MASTER

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LOFT CIS ANALYSIS LINE 2"-IA-298-AB

OUTSIDE CONTAINMENT PENETRATION S-2A

A. T. Pierce

EG&G Idaho, Inc.

IDAHO NATIONAL ENGINEERING LABORATORY

DEPARTMENT OF ENERGY

IDAHO OPERATIONS OFFICE UNDER CONTRACT EY-76-C-07-1570

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LOFT CIS ANALYSIS

LINE 2"-IA-295-AB OUTSIDE CONTAINMENT PENETRATION S-2A

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LOFT TECHNICAL REPORT
LOFT PROGRAM

FORM EG&G-229
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ABSTRACT

Line 2"-IA-295-AB outside containment penetration S-2A was analyzed to ASME Section III, Subsection NC (Class 2) criteria. The line is part of the Containment Isolation System. The model considered the line from the penetration outward through the first isolation valve. Results of the analysis show that this section of the line meets Class 2 requirements without modification.

CONTENTS

ABSTRACT -----	ii
I. SCOPE -----	1
II. INTRODUCTION -----	2
III. PIPING SYSTEM DESCRIPTION -----	3
1. STRUCTURAL DESCRIPTION -----	3
2. MATERIAL AND GEOMETRIC DATA -----	3
IV. DESIGN AND SERVICE CONDITIONS -----	5
1. DESIGN CONDITIONS -----	5
2. LEVEL A SERVICE CONDITIONS -----	5
3. LEVEL B SERVICE CONDITIONS -----	5
4. LEVEL C SERVICE CONDITIONS -----	5
5. LEVEL D SERVICE CONDITIONS -----	6
6. TEST CONDITIONS -----	6
V. PIPING SYSTEM STRUCTURAL ANALYSIS -----	7
1. WEIGHT ANALYSIS -----	7
2. THERMAL EXPANSION ANALYSIS -----	7
3. SEISMIC ANALYSES -----	7
VI. ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, STRESS ANALYSIS -----	10
1. MINIMUM THICKNESS CHECK -----	10
2. DESIGN, LEVEL A, AND LEVEL B SERVICE CONDITIONS STRESS ANALYSIS -----	11
3. LEVEL C SERVICE CONDITIONS STRESS ANALYSIS -----	11
4. LEVEL D SERVICE CONDITIONS STRESS ANALYSIS -----	11
VII. COMPONENT SUPPORT ANALYSIS -----	12
VIII. SPECIAL CONSIDERATIONS -----	14
IX. CONCLUSIONS -----	15
X. REFERENCES -----	16

CONTENTS (continued)

APPENDIX A -- BASIC DATA, INPUT PARAMETERS -----	A-i
APPENDIX B -- COMPUTER PROGRAM DESCRIPTION -----	B-i
APPENDIX C -- WEIGHT ANALYSIS RESULTS -----	C-i
APPENDIX D -- THERMAL EXPANSION ANALYSIS RESULTS -----	D-i
APPENDIX E -- SEISMIC ANALYSES RESULTS -----	E-i
APPENDIX F -- DESIGN, LEVEL A, AND LEVEL B SERVICE CONDITIONS STRESS ANALYSIS RESULTS -----	F-i
APPENDIX G -- LEVEL C SERVICE CONDITIONS STRESS ANALYSIS RESULTS -----	G-i
APPENDIX H -- LEVEL D SERVICE CONDITIONS STRESS ANALYSIS RESULTS -----	H-i
APPENDIX I -- COMPONENT SUPPORT ANALYSIS RESULTS -----	I-i

TABLES

I. Piping System Valve Design Weights and Centers of Gravity -----	8
II. Minimum Thickness Parameters -----	10
III. Loads on Piping Supports -----	13

FIGURES

1. Piping System Computer Model Plot -----	4
2. SSE-Seismic Response Spectra Envelope -----	9

I. SCOPE

This document constitutes the stress report required by Subarticle NCA-3350 of the ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components", 1977 through Winter 1977 Addenda*. The piping system analyzed, to be installed as part of the "Loss-of-Fluid-Test" (LOFT) Reactor, was line 2"-IA-295-AB outside Containment Penetration S-2A. The line was analyzed as part of the Containment Isolation System.

*Hereafter referred to as the Code^[1].

II. INTRODUCTION

The piping system was analyzed according to the procedures specified in Subsection NC-3600 of the Code and found acceptable. The governing conditions, engineering assumptions, and analytical techniques used in completing the analysis are described in the following pages. All loading conditions and design data used in performing the analysis were obtained from the LOFT specifications^[2]. The design specification is to be issued at a later date.

III. PIPING SYSTEM DESCRIPTION

The piping analyzed begins outside containment penetration S-2A. The line passes through an isolation valve and two hand valves. A one-inch line branches off, and the main line tees into another 2" line. The line is supported by a saddle support and two rod hangers.

1. STRUCTURAL DESCRIPTION

Figure 1 is an isometric plot of the Class 2 piping system analyzed in this report. The data points and elements are identified on the plot and a listing of the geometric data used in performing the system's structural analysis appears in Appendix A.

2. MATERIAL AND GEOMETRIC DATA

The piping has the following design parameters:

O.D. (inches)	2.375
Thickness (inches)	0.154
Weight (lbs/inch)	3.653
Material	SA 106 Gr. B
E_{cold} (10^6 psi)	27.9
S (100°F) (psi)	15,000
S_Y (psi)	35,000
α (10^{-6} in./in. °F)	6.39

The expansion coefficients and thermal conductivities of SA-106, Gr. B steel are defined in Tables I-4.0 and I-5.0 of the Code.

LOFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE
NUPIPE MATHEMATICAL MODEL

LEGEND

- / - NODE LOCATION
- - MASSPOINT LOCATION
- ←--- - SPRING HANGER
- - SLUEBER
- ↑ - RIGID SUPPORT
- ≡ - ANCHOR
- * - ELASTO JOINT
- ≡ - FLEXIBLE ANCHOR
- - VALVE

ROTATION ABOUT Y-AXIS = -44.860.
X-Z PLANE TILT = 45.4000.

See Reference 4.

IV. DESIGN AND SERVICE CONDITIONS

Listed in the following sections are the various design and service conditions used in analyzing the piping. This information was obtained from the LOFT specifications.

1. DESIGN CONDITIONS

An internal pressure of 250 psig and a uniform temperature of 100°F were used in this model.

2. LEVEL A SERVICE CONDITIONS

Level A service conditions, dealing mainly with the stress range due to thermal expansion, are based on the operating temperature(s) given below:

Entire model: 100°F

3. LEVEL B SERVICE CONDITIONS

The only Level B service condition resulting in significant dynamic loads for the piping system is the Operating Basis Earthquake (OBE).

4. LEVEL C SERVICE CONDITIONS

The only significant Level C service condition which affects the piping system is the Safe Shutdown Earthquake (SSE).

5. LEVEL D SERVICE CONDITIONS

The SSE plus Loss-of-Coolant Accident (LOCA) response envelopes all other Level D service responses for LOFT and will be used as the basis for Level D service conditions analysis.

