23079.86	9690.14	89805.62	91841.75	75268.25
	3L	2A	14383.50	23079.86	9690.14	89805.62	86182.94	46428.70
	3R	2A	14283.15	23006.88	9348.11	89805.62	86182.94	46428.70
	4L	A01A	14283.15	23006.88	9348.11	89805.62	85237.81	40918.99
	4R	A01A	14114.28	16132.26	18428.73	89805.62	37460.57	86854.44
	5		15123.27	15123.27	18428.71	57535.57	45381.78	69459.25
	6L	A01B	16132.26	14114.28	18428.73	25265.42	53303.09	52064.07
	6R	A01B	14601.48	12793.14	17377.59	25265.42	53303.09	52064.07
	7		14601.48	12793.14	17377.58	25265.40	56493.13	48412.07
	8		14601.48	12793.14	17377.58	25265.40	59683.17	44760.07
	9		14601.48	12793.14	17377.58	25265.40	62873.24	41108.08
	10L	A1A	14601.48	12793.14	17377.59	25265.42	66063.31	37456.10
	10R	A1A	13470.26	13328.39	6214.83	25265.42	37456.10	66063.31
	11		15757.22	9558.12	6214.82	26499.80	43583.18	71277.75
	12L	A1B	18044.19	5787.86	6214.83	27734.17	49710.27	76492.19
	12R	A1B	14218.92	1948.86	6649.07	27734.17	76492.19	49710.27
	13		14218.92	1948.86	6649.07	27734.15	65210.27	48127.04
	14		14218.92	1948.86	6649.07	27734.15	53928.31	46543.83
	15		14218.92	1948.86	6649.07	27734.15	42646.39	44960.64
	16		8526.34	7842.21	8955.50	27734.15	35056.68	40832.71
	17		8526.34	7842.21	8955.50	27734.15	31159.30	34160.08
	18		8526.34	7842.21	8955.50	27734.15	27261.90	27487.45
	19L	X01A	8526.34	7842.21	8955.50	27734.17	23364.52	20814.81
	19R	X01A	4803.47	9565.14	7338.87	27734.17	20814.81	23364.52
	20		7184.30	7184.30	7338.87	25772.24	24214.80	35765.93
	21L	X01B	9565.14	4803.47	7338.87	23810.34	27614.83	48167.38
	21R	X01B	10514.11	5533.55	3086.03	23810.34	48167.38	27614.83
	22		10514.11	5533.55	3086.03	23810.32	46661.10	32801.88
	23		10514.11	5533.55	3086.03	23810.32	45154.85	37988.98
	24		10514.11	5533.55	3086.03	23810.32	43648.56	43176.09
	25		10514.11	5533.55	3086.03	23810.32	42142.30	48363.18
	26		13023.25	5383.76	7550.32	23810.32	40599.96	47515.71
	27		13023.25	5383.76	7550.32	23810.32	39021.55	40633.65
	28		13023.25	5383.76	7550.32	23810.32	37443.16	33751.61
	29		13023.25	5383.76	7550.32	23810.32	35864.75	26869.55
	30L	X02A	13023.25	5383.76	7550.32	23810.34	34286.36	19987.48
	30R	X02A	15268.90	8801.50	7816.04	23810.34	19987.48	34286.36

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 5 (SSTI), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	31		12035.20	12035.20	7816.04	21736.37	18310.28	32321.64
	32L	X02B	8801.50	15268.90	7816.04	19662.43	16633.07	30476.93
	32R	X02B	9216.23	8302.40	16058.97	19662.43	30476.93	16633.07
	33L	X1	9216.23	8302.40	16058.97	19662.43	30572.14	17910.31
	33R	X1	9451.91	9580.89	12310.24	19662.43	30572.14	17910.31
	34L	X03A	9451.91	9580.89	12310.24	19662.43	23321.33	15151.06
	34R	X03A	10006.35	11288.34	8992.00	19662.43	15151.06	23321.33
	35		10647.34	10647.34	8992.00	21769.51	18901.52	22746.68
	36L	X03B	11288.34	10006.35	8992.00	23876.63	22651.98	22172.08
	36R	X03B	10268.75	7523.29	10404.86	23876.63	22172.08	22651.98
	37L	XX1	10268.75	7523.29	10404.86	23876.63	23784.20	24715.37
	37R	XX1	7923.51	4424.92	3909.39	23876.63	23784.20	24715.37
	38		7923.51	4424.92	3909.39	23876.61	25546.87	29992.48
	39		7923.51	4424.92	3909.39	23876.61	27309.55	35269.59
	40		7923.51	4424.92	3909.39	23876.61	29072.23	40546.71
	41		7923.51	4424.92	3909.39	23876.61	30834.90	45823.84
	42		4202.17	6557.94	3272.45	23876.61	29535.67	43975.37
	43		4202.17	6557.94	3272.45	23876.61	25174.48	35001.18
	44		4202.17	6557.94	3272.45	23876.61	20813.29	26027.00
	45		4202.17	6557.94	3272.45	23876.61	16452.09	17052.84
	46L	X04A	4202.17	6557.94	3272.45	23876.63	12090.89	8078.64
	46R	X04A	3742.51	5415.54	9841.09	23876.63	8078.64	12090.89
	47		4579.02	4579.02	9841.09	23255.29	10827.38	10267.23
	48L	X04B	5415.54	3742.51	9841.09	22633.97	13576.12	8443.59
	48R	X04B	6052.61	10607.16	4527.67	22633.97	8443.59	13576.12
	49L	X2	6052.61	10607.16	4527.67	22633.97	6717.43	17953.18
	49R	X2	6399.01	11201.16	4955.91	22633.97	6717.43	17953.18
	50L	X05A	6399.01	11201.16	4955.91	22633.97	8255.48	17074.32
	50R	X05A	7103.60	5809.80	10273.14	22633.97	17074.32	8255.48
	51		6452.20	6452.20	10273.14	26371.22	22476.93	15411.91
	52L	X05B	5800.80	7103.60	10273.14	30108.50	27879.56	22568.34
	52R	X05B	6599.14	8978.69	9530.28	30108.50	22568.34	27879.56
	53L	3	6599.14	8978.69	9530.28	30108.50	20255.82	32325.73
	53R	3	8025.77	7462.82	8944.26	30108.50	20255.82	32325.73
	54L	4	8025.77	7462.82	8944.26	30108.50	24710.27	42659.18
	54R	4	12480.19	6873.66	8862.06	45453.43	24710.27	37832.51
	55L	5	12488.19	6873.66	8862.06	45453.43	36729.82	43059.64
	55R	5	14207.49	7753.96	8796.78	45453.43	36729.82	43059.64

ED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
NAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

AD CASE NO. 5 (SSE). FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN1 (CONTD.)									
	56L	A04A	14207.49	7753.96	8796.78	45453.43	44601.38	46627.91	
	56R	A04A	15167.33	8853.64	8353.59	45453.43	46627.91	44601.38	
	57		12938.52	11454.41	8353.59	44695.21	51348.80	51662.56	
	58L	A04B	10709.71	14055.17	8353.59	43937.04	59269.72	58723.76	
	58R	A04B	11080.84	8845.09	17312.29	43937.04	58723.76	59269.72	
	59L	6	11080.84	8845.09	17312.29	43937.04	40592.19	52872.44	
	59R	6	11843.76	7635.52	16710.01	43937.04	40592.19	52872.44	
	60L	7	11843.76	7635.52	16710.01	43937.04	11164.59	43164.09	
	60R	7	14421.09	6251.83	12591.04	39407.55	11164.59	44658.61	
	61	8	14421.09	6251.83	12591.04	39407.55	19372.64	34220.30	
RUN2									
	62	8	15716.48	6837.81	10587.44	39407.55	19372.64	34220.30	
	63		15716.48	6837.81	10587.44	39407.54	32319.44	27914.61	
	64L	9	15716.48	6837.81	10587.44	39407.55	45266.32	21608.93	
	64R	9	16835.05	7787.41	8679.99	39407.55	45266.32	21608.93	
	65		16835.04	7787.41	8679.99	39407.54	61511.20	23740.60	
	66L	10	16835.05	7787.41	8679.99	39407.55	77756.12	25872.30	
	66R	10	17882.12	8000.38	7633.29	39407.55	77756.12	25872.30	
	67		17882.11	8000.38	7633.29	39407.54	83799.37	26990.21	
	68L	8A	17882.12	8000.38	7633.29	39407.55	89842.62	28108.16	
	68R	8A	18414.55	7440.21	7742.21	39407.55	89842.62	28108.16	
	69L	8B	18414.55	7440.21	7742.21	39407.55	95112.19	32374.50	
			18414.55	7440.21	7742.21	39407.55	95112.19	32374.50	BRANCH AXES
	69R	8B	24401.30	5807.53	8270.49	42465.56	75042.12	51661.89	
			24401.30	5807.53	8270.48	42465.56	75042.12	51661.89	BRANCH AXES
	70L	8C	24401.30	5807.53	8270.49	42465.56	67347.37	46477.46	
	70R	8C	25272.86	5623.82	10775.16	42465.56	67347.37	46477.46	
	71		25272.84	5623.82	10775.16	42465.54	47822.88	36231.37	
	72		24941.70	5473.11	10758.91	42758.47	28560.55	25425.74	
	73		26455.73	6118.09	13893.18	42758.47	25920.98	18348.33	
	74		26455.73	6118.09	13893.18	42758.47	39974.31	14132.14	
	75L	P5	26455.75	6118.09	13893.18	42758.49	54027.71	9915.93	
	75R	P5	27326.52	6677.64	14485.45	42758.49	54027.71	9915.93	
	76L	P4	27326.52	6677.64	14485.45	42758.49	62237.09	13464.91	
	76R	P4	29136.41	1589.97	7625.52	42758.49	62237.09	13464.91	
	77		29136.40	1589.97	7625.52	42758.47	48643.48	10926.96	
	78		29136.40	1589.97	7625.52	42758.47	35049.87	8389.01	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB - X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 5 (SSTI), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SUP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN2 (CONTD.)	79		30528.12	2235.11	7828.01	42758.47	26186.10	6808.07	
	80		30528.12	2235.11	7828.01	42758.47	16052.25	6184.16	
	81L	P3	30528.14	2235.11	7828.01	42758.49	7918.36	5560.26	
	81R	P3	31350.69	3365.83	8164.28	42758.49	7918.36	5560.26	
	82L	P2	31350.69	3365.83	8164.28	42758.49	13821.14	7868.08	
	82R	P2	144.81	192.05	164.85	0.00	123.64	144.04	
	83	P1	144.81	192.05	164.85	0.00	0.00	0.00	
RUN3	84	8B	4332.17	14699.36	13999.48	67330.94	79429.56	79325.31	
			9419.28	4332.17	17981.48	49715.91	67330.94	100647.31	BRANCH AXES
	85L	11	4332.17	14699.36	13999.48	67330.94	66585.00	65827.94	
	85R	11	3938.09	14655.89	13585.05	67330.94	66585.00	65827.94	
	86		3938.09	14655.88	13585.05	67330.94	47560.41	49265.87	
	87		3938.09	14655.88	13585.05	67330.94	28535.77	32703.78	
	88L	12	3938.09	14655.89	13585.05	67330.94	9511.07	16141.63	
	88R	12	3672.53	13815.71	11567.59	67330.94	9511.07	16141.63	
	89L	13	3672.53	13815.71	11567.59	67330.94	19436.02	28699.95	
	89R	13	13422.17	3561.93	10162.27	16071.89	67330.94	30752.16	
	90L	14	13422.17	3561.93	10162.27	16071.89	59807.73	29002.93	
	90R	14	12273.17	3342.33	8829.91	16071.89	59807.73	29002.93	
	91		12273.17	3342.33	8829.91	16071.89	50042.75	27708.91	
	92		12273.17	3342.33	8829.91	16071.89	40277.77	26414.88	
	93		10235.81	2246.95	7745.10	16071.88	30512.76	25120.83	
	94		10961.15	2402.49	7565.97	15313.01	32704.75	23269.14	
	95		10961.15	2402.49	7565.97	15313.01	35068.55	21171.27	
	96		9394.79	3938.04	7893.29	15313.01	37432.34	19073.40	
	97		9394.79	3938.04	7893.29	15313.01	47266.79	17152.22	
	98		9394.79	3938.04	7893.29	15313.01	57101.27	15231.04	
	99L	B01A	9394.79	3938.04	7893.29	15313.01	66935.75	13309.86	
	99R	B01A	8720.39	7227.84	5482.27	15313.01	13309.86	66935.75	
	100L	B01B	9392.87	6363.80	5482.27	6514.53	14904.27	69217.25	
	100R	B01B	8538.60	5058.59	5972.26	6514.53	69217.25	14904.27	
	101		8538.60	5058.59	5972.26	6514.53	66093.25	19212.22	
	102		8538.60	5058.59	5972.26	6514.53	62969.27	23520.16	
	103		7803.77	5008.53	5371.25	5174.36	60801.68	26964.44	
	104		6666.67	3101.89	4190.93	5174.36	58389.23	30261.76	
	105		6666.67	3101.89	4190.93	5174.36	54704.33	32588.61	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 5 (SSTI), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	106		7615.20	3186.49	4800.80	6514.53	49386.36	37079.55
	107		7615.20	3186.49	4800.80	6514.53	45796.55	39813.60
	108		7560.04	5542.40	6378.94	6514.53	44096.66	43184.86
	109		7560.04	5542.40	6378.94	6514.53	43341.72	46874.70
	110		7560.04	5542.40	6378.94	6514.53	42586.75	50564.52
	111L	B02A	7560.04	5542.40	6378.94	6514.53	41831.83	54254.40
	111R	B02A	7990.81	5774.50	7064.75	6514.53	54254.40	41831.83
	112L	B02R	5774.50	7990.81	7064.75	54336.80	7125.25	37336.04
	112R	B03	5381.30	7151.07	8169.20	54336.80	37336.04	7125.25
	113		5381.30	7151.07	8169.20	54336.78	32353.09	20430.39
	114L	B03A	5381.30	7151.07	8169.20	54336.80	27370.16	33735.52
	114R	B03A	5184.21	6702.09	7156.92	54336.80	27370.16	33735.52
	115L	B03B	6702.09	5184.21	7156.92	30842.68	48001.47	31298.95
	115R	B03B	6015.51	5036.70	6481.59	30842.68	42405.28	38562.59
	116		6015.51	5036.70	6481.59	30842.65	32703.45	31447.04
	117		6015.51	5036.70	6481.59	30842.65	23001.65	24331.54
	118		5144.97	4676.67	7350.90	30842.65	13299.84	17216.03
	119		5144.97	4676.67	7350.90	30842.65	21015.87	16976.08
	120		5335.70	3393.64	7829.73	31041.43	30585.37	13631.53
	121L	14S	5335.70	3393.64	7829.73	31041.45	39257.78	12712.13
	121R	14S	4901.17	3327.90	4607.65	31041.45	39257.78	12712.13
	122		4901.17	3327.90	4607.65	31041.43	38833.60	15093.66
	123L	B04A	4689.62	4383.02	4691.39	30842.68	35287.03	24372.68
	123R	B04A	4515.55	4775.57	3568.31	30842.68	30062.20	30588.69
	124L	B04B	4775.57	4515.55	3568.31	32069.80	28836.49	29020.77
	124R	B04B	4243.08	4359.24	2947.61	32069.80	28836.49	29020.77
	125		4243.08	4359.24	2947.61	32069.79	27658.33	25963.81
	126		4243.08	4359.24	2947.61	32069.79	26480.19	22906.84
	127		3584.72	4465.46	2213.28	32069.79	26179.76	23303.81
	128		3584.72	4465.46	2213.28	32069.79	26730.09	27154.68
	129L	B05A	3584.72	4465.46	2213.28	32069.80	27289.41	31005.60
	129R	B05A	3277.53	1683.46	4657.09	32069.80	31005.60	27289.41
	130L	B05B	2982.46	2138.27	4657.09	24580.53	40426.56	26713.77
	130R	B05B	2900.56	4758.81	2029.74	24580.53	26713.77	40426.56
	131L	15S	2900.56	4758.81	2029.74	24580.53	24623.19	45598.33
	131R	15S	2785.99	4666.98	2062.29	24580.53	24623.19	45598.33
	132		2785.99	4666.98	2062.29	24580.51	21111.68	40918.64
	133		2785.99	4666.98	2062.29	24580.51	17600.17	36239.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X058
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 5 (SSTI), FORCES AND MOMENTS IN LOCAL COORDINATES (CON)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	134		3010.85	4652.96	2133.36	24580.51	14088.66	31559.33
	135		3010.85	4652.96	2133.36	24580.51	10131.68	32952.56
	136		3010.85	4652.96	2133.36	24580.51	6174.69	34345.75
	137L	B06A	3010.85	4652.96	2133.36	24580.53	2217.71	35739.00
	137R	B06A	3396.91	6384.20	1774.16	24580.53	2217.71	35739.00
	138L	B06B	6384.20	3396.91	1774.16	0.00	24204.79	33380.76
	138R	B06B	5383.18	3732.60	2136.71	0.00	24204.79	33380.76
	139		5383.18	3732.60	2136.71	0.00	23935.20	32701.30
	140		5383.18	3732.60	2136.71	0.00	23665.61	32021.87
	141		5383.18	3732.60	2136.71	0.00	23396.04	31342.43
	142		3842.04	2400.16	1709.77	0.00	23409.08	31347.19
	143		3842.04	2400.16	1709.77	0.00	23704.73	32036.20
	144		3842.04	2400.16	1709.77	0.00	24000.39	32725.16
	145		2303.98	1806.39	1296.31	0.00	24296.04	33414.15
	146		2303.99	1806.39	1296.31	0.00	22252.00	30612.57
	147		2303.99	1806.39	1296.31	0.00	20207.95	27811.00
	148		2303.99	1806.39	1296.31	0.00	18163.89	25009.42
	149		767.79	3552.40	2579.34	0.00	14693.04	20235.98
	150		767.79	3552.40	2579.34	0.00	9795.36	13490.65
	151		767.79	3552.40	2579.34	0.00	4897.68	6745.32
	152	15	767.79	3552.40	2579.34	0.00	0.00	0.00
MMBS								
	15	P4	0.00	9910.29	23011.79	0.00	0.00	0.00
		PC	0.00	10074.30	23094.85	0.00	80832.00	35260.07
	16	PC	1788.93	11662.69	23678.91	0.00	80832.00	35260.07
		PB	1788.93	11662.69	23678.91	0.00	121441.37	55145.35
	17	PB	32891.19	7087.00	12101.50	42758.49	49974.39	23032.53
		PA	32891.19	7087.00	12101.50	42758.49	7541.65	4784.30
	18	PA	31875.23	4144.77	8446.90	42758.49	7541.65	4784.30
		P2	31875.23	4144.77	8446.90	42758.49	13760.96	7725.01
	19	4	2131.61	4032.01	2399.19	0.00	11995.94	20160.07
		OP4	2131.60	4031.99	2399.19	0.00	[illegible]	0.00
	20	7	1807.25	2020.43	4085.25	0.00	2042[illegible].23	10102.17
		OP7	1807.25	2020.43	4085.25	0.00	0.00	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X-5B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 6 (SSET), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	S/P NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	1	14975.16	28966.12	13474.94	139557.31	122667.25	152349.31
	2L	2	14975.16	28966.12	13474.94	139557.31	104762.50	96400.62
	2R	2	14881.93	28906.02	13189.87	139557.31	104762.50	96400.62
	3L	2A	14881.93	28906.02	13189.87	139557.31	94865.19	60783.77
	3R	2A	14781.58	28833.04	12847.84	139557.31	94865.19	60783.77
	4L	A01A	14781.58	28833.04	12847.84	139557.31	93098.62	53961.90
	4R	A01A	14612.71	19695.10	24126.11	139557.31	48374.48	97440.44
	5		17731.64	17685.67	24126.10	90757.00	78975.50	76232.69
	6L	A01B	19695.10	14612.71	24126.11	31432.72	93212.75	58710.58
	6R	A01B	18164.32	13291.57	23074.98	31432.70	93212.75	58710.58
	7		18164.32	13291.57	23074.96	31432.68	91159.44	54227.16
	8		18164.32	13291.57	23074.96	31432.68	90946.44	49751.57
	9		18164.32	13291.57	23074.96	31432.68	92357.25	45288.72
	10L	A1A	18164.32	13291.57	23074.98	31432.70	96029.31	40848.50
	10R	A1A	17033.09	19025.77	6713.25	31432.70	40848.50	96029.31
	11		20523.83	13915.85	6713.25	30778.77	46749.27	101774.69
	12L	A1B	13870.35	9287.59	6713.25	29889.86	55597.30	106116.37
	12R	A1B	20045.07	2447.29	10148.80	29889.86	106116.37	55597.30
	13		20045.07	2447.29	10148.79	29889.83	92393.44	53099.96
	14		20045.07	2447.29	10148.79	29889.83	80070.00	50611.80
	15		20045.07	2447.29	10148.79	29889.83	69103.56	48140.59
	16		14352.51	8340.64	12455.23	29889.83	62958.62	43161.12
	17		14352.51	8340.64	12455.23	29889.83	61355.19	35734.75
	18		14352.51	8340.64	12455.23	29889.83	60354.32	28627.18
	19L	X01A	14352.51	8340.64	12455.23	29889.86	60483.00	22179.75
	19R	X01A	10629.64	13064.87	7471.45	29889.86	22179.75	60483.00
	20		12341.01	11230.49	7471.45	27299.40	26127.91	75738.94
	21L	X01B	13064.87	10629.64	7471.45	25002.65	29533.16	86959.06
	21R	X01B	14013.84	5666.12	8912.20	25002.65	86959.06	29533.16
	22		14013.84	5666.12	8912.19	25002.62	82324.69	34509.67
	23		14013.84	5666.12	8912.19	25002.62	79194.75	39501.39
	24		14013.84	5666.12	8912.19	25002.62	78184.19	44510.62
	25		14013.84	5666.12	8912.19	25002.62	79350.46	49540.90
	26		16522.96	5516.33	13376.48	25002.62	82388.62	48566.31
	27		16522.96	5516.33	13376.48	25002.62	87536.37	41599.41
	28		16522.96	5516.33	13376.48	25002.62	94681.56	34688.11
	29		16522.96	5516.33	13376.48	25002.62	102802.31	27839.21
	30L	X02A	16522.96	5516.33	13376.49	25002.65	111337.94	21048.12
	30R	X02A	18768.61	14527.67	7943.61	25002.65	21048.12	111537.94

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 6 (SSET), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	OCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	31		17191.89	16081.37	7948.61	23319.75	18527.78	117218.12
	32L	X02B	14627.67	18768.61	7948.61	20871.32	17690.37	118540.19
	32R	X02B	15042.39	8434.97	19558.70	20871.32	118540.19	17690.37
	33L	X1	15042.39	8434.97	19558.70	20871.32	118817.19	18920.10
	33R	X1	15278.09	9657.75	70688.56	20871.32	118917.19	18920.10
	34L	X03A	15278.09	9657.75	70688.56	20871.32	53248.75	16089.47
	34R	X03A	15832.48	69666.62	9068.86	20871.32	16089.47	53248.75
	35		48812.96	55725.74	9068.86	22210.90	20230.69	91196.81
	36L	X03B	69666.62	15832.55	9068.86	24674.93	23719.73	127779.19
	36R	X03B	68647.06	7600.15	16231.02	24674.93	127779.19	23712.73
	37L	XX1	68647.06	7600.15	16231.02	24674.93	131046.19	25739.24
	37R	XX1	66301.81	4501.78	15090.11	24674.93	131046.19	25739.24
	38		66301.75	4501.77	15090.11	24674.91	12728.81	50884.08
	39		66301.75	4501.77	15090.11	24674.91	99414.37	36029.79
	40		66301.75	4501.77	15090.11	24674.91	76104.44	41176.50
	41		66301.75	4501.77	15090.11	24674.91	57803.92	46324.49
	42		62580.46	6634.80	14453.17	24674.91	37494.80	44349.07
	43		62580.46	6634.80	14453.17	24674.91	44867.29	35251.17
	44		62580.46	6634.80	14453.17	24674.91	60385.55	26227.01
	45		62580.46	6634.80	14453.17	24674.91	75939.44	17296.63
	46L	X04A	62580.49	6634.80	14453.17	24674.93	91502.25	8406.39
	46R	X04A	62120.82	16596.19	9917.95	24674.93	8406.39	91502.25
	47		53689.06	38031.92	9917.95	24085.57	11110.27	71191.12
	48L	X04B	16596.27	62120.80	9917.95	23105.49	14239.78	25319.16
	48R	X04B	17233.32	10684.02	62905.99	23105.49	25319.16	14239.78
	49L	X2	17233.32	10684.02	62905.99	23105.49	85343.81	18547.48
	49R	X2	17579.73	11311.09	63334.23	23105.49	85343.81	18547.48
	50L	X05A	17579.73	11311.09	63334.23	23105.49	150078.62	17724.11
	50R	X05A	18284.33	64179.09	10383.06	23105.49	17724.11	150078.62
	51		55562.24	39905.69	10383.08	27195.96	22731.10	233292.50
	52L	X05B	64179.11	18284.25	10383.08	30905.50	28251.62	258997.94
	52R	X05B	64977.46	9088.62	66519.87	30905.50	258997.94	28252.62
	53L	3	64977.46	9088.62	66519.87	30905.50	210858.06	32695.93
	53R	3	66404.06	7572.76	65933.87	30905.50	210858.06	32695.93
	54L	4	66404.06	7572.76	65933.87	30905.50	104919.37	43064.07
	54R	4	70866.50	6983.59	65851.69	46250.43	104919.37	38287.40
	55L	5	70866.50	6983.59	65851.69	46250.43	88041.75	43515.63
	55R	5	72585.81	7863.89	65786.37	46250.43	88041.75	43515.63

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB. X SNUB AT X058
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 6 (SSET), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SCP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN1 (CONTD.)									
	56L	A04A	72585.81	7863.89	65786.37	46250.43	149610.00	47115.75	
	56R	A04A	73545.62	65843.19	8463.52	46250.43	47115.75	149610.00	
	57		93370.37	25236.51	8463.52	45363.77	53861.56	200762.19	
	58L	A04B	83286.44	51319.67	8463.52	44557.77	60315.48	195728.37	
	58R	A04B	83657.62	9786.21	25364.90	44557.77	195728.37	60315.48	
	59L	6	83657.62	9786.21	25364.90	44557.77	169175.50	54194.75	
	59R	6	84420.50	8576.62	24762.62	44557.77	169175.50	54194.75	
	60L	7	84420.50	8576.62	24762.62	44557.77	124029.00	46074.18	
	60R	7	86997.87	7192.94	20643.66	40028.29	124029.00	47568.71	
	61	8	86997.87	7192.94	20643.66	40028.29	116644.69	38773.14	
RUN2									
	62	8	88293.25	7778.93	18640.06	40028.29	116644.69	38773.14	
	63		88293.25	7778.93	18640.04	40028.26	119640.50	33530.07	
	64L	9	88293.25	7778.93	18640.06	40028.29	122749.25	28288.15	
	64R	9	89411.81	8728.52	16732.61	40028.29	122749.25	28288.15	
	65		89411.81	8728.52	16732.61	40028.26	124077.62	32071.43	
	66L	10	89411.81	8728.52	16732.61	40028.29	126174.12	36052.45	
	66R	10	90458.87	9561.38	15685.91	40028.29	126174.12	36052.45	
	67		90458.87	9561.38	15685.90	40028.26	125750.50	35606.47	
	68L	8A	90458.87	9561.38	15685.91	40028.29	125770.06	35161.02	
	68R	8A	90991.31	9001.21	15794.83	40028.29	125770.06	35161.02	
	69L	8B	90991.31	9001.21	15794.83	40028.29	126100.37	37868.98	
			90991.25	9001.21	15794.83	40028.28	126100.37	37868.98	BRANCH AXES
	69R	8B	97100.44	7312.57	16197.19	43042.77	106641.56	58151.68	
			97100.44	7312.57	16197.18	43042.77	106641.56	58151.68	BRANCH AXES
	70L	8C	97100.44	7312.57	16197.19	43042.77	94610.87	51463.32	
	70R	8C	97972.00	7128.86	18701.86	43042.77	94610.87	51463.32	
	71		97971.94	7128.86	18701.86	43042.75	72452.50	38297.12	
	72		97640.81	6978.15	18685.61	43335.68	54289.74	26385.46	
	73		99154.81	7623.12	21819.89	43335.68	67854.75	22183.15	
	74		99154.81	7623.12	21819.89	43335.68	95179.94	20862.46	
	75L	P5	99154.87	7623.12	21819.89	43335.70	123398.44	19572.21	
	75R	P5	100025.62	8182.68	22412.16	43335.70	123398.44	19572.21	
	76L	P4	100025.62	8182.68	22412.16	43335.70	135954.19	23998.86	
	76R	P4	101835.56	2935.57	17220.34	43335.70	135954.19	23998.86	
	77		101835.50	2935.57	17220.32	43335.68	105152.31	19047.27	
	78		101835.50	2935.57	17220.32	43335.68	74352.62	14095.64	

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 5 (SSET), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)	
RUN2 (CONTD.)									
	79		103227.19	3580.71	17422.82	43335.68	46290.14	10101.04	
	80		103227.19	3580.71	17422.82	43335.68	21041.30	7063.53	
	81L	P3	103227.25	3580.71	17422.82	43335.70	20312.61	7094.73	
	81R	P3	104049.81	4711.42	17759.09	43335.70	20312.61	7094.73	
	82L	P2	104049.81	711.42	17759.09	43335.70	33393.46	10412.73	
	82R	P2	144.81	192.05	164.85	0.00	123.64	144.08	
	83	P1	144.8	192.05	164.85	0.00	0.00	0.00	
RUN3									
	84	9B	395.30	4858.60	14105.50	71316.31	80265.56	80565.31	
			9582.20	4395.30	18131.78	50109.01	71316.31	102090.19	BRANCH AXES
	85L	11	6[illegible]25.3[illegible]	14854.60	14105.50	71316.31	67333.94	66975.06	
	85R	11	4001.22	14811.12	13691.07	71316.31	67333.94	66975.06	
	86		4001.22	14811.12	13691.07	71316.31	48151.66	50268.58	
	87		4001.22	14811.12	13691.07	71316.31	28994.96	33625.27	
	88L	12	4001.22	14811.12	13691.07	71316.31	9892.79	17062.11	
	88R	12	3735.66	13970.95	11673.61	71316.31	9892.79	17062.11	
	89L	13	3735.66	13970.95	11673.61	71316.31	19812.61	29655.70	
	89R	13	13561.52	3625.06	10288.41	16164.38	71316.31	31772.67	
	90L	14	13561.52	3625.06	10288.41	16164.38	63678.62	29960.88	
	90R	14	12412.52	3405.46	8956.04	16164.38	63678.62	29960.88	
	91		12412.52	3405.46	8956.04	16164.38	53704.76	28051.80	
			12412.52	3405.46	8956.04	16164.38	43733.91	27143.15	
			10375.16	2310.09	7871.24	16164.37	33766.59	25735.09	
			11100.50	2465.63	7692.11	15405.50	35760.54	23771.06	
	95		11100.50	2465.63	7692.11	15405.50	37793.48	21593.91	
	96		9534.14	4001.17	8019.42	15405.50	40108.69	19361.00	
	97		9534.14	4001.17	8019.42	15405.50	49764.27	17376.20	
	98		9534.14	4001.17	8019.42	15405.50	59429.31	15[illegible].50	
	99L	B01A	9534.14	4001.17	8019.42	15405.50	69106.06	13477.09	
	99R	B01A	8859.74	7353.97	5528.85	15405.50	13477.09	69106.06	
	100L	B01B	9545.06	6474.16	5528.85	6655.71	14990.95	71260.25	
	100R	B01B	8690.79	5105.18	6082.62	6655.71	71260.25	14990.95	
	101		8690.79	5105.18	6082.62	6655.71	67989.56	19361.91	
	102		8690.79	5105.18	6082.62	6655.71	64730.01	23746.56	
	103		7955.96	5055.12	5481.61	5315.53	62440.76	27270.59	
	104		6818.86	3148.47	4301.28	5315.53	59923.82	30448.77	
	105		6818.86	3148.47	4301.28	5315.53	56155.34	33056.95	

ADVANCED LIGHT WATER REACTO[illegible] SNUB AT X05B
OPTIONAL ROUTING 7 FROM DE[illegible]
"6" SHUTDOWN COOLING LINE

LOAD CASE NO. 6 (SSET), FORCES AND MOMENTS IN [illegible]NATES (CONTD.)

