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LOFT TECHNICAL REPORT LTR 136-5
RE&C INTERNAL REPORT RE-A-78-059
OCTOBER 31, 1978

LOFT CIS ANALYSIS S-5B PENETRATION 3" IA-296-AB

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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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REMARKS: The line analysed herein will be listed in the master Containment Isolation System technical report, LTR 128-5. This master LTR will be released after the completion of the 56 subtier LTRs. This master LTR will list all the CIS lines, P&ID drawings and the seismic analysis LTRs.

SWR No. 51752 covers recommendation of this LTR.

RESEARCH, ENGINEERING AND CONSTRUCTION REPORT ENGINEERING ANALYSIS DIVISION

APPLIED MECHANICS BRANCH

LOFT CIS ANALYSIS S-5B PENETRATION 3" IA-296-AB

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**LOFT TECHNICAL REPORT
LOFT PROGRAM**

FORM EG&G-229
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PSE for PSB Mgr. Seismic P&CSB RSB Mgr. Review Mgr. <u>ABSTRACT</u>		

The 3" IA-296-AB line from the containment penetration S-5B was analyzed to ASME Code, Subsection NC (Class 2) criteria. This section of piping is part of the Containment Isolation System; the model considered the line from penetration S-5B outward through a series of elbows and through the third isolation valve. Results of this analysis show that the section of line described will meet Class 2 requirements if additional supports are installed at three locations, as described in the body of this report.

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LOFT CIS ANALYSIS S-5B PENETRATION 3" IA-296-AB

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 3" IA-296-AB line from the containment penetration S-5B outward through the third isolation valve. This was a convenient point at which to end the analytical model. This section of line is 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 design specification^[2].

III. PIPING SYSTEM DESCRIPTION

The piping being analyzed is outside LOFT containment and includes the 3"-IA-296-AB line from the containment penetration S-5B outward through the third isolation valve. There are two branches in the system; one, a short section of 3/4" pipe with a valve, and the other, a short section of 1 1/2" pipe. There are existing supports at three locations. Additional supports are required at three other locations.

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)	3.5	1.9	1.05
Thickness (inches)	.216	.145	.113
Weight (lbs/inch)	.63	.23	.09
Material	A 106 Gr. B		
E_{cold} (10^6 psi)	27.9		
S (100°F) (psi)	15,000		
S_y (psi)	32,000		
α (10^{-6} in./in. °F)	6.20		

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.

3" IA-296-AB

FIGURE I

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 design specification.

1. DESIGN CONDITIONS

An internal pressure of 190 psi and a design temperature of 100°F was used in this model^[4].

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 system: 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 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

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>
3" Gate Valve (assumed) [1st Isolation]	200 lb (est.)	8
3" Gate Valve (assumed) [2nd Isolation]	200 lb (est.)	8
3" Gate Valve (assumed) [3rd Isolation]	200 lb (est.)	8
3/4" Gate Valve (assumed)	20 lb (est.)	0

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:

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

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>
190	1.050	15000	.09	.113
190	1.900	15000	.09	.145
190	3.500	15000	.10	.216

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

Level D service conditions do not apply to this case.

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>Support No.</u>	<u>Deadweight</u>	<u>Thermal</u>	<u>OBE</u>	<u>SSE</u>	<u>Rated Load</u>
Rigid Vertical	1	85	-13	73	146	N.A.
Rigid Vertical	2	178	-9	36	72	N.A.
Rigid Horizontal N-S	3	4	-5	49	98	N.A.
Rigid Horizontal E-W	4	0	0	76	153	N.A.
Rigid Horizontal N-S	5	-101	-53	88	177	N.A. (New)
Rigid Vertical	6	6	39	69	138	N.A. (New)
Rigid Horizontal E-W	7	11	7	39	78	N.A. (New)
Rigid Vertical	8	694	-19	84	169	N.A. (New)
Rigid Horizontal E-W	9	-23	1	71	143	N.A. (New)
Rigid Horizontal N-S	10	97	56	38	77	N.A. (New)
Rigid Horizontal E-W	11	14	-1	25	49	N.A. (New)

VIII. SPECIAL CONSIDERATIONS

Supports are required at three additional locations on this system. The 1 1/2" branch should be supported near the blind flange in three orthogonal directions. A vertical and horizontal orthogonal support should be installed just north of the second isolation valve. Two orthogonal horizontal supports should be installed just above the third (flanged) isolation valve in the vertical section of pipe.