6. TEST CONDITIONS

Cold Hydrostatic Test - Design Pressure $\times$ 1.25

Cold Leakage Test - Design Pressure Only

Hot Leakage Test - Design Pressure and Level A Service Temperature(s).

V. PIPING SYSTEM STRUCTURAL ANALYSIS

The piping system was analyzed for the various structural loads described in Section IV using the computer code NUPIPE-II, developed by Nuclear Services Corporation. This computer program is described in Appendix B. All limiting assumptions made in performing the analysis are listed in the following subsections.

1. WEIGHT ANALYSIS

An analysis for normal weight loading was performed for the system; the piping uniform weights used are listed in Section III.2 of this report. The weights and C.G.'s of the valves and operators are given in Table I. The results of the weight analysis are contained in Appendix C of this report.

2. THERMAL EXPANSION ANALYSIS

The piping system addressed in this report was analyzed for the steady-state temperature conditions as outlined in Section IV.2. The results of this analysis are contained in Appendix D.

3. SEISMIC ANALYSES

The piping system was analyzed for the effects of the Operating Basis Earthquake (OBE) and the Safe Shutdown Earthquake (SSE). For this analysis, OBE is to be considered one-half the magnitude of the SSE. The SSE response spectra is shown in Figure 2. This response spectra, multiplied by conservative directional intensity factors, was applied in all three directions simultaneously. Any seismic differential anchor movement effects present on the piping were taken into account. The results of the seismic analyses are contained in Appendix E.

TABLE I.PIPING SYSTEM VALVE DESIGN WEIGHTS
AND CENTERS OF GRAVITY

<u>Valve</u>	<u>Flooded Weight</u>	<u>(Distance from C.G. axis of Pipe)</u>
CV-P7-25 (Motor-operated globe valve)	50 lbs	15" up
V-1509 (Hand valve)	20 lbs	Negligible
V-1667 (Hand valve)	20 lbs	Negligible

FIGURE 2
SSE - SEISMIC RESPONSE SPECTRA ENVELOPE
1% DAMPING

46 1323

K&S
10 X 10 TO 1/2 INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

VI. ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, STRESS ANALYSIS

A stress analysis of the Class 2 piping addressed in this report, per rules of Subsection NC-3600 of the Code, was performed using the results obtained from the analyses described in Section V of this report.

1. MINIMUM THICKNESS CHECK

The Code requires verification that the piping minimum wall thickness is satisfactory. The thickness was checked against Equation (1) of NC-3641.1:

$$t_M = \frac{P D_o}{2(S + P y)} + A$$

where

t_M = Minimum required wall thickness

P = Internal design pressure

D_o = Outside diameter

S = Allowable stress

$y = .4$ or $\frac{d}{d + D_o}$ if $D_o/t_M < 6$ (per Code)

A = Corrosion allowance (.08).

Results of this calculation are contained in Table II.

TABLE II.

MINIMUM THICKNESS PARAMETERS

<u>Pressure (psi)</u>	<u>O.D. (inches)</u>	<u>S (psi)</u>	<u>t_M (inches)</u>	<u>t_{actual} (inches)</u>
250	2.375	15,000	0.100	0.154

Since the actual thicknesses are all greater than the t_M calculated, the system meets the requirements of NC-3641.1.

2. DESIGN, LEVEL A, AND LEVEL B SERVICE CONDITIONS STRESS ANALYSIS

The loading conditions, defined as Design, Level A, and Level B in Section IV.1, 2, and 3, were used in performing a stress analysis of the piping system per the rules given in Subsection NC-3650 of the Code.

The computer program NUPIPE-II was used for this analysis. The results of Equations (8), (9), (10), and (11) are detailed in Appendix F. Test conditions are encompassed by this stress analysis.

3. LEVEL C SERVICE CONDITIONS STRESS ANALYSIS

The only loading which was postulated as a Level C service condition is the SSE. NC-3611.2 (c) requires that Equation (9) of NC-3652.2 be satisfied with an allowable of $1.8 S_h$. These results, as calculated using NUPIPE-II, are contained in Appendix G.

4. LEVEL D SERVICE CONDITIONS STRESS ANALYSIS

Not applicable.

VII. COMPONENT SUPPORT ANALYSIS

Any component supports designed and built by EG&G Idaho, Inc. have been analyzed in accordance with the AISC Manual of Steel Construction^[3]. The analysis of these component supports would be contained in Appendix I. All component supports which have been supplied by a commercial manufacturer carry loads which are less than the manufacturer's stated load capacity. A summary of sustained loads on all piping supports is contained in Table III.

TABLE III

LOADS ON PIPING SUPPORTS

<u>Support Type</u>	<u>Node No.</u>	<u>Deadweight</u>	<u>Thermal</u>	<u>OBE</u>	<u>SSE</u>	<u>Rated Load</u>
Pipe saddle	45	-184	-5	+79	+158	Vendor-designed
Rod hanger	80	-33	+6	+94	+187	610
Rod hanger	95	-20	+1	+20	39	610

VIII. SPECIAL CONSIDERATIONS

The analysis did not model the one-inch branch line beyond the first elbow.

The tee at Node 110 was treated as an assumed anchor.

IX. CONCLUSIONS

The piping system addressed in this report was analyzed for the stated loads and operating conditions using the techniques described herein. All stresses have been found to be within limits established by Section III of the ASME Boiler and Pressure Vessel Code.

X. REFERENCES

1. American Society of Mechanical Engineers, ASME Boiler & Pressure Vessel Code, Section III, Division 1, "Nuclear Power Plant Components", Subsection NC, 1977 Edition, Winter 1977 Addenda.
2. LOFT Specifications P-1, "Line Designation Tables" 3-9-76, and P-4, "Piping Materials", 8-14-72.
3. American Institute of Steel Construction, Manual of Steel Construction, Seventh Edition, pp 5-6 to 5-24, 1973.
4. Piping model based upon field measurement by Applied Mechanics Branch personnel, February 1978.

APPENDIX A
BASIC DATA, INPUT PARAMETERS

04/25/72

NUFIFE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LOFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