RUN GROUP	SUP NAME	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	106		7767.39	3233.07	4911.16	6655.71	50778.49	37[illegible].52
	107		7767.39	3233.07	4911.16	6655.71	47157.68	4[illegible]38
	108		7712.23	5588.98	6489.30	6655.71	45456.59	43898.56
	109		7712.23	5588.98	6489.30	6655.71	44730.29	47670.60
	110		7712.23	5588.98	6489.30	6655.71	44032.07	51444.48
	111L	B02A	7712.23	5588.98	6489.30	6655.71	43358.83	55219.59
	111R	B02A	8143.00	5884.86	7242.27	6655.71	55219.59	3358.83
	112L	B02B	5884.86	8143.00	7242.27	55422.00	7290.26	38743.64
	112R	B02B	5491.66	7328.60	8321.39	55422.00	38743.64	7290.26
	113		5491.66	7328.60	8321.39	55421.98	33462.98	20922.19
	114L	B03A	5491.66	7328.60	8321.39	55422.00	28187.44	34576.60
	114R	B03A	5294.57	6795.54	7309.11	55422.00	28187.44	34576.60
	115L	B03B	6795.54	5294.57	7309.11	31482.46	48897.24	32112.39
	115R	B03B	6108.96	5191.93	6587.60	31482.46	43018.01	39605.66
	116		6108.96	5191.93	6587.60	31482.45	33128.83	32196.17
	117		6108.96	5191.93	6587.60	31482.45	23262.11	24788.57
	118		5238.42	4831.90	7456.91	31482.45	13489.98	17392.32
	119		5238.42	4831.90	7456.91	31482.45	21308.78	17142.59
	120		5429.15	3548.87	7935.75	31681.21	31050.99	14077.50
	121L	14S	5429.15	3548.88	7935.75	31681.24	39912.93	13450.06
	121R	14S	4994.62	3483.13	4635.95	31681.24	39912.93	13450.06
	122		4994.62	3483.13	4635.95	31681.21	39472.39	16005.25
	123L	B04A	4783.07	4538.25	4719.69	31482.46	35910.67	25458.23
	123R	B04A	4609.01	4905.30	3658.14	31482.46	31105.02	31281.25
	124L	B04B	4905.30	4609.01	3658.14	33220.64	29364.30	29735.96
	124R	B04B	4372.81	4452.70	3037.44	33220.64	29364.30	29735.96
	125		4372.81	4452.70	3037.44	33220.62	28008.34	26509.69
	126		4372.81	4452.70	3037.44	33220.62	26653.85	23298.46
	127		3714.45	4558.91	2303.11	33220.62	26210.88	23581.89
	128		3714.45	4558.91	2303.11	33220.62	26923.45	27419.52
	129L	B05A	3714.45	4558.91	2303.11	33220.64	27659.53	31369.04
	129R	B05A	3407.26	1773.29	4750.55	33220.64	31369.04	27659.53
	130L	B05B	3137.69	2166.57	4750.55	25368.25	41351.55	27115.52
	130R	B05B	3055.80	4852.26	2058.04	25368.25	27115.52	41351.55
	131L	15S	3055.80	4852.26	2058.04	25368.25	24982.99	46524.20
	131R	15S	2941.22	5105.05	2090.59	25368.25	24982.99	46524.20
	132		2941.22	5105.05	2090.59	25368.23	21417.42	41486.19
	133		2941.22	5105.05	2090.59	25368.23	17851.84	37329.47

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

LOAD CASE NO. 6 (SSET), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SUP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN3 (CONTD.)								
	134		3166.08	5091.03	2161.66	25368.23	14286.26	33418.72
	135		3166.08	5091.03	2161.66	25368.23	10275.20	35622.11
	136		3166.08	5091.03	2161.66	25368.23	6264.14	37838.14
	137L	B06A	3166.08	5091.03	2161.66	25368.25	2253.08	40059.66
	137R	B06A	3552.14	6384.20	1802.47	25368.25	2253.08	40059.66
	138L	B06B	6384.20	3552.14	1802.47	0.00	24957.13	37507.37
	138R	B06B	5383.18	3887.84	2165.01	0.00	24957.13	37507.37
	139		5383.18	3887.83	2165.01	0.00	24633.81	36533.14
	140		5383.18	3887.83	2165.01	0.00	24310.47	35558.96
	141		5383.18	3887.83	2165.01	0.00	23987.16	34584.76
	142		3842.04	2555.39	1738.07	0.00	23946.47	34294.76
	143		3842.04	2555.39	1738.07	0.00	24188.37	34689.01
	144		3842.04	2555.39	1738.07	0.00	24430.30	35083.23
	145		2303.98	1961.62	1324.61	0.00	24672.20	35477.46
	146		2303.99	1961.62	1324.61	0.00	22574.42	32381.12
	147		2303.99	1961.62	1324.61	0.00	20476.65	29284.79
	148		2303.99	1961.62	1324.61	0.00	18378.85	26188.46
	149		767.79	3707.63	2607.64	0.00	14854.25	21170.26
	150		767.79	3707.63	2607.64	0.00	9902.84	14080.17
	151		767.79	3707.63	2607.64	0.00	4951.42	7040.09
	152	15	767.79	3707.63	2607.64	0.00	0.00	0.00
MMBS								
	15	P4	0.00	12760.75	40264.79	0.00	0.00	0.00
		PC	0.00	12924.77	40347.84	0.00	141217.44	45236.68
	16	PC	1788.93	14513.15	40931.90	0.00	141217.44	45236.68
		PB	1788.93	14513.15	40931.90	0.00	211481.31	70021.31
	17	PB	105590.31	8355.96	18744.36	43335.70	86698.44	29325.18
		PA	105590.31	8355.96	18744.36	43335.70	19935.89	6318.78
	18	PA	104574.37	5490.36	18041.72	43335.70	19935.89	6318.78
		P2	104574.37	5490.36	18041.72	43335.70	33333.27	10268.66
	19	4	2131.61	4032.01	2399.19	0.00	19995.94	20160.07
		DP4	2131.60	4031.99	2399.19	0.00	0.00	0.00
	20	7	1807.25	2020.43	4085.25	0.00	20426.23	10102.17
		DP7	1807.25	2020.43	4085.25	0.00	0.00	0.00

APPENDIX D

DIRECT VESSEL INJECTION

PRELIMINARY ROUTING AND LOADS ANALYSIS

APPENDIX D

DIRECT VESSEL INJECTION - PRELIMINARY ROUTING AND LOADS ANALYSIS

Purpose

This appendix reports the results of a preliminary stress analysis of a System 80+ Direct Vessel Injection (DVI) line in the Reactor Building to provide applicable forces and moments for the Leak-Before-Break (LBB) evaluation. The piping included in the model is represented in the isometric sketch that follows. The analysis model originates at the Reactor Vessel nozzle and terminates at the anchor on the inside face of the crane wall. Anchors are modelled at these locations. All applicable design conditions, loadings, codes, and regulatory requirements are defined in the System 80+ Certification Program Draft Distribution Systems Design Guide, Reference 2.

The types of analysis results required for the LBE evaluation are shown on the following page. Other results in the detailed analysis include pipe displacements, stresses, support/restraint loads, and nozzle loads (anchor loads). Since the analysis is preliminary and design information is not available for allowable nozzle loads, it is not within the scope of the calculation to evaluate those loads.

A code compliance check is performed to verify that pipe stresses are within the ASME allowables for the pipe as modelled. As additional design information becomes available, it will be included in a final analysis.

Method

The piping is modelled as a three dimensional framework for analysis. Static analysis is performed by the Direct Stiffness Method and a simple Lumped Mass Idealization is used to determine mode shapes and frequencies for the dynamic analysis. This piping is analyzed using the SUPERPIPE computer program.

References and Design Inputs

1. ASME Boiler and Pressure Vessel Code, Section III, 1989.

2. Draft Distribution Systems Design Guide.

3. ABB-CE Letter dated 4/21/92 to R.W. Bonsall enclosing Preliminary Thermal Movements and SSE Seismic Anchor Movements.

4. ABB-Impell memo dated 5/21/92 to ABB-CE, Attn: R.A. Matzie enclosing System 80+ N-411 Spectra and SAM.

5. System 80+ Safety Injection System Piping and Instrumentation Diagram.

6. System 80+ Nuclear Island Detailed Arrangement Drawings.

Results

Forces and moments results for the load cases listed below are provided for the Leak-Before-Break evaluation shown in Appendix J.

1. Gravity - Fluid-filled

2. Thermal Expansion

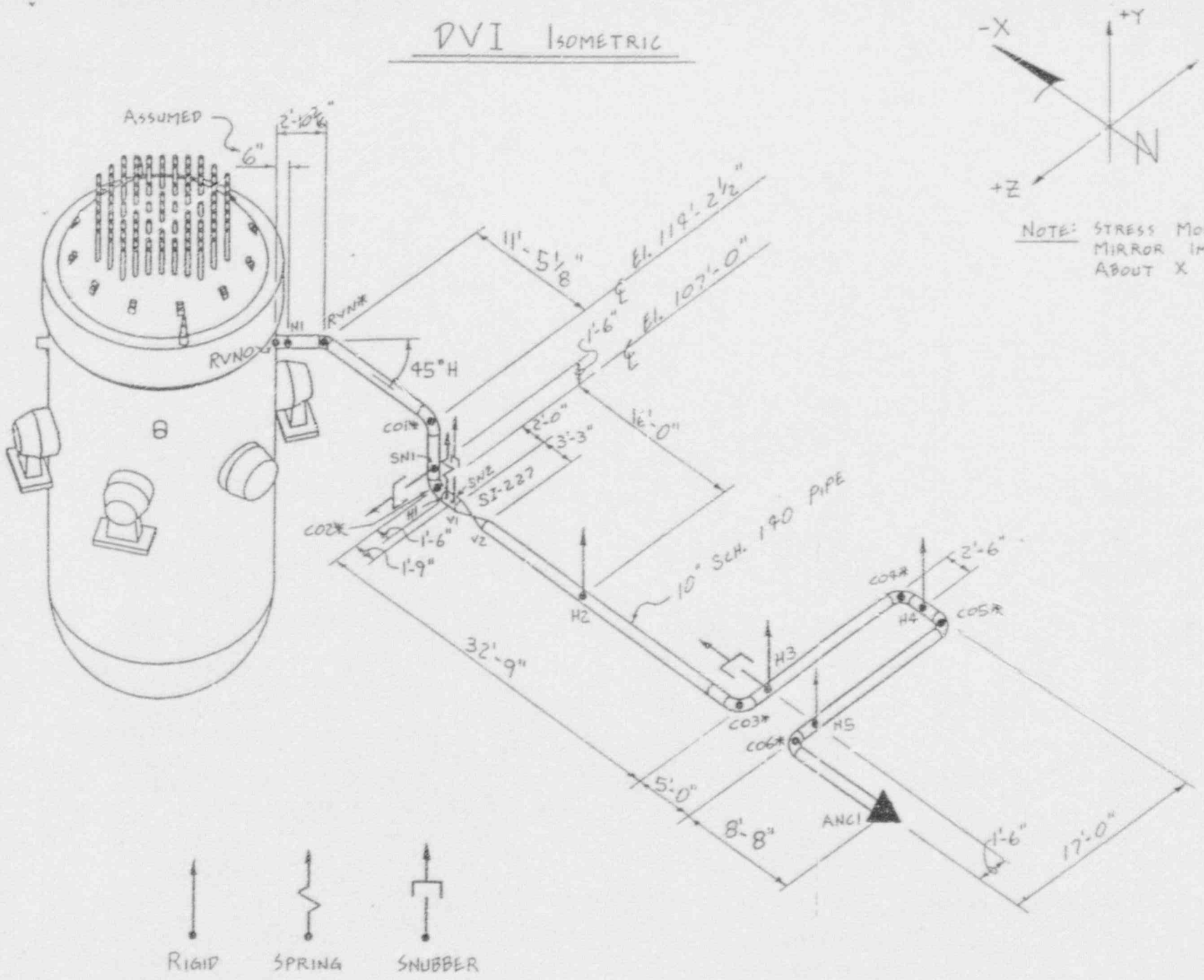
3. Gravity + Thermal (Normal Operation)

4. Seismic Inertia - SSE

5. Seismic Anchor Movement - SSE

6. Seismic Inertia + Seismic Anchor Movement

DVI ISOMETRIC



NOTE: STRESS MODEL IS MIRROR IMAGE ABOUT X AXIS.

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SUP NUB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	RVNO	5.54	1212.35	-5.66	336.90	52.56	3592.16
	2	N1	5.54	1199.30	-5.66	336.90	49.73	2989.25
	3L	RVNA	5.54	925.15	-5.66	336.90	39.26	1021.97
	3R	RVNA	5.54	-5.66	-925.15	336.90	1021.97	-39.26
	4L	RVNB	7.92	-0.08	-779.82	-172.31	207.37	-36.29
	4R	RVNB	7.92	779.82	-0.08	-172.31	36.29	207.37
	5		7.92	493.85	-0.08	-172.31	36.13	-1022.90
	6		7.92	207.88	-0.08	-172.31	35.98	-1700.72
	7		7.92	-78.10	-0.08	-172.31	35.83	-1826.08
	8		7.92	-364.07	-0.08	-172.31	35.67	-1398.98
	9	C01A	7.92	-650.04	-0.08	-172.31	35.52	-419.41
	10	C01B	940.70	7.92	-0.08	-35.42	-172.41	564.91
	11		1160.69	7.92	-0.08	-35.42	-172.52	553.14
	12		1380.67	7.92	-0.08	-35.42	-172.64	541.38
	13	SN1	1600.66	7.92	-0.08	-35.42	-172.76	529.61
	14L	C02A	1637.67	7.92	-0.08	-35.42	-172.78	527.63
	14R	C02A	1637.67	-7.92	0.08	-35.42	172.78	-527.63
	15L	C02B	7.92	1928.32	0.08	-172.88	-35.32	-2746.47
	15R	C02B	7.92	-1928.32	-0.08	-172.88	35.32	2746.47
	16L	H1	7.92	-1965.33	-0.08	-172.88	35.30	3233.18
	16R	H1	7.92	2363.98	-0.08	-172.88	35.30	3233.18
	17	SN2	7.92	2326.97	-0.08	-172.88	35.28	2646.81
	18L	V1	7.92	2289.96	-0.08	-172.88	35.26	2069.69
	18R	V1	7.92	1289.96	-0.08	-172.88	35.26	2069.69
	19		7.92	1247.55	-0.08	-172.88	35.13	7.96
	20L	V2	7.92	1205.14	-0.08	-172.88	35.00	-1984.85
	20R	V2	7.92	205.14	-0.08	-172.88	35.00	-1984.85
	21		7.92	-60.08	-0.08	-172.88	34.86	-2114.80
	22		7.92	-325.30	-0.08	-172.88	34.71	-1769.56
	23		7.92	-590.52	-0.08	-172.88	34.57	-949.14
	24		7.92	-855.74	-0.08	-172.88	34.43	346.46
	25		7.92	-1120.96	-0.08	-172.88	34.28	2117.25
	26L	H2	7.92	-1386.18	-0.08	-172.88	34.14	4363.23
	26R	H2	7.92	1487.73	-0.08	-172.88	34.14	4363.23
	27		7.92	1200.93	-0.08	-172.88	33.99	1758.60
	28		7.92	914.12	-0.08	-172.88	33.83	-290.35
	29		7.92	627.31	-0.08	-172.88	33.68	-1783.62
	30		7.92	340.51	-0.08	-172.88	33.52	-2721.20
	31		7.92	53.70	-0.08	-172.88	33.37	-3103.09
	32		7.92	-233.11	-0.08	-172.88	33.21	-2929.29

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	33		7.92	-519.91	-0.08	-172.88	33.06	-2199.80
	34L	C03A	7.92	-806.72	-0.08	-172.88	32.91	-914.61
	34R	C03A	7.92	0.08	-806.72	-172.88	914.61	32.91
	35L	C03B	-0.08	7.92	-1097.38	275.45	-1362.94	22.91
	35R	C03B	-0.08	-1097.38	-7.92	275.45	22.91	1362.94
	36L	H3	-0.08	-1134.38	-7.92	275.45	20.93	1641.91
	36R	H3	-0.08	1263.91	-7.92	275.45	20.93	1641.91
	37		-0.08	1000.24	-7.92	275.45	6.82	-374.58
	38		-0.08	736.56	-7.92	275.45	-7.28	-1921.42
	39		-0.08	472.88	-7.92	275.45	-21.38	-2998.58
	40		-0.08	209.21	-7.92	275.45	-35.49	-3606.07
	41		-0.08	-54.47	-7.92	275.45	-49.59	-3743.88
	42		-0.08	-318.15	-7.92	275.45	-63.70	-3412.01
	43		-0.08	-581.83	-7.92	275.45	-77.80	-2610.47
	44L	C04A	-0.08	-845.51	-7.92	275.45	-91.91	-1339.25
	44R	C04A	-0.08	-7.92	845.51	275.45	-1339.25	91.91
	45L	C04B	7.92	-0.08	1136.16	100.71	1513.99	101.90
	45R	C04B	7.92	-1136.16	-0.08	100.71	-101.90	1513.99
	46L	H4	7.92	-1321.20	-0.08	100.71	-102.00	3049.84
	46R	H4	7.92	1327.04	-0.08	100.71	-102.00	3049.84
	47L	C05A	7.92	1142.00	-0.08	100.71	-102.10	1506.69
	47R	C05A	7.92	-0.08	-1142.00	100.71	1506.69	102.10
	48L	C05B	0.08	7.92	-851.34	-260.85	-1145.13	92.31
	48R	C05B	0.08	851.34	7.92	-260.85	-92.31	-1145.13
	49		0.08	587.67	7.92	-260.85	-78.20	-2426.75
	50		0.08	323.99	7.92	-260.85	-64.10	-3238.69
	51		0.08	60.31	7.92	-260.85	-49.99	-3580.97
	52		0.08	-203.36	7.92	-260.85	-35.89	-3453.56
	53		0.08	-467.04	7.92	-260.85	-21.78	-2856.49
	54		0.08	-730.72	7.92	-260.85	-7.68	-1789.73
	55		0.08	-994.39	7.92	-260.85	6.43	-253.30
	56L	H5	0.08	-1258.07	7.92	-260.85	20.53	1752.81
	56R	H5	0.08	736.50	7.92	-260.85	20.53	1752.81
	57L	C06A	0.08	699.50	7.92	-260.85	22.51	1573.31
	57R	C06A	0.08	-7.92	699.50	-260.85	-1573.31	22.51
	58L	C06B	7.92	0.08	408.84	880.60	431.86	32.31
	58R	C06B	7.92	408.84	-0.08	880.60	32.31	-431.86
	59		7.92	134.37	-0.08	880.60	32.16	-935.46
	60		7.92	-140.09	-0.08	880.60	32.01	-930.15

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

STATIC ANALYSIS NO. 1 (GRAV), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SUP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	61		7.52	-414.56	-0.08	880.60	31.86	-415.95
	62	ANC1	7.92	-689.03	-0.03	880.60	31.72	607.17

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 2$ (THMX), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP NUMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	RVNO	2880.10	809.50	-1968.85	8882.34	-3079.83	13024.57
	2	N1	2880.10	809.50	-1968.85	8882.34	-3545.55	12727.48
	3L	RVNA	2880.10	809.50	-1968.85	8882.34	-7192.33	11627.02
	3R	RVNA	2880.10	-1968.85	-809.50	8882.34	11627.02	7192.33
	4L	RVNB	3428.72	644.35	-809.50	-3440.64	339.7.11	7917.85
	4R	RVNB	3428.72	809.50	644.35	-3440.64	-7917.85	13082.54
	5		3428.72	809.50	644.35	-3440.64	-6600.92	12008.11
	6		3428.72	809.50	644.35	-3440.64	-5283.98	10933.68
	7		3428.72	809.50	644.35	-3440.64	-3967.05	9859.25
	8		3428.72	809.50	644.35	-3440.64	-2650.11	10094.63
	9	C0.\	3428.72	809.50	644.35	-3440.64	-1801.27	11602.02
	10L	C01B	-809.50	3428.72	644.35	1361.13	-2588.53	8043.11
	10R	C01B	-809.50	3428.72	644.35	1313.98	-2588.53	8043.11
	11		-809.50	3428.72	644.35	1313.98	-1575.47	2652.44
	12		-809.50	3428.72	644.35	1313.98	-562.41	-2738.23
	13	SN1	-809.50	3428.72	644.35	1313.98	450.65	-8128.91
	14L	C02A	-809.50	3428.72	644.35	1313.98	621.07	-9035.76
	14R	C02A	-809.50	-3428.72	-644.35	1313.98	-621.07	9035.76
	15L	C02B	3428.72	-809.50	-644.35	1473.19	889.10	12594.67
	15R	C02B	3428.72	809.50	644.35	1473.19	-889.10	-12594.67
	16	H1	3428.72	809.50	644.35	1473.19	-804.12	-12399.60
	17	SN2	3428.72	809.50	644.35	1473.19	-719.14	-12204.53
	18	V1	3428.72	809.50	644.35	1473.19	882.32	-12009.46
	19		3428.72	809.50	644.35	1473.19	1990.07	-10741.52
	20	V2	3428.72	809.50	644.35	1473.19	3097.82	-9473.59
	21		3428.72	809.50	644.35	1473.19	4319.17	-8075.61
	22		3428.72	809.50	644.35	1473.19	5540.53	-8000.09
	23		3428.72	809.50	644.35	1473.19	6761.90	-9962.02
	24		3428.72	809.50	644.35	1473.19	7983.26	-10923.95
	25		3428.72	809.50	644.35	1473.19	9204.62	-11885.89
	26L	H2	3428.72	809.50	644.35	1473.19	10425.99	-12847.82
	26R	H2	3428.72	-799.85	644.35	1473.19	10425.99	-12847.82
	27		3428.72	-799.85	644.35	1473.19	11746.76	-11281.51
	28		3428.72	-799.85	644.35	1473.19	13067.53	-9715.20
	29		3428.72	-799.85	644.35	1473.19	14388.31	-8148.87
	30		3428.72	-799.85	644.35	1473.19	15709.08	-6582.56
	31		3428.72	-799.85	644.35	1473.19	17029.86	-5016.24
	32		3428.72	-799.85	644.35	1473.19	18350.63	-3449.92

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 3'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 20 (THMX), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	33		3428.72	-799.85	644.35	1473.19	19671.41	-1883.60
	34L	C03A	3428.72	-799.85	644.35	1473.19	20992.20	-317.27
	34R	C03A	3428.72	-644.35	-799.85	1473.19	317.28	20992.20
	35L	C03B	644.36	3428.72	-799.85	693.25	1395.36	17310.06
	35R	C03B	644.35	-799.85	-3428.72	693.25	17310.06	-1395.36
	36L	H3	644.35	-799.85	-3428.72	693.25	16403.21	-1379.80
	36R	H3	644.35	-90.31	-3428.72	693.25	16403.21	-1379.80
	37		644.35	-90.31	-3428.72	693.25	9941.96	-1209.62
	38		644.35	-90.31	-3428.72	693.25	3480.67	-1039.44
	39		644.35	-90.31	-3428.72	693.25	-2980.63	-869.25
	40		644.35	-90.31	-3428.72	693.25	-9441.93	-699.07
	41		644.35	-90.31	-3428.72	693.25	-15903.23	-528.89
	42		644.35	-90.31	-3428.72	693.25	-22364.52	-358.70
	43		644.35	-90.31	-3428.72	693.25	-28825.81	-210.81
	44L	C04A	644.35	-90.31	-3428.72	693.25	-35287.17	-286.57
	44R	C04A	644.36	-3428.72	90.31	693.25	-286.57	35287.17
	45L	C04B	3428.72	644.35	90.31	341.31	640.08	38969.30
	45R	C04B	3428.72	-90.31	644.35	341.31	-38969.30	640.08
	46L	H4	3428.72	-90.31	644.35	341.31	-38117.19	586.92
	46R	H4	3428.72	29.35	644.35	341.31	-38117.19	586.92
	47L	C05A	3428.72	29.35	644.35	341.31	-37265.08	549.84
	47R	C05A	3428.72	644.36	-29.35	341.31	549.84	37265.08
	48L	C05B	-644.35	3428.72	-29.35	-512.76	305.75	31878.71
	48R	C05B	-644.35	29.35	3428.72	-512.76	-31878.71	305.75
	49		-644.35	29.35	3428.72	-512.76	-25417.42	255.08
	50		-644.35	29.35	3428.72	-512.76	-18956.16	204.40
	51		-644.35	29.35	3428.72	-512.76	-12494.87	153.73
	52		-644.35	29.35	3428.72	-512.76	-6033.57	103.06
	53		-644.35	29.35	3428.72	-512.76	1045.58	52.38
	54		-644.35	29.35	3428.72	-512.76	6889.02	-31.62
	55		-644.35	29.35	3428.72	-512.76	13350.32	-82.21
	56L	H5	-644.35	29.35	3428.72	-512.76	19811.67	-132.04
	56R	H5	-644.35	71.58	3428.72	-512.76	19811.67	-132.04
	57L	C06A	-644.35	71.58	3428.72	-512.76	20713.52	-128.13
	57R	C06A	-644.35	-3428.72	71.58	-512.76	138.13	20713.52
	58L	C06B	3428.72	-644.36	71.58	-228.57	-422.32	26104.86
	58R	C06B	3428.72	71.58	644.35	-228.57	26104.86	422.32

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 2[illegible] (THMX), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	59		3428.72	71.58	644.35	-228.57	27368.80	288.18
	60		3428.72	71.58	644.35	-228.57	28632.75	134.03
	61		3428.72	71.58	644.35	-228.57	29896.69	22.21
	62	ANC1	3428.72	71.58	644.35	-228.57	31160.67	-114.26

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 2 (THMP), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	RVN0	2880.10	809.50	125.67	8882.34	0.00	13024.57
	2	N1	2880.10	809.50	125.67	8882.34	0.00	12727.48
	3L	RVNA	2880.10	809.50	125.67	8882.34	0.00	11627.02
	3R	RVNA	2880.10	125.67	737.54	8882.34	1162..02	7192.33
	4L	RVNB	3428.72	644.35	737.54	108.58	13977.11	7917.85
	4R	RVNB	3428.72	809.50	644.35	108.57	0.00	13082.54
	5		3428.72	809.50	644.35	108.57	0.00	12008.11
	6		3428.72	809.50	644.35	108.57	0.00	10933.68
	7		3428.72	809.50	644.35	108.57	0.00	9859.25
	8		3428.72	809.50	644.35	108.57	0.00	10094.63
	9	C01A	3428.72	809.50	644.35	108.57	0.00	11602.02
	10L	C01B	737.54	3428.72	644.35	1361.13	109.73	8043.11
	10R	C01B	737.54	3428.72	644.35	1313.98	109.73	8043.11
	11		737.54	3428.72	644.35	1313.98	111.10	2652.44
	12		737.54	3428.72	644.35	1313.98	112.47	1635.46
	13	SN1	737.54	3428.72	644.35	1313.98	450.65	1896.34
	14L	C02A	737.54	3428.72	644.35	1313.98	621.07	1940.23
	14R	C02A	737.54	176.80	0.00	1313.98	0.00	9035.76
	15L	C02B	3428.72	737.53	0.00	1473.19	889.10	12594.67
	15R	C02B	3428.72	809.50	644.35	1473.19	371.05	1154.95
	16	H1	3428.72	809.50	644.35	1473.19	541.48	954.00
	17	SN2	3428.72	809.50	644.35	1473.19	711.90	753.06
	18	V1	3428.72	809.50	644.35	1473.19	882.32	552.11
	19		3428.72	809.50	644.35	1473.19	1990.07	0.00
	20	V2	3428.72	809.50	644.35	1473.19	3097.82	0.00
	21		3428.72	809.50	644.35	1473.19	4319.17	0.00
	22		3428.72	809.50	644.35	1473.19	5540.53	0.00
	23		3428.72	809.50	644.35	1473.19	6761.90	0.00
	24		3428.72	809.50	644.35	1473.19	7983.26	0.00
	25		3428.72	809.50	644.35	1473.19	9204.62	0.00
	26L	H2	3428.72	809.50	644.35	1473.19	10425.99	0.00
	26R	H2	3428.72	0.00	644.35	1473.19	10425.99	0.00
	27		3428.72	0.00	644.35	1473.19	11746.76	0.00
	28		3428.72	0.00	644.35	1473.19	13067.53	0.00
	29		3428.72	0.00	644.35	1473.19	14388.31	0.00
	30		3428.72	0.00	644.35	1473.19	15709.08	0.00
	31		3428.72	0.00	644.35	1473.19	17029.86	0.00
	32		3428.72	0.00	644.35	1473.19	18350.63	0.00

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 2 (THMP), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SUP NUB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	33		3428.72	0.00	644.35	1473.19	19671.41	0.00
	34L	C03A	3428.72	0.00	644.35	1473.19	20992.20	0.00
	34R	C03A	3428.72	0.00	0.00	1473.19	317.28	20992.20
	35L	C03B	644.36	3428.72	0.00	693.25	1395.36	17310.06
	[illegible]	C03B	644.35	0.00	176.80	693.25	17310.06	729.84
	36[illegible]	H3	644.35	0.00	176.80	693.25	16403.21	898.85
	36[illegible]	H3	644.35	80.58	176.80	693.25	16403.21	898.85
	37		644.35	80.58	176.80	693.25	9941.96	756.33
	38		644.35	80.58	176.80	693.25	3480.67	613.81
	39		644.35	80.58	176.80	693.25	514.73	471.30
	40		644.35	80.58	176.80	693.25	827.43	328.78
	41		644.35	80.58	176.80	693.25	1140.13	186.25
	42		644.35	80.58	176.80	693.25	1452.83	43.74
	43		644.35	80.58	176.80	693.25	1765.53	0.00
	44L	C04A	644.35	80.58	176.80	693.25	2078.23	0.00
	44R	C04A	644.36	176.80	90.31	693.25	0.00	35287.17
	45L	C04B	3428.72	644.35	90.31	341.31	640.08	38969.30
	45R	C04B	3428.72	80.58	644.35	341.31	2298.83	640.08
	46L	H4	3428.72	80.58	644.35	341.31	2299.98	586.92
	46R	H4	3428.72	29.35	644.35	341.31	2299.98	586.92
	47L	C05A	3428.72	29.35	644.35	341.31	2301.13	549.84
	47R	C05A	3428.72	644.36	5.50	341.31	549.84	37265.08
	48L	C05B	0.00	3428.72	5.50	0.00	305.75	31878.71
	48R	C05B	0.00	29.35	3428.72	0.00	2082.85	305.75
	49		0.00	29.35	3428.72	0.00	1770.15	255.08
	50		0.00	29.35	3428.72	0.00	1457.45	204.40
	51		0.00	29.35	3428.72	0.00	1144.75	153.73
	52		0.00	29.35	3428.72	0.00	832.05	103.06
	53		0.00	29.35	3428.72	0.00	1045.58	52.38
	54		0.00	29.35	3426.72	0.00	6889.02	1.71
	55		0.00	29.35	3428.72	0.00	13350.32	0.00
	56L	H5	0.00	29.35	3428.72	0.00	19811.67	0.00
	56R	H5	0.00	71.58	3428.72	0.00	19811.67	0.00
	57L	C06A	0.00	71.58	3428.72	0.00	20718.52	0.00
	57R	C06A	0.00	176.80	71.58	0.00	138.13	20718.52
	58L	C06B	3428.72	0.00	71.58	0.00	0.00	26104.86
	58R	C06B	3428.72	71.58	644.35	0.00	26104.86	422.32

DVI ANALISIS FOR DESI **
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LOAD CASE NO. 2 (THMP), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	59		3428.72	71.58	644.35	0.00	27368.80	288.18
	60		3428.72	71.58	644.35	0.00	28632.75	154.03
	61		3428.72	71.58	644.35	0.00	29396.69	22.21
	62	ANC1	3428.72	71.58	644.35	0.00	31160.67	0.00

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** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 2 (THMN), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SUP NUMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	RVNO	-124.36	-737.54	-1968.85	0.00	-3079.83	0.00
	2	N1	-124.36	-737.54	-1968.85	0.00	-3545.55	0.00
	3L	RVNA	-124.36	-737.54	-1968.85	0.00	-7192.33	0.00
	3R	RVNA	-124.36	-1968.85	-809.50	0.00	0.00	0.00
	4L	RVNB	-176.80	0.00	-809.50	-3440.64	0.00	0.00
	4R	RVNB	-176.80	-737.54	0.00	-3440.64	-7917.85	0.00
	5		-176.80	-737.54	0.00	-3440.64	-6600.92	0.00
	6		-176.80	-737.54	0.00	-3440.64	-5283.98	0.00
	7		-176.80	-737.54	0.00	-3440.64	-3967.05	0.00
	8		-176.80	-737.54	0.00	-3440.64	-2650.11	0.00
	9	C01A	-176.80	-737.54	0.00	-3440.64	-1801.27	0.00
	10	C01B	-809.50	-176.80	0.00	0.00	-2588.53	0.00
	11		-809.50	-176.80	0.00	0.00	-1575.47	0.00
	12		-809.50	-176.80	0.00	0.00	562.41	-2738.23
	13	SN1	-809.50	-176.80	0.00	0.00	0.00	-8128.91
	14L	C02A	-809.50	-176.80	0.00	0.00	0.00	-9035.76
	14R	C02A	-809.50	-3428.72	-644.35	0.00	-621.07	-1940.23
	15L	C02B	-176.80	-809.50	-644.35	0.00	-371.06	-1154.95
	15R	C02B	-176.80	-737.54	0.00	0.00	-889.10	-12594.67
	16	H1	-176.80	-737.54	0.00	0.00	-804.12	-12399.60
	17	SN2	-176.80	-737.54	0.00	0.00	-719.14	-12204.53
	18	V1	-176.80	-737.54	0.00	0.00	-715.06	-12009.46
	19		-176.80	-737.54	0.00	0.00	-713.56	-10741.52
	20	V2	-176.80	-737.54	0.00	0.00	-712.06	-9473.59
	21		-176.80	-737.54	0.00	0.00	-710.41	-8075.61
	22		-176.80	-737.54	0.00	0.00	-708.76	-9000.09
	23		-176.80	-737.54	0.00	0.00	-707.10	-9962.02
	24		-176.80	-737.54	0.00	0.00	-705.45	-10923.95
	25		-176.80	-737.54	0.00	0.00	-703.80	-11885.89
	26L	H2	-176.80	-737.54	0.00	0.00	-702.15	-12847.82
	26R	H2	-176.80	-799.85	0.00	0.00	-702.15	-12847.82
	27		-176.80	-799.85	0.00	0.00	-700.36	-11281.51
	28		-176.80	-799.85	0.00	0.00	-698.57	-9715.20
	29		-176.80	-799.85	0.00	0.00	-696.78	-8148.87
	30		-176.80	-799.85	0.00	0.00	-695.00	-6582.56
	31		-176.80	-799.85	0.00	0.00	-693.21	-5016.24
	32		-176.80	-799.85	0.00	0.00	-691.42	-3449.92
	33		-176.80	-799.85	0.00	0.00	-689.64	-1883.60

DVI ANALISIS FOR DESI **
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LOAD CASE NO. 2 (THMN), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	34L	C03A	-176.80	-799.85	0.00	0.00	-687.85	-317.27
	34R	C03A	-176.80	-644.35	-799.85	0.00	0.00	-687.85
	35L	C03B	0.00	-176.80	-799.85	-42.86	-729.85	-467.26
	35R	C03B	0.00	-799.85	-3428.72	-42.86	-467.26	-1595.36
	36L	H3	0.00	-799.85	-3428.72	-42.86	423.37	-1379.80
	36R	H3	0.00	-90.31	-3428.72	-42.86	-423.37	-1379.80
	37		0.00	-90.31	-3428.72	-42.86	-110.67	-1209.62
	38		0.00	-90.31	-3428.72	-42.86	0.00	-1039.44
	39		0.00	-90.31	-3428.72	-42.86	-2980.63	-869.25
	40		0.00	-90.31	-3428.72	-42.86	-9441.93	-699.07
	41		0.00	-90.31	-3428.72	-42.86	-15903.23	-528.89
	42		0.00	-90.31	-3428.72	-42.86	-22364.52	-358.70
	43		0.00	-90.31	-3428.72	-42.86	-28825.81	-210.81
	44L	C04A	0.00	-90.31	-3428.72	-42.86	-35287.17	-286.57
	44R	C04A	0.00	-3428.72	-80.58	-42.86	-286.57	-2078.23
	45L	C04B	-176.80	0.00	-80.58	-101.09	0.00	-2298.83
	45R	C04B	-176.80	-90.31	0.00	-101.09	-38969.30	0.00
	46L	H4	-176.80	-90.31	0.00	-101.09	-38117.19	0.00
	46R	H4	-176.80	-5.50	0.00	-101.09	-38117.19	0.00
	47L	C05A	-176.80	-5.50	0.00	-101.09	-37265.08	0.00
	47R	C05A	-176.80	0.00	-29.35	-101.09	0.00	-2301.13
	48L	C05B	-644.35	-176.80	-29.35	-512.76	-93.82	-2082.85
	48R	C05B	-644.35	-5.50	-176.80	-512.76	-31878.71	-93.82
	49		-644.35	-5.50	-176.80	-512.76	-25417.42	-83.45
	50		-644.35	-5.50	-176.80	-512.76	-18956.16	-73.08
	51		-644.35	-5.50	-176.80	-512.76	-12494.87	-62.72
	52		-644.35	-5.50	-176.80	-512.76	-6033.57	-52.35
	53		-644.35	-5.50	-176.80	-512.76	0.00	-41.99
	54		-644.35	-5.50	-176.80	-512.76	0.00	-31.62
	55		-644.35	-5.50	-176.80	-512.76	-106.06	-67.21
	56L	H5	-644.35	-5.50	-176.80	-512.76	-418.76	-120.04
	56R	H5	-644.35	0.00	-176.80	-512.76	-418.76	-120.04
	57L	C06A	-644.35	0.00	-176.80	-512.76	-462.65	-138.13
	57R	C06A	-644.35	-3428.72	0.00	-512.76	0.00	-462.65
	58L	C06B	-176.80	-644.36	0.00	-228.57	-422.32	-680.93
	58R	C06B	-176.80	0.00	0.00	-228.57	-680.93	0.00
	59		-176.80	0.00	0.00	-228.57	-679.22	0.00

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LOAD CASE NO. 2 (THMN), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	60		-176.80	0.00	0.00	-228.57	-677.51	0.00
	61		-176.80	0.00	0.00	-228.57	-675.80	-10.90
	62	ANC1	-176.80	0.00	0.00	-228.57	-674.09	-114.26