IX. CONCLUSIONS

The piping system addressed in this report was analyzed for the loads and operating conditions given in the design specification 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. SDD 1.3.6 Plant, Instrument and Breathing Air System.
3. American Institute of Steel Construction, Manual of Steel Construction, Seventh Edition, pp 5-6 to 5-24, 1973.
4. Telecon with N. B. Smith, LOFT PSB, 3:55 p.m., February 24, 1978.

03/02/

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
XSECT	0	1	.350E+01	.216E+00	.758E+01	.279E+02	.190E+03	0.
XSECT	0	2	.105E+01	.113E+00	.113E+01	.279E+02	.190E+03	0.
XSECT	0	3	.190E+01	.145E+00	.272E+01	.279E+02	.190E+03	0.
OPVAL	1	1	.279E+02	.270E-02	0.	0.	.190E+03	0.
CHECK MAGNITUDE OF ENTRIES ON ABOVE OPVAL CARD ****								
ANCHOR	0	1	0.	0.	0.	0.	0.	0.
FGRUN	1	5	.300E+01	0.	-.400E+00	.100E+01	.100E+01	0.
MASSPT	0	5	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	5	10	.300E+01	0.	-.400E+00	.100E+01	.100E+01	0.
MASSPT	0	10	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	10	15	.300E+01	0.	-.400E+00	.100E+01	.100E+01	0.
MASSPT	0	15	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	15	0.	.100E+06	0.	0.	0.	0.
FGRUN	15	20	.273E+01	0.	-.360E+00	.100E+01	.100E+01	0.
MASSPT	0	20	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	20	25	0.	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	25	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	25	30	0.	0.	-.367E+01	.100E+01	.100E+01	0.
MASSPT	0	30	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	30	35	0.	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	35	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	35	40	0.	-.281E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	40	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	40	45	0.	-.281E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	45	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	45	50	0.	-.281E+01	0.	.100E+01	.100E+01	0.

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
MASSPT	0	50	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	50	55	0.	-.281E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	55	.100E+01	.100E+01	.100E+01	0.	0.	0.

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
MASSPT	0	50	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	50	55	0.	-.281E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	55	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	55	60	0.	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	60	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	60	65	0.	0.	-.134E+01	.100E+01	.100E+01	0.
MASSPT	0	65	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	65	70	0.	0.	-.133E+01	.100E+01	.100E+01	0.
MASSPT	0	70	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	70	0.	.100E+06	0.	0.	0.	0.
FGRUN	70	75	0.	0.	-.183E+01	.100E+01	.100E+01	0.
MASSPT	0	75	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	75	80	0.	0.	-.188E+01	.100E+01	.100E+01	0.
MASSPT	0	80	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	80	85	0.	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	85	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	85	90	0.	-.208E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	90	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	90	95	0.	-.209E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	95	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	95	.100E+06	0.	.100E+06	0.	0.	0.
FGRUN	95	100	0.	-.292E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	100	.100E+01	.100E+01	.100E+01	0.	0.	0.
BRANCH	100	195	-.875E-01	0.	0.	.200E+01	.100E+01	0.
MASSPT	0	195	.100E+01	.100E+01	.100E+01	0.	0.	0.

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
FGRUN	195	200	-.142E+00	0.	0.	.200E+01	.100E+01	0.
MASSPT	0	200	.100E+01	.100E+01	.100E+01	0.	0.	0.

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
FGRUN	195	200	-.142E+00	0.	0.	.200E+01	.100E+01	0.
MASSPT	0	200	.100E+01	.100E+01	.100E+01	0.	0.	0.
VALVE	200	205	-.310E+00	0.	0.	.200E+01	.100E+01	0.
MASSPT	0	205	.200E+02	.200E+02	.200E+02	0.	0.	0.
CWEIGHT	0	205	0.	.200E+02	0.	0.	0.	0.
VALVE	205	210	-.310E+00	0.	0.	.200E+01	.100E+01	0.
MASSPT	0	210	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	210	215	-.900E+00	0.	0.	.200E+01	.100E+01	0.
MASSPT	0	215	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	215	220	0.	0.	0.	.200E+01	.100E+01	0.
MASSPT	0	220	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	220	225	0.	.250E+00	0.	.200E+01	.100E+01	0.
MASSPT	0	225	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	100	105	0.	-.225E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	105	.100E+01	.100E+01	.100E+01	0.	0.	0.
BRANCH	105	230	0.	0.	-.158E+00	.300E+01	.100E+01	0.
MASSPT	0	230	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	230	235	0.	0.	-.592E+00	.300E+01	.100E+01	0.
MASSPT	0	235	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	235	240	0.	0.	0.	.300E+01	.100E+01	0.
MASSPT	0	240	.100E+02	.100E+02	.100E+02	0.	0.	0.
CWEIGHT	0	240	0.	.100E+02	0.	0.	0.	0.
RESTRAINT	0	240	.100E+06	.100E+06	.100E+06	0.	0.	0.
FGRUN	105	110	0.	-.750E+00	0.	.100E+01	.100E+01	0.
MASSPT	0	110	.100E+01	.100E+01	.100E+01	0.	0.	0.