PAGE 3

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
XSECTN	0	1	.238E+01	.154E+00	.365E+01	.279E+02	.250E+03	0.
XSECTN	0	2	.132E+01	.133E+00	.205E+01	.279E+02	.250E+03	0.
CPVAL	1	1	.279E+02	.238E+02	0.	0.	.185E+03	0.
CHECK MAGNITUDE OF ENTRIES IN ABOVE CPVAL CARD ***								
ANCHOR	0	5	0.	0.	0.	0.	0.	0.
RUN	5	10	.226E+01	0.	-.173E+01	.100E+01	.100E+01	0.
RUN	10	15	.226E+01	0.	-.173E+01	.100E+01	.100E+01	0.
RUN	15	20	.226E+01	0.	-.173E+01	.100E+01	.100E+01	0.
RUN	20	25	.226E+01	0.	-.173E+01	.100E+01	.100E+01	0.
SRUN	25	30	.103E+01	0.	-.786E+00	.100E+01	.100E+01	0.
SRUN	30	35	0.	-.175E+01	0.	.100E+01	.100E+01	0.
SRUN	35	40	-.364E+00	0.	-.279E+00	.100E+01	.100E+01	0.
VALVE	40	41	-.364E+00	0.	-.279E+00	.100E+01	.100E+01	0.
VALVE	41	42	0.	.129E+01	0.	.100E+01	.100E+01	0.
CWE	0	42	0.	.500E+02	0.	0.	0.	0.
VALVE	41	43	-.364E+00	0.	-.279E+00	.100E+01	.100E+01	0.
RUN	43	45	-.364E+00	0.	-.279E+00	.100E+01	.100E+01	0.
RESTRAINT	0	45	0.	.100E+07	0.	0.	0.	0.
RSKEW	0	45	.100E+01	.200E+01	.609E+00	0.	-.793E+00	.100E+03
SRUN	45	50	-.926E+00	0.	-.710E+00	.100E+01	.100E+01	0.
TEE	50	55	0.	0.	0.	0.	0.	0.
SRUN	50	51	-.397E+00	0.	-.304E+00	.100E+01	.100E+01	0.
CWEIGHT	0	51	0.	.500E+01	0.	0.	0.	0.
SRUN	50	55	0.	.667E+00	0.	.100E+01	.100E+01	0.
VALVE	55	56	0.	.250E+00	0.	.100E+01	.100E+01	0.
CWE	0	56	0.	.200E+02	0.	0.	0.	0.

LIR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
LCFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

PAGE 4

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
VALVE	56	57	0.	.250E+00	0.	.100E+01	.100E+01	0.
RUN	57	60	0.	.250E+00	0.	.100E+01	.100E+01	0.
VALVE	60	61	0.	.250E+00	0.	.100E+01	.100E+01	0.
CWE	0	61	0.	.200E+02	0.	0.	0.	0.
VALVE	61	62	0.	.250E+00	0.	.100E+01	.100E+01	0.
RLN	62	65	0.	.255E+01	0.	.100E+01	.100E+01	0.
RUN	65	70	0.	.253E+01	0.	.100E+01	.100E+01	0.
TEE	70	75	0.	0.	0.	0.	0.	0.
RUN	70	75	0.	0.	-.204E+01	.100E+01	.100E+01	0.
RLN	75	80	0.	0.	-.204E+01	.100E+01	.100E+01	0.
RES	0	80	0.	.100E+06	0.	0.	0.	0.
RUN	80	85	0.	0.	-.350E+01	.100E+01	.100E+01	0.
RUN	85	90	0.	0.	-.188E+01	.100E+01	.100E+01	0.
RUN	90	95	0.	0.	-.188E+01	.100E+01	.100E+01	0.
RES	0	95	0.	.100E+06	0.	0.	0.	0.
RUN	95	100	0.	0.	-.221E+01	.100E+01	.100E+01	0.
SRUN	100	105	0.	0.	-.221E+01	.100E+01	.100E+01	0.
SRUN	105	110	0.	-.250E+01	0.	.100E+01	.100E+01	0.
ANCHOR	0	110	0.	0.	0.	0.	0.	0.
SRUN	70	200	0.	.208E+00	0.	.100E+01	.100E+01	0.
REDUCER	200	201	0.	.333E+00	0.	.100E+01	.100E+01	0.
VALVE	201	202	0.	.230E+00	0.	.200E+01	.100E+01	0.
CWE	0	202	0.	.200E+02	0.	0.	0.	0.
VALVE	202	203	0.	.250E+00	0.	.200E+01	.100E+01	0.
SRUN	203	205	0.	.459E+00	0.	.200E+01	.100E+01	0.

LTR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
LEFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

PAGE 5

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
MASSPT	C	10	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	15	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	20	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	25	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	30	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	35	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	41	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	42	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	50	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	51	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	58	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	61	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	65	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	70	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	75	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	80	.100E+01	0.	.100E+01	0.	0.	0.
MASSPT	C	85	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	90	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	95	.100E+01	0.	.100E+01	0.	0.	0.
MASSPT	C	100	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	105	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	202	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	C	205	.100E+01	.100E+01	.100E+01	0.	0.	0.
STRESS7	C	0	0.	0.	0.	0.	0.	0.

LTR 136 6

APPENDIX B
COMPUTER PROGRAM DESCRIPTION

The NUPIPE-II computer program performs linear elastic analysis of three-dimensional piping systems subject to thermal, deadweight, seismic, and other static and dynamic loads. The NUPIPE-II program is also designed to perform stress and fatigue analyses in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Nuclear Power Plant Components, 1974 Edition through the Summer 1975 Addenda; and the ANSI B31.1 Code, 1967 and Summer 1973 versions. Piping systems of more than one classification can be analyzed.

NUPIPE-II utilizes the finite element method of analysis with special features incorporated to accommodate specific requirements of piping system analysis. In accordance with the finite element method, the continuous piping is mathematically idealized as an assembly of elastic structural members connecting discrete nodal points. Nodal points are placed in such a manner as to isolate particular types of piping elements, such as straight runs of pipe, elbows, valves, etc., for which force-deformation characteristics can be categorized. Nodal points are also placed at all discontinuities, such as piping supports, concentrated weights, branch lines, and changes in cross-section. System loads such as weights, equivalent thermal forces, and earthquake inertia forces are applied at the nodal points. For the deadweight and dynamic time-history and response spectra analyses, distributed weight properties of the piping as well as concentrated weights, such as valves, pumps, or snubbers, can be considered. A lumped mass model of the piping system is used for all dynamic analyses. Both translational and rotational degrees-of-freedom may be considered.

For further information concerning NUPIPE-II capabilities or analytical procedures, contact Applied Mechanics Branch.

APPENDIX C
WEIGHT ANALYSIS RESULTS

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
LCFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

LEFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

DEADWEIGHT

NODE	TYPE	REACTION (LBS OR IN-LBS)	DIPECTION
5	1	1.	X CCGK0
2	1	21.	Y CCGK0
3	1	1.	Z CCGK0
4	1	41.	X CCGK0
5	1	31.	Y CCGK0
6	1	569.	Z CCGK0
7	1	184.	X CCGK0
8	1	12.	Y CCGK0
9	1	23.	Z CCGK0
10	1	1.	X CCGK0
11	1	16.	Y CCGK0
12	1	1.	Z CCGK0
13	1	-34.	X CCGK0
14	1	87.	Y CCGK0
15	1	-103.	Z CCGK0