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	RVNO	2885.64	2021.86	-1974.50	9219.24	-3027.27	16616.73
	2	N1	2885.64	2008.81	-1974.50	9219.24	-3495.82	15716.72
	3L	RVNA	2885.64	1734.65	-1974.50	9219.24	-7153.07	12648.98
	3R	RVNA	2885.64	-1974.50	-1734.65	9219.24	12648.99	7153.07
	4L	RVNB	3436.64	644.27	-1589.32	-3612.95	14184.48	7881.56
	4R	RVNB	3436.64	1589.32	644.27	-3612.95	-7881.56	13289.90
	5		3436.64	1303.35	644.27	-3612.95	-6564.78	10985.21
	6		3436.64	1017.38	644.27	-3612.95	-5248.00	9232.96
	7		3436.64	-815.63	644.27	-3612.95	-3931.22	8033.18
	8		3436.64	-1101.61	644.27	-3612.95	-2614.44	8695.66
	9	C01A	3436.64	-1387.58	644.27	-3612.95	-1765.75	11182.61
	10L	C01B	1678.24	3436.64	644.27	1325.72	-2760.93	8608.02
	10R	C01B	1678.23	3436.64	644.27	1278.56	-2760.93	8608.02
	11		1898.22	3436.64	644.27	1278.56	-1747.99	3205.58
	12		2118.21	3436.64	644.27	1278.56	-735.05	-2196.86
	13	SN1	2138.19	3436.64	644.27	1278.56	277.89	-7599.30
	14L	C02A	2 75.20	3436.64	644.27	1278.56	448.29	-8508.13
	14R	C02A	2 75.20	-3436.64	-644.27	1278.56	-448.29	8508.13
	15L	C02B	3436.64	2665.85	-644.27	1300.31	853.78	9848.20
	15R	C02B	3436.64	-2665.86	644.27	1300.31	-853.78	-9848.20
	16L	H1	3436.64	-2702.86	644.27	1300.31	-768.82	-9166.42
	16R	H1	3436.64	3173.48	644.27	1300.31	-768.82	-9166.42
	17	SN2	3436.64	3136.47	644.27	1300.31	747.18	-9557.72
	18L	V1	3436.64	3099.46	644.27	1300.31	917.58	-9939.77
	18R	V1	3436.64	2099.46	644.27	1300.31	917.58	-9939.77
	19		3436.64	2057.05	644.27	1300.30	2025.20	-10733.56
	20L	V2	3436.64	2014.64	644.27	1300.31	3132.82	-11458.43
	20R	V2	3436.64	1014.64	644.27	1300.31	3132.82	-11458.43
	21		3436.64	-797.61	644.27	1300.30	4354.03	-10190.40
	22		3436.64	-1062.83	644.27	1300.30	5675.25	-10769.65
	23		3436.64	-1328.05	644.27	1300.30	6796.47	-10911.16
	24		3436.64	-1593.27	644.27	1300.30	8017.69	-10577.49
	25		3436.64	-1858.49	644.27	1300.30	9238.91	-9768.64
	26L	H2	3436.64	-2123.71	644.27	1300.31	10460.13	-8484.59
	26R	H2	3436.64	1487.73	644.27	1300.31	10460.13	-8484.59
	27		3436.64	1200.93	644.27	1300.30	11780.74	-9522.91
	28		3436.64	914.12	644.27	1300.30	13101.37	-10005.54
	29		3436.64	627.31	644.27	1300.30	14421.98	-9932.50

DVI ANALISIS FOR DESI **
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LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SUP NUB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	30		3436.64	-459.35	644.27	1300.30	15742.61	-9303.75
	31		3436.64	-746.15	644.27	1300.30	17063.23	-8119.32
	32		3436.64	-1032.96	644.27	1300.30	18383.85	-6379.21
	33		3436.64	-1319.77	644.27	1300.30	19704.47	-4083.40
	34L	C03A	3436.64	-1606.57	644.27	1300.31	21025.10	-1231.89
	34R	C03A	3436.64	-644.27	-1606.57	1300.30	1231.89	21025.10
	35L	C03B	644.28	3436.64	-1897.23	968.70	-2092.78	17332.97
	35R	C03B	644.27	-1897.23	-3436.64	968.70	17332.97	2092.78
	36L	H3	644.27	-1934.54	-3436.64	968.70	16424.14	2540.76
	36R	H3	644.27	1344.49	-3436.64	968.70	16424.14	2540.76
	37		644.27	1080.82	-3436.64	968.70	9948.79	-1584.20
	38		644.27	817.14	-3436.64	968.70	3473.39	-2960.85
	39		644.27	553.46	-3436.64	968.70	-3002.02	-3867.63
	40		644.27	289.79	-3436.64	968.70	-9477.42	-4305.13
	41		644.27	-144.78	-3436.64	968.70	-15952.82	-4272.76
	42		644.27	-408.46	-3436.64	968.70	-22428.20	-3770.71
	43		644.27	-672.13	-3436.64	968.70	-28903.61	-2821.28
	44L	C04A	644.27	-935.81	-3436.64	968.70	-35379.07	-1625.82
	44R	C04A	644.28	-3436.64	935.81	968.70	-1625.82	35379.07
	45L	C04B	3436.64	644.27	1226.47	442.02	2154.07	39071.19
	45R	C04B	3436.64	-1226.47	644.27	442.02	-39071.19	2154.07
	46L	H4	3436.64	-1417.50	644.27	442.02	-38219.18	3636.75
	46R	H4	3436.64	1356.38	644.27	442.02	-38219.18	3636.75
	47L	C05A	3436.64	1171.35	644.27	442.02	-37367.17	2056.52
	47R	C05A	3436.64	644.28	-1171.35	442.02	2056.52	37367.17
	48L	C05B	-644.27	3436.64	-880.69	-773.61	-1238.95	31971.01
	48R	C05B	-644.27	880.69	3436.64	-773.61	-31971.01	-1238.95
	49		-644.27	617.02	3436.64	-773.61	-25495.61	-2510.19
	50		-644.27	353.34	3436.64	-773.61	-19020.26	-3311.78
	51		-644.27	89.56	3436.64	-773.61	-12544.86	-3643.68
	52		-644.27	-208.86	3436.64	-773.61	-6069.46	-3505.91
	53		-644.27	-472.54	3436.64	-773.61	1025.80	-2898.47
	54		-644.27	-736.22	3436.64	-773.61	6881.34	-1821.35
	55		-644.27	-999.90	3436.64	-773.61	13356.75	-320.51
	56L	H5	-644.27	-1263.57	3436.64	-773.61	19832.20	1752.81
	56R	H5	-644.27	808.09	3436.64	-773.61	19832.20	1752.81
	57L	C06A	-644.27	771.08	3436.64	-773.61	20771.02	1573.31

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 3 (NORM), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MEB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	57R	C06A	-644.27	-3436.64	771.08	-773.60	-1573.31	20741.02
	58L	C06B	3436.64	-644.28	480.42	880.60	431.86	26137.15
	58R	C06B	3436.64	480.42	644.27	880.60	26137.15	-431.86
	59		3436.64	205.95	644.27	880.60	27400.94	-935.46
	60		3436.64	-140.09	644.27	880.60	28664.76	-930.16
	61		3436.64	-414.56	644.27	880.60	29928.55	-426.85
	62	ANC1	3436.64	-689.03	644.27	880.60	31192.36	607.17

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

4
LOAD CASE NO. [illegible] (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	RVN0	9473.87	5551.01	9359.57	12474.87	30836.29	25838.46
	2	N1	9473.87	5551.01	9359.57	12474.87	27064.13	23162.21
	3L	RVNA	9473.87	5551.01	9359.57	12474.87	17467.59	13600.41
	3R	RVNA	9473.87	9359.56	5551.01	12474.87	13600.41	17467.59
	4L	RVNB	13158.86	2043.99	5551.01	8297.20	11758.27	16091.86
	4R	RVNB	13158.87	5551.01	2044.00	8297.20	16091.86	11758.27
	5		13158.86	5551.01	2043.99	8297.20	12245.34	3755.31
	6		13158.86	5551.01	2043.99	8297.20	8492.98	11336.90
	7		13158.86	5551.01	2043.99	8297.20	5048.52	21630.03
	8		13158.86	5551.01	2043.99	8297.20	3164.68	32204.45
	9L	C01A	13158.87	5551.01	2044.00	8297.20	5078.76	42853.44
	9R	C01A	13158.87	5551.00	2044.00	8297.20	5078.75	42853.44
	10L	C01B	5551.02	13158.86	2044.00	7253.04	5755.80	33323.00
	10R	C01B	5551.01	13158.87	2044.00	7253.04	5755.80	33323.00
	11		5551.01	13158.86	2043.99	7253.04	2767.01	13812.68
	12		5551.01	13158.86	2043.99	7253.04	794.65	5999.89
	13L	SN1	5551.01	13158.87	2044.00	7253.04	3475.08	25417.09
	13R	SN1	5551.01	13158.87	507.14	7253.04	3475.08	25417.09
	14L	C02A	5551.01	13158.87	507.14	7253.04	3408.98	28701.99
	14R	C02A	5551.02	13158.86	507.14	7253.04	3408.98	28701.99
	15L	C02B	13158.87	5551.00	507.14	3135.25	6797.40	38280.28
	15R	C02B	13158.87	5551.01	507.14	3135.25	6797.39	38280.28
	16	N1	13158.87	5551.01	507.14	3135.25	6709.75	36912.82
	17L	SN2	13158.87	5551.01	507.14	3135.25	6623.38	35546.51
	17R	SN2	13158.87	3012.32	507.14	3135.25	6623.38	35546.51
	18	V1	13158.87	3012.32	507.14	3135.25	6538.33	34793.44
	19		13158.86	3012.32	507.14	3135.25	6021.55	29898.44
	20	V2	13158.87	3012.32	507.14	3135.25	5579.48	25003.44
	21		13158.86	3012.32	507.14	3135.25	5201.55	19606.45
	22		13158.86	3012.32	507.14	3135.25	4963.76	14209.46
	23		13158.86	3012.32	507.14	3135.25	4886.36	8812.62
	24		13158.86	3012.32	507.14	3135.25	4976.38	3416.54
	25		13158.86	3012.32	507.14	3135.25	5224.79	1984.99
	26L	H2	13158.87	3012.32	507.14	3135.25	5610.46	7380.04
	26R	H2	13158.87	467.32	507.14	3135.25	5610.46	7380.04
	27		13158.86	467.32	507.14	3135.25	6152.06	6475.04
	28		13158.86	467.32	507.14	3135.25	6792.99	5570.18
	29		13158.86	467.32	507.14	3135.25	7507.99	4665.55

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

A

LOAD CASE NO. 8 (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	30		13158.86	467.32	507.14	3135.25	8277.97	3761.31
	31		13158.86	467.32	507.14	3135.25	9089.00	2857.82
	32		13158.86	467.32	507.14	3135.25	9931.07	1956.14
	33		13158.86	467.32	507.14	3135.25	10796.91	1060.88
	34L	C03A	13158.87	467.32	507.14	3135.25	11681.26	252.79
	34R	C03A	13158.87	507.14	467.32	3135.25	252.79	11681.26
	35L	C03B	507.15	13158.86	467.32	499.40	3228.00	4191.35
	35R	C03B	507.14	467.32	13158.87	499.40	4191.35	3228.00
	36L	H3	507.14	467.32	13158.87	499.40	7480.24	3258.87
	36R	H3	507.14	232.84	503.62	499.40	7480.24	3258.87
	37		507.14	232.84	503.62	499.40	6585.97	2844.68
	38		507.14	232.84	503.62	499.40	5692.58	2430.67
	39		507.14	232.84	503.62	499.40	4800.55	2016.96
	40		507.14	232.84	503.62	499.40	3910.85	1603.79
	41		507.14	232.84	503.62	499.40	3025.51	1191.70
	42		507.14	232.84	503.62	499.40	2149.90	782.42
	43		507.14	232.84	503.62	499.40	1303.80	385.02
	44L	C04A	507.14	232.84	503.62	499.40	621.56	137.92
	44R	C04A	507.14	503.6	232.84	499.40	167.92	621.56
	45L	C04B	503.62	507.14	232.84	386.62	361.18	931.64
	45R	C04B	503.62	232.84	507.14	386.62	931.64	361.18
	46L	H4	503.62	232.84	507.14	386.62	1453.47	425.71
	46R	H4	503.62	27.99	507.14	386.62	1453.47	425.71
	47L	C05A	503.62	27.99	507.14	386.62	2039.85	428.54
	47R	C05A	503.62	507.14	27.99	386.62	428.54	2039.85
	48L	C05B	507.14	503.62	27.99	434.17	351.92	2046.84
	48R	C05B	507.14	27.99	503.62	434.17	2046.84	351.92
	49		507.14	27.99	503.62	434.17	1238.97	302.58
	50		507.14	27.99	503.62	434.17	698.95	253.45
	51		507.14	27.99	503.62	434.17	1026.60	204.66
	52		507.14	27.99	503.62	434.17	1796.96	154.56
	53		507.14	27.99	503.62	434.17	2648.23	110.02
	54		507.14	27.99	503.62	434.17	3522.29	68.34
	55		507.14	27.99	503.62	434.17	4405.61	47.03
	56L	H5	507.14	27.99	503.62	434.17	5293.56	68.65
	56R	H5	507.14	66.20	503.62	434.17	5293.56	68.65
	57L	C06A	507.14	66.20	503.62	434.17	5418.43	77.79

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

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LOAD CASE NO. [redacted] (SSST), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	57R	C06A	507.14	503.62	66.20	434.17	77.79	5418.43
	58L	C06B	503.62	507.14	66.20	144.81	351.63	5541.99
	58R	C06B	503.62	66.20	507.14	144.81	5541.99	351.63
	59		503.62	66.20	507.14	144.81	4855.55	229.48
	60		503.62	66.20	507.14	144.81	4266.70	108.68
	61		503.62	66.20	507.14	144.81	3820.50	33.08
	62	ANC1	503.62	66.20	507.14	144.81	3570.61	143.19

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 5 (SSTI), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	RVNO	6470.34	3190.72	3803.59	9533.27	19278.79	10738.13
	2L	N1	6470.34	3190.72	3803.59	9533.27	17839.19	9431.60
	2R	N1	6390.04	3001.39	3686.26	9533.27	17839.19	9431.60
	3L	RVNA	6390.04	3001.39	3686.26	9533.27	13540.73	6076.87
	3R	RVNA	6282.93	3511.61	2730.18	9533.27	6076.87	13540.73
	4L	RVNB	5885.50	4135.91	2730.18	9904.99	3929.50	11175.97
	4R	RVNB	5600.52	2260.28	3983.41	9904.99	11175.97	3929.50
	5		5600.52	2260.28	3983.41	9904.99	12342.49	5290.43
	6		5600.52	2260.28	3983.41	9904.99	13509.00	6651.36
	7		5228.81	2170.46	3461.56	9904.99	17305.45	8975.50
	8		5228.81	2170.46	3461.56	9904.99	23731.86	12262.84
	9L	C01A	5228.81	2170.46	3461.56	9904.99	30158.27	15550.19
	9R	C01A	5057.18	3003.24	3502.20	9904.99	30158.27	15550.19
	10L	C01B	3003.24	5057.18	3502.20	34235.01	7645.61	12114.04
	10R	C01B	4145.87	4922.50	4151.04	34235.01	7645.61	12114.04
	11		4145.87	4922.50	4151.04	34234.99	10371.03	11499.36
	12		4145.87	4922.50	4151.04	34234.99	13096.44	10884.67
	13L	SN1	4145.87	4922.50	4151.04	34235.01	15821.86	10269.98
	13R	SN1	5055.51	4759.16	10811.25	34235.01	15821.86	10269.98
	14L	C02A	5055.51	4759.16	10811.25	34235.01	13213.41	11416.52
	14R	C02A	5494.89	4705.13	10772.28	34235.01	13213.41	11416.52
	15L	C02B	4705.13	5494.89	10772.28	3595.95	23699.83	14428.15
	15R	C02B	4690.91	5829.54	10602.79	3595.95	23699.83	14428.15
	16L	H1	4690.91	5829.54	10602.79	3595.95	21986.53	14268.68
	16R	H1	4690.23	5898.68	10559.79	3595.95	21986.53	14268.68
	17L	SN2	4690.23	5898.68	10559.79	3595.95	20474.35	14180.07
	17R	SN2	4690.31	5415.42	10511.50	3595.95	20474.35	14180.07
	18L	V1	4690.31	5415.42	10511.50	3595.95	19206.47	13416.68
	18R	V1	5012.69	3631.93	9096.49	3595.95	19206.47	13416.68
	19		5012.69	3631.92	9096.48	3595.94	22532.27	12424.73
	20L	V2	5012.69	3631.93	9096.49	3595.95	25858.09	11432.78
	20R	V2	6237.83	1233.48	5378.07	3595.95	25858.09	11432.78
	21		6237.83	1233.48	5378.07	3595.94	32319.34	10261.42
	22		6237.83	1233.48	5378.07	3595.94	38780.58	9090.05
	23		7149.04	2514.69	4053.26	3595.94	45241.87	7918.68
	24		7149.04	2514.69	4053.26	3595.94	47918.91	7731.35
	25		7149.04	2514.69	4053.26	3595.94	50595.95	7544.02
	26L	H2	7149.04	2514.69	4053.26	3595.95	53273.02	7356.68

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERN; ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 5 (SSTI), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP ###	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	26R	H2	8130.62	1896.86	4367.09	3595.95	53273.02	7356.68
	27		8130.62	1896.86	4367.09	3595.94	52614.65	6645.57
	28		8130.62	1896.86	4367.09	3595.94	51956.30	5934.47
	29		9144.77	767.31	5646.99	3595.94	51071.91	5669.73
	30		9144.77	767.31	5646.99	3595.94	49735.42	6297.71
	31		9144.77	767.31	5646.99	3595.94	48398.93	6925.71
	32		10189.33	1288.29	7053.98	3595.94	50330.08	5918.02
	33		10189.33	1288.29	7053.98	3595.94	53895.09	4092.50
	34L	C03A	10189.33	1288.29	7053.98	3595.95	57460.13	2266.97
	34R	C03A	10918.70	7104.98	1873.73	3595.95	2266.97	57460.13
	35L	C03B	7104.98	10918.70	1873.73	2295.29	4358.16	66289.44
	35R	C03B	7102.26	2108.64	11059.80	2295.29	66289.44	4358.16
	36L	H3	7102.26	2108.64	11059.80	2295.29	67410.87	4671.37
	36R	H3	7236.39	1410.83	6584.71	2295.29	67410.87	4671.37
	37		7236.38	1410.83	6584.71	2295.29	58042.12	5325.81
	38		7236.38	1410.83	6584.71	2295.29	48673.30	5980.26
	39		7977.30	459.23	5731.46	2295.29	40357.71	6489.77
	40		7977.30	459.23	5731.46	2295.29	34148.52	6709.39
	41		7977.30	459.23	5731.46	2295.29	27939.31	6929.00
	42		9215.19	1127.00	4657.50	2295.29	25324.97	5750.62
	43		9215.19	1127.00	4657.50	2295.29	24508.06	3873.24
	44L	C04A	9215.19	1127.01	4657.50	2295.29	23691.14	1995.86
	44R	C04A	10293.53	3515.04	1597.89	2295.29	1995.86	23691.14
	45L	C04B	3515.04	10293.53	1597.89	1229.39	2581.93	13160.17
	45R	C04B	3165.43	1811.21	10806.34	1229.39	13160.17	2581.93
	46L	H4	3165.43	1811.21	10806.34	1229.39	9533.99	4239.33
	46R	H4	3100.61	1989.09	11164.88	1229.39	9533.99	4239.33
	47L	C05A	3100.61	1989.09	11164.88	1229.39	19808.00	2379.99
	47R	C05A	3304.30	11579.15	1755.17	1229.39	2379.99	19808.00
	48L	C05B	11579.15	3304.30	1755.17	2242.81	2011.84	30459.23
	48R	C05B	12462.29	1270.52	4420.68	2242.81	30459.23	2011.84
	49		12462.29	1270.52	4420.68	2242.81	26672.53	3967.52
	50		12462.29	1270.52	4420.68	2242.81	22885.84	5923.20
	51		13898.17	380.01	5626.25	2242.81	21648.79	7029.20
	52		13898.17	380.01	5626.25	2242.81	25510.93	6435.85
	53		13898.17	380.01	5626.25	2242.81	29373.07	5842.51
	54		15497.18	1619.75	6426.71	2242.81	36947.55	4862.46

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

5
LOAD CASE NO. 8 (SSTI), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MNB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	55		15497.18	1619.75	6426.71	2242.81	46378.18	3689.07
	56L	H5	15497.18	1619.75	6426.72	2242.81	55808.84	2515.68
	56R	H5	16387.31	1297.59	6538.48	2242.81	55808.84	2515.68
	57L	C06A	16387.31	1297.59	6538.48	2242.81	57271.90	2400.44
	57R	C06A	16790.60	6595.26	1002.83	2242.81	2400.44	57271.90
	58L	C06B	6595.26	16790.60	1002.83	2464.50	2300.52	52302.92
	58R	C06B	6744.05	336.02	17716.58	2464.50	52502.92	2300.52
	59		6744.05	336.02	17716.57	2464.50	57196.01	1999.35
	60		6998.48	1177.81	18173.61	2464.49	62089.04	1698.16
	61		6998.48	1177.81	18173.63	2464.50	90095.81	2498.28
	62	ANC1	6998.48	1177.81	18173.64	2464.50	118102.62	3298.40

DVI ANALYSIS FOR DL.2 **
*** ANCHOR ADDED 8'-6" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

6
LOAD CASE NO. 6 (SSE), FORCES AND MOMENTS IN LOCAL COORDINATES

RUN GROUP	SOP NMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1								
	1	RVNA	15944.21	8741.72	13163.15	22008.14	50115.66	36[illegible].58
	2L	N1	15944.21	8741.72	13163.15	22008.14	44902.20	32[illegible].79
	2R	N1	15863.92	8552.39	13045.83	22008.14	44903.[illegible]	32[illegible].79
	3L	RVNA	15863.92	8552.39	13045.83	22008.14	31008.52	19677.29
	3R	RVNA	15756.01	8871.17	8281.19	22008.14	19677.29	31008.32
	4L	RVNB	19044.36	6179.91	8281.19	18202.20	15687.77	27267.82
	4R	RVNB	18759.36	7811.29	6027.41	18202.20	27267.82	15687.77
	5		18759.37	7811.29	6027.41	18202.20	24587.81	9045.73
	6		18759.37	7811.29	6027.41	18202.20	22001.98	17988.26
	7		18387.66	7721.46	5505.55	18202.20	22353.96	30605.51
	8		18387.66	7721.46	5505.55	18202.20	26896.53	44467.29
	9L	C01A	18387.66	7721.46	5505.55	18202.20	35237.02	58403.61
	9R	C01A	18216.04	8554.24	5546.20	18202.20	35237.02	58403.61
	10L	C01B	8554.26	18216.04	5546.20	41488.04	13401.41	45437.04
	10R	C01B	9696.80	18081.36	6195.04	41488.04	13401.42	45437.04
	11		9696.87	18081.36	6195.04	41488.67	13138.64	25712.04
	12		9696.87	18081.36	6195.04	41488.02	13891.09	16884.56
	13L	SN1	9696.88	18081.36	6195.04	41488.04	19296.95	35687.07
	13R	SN1	10606.52	17918.02	11318.40	41488.04	19296.95	35687.07
	14L	C02A	10606.52	17918.02	11318.40	41488.04	16622.39	40118.49
	14R	C02A	11045.91	17863.98	11279.42	41488.04	16622.39	40118.49
	15L	C02B	17864.00	11045.89	11279.42	6731.19	30497.21	52708.42
	15R	C02B	17849.78	11380.55	11109.93	6731.20	30497.21	52708.42
	16L	H1	17849.78	11380.55	11109.93	6731.20	28696.27	51181.30
	16R	H1	17849.09	11449.69	11066.94	6731.20	28696.27	51181.30
	17L	SN2	17849.09	11449.69	11066.94	6731.20	27097.72	49726.57
	17R	SN2	17849.17	8427.74	11018.64	6731.20	27097.72	49726.57
	18L	V1	17849.17	8427.74	11018.64	6731.20	25744.79	48210.11
	18R	V1	18171.55	6644.25	9603.63	6731.20	25744.79	48210.11
	19		18[illegible].55	6644.25	9603.63	6731.19	28553.82	42323.16
	20L	V2	18171.55	6644.25	9603.63	6731.20	31437.56	36476.22
	20R	V2	19396.70	4245.80	5885.21	6731.20	31437.56	36476.22
	21		19396.70	4245.80	5885.21	6731.19	37520.88	29867.86
	22		19396.70	4245.80	5885.21	6731.19	43744.33	23299.52
	23		20307.91	5527.01	4560.41	6731.19	50128.22	16731.31
	24		20307.91	5527.01	4560.41	6731.19	52895.29	11147.89
	25		20307.91	5527.01	4560.41	6731.19	55820.75	9529.00
	26L	H2	20307.91	5[illegible]	4560.41	6731.20	58883.47	14736.72

DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 6 (SSET), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	PCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	26R	H2	21289.49	2364.18	4874.24	6731.20	58883.47	14736.
	27		21289.47	2364.18	4874.24	6731.19	58766.71	13120.61
	28		21289.47	2364.18	4874.24	6731.19	58749.29	11504.55
	29		22303.62	1234.64	6154.13	6731.19	58579.88	10335.28
	30		22303.62	1234.64	6154.13	6731.19	58013.37	10059.02
	31		22303.62	1234.64	6154.13	6731.19	57407.92	9783.53
	32		23348.19	1755.61	7561.12	6731.19	60261.14	7874.17
	33		23348.19	1755.61	7561.12	6731.19	64691.98	5153.37
	34L	C03A	23348.19	1755.61	7561.12	6731.20	69141.37	2519.76
	34R	C03A	24077.56	7612.12	2341.06	6731.20	2519.76	69141.37
	35L	C03B	7612.14	24077.56	2341.06	2794.69	7586.16	70480.75
	35R	C03B	7609.41	2575.97	24218.67	2794.69	70480.75	7586.16
	36L	H3	7609.41	2575.97	24218.67	2794.69	74891.12	7930.24
	36R	H3	7743.53	1643.66	7088.33	2794.69	74891.12	7930.24
	37		7743.53	1643.66	7088.33	2794.69	64628.08	8170.49
	38		7743.53	1643.66	7088.33	2794.69	54365.87	8410.93
	39		8484.45	692.06	6235.09	2794.69	45158.25	8506.73
	40		8484.45	692.06	6235.09	2794.69	38059.37	8313.17
	41		8484.45	692.06	6235.09	2794.69	30964.80	8120.70
	42		9722.34	1359.84	5161.12	2794.69	27474.87	6533.04
	43		9722.34	1359.84	5161.12	2794.69	25811.85	4258.26
	44L	C04A	9722.34	1359.84	5161.12	2794.69	24312.68	2163.78
	44R	C04A	10800.67	4018.66	1830.72	2794.69	2163.78	24312.68
	45L	C04B	4018.66	10800.67	1830.72	1616.01	2943.11	14091.80
	45R	C04B	3669.06	2044.05	11313.49	1616.01	14091.80	2943.11
	46L	H4	3669.06	2044.05	11313.49	1616.01	10987.46	4665.04
	46R	H4	3604.23	2017.08	11672.02	1616.01	10987.46	4665.04
	47L	C05A	3604.23	2017.08	11672.02	1616.01	21847.84	2808.53
	47R	C05A	3807.92	12086.29	1783.15	1616.01	2808.53	21847.84
	48L	C05B	12086.29	3807.92	1783.15	2676.98	2363.76	32506.07
	48R	C05B	12969.44	1298.51	4924.30	2676.98	32506.07	2363.76
	49		12969.44	1298.51	4924.30	2676.98	27911.50	4270.10
	50		12969.44	1298.51	4924.30	2676.98	23584.78	6176.64
	51		14405.31	407.99	6129.87	2676.98	22075.37	7233.86
	52		14405.31	407.99	6129.87	2676.98	27307.88	6592.41
	53		14405.31	407.99	6129.87	2676.98	32021.29	5952.52
	54		16004.32	1647.77	6930.34	2676.98	40469.83	4930.80

** DVI ANALISIS FOR DESI **
*** ANCHOR ADDED 8'-8" S OF C06* DUE TO LBB CONCERNS ***
** DIRECT VESSEL INJECTION SYSTEM **
ANALYSIS BY: C. E. RIDDLE DATE: 8/19/92

LOAD CASE NO. 6 (SSET), FORCES AND MOMENTS IN LOCAL COORDINATES (CONTD.)

RUN GROUP	SOP MMB	DCP NAME	AXIAL FORCE (LB)	Y FORCE (LB)	Z FORCE (LB)	XX MOMENT (LB.FT)	YY MOMENT (LB.FT)	ZZ MOMENT (LB.FT)
RUN1 (CONTD.)								
	55		16004.32	1647.73	6930.34	2676.98	59783.78	3736.10
	56L	H5	16004.32	1647.73	6930.34	2676.98	61102.40	2584.32
	56R	H5	16894.45	1363.79	7042.10	2676.98	61102.40	2584.32
	57L	C06A	16894.45	1363.79	7042.10	2676.98	62690.32	2478.22
	57R	C06A	17297.74	7098.88	1069.03	2676.98	2478.22	62690.32
	58L	C06B	7098.89	17297.74	1069.03	2609.31	2652.15	57844.89
	58R	C06B	7247.68	402.22	18223.72	2609.31	57844.89	2652.15
	59		7247.67	402.22	18223.71	2609.31	62051.54	2228.83
	60		7502.10	1244.00	18680.75	2609.31	66355.69	1806.84
	61		7502.11	1244.01	18680.77	2609.31	93916.31	2531.36
	62	ANC1	7502.11	1244.01	18680.79	2609.31	121673.19	3441.58

APPENDIX E

DESCRIPTION OF LEAK-BEFORE-BREAK METHODS

APPENDIX E

DESCRIPTION OF LEAK-BEFORE-BREAK METHODS

PURPOSE

This appendix describes the common analytical methods and assumptions employed in the stability analyses for the System 80+ piping systems presented in Appendices F to J of this report.

SCOPE

The methods and assumptions presented in this appendix are applicable to the analysis of the following System 80+ piping systems:

Main Coolant Loop Hot Leg (HL)

Main Coolant Loop Cold Leg (CL)

Surge Line (SL)

Main Steam Line (MSL)

Shutdown Cooling Line (SC)

Direct Vessel Injection Line (DVI)

For the purpose of the discussion in these appendices, passing LBB means that the pipeline under consideration has been demonstrated to be acceptable for LBB stability evaluation and has passed the stability evaluation of $\sqrt{2}$ x (NOP + maximum design load) for the leakage crack length and (NOP + maximum design load) for two times the leakage crack length, where the maximum design load is defined in the Distribution Systems Design Guide. The leakage crack length is determined by the criteria specified in the Design Guide.

This appendix discusses material properties, leakage crack determination methods, flow rate correlation, and finite element models common to the piping systems evaluated in this report.

MATERIAL PROPERTIES

The detailed analysis of cracks in pipes requires consideration of the properites of the pipe and the weld materials. Previous work of Reference (1) has shown that a conservative bounding analysis results when the material stress-strain properties of the base metal (lower yield) and the fracture properties of the weld (lower toughness) are used for the entire pipeline. Methods for calculating the leakage crack length generally require a simple Ramberg-Osgood (R-O) material characterization. The fitting of the actual data is for this purpose only. It has been found that crack opening area calculations, which are elastic, require that the R-O curve fit for small strains in order to match assumed flow correlations. The actual material behavior is input for the finite element calculation.

Stress-Strain Curves

The HL, CL and MSL are fabricated from SA516 Gr70. The material stress-strain [illegible] from the Piping Fracture Mechancis Data Base (PIFRAC), Reference (2). The stress-strain data are shown in Figure (1). The data shown in Figure (1) are used in the finite element analysis. In order to use these data in procedures requiring a R-O material behavior, the small strains characterization are emphasized by the fit.

The crack opening area calculations are very sensitive to the R-O parameters. Since the crack opening area calculations are essentially elastic, a good characterization of the elastic, small strain, behavior is required. The R-O fit is shown in Figure (2).

The SC, SL and DVI lines are fabricated with 316 stainless steel. A low strength 316 material is chosen from the PIFRAC data base, which bounds the stainless steel used in the System 80+ design. The stress-strain data are shown in Figure (3). The R-O fit to small strain data is shown in Figure (4). The rationale to the small strain fit follows the reasoning for establishing the SA516 Gr70 R-O parameters.

Material Resistance Curves

The material resistance curves (J-R) for each of the pipelines is taken from the PIFRAC data base. The J-R material curve for the HL, CL, and MSL is for a SA516 Gr70, shielded metal arc weld (SMAW) and is shown in Figure (5). A fit to the data used in the stability evaluation is also shown in the figure. This J-R curve bounds the material toughness behavior in any of these pipelines.

The J-R material curve plotted in Figure (6) for the SC, SL and DVI lines is taken from the PIFRAC data base and is for a 304 stainless steel SMAW weld. This curve was taken from a set of data and is a lower bound result from a group of data for which significant crack extension was measured. This J-R curve bounds the material toughness behavior in any of these lines. In order to ensure LBB is satisfied for the SC, SL and DVI, which are relatively small diameter pipes, gas tungsten arc weld (GTAW) will be specified for all shop and field welds. A J-R material curve for GTAW weld will be developed and will be used in the stability evaluations of these lines.

The complete summary of material properties and R-O constants are given in Table (I) for each of the materials used in these evaluations.

LEAKAGE CRACK LENGTH DETERMINATION

The leakage flow rate used in the LBB evaluation should be based on theoretical and experimental data and must be sufficiently conservative to encompass many unknown variables. The following discussion is applicable to piping systems containing subcooled liquid and therefore pertains to all pipes reported herein except the MSL.

NUREG/CR-1319, Reference (3), provides a treatment of leakage through small cracks considering various uncertainties in crack definition. NUREG/CR-1319 addresses crack wall surface roughness, effective hydraulic ratio of the elongated crack shape, and the possibility that the crack may be longer at the inside of the pipe wall than at the outer surface of the pipe, resulting in a convergent opening. For typical PWR conditions at 2250 psi and 550°F for a high friction factor of .01, three different inlet and outlet crack opening areas are plotted on Figure (7) in units of gpm per square inch of crack opening versus outer surface crack area, Ae. Also plotted in Figure (7) are flow predictions based on simple orifice flow with a discharge coefficient of 0.6 and also a flow prediction using a Henry-Fauske critical flow model, Reference (4).

The Henry-Fauske correlation was developed on the basis of subcooled flow through nozzles, and provides an upper bound for flow through an irregular crack opening. The orifice flow does not consider subcooled water effects, and the constant discharge coefficient does not consider the irregular crack shape. Even so, the orifice prediction falls in the range of the NUREG/CR-1319 predictions, providing a measure of comparison.

The NUREG/CR-1319 predictions show a slight increase in flow rate per unit of exit area with increasing area, and a large increase for decreasing Ae/Ao ratio. Since for the purposes of identifying a through wall crack by means of leakage it would be conservative to underpredict the flow rate, the lowest value of all of these various predictions is used. The lowest flow rate prediction is about 885 gpm/in^2 at 0.001 in^2. This means that a crack which opens to slightly greater than 0.001 square inches will leak at least 1.0 gpm. Application of the factor of 10 safety margin recommended in NUREG-1061, Volume 3, leads to a leakage area of 0.01 square inches for this leak rate.