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 LOFT CIS ANALYSIS - S-5B PENETRATION DUCT (3 IA-296-AB) WXB-04

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
ELBOW	110	115	0.	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	115	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	115	120	0.	0.	0.	.100E+01	.100E+01	0.

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
ELBOW	110	115	0.	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	115	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	115	120	-.830E+00	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	120	.100E+01	.100E+01	.100E+01	0.	0.	0.
VALVE	120	125	-.500E+00	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	125	.133E+03	.133E+03	.133E+03	0.	0.	0.
CWEIGHT	0	125	0.	.133E+03	0.	0.	0.	0.
RUN	125	130	0.	.830E+00	0.	.100E+01	.100E+01	0.
MASSPT	0	130	.500E+02	.500E+02	.500E+02	0.	0.	0.
CWEIGHT	0	130	0.	.500E+02	0.	0.	0.	0.
VALVE	125	135	-.500E+00	0.	0.	.100E+01	.100E+01	0.
VALVE	125	135	-.500E+00	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	135	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	135	140	-.750E+00	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	140	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	140	0.	.100E+06	.100E+06	0.	0.	0.
VALVE	140	145	-.500E+00	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	145	.133E+03	.133E+03	.133E+03	0.	0.	0.
CWEIGHT	0	145	0.	.133E+03	0.	0.	0.	0.
RUN	145	150	0.	.830E+00	0.	.100E+01	.100E+01	0.
MASSPT	0	150	.500E+02	.500E+02	.500E+02	0.	0.	0.
CWEIGHT	0	150	0.	.500E+02	0.	0.	0.	0.
VALVE	145	155	-.500E+00	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	155	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	155	160	-.830E+00	0.	0.	.100E+01	.100E+01	0.

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
MASSPT	0	160	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	160	165	0.	0.	0.	.100E+01	.100E+01	0.

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*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
MASSPT	0	160	.100E+01	.100E+01	.100E+01	0.	0.	0.
ELBOW	160	165	0.	0.	0.	.100E+01	.100E+01	0.
MASSPT	0	165	.100E+01	.100E+01	.100E+01	0.	0.	0.
FGRUN	165	170	0.	.420E+00	0.	.100E+01	.100E+01	0.
MASSPT	0	170	.100E+01	.100E+01	.100E+01	0.	0.	0.
VALVE	170	175	0.	.500E+00	0.	.100E+01	.100E+01	0.
MASSPT	0	175	.133E+03	.133E+03	.133E+03	0.	0.	0.
CWEIGHT	0	175	0.	.133E+03	0.	0.	0.	0.
RUN	175	180	0.	0.	-.667E+00	.100E+01	.100E+01	0.
MASSPT	0	180	.500E+02	.500E+02	.500E+02	0.	0.	0.
CWEIGHT	0	180	0.	.500E+02	0.	0.	0.	0.
VALVE	175	185	0.	.500E+00	0.	.100E+01	.100E+01	0.
MASSPT	0	185	.100E+01	.100E+01	.100E+01	0.	0.	0.
RESTRAINT	0	185	.100E+06	0.	.100E+06	0.	0.	0.
FGRUN	185	190	0.	.292E+01	0.	.100E+01	.100E+01	0.
MASSPT	0	190	.100E+01	.100E+01	.100E+01	0.	0.	0.
STRESS7	0	0	0.	0.	0.	0.	0.	0.
9CASES		0	1	0	3	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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LCFT CIS ANALYSIS - S-5B PENETRATION DUCT (3 IA-296-AB) WXB-04

