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LOFT TECHNICAL REPORT LTR 132-2

RE & C REPORT NUMBER RE-A-78-140

AUGUST 18, 1978

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LOFT CIS ANALYSIS 4"-IW-179-AB
OUTSIDE CONTAINMENT PENETRATION S-5B

D. K. Morton

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 TECHNICAL REPORT LTR 132-2

RE&C Report # RE-A-78-140

DATE AUGUST 18, 1978 *sh*

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RESEARCH, ENGINEERING AND CONSTRUCTION REPORT ENGINEERING ANALYSIS DIVISION

APPLIED MECHANICS BRANCH

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LOFT CIS ANALYSIS 4"-IW-179-AB

OUTSIDE CONTAINMENT PENETRATION S-5B

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AUTHOR

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LOFT TECHNICAL REPORT
LOFT PROGRAM

FORM EG&G-229
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P/H
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PSE
5-16-78

ABSTRACT

A stress analysis was performed on the 4"-IW-179-AB pipe system outside containment penetration S-5B. Deadweight, thermal expansion, and seismic loads were considered. The results indicate that this piping will meet ASME Section III, Class 2 requirements.

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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 the 4"-IW-179-AB outside containment penetration S-5B.

*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 cognizant engineer^[2]. The design specification is to be issued at a later date.

III. PIPING SYSTEM DESCRIPTION

The Service Water System (IW) supplies water for (1) cooling heat exchangers (2) the Softened and Demineralized Water System (3) the pump seals to prevent the outleakage of fluids (4) HV equipment and (5) various washing and flushing operations.

The purposes of this analysis were to (1) determine the loads imposed on the containment penetration and (2) assure containment isolation integrity. As a result, not all of the main piping system or branch piping may have been analyzed due to its negligible effect on the two primary purposes of this analysis.

1. STRUCTURAL DESCRIPTION

Figure 1 is a computer 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)	4.500
Thickness (inches)	0.237
Weight (lbs/inch)	1.358
Material	SA-106 GR. B
E_{cold} (10^6 psi)	27.9
S (365°F) (psi)	15000
S_y (psi)	35000
α (10^{-6} in./in.°F)	6.07

LOFT CIS ANALYSIS - 4-14-179-AB OUTSIDE
NUPIPE MATHEMATICAL MODEL

##LEGEND##

- / - NODE LOCATION
- o - MASSPOINT LOCATION
- - SPRING HANGER
- - SNUBBER
- - RIGID SUPPORT
- - ANCHOR
- - ELASTO JOINT
- - FLEXIBLE ANCHOR
- - VALVE

ROTATION ABOUT Y-AXIS = 30.4DEG.
X-Z PLANE TILT = 45.4DEG.

SEE REFERENCE 4.

Figure 1. Piping System Computer Model Plot

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.

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 cognizant engineer.

1. DESIGN CONDITIONS

Class 2 - All Piping

Design Pressure: 150 psi

Design Temperature: 365°F

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:

Class 2 - All Piping

Operating Pressure: 125 psi

Operating Temperature: 70°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 x 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.

FIGURE 2.
SSE - SEISMIC RESPONSE SPECTRA ENVELOPE

1% DAMPING

46 1323

TABLE IPIPING SYSTEM VALVE DESIGN WEIGHTS
AND CENTERS OF GRAVITY

<u>Valve</u>	<u>Flooded Weight</u>	(Distance from <u>C.G. axis of Pipe</u>)
CV-P-6-42	150 lb _f	30 inches

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>
150	4.5	15000	0.102	0.237

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

There were no Level D service conditions specified for this piping.

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.

With regard to the rod hangers already present on the piping system, the cognizant engineer should assure that the pipe experiences and equivalent amount of support in both the upward and downward directions. If this is not the case, an appropriate pipe clamp (or its equivalent) should be installed.

TABLE IIILOADS ON PIPING SUPPORTS

<u>Support Type</u>	<u>Support No.</u>	<u>Deadweight</u>	<u>Thermal</u>	<u>OBE</u>	<u>SSE</u>	<u>Rated Load</u>
Rod*	S1-Y	202	0	60	121	1250
Rod*	S2-Y	201	0	282	564	1250
Rod*	S3-Y	285	0	202	404	1040
Rod*	S4-Y	160	0	26	52	400
U-bolt	S5-Y	114	0	12	25	1220
	S5-Z	0	0	46	93	
U-bolt	S6-Y	87	0	6	13	1220
	S6-Z	0	0	27	55	
Rod*	S7-Y	91	0	39	77	400

All loads are in lb_f.

* - Assure equivalent support for both upward and downward directions.

VIII. SPECIAL CONSIDERATIONS

The piping system modeled has both "A" and "AB" pipe material specifications. A sufficient amount of piping with the "A" material specification was modeled in only to assure correct loading on the pipe with the "AB" material specification. A Class 2 analysis was then performed which showed the "AB" piping adequate. Any stress results pertaining to the "A" piping should be disregarded. The "A" piping has screwed fittings which would require additional analysis not required at this time.

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. Telephone conversation with B. C. Huntsman of LOFT TS on April 26, 1978.
3. American Institute of Steel Construction, Manual of Steel Construction, Seventh Edition, pp 5-6 to 5-24, 1973.
4. Computer plot based on sketches made at LOFT by Applied Mechanics personnel during March, 1978.

APPENDIX A
BASIC DATA, INPUT PARAMETERS

05/08/78

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

PAGE 1

LGFT CIS ANALYSIS - 4"-14-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

PROGRAM CONTROL CARDS

CARDTYPE	NCHECK	DAMP	CODE	GLOB	DYN	THEATA	INTOUT	STORE
CONTROL	0	0	2.	0.	0.	0.0000	0.	0.

CARDTYPE	NPR	NPIPS	UNITS	EIGSAV
CONTROL	10	0	ENGLISH	0

FLEXIBILITY ANALYSIS CONTROL CARDS

CARDTYPE	NCASE	PLCE	TLDAC	CMODE	CFREE	SPEC	SAVE	CYCLE	TITLE
FLEXAN	1	1	3.	0.	0.	0.00	1.	0.	DEADWEIGHT
FLEXAN	2	1	2.	0.	0.	0.00	1.	0.	THERMAL EXPANSION PLUS ANCHOR MOVEMENTS
FLEXAN	3	1	11.	40.	50.	1.00	1.	0.	SSE RESPONSE SPECTRUM - 12 DAMPING

CASE COMBINATION CONTROL CARDS

CARDTYPE	NCASE	CASES-COMB	AMULT	BMULT	CMODE	SAVE	CYCLE	TITLE
MODFLEX	4	3 AND 1	.5	0.0	0.0	1.0	0.0	OBE RESPONSE SPECTRUM - ONE-HALF SSE

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A-1

LEFT CIS ANALYSIS - 4"-14-175-A, OUTSIDE CONTAINMENT PENETRATION 35-B

SEISMIC RESPONSE SPECTRA - SET 1

X-EARTHQUAKE		Y-EARTHQUAKE		Z-EARTHQUAKE	
PERIOD (SEC)	ACCELERATION (G)	PERIOD (SEC)	ACCELERATION (G)	PERIOD (SEC)	ACCELERATION (G)
0.000	.342	0.000	.228	0.000	.342
.010	.342	.010	.228	.010	.342
.250	1.480	.130	.973	.250	1.480
.800	.637	.800	.425	.800	.637
1.400	.342	1.400	.228	1.400	.342
2.200	.217	2.200	.145	2.200	.217

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A-2

LEFT CIS ANALYSIS - 4"-IM-175-AL OUTSIDE CONTAINMENT PENETRATION S5-B

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
XSECTN	0	1	.450E+01	.237E+00	.163E+02	.279E+02	.150E+03	0.
OPVAL	1	1	.279E+02	0.	0.	0.	.125E+03	0.
CHECK MAGNITUDE OF ENTRIES ON ABOVE OPVAL CARD ****								
ANCHER	0	5	0.	0.	0.	0.	0.	0.
FGRUN	5	10	0.	0.	-.148E+01	.100E+01	.100E+01	0.
MASSPT	0	10	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	10	15	0.	0.	-.148E+01	.100E+01	.100E+01	0.
MASSPT	0	15	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	15	20	0.	0.	-.148E+01	.100E+01	.100E+01	0.
MASSPT	0	20	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	20	25	0.	0.	-.148E+01	.100E+01	.100E+01	0.
MASSPT	0	25	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	25	30	0.	0.	-.148E+01	.100E+01	.100E+01	0.
MASSPT	0	30	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	30	35	0.	0.	-.148E+01	.100E+01	.100E+01	0.
MASSPT	0	35	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	35	0.	.100E+06	0.	0.	0.	0.
VALVE	35	40	0.	0.	-.133E+01	.100E+01	.100E+01	0.
MASSPT	0	40	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	40	45	0.	-.250E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	45	.150E+03	.150E+03	.150E+03	0.	0.	0.
CHEIGHT	0	45	0.	.150E+03	0.	0.	0.	0.
VALVE	40	50	0.	0.	-.167E+01	.100E+01	.100E+01	0.
MASSPT	0	50	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	50	55	.600E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	55	.100E+01	.100E+01	.100E+01	0.	0.	0.