C-1

LTR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1

PAGE 22

22

LEFT CIS ANALYSIS - 2-IA-295-AB OUTSIDE - PIERCE

INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 2

DEADWEIGHT

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	15	-1:	-28:	-1:	491:	31:	595:	-.000	-.000	.000	-.0000	-.0000	-.0000
	16	-1:	-17:	-1:	-21:	-30:	18:	-.001	-.016	.001	-.0005	-.0001	-.0005
RUN	16	-1:	17:	-1:	21:	-30:	-18:	.001	-.016	.001	-.0005	-.0001	-.0005
	15	-1:	-7:	-1:	234:	-29:	350:	.002	-.036	.003	-.0003	-.0001	-.0002
RUN	20	-1:	7:	-1:	-234:	-29:	-350:	.002	-.036	.003	-.0003	-.0001	-.0002
	21	-1:	3:	-1:	273:	-27:	401:	.005	-.033	.007	-.0002	-.0002	-.0005
RUN	21	-1:	-3:	-1:	-273:	-27:	-401:	.005	-.033	.007	-.0002	-.0002	-.0005
	20	-1:	14:	-1:	96:	-26:	171:	.009	-.003	.012	.0005	-.0002	.0011
SRUN	25	-1:	-14:	-1:	-96:	-26:	-171:	.009	-.003	.012	.0005	-.0002	.0011
	26	-1:	18:	-1:	-55:	-25:	-27:	.011	-.015	.014	.0005	-.0002	.0011
SRUN	30	-1:	-18:	-1:	55:	-25:	27:	.011	.015	.014	.0005	-.0002	.0011
	31	-1:	25:	-1:	-41:	-25:	-10:	.034	.015	.005	.0004	-.0003	.0011
SRUN	40	-1:	-25:	-1:	41:	-25:	10:	.034	.015	.005	.0004	-.0003	.0011
	41	-1:	26:	-1:	-127:	-31:	102:	.035	.012	.003	.0004	-.0003	.0011
VALVE	41	-1:	-26:	-1:	127:	-31:	-102:	.035	.012	.003	.0004	-.0003	.0011
	42	-1:	28:	-1:	-218:	-36:	222:	.036	.008	.002	.0004	-.0003	.0011
VALVE	42	0:	-55:	-0:	-0:	-0:	-0:	.036	.008	.002	.0004	-.0003	.0011
	43	0:	-50:	-0:	0:	-0:	-0:	.036	.008	.002	.0004	-.0003	.0011
VALVE	43	-1:	-63:	-1:	218:	-36:	-222:	.036	.008	.002	.0004	-.0003	.0011
	44	-1:	64:	-1:	-218:	-36:	222:	.037	.008	.001	.0004	-.0003	.0012
RUN	43	-1:	-64:	-1:	498:	-42:	-587:	.037	.008	.001	.0004	-.0003	.0012
	44	-1:	66:	-1:	-498:	-42:	587:	.037	.004	-.001	.0004	-.0003	.0012
SRUN	50	-1:	-66:	-1:	783:	-48:	-958:	.036	-.000	-.000	.0002	-.0003	.0014
	51	-1:	98:	-1:	-783:	-48:	958:	.041	-.000	-.000	.0002	-.0003	.0014
SRUN	50	-1:	-94:	-1:	39:	-29:	-103:	.041	-.019	-.004	-.0001	-.0003	.0017
	51	-0:	7:	-0:	27:	-0:	-28:	.042	-.019	-.005	-.0001	-.0003	.0017
SRUN	50	-1:	-87:	-1:	-56:	-29:	136:	.041	-.019	-.004	-.0001	-.0003	.0017
	51	-1:	88:	-1:	56:	-29:	-131:	.027	-.019	-.005	-.0001	-.0003	.0017

LTR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LCFT CIS ANALYSIS - 2-IA-295-AB OUTSIDE - PIERCE

PAGE 23

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
VALVE	55	-1:	-85:	-1:	-85:	-29:	-131:	.027	-.019	-.005	-.0001	-.0003	.0017
	56	-1:	-84:	-1:	-84:	-29:	-129:	.022	-.019	-.005	-.0001	-.0003	.0016
VALVE	56	-1:	-84:	-1:	-84:	-29:	-129:	.022	-.019	-.005	-.0001	-.0003	.0016
	57	-1:	-83:	-1:	-83:	-29:	-128:	.017	-.019	-.005	-.0001	-.0003	.0016
RUN	57	-1:	-83:	-1:	-83:	-29:	-128:	.017	-.019	-.005	-.0001	-.0003	.0016
	60	-1:	-82:	-1:	-82:	-29:	-126:	.013	-.019	-.005	-.0001	-.0004	.0016
VALVE	60	-1:	-82:	-1:	-82:	-29:	-126:	.013	-.019	-.005	-.0001	-.0004	.0016
	61	-1:	-81:	-1:	-81:	-29:	-124:	.008	-.019	-.005	-.0001	-.0004	.0016
VALVE	61	-1:	-81:	-1:	-81:	-29:	-124:	.008	-.019	-.005	-.0001	-.0004	.0016
	62	-1:	-41:	-1:	-80:	-29:	-124:	.008	-.019	-.005	-.0001	-.0004	.0016
	62	-1:	-40:	-1:	-83:	-29:	-122:	.003	-.019	-.006	-.0001	-.0004	.0016
RUN	62	-1:	-40:	-1:	-83:	-29:	-122:	.003	-.019	-.006	-.0001	-.0004	.0016
	65	-1:	-31:	-1:	-119:	-29:	-103:	-.003	-.019	-.006	-.0001	-.0004	.0014
RUN	65	-1:	-31:	-1:	-119:	-29:	-103:	-.003	-.019	-.006	-.0001	-.0004	.0014
	70	-1:	-2:	-1:	-155:	-29:	-84:	-.084	-.019	-.006	-.0001	-.0005	.0013
	75	-1:	10:	-1:	8:	-14:	-84:	-.072	-.009	.001	.0004	-.0005	.0011
RUN	75	-1:	10:	-1:	8:	-14:	-84:	-.072	-.009	.001	.0004	-.0005	.0011
	80	-1:	-10:	-1:	-327:	14:	-84:	-.059	-.006	.001	.0002	-.0005	.0010
RUN	80	-1:	-10:	-1:	-327:	14:	-84:	-.059	-.006	.001	.0002	-.0005	.0010
	85	-1:	18:	-1:	327:	-1:	-84:	-.059	-.000	.001	-.0002	-.0005	.0010
	85	-1:	-3:	-1:	-76:	27:	-84:	-.038	-.000	.001	-.0001	-.0005	.0007
RUN	85	-1:	-3:	-1:	-76:	27:	-84:	-.038	-.000	.001	-.0001	-.0005	.0007
	90	-1:	4:	-1:	-72:	-41:	-84:	-.027	-.001	.001	-.0001	-.0005	.0006
RUN	90	-1:	4:	-1:	-72:	-41:	-84:	-.027	-.001	.001	-.0001	-.0005	.0006
	95	-1:	-4:	-1:	-72:	-41:	-84:	-.027	-.001	.001	.0000	-.0004	.0006
	95	-1:	10:	-1:	-87:	55:	-84:	-.018	-.000	.001	.0000	-.0004	.0005
RUN	95	-1:	10:	-1:	-87:	55:	-84:	-.018	-.000	.001	.0000	-.0004	.0005
	100	-1:	10:	-1:	87:	-55:	-84:	-.018	-.000	.001	-.0000	-.0004	.0005
	100	-1:	-2:	-1:	61:	71:	-84:	-.009	-.001	.001	-.0000	-.0003	.0003
SRUN	100	-1:	-2:	-1:	61:	71:	-84:	-.009	-.001	.001	-.0000	-.0003	.0003
	105	-1:	2:	-1:	-61:	-71:	-84:	-.002	-.000	.001	.0000	-.0002	.0002
SRUN	105	-1:	2:	-1:	-61:	-71:	-84:	-.002	-.000	.001	.0000	-.0002	.0002
	110	-1:	-6:	-1:	-4:	-87:	-84:	-.002	-.000	.001	.0000	-.0002	.0002
	110	-1:	16:	-1:	-39:	87:	-103:	-.000	-.000	.000	.0000	-.0000	.0000
SRUN	110	-1:	16:	-1:	-39:	87:	-103:	-.000	-.000	.000	.0000	-.0000	.0000
	200	-0:	-24:	-0:	-0:	-0:	-0:	-.084	-.019	.001	.0003	-.0005	.0013
SRUN	200	-0:	-24:	-0:	-0:	-0:	-0:	-.084	-.019	.001	.0003	-.0005	.0013