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STRAIGHT ELEMENTS

MEMBER	END NI	END NJ	SECTION NUMBER	LENGTH FT	OUTSIDE DIAMETER IN	WALL THICKNESS IN	WEIGHT LB/FT	MODULUS COLD * 1.0E-6 PSI	OPERATING VALUE
FGRUN	1	5	1	3.03	3.500	.2160	7.58	27.90000	1

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STRAIGHT ELEMENTS

MEMBER	END NI NJ	SECTION NUMBER	LENGTH FT	OUTSIDE DIAMETER IN	WALL THICKNESS IN	WEIGHT LB/FT	MODULUS COLD * 1.0E-6 PSI	OPERATING VALUE
FGRUN	1 5	1	3.03	3.500	.2160	7.58	27.90000	1
FGRUN	5 10	1	3.03	3.500	.2160	7.58	27.90000	1
FGRUN	10 15	1	3.03	3.500	.2160	7.58	27.90000	1
FGRUN	15 20	1	2.42	3.500	.2160	7.58	27.90000	1
FGRUN	20 25	1	2.97	3.500	.2160	7.58	27.90000	1
FGRUN	25 30	1	2.44	3.500	.2160	7.58	27.90000	1
FGRUN	30 35	1	2.81	3.500	.2160	7.58	27.90000	1
FGRUN	35 40	1	2.81	3.500	.2160	7.58	27.90000	1
FGRUN	40 45	1	2.44	3.500	.2160	7.58	27.90000	1
FGRUN	45 50	1	2.96	3.500	.2160	7.58	27.90000	1
FGRUN	50 55	1	2.44	3.500	.2160	7.58	27.90000	1
FGRUN	55 60	1	1.33	3.500	.2160	7.58	27.90000	1
FGRUN	60 65	1	1.83	3.500	.2160	7.58	27.90000	1
FGRUN	65 70	1	1.51	3.500	.2160	7.58	27.90000	1
FGRUN	70 75	1	1.71	3.500	.2160	7.58	27.90000	1
FGRUN	75 80	1	2.09	3.500	.2160	7.58	27.90000	1
FGRUN	80 85	1	2.92	3.500	.2160	7.58	27.90000	1
FGRUN	85 90	1	2.09	3.500	.2160	7.58	27.90000	1
FGRUN	90 95	1	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	95 100	1	1.14	3.500	.2160	7.58	27.90000	1
BRANCH	100 195	2	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	195 200	2	1.14	3.500	.2160	7.58	27.90000	1
VALVE	200 205	2	1.14	3.500	.2160	7.58	27.90000	1
VALVE	205 210	2	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	210 215	2	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	215 220	2	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	220 225	2	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	225 230	2	1.14	3.500	.2160	7.58	27.90000	1
BRANCH	230 235	3	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	235 240	3	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	240 245	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	245 250	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	250 255	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	255 260	3	1.14	3.500	.2160	7.58	27.90000	1
FGRUN	260 265	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	265 270	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	270 275	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	275 280	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	280 285	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	285 290	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	290 295	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	295 300	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	300 305	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	305 310	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	310 315	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	315 320	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	320 325	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	325 330	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	330 335	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	335 340	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	340 345	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	345 350	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	350 355	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	355 360	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	360 365	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	365 370	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	370 375	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	375 380	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	380 385	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	385 390	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	390 395	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	395 400	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	400 405	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	405 410	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	410 415	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	415 420	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	420 425	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	425 430	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	430 435	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	435 440	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	440 445	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	445 450	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	450 455	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	455 460	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	460 465	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	465 470	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	470 475	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	475 480	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	480 485	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	485 490	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	490 495	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	495 500	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	500 505	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	505 510	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	510 515	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	515 520	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	520 525	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	525 530	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	530 535	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	535 540	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	540 545	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	545 550	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	550 555	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	555 560	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	560 565	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	565 570	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	570 575	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	575 580	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	580 585	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	585 590	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	590 595	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	595 600	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	600 605	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	605 610	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	610 615	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	615 620	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	620 625	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	625 630	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	630 635	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	635 640	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	640 645	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	645 650	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	650 655	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	655 660	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	660 665	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	665 670	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	670 675	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	675 680	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	680 685	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	685 690	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	690 695	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	695 700	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	700 705	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	705 710	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	710 715	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	715 720	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	720 725	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	725 730	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	730 735	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	735 740	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	740 745	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	745 750	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	750 755	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	755 760	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	760 765	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	765 770	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	770 775	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	775 780	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	780 785	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	785 790	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	790 795	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	795 800	3	1.14	3.500	.2160	7.58	27.90000	1
VALVE	800 805	3						