Another procedure for relating the crack opening area to leakage rate was developed by EPRI and is used in the PICEP program, Reference (5). Using a procedure similar to PICEP with conservative input assumptions, cracks in the pipes considered here produce leakgae rates of 250 to 350 gpm/in^2. This implies a detectable leage area of 0.003 to 0.004 square inches.

The value of 250 gpm/in^2 was also used in Reference (6) as an assumed conservative value. The flow correlation 250 gpm/in^2 is used for all lines in these analyses with subcooled liquid. The acceptability of the leakage crack length is determined from the area calculation in the finite element analysis using the real stress-strain law. Therefore, a crack length pertaining to a 1.0 gpm leak rate must have an area of 0.004 square inches.

In order to determine the leakage rate for steam lines, a study generalizing the previous work has been performed. For a given size leakage crack length, correlations to predict discharge rates have been developed based on thermodynamic conditions inside the pipe. These correlations are based on choked ("critical") flow downstream of a reservoir ("source") at a given stagnation pressure. Isentropic expansion is assumed to occur between the source and choke points. The ratio of choke point ("throat" or "critical") pressure to upstream stagnation pressure is determined by thermodynamic properties of the steam-water mixture, and is generally about 0.56 to 0.58. Flow at this cross section is, by definition, a limiting value and thereby determines discharge rate. Each correlation, (1) Henry-Fauske, (2) Moody, and (3) Homogeneous, uses some assumption about the interaction between liquid and gaseous phases moving at different speeds during the expansion process.

For a constant stagnation pressure, each correlation provides the relationship betwwen flow rate and stagnation enthalpy. These three correlations are compared at 2250 psia and 900 psia in Figures (8) and (9).

Low values of enthalpy are associated with subcooled ("compressed") liquid, ie., temperatures below saturation at that pressure. The saturation enthalpy corresponds to the onset of liquid boiling. As enthalpy increases beyond saturation, a two-phase steam-water mixture is present. While neither pressure nor temperature change, as enthalpy increases the steam gets progressively "drier", tending towards 0% moisture ("dry steam"). Any further increase in enthalpy constitutes superheated steam. The correlations, as plotted, terminate at the enthalpy corresponding to dry steam (the onset of superheat). However, the ASME Steam Tables (Figure 10) for critical mass flow rate can be used to predict the discharge of superheated steam. As Figures (8) and (9) indicate, the correlations do not yield identical results at the point of saturated liquid, but converge as the dry steam enthalpy is approached.

The Henry-Fauske correlation is an accepted method of computing discharge rates which is known to be conservative. Considering the main loop piping (550°F, 2250 psia) the enthalpy for entering the curve is based almost entirely on temperature. The enthapy of saturated water at 550°F (saturation pressure 1045 psia), the enthapy of subcooled water at 550°F (2250 psia, "compressed liquid") is 547.3 Btu/lbm. From Figure (8), the Henry-Fauske correlation yield 23,600 lbm/ft^2/sec. This is based on choked flow in the leakage crack, and assumes zero head loss in the rapidly flowing liquid phase prior to the choke point. Hence, it is a conservative result. The Henry-Fauske correlation value, 23,600 lbm/ft /sec, is equivalent to 1233 gpm/in^2, where the gallonage is in terms of condensed water at 200°F.

Discharge rates for dry steam conditions at 900 psia are considered next. The enthalpy for entering the curve is 1196.4 Btu/lbm which correspnds to 0% moisture. Note that all three correlations give essentially the same result, 1800 lbm/ft^2/sec assuming choked flow. Therefore, there is no uncertainty about the extent to which the presence of liquid water influences the mass flow rate (unlike the situation when conditions are near saturated liquid). A discharge rate of 1800 lbm/ft^2/sec correspords to 93.7 gal/in^2/min of 200°F water. Using the ASME Steam Table, Figure (10) yields an identical result, as expected.

This discharge rate is somewhat below that which would be predicted for a perfect gas flowing through a nozzle (2350 lbm/ft^2/sec) as determined by compressible flow equations and based on the throat to stagnation pressure ratio of 0.585 for homogeneous flow and a specific heat ratio ("gamma") of 1.30 for steam. This serves as a check on the result since steam has slightly adhesive qualities compared to a perfect gas.

From Figures (8) and (9), it is clear that there is less uncertainty in the flow rates of dry steam than subcooled water. There is no uncertainty associated with the phase change during flow through the crack. It is reasonable then to use a margin on the order of 2.0 to 2.5 for the steam flow rate with respect to the theoretical value. The use of this margin would give a range of 38 to 47 gpm/in^2 of water at 200°F. For simplicity, the value of 40 gpm/in^2 is chosen as a conservative leakage rate for the steam line, which corresponds to the 250 gpm/in^2 flow rate chosen for the primary coolant loop piping. The flow correlation of 40 gpm(water)/in^2 is used for the MSL. Again, the acceptability of the leakage crack length is determined from the area calculation in the finite element analysis using the real stress-strain law. For the MSL, a crack length pertaining to 1.0 gpm must have an area of 0.025 square inches.

FINITE ELEMENT MODEL DESCRIPTION

Geometry and Boundary Conditions

The finite element model for a typical leakage crack length in the surge line is shown in Figure (11). All the finite element models used to model each of the lines are scaled from a base pattern and look essentially like the model shown in Figure (11). A close-up of the crack tip area is shown in Figure (12). The finite element model is simply a means for applying the pressure and moment loading to a section of pipe containing the hypothetical crack at some location in the pipeline. Since the crack is assumed to be aligned with the moment, a quarter symmetry model is used. The length of the pipe is chosen to at least five (5) pipe diameters in order that the point of load application not be close to the crack tip region. The mesh uses 20 node isoparametric solid elements. Boundary conditions are imposed on the model based upon symmetry and crack location. The crack surface area is free from constraint.

Loadings

The finite element model is loaded with internal pressure appropriate to the normal operating conditions of each piping system. An axial end load traction, which when integrated over the pipe cross-sectional area, is equal to the continuity axial force, is applied to the far end of the pipe. Moments are applied as a linearly varying traction to the far end of the pipe.

J-Integral Calculation

The J-integral is evaluated from the calculated energy release rate using the virtual crack extension method. A virtual crack extension generates a strain energy change which, when divided by the virtual extension, provides the energy release rate. The following is the basic definition of J-integral:

$$J = \frac{1}{t} \times \frac{\Delta u}{\Delta a}$$

Δu = strain energy change (in-lbs.)

Δa = virtual crack advance (inches)

t = thickness (inches)

Stability Evaluation

There are two aspects to the LBB fracture mechanics method of evaluating the stability of a piping system. At each point of interest,

(1) $J_{LOAD} < J_{MAT}$

(2) $\left.\frac{dJ}{da}\right|_{LOAD} < \left.\frac{dJ}{da}\right|_{MAT}$

for some amount of ductile crack growth. In order to evaluate the derivative in the region of the leakage crack length tip location, three meshes are used. For a given leakage crack length "1" and model crack length "a_l", the three meshes have crack length $a_l - \delta$, a_l, and $a_l + \delta$. The value δ is a length appropriate to the anticipated amount of stable crack growth. This is indicated in Figure (13). These three meshes are used in the analysis of the leakage crack. Similarly, three more meshes are generated for the anlysis of twice the leakage crack length, $2a_l - \delta$, $2a_l$, and $2a_l + \delta$.

In order to determine the critical load at instability, the material curve, J vs. a, is positioned at the crack tip location of either a_l or $2a_l$. The loading J curves for various load levels are plotted at a_l, a_l, and a_l or $2a_l$, $2a_l$, and $2a_l$. Figure (14) indicates this procedure. The point of tangency which is derived graphically is shown in Figure (14). The loading line vs. crack position labeled M_3 is just equal in J ($J_{LOAD} = J_{MAT}$) and tangent to the material curve $\left.\frac{dJ}{da}\right|_{LOAD} = \left.\frac{dJ}{da}\right|_{MAT}$.

LBB PIPING EVALUATION PLOTS

Constructing LBB Piping Evaluation Diagrams

In the course of developing routings and loadings for many different piping lines, it is not necessary to wait until the final design to analyze the line for LBB. A method has been developed which allows for the quick evaluation of the line in advance of the piping analysis, so that the LBB can be considered during the piping design. The LBB piping evaluation diagram can be prepared prior to the piping design and analysis and be used to quickly evaluate all points in a pipeline. The maximum design load at any time during the plant operation is the loading to be used in the stability analysis. Traditionally, this loading has been NOP + SSE. In the case of the surge line, a different situation occurs with stratified flow. That situation is particular to the surge line and is discussed in Appendix G. For the present discussion, the maximum design load is considered to be NOP + SSE.

The LBB piping evaluation plot requires performing two complete LBB evaluations. The evaluations are for two normal operating loads (NOP) which span the typical loadings for the line under consideration. A completed typical diagram is shown in Figure (15). The procedure used for generating that figure is as follows:

(1) Choose NOP = Pressure + NOP_1

(2) Determine a_1

(3) Increase the analysis moment until the critical moment is found for a_1 and $2a_1$

(4) Separate the critical analysis moment, M_c, into the correct addition of SSE and NOP_1 proportion for the a_1 and $2a_1$ evaluations.

(a) $M_c = \sqrt{2}\,(NOP_1 + SSE_1)$ a_1 analysis

$$SSE_1 = \frac{M_c}{\sqrt{2}} - NOP_1$$

(b) $M_c = (NOP_1 + SSE_1)$ $2a_1$ analysis

$$SSE_1 = M_c - NOP_1$$

(5) Plot values from (4a) and (4b) at NOP_1. This corresponds to the points labeled 1. in Figure (15).

(6) Repeat steps (1) to (5) for NOP_2. The results are shown Figure (15), labeled 2.

Two stability evalutaions must be performed for each pipeline under consideration in order to complete the piping evaluation diagram.

Using a LBB Piping Evaluation Diagram

Once the lines marking the acceptable areas of allowable piping loads are plotted as described in the previous section, all significant piping load results are plotted. Corresponding NOP and SSE values for all piping locations are plotted on the evaluation diagram. Figure (16) shows how the plot is used for a hypothetical line. Three points failed LBB in this example. The reasons for each failure are given in the figure. The designer can now use these results to revise the piping design; eg., lower the SSE response load by rerouting or by adding a snubber. Further review by the designer may result in other options for reducing the loads.

REFERENCES

(1) "Analysis of Cracked Pipe Weldments", EPRI Report NP-5057, February 1987.

(2) "A Users Guide to the NRC's Piping Fracture Mechanics Data Base (PIFRAC)", NUREG/CR-4894, May 1987.

(3) "Cold Leg Integrity Evaluation", Battelle Columbus Laboratories, NURER/CR-1319, February 1980.

(4) "The Two-Phase Critical Flow of One-Component Mixture in Nozzles, Orifices, and Short Tubes", Henry, R. E., and Fauske, H. R., Journal of Heat Transfer, Vol. 93, pp. 179-187, 1971.

(5) PICEP: Pipe Crack Evaluation Program, EPRI, NP-3596-SR, August 1984.

(6) "NRC Leak-Before-Break (LBB,NRC) Analysis Methods for Circumferentially Through-Wall Cracked Pipes Under Axial Plus Bending Loads", Klecker, R., Brust, F., Wilkowski, A., NUREG/CR-4572, May 1986.

LIST OF FIGURES

TABLE I

MATERIAL CONSTANTS

Sa516 Gr70 (Hot Leg, Cold Leg, Main Steam Line)

Ramberg-Osgood Law Material Characterization

$$\frac{\epsilon}{\epsilon_o} = \frac{\sigma}{\sigma_o} + \alpha \left(\frac{\sigma}{\sigma_o}\right)^n$$

$\alpha = 2.0$

$n = 4.5$

$\sigma_o = 30{,}500$ psi

Modulus E = 28×10^6 psi

Finite Element Analysis (from PIFRAC Data Base)

Modulus E = 27.7×10^6 psi

Yield = 33,930 psi

Work hardening slopes derived from data shown in Figure (1)

Stainless 316 (Shutdown Cooling, Surge and Direct Vessel Injection)

Ramberg-Osgood Law Material Characterization

$$\frac{\epsilon}{\epsilon_o} = \frac{\sigma}{\sigma_o} + \alpha \left(\frac{\sigma}{\sigma_o}\right)^n$$

$\alpha = 7.06$

$n = 4.69$

$\sigma_o = 30{,}000$ psi

Modulus E = 27.7×10^6 psi

Finite Element Analysis (from PIFRAC Data Base)

Modulus E = 27.7×10^6 psi

Yield = 24,143 psi

Work hardening slopes derived from data shown in Figure (3)