LTR 136 6

04/25/76

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LGFT CIS ANALYSIS - 2-1A-299-AB OUTSIDE - PIERCE

PAGE 24

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
REDUCE	200	-0.	-23.	-0.	-0.	-0.	-0.	-.087	-.019	.001	.0003	-.0005	.0013
	201	-0.	-22.	0.	0.	-0.	0.	-.092	-.019	.003	.0003	-.0005	.0013
VALVE	201	-0.	-22.	-0.	-0.	-0.	-0.	-.092	-.019	.003	.0003	-.0005	.0013
	202	-0.	-21.	0.	0.	-0.	0.	-.095	-.019	.004	.0003	-.0005	.0013
VALVE	202	-0.	-1.	-0.	-0.	-0.	-0.	-.095	-.019	.004	.0003	-.0005	.0013
	203	-0.	-1.	0.	0.	-0.	0.	-.100	-.019	.005	.0003	-.0005	.0013
SRUN	203	-0.	-1.	0.	-0.	-0.	-0.	-.100	-.019	.005	.0003	-.0005	.0013
	204	0.	-0.	0.	0.	-0.	0.	-.107	-.019	.005	.0003	-.0005	.0013

C-4

LTR 136 6

APPENDIX D
THERMAL EXPANSION ANALYSIS RESULTS

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1

PAGE 17

LEFT CIS ANALYSIS - 2-IA-295-AB OUTSIDE - PIERCE

INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 1

THERMAL

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	5	-1.	-0.	-4.	-13.	-242.	-41.	-.000	.000	.000	-.0000	-.0000	.0000
	10	-1.	-0.	-4.	-13.	-153.	-39.	-.000	.001	.001	-.0000	-.0004	.0001
RUN	10	-1.	-0.	-4.	-13.	153.	-39.	.000	.001	.001	-.0000	-.0004	.0001
	15	-1.	-0.	-4.	-13.	-64.	-35.	.024	.003	.010	-.0001	-.0006	.0002
RUN	15	-1.	-0.	-4.	-13.	64.	-35.	.024	.003	.010	-.0001	-.0006	.0002
	20	-1.	-0.	-4.	-17.	24.	-32.	.042	.006	.022	-.0001	-.0006	.0002
RUN	20	-1.	-0.	-4.	-17.	-24.	-34.	.042	.006	.022	-.0001	-.0006	.0002
	25	-1.	-0.	-4.	-19.	113.	-32.	.059	.011	.033	-.0002	-.0005	.0003
SRUN	25	-1.	-0.	-4.	-19.	-113.	-32.	.059	.011	.033	-.0002	-.0005	.0003
	30	-1.	-0.	-4.	-19.	154.	-31.	.065	.013	.037	-.0002	-.0004	.0003
SPUN	30	-1.	-0.	-4.	-19.	-154.	-31.	.065	.013	.037	-.0002	-.0004	.0003
	35	-1.	-0.	-4.	-69.	154.	-55.	.073	.009	.041	-.0002	-.0001	.0004
SPUN	35	-1.	-0.	-4.	-69.	-154.	-55.	.073	.009	.041	-.0002	-.0001	.0004
	40	-1.	-0.	-4.	-68.	132.	-56.	.072	.007	.040	-.0001	-.0001	.0004
VALVE	40	-1.	-0.	-4.	-68.	-132.	-56.	.072	.007	.040	-.0001	-.0001	.0004
	41	-1.	-0.	-4.	-68.	109.	-56.	.072	.005	.039	-.0001	-.0001	.0004
VALVE	41	-0.	-0.	-0.	-0.	-0.	-0.	.072	.005	.039	-.0001	-.0001	.0004
	42	-0.	-0.	-0.	-0.	-0.	-0.	.065	.007	.037	-.0001	-.0001	.0004
VALVE	41	-1.	-0.	-4.	-68.	-109.	-55.	.072	.005	.039	-.0001	-.0001	.0004
	42	-1.	-0.	-4.	-68.	87.	-57.	.071	.002	.038	-.0001	-.0001	.0004
RUN	43	-1.	-0.	-4.	-68.	-87.	-57.	.071	.002	.038	-.0001	-.0001	.0004
	45	-1.	-0.	-4.	-67.	85.	-57.	.070	-.000	.037	-.0001	-.0000	.0003
SRUN	45	-0.	-5.	-3.	-67.	-85.	-57.	.070	-.000	.037	-.0001	-.0000	.0003
	50	-0.	-5.	-3.	111.	27.	-3.	.066	-.000	.035	-.0000	-.0000	.0003
SRUN	50	-0.	-0.	-0.	0.	-0.	-0.	.066	-.000	.035	-.0000	-.0000	.0003
	51	-0.	-0.	-0.	0.	-0.	-0.	.066	-.000	.034	-.0000	-.0000	.0003
SRUN	50	-0.	-5.	-3.	-111.	-27.	-3.	.066	-.000	.035	-.0000	-.0000	.0003
	55	-0.	-5.	-3.	86.	27.	-3.	.065	-.000	.035	-.0000	-.0000	.0003

LTR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LCFT CIS ANALYSIS - 2-IA-295-AB OUTSIDE - PIERCE