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A-3

LGFT DIS ANALYSIS - 4"-18-179-4F OUTSIDE CONTAINMENT PENETRATION S5-B

*** INPUT DATA ***

CARDTYPE	11	12	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
RESTRAINT	0	55	0.	.100E+02	0.	0.	0.	0.
FGRUN	55	60	-.150E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	60	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	60	65	-.150E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	65	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	65	70	.600E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	70	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	70	75	0.	-.198E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	75	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	75	80	0.	-.198E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	80	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	80	85	0.	-.198E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	85	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	85	90	0.	-.198E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	90	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	90	.100E+03	0.	.100E+03	0.	0.	0.
RUN	90	95	0.	-.200E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	95	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	95	.100E+03	0.	.100E+03	0.	0.	0.
RUN	95	100	0.	-.917E+00	0.	.100E+01	.100E+01	0.
MASSPT	0	100	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	100	105	0.	-.917E+00	0.	.100E+01	.100E+01	0.
MASSPT	0	105	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	105	110	.600E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	110	.100E+01	.100E+01	.100E+01	0.	0.	0.

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A-4

LOFT CIS ANALYSIS - 4"-IN-179-AB OUTSIDE CONTAINMENT PENETRATION 55-6

*** INPUT DATA ***

CARCTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
FGRUN	110	115	-.142E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	115	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	115	120	-.142E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	120	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	120	0.	.100E+00	0.	0.	0.	0.
RUN	120	125	-.833E+00	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	125	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	125	0.	.100E+05	.100E+05	0.	0.	0.
RUN	125	130	-.200E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	130	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	130	0.	.100E+05	.100E+05	0.	0.	0.
RUN	130	135	-.146E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	135	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	135	140	-.146E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	140	.100E+01	.100E+01	.100E+01	0.	0.	0.
CWEIGHT	0	140	0.	.300E+02	0.	0.	0.	0.
FGRUN	140	145	-.133E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	145	.100E+01	.100E+01	.100E+01	0.	0.	0.
CWEIGHT	0	145	0.	.300E+02	0.	0.	0.	0.
FGRUN	145	150	-.150E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	150	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	150	0.	.100E+00	0.	0.	0.	0.
RUN	150	155	-.170E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	155	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	155	160	-.170E+01	0.	0.	.100E+01	.100E+01	0.

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LOFT CIS ANALYSIS - 4"-1A-174-AB OUTSIDE CONTAINMENT PENETRATION S5-B

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
MASSPT	C	160	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	160	165	-.170E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	165	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	165	170	-.170E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	170	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	170	175	-.170E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	175	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	C	175	0.	.100E+06	.100E+06	0.	0.	0.
RUN	175	180	-.167E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	180	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	180	185	-.167E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	185	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	185	190	-.167E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	190	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	C	190	0.	.100E+06	.100E+06	0.	0.	0.
RUN	190	195	-.158E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	195	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	195	200	-.158E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	200	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	200	205	-.158E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	205	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	205	210	-.158E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	C	210	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	C	210	0.	.100E+06	0.	0.	0.	0.
RUN	210	215	-.133E+01	0.	0.	.100E+01	.100E+01	0.

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NUPIPE-11M - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 LGFT CIS ANALYSIS - 4"-IN-179-AL OUTSIDE CONTAINMENT PENETRATION S5-B

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*** INPUT DATA ***

CARDTYPE	11	12	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
MASSPT	0	215	.100E+01	.100E+01	.100E+01	0.	0.	0.
RUN	215	220	-.133E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	220	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	220	225	-.133E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	225	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBCH	225	230	.000E+01	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	230	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	230	235	0.	-.125E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	235	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	235	240	0.	-.125E+01	0.	.100E+01	.100E+01	0.
ANCHOR	0	240	0.	0.	0.	0.	0.	0.
STRESS7	0	0	0.	0.	0.	0.	0.	0.
9CASES		1	0	0	0	0	0	0
10CASES		0	0	0	0	0	0	0
CKNODES		0	0	0	0	0	0	0
ALLDONE		0	0	0	0	0	0	0

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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

LOFT CIS ANALYSIS - 4"-16-179-AB OUTSIDE CONTAINMENT PENETRATION SS-B

SUPPORT REACTIONS FOR LOAD CASE NO. 1

DEADHEIGHT

NODE	TYPE	REACTION (LBS OR IN-LBS)	DIRECTION
------	------	-----------------------------	-----------

5	FORCE	0.	X COORD
5	FORCE	84.	Y COORD
5	FORCE	-1.	Z COORD
5	MOMENT	1716.	X COORD
5	MOMENT	-36.	Y COORD
5	MOMENT	-617.	Z COORD
35	FORCE	202.	Y COORD
55	FORCE	201.	Y COORD
90	FORCE	-1.	X COORD
90	FORCE	0.	Z COORD
95	FORCE	-1.	X COORD
95	FORCE	0.	Z COORD
120	FORCE	285.	Y COORD
125	FORCE	4.	Y COORD
125	FORCE	2.	Z COORD
130	FORCE	-5.	Y COORD
130	FORCE	-1.	Z COORD
150	FORCE	160.	Y COORD
175	FORCE	114.	Y COORD
175	FORCE	-0.	Z COORD
190	FORCE	87.	Y COORD
190	FORCE	0.	Z COORD
210	FORCE	91.	Y COORD
240	FORCE	2.	X COORD
240	FORCE	63.	Y COORD
240	FORCE	-0.	Z COORD
240	MOMENT	0.	X COORD
240	MOMENT	0.	Y COORD
240	MOMENT	57.	Z COORD

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LOFT CIS ANALYSIS - 4"-1X-179-AD OUTSIDE CONTAINMENT PENETRATION S5-8

INTERNAL FORCES AND DEFLECTIONS FOR LOAL CASE NO. 1

DEADWEIGHT

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	5	C.	84.	-1.	1718.	-36.	-617.	-.000	-.000	.000	-.0000	.0000	.0000
	10	-C.	-59.	1.	-447.	35.	617.	-.000	-.001	.000	-.0001	.0000	.0001
RUN	10	C.	59.	-1.	447.	-35.	-617.	-.000	-.001	.000	-.0001	.0000	.0001
	15	-C.	-35.	1.	-394.	33.	617.	-.000	-.003	.000	-.0001	.0000	.0001
RUN	15	C.	35.	-1.	-394.	-33.	-617.	-.000	-.003	.000	-.0001	.0000	.0001
	20	-C.	-11.	1.	807.	32.	617.	-.000	-.004	.000	-.0000	.0000	.0002
RUN	20	C.	11.	-1.	-807.	-32.	-617.	-.000	-.004	.000	-.0000	.0000	.0002
	25	-C.	13.	1.	793.	33.	617.	-.000	-.004	.000	.0000	.0000	.0003
RUN	25	C.	-13.	-1.	-793.	-30.	-617.	-.000	-.004	.000	.0000	.0000	.0003
	30	-C.	37.	1.	351.	29.	617.	-.001	-.003	.000	.0001	.0000	.0004
RUN	30	C.	-37.	-1.	-351.	-29.	-617.	-.001	-.003	.000	.0001	.0000	.0004
	35	-C.	61.	1.	-319.	27.	617.	-.001	-.002	.000	.0001	.0000	.0004
VALVE	35	C.	141.	-1.	619.	-27.	-617.	-.001	-.002	.000	.0001	.0000	.0004
	40	-C.	-120.	1.	-1509.	20.	617.	-.001	-.001	.000	.0001	.0000	.0004
RUN	40	C.	120.	0.	-0.	-0.	-0.	-.001	-.001	.000	.0001	.0000	.0004
	45	-C.	-150.	0.	-0.	0.	0.	.012	-.001	-.002	.0001	.0000	.0004
VALVE	40	C.	-71.	-1.	-1509.	-25.	-617.	-.001	-.001	.000	.0001	.0000	.0004
	50	-C.	90.	1.	441.	25.	617.	-.001	.000	.000	.0001	.0000	.0005
ELBCH	50	C.	-90.	-1.	-441.	-25.	-617.	-.001	.000	.000	.0001	.0000	.0005
	55	-C.	103.	1.	-137.	18.	1198.	-.002	-.002	.000	.0001	.0000	.0006
FGRUN	55	C.	98.	-1.	137.	-16.	-1198.	-.002	-.002	.000	.0001	.0000	.0006
	60	-C.	-82.	1.	-137.	6.	115.	-.002	-.010	.000	.0001	.0000	.0006
FGRUN	60	C.	82.	-1.	137.	-6.	-115.	-.002	-.010	.000	.0001	.0000	.0006
	65	-C.	-60.	1.	-137.	-7.	-771.	-.002	-.017	.001	.0001	.0000	.0006
ELBCH	65	C.	60.	-1.	137.	7.	771.	-.002	-.017	.001	.0001	.0000	.0006
	70	-C.	-53.	1.	-131.	-13.	-1126.	.001	-.020	.001	.0000	.0000	.0004
FGRUN	70	C.	53.	-1.	131.	13.	1126.	.001	-.020	.001	.0000	.0000	.0004
	75	-C.	-29.	1.	-113.	-13.	-1125.	.007	-.020	-.000	.0000	.0000	.0003