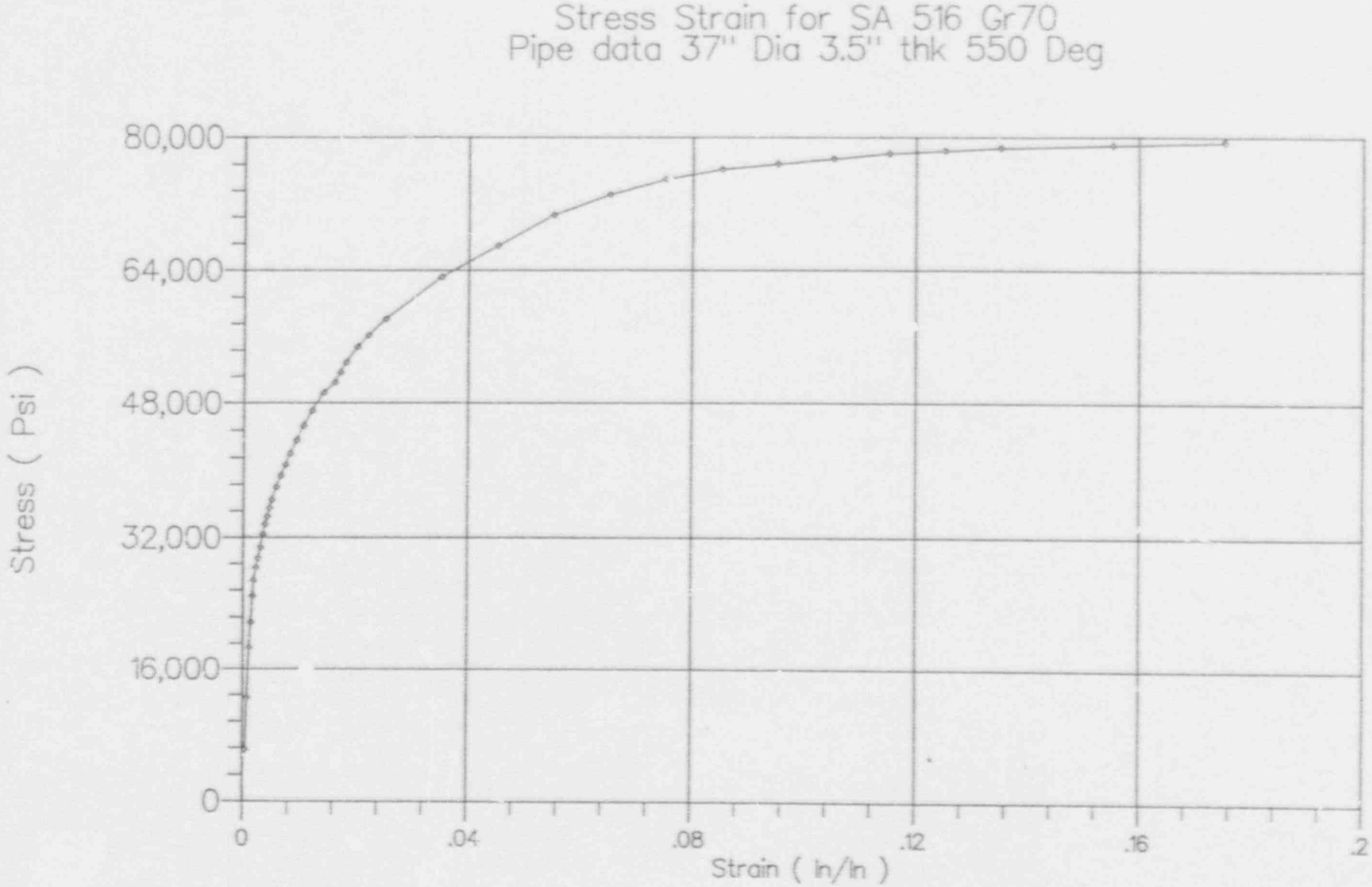


Figure 1
516 Stress-Strain PIFRAC

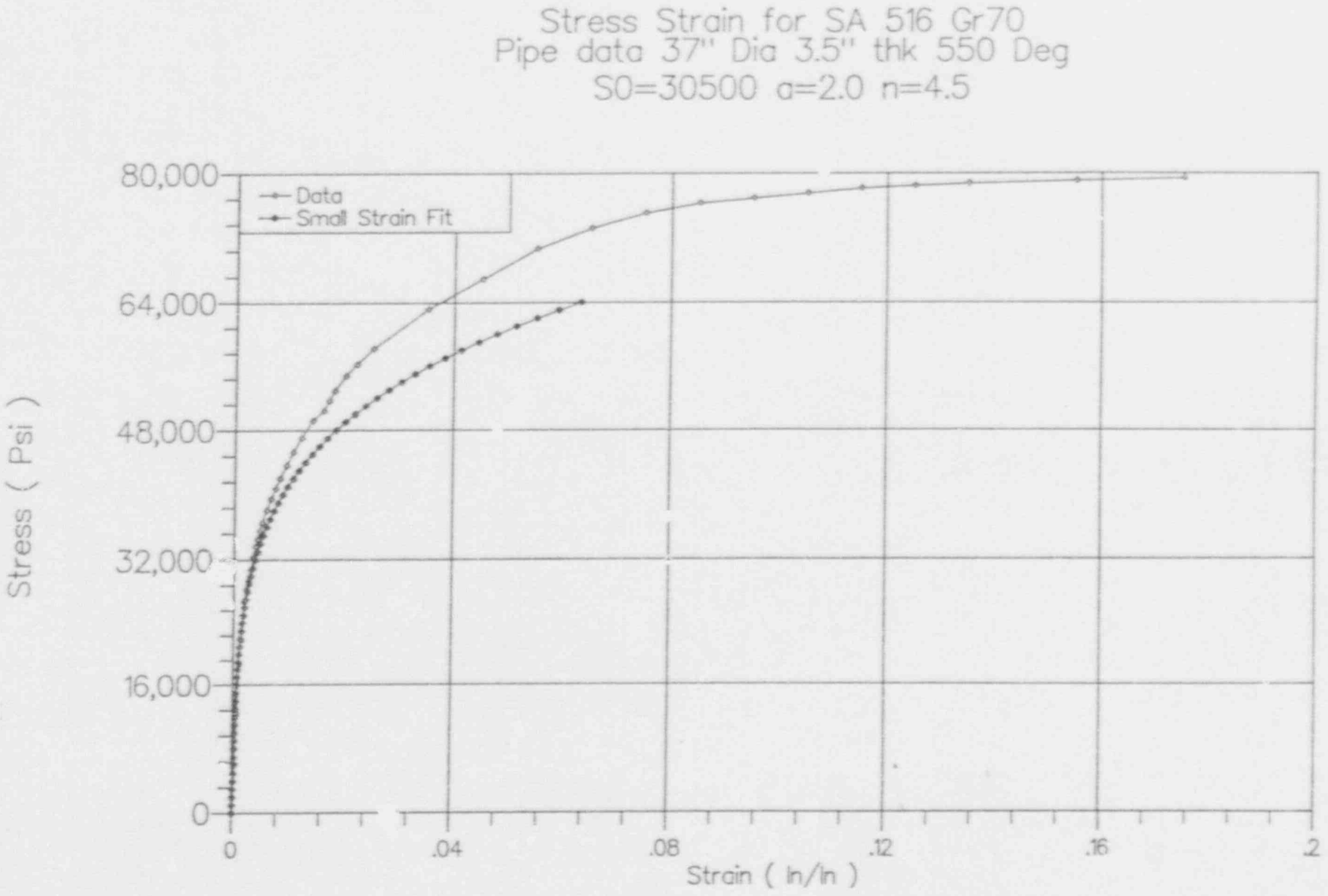


Figure 2
516 Stress-Strain Small Strain Fit

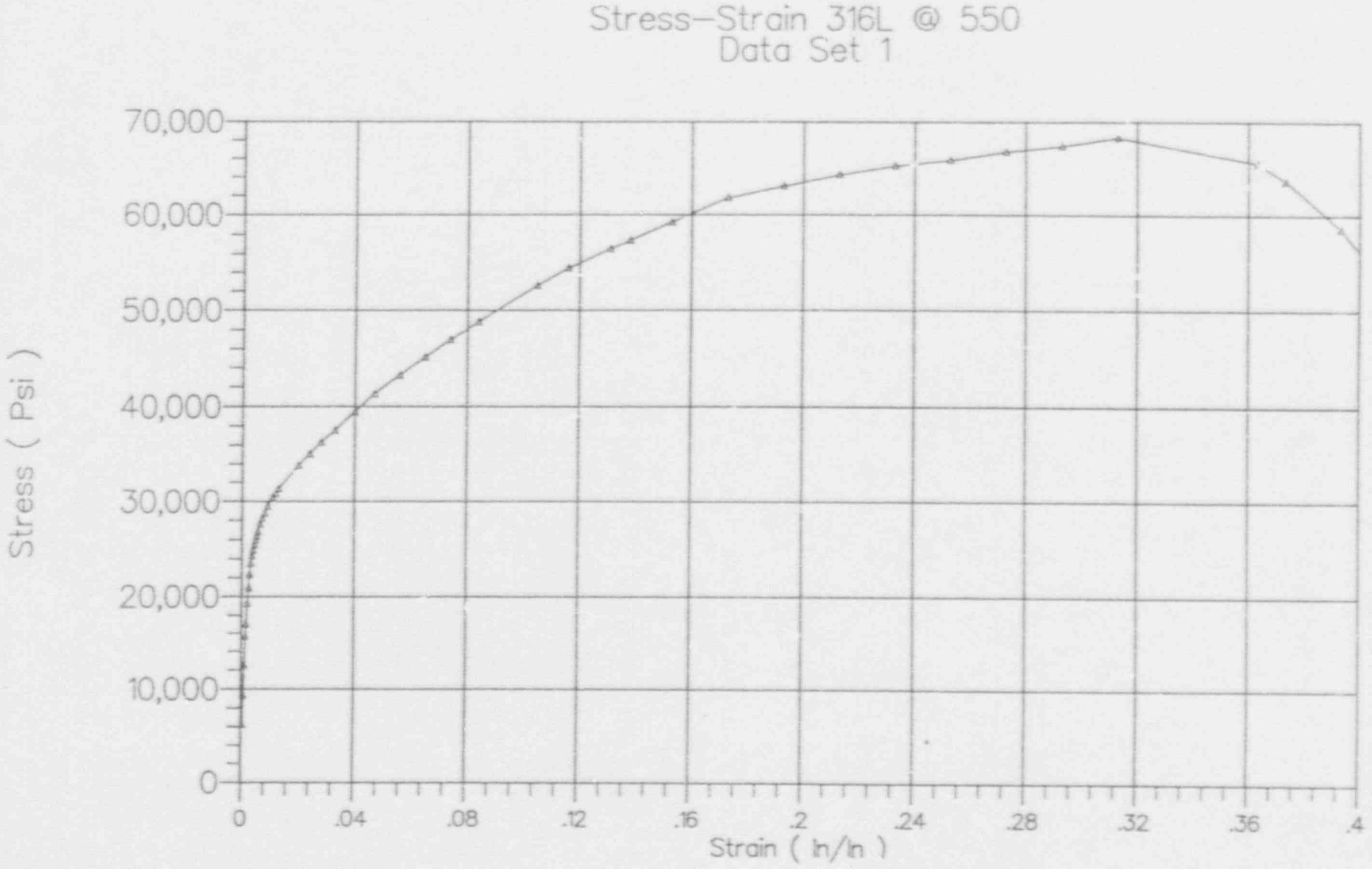


Figure 3
316 Stress-Strain PIFRAC

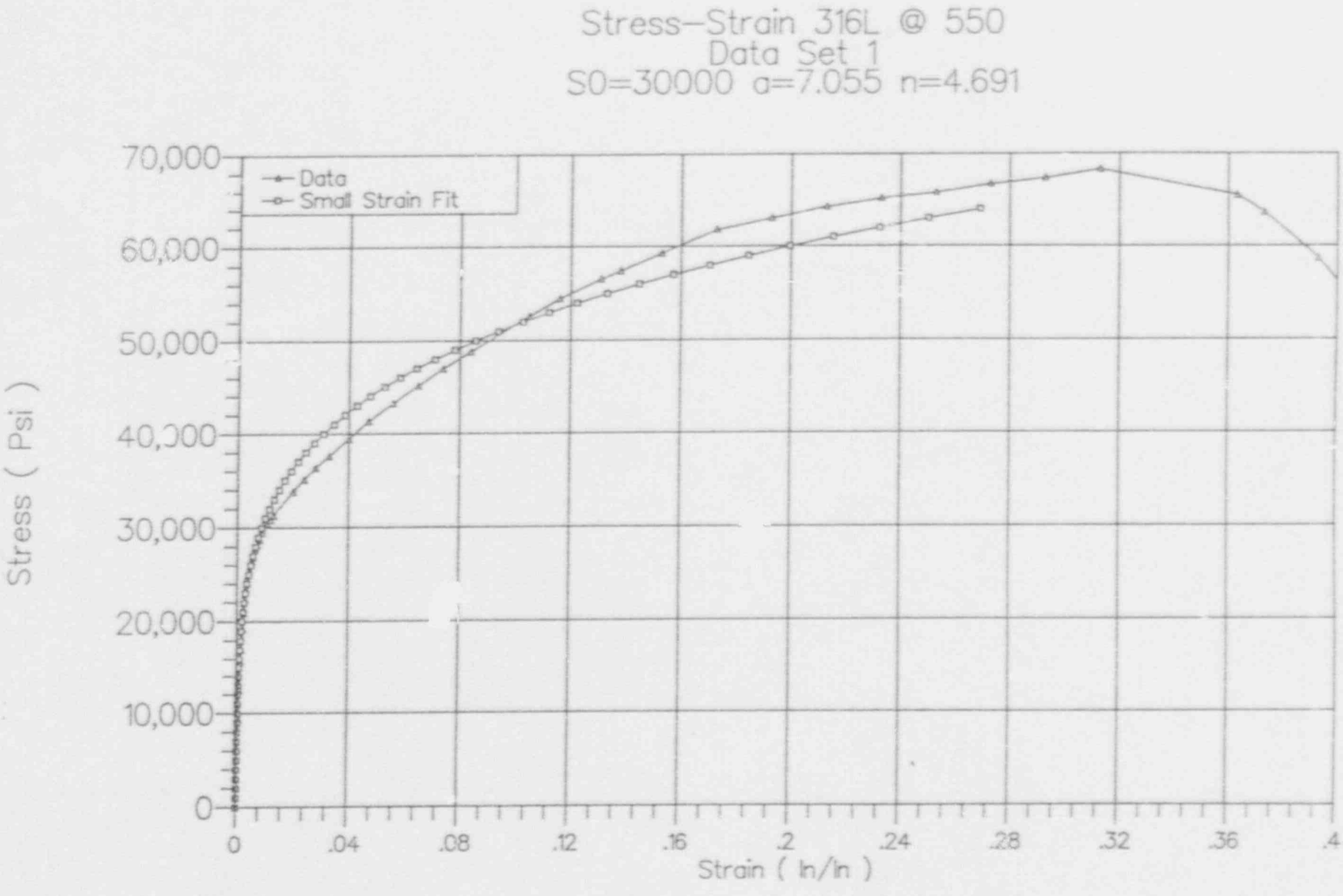


Figure 4
316 Stress-Strain Small Strain Fit

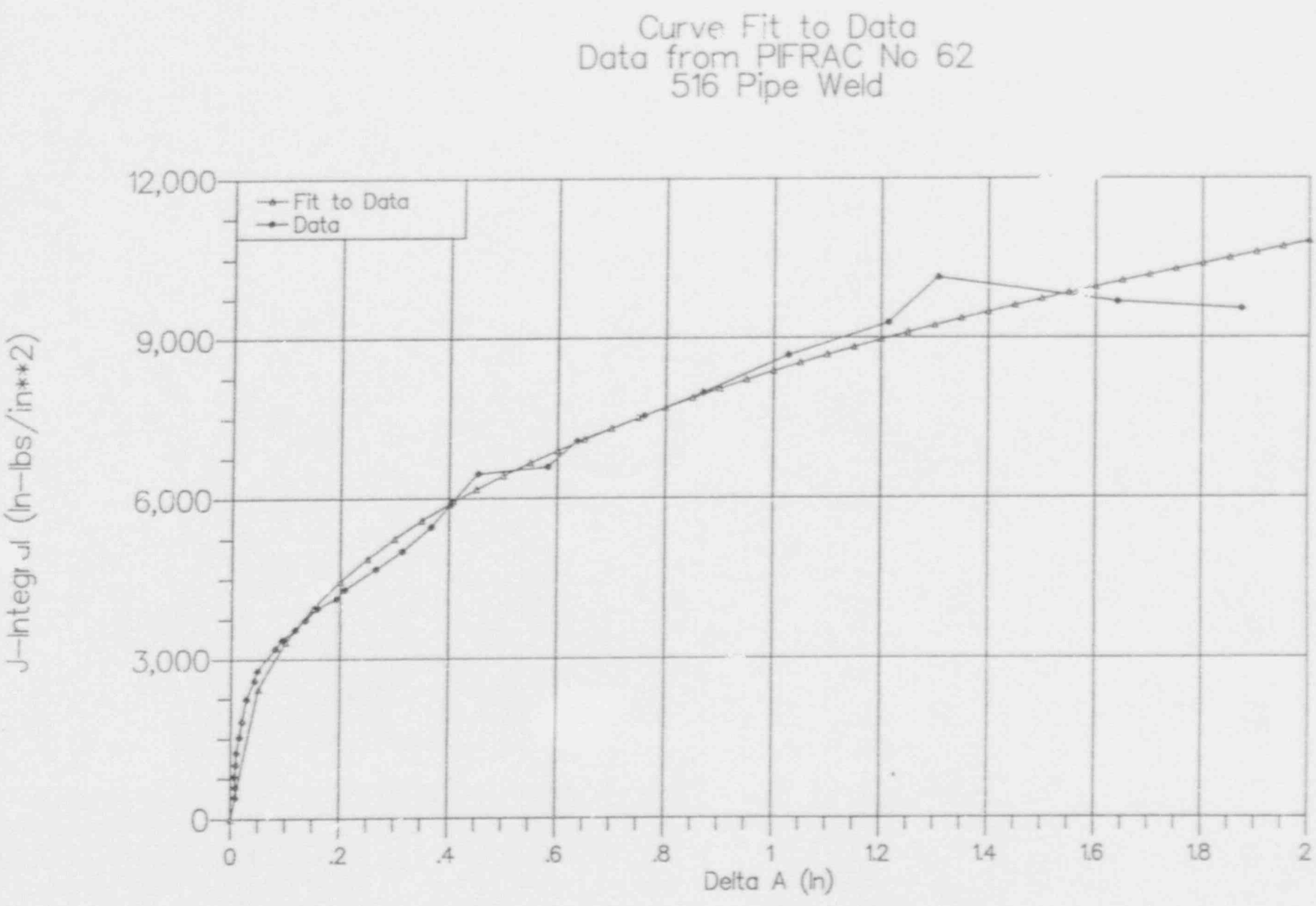


Figure 5
516 J-R Data and Fit PIFRAC

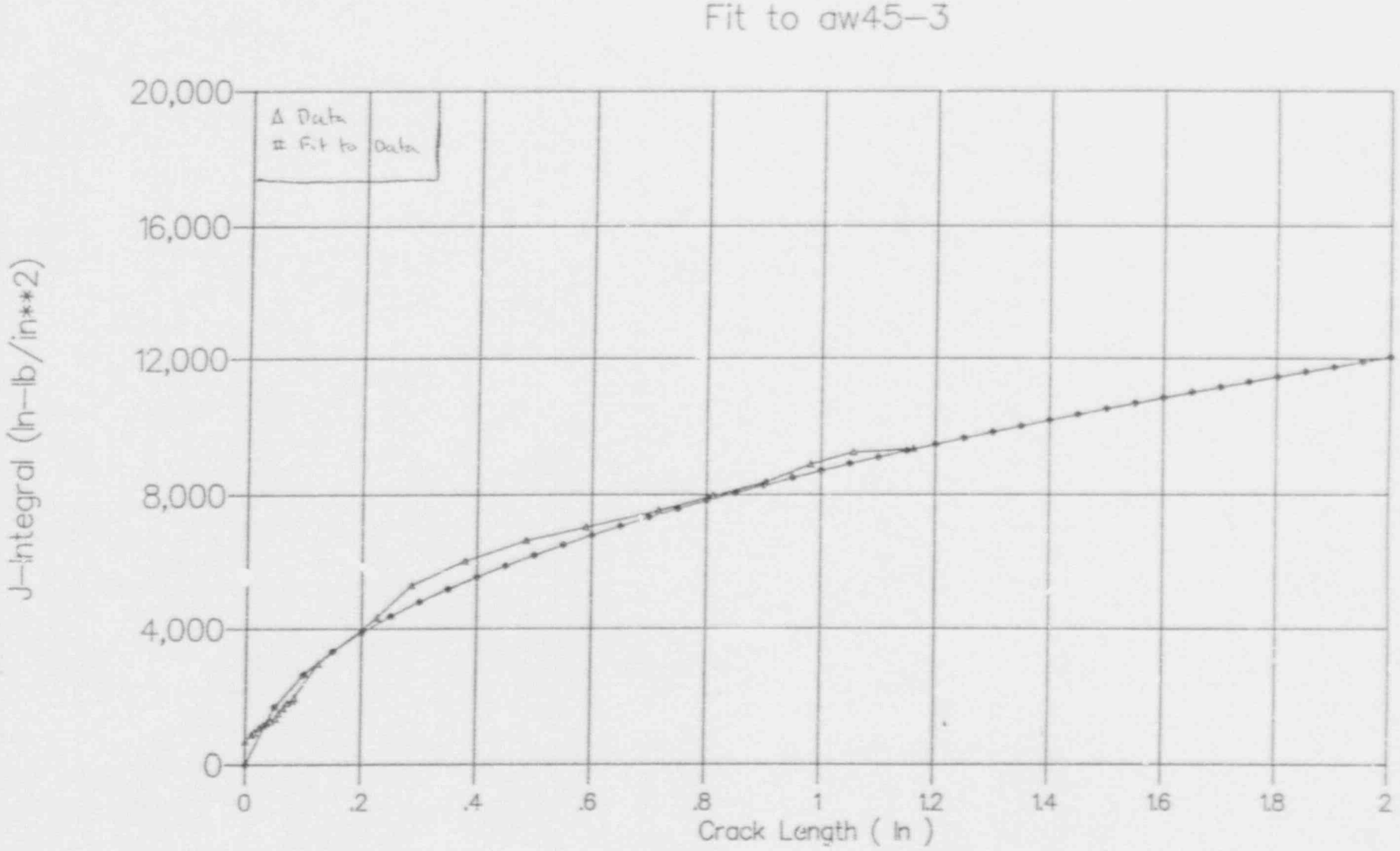


Figure 6
304 J-R Data and Fit PIFRAC

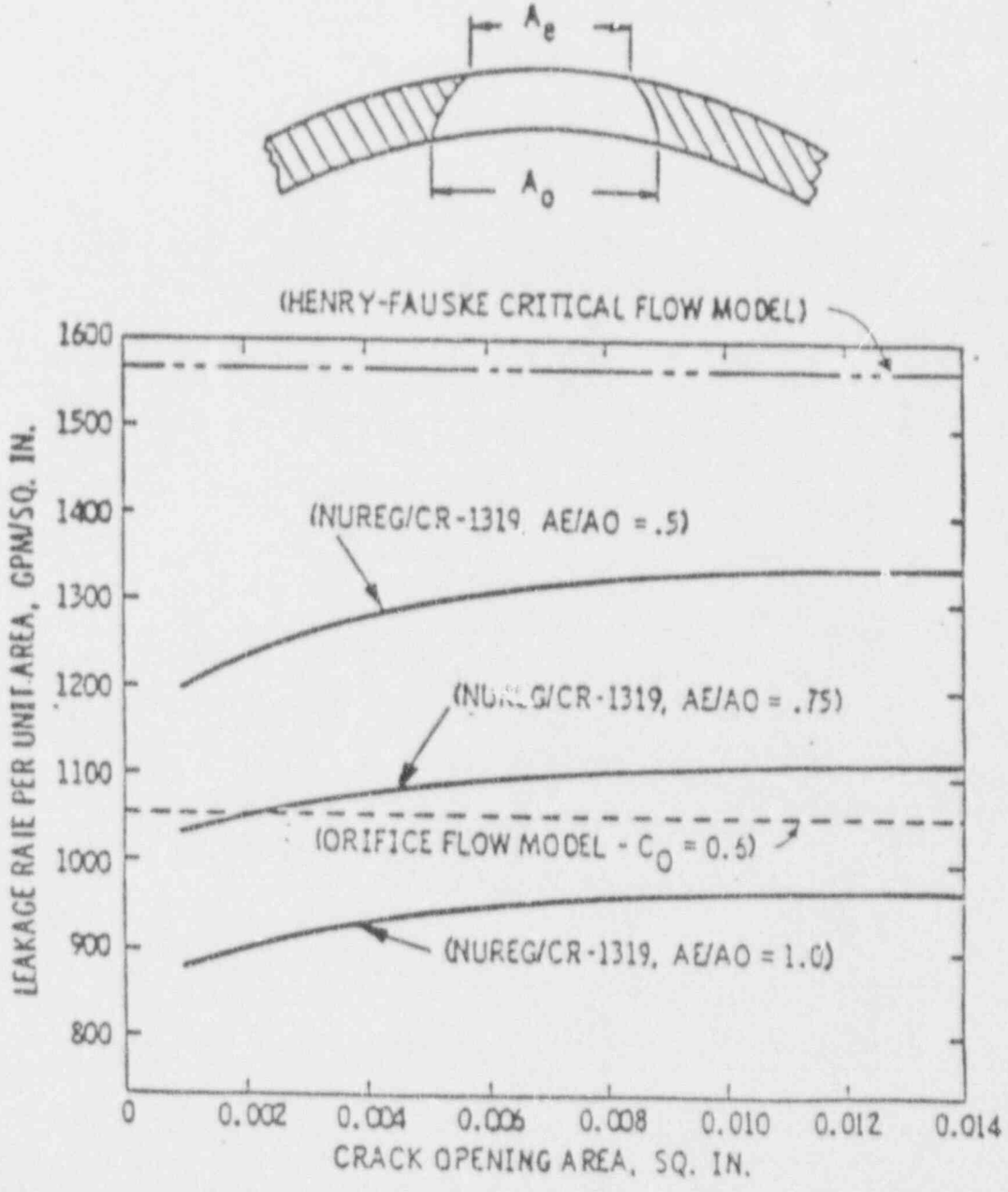


Figure 7
Flow Rate vs Crack Opening Area Correlations

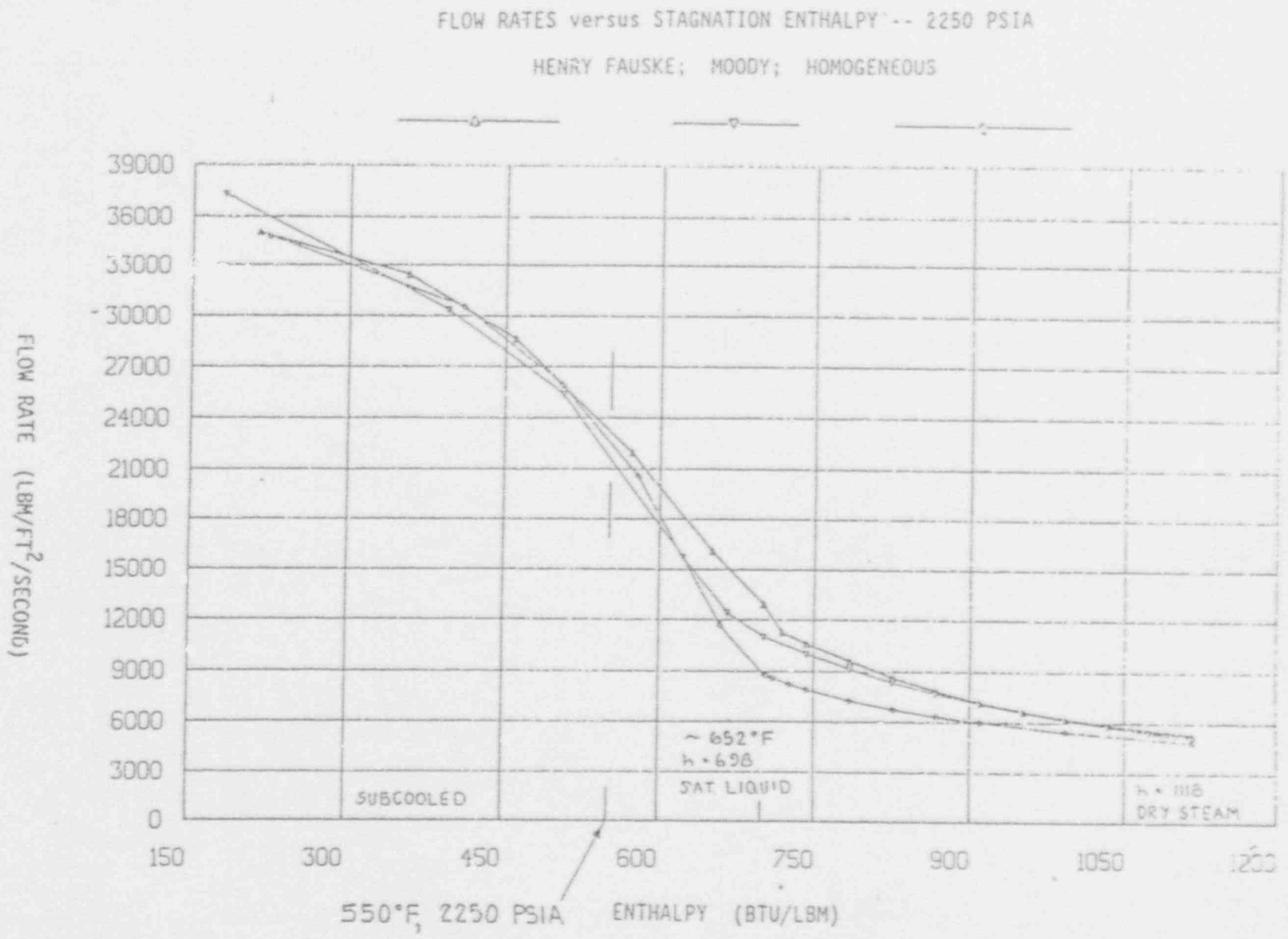


Figure 8
Stagnation Enthalpy at 2250 psia

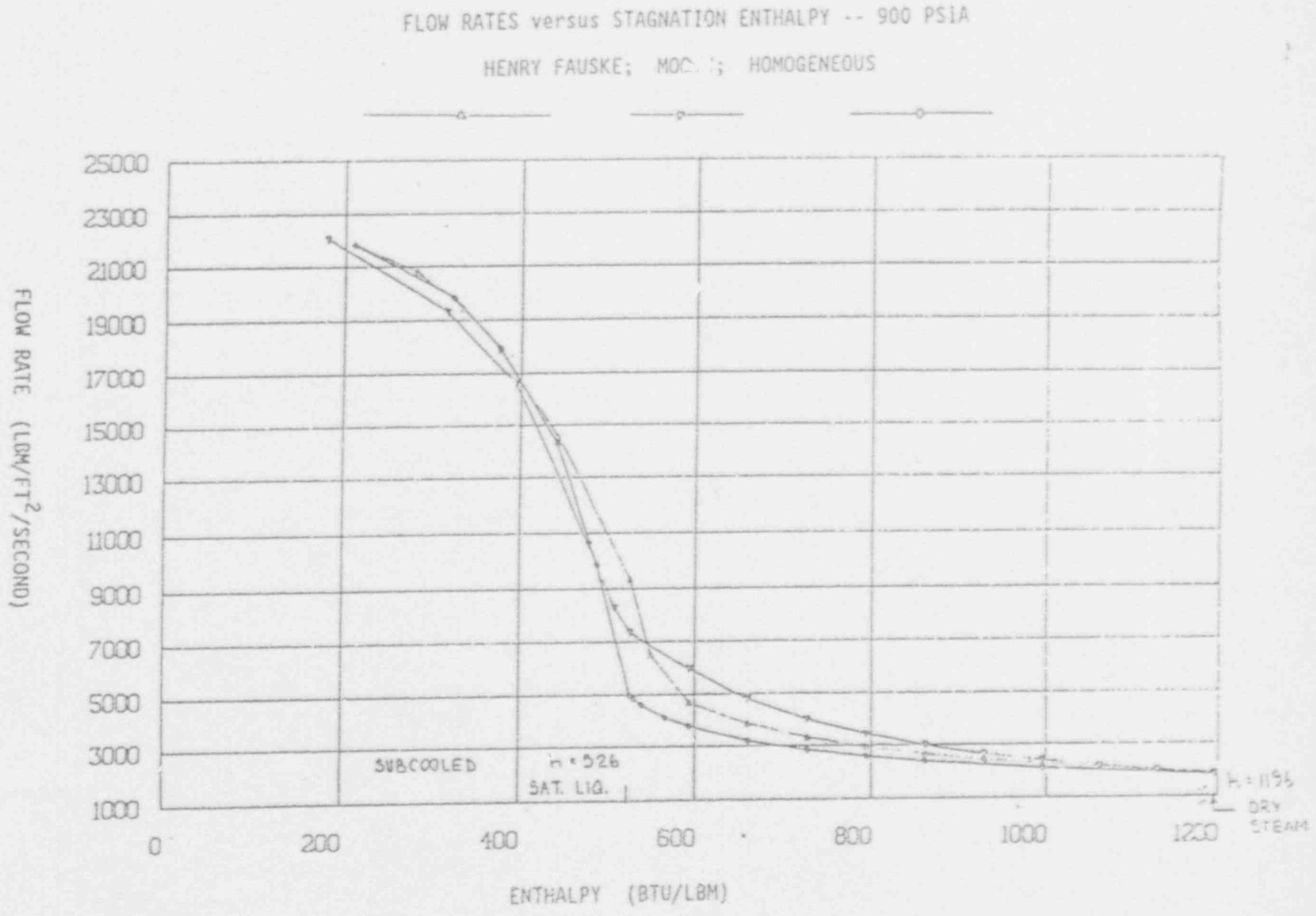


Figure 9
Stagnation Enthalpy at 900 psia

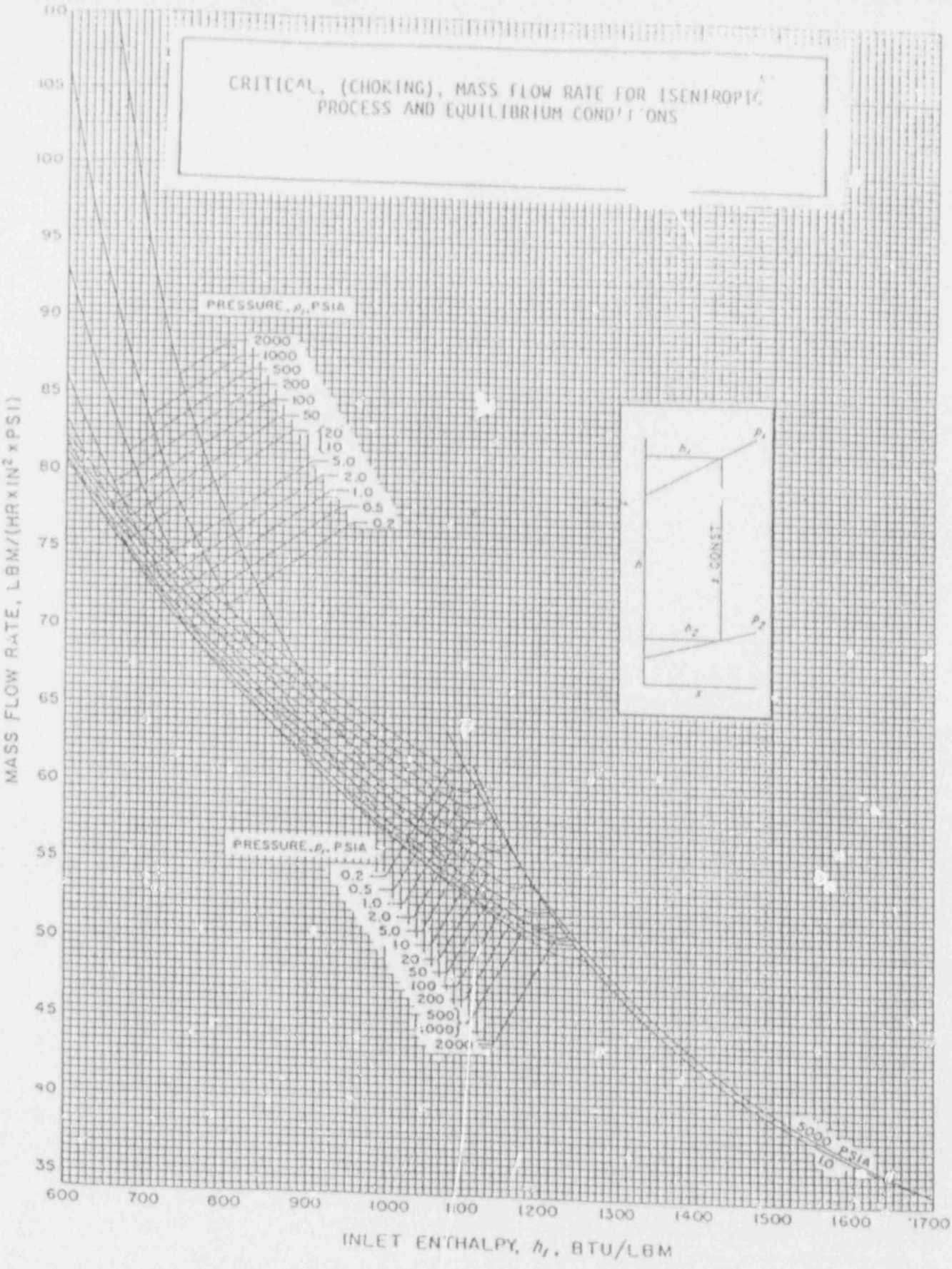


Figure 10
Steam Table, Critical Flow Model

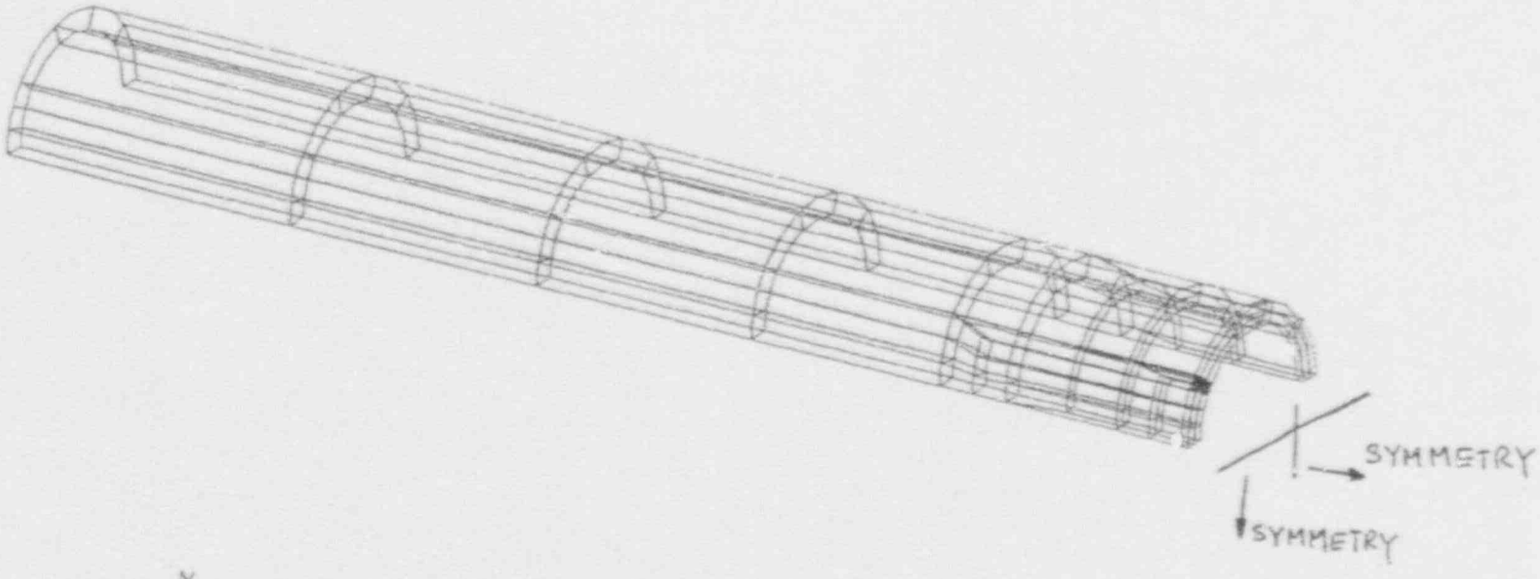


Figure 11
Overall Finite Element Model

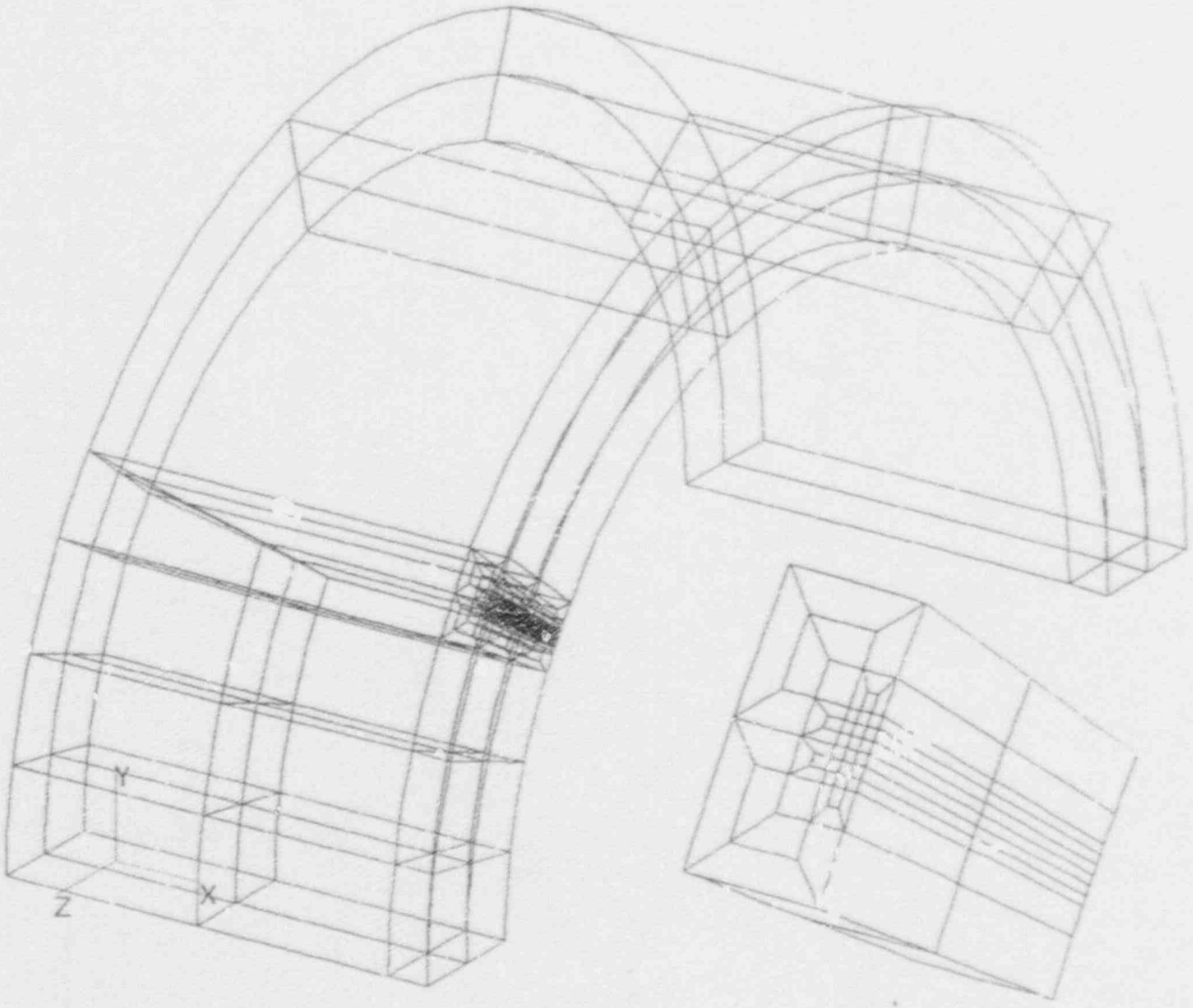
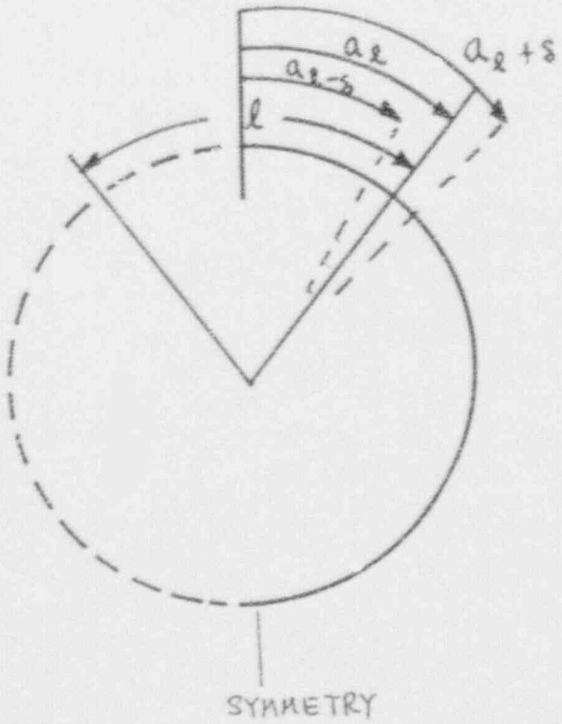


Figure 12
Crack Area Closeup of Finite Element Model



ℓ = Leakage Crack Length

a_ℓ = model crack length

$a_\ell \pm \delta$ model crack length ± a small amount

Figure 13
Different Crack Lengths Used to Calculate Derivative

M_i ; $i = 1-4$ J results for 4 load levels at 3 crack positions

M_1, M_2 load levels O.K. since $J_{LOAD} < J_{MAT}$ & $\frac{dJ}{da}\Big|_{LOAD} < \frac{dJ}{da}\Big|_{MAT}$ STABLE TEARING

Critical Load at level $M_C = M_3$ $J_{LOAD} = J_{MAT}$ & $\frac{dJ}{da}\Big|_{LOAD} = \frac{dJ}{da}\Big|_{MAT}$

M_4 Unstable tearing $J_{LOAD} > J_{MAT}$ & $\frac{dJ}{da}\Big|_{LOAD} > \frac{dJ}{da}\Big|_{MAT}$

Acceptable LBB loads are below M_3

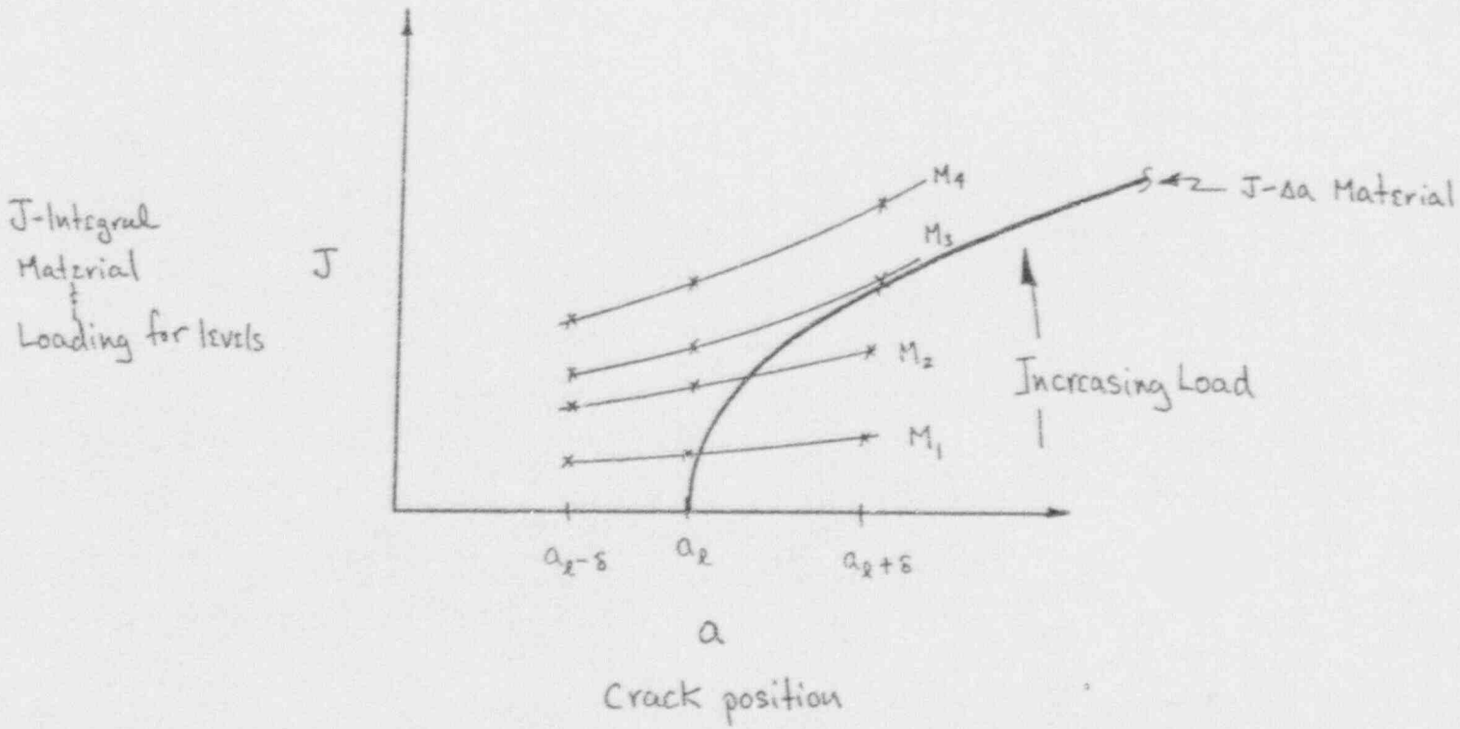


Figure 14
Stability Diagram

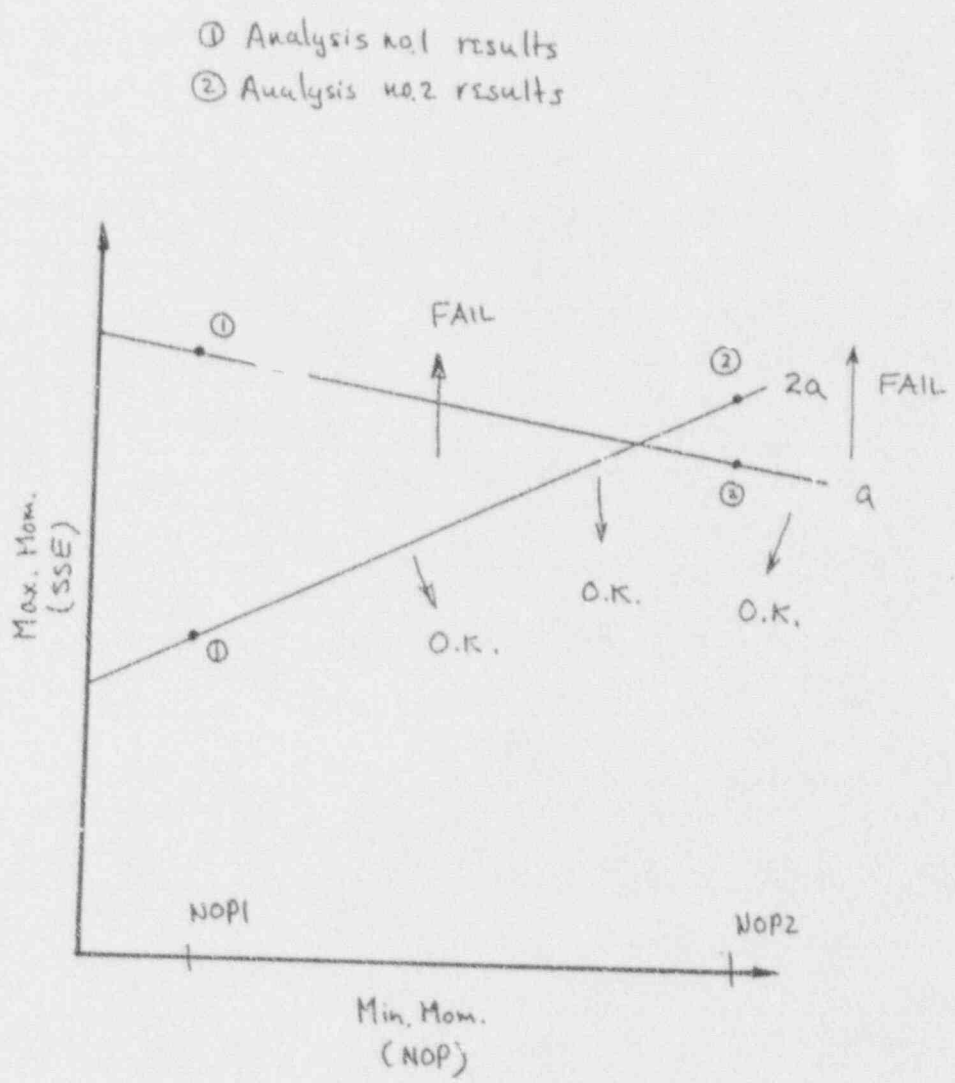
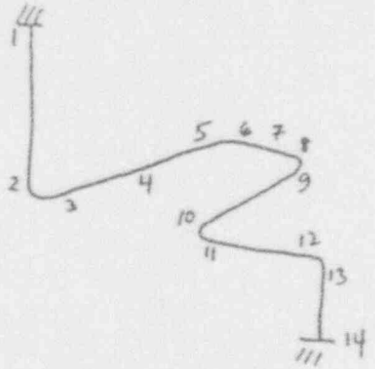
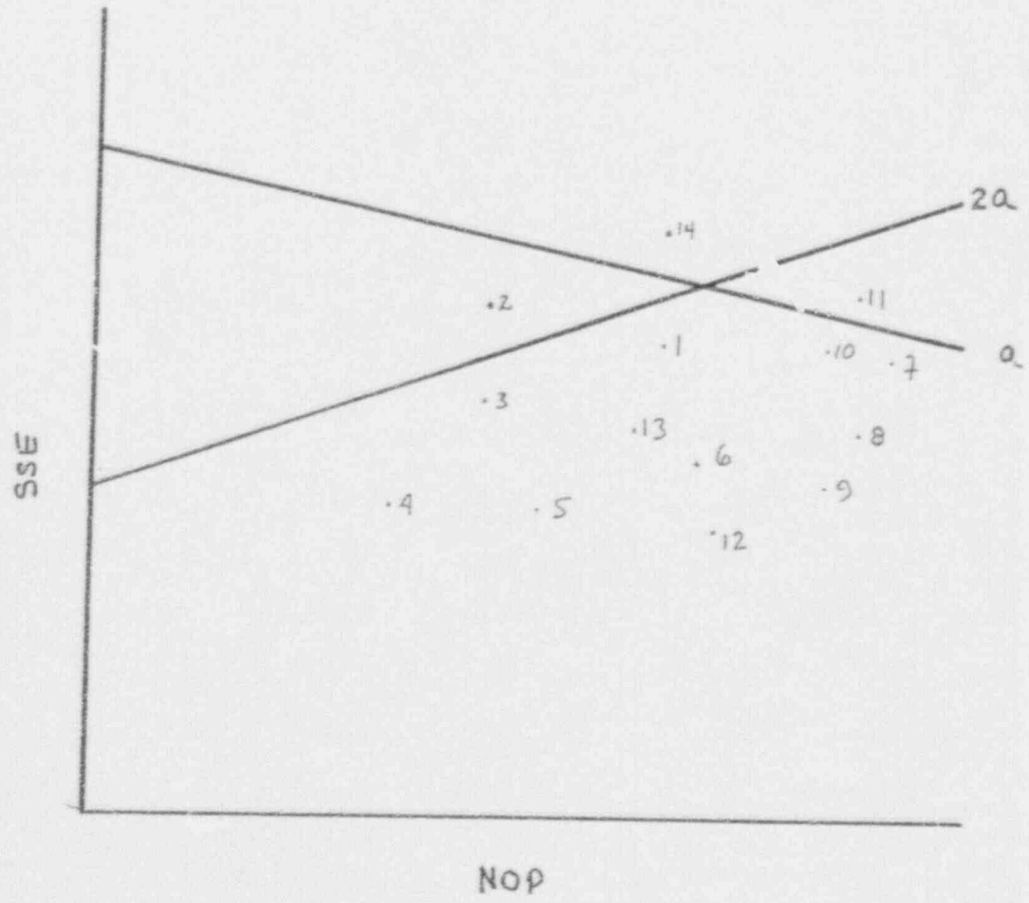


Figure 15
LBB Piping Evaluation Diagram



PIPE LING ⟹ LOADS



Points 1, 3-10, 12, 13 pass LBB

Point 2 fails (NOP+SSE) on 2a

Point 11 fails $\sqrt{2}$(NOP+SSE) on a

Point 14 fails (NOP+SSE) on 2a
and $\sqrt{2}$(NOP+SSE) on a

Figure 16
Use of the LBB Piping Evaluation Diagram

APPENDIX F

MAIN COOLANT LOOP

LEAK-BEFORE-BREAK EVALUATION

APPENDIX F

LBB EVALUATION OF THE MAIN COOLANT LOOP

LBB EVALUATION OF THE HOT LEG

The RCS hot leg was analyzed as a 49-inch OD, 3.5-inch thick pipe. The material used in this evaluation is discussed in Appendix E. The NOP loads for this System 80+ evaluation are based on specified loads from a previous (System 80) ABB-CE plant design. The maximum design loads for the hot leg are the SSE loads. The SSE loads are based on System 80+ envelope results of the RCS seismic analysis for all soil cases. Margin is included in all loads given to account for uncertainties. The loads are given in Table I.