PAGE 18

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
VALVE	55	-0.	-5.	-3.	-86.	-27.	3.	.065	-.004	.035	.0000	.0000	.0005
	56	-0.	-5.	-3.	-77.	-27.	-4.	.063	-.004	.035	.0000	.0000	.0005
VALVE	56	-0.	-5.	-3.	-77.	-27.	4.	.063	-.004	.035	.0000	.0000	.0005
	57	-0.	-5.	-3.	-68.	-27.	-5.	.062	-.003	.035	.0000	.0000	.0005
RUN	57	-0.	-5.	-3.	-62.	-27.	5.	.062	-.003	.035	.0000	.0000	.0005
	60	-0.	-5.	-3.	-54.	-27.	-6.	.060	-.002	.035	.0000	.0000	.0005
VALVE	60	-0.	-5.	-3.	-59.	-27.	6.	.060	-.002	.035	.0000	.0000	.0005
	61	-0.	-5.	-3.	-49.	-27.	-7.	.059	-.002	.035	.0001	.0000	.0005
VALVE	61	-0.	-5.	-3.	-49.	-27.	7.	.059	-.002	.035	.0001	.0000	.0005
	62	-0.	-5.	-3.	-40.	-27.	-8.	.057	-.001	.035	.0001	.0000	.0005
RUN	62	-0.	-5.	-3.	-40.	-27.	8.	.057	-.001	.035	.0001	.0000	.0005
	65	-0.	-5.	-3.	-54.	-27.	-18.	.043	-.004	.037	.0000	.0001	.0005
RUN	65	-0.	-5.	-3.	-54.	-27.	18.	.043	-.004	.037	.0000	.0001	.0005
	70	-0.	-5.	-3.	-148.	-27.	-29.	.030	.010	.037	-.0001	.0001	.0004
RUN	70	-0.	-5.	-3.	-148.	-27.	29.	.030	.010	.037	-.0001	.0001	.0004
	75	-0.	-5.	-3.	22.	-19.	-29.	.026	.006	.032	-.0002	.0002	.0004
RUN	75	-0.	-5.	-3.	22.	-19.	29.	.026	.006	.032	-.0002	.0002	.0004
	80	-0.	-1.	-3.	-104.	-11.	-29.	.022	-.000	.027	-.0002	.0002	.0003
RUN	80	-0.	-1.	-3.	-104.	-11.	29.	.022	-.000	.027	-.0002	.0002	.0003
	85	-0.	-1.	-3.	-66.	-4.	-29.	.014	-.003	.018	.0000	.0002	.0002
RUN	85	-0.	-1.	-3.	-66.	-4.	29.	.014	-.003	.018	.0000	.0002	.0002
	90	-0.	-1.	-3.	-25.	-19.	-29.	.010	-.000	.010	.0001	.0002	.0002
RUN	90	-0.	-1.	-3.	-25.	-19.	29.	.010	-.000	.010	.0001	.0002	.0002
	95	-0.	-2.	-3.	-25.	-28.	-29.	.006	.000	.010	.0001	.0002	.0001
RUN	95	-0.	-2.	-3.	-25.	-28.	29.	.006	.000	.010	.0001	.0002	.0001
	100	-0.	-2.	-3.	-76.	-38.	-29.	-.001	.006	.000	-.0000	.0001	.0000
SRUN	100	-0.	-2.	-3.	-76.	-38.	29.	-.001	.006	.000	-.0000	.0001	.0000
	105	-0.	-2.	-3.	76.	-38.	-19.	-.001	-.000	-.000	-.0000	.0000	.0000
SRUN	105	-0.	-2.	-3.	76.	-38.	19.	-.001	-.000	-.000	-.0000	.0000	.0000
	110	-0.	-0.	-0.	-0.	-0.	-0.	.030	.010	.037	-.0001	.0001	.0004
SRUN	110	-0.	-0.	-0.	-0.	-0.	0.	.029	.011	.036	-.0001	.0001	.0004

LTR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LGFT CIS ANALYSIS - 2-IA-295-AB OUTSIDE - PIERCE

PAGE 19

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
REDUCE	200	-0.	-0.	-0.	-0.	0.	0.	.029	.011	.035	-.0001	.0001	.0004
	201	0.	0.	0.	0.	-0.	-0.	.027	.012	.036	-.0001	.0001	.0004
VALVE	201	-0.	-0.	-0.	-0.	-0.	0.	.027	.012	.036	-.0001	.0001	.0004
	202	0.	0.	0.	0.	0.	-0.	.026	.012	.035	-.0001	.0001	.0004
VALVE	202	-0.	-0.	-0.	-0.	-0.	0.	.026	.012	.035	-.0001	.0001	.0004
	203	0.	0.	0.	0.	0.	-0.	.024	.013	.035	-.0001	.0001	.0004
SRUN	203	-0.	-0.	-0.	-0.	0.	0.	.024	.013	.035	-.0001	.0001	.0004
	205	0.	0.	0.	0.	-0.	-0.	.022	.014	.034	-.0001	.0001	.0004

D-4

LFR 136 6

APPENDIX E
SEISMIC ANALYSES RESULTS

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1

PAGE 41

LCFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

SUPPORT REACTIONS FOR LOAD CASE NO. 3

SEE RESPONSE SPECTRUM - 1% DAMPING

COMBINED RESULT FOR MODE 1 THRU 15 BY RMS SUMMATION

SPECTRA SET = 1

NODE	TYPE	REACTIONS (LBS OR IN-LBS)	DIRECTION
5	FORCE	155.	X CCORD
5	FORCE	27.	Y CCORD
5	FORCE	87.	Z CCORD
5	FORCE	911.	X CCORD
5	FORCE	5526.	Y CCORD
5	FORCE	846.	Z CCORD
5	FORCE	156.	Y CCORD
5	FORCE	27.	INCLINED
5	FORCE	187.	Y CCORD
5	FORCE	39.	Y CCORD
5	FORCE	69.	X CCORD
5	FORCE	31.	Y CCORD
5	FORCE	159.	Z CCORD
5	FORCE	3273.	X CCORD
5	FORCE	5127.	Y CCORD
5	FORCE	3259.	Z CCORD

LTR 136 6

04/25/78

NUPIPE-ITM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1

PAGE 42

LOFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 3

SSE RESPONSE SPECTRUM - 1% DAMPING

COMBINED RESULT FOR MODE 1 THRU 15 BY RMS SUMMATION

SPECTRA SET = 1

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	OX	OY	OZ	RX	RY	RZ
RUN	5	155.	27.	87.	911.	5526.	846.	.000	.000	.000	.0000	.0000	.0000
	10	155.	27.	87.	435.	4203.	544.	.007	.024	.126	.0014	.0089	.0013
RUN	10	154.	25.	87.	435.	4203.	544.	.097	.024	.126	.0014	.0089	.0013
	15	154.	25.	87.	366.	3028.	930.	.355	.062	.462	.0021	.0155	.0024
RUN	15	153.	22.	87.	366.	3028.	930.	.355	.062	.462	.0021	.0155	.0024
	20	153.	22.	87.	702.	2085.	1451.	.725	.081	.945	.0025	.0199	.0044
RUN	20	151.	22.	89.	702.	2085.	1451.	.725	.081	.945	.0025	.0199	.0044
	25	151.	22.	89.	1095.	1534.	2006.	1.169	.145	1.522	.0031	.0227	.0074
SRUN	25	147.	23.	93.	1095.	1534.	2006.	1.169	.145	1.522	.0031	.0227	.0074
	30	147.	23.	93.	1240.	1472.	2272.	1.365	.226	1.804	.0037	.0235	.0092
SRUN	30	144.	24.	97.	1290.	1472.	2272.	1.365	.226	1.804	.0037	.0235	.0092
	35	144.	24.	97.	2948.	1472.	4777.	1.271	.226	1.869	.0052	.0247	.0126
SRUN	35	141.	25.	100.	2948.	1472.	4777.	1.271	.226	1.869	.0052	.0247	.0126
	40	141.	25.	100.	3009.	1030.	4636.	1.353	.171	1.763	.0062	.0244	.0141
VALVE	40	141.	25.	100.	3071.	1262.	4595.	1.435	.171	1.658	.0065	.0248	.0145
	41	141.	25.	100.	3071.	1262.	4595.	1.435	.171	1.658	.0065	.0248	.0145
VALVE	41	41.	9.	44.	665.	0.	608.	1.435	.115	1.558	.0065	.0248	.0145
	42	41.	9.	44.	0.	0.	0.	1.575	.115	1.567	.0064	.0248	.0145
VALVE	41	102.	31.	133.	3600.	1262.	4128.	1.435	.115	1.658	.0065	.0248	.0145
	43	102.	31.	133.	3669.	2002.	4022.	1.516	.058	1.554	.0069	.0247	.0150
RUN	43	102.	31.	133.	3669.	2002.	4022.	1.516	.058	1.554	.0069	.0247	.0150
	45	102.	31.	133.	3740.	2841.	3919.	1.597	.000	1.452	.0083	.0241	.0163
SRUN	45	95.	168.	122.	3740.	2841.	3919.	1.597	.000	1.452	.0083	.0241	.0163
	50	95.	168.	122.	5066.	4830.	2838.	1.788	.156	1.215	.0124	.0213	.0194
SRUN	50	8.	2.	8.	7.	53.	9.	1.788	.156	1.215	.0124	.0213	.0194
	51	8.	2.	8.	0.	0.	0.	1.865	.224	1.123	.0124	.0213	.0194
SRUN	50	91.	168.	126.	5067.	4839.	2834.	1.788	.156	1.215	.0124	.0213	.0194
	55	81.	168.	126.	4096.	4839.	2283.	1.849	.156	1.108	.0143	.0187	.0204
VALVE	55	81.	168.	126.	4096.	4839.	2283.	1.849	.156	1.108	.0143	.0187	.0204
	56	81.	168.	126.	3738.	4839.	2091.	1.943	.156	1.065	.0145	.0183	.0205