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LCFT CIS ANALYSIS - 4"-1K-179-AD OUTSIDE CONTAINMENT PENETRATION S5-B

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	75	0.	29.	-1.	113.	13.	1125.	.007	-.020	-.000	.0000	.0000	.0003
	80	-0.	3.	1.	-89.	-13.	-1123.	.012	-.020	-.001	.0000	.0000	.0001
RUN	80	0.	-3.	-1.	89.	13.	1123.	.012	-.020	-.001	.0000	.0000	.0001
	85	-0.	36.	1.	-64.	-13.	-1121.	.014	-.020	-.001	.0000	.0000	.0000
RUN	85	0.	-36.	-1.	64.	13.	1121.	.014	-.020	-.001	.0000	.0000	.0000
	90	-0.	68.	1.	-40.	-13.	-1119.	.012	-.020	-.001	.0000	.0000	-.0001
RUN	90	-1.	-68.	-1.	40.	13.	1119.	.012	-.020	-.001	.0000	.0000	-.0001
	95	1.	101.	1.	-18.	-13.	-1146.	.008	-.020	-.001	-.0000	.0000	-.0003
RUN	95	-2.	-101.	-1.	18.	13.	1146.	.008	-.020	-.001	-.0000	.0000	-.0003
	100	2.	115.	1.	-8.	-13.	-1167.	.005	-.020	-.001	-.0000	.0000	-.0003
FGRUN	100	-2.	-115.	-1.	8.	13.	1167.	.005	-.020	-.001	-.0000	.0000	-.0003
	105	2.	122.	1.	-4.	-13.	-1177.	.003	-.020	-.001	-.0000	.0000	-.0003
ELBOW	105	-2.	-122.	-1.	4.	13.	1177.	.003	-.020	-.001	-.0000	.0000	-.0003
	110	2.	139.	1.	1.	-18.	-417.	.000	-.017	-.001	-.0000	.0000	-.0006
FGRUN	110	-2.	-135.	-1.	-1.	18.	417.	.000	-.017	-.001	-.0000	.0000	-.0006
	115	2.	150.	1.	1.	-27.	1151.	.000	-.011	-.001	-.0000	.0000	-.0006
RUN	115	-2.	-150.	-1.	-1.	27.	-1151.	.000	-.011	-.001	-.0000	.0000	-.0006
	120	2.	173.	1.	1.	-41.	3898.	.000	-.003	-.000	-.0000	.0000	-.0003
RUN	120	-2.	112.	-1.	-1.	41.	-3898.	.000	-.003	-.000	-.0000	.0000	-.0003
	125	2.	-99.	1.	1.	-50.	2842.	.000	-.000	-.000	-.0000	.0000	-.0002
RUN	125	-2.	103.	1.	-1.	50.	-2842.	.000	-.000	-.000	-.0000	.0000	-.0002
	130	2.	-70.	-1.	1.	-31.	763.	.000	.001	.000	-.0000	.0000	.0000
RUN	130	-2.	69.	0.	-1.	31.	-763.	.000	.001	.000	-.0000	.0000	.0000
	135	2.	-41.	-0.	1.	-27.	-163.	.000	-.001	.000	-.0000	.0000	.0001
FGRUN	135	-2.	41.	0.	-1.	27.	163.	.000	-.001	.000	-.0000	.0000	.0001
	140	2.	-17.	-0.	1.	-22.	-674.	.000	-.002	.000	-.0000	.0000	.0000
FGRUN	140	-2.	-13.	0.	-1.	22.	674.	.000	-.002	.000	-.0000	.0000	.0000
	145	2.	34.	-0.	1.	-18.	-298.	.000	-.002	.000	-.0000	.0000	-.0000
FGRUN	145	-2.	-64.	0.	-1.	18.	298.	.000	-.002	.000	-.0000	.0000	-.0000
	150	2.	89.	-0.	1.	-14.	1081.	.000	-.002	.000	-.0000	-.0000	.0000
RUN	150	-2.	72.	0.	-1.	14.	-1081.	.000	-.002	.000	-.0000	-.0000	.0000
	155	2.	-44.	-0.	1.	-8.	-97.	.000	-.003	.000	-.0000	-.0000	.0001

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LOFT CIS ANALYSIS - 40-16-179-A0 OUTSIDE CONTAINMENT PENETRATION S5-B

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	UX	UY	UZ	RX	RY	RZ
RUN	155	-2.	44.	0.	-1.	8.	97.	.000	-.003	.000	-.0000	-.0000	.0001
	160	2.	-16.	-0.	1.	-3.	-710.	.000	-.004	.000	-.0000	-.0000	.0000
RUN	160	-2.	16.	0.	-1.	3.	710.	.000	-.004	.000	-.0000	-.0000	.0000
	165	2.	11.	-0.	1.	2.	-758.	.000	-.004	.000	-.0000	-.0000	.0000
RUN	165	-2.	-11.	0.	-1.	-2.	758.	.000	-.004	.000	-.0000	-.0000	.0000
	170	2.	39.	-0.	1.	7.	-241.	.000	-.003	.000	-.0000	-.0000	.0001
RUN	170	-2.	-39.	0.	-1.	-7.	241.	.000	-.003	.000	-.0000	-.0000	.0001
	175	2.	67.	-0.	1.	12.	840.	.000	-.001	.000	-.0000	-.0000	.0001
RUN	175	-2.	47.	-0.	-1.	-12.	-840.	.000	-.001	.000	-.0000	-.0000	.0001
	180	1.	-20.	0.	1.	7.	173.	.000	-.001	-.000	-.0000	-.0000	.0000
RUN	180	-2.	20.	-0.	-1.	-7.	-173.	.000	-.001	-.000	-.0000	-.0000	.0000
	185	2.	7.	0.	1.	3.	50.	.000	-.001	-.000	-.0000	.0000	.0000
RUN	185	-2.	-7.	-0.	-1.	-3.	-50.	.000	-.001	-.000	-.0000	.0000	.0000
	190	2.	39.	0.	1.	-2.	469.	.000	-.001	-.000	-.0000	.0000	.0000
RUN	190	-2.	32.	0.	-1.	2.	-469.	.000	-.001	-.000	-.0000	.0000	.0000
	195	2.	-26.	-0.	1.	-1.	-273.	.000	-.002	.000	-.0000	.0000	.0000
RUN	195	-2.	26.	0.	-1.	1.	273.	.000	-.002	.000	-.0000	.0000	.0000
	200	2.	-0.	-0.	1.	-1.	-526.	.000	-.002	.000	-.0000	.0000	.0000
RUN	200	-2.	0.	0.	-1.	1.	526.	.000	-.002	.000	-.0000	.0000	.0000
	205	2.	25.	-0.	1.	-1.	-289.	.000	-.002	.000	-.0000	-.0000	.0000
RUN	205	-2.	-25.	0.	-1.	1.	289.	.000	-.002	.000	-.0000	-.0000	.0000
	210	2.	51.	-0.	1.	-0.	438.	.000	-.001	.000	-.0000	-.0000	.0000
RUN	210	-2.	40.	0.	-1.	0.	-438.	.000	-.001	.000	-.0000	-.0000	.0000
	215	2.	-13.	-0.	1.	-0.	-22.	.000	-.001	.000	-.0000	-.0000	.0000
RUN	215	-2.	18.	0.	-1.	0.	22.	.000	-.001	.000	-.0000	-.0000	.0000
	220	2.	4.	-0.	1.	0.	-134.	.000	-.000	.000	-.0000	-.0000	.0000
FGRUN	220	-2.	-4.	0.	-1.	-0.	134.	.000	-.000	.000	-.0000	-.0000	.0000
	225	2.	17.	-0.	1.	0.	-28.	.000	-.000	-.000	-.0000	-.0000	.0000
ELBOW	225	-2.	-17.	0.	-1.	-0.	28.	.000	-.000	-.000	-.0000	-.0000	.0000
	230	2.	30.	-0.	1.	0.	103.	.000	-.000	-.000	-.0000	-.0000	.0000
FGRUN	230	-2.	-30.	0.	-1.	-0.	-103.	.000	-.000	-.000	-.0000	-.0000	.0000
	235	2.	42.	-0.	1.	0.	86.	.000	-.000	-.000	-.0000	-.0000	.0000