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ELBOW ELEMENTS

MEMBER	END NI	END NJ	SECTION NUMBER	RADIUS IN	OUTSIDE DIAMETER IN	WALL THICKNESS IN	WEIGHT LB/FT	MODULUS COLD * 1.0E-6 PSI	OPERATING VALUE
ELBOW	20	25	1	4.50	3.500	.2160	7.58	27.90000	1
ELBOW	30	35	1	4.50	3.500	.2160	7.58	27.90000	1
ELBOW	55	60	1	4.50	3.500	.2160	7.58	27.90000	1
ELBOW	80	85	1	4.50	3.500	.2160	7.58	27.90000	1
ELBOW	215	220	2	1.13	1.050	.1130	1.13	27.90000	1
ELBOW	235	240	3	2.25	1.900	.1450	2.72	27.90000	1
ELBOW	110	115	1	4.50	3.500	.2160	7.58	27.90000	1
ELBOW	160	165	1	4.50	3.500	.2160	7.58	27.90000	1

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OPERATING CONDITIONS

OPERATING VALUE	MODE	MODULUS HOT * 1.0E-6 PSI	ALPHA T-BAR IN/FT	ALPHA DT-1 IN/FT	ALPHA DT-2 IN/FT	OPERATING PRESSURE PSI	ALLOWABLE STRESS PSI
1	1	27.98000	.2700000E-02	0.	0.	190.0000	0.00

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OPERATING CONDITIONS

OPERATING VALUE	MODE	MODULUS HOT + 1.E-6 PSI	ALPHA T-BAR IN/FT	ALPHA DT-1 IN/FT	ALPHA DT-2 IN/FT	OPERATING PRESSURE PSI	ALLOWABLE STRESS PSI
1	1	27.90000	.2700000E-02	0.	0.	190.0000	0.00

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STATIC RESTRAINT TABLE

NODE	TYPE	STIFFNESS TRANS LB/IN ROT FT-LB/RAD	DIRECTION	DIRECTION COSINES FOR SKEW RESTRAINTS X Y Z
1	TRANS	.6034312E+11	X	
1	TRANS	.6034312E+11	Y	
1	TRANS	.6034312E+11	Z	

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STATIC RESTRAINT TABLE

NODE	TYPE	STIFFNESS TRANS LB/IN ROT FT-LB/RAD	DIRECTION COSINES FOR SKEW RESTRAINTS		
			X	Y	Z
1	TRANS	.6034312E+11	X		
1	TRANS	.6034312E+11	Y		
1	TRANS	.6034312E+11	Z		
1	ROT	.6034312E+11	X		
1	ROT	.6034312E+11	Y		
1	ROT	.6034312E+11	Z		
15	TRANS	.1000000E+06	Y		
70	TRANS	.1000000E+06	Y		
95	TRANS	.1000000E+06	X		
95	TRANS	.1000000E+06	Z		
240	TRANS	.1000000E+06	X		
240	TRANS	.1000000E+06	Y		
240	TRANS	.1000000E+06	Z		
140	TRANS	.1000000E+06	Y		
140	TRANS	.1000000E+06	Z		
185	TRANS	.1000000E+06	X		
185	TRANS	.1000000E+06	Z		

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SECTION PROPERTIES

INSECT	OUTSIDE DIAMETER IN	WALL THICKNESS IN	WEIGHT LB/FT	MODULUS COLD * 1.0E-6 PSI	DESIGN PRESSURE PSI	WELD REF.NO.
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SECTION PROPERTIES

NSECT	OUTSIDE DIAMETER IN	WALL THICKNESS IN	WEIGHT LB/FT	MODULUS COLD * 1.0E-6 PSI	DESIGN PRESSURE PSI	WELD REF.NO.
1	3.500	.2160	7.58	27.90000	190.00	0
2	1.050	.1130	1.13	27.90000	190.00	0
3	1.900	.1450	2.72	27.90000	190.00	0