LTR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LGFT CIS ANALYSIS - 2-1A-295-A8 OUTSIDE - PIERCE

PAGE 43

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	UX	UY	UZ	RX	RY	RZ
VALVE	56	62.	168.	137.	3738.	4839.	2091.	1.943	.155	1.021	.0145	.0183	.0205
	57	62.	168.	137.	3340.	4839.	1928.	1.989	.155	1.021	.0147	.0180	.0206
RUN	57	62.	168.	137.	3340.	4839.	1928.	1.989	.156	1.021	.0147	.0180	.0206
	60	62.	168.	137.	2945.	4839.	1769.	2.035	.156	1.977	.0152	.0170	.0209
VALVE	60	62.	168.	137.	2945.	4839.	1769.	2.035	.156	.977	.0152	.0170	.0209
	61	62.	168.	137.	2554.	4839.	1615.	2.083	.156	.931	.0154	.0167	.0210
VALVE	61	44.	169.	150.	2554.	4839.	1615.	2.083	.156	.931	.0154	.0167	.0210
	62	44.	169.	150.	2124.	4839.	1486.	2.131	.156	.885	.0155	.0164	.0210
RUN	62	44.	169.	150.	2124.	4839.	1486.	2.131	.156	.885	.0155	.0164	.0210
	65	44.	169.	150.	2656.	4839.	352.	2.670	.156	.402	.0151	.0071	.0221
RUN	65	36.	169.	153.	2656.	4839.	352.	2.670	.156	.402	.0151	.0071	.0221
	70	36.	169.	153.	7229.	4839.	971.	3.252	.156	.043	.0076	.0066	.0214
RUN	70	30.	170.	153.	7232.	4839.	1347.	3.252	.156	.043	.0076	.0068	.0214
	75	30.	170.	153.	3201.	4157.	1347.	3.038	.073	.042	.0032	.0118	.0191
RUN	75	39.	170.	154.	3201.	4157.	1347.	3.038	.073	.042	.0032	.0118	.0191
	80	39.	170.	154.	1720.	3250.	1347.	2.696	.002	.042	.0024	.0164	.0186
RUN	80	50.	24.	155.	1720.	3250.	1347.	2.696	.002	.042	.0024	.0164	.0186
	85	50.	24.	155.	715.	1252.	1347.	1.896	.034	.042	.0003	.0211	.0128
RUN	85	58.	25.	155.	715.	1252.	1347.	1.896	.034	.042	.0003	.0211	.0128
	90	58.	25.	155.	244.	543.	1347.	1.414	.020	.042	.0009	.0216	.0107
RUN	90	53.	25.	156.	244.	543.	1347.	1.414	.020	.042	.0009	.0216	.0107
	95	53.	25.	156.	480.	1656.	1347.	.937	.000	.042	.0008	.0205	.0086
RUN	95	57.	31.	157.	480.	1656.	1347.	.937	.000	.042	.0008	.0205	.0086
	100	57.	31.	157.	767.	3370.	1347.	.436	.015	.042	.0002	.0169	.0061
SRUN	100	59.	31.	158.	767.	3370.	1347.	.436	.015	.042	.0002	.0169	.0061
	105	59.	31.	158.	1506.	5167.	1347.	.063	.000	.042	.0014	.0109	.0037
SRUN	105	59.	31.	158.	1506.	5167.	1347.	.063	.000	.042	.0014	.0109	.0037
	110	59.	31.	159.	3273.	5167.	3269.	.000	.000	.000	.0000	.0000	.0000
SRUN	110	59.	31.	159.	3273.	5167.	3269.	.000	.000	.000	.0000	.0000	.0000
	200	40.	5.	11.	103.	0.	389.	3.252	.156	.043	.0076	.0068	.0214
REDUCE	200	40.	5.	11.	77.	0.	290.	3.300	.156	.028	.0076	.0068	.0214
	201	40.	5.	11.	35.	0.	131.	3.377	.156	.025	.0076	.0068	.0215

LTR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LEFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

PAGE 44

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	OX	DY	DZ	RX	RY	RZ
VALVE	201	40:	5:	11:	35:	0:	131:	3.377	.156	.025	.0076	.0068	.0215
	202	40:	5:	11:	3:	0:	11:	3.436	.156	.042	.0076	.0068	.0215
VALVE	202	1:	0:	0:	3:	0:	11:	3.436	.156	.042	.0076	.0068	.0215
	203	1:	0:	0:	2:	0:	7:	3.495	.156	.063	.0076	.0068	.0215
SRUN	203	1:	0:	0:	2:	0:	7:	3.495	.156	.063	.0076	.0068	.0215
	205	1:	0:	0:	0:	0:	0:	3.603	.156	.103	.0076	.0058	.0215

E-4

LTR 136 6

APPENDIX F
DESIGN, LEVEL A, AND LEVEL B SERVICE
CONDITIONS STRESS ANALYSIS RESULTS

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LCFT CIS ANALYSIS - 2-IA-295-AB OUTSIDE - PIERCE