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LOFT CIS ANALYSIS - 4"-1A-179-AB OUTSIDE CONTAINMENT PENETRATION SS-2

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	235	-2.	-42.	0.	-1.	-0.	-80.	.000	-.000	-.000	-.0000	-.0000	-.0000
	240	2.	63.	-0.	0.	0.	57.	-.000	-.000	-.000	-.0000	-.0000	-.0000

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APPENDIX D
THERMAL EXPANSION ANALYSIS RESULTS

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LOFT CIS ANALYSIS - 4"-16-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

SUPPORT REACTIONS FOR LOAD CASE NO. 2

THERMAL EXPANSION PLUS ANCHOR MOVEMENTS

NODE	TYPE	REACTION (LBS OR IN-LBS)	DIRECTION
------	------	-----------------------------	-----------

5	FORCE	0.	X COORD
5	FORCE	0.	Y COORD
5	FORCE	0.	Z COORD
5	MOMENT	0.	X COORD
5	MOMENT	0.	Y COORD
5	MOMENT	0.	Z COORD
35	FORCE	0.	Y COORD
55	FORCE	0.	Y COORD
90	FORCE	0.	X COORD
90	FORCE	0.	Z COORD
95	FORCE	0.	X COORD
95	FORCE	0.	Z COORD
120	FORCE	0.	Y COORD
125	FORCE	0.	Y COORD
125	FORCE	0.	Z COORD
130	FORCE	0.	Y COORD
130	FORCE	0.	Z COORD
150	FORCE	0.	Y COORD
175	FORCE	0.	Y COORD
175	FORCE	0.	Z COORD
190	FORCE	0.	Y COORD
190	FORCE	0.	Z COORD
210	FORCE	0.	Y COORD
240	FORCE	0.	X COORD
240	FORCE	0.	Y COORD
240	FORCE	0.	Z COORD
240	MOMENT	0.	X COORD
240	MOMENT	0.	Y COORD
240	MOMENT	0.	Z COORD

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

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LCFT CIS ANALYSIS - 4"-IN-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. - 2

THERMAL EXPANSION PLUS ANCHOR MOVEMENTS

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FCRUN	5	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	10	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	10	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	15	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	20	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	25	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	25	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	30	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	30	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	35	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
VALVE	35	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	40	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	40	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	45	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
VALVE	45	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	50	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
ELBOW	50	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	55	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FCRUN	55	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	60	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FCRUN	60	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	65	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
ELBOW	65	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	70	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FCRUN	70	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	75	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000

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LEFT CIS ANALYSIS - 4"-1H-179-A6 OUTSIDE CONTAINMENT PENETRATION SS-B

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	UX	UY	UZ	RX	RY	RZ
RUN	75	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	80	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	80	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	85	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	85	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	90	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	90	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	95	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	95	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	100	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FGRUN	100	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	105	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
ELBCH	105	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	110	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FGRUN	110	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	115	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	115	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	120	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	120	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	125	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	125	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	130	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	130	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	135	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FGRUN	135	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	140	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FGRUN	140	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	145	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FGRUN	145	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	150	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	150	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	155	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000

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LOFT CIS ANALYSIS - 4"-IN-179-AL OUTSIDE CONTAINMENT PENETRATION S5-B

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	UX	UY	UZ	RX	RY	RZ
RUN	155	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	160	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	160	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	165	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	165	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	170	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	170	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	175	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	175	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	180	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	180	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	185	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	185	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	190	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	190	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	195	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	195	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	200	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	200	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	205	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	205	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	210	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	210	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	215	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
RUN	215	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	220	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FGRUN	220	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	225	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
ELEC	225	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	230	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
FGRUN	230	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000
	235	0.	0.	0.	0.	0.	0.	0.000	0.000	0.000	0.0000	0.0000	0.0000

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LOFT CIS ANALYSIS - 4"-14-179-A6 OUTSIDE CONTAINMENT PENETRATION S5-B

[illegible]

APPENDIX E
SEISMIC ANALYSES RESULTS

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LEFT CIS ANALYSIS - 4"-1N-175-AD OUTSIDE CONTAINMENT PENETRATION S5-B

SUPPORT REACTIONS FOR LOAD CASE NO. 1

SSE RESPONSE SPECTRUM - 12 DAMPING

COMBINED RESULT FOR MODE 1 THRU 15 BY RMS SUMMATION

SPECTRA SET = 1

MODE	TYPE	REACTIONS (LBS OR IN-LBS)	DIRECTION
------	------	------------------------------	-----------

5	FORCE	320.	X CCORD
5	FORCE	14.	Y CCORD
5	FORCE	117.	Z CCORD
5	MOMENT	452.	X CCORD
5	MOMENT	30834.	Y CCORD
5	MOMENT	2772.	Z CCORD
35	FORCE	121.	Y CCORD
55	FORCE	564.	Y CCORD
90	FORCE	27.	X CCORD
90	FORCE	6.	Z CCORD
95	FORCE	12.	X CCORD
95	FORCE	2.	Z CCORD
120	FORCE	404.	Y CCORD
125	FORCE	40.	Y CCORD
125	FORCE	89.	Z CCORD
130	FORCE	43.	Y CCORD
130	FORCE	104.	Z CCORD
150	FORCE	52.	Y CCORD
175	FORCE	29.	Y CCORD
175	FORCE	93.	Z CCORD
190	FORCE	13.	Y CCORD
190	FORCE	55.	Z CCORD
210	FORCE	77.	Y CCORD
240	FORCE	413.	X CCORD
240	FORCE	67.	Y CCORD
240	FORCE	33.	Z CCORD
240	MOMENT	1230.	X CCORD
240	MOMENT	372.	Y CCORD
240	MOMENT	9566.	Z CCORD

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LEFT CIS ANALYSIS - 4"-1R-179-AB OUTSIDE CONTAINMENT PENETRATION S5-6