A piping evaluation diagram was constructed for the hot leg using the procedure described in Appendix E. The data for this diagram were generated from two stability analyses. The first was for a leakage crack determined by pressure only, M = 0. The stability plots are shown in Figures (1) and (2). The second stability analysis was for a leakage crack length determined by pressure and a moment of 50,000 inch-kips. The stability plots are shown in Figures (3) and (4). These two stability analyses are used to construct the piping evaluation diagram, Figure (5).

The values for the NOP and SSE loading conditions from Table I are plotted on the diagram in Figure (5). The hot leg passes LBB for the preliminary loads and assumed lower bound material properties.

LBB EVALUATION OF THE COLD LEG

The RCS cold leg was analyzed as a 36-inch OD, 3.0-inch thick pipe. The material used in this evaluation is discussed in Appendix E. The NOP loads for this System 80+ evaluation are based on specified loads from a previous (System 80) ABB-CE plant design. The maximum design loads for the cold leg are the SSE loads. The SSE loads are based on System 80+ envelope results of the RCS seismic analysis for all soil cases. Margin is included in all loads given to account for uncertainties. The loads are given in Table I.

Rather than construct a piping evaluation diagram, a single stability evaluation was performed on a pressure only leakage crack length. The stability analysis of $\sqrt{2}$ x (NOP + SSE) for the leakage crack is shown in Figure (6). The maximum NOP + SSE combination was used. The stability analysis of (NOP + SSE) for 2 times the leakage crack is shown in Figure (7). The maximum NOP + SSE combination of loads at all locations was used.

RESULTS AND DISCUSSION

The RCS hot leg and cold leg clearly pass the stability analysis portion of the LBB evaluation for the given loads and lower bound material assumptions. The hot leg was analyzed using the piping evaluation diagram. The utility of this diagram is that for any changes in the loadings, the pipeline may immediately be reanalyzed without any more lengthy J-integral finite element analyses. The cold leg was analyzed usirg a limiting, conservative pressure-only crack length and highest combination of NOP and SSE loads at all locations. The cold leg passed the LBB stability evaluation with very low J-integral values.

TABLE I

PRELIMINARY SYSTEM 80+ MAIN COOLANT LOOP

HOT LEG AND COLD LEG NOP AND SSE LOADS

LOCATION	NORMAL OPERATION	SSE
	RSS MOMENT (inch-kips)	RSS MOMENT (inch-kips)
Hot Leg		
RV Outlet Nozzle	95,800	25,100
SG Inlet Nozzle	43,200	14,700
Cold Leg		
RV Inlet Nozzle	11,500	7,300
SG Outlet Nozzle	7,700	5,200
RCP Discharge Nozzle	13,600	6,100
RCP Suction Nozzle	11,700	4,800

System pressure = 2250 psia

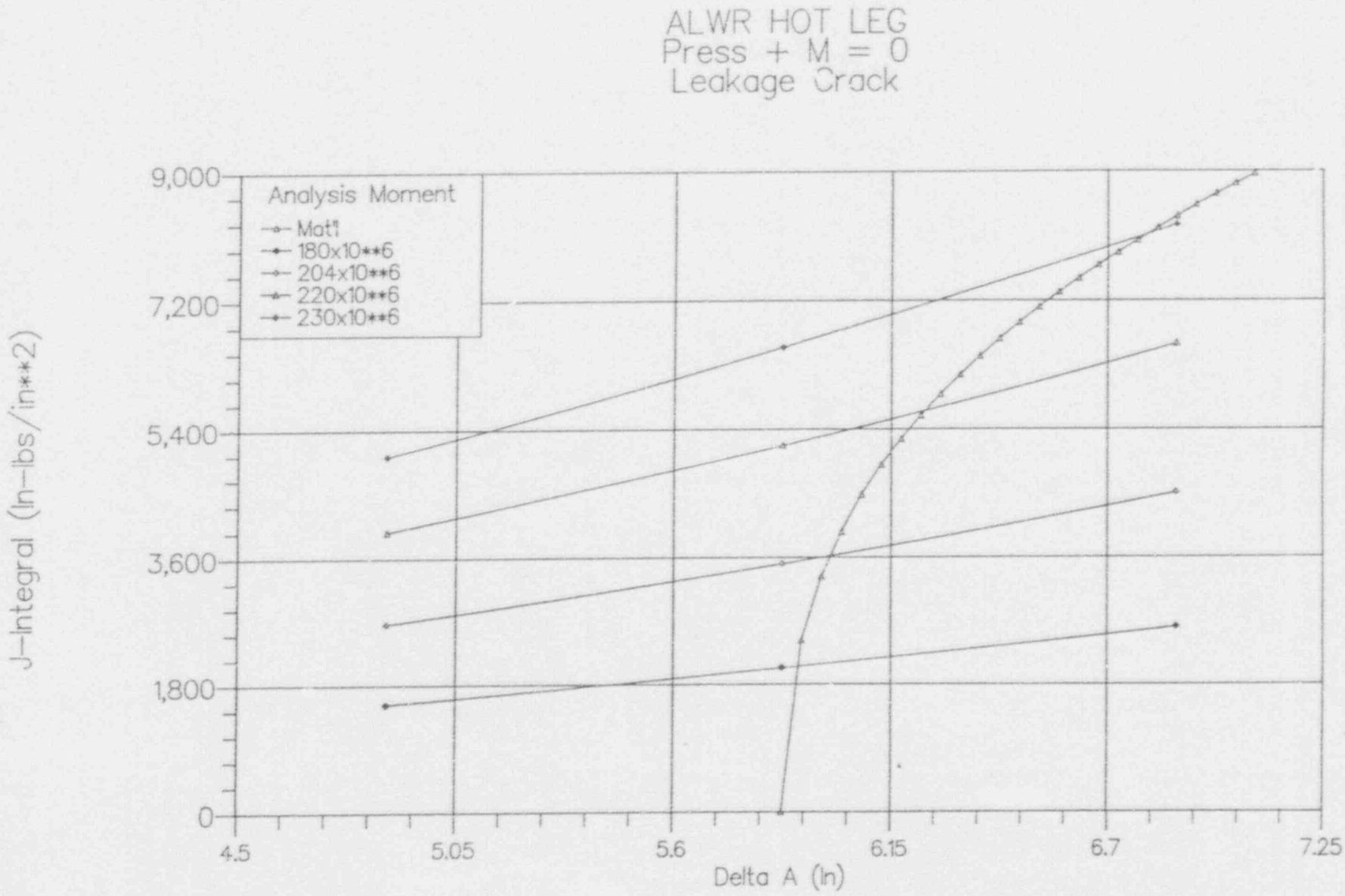

ALWR HOT LEG
Press + M = 0
Leakage Crack
Analysis Moment
Mat1
180x10**6
204x10**6
220x10**6
230x10**6
9,000
7,200
5,400
3,600
1,800
0
J-Integral (in-lbs/in**2)
4.5
5.05
5.6
6.15
6.7
7.25
Delta A (in)

Figure 1

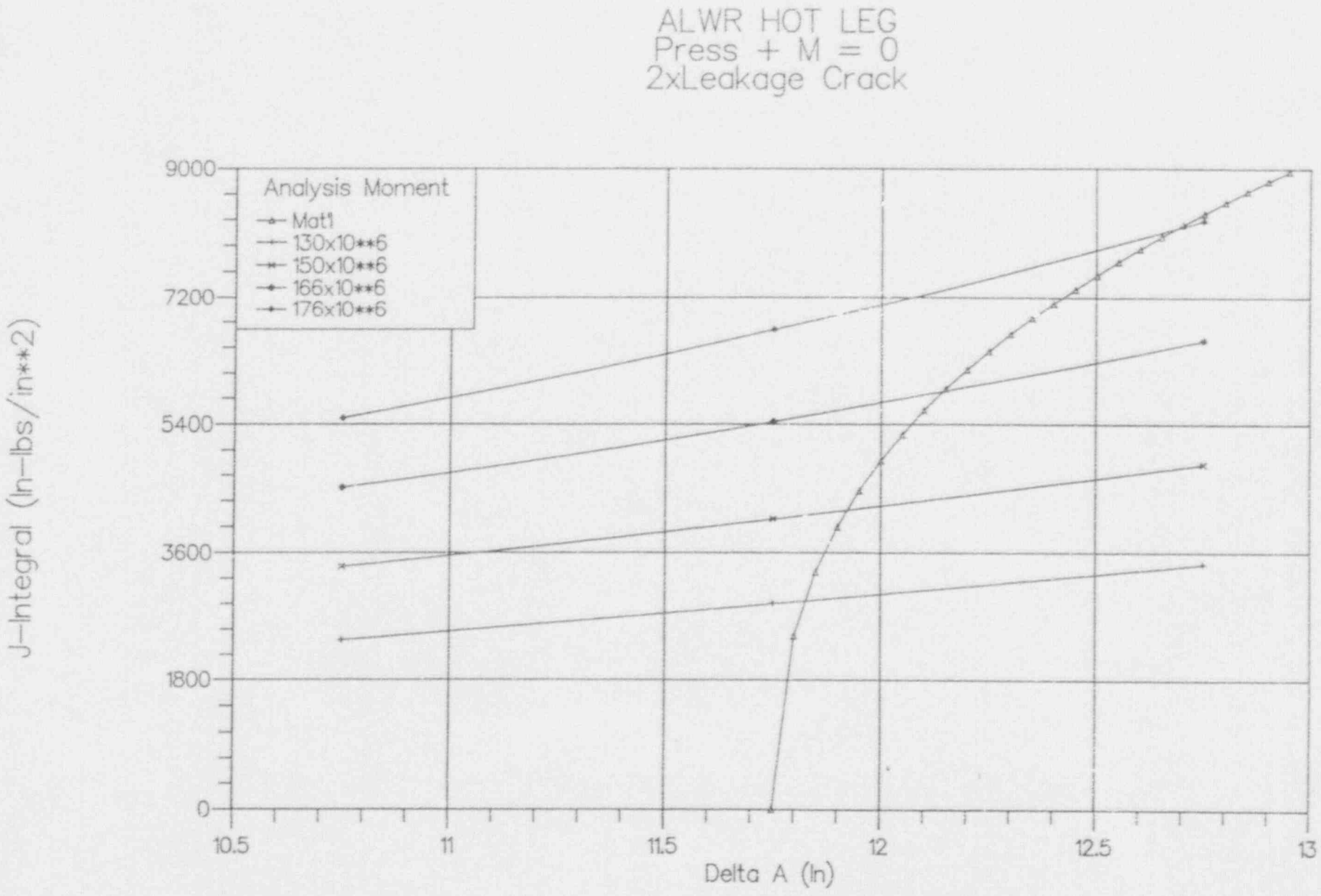

ALWR HOT LEG
Press + M = 0
2xLeakage Crack
Analysis Moment
Mat1
130x10**6
150x10**6
166x10**6
176x10**6
9000
7200
5400
3600
1800
0
J-Integral (in-lbs/in**2)
10.5
11
11.5
12
12.5
13
Delta A (in)

Figure 2

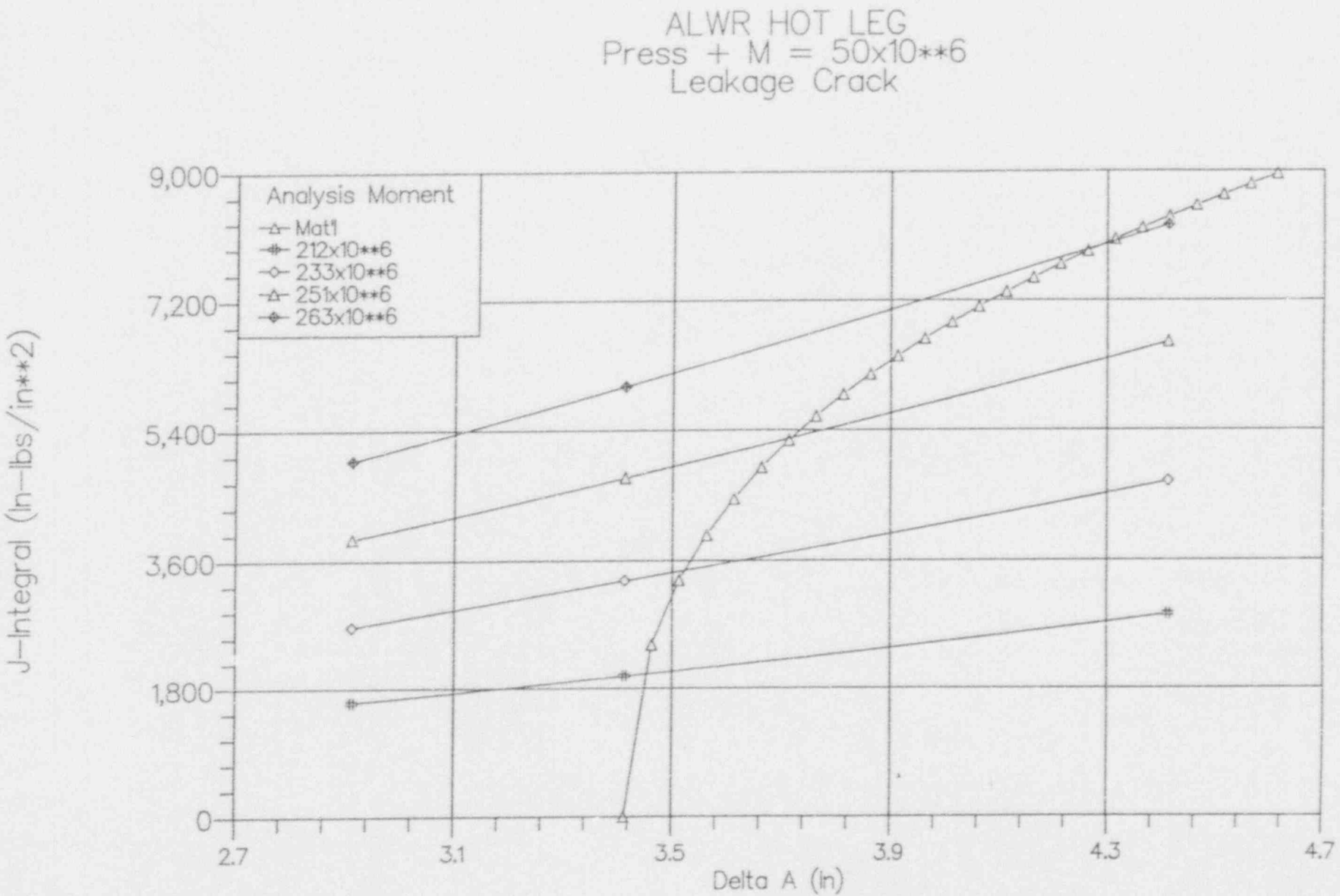

ALWR HOT LEG
Press + M = 50x10**6
Leakage Crack
Analysis Moment
Mat1
212x10**6
233x10**6
251x10**6
263x10**6
J-Integral (in-lbs/in**2)
9,000
7,200
5,400
3,600
1,800
0
2.7
3.1
3.5
3.9
4.3
4.7
Delta A (in)

Figure 3

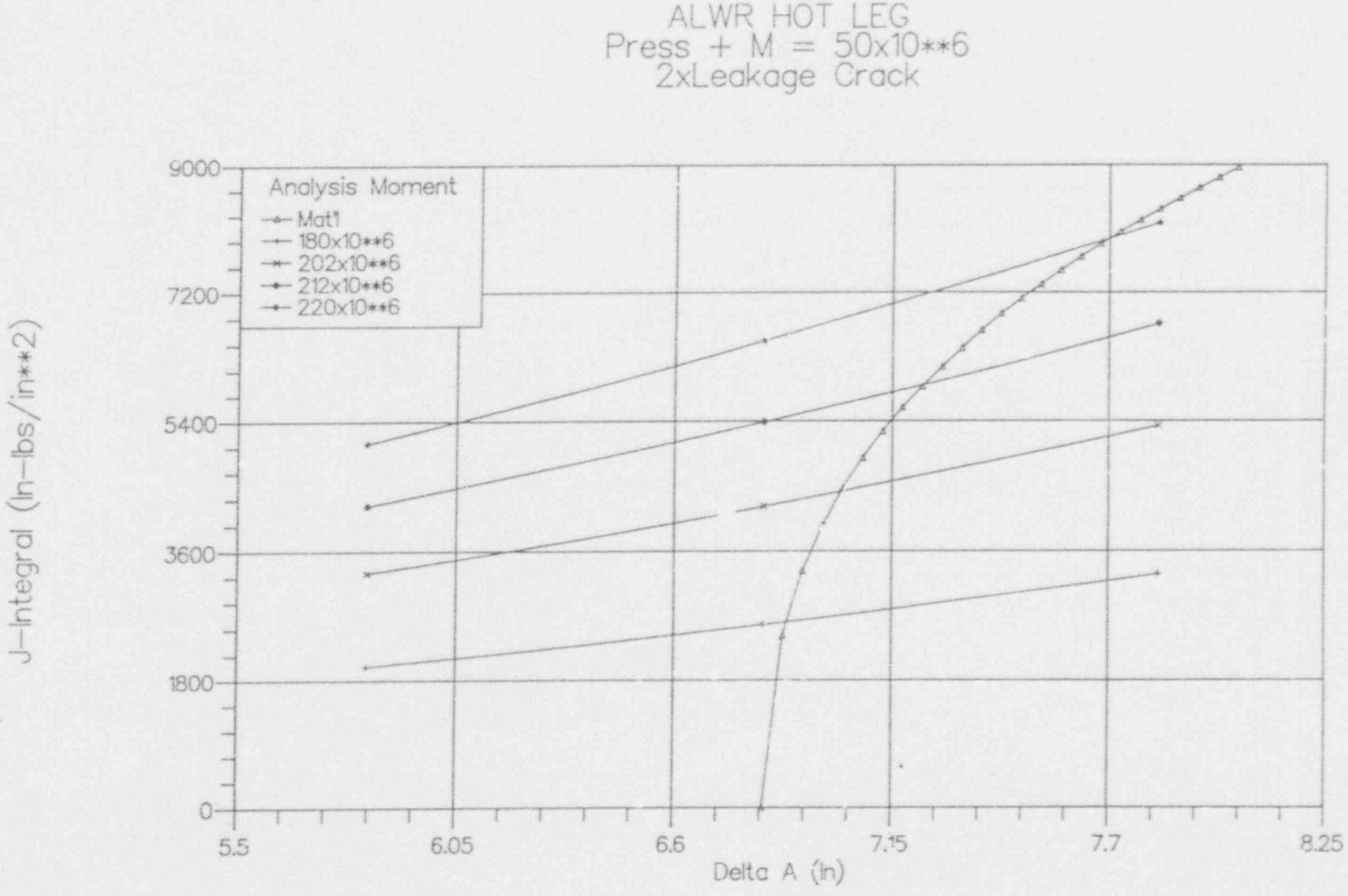

ALWR HOT LEG
Press + M = 50x10**6
2xLeakage Crack
Analysis Moment
Mat'l
180x10**6
202x10**6
212x10**6
220x10**6
J-Integral (in-lbs/in**2)
9000
7200
5400
3600
1800
0
5.5
6.05
6.6
7.15
7.7
8.25
Delta A (in)

Figure 4

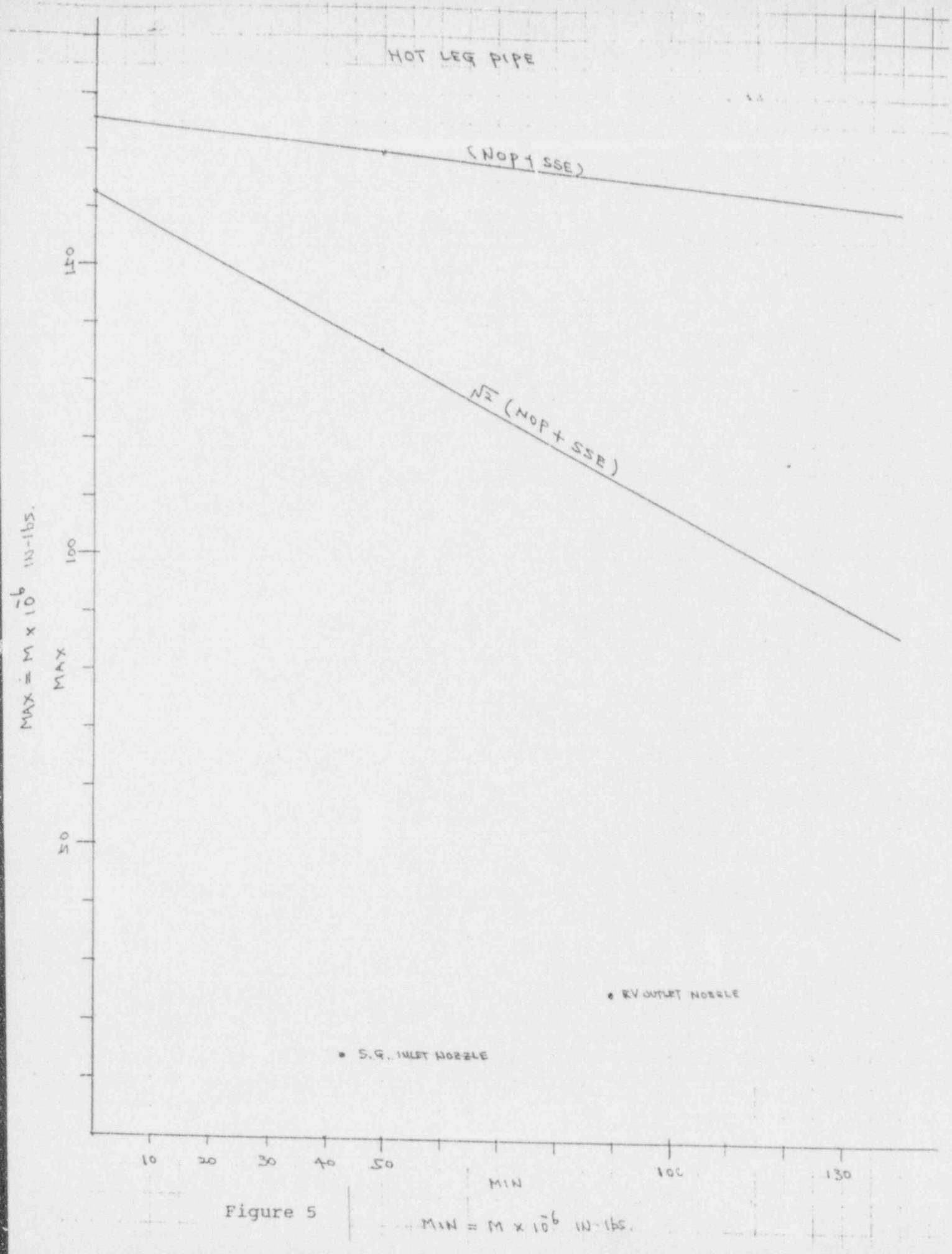

HOT LEG PIPE
(NOP + SSE)
√2 (NOP + SSE)
MAX = M x 10⁻⁶ IN-LBS.
MAX
150
100
40
• S.G. INLET NOZZLE
• RV OUTLET NOZZLE
10
20
30
40
50
100
130
MIN
MIN = M x 10⁻⁶ IN-LBS.

Figure 5

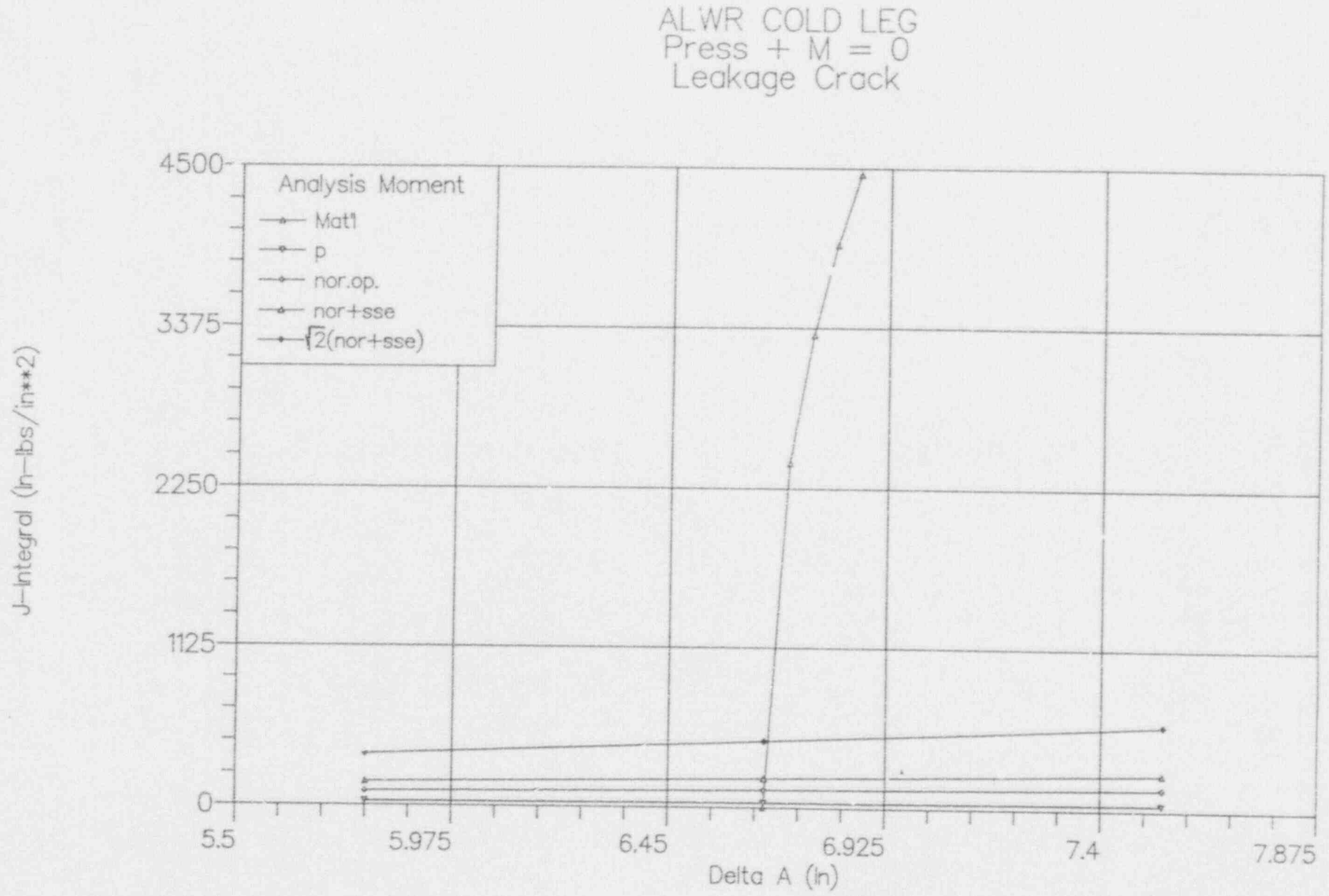

ALWR COLD LEG
Press + M = 0
Leakage Crack
Analysis Moment
Mat1
p
nor.op.
nor+sse
√2(nor+sse)
4500
3375
2250
1125
0
J-Integral (in-lbs/in**2)
5.5
5.975
6.45
6.925
7.4
7.875
Delta A (in)

Figure 6

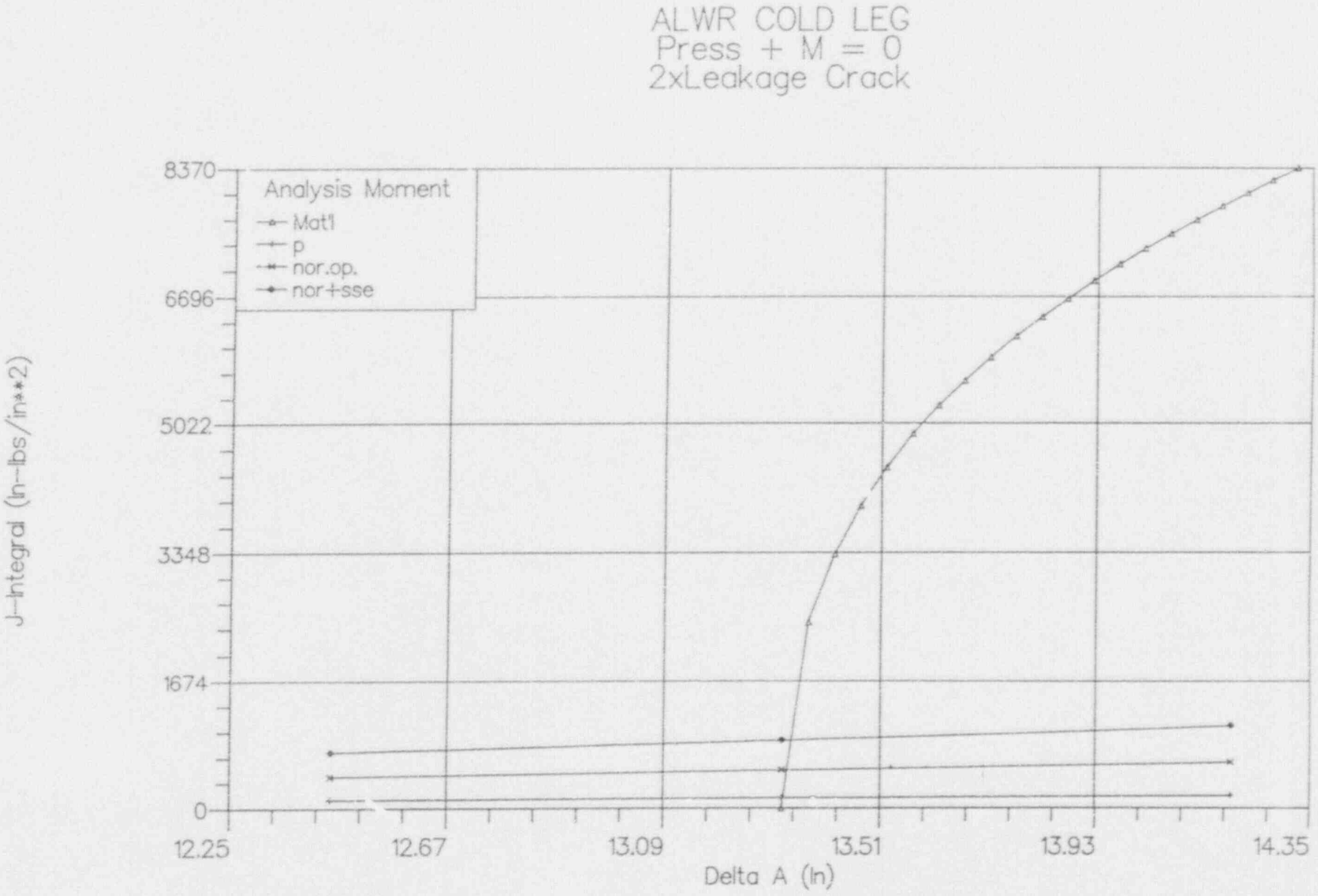

ALWR COLD LEG
Press + M = 0
2xLeakage Crack
Analysis Moment
Matl
p
nor.op.
nor+sse
8370
6696
5022
3348
1674
0
J-Integral (in-lbs/in**2)
12.25
12.67
13.09
13.51
13.93
14.35
Delta A (in)

Figure 7

APPENDIX G

SURGE LINE

LEAK-BEFORE-BREAK EVALUATION

APPENDIX G

LBB EVALUATION OF THE PRELIMINARY SURGE LINE

The surge line was analyzed as a 12.75-inch OD, 1.312-inch thick pipe. The material used in this evaluation is discussed in Appendix E. The pipe loads are developed and discussed in Appendix A. A piping evaluation diagram was constructed for the surge line using the procedure described in Appendix E. The stability of the leakage crack is evaluated for (NOP + maximum design load) and $\sqrt{2}$ x (NOP + maximum design load), where the maximum design load is either the SSE load or the stratified flow (SF) load. The data for this diagram were generated from two stability analyses. The first was for a leakage crack length determined by pressure + M_1 = (later). The stability plots are shown in Figures (1) and (2). The second stability analysis was for a leakage crack determined by pressure + M_2 = (later). The stability plots are shown in Figures (3) and (4). These two stability analyses are used to construct the piping evaluation diagrams, Figures (5) and (6).

For maximum design load = SSE:

From the first analysis, Figures (1) and (2):

Analysis of a: $\sqrt{2}\ (NOP + SSE_1) = M_{CRIT}$

$$SSE_1 = \frac{M_{CRIT}}{\sqrt{2}} - NOP_1$$

Analysis of 2a: $(NOP + SSE_2) = M_{CRIT}$

$$SSE_2 = M_{CRIT} - NOP$$

From the second analysis, Figures (3) and (4):

Analysis of a: $\sqrt{2}\ (NOP + SSE_3) = M_{CRIT}$

$$SSE_3 = \frac{M_{CRIT}}{\sqrt{2}} - NOP$$

Analysis of 2a: $(NOP + SSE_4) = M_{CRIT}$

$$SSE_4 = M_{CRIT} - NOP$$

Each of the calculated SSE and NOP values are plotted on the piping evaluation diagram, Figure (5).

For maximum design load = stratified flow (SF) load:

From the first analysis, Figures (1) and (2):

Analysis of a: $\sqrt{2}\ (SF_1) = M_{CRIT}$

$$SF_1 = \frac{M_{CRIT}}{\sqrt{2}}$$

Analysis of 2a: $SF_2 = M_{CRIT}$

From the second analysis, Figures (3) and (4):

Analysis of a: $\sqrt{2}\ (SF_3) = M_{CRIT}$

$$SF_3 = \frac{M_{CRIT}}{\sqrt{2}}$$

Analysis of 2a: $SF_4 = M_{CRIT}$

Each of the calculated SF and NOP values are plotted on the piping evaluation diagram, Figure (6).

The moment, M, will be determined (later). Figures (1) through (6) will be generated (later).

APPENDIX H

MAIN STEAM LINE

LEAK-BEFORE-BREAK EVALUATION

APPENDIX H

LBB EVALUATION OF THE PRELIMINARY MAIN STEAM LINE

The main steam line (MSL) was analyzed as a 28-inch ID, 1.5-inch thick pipe. The material used in this evaluation is discussed in Appendix E. MSL loads are developed and discussed in Appendix B. The maximum design load was determined to be the SSE load. A piping evaluation diagram was constructed for the MSL using the procedure in Appendix E. The data for this diagram were generated from two stability analyses. The first was for a leakage crack length determined by pressure + M = 1×10^6 inch-lbs. The stability plots are shown in Figures (1) and (2). The second stabilit analysis was for a leakage crack length determined by pressure + M = 50×10^6 inch-lbs. The stability plots are shown in Figures (3) and (4). These two stability analyses are used to construct the piping evaluation diagram, Figure (5).

From the first analysis, Figures (1) and (2):

Analysis of a: $\sqrt{2} \times (NOP + SSE_1) = M_{CRIT}$ NOP = 1×10^6 in-lb
M = 32.6×10^6 in-lb

$$SSE_1 = \left(\frac{32.6}{\sqrt{2}} - 1\right) \times 10^6$$

$$SSE_1 = 22 \times 10^6$$

Analysis of 2a: $(NOP + SSE_2) = M_{CRIT}$ NOP = 1×10^6 in-lb
M = 13.4×10^6 in-lb

$$SSE_2 = 12.4 \times 10^6$$

From the second analysis, Figures (3) and (4):

Analysis of a: $\sqrt{2} \times (NOP + SSE_3) = M_{CRIT}$ NOP = 5×10^6 in-lb, M = 37.5×10^6 in-lb

$$SSE_3 = \left(\frac{37.5}{\sqrt{2}} - 5\right) \times 10^6$$

$$SSE_3 = 21.5 \times 10^6$$

Analysis of 2a: $(NOP + SSE_4) = M_{CRIT}$ NOP = 5×10^6 in-lb, M = 20.5×10^6 in-lb

$$SSE_4 = 15.5 \times 10^6$$

Each of these calculated SSE vs. NOP values are plotted on the piping evaluation diagram, Figure (5).