PAGE 52

ASME SECTION III CLASS 2 OR ANSI B31.1.8 STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIF FACTOR	SUSTAINED STRESS EQ. 8 (PSI)	OCCASIONAL STRESS EQ. 9 (PSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
RUN	5	1.000	2259.	7006.	413.	2671.
	10	1.000	1032.	4602.	266.	1298.
RUN	10	1.000	1032.	4602.	266.	1298.
	15	1.000	1671.	4343.	127.	1798.
RUN	20	1.000	1778.	3991.	76.	1954.
	25	1.000	1778.	3991.	76.	1954.
RUN	25	1.000	1778.	3991.	76.	1954.
	30	1.000	1295.	3602.	200.	1495.
SRUN	30	2.100	1486.	5119.	420.	1906.
	35	2.100	1136.	5097.	557.	1695.
SRUN	35	2.100	1136.	5097.	557.	1695.
	40	2.100	1093.	6753.	624.	1717.
SRUN	40	2.100	1401.	6876.	558.	1959.
RUN	45	1.000	2251.	7117.	208.	2463.
	50	1.000	3041.	8167.	184.	3224.
SRUN	50	2.100	4235.	12309.	386.	4621.
	55	2.100	1273.	11242.	403.	1676.
SRUN	55	2.100	1058.	1129.	0.	1058.
	60	2.100	964.	964.	0.	964.
SRUN	60	2.100	1360.	11335.	403.	1764.
	65	2.100	1359.	10253.	319.	1678.
RUN	65	1.000	1215.	6400.	123.	1338.
	70	1.000	1215.	6188.	109.	1324.
RUN	70	1.000	1216.	5817.	82.	1299.
	75	1.000	1233.	5868.	106.	1339.
RUN	75	1.000	1233.	5868.	106.	1339.
	80	1.251	1264.	8600.	322.	1587.

LTR 136 6

04/25/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LOFT CIS ANALYSIS - 2-IA-295-AB OUTSIDE - PIERCE

PAGE 53

ASME SECTION III CLASS 2 OR ANSI B31.1.8 STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIFY FACTOR	SUSTAINED STRESS EQ. 8 (PSI)	OCCASIONAL STRESS EQ. 9 (FSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
RUN	70	1.251	1264.	8643.	322.	1587.
	75	1.000	1108.	5647.	69.	1177.
RUN	75	1.000	1108.	5647.	69.	1177.
	80	1.000	1530.	4812.	181.	1711.
RUN	80	1.000	1530.	4812.	181.	1711.
	85	1.000	1160.	2814.	121.	1281.
RUN	85	1.000	1160.	2814.	121.	1281.
	90	1.000	1162.	2814.	93.	1254.
RUN	90	1.000	1162.	2814.	93.	1254.
	95	1.000	1162.	2396.	72.	1259.
RUN	95	1.000	1162.	2396.	72.	1259.
	100	1.000	1187.	3021.	80.	1259.
SRUN	100	2.100	1176.	4284.	80.	1259.
	105	2.100	1287.	6194.	168.	1465.
SRUN	105	2.100	1287.	6194.	168.	1465.
	110	2.100	1285.	8608.	315.	1600.
SRUN	110	2.100	1335.	10490.	159.	1494.
	200	2.100	964.	1495.	0.	964.
REDUCE	200	2.000	964.	1360.	0.	964.
	201	2.000	964.	1341.	0.	964.
SRUN	201	2.000	964.	1134.	0.	964.
	202	2.100	618.	659.	0.	618.
SRUN	202	2.100	618.	618.	0.	618.

LTR 136 6

APPENDIX G
LEVEL C SERVICE CONDITIONS
STRESS ANALYSIS RESULTS

04/26/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1

PAGE 52

LOFT CTS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

PIPE SECTION III CLASS 2 OF ANSI B31.1'S STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIF FACTOR	SUSTAINED STRESS EQ.8 (PSI)	OCCASIONAL STRESS EQ.9 (PSI)	EXPANSION STRESS EQ.10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ.11 (PSI)
PUN	5	1.000	2259.	11753.	0.	2259.
	10	1.000	1032.	8172.	0.	1032.
PUN	10	1.000	1032.	8172.	0.	1032.
	15	1.000	1671.	7015.	0.	1671.
PUN	15	1.000	1671.	7015.	0.	1671.
	20	1.000	1778.	6204.	0.	1778.
PUN	20	1.000	1778.	6204.	0.	1778.
	25	1.000	1295.	5909.	0.	1295.
SPUN	25	2.100	1486.	8752.	0.	1486.
	30	2.100	1138.	9055.	0.	1138.
SPUN	30	2.100	1138.	9055.	0.	1138.
	35	2.100	1093.	16413.	0.	1093.
SPUN	35	2.100	1093.	16413.	0.	1093.
	40	2.100	1401.	16350.	0.	1401.
PUN	43	1.000	2255.	11978.	0.	2255.
	45	1.000	3041.	13293.	0.	3041.
SPUN	45	2.100	4235.	20382.	0.	4235.
	50	2.100	1273.	21212.	0.	1273.
SPUN	50	2.100	1058.	1200.	0.	1058.
	51	2.100	964.	964.	0.	964.
SPUN	50	2.100	1360.	21311.	0.	1360.
	55	2.100	1359.	19147.	0.	1359.
PUN	57	1.000	1215.	11586.	0.	1215.
	60	1.000	1215.	11161.	0.	1215.
PUN	62	1.000	1216.	10417.	0.	1216.
	65	1.000	1233.	10503.	0.	1233.
PUN	65	1.000	1233.	10503.	0.	1233.
	70	1.251	1264.	15935.	0.	1264.

LIR 136 6

04/26/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1

PAGE 53

LOFT CIS ANALYSIS - 2-1A-295-AB OUTSIDE - PIERCE

ASME SECTION III CLASS 2 OR ANSI B31.1.3 STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIF FACTOR	SUSTAINED STRESS EQ.8 (PSI)	OCCASIONAL STRESS EQ.9 (PSI)	EXPANSION STRESS EQ.10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ.11 (PSI)
PUN	70	1.251	1264.	16023.	0.	1264.
	75	1.000	1108.	10187.	0.	1108.
PIIN	75	1.000	1108.	10187.	0.	1108.
	80	1.000	1530.	8094.	0.	1530.
PIIN	80	1.000	1530.	8094.	0.	1530.
	85	1.000	1160.	4467.	0.	1160.
PIIN	85	1.000	1160.	4467.	0.	1160.
	90	1.000	1162.	3630.	0.	1162.
PIIN	90	1.000	1162.	3630.	0.	1162.
	95	1.000	1187.	4854.	0.	1187.
PUN	95	1.000	1187.	4854.	0.	1187.
	100	1.000	1176.	7393.	0.	1176.
SPUN	100	2.100	1297.	11090.	0.	1297.
	105	2.100	1285.	15931.	0.	1285.
SPUN	105	2.100	1285.	15931.	0.	1285.
	110	2.100	1335.	19644.	0.	1335.
SPUN	70	2.100	964.	2027.	0.	964.
	200	2.100	964.	1755.	0.	964.
REDUCE	200	2.000	964.	1718.	0.	964.
	201	2.000	964.	1304.	0.	964.
SPUN	203	2.100	618.	700.	0.	618.
	205	2.100	618.	618.	0.	618.

LTR 136 6

APPENDIX H
LEVEL D SERVICE CONDITIONS
STRESS ANALYSIS RESULTS

LTR 136 6

THERE ARE NO LEVEL D SERVICE
CONDITIONS FOR THIS SYSTEM

APPENDIX I
COMPONENT SUPPORT ANALYSIS RESULTS

THERE ARE NO COMPONENT SUPPORTS
WHICH REQUIRE ANALYSIS