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	DX	DY	DZ	RX	RY	RZ
FGRUN	5	320.	14.	117.	452.	30834.	2772.	.000	.000	.000	.0000	.0000	.0000
	10	320.	14.	117.	203.	25194.	2772.	.023	.000	.000	.0000	.0025	.0003
RUN	10	318.	14.	117.	203.	25194.	2772.	.023	.000	.000	.0000	.0025	.0003
	15	318.	14.	117.	46.	19600.	2772.	.085	.001	.000	.0000	.0044	.0006
RUN	15	313.	13.	117.	46.	19600.	2772.	.085	.001	.000	.0000	.0044	.0006
	20	313.	13.	117.	271.	14134.	2772.	.178	.001	.000	.0000	.0059	.0010
RUN	20	303.	12.	117.	271.	14134.	2772.	.178	.001	.000	.0000	.0059	.0010
	25	303.	12.	117.	479.	8698.	2772.	.293	.002	.000	.0000	.0069	.0013
RUN	25	288.	11.	117.	479.	8698.	2772.	.293	.002	.000	.0000	.0069	.0013
	30	288.	11.	117.	642.	4210.	2772.	.421	.001	.000	.0001	.0075	.0016
RUN	30	267.	10.	117.	645.	4210.	2772.	.421	.001	.000	.0001	.0075	.0016
	35	267.	10.	117.	839.	2645.	2772.	.556	.001	.000	.0001	.0076	.0019
VALVE	35	241.	111.	117.	839.	2645.	2772.	.556	.001	.000	.0001	.0076	.0019
	40	241.	111.	117.	1353.	5586.	2772.	.677	.003	.000	.0001	.0075	.0020
RUN	40	240.	7.	66.	1969.	0.	7190.	.677	.003	.000	.0001	.0075	.0020
	45	240.	7.	66.	0.	0.	0.	.745	.003	.000	.0002	.0075	.0025
VALVE	40	70.	110.	96.	1399.	5586.	4467.	.677	.003	.000	.0001	.0075	.0020
	50	70.	110.	96.	2390.	4971.	4467.	.761	.005	.000	.0001	.0074	.0019
ELBCH	50	86.	110.	96.	2390.	4971.	4467.	.781	.005	.000	.0001	.0074	.0019
	55	86.	110.	96.	2959.	4373.	3923.	.823	.006	.041	.0002	.0065	.0014
FGRUN	55	104.	464.	94.	2959.	4373.	3923.	.823	.006	.041	.0002	.0065	.0014
	60	104.	464.	94.	2959.	4128.	5190.	.823	.021	.117	.0004	.0063	.0011
FGRUN	60	127.	463.	85.	2959.	4128.	5190.	.823	.021	.117	.0004	.0063	.0011
	65	127.	463.	85.	2959.	4129.	14669.	.823	.030	.191	.0006	.0060	.0005
ELBCH	65	150.	462.	73.	2959.	4129.	14669.	.823	.030	.191	.0006	.0060	.0005
	70	150.	462.	73.	2943.	4180.	16556.	.810	.025	.219	.0013	.0052	.0037
FGRUN	70	178.	461.	56.	2943.	4180.	16556.	.810	.025	.219	.0013	.0052	.0037
	75	178.	461.	56.	2978.	4180.	13492.	.732	.025	.195	.0015	.0047	.0050
RUN	75	217.	460.	37.	2978.	4180.	13492.	.732	.025	.195	.0015	.0047	.0050
	80	217.	460.	37.	2670.	4180.	3460.	.598	.025	.157	.0018	.0041	.0063

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LEFT DIS ANALYSIS - 4"-1A-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	LX	LY	LZ	RX	RY	RZ
RUN	80	254.	459.	34.	2870.	4180.	2805.	.596	.025	.157	.0018	.0041	.0063
	85	254.	459.	34.	2370.	4180.	2805.	.438	.026	.112	.0021	.0035	.0069
RUN	85	283.	458.	44.	2370.	4180.	2805.	.438	.026	.112	.0021	.0035	.0069
	90	283.	458.	44.	1536.	4180.	4572.	.273	.026	.063	.0022	.0028	.0068
RUN	90	275.	458.	47.	1536.	4180.	4572.	.273	.026	.063	.0022	.0028	.0068
	95	275.	458.	47.	690.	4180.	10951.	.118	.026	.022	.0023	.0022	.0059
RUN	95	270.	458.	49.	690.	4180.	10951.	.118	.026	.022	.0023	.0022	.0059
	100	270.	458.	49.	572.	4180.	13876.	.057	.026	.029	.0023	.0019	.0052
FGRUN	100	272.	459.	50.	572.	4180.	13876.	.057	.026	.029	.0023	.0019	.0052
	105	272.	459.	50.	648.	4180.	15216.	.032	.026	.038	.0023	.0018	.0049
ELBOW	105	273.	459.	53.	648.	4180.	15216.	.032	.026	.036	.0023	.0018	.0049
	110	273.	459.	53.	822.	3962.	14105.	.014	.013	.041	.0024	.0012	.0012
FGRUN	110	274.	459.	59.	822.	3962.	14105.	.014	.013	.041	.0024	.0012	.0012
	115	274.	459.	59.	822.	3636.	9137.	.014	.007	.029	.0023	.0010	.0006
RUN	115	276.	460.	67.	822.	3636.	9137.	.014	.007	.029	.0023	.0010	.0006
	120	276.	460.	67.	822.	3429.	2476.	.014	.004	.014	.0022	.0008	.0003
RUN	120	276.	83.	74.	822.	3429.	2476.	.014	.004	.014	.0022	.0008	.0003
	125	276.	83.	74.	822.	3523.	1737.	.014	.004	.009	.0022	.0006	.0002
RUN	125	280.	49.	65.	822.	3533.	1737.	.014	.004	.009	.0022	.0006	.0002
	130	280.	49.	65.	822.	2379.	691.	.014	.004	.010	.0021	.0004	.0001
RUN	130	284.	15.	81.	822.	2379.	691.	.014	.004	.010	.0021	.0004	.0001
	135	284.	15.	81.	822.	1401.	570.	.014	.004	.017	.0020	.0004	.0001
FGRUN	135	287.	13.	73.	822.	1401.	570.	.014	.004	.017	.0020	.0004	.0001
	140	287.	13.	73.	822.	1421.	436.	.014	.003	.023	.0019	.0003	.0001
FGRUN	140	296.	22.	47.	822.	1421.	436.	.014	.003	.023	.0019	.0003	.0001
	145	296.	22.	47.	822.	1817.	206.	.013	.002	.026	.0018	.0002	.0001
FGRUN	145	306.	32.	18.	822.	1817.	206.	.013	.002	.026	.0018	.0002	.0001
	150	306.	32.	18.	822.	1898.	554.	.013	.001	.028	.0017	.0001	.0001
RUN	150	311.	21.	15.	822.	1898.	554.	.013	.001	.028	.0017	.0001	.0001
	155	311.	21.	15.	822.	1696.	311.	.013	.001	.026	.0016	.0002	.0000
RUN	155	317.	14.	26.	822.	1696.	311.	.013	.001	.026	.0016	.0002	.0000
	160	317.	14.	26.	822.	1157.	366.	.013	.002	.022	.0015	.0003	.0000

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LEFT CIS ANALYSIS - 4"-1K-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	160	323.	5.	42.	822.	1157.	366.	.013	.002	.022	.0015	.0003	.0000
	165	323.	5.	42.	822.	366.	344.	.013	.002	.014	.0014	.0004	.0000
RUN	165	330.	12.	52.	822.	366.	344.	.013	.002	.014	.0014	.0004	.0000
	170	330.	12.	52.	822.	801.	116.	.013	.001	.007	.0013	.0003	.0000
RUN	170	336.	19.	57.	822.	801.	116.	.013	.001	.007	.0013	.0003	.0000
	175	336.	19.	57.	822.	1942.	276.	.013	.000	.001	.0012	.0002	.0000
RUN	175	343.	5.	36.	822.	1942.	276.	.013	.000	.001	.0012	.0002	.0000
	180	343.	5.	36.	822.	1270.	193.	.013	.000	.002	.0011	.0001	.0000
RUN	180	350.	6.	37.	822.	1270.	193.	.013	.000	.002	.0011	.0001	.0000
	185	350.	6.	37.	822.	689.	100.	.013	.000	.002	.0009	.0000	.0000
RUN	185	357.	7.	38.	822.	689.	100.	.013	.000	.002	.0009	.0000	.0000
	190	357.	7.	38.	822.	639.	99.	.013	.000	.001	.0008	.0001	.0000
RUN	190	364.	8.	30.	822.	639.	99.	.013	.000	.001	.0008	.0001	.0000
	195	364.	8.	30.	822.	187.	73.	.013	.000	.002	.0007	.0001	.0000
RUN	195	371.	8.	24.	822.	187.	73.	.013	.000	.002	.0007	.0001	.0000
	200	371.	8.	24.	822.	436.	219.	.013	.000	.004	.0006	.0001	.0000
RUN	200	378.	8.	14.	822.	436.	219.	.013	.000	.004	.0006	.0001	.0000
	205	378.	8.	14.	822.	677.	365.	.013	.000	.005	.0005	.0000	.0000
RUN	205	385.	8.	2.	822.	677.	365.	.013	.000	.005	.0005	.0000	.0000
	210	385.	8.	2.	822.	673.	511.	.012	.001	.006	.0004	.0000	.0001
RUN	210	392.	69.	13.	822.	673.	511.	.012	.001	.006	.0004	.0000	.0001
	215	392.	69.	13.	822.	475.	599.	.012	.002	.005	.0004	.0001	.0001
RUN	215	396.	66.	22.	822.	476.	599.	.012	.002	.005	.0004	.0001	.0001
	220	396.	66.	22.	822.	163.	1691.	.012	.003	.004	.0003	.0001	.0000
FGRUN	220	403.	67.	27.	822.	163.	1691.	.012	.003	.004	.0003	.0001	.0000
	225	403.	67.	27.	822.	211.	2363.	.012	.002	.003	.0002	.0001	.0001
ELBOW	225	407.	67.	30.	822.	211.	2363.	.012	.002	.003	.0002	.0001	.0001
	230	407.	67.	30.	834.	372.	219.	.010	.000	.002	.0001	.0001	.0005
FGRUN	230	410.	67.	31.	634.	372.	219.	.010	.000	.002	.0001	.0001	.0005
	235	410.	67.	31.	926.	372.	3372.	.005	.000	.001	.0001	.0000	.0005
FGRUN	235	413.	67.	33.	926.	372.	3372.	.005	.000	.001	.0001	.0000	.0005
	240	413.	67.	33.	1230.	372.	5560.	.000	.000	.000	.0000	.0000	.0000