The NOP and SSE piping loads from Appendix B are summarized in Tables I and II. The NOP and SSE loads are cross-plotted on the piping evaluation diagram, Figure (5), and all points in the line are shown to pass LBB.

TABLE I

PRELIMINARY SYSTEM 80+ MAIN STEAM LINE

NOP LOADS

LOCATION POINT	M_{YY} (ft-lb)	M_{ZZ} (ft-lb)	RSS MOMENT (in-lb) x 10^{-6}
1	399,766	61,265	4.85
2	286,304	32,905	3.46
3	87,290	118,684	1.77
4	18,375	80,246	0.99
5	51,743	80,246	1.12
6	41,490	92,480	1.22
7	1,032	215,206	2.59
8	48,929	1,193,969	14.30
9	23,205	512,392	6.15
10	47,502	1,125,951	13.50
11	50,442	1,092,779	13.10
12	41,441	939,114	11.30
13	19,162	311,093	3.70
14	21,341	365,042	4.38
15	144,421	113,310	2.20
16	206,115	471	2.47
17	211,885	10,688	2.54
18	938,075	33,312	11.30

TABLE II

PRELIMINARY SYSTEM 80+ MAIN STEAM LINE

SSE LOADS

LOCATION POINT	M_{YY} (ft-lb)	M_{ZZ} (ft-lb)	RSS MOMENT (in-lb) x 10^{-6}
1	1,039,879	571,269	14.2
2	517,093	286,633	7.1
3	414,491	297,315	6.1
4	441,965	446,924	7.5
5	649,210	446,735	9.4
6	222,917	405,273	5.5
7	160,724	232,030	3.1
8	525,076	865,389	12.1
9	180,342	411,113	5.4
10	296,882	215,747	4.4
11	340,332	329,484	5.7
12	303,088	321,605	5.3
13	143,502	208,991	3.0
14	175,804	259,808	3.7
15	150,27[illegible]	126,952	2.4
16	220,817	163,335	3.3
17	229,075	168,545	3.4
18	979,682	680,325	14.3

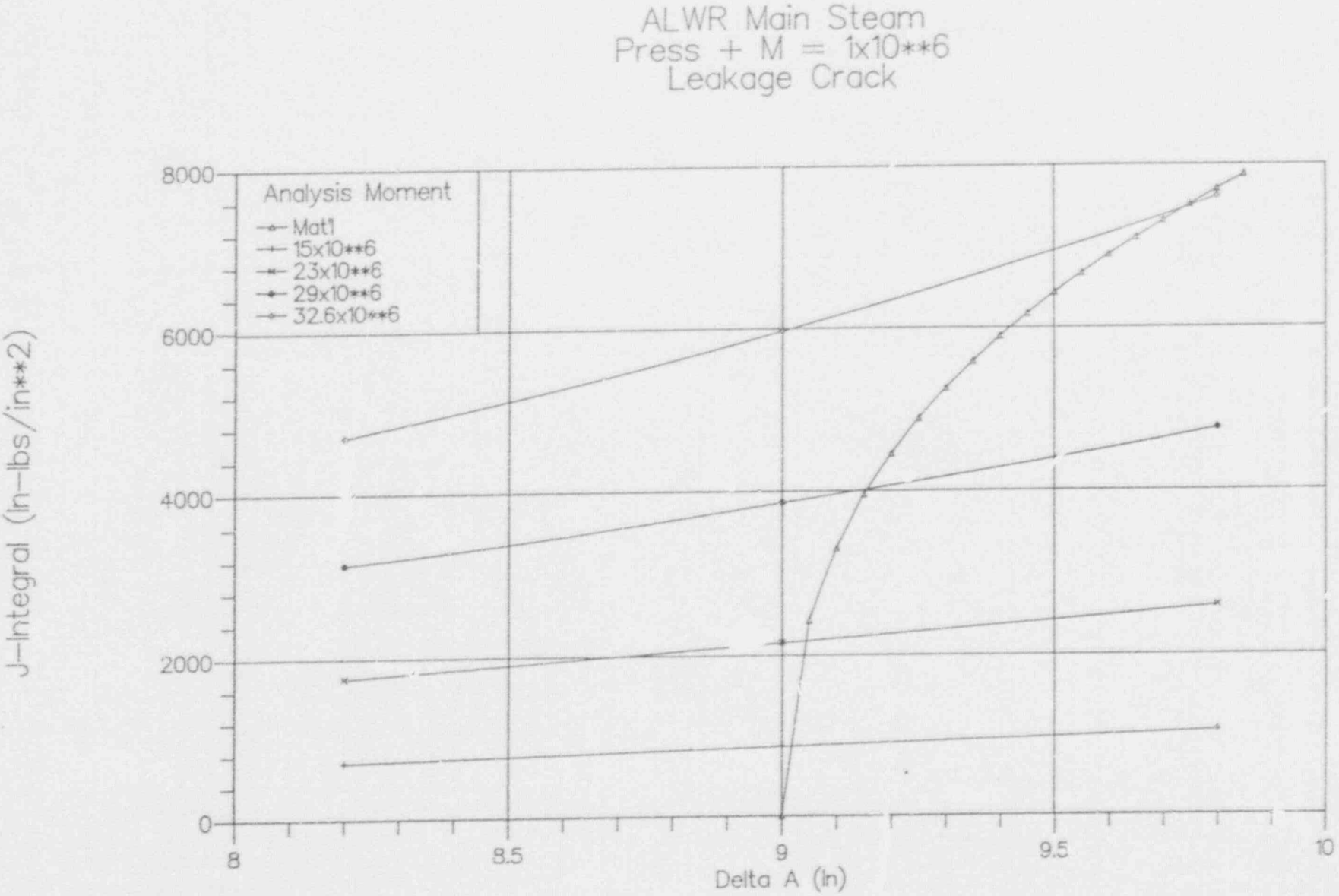

ALWR Main Steam
Press + M = 1x10**6
Leakage Crack
Analysis Moment
Mat1
15x10**6
23x10**6
29x10**6
32.6x10**6
J-Integral (in-lbs/in**2)
8000
6000
4000
2000
0
8
8.5
9
9.5
10
Delta A (in)

Figure 1

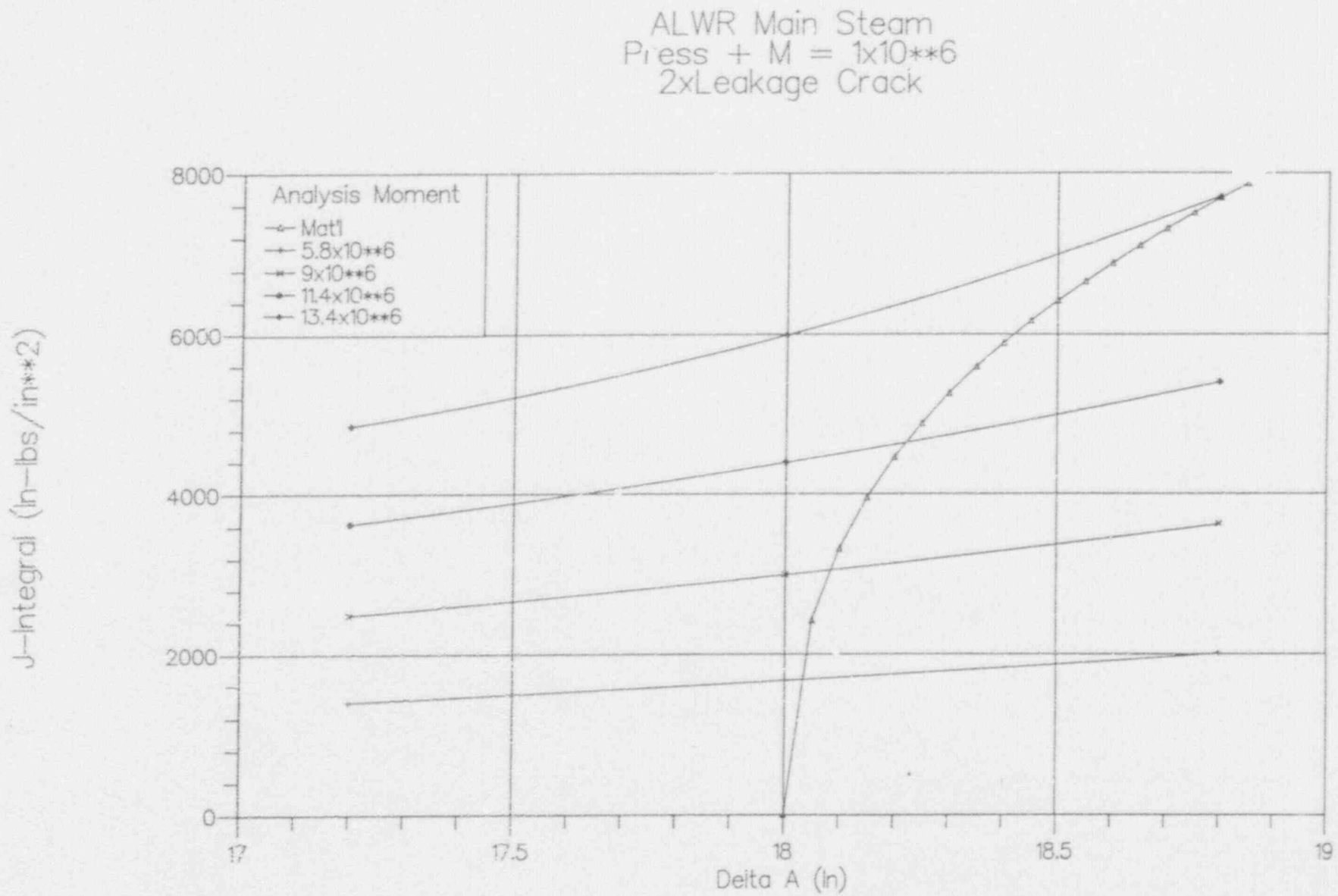

ALWR Main Steam
Press + M = 1x10**6
2xLeakage Crack
Analysis Moment
Mat1
5.8x10**6
9x10**6
11.4x10**6
13.4x10**6
8000
6000
4000
2000
0
J-Integral (in-lbs/in**2)
17
17.5
18
18.5
19
Delta A (in)

Figure 2

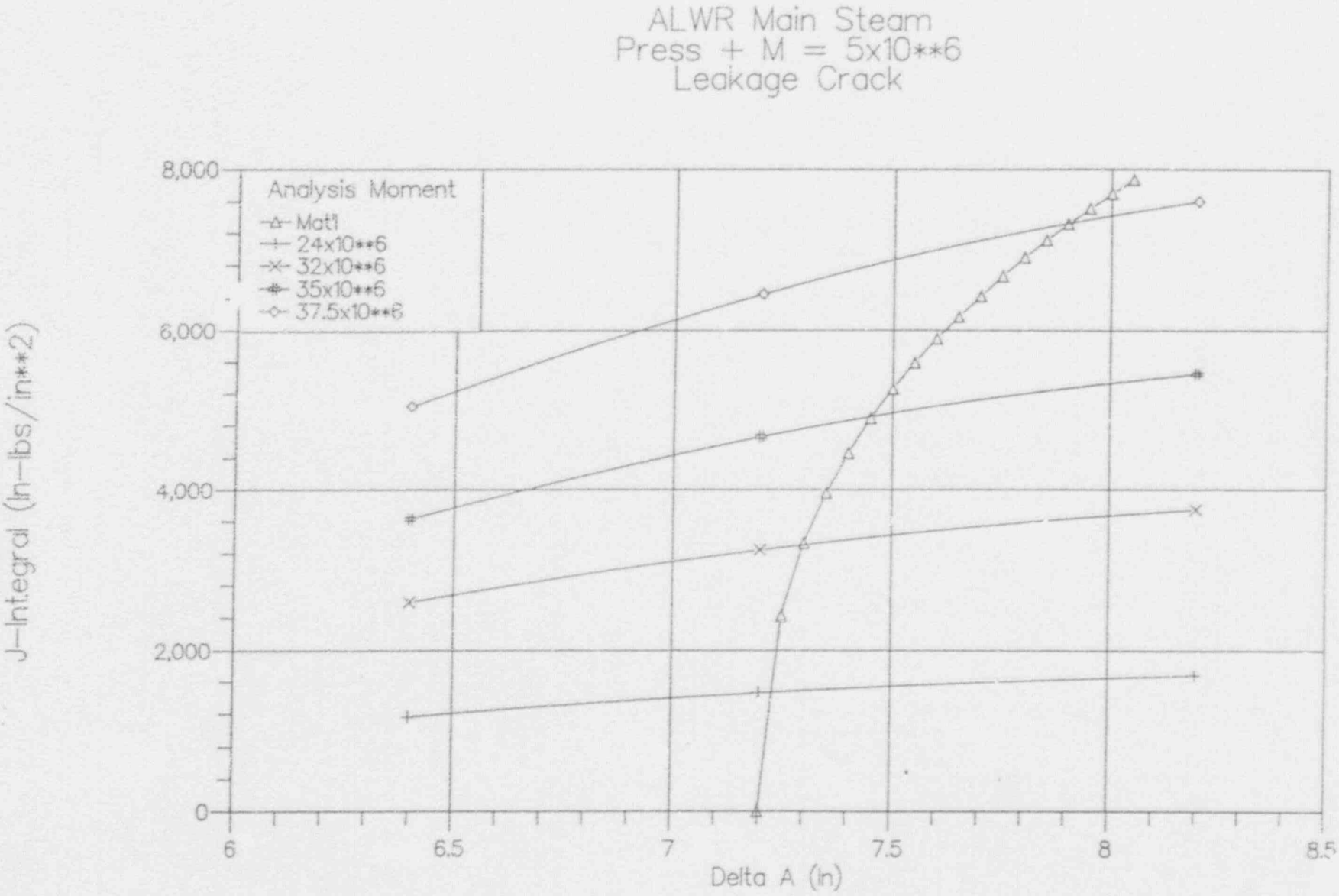

ALWR Main Steam
Press + M = 5x10**6
Leakage Crack
Analysis Moment
Matl
24x10**6
32x10**6
35x10**6
37.5x10**6
J-Integral (in-lbs/in**2)
8,000
6,000
4,000
2,000
0
6
6.5
7
7.5
8
8.5
Delta A (in)

Figure 3

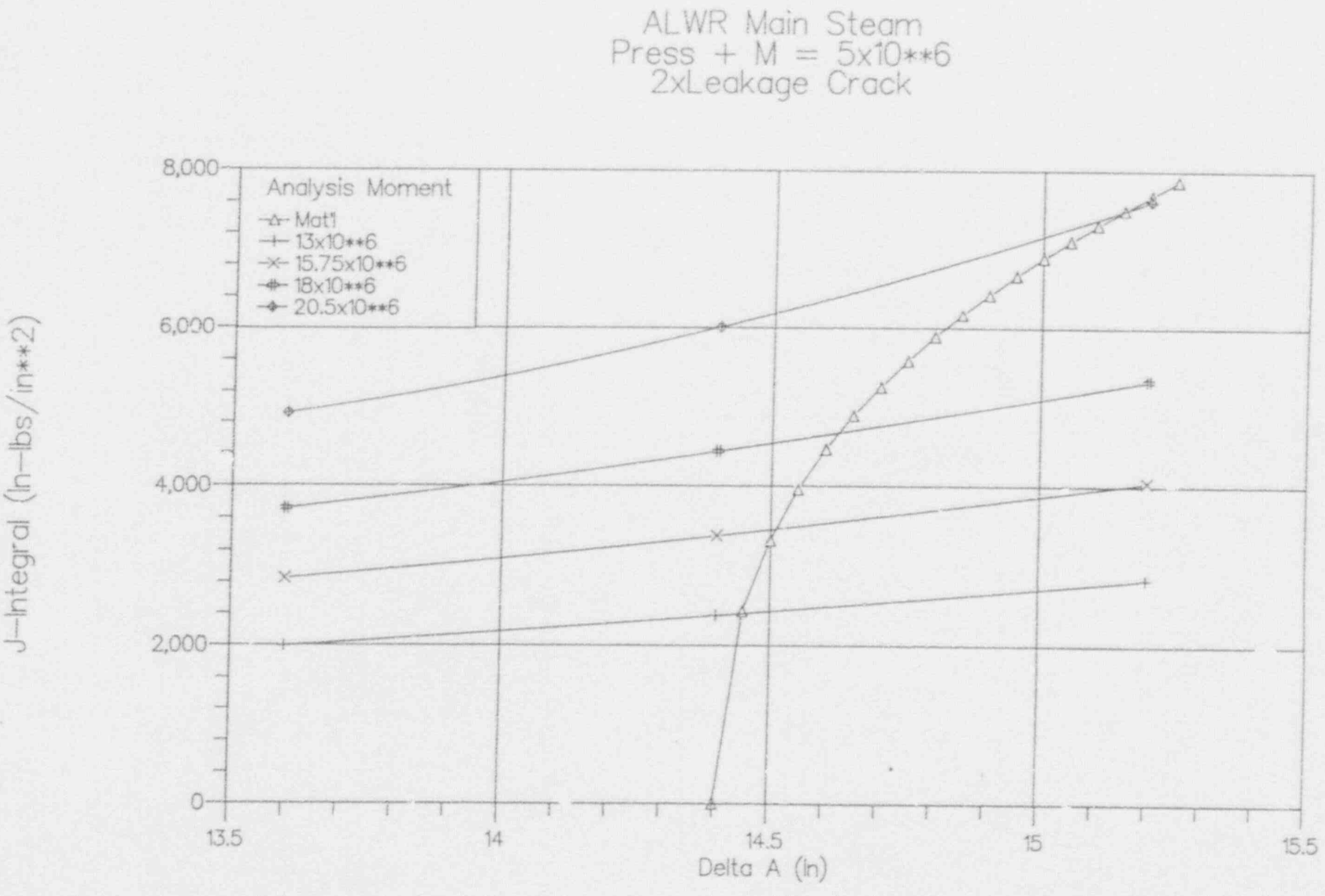

ALWR Main Steam
Press + M = 5x10**6
2xLeakage Crack
Analysis Moment
Mat'l
13x10**6
15.75x10**6
18x10**6
20.5x10**6
8,000
6,000
4,000
2,000
0
J-Integral (In-lbs/in**2)
13.5
14
14.5
15
15.5
Delta A (In)

Figure 4

SYSTEM 80+

Main Steam Line

LBLOCA Piping Evaluation Diagram

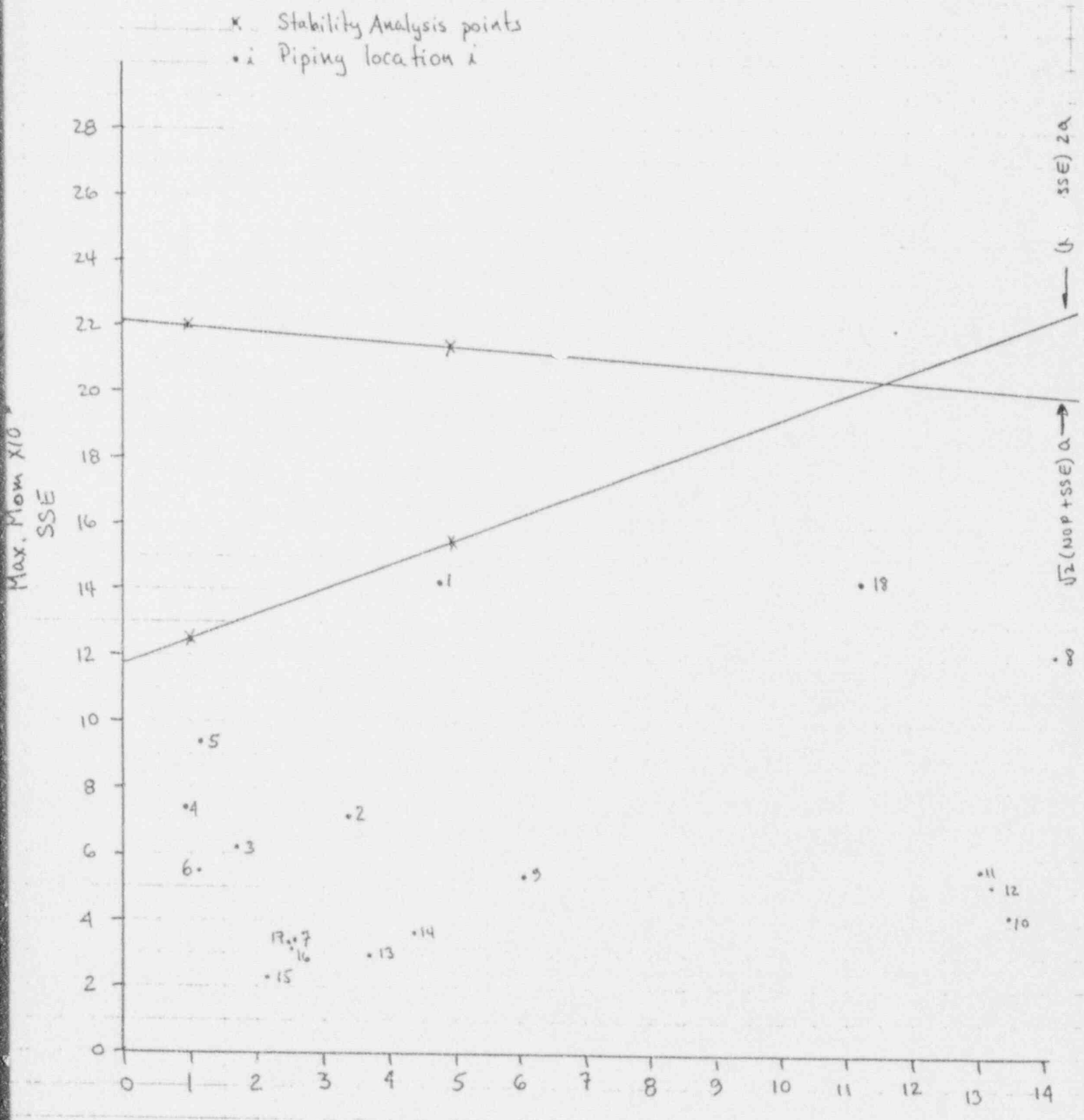


Figure 5

APPENDIX I

SHUTDOWN COOLING LINE

LEAK-BEFORE-BREAK EVALUATION

APPENDIX I

LBB EVALUATION OF THE PRELIMINARY SHUTDOWN COOLING LINE

The shutdown cooling line was analyzed as a 16.00-inch OD, 1.438-inch thick pipe. The material used in this evaluation is discussed in Appendix E. The pipe loads are developed and discussed in Appendix C. A piping evaluation diagram was constructed for the shutdown cooling line using the procedure described in Appendix E. The data for this diagram were generated from two stability analyses. The first was for a leakage crack length determined by pressure + M_1 = (later). The stability plots are shown in Figures (1) and (2). The second stability analysis was for a leakage crack determined by pressure + M_2 = (later). The stability plots are shown in Figures (3) and (4). These two stability analyses are used to construct the piping evaluation diagram, Figure (5).

The LBB evaluation of the shutdown cooling line is performed for the normally pressurized portion of the line, based on the Appendix C loads analysis for the anchor-to-anchor portion of the line.

From the first analysis, Figures (1) and (2):

Analysis of a: $\sqrt{2}\ (NOP + SSE_1) = M_{CRIT}$

$$SSE_1 = \frac{M_{CRIT}}{\sqrt{2}} - NOP_1$$

Analysis of 2a: $(NOP + SSE_2) = M_{CRIT}$

$$SSE_2 = M_{CRIT} - NOP$$

From the second analysis, Figures (3) and (4):

Analysis of a: $\sqrt{2}\ (NOP + SSE_3) = M_{CRIT}$

$$SSE_3 = \frac{M_{CRIT}}{\sqrt{2}} - NOP$$

Analysis of 2a: $(NOP + SSE_4) = M_{CRIT}$

$$SSE_4 = M_{CRIT} - NOP$$

Each of the calculated SSE and NOP values are plotted on the piping evaluation diagram, Figure (5).

The moment, M, will be determined (later). Figures (1) through (5) will be generated (later).

APPENDIX J

DIRECT VESSEL INJECTION

LEAK-BEFORE-BREAK EVALUATION

APPENDIX J

LBB EVALUATION OF THE PRELIMINARY DIRECT VESSEL INJECTION

The direct vessel injection line was analyzed as a 10.75-inch OD, 1.0-inch thick pipe. The material used in this evaluation is discussed in Appendix E. The pipe loads are developed and discussed in Appendix D. A piping evaluation diagram was constructed for the direct vessel injection cooling line using the procedure described in Appendix E. The data for this diagram were generated from two stability analyses. The first was for a leakage crack length determined by pressure + M_1 = (later). The stability plots are shown in Figures (1) and (2). The second stability analysis was for a leakage crack determined by pressure + M_2 = (later). The stability plots are shown in Figures (3) and (4). These two stability analyses are used to construct the piping evaluation diagram, Figure (5).

From the first analysis, Figures (1) and (2):

Analysis of a: $\sqrt{2}\ (NOP + SSE_1) = M_{CRIT}$

$$SSE_1 = \frac{M_{CRIT}}{\sqrt{2}} - NOP_1$$

Analysis of 2a: $(NOP + SSE_2) = M_{CRIT}$

$$SSE_2 = M_{CRIT} - NOP$$

From the second analysis, Figures (3) and (4):

Analysis of a: $\sqrt{2}\ (NOP + SSE_3) = M_{CRIT}$

$$SSE_3 = \frac{M_{CRIT}}{\sqrt{2}} - NOP$$

Analysis of 2a: $(NOP + SSE_4) = M_{CRIT}$

$$SSE_4 = M_{CRIT} - NOP$$

Each of the calculated SSE and NOP values are plotted on the piping evaluation diagram, Figure (5).

The moment, M, will be determined (later). Figures (1) through (5) will be generated (later).

APPENDIX K

SAMPLE ASME CLASS 1 PIPING ANALYSIS

APPENDIX K

SAMPLE ASME CLASS 1 PIPING ANALYSIS

Purpose

This appendix summarizes the results of a sample ASME Class 1 stress analysis. The System 80+ Shutdown Cooling line in the Reactor Building is used as the sample model. The piping included in the model is represented in the isometric sketch shown in Appendix C. The analysis model originates at the hot leg nozzle and terminates at the Reactor Building penetration. Anchors are modelled at these locations. The model also includes additional piping for the relief valve discharge to the holdup volume. All applicable design conditions, loadings, cases, and regulatory requirements are met in the analysis as defined in the System 80+ Certification Program Draft Distribution Systems Design Guide, Reference 2.

Method

The piping is modelled as a three dimensional framework for analysis. Static analysis is performed by the Direct Stiffness Method and a simple Lumped Mass Idealization is used to determine mode shapes and frequencies for the dynamic analysis. This piping is analyzed using the SUPERPIPE computer program.

References and Design Inputs

1. ASME Boiler and Pressure Vessel Code, Section III, 1989.
2. Draft Distribution Systems Design Guide.
3. ABB-CE Letter dated 4/21/92 to R.W. Bonsall enclosing Preliminary Thermal Movements and SSE Seismic Anchor Movements.
4. ABB-Impell memo dated 5/21/92 to ABB-CE, Attn: R.A. Matzie enclosing System 80+ N-411 Spectra and SAM.
5. ABB-CE Letter dated 6/16/92 to R.W. Bonsall enclosing Vibratory Motion at Steam Generator Nozzles Due to Feedwater Line Break.
6. ABB-CE Letter dated 5/8/92 to R.W. Bonsall enclosing Thermal Transient Data.
7. System 80+ Shutdown Cooling System Piping and Instrumentation Diagram.
8. System 80+ Nuclear Island Detailed Arrangement Drawings.

Results

The following pages provide the Class 1 code compliance check of ASME code equations for the pipe as modelled. As additional design information becomes available, it will be included in a final analysis. Results from the detailed analysis include pipe displacements, forces, moments, and stresses, support/restraint loads, and nozzle loads (anchor loads). Since the analysis is preliminary and design information is not available for allowable nozzle or penetration loads, it is not within the scope of the calculation to evaluate those loads.

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

ASME SECTION III CLASS 1 CODE COMPLIANCE SUMMARY

NB-3640 PRESSURE DESIGN OF COMPONENTS

MAXIMUM RATIO OF DESIGN PRESSURE TO EQ. 3 ALLOWABLE PRESSURE (RATIO OF 1.0 IS ACCEPTABLE)

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	SECTION NAME	PRESSURE RATIO
RUN1	3R	2A	STRP	16S140	0.89

SINCE THE RATIO DOES NOT EXCEED 1.00 THE CODE REQUIREMENTS FOR STRP, CRVP AND BELB COMPONENTS UNDER INTERNAL PRESSURE ARE MET

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

ASME SECTION III CLASS 1 CODE COMPLIANCE SUMMARY

NB-3652 CONSIDERATION OF DESIGN CONDITIONS

MAXIMUM RATIO OF EQ.9 STRESS TO 1.50SM

RUN NAME	LOP NO.	DCP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	STRESS RATIO
RUN1	3M	2A	AMTT	AMTT-NOZ	SA376 TP316	0.43
RUN1	3R	2A	STRP	16S140	SA376 TP316	0.43

SINCE THE RATIO DOES NOT EXCEED 1.0 THE CODE REQUIREMENTS FOR PRIMARY STRESSES ARE MET

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

ASME SECTION III CLASS 1 CODE COMPLIANCE SUMMARY

NB-3653, NB-3654 CONSIDERATION OF LEVEL A AND B SERVICE LIMITS

MAXIMUM CUMULATIVE USAGE FACTOR

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	USAGE FACTOR
RUN1	1R	1	STRP	RIGID	SA376 TP316	0.00
RUN1	2L	2	STRP	RIGID	SA376 TP316	0.00
RUN1	2R	2	STRP	3XTK	SA376 TP316	0.00
RUN1	3L	2A	STRP	3XTK	SA376 TP316	0.00
RUN1	3W	2A	AWTT	AWTT-NOZ	SA376 TP316	0.00
RUN1	3R	2A	STRP	16S140	SA376 TP316	0.00
RUN1	4L	A01A	STRP	16S140	SA376 TP316	0.00
RUN1	4W	A01A	AWBW	AWBW	SA376 TP316	0.00
RUN1	4R	A01A	BELB	16S140	SA376 TP316	0.00
RUN1	5		BELB	16S140	SA376 TP316	0.00
RUN1	6L	A01B	BELB	16S140	SA376 TP316	0.00
RUN1	6W	A01B	AWBW	AWBW	SA376 TP316	0.00
RUN1	6R	A01B	STRP	16S140	SA376 TP316	0.00
RUN1	7		STRP	16S140	SA376 TP316	0.00
RUN1	8		STRP	16S140	SA376 TP316	0.00
RUN1	9		STRP	16S140	SA376 TP316	0.00
RUN1	10L	A1A	STRP	16S140	SA376 TP316	0.00
RUN1	10W	A1A	AWBW	AWBW	SA376 TP316	0.00
RUN1	10R	A1A	BELB	16S140	SA376 TP316	0.00
RUN1	11		BELB	16S140	SA376 TP316	0.00
RUN1	12L	A1B	BELB	16S140	SA376 TP316	0.00
RUN1	12W	A1B	AWBW	AWBW	SA376 TP316	0.00
RUN1	12R	A1B	STRP	16S140	SA376 TP316	0.00
RUN1	13		STRP	16S140	SA376 TP316	0.00
RUN1	14		STRP	16S140	SA376 TP316	0.00
RUN1	15		STRP	16S140	SA376 TP316	0.00
RUN1	16		STRP	16S140	SA376 TP316	0.00
RUN1	17		STRP	16S140	SA376 TP316	0.00
RUN1	18		STRP	16S140	SA376 TP316	0.00
RUN1	19L	X01A	STRP	16S140	SA376 TP316	0.00
RUN1	19W	X01A	AWBW	AWBW	SA376 TP316	0.00
RUN1	19R	X01A	BELB	16S140	SA376 TP316	0.00
RUN1	20		BELB	16S140	SA376 TP316	0.00
RUN1	21L	X01B	BELB	16S140	SA376 TP316	0.00
RUN1	21W	X01B	AWBW	AWBW	SA376 TP316	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL RJUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

ASME SECTION III CLASS 1 CODE COMPLIANCE SUMMARY

NB-3653, NB-3654 CONSIDERATION OF LEVEL A AND B SERVICE LIMITS (CONTD.)

MAXIMUM CUMULATIVE USAGE FACTOR

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	USAGE FACTOR
RUN1	21R	X01B	STRP	16S140	SA376 TP316	0.00
RUN1	22		STRP	16S140	SA376 TP316	0.00
RUN1	23		STRP	16S140	SA376 TP316	0.00
RUN1	24		STRP	16S140	SA376 TP316	0.00
RUN1	25		STRP	16S140	SA376 TP316	0.00
RUN1	26		STRP	16S140	SA376 TP316	0.00
RUN1	27		STRP	16S140	SA376 TP316	0.00
RUN1	28		STRP	16S140	SA376 TP316	0.00
RUN1	29		STRP	16S140	SA376 TP316	0.00
RUN1	30L	X02A	STRP	16S140	SA376 TP316	0.00
RUN1	30M	X02A	AMBW	AMBW	SA376 TP316	0.00
RUN1	30R	X02A	BELB	16S140	SA376 TP316	0.00
RUN1	31		BELB	16S140	SA376 TP316	0.00
RUN1	32L	X02B	BELB	16S140	SA376 TP316	0.00
RUN1	32M	X02B	AMBW	AMBW	SA376 TP316	0.00
RUN1	32R	X02B	STRP	16S140	SA376 TP316	0.00
RUN1	33L	X1	STRP	16S140	SA376 TP316	0.00
RUN1	34L	X03A	STRP	16S140	SA376 TP316	0.00
RUN1	34M	X03A	AMBW	AMBW	SA376 TP316	0.00
RUN1	34R	X03A	BELB	16S140	SA376 TP316	0.00
RUN1	35		BELB	16S140	SA376 TP316	0.00
RUN1	36L	X03B	BELB	16S140	SA376 TP316	0.00
RUN1	36M	X03B	AMBW	AMBW	SA376 TP316	0.00
RUN1	36R	X03B	STRP	16S140	SA376 TP316	0.00
RUN1	37L	XX1	STRP	16S140	SA376 TP316	0.00
RUN1	38		STRP	16S140	SA376 TP316	0.00
RUN1	39		STRP	16S140	SA376 TP316	0.00
RUN1	40		STRP	16S140	SA376 TP316	0.00
RUN1	41		STRP	16S140	SA376 TP316	0.00
RUN1	42		STRP	16S140	SA376 TP316	0.00
RUN1	43		STRP	16S140	SA376 TP316	0.00
RUN1	44		STRP	16S140	SA376 TP316	0.00
RUN1	45		STRP	16S140	SA376 TP316	0.00
RUN1	46L	X04A	STRP	16S140	SA376 TP316	0.00
RUN1	46M	X04A	AMBW	AMBW	SA376 TP316	0.00

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

ASME SECTION III CLASS 1 CODE COMPLIANCE SUMMARY

NB-3653, NB-3654 CONSIDERATION OF LEVEL A AND B SERVICE LIMITS (CONTD.)