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LOFT CIS ANALYSIS - 4"-IN-175-46 OUTSIDE CONTAINMENT PENETRATION S5-B

SUPPORT REACTIONS FOR LOAD COMBINATION CASE NO. 4

DBE RESPONSE SPECTRUM - ONE-HALF SSE

NODE	TYPE	REACTIONS (LBS OR IN-LBS)	DIRECTION
------	------	------------------------------	-----------

5	FORCE	160.	X COORD
5	FORCE	7.	Y COORD
5	FORCE	59.	Z COORD
5	MOMENT	226.	X COORD
5	MOMENT	15417.	Y COORD
5	MOMENT	1386.	Z COORD
35	FORCE	60.	Y COORD
55	FORCE	282.	Y COORD
90	FORCE	14.	X COORD
90	FORCE	3.	Z COORD
95	FORCE	6.	X COORD
95	FORCE	1.	Z COORD
120	FORCE	202.	Y COORD
125	FORCE	20.	Y COORD
125	FORCE	45.	Z COORD
130	FORCE	21.	Y COORD
130	FORCE	52.	Z COORD
150	FORCE	20.	Y COORD
175	FORCE	12.	Y COORD
175	FORCE	46.	Z COORD
190	FORCE	6.	Y COORD
190	FORCE	27.	Z COORD
210	FORCE	39.	Y COORD
240	FORCE	206.	X COORD
240	FORCE	33.	Y COORD
240	FORCE	16.	Z COORD
240	MOMENT	615.	X COORD
240	MOMENT	166.	Y COORD
240	MOMENT	4783.	Z COORD

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LOFT CIS ANALYSIS - 4"-14-179-AD OUTSIDE CONTAINMENT PENETRATION 55-0

INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 4

OBE RESPONSE SPECTRUM - ONE-HALF SSE

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	CX	DY	DZ	RX	RY	RZ
FGRUN	5	100.	7.	59.	226.	15417.	1386.	.000	.000	.000	.0000	.0000	.0000
	10	100.	7.	59.	101.	12597.	1386.	.011	.000	.000	.0000	.0012	.0002
RUN	10	159.	7.	59.	101.	12597.	1386.	.011	.000	.000	.0000	.0012	.0002
	15	159.	7.	59.	23.	9803.	1386.	.043	.000	.000	.0000	.0022	.0003
RUN	15	157.	6.	59.	23.	9803.	1386.	.043	.000	.000	.0000	.0022	.0003
	20	157.	6.	59.	135.	7067.	1386.	.089	.001	.000	.0000	.0030	.0005
RUN	20	152.	6.	59.	135.	7067.	1386.	.089	.001	.000	.0000	.0030	.0005
	25	152.	6.	59.	239.	4449.	1386.	.146	.001	.000	.0000	.0035	.0006
RUN	25	144.	5.	58.	239.	4449.	1386.	.146	.001	.000	.0000	.0035	.0006
	30	144.	5.	58.	332.	2105.	1386.	.211	.001	.000	.0000	.0037	.0008
RUN	30	134.	5.	58.	332.	2105.	1386.	.211	.001	.000	.0000	.0037	.0008
	35	134.	5.	58.	419.	1322.	1386.	.278	.001	.000	.0001	.0038	.0010
VALVE	35	121.	56.	58.	419.	1322.	1386.	.278	.001	.000	.0001	.0038	.0010
	40	121.	56.	58.	679.	2793.	1386.	.338	.002	.000	.0001	.0038	.0010
RUN	40	120.	4.	33.	984.	0.	3595.	.338	.002	.000	.0001	.0038	.0010
	45	120.	4.	33.	0.	0.	0.	.372	.002	.003	.0001	.0038	.0013
VALVE	40	35.	55.	48.	700.	2793.	2233.	.338	.002	.000	.0001	.0038	.0010
	50	35.	55.	48.	1195.	2486.	2233.	.391	.002	.000	.0001	.0037	.0009
ELBOW	50	43.	55.	48.	1195.	2486.	2233.	.391	.002	.000	.0001	.0037	.0009
	55	43.	55.	48.	1479.	2186.	1962.	.412	.003	.020	.0001	.0032	.0007
FGRUN	55	52.	232.	47.	1479.	2186.	1962.	.412	.003	.020	.0001	.0032	.0007
	60	52.	232.	47.	1479.	2064.	4595.	.412	.010	.059	.0002	.0031	.0005
FGRUN	60	64.	231.	43.	1479.	2064.	4595.	.412	.010	.059	.0002	.0031	.0005
	65	64.	231.	43.	1479.	2065.	7334.	.412	.015	.095	.0003	.0030	.0002
ELBOW	65	75.	231.	36.	1479.	2065.	7334.	.412	.015	.095	.0003	.0030	.0002
	70	75.	231.	36.	1472.	2090.	8278.	.405	.013	.110	.0006	.0026	.0019
FGRUN	70	89.	231.	28.	1472.	2090.	8278.	.405	.013	.110	.0006	.0026	.0019
	75	89.	231.	28.	1489.	2090.	6746.	.366	.013	.098	.0008	.0024	.0025
RUN	75	109.	230.	19.	1489.	2090.	6746.	.366	.013	.098	.0008	.0024	.0025
	80	109.	230.	19.	1435.	2090.	4230.	.298	.013	.078	.0009	.0021	.0032

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LOFT CIS ANALYSIS - 4"-1A-179-AB OUTSIDE CONTAINMENT PENETRATION 35-B

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	HX	HY	HZ	DX	DY	DZ	RX	RY	RZ
RUN	80	127.	230.	17.	1435.	2090.	4130.	.298	.013	.078	.0009	.0021	.0032
	85	127.	230.	17.	1185.	2090.	1403.	.219	.013	.056	.0010	.0017	.0035
RUN	85	141.	229.	22.	1185.	2090.	1403.	.219	.013	.056	.0010	.0017	.0035
	90	141.	229.	22.	768.	2090.	2286.	.136	.013	.031	.0011	.0014	.0034
RUN	90	137.	229.	24.	768.	2090.	2286.	.136	.013	.031	.0011	.0014	.0034
	95	137.	229.	24.	345.	2090.	5476.	.059	.013	.011	.0011	.0011	.0030
RUN	95	135.	229.	24.	345.	2090.	5476.	.059	.013	.011	.0011	.0011	.0030
	100	135.	229.	24.	286.	2090.	6938.	.029	.013	.014	.0011	.0010	.0026
FGRUN	100	136.	229.	25.	286.	2090.	6938.	.029	.013	.014	.0011	.0010	.0026
	105	136.	229.	25.	324.	2090.	7608.	.016	.013	.019	.0011	.0009	.0024
ELBOW	105	137.	229.	27.	324.	2090.	7608.	.016	.013	.019	.0011	.0009	.0024
	110	137.	229.	27.	411.	1981.	7052.	.007	.007	.020	.0012	.0006	.0006
FGRUN	110	137.	230.	29.	411.	1981.	7052.	.007	.007	.020	.0012	.0006	.0006
	115	137.	230.	29.	411.	1816.	4569.	.007	.003	.014	.0012	.0005	.0003
RUN	115	138.	230.	34.	411.	1816.	4569.	.007	.003	.014	.0012	.0005	.0003
	120	136.	230.	34.	411.	1715.	1238.	.007	.002	.007	.0011	.0004	.0001
RUN	120	139.	42.	37.	411.	1715.	1238.	.007	.002	.007	.0011	.0004	.0001
	125	139.	42.	37.	411.	1766.	869.	.007	.002	.004	.0011	.0003	.0001
RUN	125	140.	24.	33.	411.	1766.	869.	.007	.002	.004	.0011	.0003	.0001
	130	140.	24.	33.	411.	1189.	346.	.007	.002	.005	.0010	.0002	.0000
RUN	130	142.	7.	41.	411.	1189.	346.	.007	.002	.005	.0010	.0002	.0000
	135	142.	7.	41.	411.	701.	285.	.007	.002	.008	.0010	.0002	.0000
FGRUN	135	144.	7.	36.	411.	701.	285.	.007	.002	.008	.0010	.0002	.0000
	140	144.	7.	36.	411.	711.	218.	.007	.001	.011	.0009	.0002	.0000
FGRUN	140	148.	11.	23.	411.	711.	218.	.007	.001	.011	.0009	.0002	.0000
	145	148.	11.	23.	411.	906.	103.	.007	.001	.013	.0009	.0001	.0000
FGRUN	145	153.	16.	9.	411.	908.	103.	.007	.001	.013	.0009	.0001	.0000
	150	153.	16.	9.	411.	949.	277.	.007	.000	.014	.0008	.0000	.0000
RUN	150	155.	10.	8.	411.	949.	277.	.007	.000	.014	.0008	.0000	.0000
	155	155.	10.	8.	411.	848.	155.	.007	.001	.013	.0008	.0001	.0000
RUN	155	158.	7.	14.	411.	848.	155.	.007	.001	.013	.0008	.0001	.0000
	160	158.	7.	14.	411.	579.	183.	.007	.001	.011	.0007	.0002	.0000