MAXIMUM CUMULATIVE USAGE FACTOR

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	USAGE FACTOR
RUN1	46R	X04A	BELB	16S140	SA376 TP316	0.00
RUN1	47		BELB	16S140	SA376 TP316	0.00
RUN1	48L	X04B	BELB	16S140	SA376 TP316	0.00
RUN1	48M	X04B	AMBM	AMBM	SA376 TP316	0.00
RUN1	48R	X04B	STRP	16S140	SA376 TP316	0.00
RUN1	49L	X2	STRP	16S140	SA376 TP316	0.00
RUN1	50L	X05A	STRP	16S140	SA376 TP316	0.00
RUN1	50M	X05A	AMBM	AMBM	SA376 TP316	0.00
RUN1	50R	X05A	BELB	16S140	SA376 TP316	0.00
RUN1	51		BELB	16S140	SA376 TP316	0.00
RUN1	52L	X05B	BELB	16S140	SA376 TP316	0.00
RUN1	52M	X05B	AMBM	AMBM	SA376 TP316	0.00
RUN1	52R	X05B	STRP	16S140	SA376 TP316	0.00
RUN1	53L	3	STRP	16S140	SA376 TP316	0.00
RUN1	53M	3	AMTT	AMTT-VLV	SA376 TP316	0.00
RUN1	55M	5	AMTT	AMTT-VLV	SA376 TP316	0.00
RUN1	55R	5	STRP	16S140	SA376 TP316	0.00
RUN1	56L	A04A	STRP	16S140	SA376 TP316	0.00
RUN1	56M	A04A	AMBM	AMBM	SA376 TP316	0.00
RUN1	56R	A04A	BELB	16S140	SA376 TP316	0.00
RUN1	57		BELB	16S140	SA376 TP316	0.00
RUN1	58L	A04B	BELB	16S140	SA376 TP316	0.00
RUN1	58M	A04B	AMBM	AMBM	SA376 TP316	0.00
RUN1	58R	A04B	STRP	16S140	SA376 TP316	0.00
RUN1	59L	6	STRP	16S140	SA376 TP316	0.00
RUN1	59M	6	AMTT	AMTT-VLV	SA376 TP316	0.00

SINCE THE USAGE FACTOR DOES NOT EXCEED 1.0 THE CODE REQUIREMENTS FOR SECONDARY AND PEAK STRESSES ARE MET

ADVANCED LIGHT WATER REACTOR *** X1 Z SNUB, X SNUB AT X05B
OPTIONAL ROUTING 7 FROM DESI
16" SHUTDOWN COOLING LINE

ASME SECTION III CLASS 1 CODE COMPLIANCE SUMMARY

NB-3656.1 CONSIDERATION OF LEVEL D SERVICE CONDITIONS - PERMISSIBLE PRESSURE

MAXIMUM RATIO OF LEVEL D PRESSURE TO EQ. 3 ALLOWABLE PRESSURE (RATIO OF 2.00 IS ACCEPTABLE)

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	SECTION NAME	PRESSURE RATIO
RUN1	3R	2A	STRP	16S140	0.89

SINCE THE RATIO DOES NOT EXCEED 2.00 THE CODE REQUIREMENTS FOR STRP, CRVP AND BELB COMPONENTS UNDER INTERNAL PRESSURE ARE MET

NB-3656.2 CONSIDERATION OF LEVEL D SERVICE CONDITIONS - ANALYSIS OF PIPING COMPONENTS

MAXIMUM RATIO OF EQ.9 STRESS TO 3.00SM

RUN NAME	SOP NO.	DCP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	STRESS RATIO
RUN1	4R	A01A	BELB	16S140	SA376 TP316	0.42

SINCE THE RATIO DOES NOT EXCEED 1.0 THE CODE REQUIREMENTS FOR PRIMARY STRESSES ARE MET

APPENDIX L

SAMPLE ASME CLASS 2/3 PIPING ANALYSIS

APPENDIX L

SAMPLE ASME CLASS 2/3 PIPING ANALYSIS

Purpose

This appendix summarizes the results of a sample ASME Class 2/3 stress analysis which includes a postulated pipe break analysis. The System 80+ Feedwater economizer line in the Reactor Building is used as the sample model. The piping included in the model is represented in the isometric sketch shown on the following page. The analysis model originates at the Steam Generator nozzles and terminates at the Main Steam Valve House exterior wall. Anchors are modelled at these locations. All applicable design conditions, loadings, codes, and regulatory requirements are met in the analysis as defined in the System 80+ Certification Program Draft Distribution Systems Design Guide, Reference 2.

Method

The piping is modelled as a three dimensional framework for analysis. Static analysis is performed by the Direct Stiffness Method and a simple Lumped Mass Idealization is used to determine mode shapes and frequencies for the dynamic analysis. This piping is analyzed using the SUPERPIPE computer program.

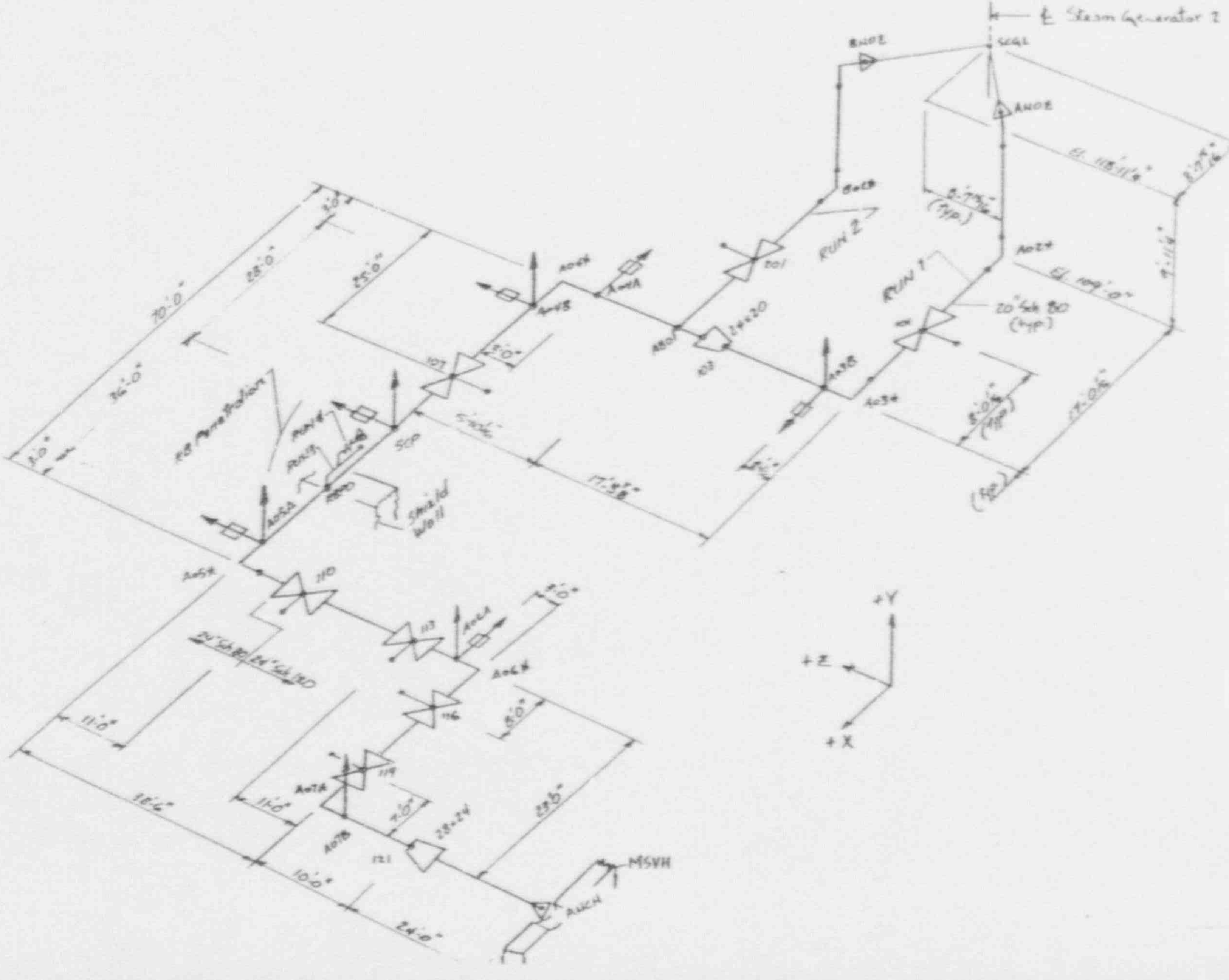
References and Design Inputs

1. ASME Boiler and Pressure Vessel Code, Section III, 1989.
2. Draf Distribution Systems Design Guide.
3. ABB-CE Letter dated 4/21/92 to R.W. Bonsall enclosing Preliminary Thermal Movements and SSE Seismic Anchor Movements.
4. ABB-Impell memo dated 5/21/92 to ABB-CE, Attn: R.A. Matzie enclosing System 80+ N-411 Spectra and SAM.
5. ABB-CE Letter dated 6/16/92 to R.W. Bonsall enclosing Vibratory Motion at Steam Generator Nozzles Due to Feedwater Line Break.
6. System 80+ Feedwater System Flow Diagram.
7. System 80+ Nuclear Island Detailed Arrangement Drawings.
8. CESSAR Design Certification, Chapter 3.6.

Results

The following pages provide the Class 2/3 code compliance check of ASME code equations for the pipe as modelled. The postulated pipe break analysis results are also included, which provide the bases for design of possible jet shields and pipe whip restraints. CESSAR-DC Chapter 3.6 and the Distribution Systems Design Guide, Section 7.1.8 provide the criteria for protection against dynamic effects associated with the postulated rupture of piping. As additional design information becomes available, it will be included in a final analysis.

Results from the detailed analysis include pipe displacements, forces, moments, and stresses, support/restraint loads, and nozzle loads (anchor loads). Since the analysis is preliminary and design information is not available for allowable nozzle or penetration loads, it is not within the scope of the calculation to evaluate those loads.



℄ Steam Generator 2
SCGL
BN02
AN02
EL 118'-11¼"
EL 109'-0"
RUN 2
RUN 1
20" Sch 80 (typ.)
24x20
201
103
107
110
113
116
119
121
28x24
SCP
Shield Wall
RB Penetration
MSVH
ANCH
+Y
+Z
+X
70'-0"
28'-0"
36'-0"
25'-0"
18'-6"
11'-0"
10'-0"
24'-0"
23'-0"
8'-0"

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY FEEDWATER ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

ASME SECTION III CLASS 2/3 CODE COMPLIANCE SUMMARY (CONTD.)

NORMAL (LEVEL A)

TEMPERATURE DISTRIBUTION: TEMP PRESSURE DISTRIBUTION: PRES

LOAD CASES SPECIFIED

MA	MB	MC	SAM	MD
MT-1				

MAXIMUM STRESS RATIO OF EQUATION 8 TO 1.0SH

SOP NO.	DCP NAME	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	SIF	ALLOW. STRESS	COMPUTED STRESS	STRESS RATIO
45L	122		BRED	28X24	SA106 B	2.000	22500.00	13369.01	0.594

UPSET (LEVEL B)

TEMPERATURE DISTRIBUTION: TEMP PRESSURE DISTRIBUTION: PRES

LOAD CASES SPECIFIED

MA	MB	MC	SAM	MD
MT-1	EQ-9		SAMD	

MAXIMUM STRESS RATIO OF EQUATION 9 TO 1.2SH

SOP NO.	DCP NAME	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	SIF	ALLOW. STRESS	COMPUTED STRESS	STRESS RATIO
55	AB01		BTEE	24X20	SA106 B	1.488	26999.98	20623.55	0.764

ABB COMBUSTION ENGINEERING
SYSTEM 80+
PRELIMINARY FEEDWATER ANALYSIS
DUKE ENGINEERING & SERVICES, INC.

ASME SECTION III CLASS 2/3 CODE COMPLIANCE SUMMARY (CONTD.)

FAULTED (LEVEL D)

TEMPERATURE DISTRIBUTION: TEMP PRESSURE DISTRIBUTION: PRES

MA	LOAD CASES SPECIFIED MB	MC	SAM	MD
MT-1	EQ9F			

MAXIMUM STRESS RATIO OF EQUATION 9F TO 2.4SH

SOP NO.	DCP NAME	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	SIF	ALLOW. STRESS	COMPUTED STRESS	STRESS RATIO
55	A801		BTEE	24X20	SA106 B	1.488	45000.00	34750.91	0.772

SECONDARY (LEVEL A & B)

TEMPERATURE DISTRIBUTION: TEMP PRESSURE DISTRIBUTION: F FACTOR: 1.000

MA	LOAD CASES SPECIFIED MB	MC	SAM	MD
		TH-1		

MAXIMUM STRESS RATIO OF EQUATION 10 TO 1.0SA

SOP NO.	DCP NAME	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	SIF	ALLOW. STRESS	COMPUTED STRESS	STRESS RATIO
26R	A05A		BELB	24S80	SA106 B	1.855	22500.00	20888.55	0.928

ABB COMBUSTION ENGINEERING
SYSTEM 80+
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CLASS 2 BREAK LOCATIONS, CHECK TYPE C2BL

CHECKING REGION INDICATOR	=	(ALL CLASS 2 RUNS)
OUTPUT DETAIL INDICATOR	= DETL	(DETAILED PRINTOUT)
COMMENTARY INDICATOR	=	(NO COMMENTARY)
LOAD CASE INDICATOR	=	(RE-USE PREVIOUS CASES)
PRESSURE DISTRIBUTION INDICATOR	=	(RE-USE PREVIOUS DISTRIBUTIONS)
TEMPERATURE DISTRIBUTION INDICATOR	=	(RE-USE PREVIOUS DISTRIBUTIONS)
SECTION MODULUS INDICATOR	= EXTF	(AT EXTREME FIBER)
PRESSURE TERM INDICATOR	= D/4T	(USE PD/4T)

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LOAD SET SPECIFICATION

LOAD SET NAME	MA CASE	MB CASE	MC CASE	FACTOR A	FACTOR B	PRESSURE SET	TEMPERATURE SET FOR SH	TEMPERATURE SET FOR SC	MIN. PEAKS	PERCENT RANGE	TITLE
BREK	MT-1	EQ-9	TH-1	0.960	0.800	PRES	TEMP		3	10	

ABB COMBUSTION ENGINEERING
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BREAK LOCATION INFORMATION

RUN NAME	SOP NO.	DCP NAME	PROP. OF RUN	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	LOAD SET	PRESS (PSI)	SH TEMP	SC TEMP	ALLOW. STRESS (PSI)	CALC. STRESS (PSI)	STRESS RATIO	SEQ A	SEQ B
RUN1																
	1	ANOZ	0.0000		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	18902.89	0.583	13	END
	2L	A01B	0.0187		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	13074.51	0.404	32	
	2R	A01B	0.0187		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	10082.87	0.311		
	3L	A02A	0.0423		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	9854.40	0.304		
	3R	A02A	0.0423		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	12778.17	0.394	33	
	4L	A02B	0.0610		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	14379.79	0.444	27	
	4R	A02B	0.0610		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	10878.81	0.336		
	5L	100	0.0848		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	10216.79	0.315		
	5M	100	0.0848		AMTT	AMTT		BREK	1200.00	650.0	70.0	32400.00	12241.04	0.378	35	
	5R	100	0.0848		VALV	SG612	SA106 B						N/A			
	6	101	0.0920		VALV	SG612	SA106 B						N/A			
	7L	102	0.0991		VALV	SG612	SA106 B						N/A			
	7M	102	0.0991		AMTT	AMTT		BREK	1200.00	650.0	70.0	32400.00	11259.54	0.348	37	
	7R	102	0.0991		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	9608.19	0.297		
	8L	A03A	0.1182		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	9202.84	0.284		
	8R	A03A	0.1182		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	11376.77	0.351	36	
	9L	A03B	0.1370		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	10701.73	0.330	38	
	9R	A03B	0.1370		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	8923.56	0.275		

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BREAK LOCATION INFORMATION (CONTD.)

RUN NAME	SOP NO.	DCP NAME	PROP. OF RUN	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	LOAD SET	PRESS (PSI)	SH TEMP	SC TEMP	ALLOW. STRESS (PSI)	CALC. STRESS (PSI)	STRESS RATIO	SEQ A	SEQ B
RUN1 (CONTD.)																
	10L	103	0.1929		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	19794.27	0.611		
	10R	103	0.1929		BRED-E	24X20	SA106 B	BREK	1200.00	650.0	70.0	32400.00	30535.24	0.942	2	2
	11L	104	0.2009		BRED-E	24X20	SA106 B	BREK	1200.00	650.0	70.0	32400.00	21950.94	0.677	5	
	11R	104	0.2009		BTEE-R	24X20	SA106 B							N/A		
	12BL	AB01	0.2076		BTEE-R	24X20	SA106 B	BREK	1200.00	650.0	70.0	32400.00	18713.36	0.578		
	12R	AB01	0.2076		BTEE-R	24X20	SA106 B	BREK	1200.00	650.0	70.0	32400.00	19825.25	0.612	7	
	13L	105	0.2144		BTEE-R	24X20	SA106 B							N/A		
	13R	105	0.2144		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	15135.30	0.467	23	
	14L	A04A	0.2212		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	13943.25	0.430		
	14R	A04A	0.2212		BELB	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	19140.43	0.591	10	
	15L	A04B	0.2436		BELB	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	14540.38	0.449	25	
	15R	A04B	0.2436		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	11357.74	0.351		
	16	CMSI	0.2549		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	9820.55	0.303	39	
	17	CMSO	0.2744		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	9689.40	0.299	40	
	18L	106	0.3342		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	11454.29	0.354		
	18M	106	0.3342		AMTT	AMTT		BREK	1200.00	650.0	70.0	32400.00	13502.03	0.417	30	
	18R	106	0.3342		VALV	SG599	SA106 B							N/A		
	19	107	0.3485		VALV	SG599	SA106 B							N/A		

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SYSTEM 80+
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DUKE ENGINEERING & SERVICES, INC.

BREAK LOCATION INFORMATION (CONTD.)

RUN NAME	SCP NO.	DCP NAME	PROP. OF RUN	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	LOAD SET	PRESS (PSI)	SH TEMP	SC TEMP	ALLOW. STRESS (PSI)	CALC. STRESS (PSI)	STRESS RATIO	SEQ A	SEQ B
RUN1 (CONTD.)																
	20L	108	0.3628		VALV	SG599	SA106 B						N/A			
	20M	108	0.3628		AMTT	AMTT		BREK	1200.00	650.0	70.0	32400.00	15074.43	0.465	24	
	20R	108	0.3628		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	12306.44	0.380		
	21	SCP	0.3771		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	15137.42	0.467	22	
	22	RBPI	0.4534		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	17901.45	0.553	17	
	23L	RBPO	0.4727		STRP	24S80	SA106 B	BREK	12 3.00	650.0	70.0	32400.00	19795.28	0.611	8	
	23R	RBPO	0.4727		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	18021.30	0.556		
	24	VHSO	0.5202		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	17556.71	0.542	18	
	25	VHSI	0.5392		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	19408.19	0.599	9	
	26L	A05A	0.5488		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	20989.80	0.648		
	26R	A05A	0.5488		BELB	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	32112.18	0.991	1	1
	27L	A05B	0.5712		BELB	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	28610.55	0.883	3	
	27R	A05B	0.5712		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	18785.39	0.580		
	28L	109	0.5951		STRP	24S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	20101.45	0.620		
	28M	109	0.5951		AMTT	AMTT		BREK	1200.00	650.0	70.0	32400.00	26626.82	0.822	4	
	28R	109	0.5951		VALV	SG137	SA106 B						N/A			
	29	110	0.6094		VALV	SG137	SA106 B						N/A			
	30L	111	0.6237		VALV	SG137	SA106 B						N/A			

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BREAK LOCATION INFORMATION (CONTD.)

RUN NAME	SOP NO.	DCP NAME	PROP. OF RUN	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	LOAD SET	PRESS (PSI)	SH TEMP	SC TEMP	ALLOW. STRESS (PSI)	CALC. STRESS (PSI)	STRESS RATIO	SEQ A	SEQ B
RUN1 (CONTD.)																
	30M	111	0.6237		AMTT	AMTT		BREK	1900.00	650.0	70.0	32400.00	18968.94	0.585	12	
	30R	111	0.6237		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	16205.79	0.500		
	31L	112	0.6738		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	12203.38	0.377		
	31M	112	0.6738		AMTT	AMTT		BREK	1900.00	650.0	70.0	32400.00	13348.00	0.412	31	
	31R	112	0.6738		VALV	SG177	SA106 B						N/A			
	32	113	0.6881		VALV	SG177	SA106 B						N/A			
	33L	114	0.7024		VALV	SG177	SA106 B						N/A			
	33M	114	0.7024		AMTT	AMTT		BREK	1900.00	650.0	70.0	32400.00	13539.50	0.418	29	
	33R	114	0.7024		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	11611.98	0.358		
	34L	A06A	0.7262		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	13412.79	0.414		
	34R	A06A	0.7262		BELB	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	15291.76	0.472	21	
	35L	A06B	0.7487		BELB	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	16565.50	0.511	20	
	35R	A06B	0.7487		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	14412.80	0.445		
	36L	115	0.7582		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	15126.32	0.467		
	36M	115	0.7582		AMTT	AMTT		BREK	1900.00	650.0	70.0	32400.00	18452.76	0.570	15	
	36R	115	0.7582		VALV	SG1122	SA106 B						N/A			
	37	116	0.7723		VALV	SG1122	SA106 B						N/A			
	38L	117	0.7868		VALV	SG1122	SA106 B						N/A			

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BREAK LOCATION INFORMATION (CONTD.)

RUN NAME	SOP NO.	DCP NAME	PROP. OF RUN	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	LOAD SET	PRESS (PSI)	SH TEMP	SC TEMP	ALLOW. STRESS (PSI)	CALC. STRESS (PSI)	STRESS RATIO	SEQ A	SEQ B
RUN1 (CONTD.)																
	38H	117	0.7868		AHTT	AHTT		BREK	1900.00	650.0	70.0	32400.00	19090.91	0.589	11	
	38R	117	0.7868		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	15966.08	0.493		
	39L	118	0.7964		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	15622.12	0.482		
	39H	118	0.7964		AHTT	AHTT		BREK	1900.00	650.0	70.0	32400.00	18555.21	0.573	14	
	39R	118	0.7964		VALV	SG113	SA106 B						N/A			
	40	119	0.8107		VALV	SG113	SA106 B						N/A			
	41L	120	0.8250		VALV	SG113	SA106 B						N/A			
	41H	120	0.8250		AHTT	AHTT		BREK	1900.00	650.0	70.0	32400.00	14470.13	0.447	26	
	41R	120	0.8250		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	12376.34	0.382		
	42L	A07A	0.8297		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	11590.39	0.358		
	42R	A07A	0.8297		BELB	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	12756.04	0.394	34	
	43L	A07B	0.8522		BELB	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	13580.87	0.419	28	
	43R	A07B	0.8522		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	12164.25	0.375		
	44L	121	0.8856		STRP	24S120	SA106 B	BREK	1900.00	650.0	70.0	32400.00	14159.09	0.437		
	44R	121	0.8856		BRED-E	28X24	SA106 B	BREK	1900.00	650.0	70.0	32400.00	21219.91	0.655	6	3
	45L	122	0.8951		BRED-E	28X24	SA106 B	BREK	1900.00	650.0	70.0	32400.00	17332.87	0.535	19	
	45R	122	0.8951		STRP	CGSPEC	SA106 B	BREK	1900.00	650.0	70.0	32400.00	12235.76	0.378		
	46	ANCH	1.0000		STRP	CBSPEC	SA106 B	BREK	1900.00	650.0	70.0	32400.00	18075.00	0.558	16	END

ABB COMBUSTION ENGINEERING
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BREAK LOCATION INFORMATION (CONTD.)

RUN NAME	SOP NO.	DCP NAME	PROP. OF RUN	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	LOAD SET	PRESS (PSI)	SH TEMP	SC TEMP	ALLOW. STRESS (PSI)	CALC. STRESS (PSI)	STRESS RATIO	SEQ A	SEQ B
RUN2																
	47	BN02	0.0000		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	27119.48	0.837	1	END
	48L	B01B	0.1439		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	17451.09	0.539	3	
	48R	B01B	0.1439		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	12514.07	0.386		
	49L	B02A	0.3243		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	10663.66	0.329		
	49R	B02A	0.3243		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	14136.54	0.436	5	
	50L	B02B	0.4686		BELB	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	18842.22	0.582	2	1
	50R	B02B	0.4686		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	13306.96	0.411		
	51L	200	0.6518		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	12381.62	0.382		
	51M	200	0.6518		AMTT	AMTT		BREK	1200.00	650.0	70.0	32400.00	15718.13	0.485	4	
	51R	200	0.6518		VALV	SG651	SA106 B						N/A			
	52	201	0.7067		VALV	SG651	SA106 B						N/A			
	53L	202	0.7617		VALV	SG651	SA106 B						N/A			
	53M	202	0.7617		AMTT	AMTT		BREK	1200.00	650.0	70.0	32400.00	13584.95	0.419	6	
	53R	202	0.7617		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	11151.39	0.344		
	54L	203	0.9461		STRP	20S80	SA106 B	BREK	1200.00	650.0	70.0	32400.00	9546.52	0.295	8	
	54R	203	0.9483		BTEE-B	24X20	SA106 B						N/A			
	55	AB01	1.0000		BTEE-B	24X20	SA106 B	BREK	1200.00	650.0	70.0	32400.00	10071.89	0.311	7	END

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BREAK LOCATION INFORMATION (CONTD.)

RUN NAME	SOP NO.	DCP NAME	PROP. OF RUN	COMP NAME	COMP TYPE	SECTION NAME	MATERIAL NAME	LOAD SET	PRESS (PSI)	SH TEMP	SC TEMP	ALLOW. STRESS (PSI)	CALC. STRESS (PSI)	STRESS RATIO	SEQ A	SEQ B
RUN3																
	56	RBP0	0.0000		STRP	30ID	SA106 B	BREK	1200.00	650.0	70.0	32400.00	7431.64	0.229	1	END
	57	CD01	0.8889		STRP	30ID	SA106 B	BREK	1200.00	650.0	70.0	32400.00	6610.51	0.204	2	
	58	301	1.0000		STRP	30TD	SA106 B	BREK	1200.00	650.0	70.0	32400.00	6600.00	0.204	3	END
RUN4																
	59	CD01	0.0000		FLXC	FLXC	SA106 B						N/A			
	60	401	1.0000		FLXC	FLXC	SA106 B						N/A			

APPENDIX M

SAMPLE HVAC DUCTWORK ANALYSIS

APPENDIX M

SAMPLE HVAC DUCTWORK ANALYSIS

Purpose

This appendix reports the results of the stress analysis of a sample section of System 80+ Annulus Ventilation ductwork. The analysis determines support/restraint (S/R) locations, S/R loads (including seismic), and provides a seismic qualification of the ductwork. The ductwork included in the model is represented in the sketch that follows. All applicable design conditions, loadings, codes, and regulatory requirements are defined in the System 80+ Certification Program Draft Distribution Systems Design Guide, Reference 1.

Method

The ductwork is modelled as a three dimensional framework for analysis. The conservative static coefficient method is used to preclude determination of the system natural frequency. Instead, the system response is assumed to be the peak of the required response spectra. A 5% damped response spectra is utilized. This response is then multiplied by a static coefficient of 1.5, which takes into account the effects of both multifrequency excitation and multimode response. Having determined the peak response accelerations, the S/R loadings are determined as follows:

1. Determination of seismic coefficients, S_{SSE} and S_{OBE}.
2. Layout of support/restraints (see attached sketch).
3. Seismic qualification of ductwork spans.
4. Calculation of support/restraint loads (normal, upset, emergency, and faulted).

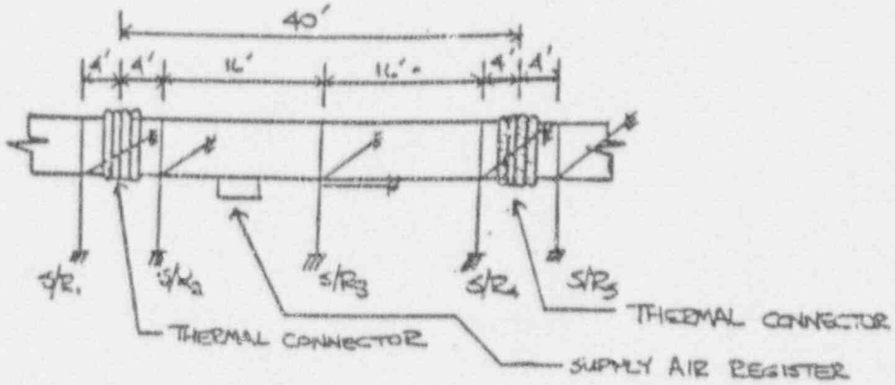
References and Design Inputs

1. Draft Distribution Systems Design Guide.
2. ABB-Impell Letter dated 6/10/92 to DE&S, Attn: S.R. McDowell enclosing System 80+ Node 169 2% and 5% Spectra Preliminary Model.
3. System 80+ Annulus Ventilation System Air Flow Diagram.
4. System 80+ Nuclear Island Detailed Arrangement Drawings.
5. ANSI/ANS N690-1984, Nuclear Facilities-Steel Safety-Related Structures for Design Fabrication and Erection.

Results

Results of the analysis are shown below.

1. Figure



2. Static coefficients

   $S_{SSE} = 5.55$

   $S_{OBE} = 2.5$

3. Support/restraint layout - See figure above

4. Seismic duct qualification

   a. Allowable stress = 16600 psi

   b. Stress results

Condition	Max. Stress	Allow. Stress
Service Level A	281 psi	16,600 psi
Service Level B	2262 psi	16,600 psi
Service Level C	4679 psi	16,600 psi x 1.6
Service Level D	Qualified by inspection	16,600 psi x 1.7

5. Support/restraint loads (normal, upset, emergency, and faulted) - See table below for Support No. 3.

	DIRECTION		
	Lateral	Vertical	Axial
Normal Load	0 lb	858.32 lb	0 lb
Upset Load	± 2145.8 lb	3004.12 lb - 1287.48 lb	± 4489.5 lb
Emergency Load	± 4763.68 lb	5622.0 lb - 3905.36 lb	± 9966.69 lb
Faulted Load	same as Emergency Load	same as Emergency Load	same as Emergency Load

APPENDIX N

SAMPLE CABLE TRAY ANALYSIS

APPENDIX N

SAMPLE CABLE TRAY ANALYSIS

Purpose

This appendix reports the results of the stress analysis of a sample section of System 80+ cable tray. The analysis determines support/restraint (S/R) locations, S/R loads (including seismic), and provides a seismic qualification of the cable tray. The cable tray included in the model is represented in the sketch that follows. All applicable design conditions, loadings, codes, and regulatory requirements are defined in the System 80+ Certification Program Draft Distribution Systems Design Guide, Reference 1.

Method

The cable tray is modelled as a three dimensional framework for analysis. The conservative static coefficient method is used to preclude determination of the system natural frequency. Instead, the system response is assumed to be the peak of the required response spectra. A 5% damped response spectra is utilized. This response is then multiplied by a static coefficient of 1.5, which takes into account the effects of both multifrequency excitation and multimode response. Having determined the peak response accelerations, the S/R loadings are determined as follows:

1. Determination of seismic coefficients, S_{SSE} and S_{OBE}.
2. Layout of support/restraints (see attached sketch).
3. Seismic qualification of cable tray spans.
4. Calculation of support/restraint loads (normal, upset, emergency, and faulted).

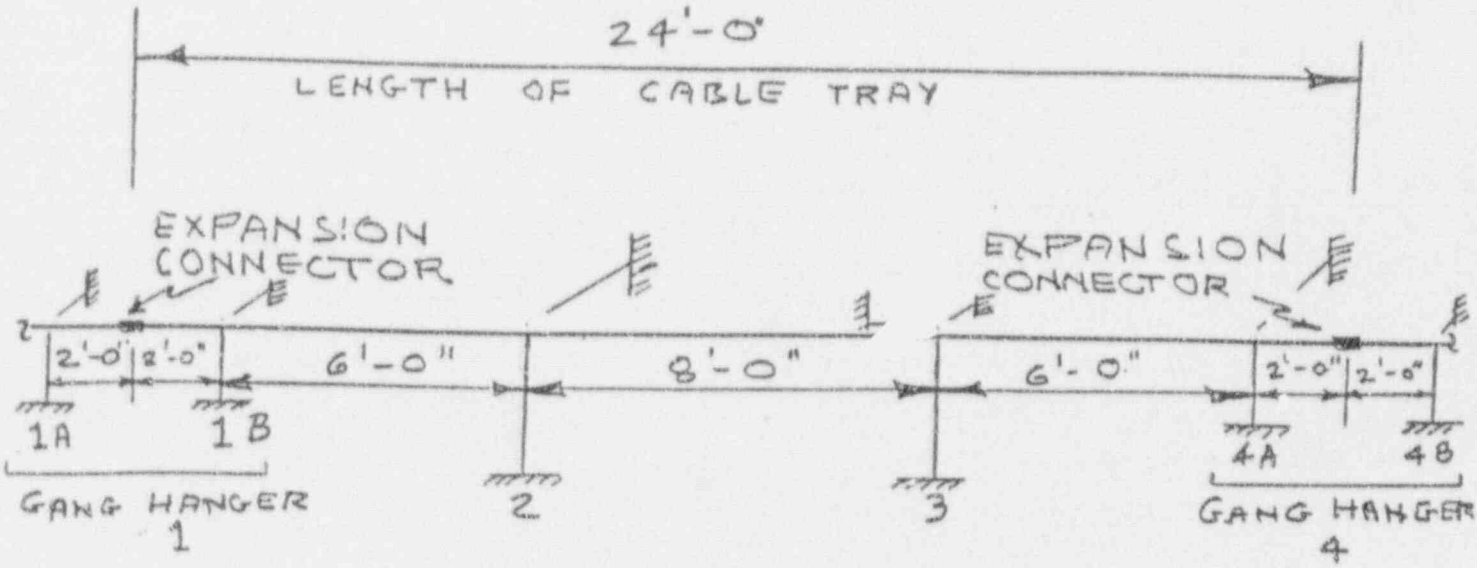
References and Design Inputs

1. Draft Distribution Systems Design Guide.
2. ABB-Impell Letter dated 6/10/92 to DE&S, Attn: S.R. McDowell enclosing System 80+ Node 169 2% and 5% Spectra Preliminary Model.
3. National Electrical Manufacturers Association Standards Publication No. VE 1-1984, Metallic Cable Tray Systems.
4. System 80+ Nuclear Island Detailed Arrangement Drawings.
5. ANSI/ANS N690-1984, Nuclear Facilities-Steel Safety-Related Structures for Design Fabrication and Erection.

Results

Results of the analysis are shown below.

1. Figure



2. Static coefficients

S_{SSE} = 1.575

S_{OBE} = 0.709

3. Support/restraint layout - See figure above

4. Seismic cable tray qualification

   a. Allowable stress = 36000 psi

   b. Stress results

Condition	Max. Stress	Allow. Stress
Service Level A	4,248 psi	36,000 psi
Service Level B	16,964 psi	36,000 psi
Service Level C	32,496 psi	36,000 psi x 1.6
Service Level D	Qualified by inspection	36,000 psi x 1.7

5. Support/restraint loads (normal, upset, emergency, and faulted) - See table below for Support No. 3.

	DIRECTION		
	Lateral	Vertical	Axial
Normal Load	0 lb	400 lb	0 lb
Upset Load	± 283.6 lb	683.6 lb	± 886.25 lb
Emergency Load	± 630 lb	1030 lb - 230 lb	± 1968.75 lb
Faulted Load	same as emergency load	same as emergency load	same as emergency load