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LOFT CIS ANALYSIS - 4"-16-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	160	162.	3.	21.	411.	579.	163.	.007	.001	.011	.0007	.0002	.0000
	165	162.	3.	21.	411.	183.	172.	.007	.001	.007	.0007	.0002	.0000
RUN	165	165.	6.	26.	411.	183.	172.	.007	.001	.007	.0007	.0002	.0000
	170	165.	6.	26.	411.	400.	58.	.007	.001	.003	.0006	.0002	.0000
RUN	170	168.	9.	29.	411.	400.	58.	.007	.001	.003	.0006	.0002	.0000
	175	168.	9.	29.	411.	971.	138.	.007	.000	.000	.0006	.0001	.0000
RUN	175	172.	2.	18.	411.	971.	138.	.007	.000	.000	.0006	.0001	.0000
	180	172.	2.	18.	411.	635.	96.	.006	.000	.001	.0005	.0000	.0000
RUN	180	175.	3.	18.	411.	635.	96.	.006	.000	.001	.0005	.0000	.0000
	185	175.	3.	18.	411.	344.	50.	.006	.000	.001	.0005	.0000	.0000
RUN	185	179.	3.	19.	411.	344.	50.	.006	.000	.001	.0005	.0000	.0000
	190	179.	3.	19.	411.	319.	49.	.006	.000	.000	.0004	.0000	.0000
RUN	190	182.	4.	15.	411.	319.	49.	.006	.000	.000	.0004	.0000	.0000
	195	182.	4.	15.	411.	94.	37.	.006	.000	.001	.0004	.0001	.0000
RUN	195	186.	4.	12.	411.	94.	37.	.006	.000	.001	.0004	.0001	.0000
	200	186.	4.	12.	411.	219.	110.	.006	.000	.002	.0003	.0000	.0000
RUN	200	189.	4.	7.	411.	219.	110.	.006	.000	.002	.0003	.0000	.0000
	205	189.	4.	7.	411.	339.	183.	.006	.000	.003	.0003	.0000	.0000
RUN	205	193.	4.	1.	411.	339.	183.	.006	.000	.003	.0003	.0000	.0000
	210	193.	4.	1.	411.	337.	255.	.006	.000	.003	.0002	.0000	.0000
RUN	210	196.	39.	6.	411.	337.	255.	.006	.000	.003	.0002	.0000	.0000
	215	196.	39.	6.	411.	238.	299.	.006	.001	.002	.0002	.0000	.0000
RUN	215	199.	34.	11.	411.	238.	299.	.006	.001	.002	.0002	.0000	.0000
	220	199.	34.	11.	411.	81.	846.	.006	.001	.002	.0001	.0000	.0000
FGRUN	220	202.	34.	14.	411.	81.	846.	.006	.001	.002	.0001	.0000	.0000
	225	202.	34.	14.	411.	106.	1181.	.006	.001	.001	.0001	.0000	.0001
ELBCH	225	204.	33.	15.	411.	106.	1181.	.006	.001	.001	.0001	.0000	.0001
	230	204.	33.	15.	417.	186.	159.	.005	.000	.001	.0001	.0000	.0003
FGRUN	230	205.	33.	16.	417.	186.	159.	.005	.000	.001	.0001	.0000	.0003
	235	205.	33.	16.	463.	186.	1886.	.002	.000	.000	.0000	.0000	.0002
FGRUN	235	206.	33.	16.	463.	186.	1886.	.002	.000	.000	.0000	.0000	.0002
	240	206.	33.	16.	615.	186.	4783.	.000	.000	.000	.0000	.0000	.0000

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

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 LOFT CIS ANALYSIS - 4"-IW-179-AB OUTSIDE CONTAINMENT PENETRATION S5-8

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ASME SECTION III CLASS 2 OF ANSI 831.1-B 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)
FGRUN	5	1.000	1251.	5628.	0.	1251.
	10	1.000	938.	4684.	0.	938.
RUN	10	1.000	938.	4684.	0.	938.
	15	1.000	929.	3856.	0.	929.
RUN	15	1.000	929.	3856.	0.	929.
	20	1.000	1013.	3142.	0.	1013.
RUN	20	1.000	1013.	3142.	0.	1013.
	25	1.000	1009.	2388.	0.	1009.
RUN	25	1.000	1009.	2388.	0.	1009.
	30	1.000	922.	1674.	0.	922.
RUN	30	1.000	922.	1674.	0.	922.
	35	1.000	951.	1530.	0.	951.
RUN	35	1.000	951.	1530.	0.	951.
	40	1.000	712.	1814.	0.	712.
RUN	40	1.000	712.	1814.	0.	712.
ELBOW	50	1.953	1041.	2578.	0.	1041.
	55	1.953	1233.	2658.	0.	1233.
FGRUN	55	1.000	1068.	2040.	0.	1068.
	60	1.000	765.	2317.	0.	765.
FGRUN	60	1.000	765.	2317.	0.	765.
	65	1.000	944.	3238.	0.	944.
ELBOW	65	1.953	1051.	4412.	0.	1051.
	70	1.953	1203.	4955.	0.	1203.
FGRUN	70	1.000	1047.	3608.	0.	1047.
	75	1.000	1046.	3180.	0.	1046.
RUN	75	1.000	1046.	3180.	0.	1046.
	80	1.000	1045.	2503.	0.	1045.
RUN	80	1.000	1045.	2503.	0.	1045.
	85	1.000	1044.	1866.	0.	1044.

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LOFT CIS ANALYSIS - 4"-IN-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

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	85	1.000	1044:	1866:	0:	1044:
	90	1.000	1043:	1986:	0:	1043:
RUN	90	1.000	1043:	1986:	0:	1043:
	95	1.000	1051:	2786:	0:	1051:
RUN	95	1.000	1051:	2786:	0:	1051:
	100	1.000	1057:	3201:	0:	1057:
FGRUN	100	1.000	1057:	3201:	0:	1057:
	105	1.000	1060:	3394:	0:	1060:
ELBOW	105	1.953	1222:	4641:	0:	1222:
	110	1.953	893:	4070:	0:	893:
FGRUN	110	1.000	835:	3004:	0:	835:
	115	1.000	1053:	2511:	0:	1053:
RUN	115	1.000	1053:	2511:	0:	1053:
	120	1.000	1864:	2501:	0:	1864:
RUN	120	1.000	1864:	2501:	0:	1864:
	125	1.000	1552:	2147:	0:	1552:
RUN	125	1.000	1552:	2147:	0:	1552:
	130	1.000	938:	1324:	0:	938:
RUN	130	1.000	938:	1324:	0:	938:
	135	1.000	761:	1016:	0:	761:
FGRUN	135	1.000	761:	1016:	0:	761:
	140	1.000	911:	1163:	0:	911:
FGRUN	140	1.000	911:	1163:	0:	911:
	145	1.000	800:	1097:	0:	800:
FGRUN	145	1.000	800:	1097:	0:	800:
	150	1.000	1032:	1348:	0:	1032:
RUN	150	1.000	1032:	1348:	0:	1032:
	155	1.000	741:	1023:	0:	741:

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LOFT CIS ANALYSIS - 4"-IW-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B.

ASME SECTION III CLASS 2 OR ANSI 831.1.8 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	155	1.000	741.	1023.	0:	741.
	160	1.000	922.	1139.	0:	922.
RUN	160	1.000	922.	1139.	0:	922.
	165	1.000	936.	1079.	0:	936.
RUN	165	1.000	936.	1079.	0:	936.
	170	1.000	783.	954.	0:	783.
	175	1.000	960.	1275.	0:	960.
RUN	175	1.000	960.	1275.	0:	960.
	180	1.000	763.	989.	0:	763.
RUN	180	1.000	763.	989.	0:	763.
	185	1.000	727.	886.	0:	727.
RUN	185	1.000	727.	886.	0:	727.
	190	1.000	851.	1005.	0:	851.
	195	1.000	851.	1005.	0:	851.
RUN	195	1.000	851.	1005.	0:	851.
	200	1.000	793.	918.	0:	793.
	205	1.000	867.	1009.	0:	867.
RUN	200	1.000	867.	1009.	0:	867.
	210	1.000	797.	964.	0:	797.
	215	1.000	842.	1016.	0:	842.
RUN	210	1.000	842.	1016.	0:	842.
	220	1.000	718.	884.	0:	718.
	225	1.000	752.	1031.	0:	752.
FGRUN	220	1.000	752.	1031.	0:	752.
	225	1.000	720.	1091.	0:	720.

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LGFT CIS ANALYSIS - 4"-IW-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

ASME SECTION III CLASS 2 OR ANSI 831.1.8 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)
ELBOW	225	1.953	724:	1268:	0:	724:
	230	1.953	757:	968:	0:	757:
FGRUN	230	1.000	742:	885:	0:	742:
	235	1.000	737:	1257:	0:	737:
FGRUN	235	1.000	737:	1257:	0:	737:
	240	1.000	729:	2156:	0:	729:

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APPENDIX G
LEVEL C SERVICE CONDITIONS
STRESS ANALYSIS RESULTS

LGFT CIS ANALYSIS - 4"-IR-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

ASME SECTION III CLASS 2 OR ANSI B31.1.1.1 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)
FGRUN	5	1.000	1251.	10404.	0.	1251.
	10	1.000	938.	8431.	0.	938.
RUN	10	1.000	938.	8431.	0.	938.
	15	1.000	929.	8782.	0.	929.
RUN	15	1.000	929.	8782.	0.	929.
	20	1.000	1013.	5271.	0.	1013.
RUN	20	1.000	1013.	5271.	0.	1013.
	25	1.000	1009.	3788.	0.	1009.
RUN	25	1.000	1009.	3788.	0.	1009.
	30	1.000	922.	2425.	0.	922.
RUN	30	1.000	922.	2425.	0.	922.
	35	1.000	951.	2110.	0.	951.
RUN	40	1.000	712.	2918.	0.	712.
	45	1.000	712.	712.	0.	712.
ELBCH	50	1.953	1041.	4114.	0.	1041.
	55	1.953	1233.	4082.	0.	1233.
FGRUN	55	1.000	1068.	3012.	0.	1068.
	60	1.000	765.	3869.	0.	765.
FGRUN	60	1.000	765.	3869.	0.	765.
	65	1.000	944.	5533.	0.	944.
ELBCH	65	1.953	1051.	7773.	0.	1051.
	70	1.953	1203.	8706.	0.	1203.
FGRUN	70	1.000	1047.	6189.	0.	1047.
	75	1.000	1046.	5313.	0.	1046.
RUN	75	1.000	1046.	5313.	0.	1046.
	80	1.000	1045.	3981.	0.	1045.
RUN	80	1.000	1045.	3981.	0.	1045.
	85	1.000	1044.	2889.	0.	1044.

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LOFT CIS ANALYSIS - 4"-1K-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

ASME SECTION III CLASS 2 OR ANSI B31.1.2 STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIFY FACTOR	SUSTAINED STRESS EQ. 8 (PSI)	OCCASIONAL STRESS EQ. 9 (PSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
RUN	85	1.000	1044.	2669.	0.	1044.
	90	1.000	1043.	2930.	0.	1043.
RUN	90	1.000	1043.	2930.	0.	1043.
	95	1.000	1051.	4522.	0.	1051.
RUN	95	1.000	1051.	4522.	0.	1051.
	100	1.000	1057.	5344.	0.	1057.
FGRUN	100	1.000	1057.	5344.	0.	1057.
	105	1.000	1060.	5729.	0.	1060.
ELBCH	105	1.953	1222.	8081.	0.	1222.
	110	1.953	893.	7247.	0.	893.
FGRUN	110	1.000	835.	5173.	0.	835.
	115	1.000	1053.	3970.	0.	1053.
RUN	115	1.000	1053.	3970.	0.	1053.
	120	1.000	1864.	3138.	0.	1864.
RUN	120	1.000	1864.	3138.	0.	1864.
	125	1.000	1552.	2741.	0.	1552.
RUN	125	1.000	1552.	2741.	0.	1552.
	130	1.000	938.	1709.	0.	938.
RUN	130	1.000	938.	1709.	0.	938.
	135	1.000	761.	1270.	0.	761.
FGRUN	135	1.000	761.	1270.	0.	761.
	140	1.000	911.	1414.	0.	911.
FGRUN	140	1.000	911.	1414.	0.	911.
	145	1.000	800.	1393.	0.	800.
FGRUN	145	1.000	800.	1393.	0.	800.
	150	1.000	1032.	1665.	0.	1032.
RUN	150	1.000	1032.	1665.	0.	1032.
	155	1.000	741.	1306.	0.	741.

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LCFT CIS ANALYSIS - 4"-1K-179-AB OUTSIDE CONTAINMENT PENETRATION S5-B

ASME SECTION III CLASS 2 OR ANSI B31.1-B STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIFY FACTOR	SUSTAINED STRESS E2.8 (PSI)	OCCASIONAL STRESS E3.9 (PSI)	EXPANSION STRESS E3.10 (PSI)	SUSTAINED PLUS EXPANSION STRESS E2.11 (PSI)
RUN	155	1.000	741.	1300.	0.	741.
	160	1.000	922.	1355.	0.	922.
RUN	160	1.000	922.	1355.	0.	922.
	165	1.000	936.	1221.	0.	936.
RUN	165	1.000	936.	1221.	0.	936.
	170	1.000	783.	1124.	0.	783.
RUN	170	1.000	783.	1124.	0.	783.
	175	1.000	960.	1589.	0.	960.
RUN	175	1.000	960.	1589.	0.	960.
	180	1.000	763.	1214.	0.	763.
RUN	180	1.000	763.	1214.	0.	763.
	185	1.000	727.	1045.	0.	727.
RUN	185	1.000	727.	1045.	0.	727.
	190	1.000	851.	1160.	0.	851.
RUN	190	1.000	851.	1160.	0.	851.
	195	1.000	793.	1043.	0.	793.
RUN	195	1.000	793.	1043.	0.	793.
	200	1.000	867.	1150.	0.	867.
RUN	200	1.000	867.	1150.	0.	867.
	205	1.000	797.	1130.	0.	797.
RUN	205	1.000	797.	1130.	0.	797.
	210	1.000	842.	1190.	0.	842.
RUN	210	1.000	842.	1190.	0.	842.
	215	1.000	718.	1050.	0.	718.
RUN	215	1.000	718.	1050.	0.	718.
	220	1.000	752.	1310.	0.	752.
FGRUN	220	1.000	752.	1310.	0.	752.
	225	1.000	720.	1463.	0.	720.

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LOFT CIS ANALYSIS - 4"-IW-179-AB OUTSIDE CONTAINMENT PENETRATION SS-B

ASME SECTION III CLASS 2 OR ANSI B31.1-80 STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIFY FACTOR	SUSTAINED STRESS EQ. 8 (PSI)	OCCASIONAL STRESS EQ. 9 (PSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
ELBOW	225	1.953	724.	1811.	0.	724.
	230	1.953	757.	1175.	0.	757.
FGRUN	230	1.000	742.	1028.	0.	742.
	235	1.000	737.	1777.	0.	737.
FGRUN	235	1.000	737.	1777.	0.	737.
	240	1.000	729.	3582.	0.	729.

APPENDIX H
LEVEL D SERVICE CONDITIONS
STRESS ANALYSIS RESULTS

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THERE ARE NO LEVEL D SERVICE CONDITIONS
APPLICABLE TO THIS SYSTEM

APPENDIX I
COMPONENT SUPPORT ANALYSIS RESULTS

THIS SYSTEM CONTAINS NO SUPPORTS
WHICH REQUIRE ANALYSIS