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CONCENTRATED WEIGHTS

NODE	WEIGHT LB	NODE	WEIGHT LB	NODE	WEIGHT LB	NODE	WEIGHT LB
205	20.000	240	10.000	125	133.000	130	50.000
150	50.000	175	133.000	180	50.000	145	133.000

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CONCENTRATED WEIGHTS

NODE	WEIGHT LB	NODE	WEIGHT LB	NODE	WEIGHT LB	NODE	WEIGHT LB
203	20.000	240	10.000	125	133.000	130	50.000
150	50.000	175	133.000	180	50.000	145	133.000

All

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*** NODE GLOBAL COORDINATES ***

POINT NO.	X-COORDINATE (FT)	Y-COORDINATE (FT)	Z-COORDINATE (FT)
1	0.000	0.000	0.000
5	3.000	0.000	-4.00

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*** NODE GLOBAL COORDINATES ***

POINT NO.	X-COORDINATE (FT)	Y-COORDINATE (FT)	Z-COORDINATE (FT)
1	0.000	0.000	0.000
5	3.000	0.000	-0.400
10	6.000	0.000	-0.800
15	9.000	0.000	-1.200
20	11.404	0.000	-1.517
25	11.730	0.000	-1.889
30	11.730	0.000	-4.855
35	11.730	-0.375	-5.230
40	11.730	-2.810	-5.230
45	11.730	-5.620	-5.230
50	11.730	-8.430	-5.230
55	11.730	-10.865	-5.230
60	11.730	-11.240	-5.605
65	11.730	-11.240	-6.570
70	11.730	-11.240	-7.990
75	11.730	-11.240	-9.730
80	11.730	-11.240	-11.235
85	11.730	-11.615	-11.610
90	11.730	-13.320	-11.610
95	11.730	-15.410	-11.610
100	11.730	-18.330	-11.610
195	11.643	-18.330	-11.610
200	11.501	-18.330	-11.610
205	11.191	-18.330	-11.610
210	10.881	-18.330	-11.610

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*** NODE GLOBAL COORDINATES ***

POINT NO.	X-COORDINATE (FT)	Y-COORDINATE (FT)	Z-COORDINATE (FT)
215	10.075	-18.330	-11.610
220	9.981	-18.236	-11.610

LTR 135.5

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LOFT CIS ANALYSIS - S-5B PENETRATION DUCT (3 IA-296-AB) WXB-04

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*** NODE GLOBAL COORDINATES ***

POINT NO.	X-COORDINATE (FT)	Y-COORDINATE (FT)	Z-COORDINATE (FT)
215	10.075	-18.330	-11.610
220	9.981	-18.236	-11.610
225	9.981	-18.080	-11.610
105	11.730	-20.580	-11.610
230	11.730	-20.580	-11.768
235	11.730	-20.580	-12.173
240	11.730	-20.768	-12.360
110	11.730	-20.955	-12.360
115	11.355	-21.330	-12.360
120	10.900	-21.330	-12.360
125	10.400	-21.330	-12.360
130	10.400	-20.500	-12.360
135	9.900	-21.330	-12.360
140	9.150	-21.330	-12.360
145	8.650	-21.330	-12.360
150	8.650	-20.500	-12.360
155	8.150	-21.330	-12.360
160	7.695	-21.330	-12.360
165	7.320	-20.955	-12.360
170	7.320	-20.910	-12.360
175	7.320	-20.410	-12.360
180	7.320	-20.410	-13.027
185	7.320	-19.910	-12.360
190	7.320	-16.990	-12.360

TOTAL STATIC DEGREES OF FREEDOM = 294

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*** LUMPED MASS TABLE ***

POINT NO.	X-COORDINATE LBS	Y-COORDINATE LBS	Z-COORDINATE LBS
5	34.412	34.412	34.412
10	22.941	22.941	22.941
-	20.661	20.661	20.661

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*** LUMPED MASS TABLE ***

POINT NO.	X-COORDINATE LBS	Y-COORDINATE LBS	Z-COORDINATE LBS
5	34.412	34.412	34.412
10	22.941	22.941	22.941
15	20.661	20.661	20.661
20	11.236	11.236	11.236
25	13.288	13.288	13.288
30	13.474	13.474	13.474
35	11.461	11.461	11.461
40	19.879	19.879	19.879
45	21.300	21.300	21.300
50	19.879	19.879	19.879
55	11.461	11.461	11.461
60	5.890	5.890	5.890
65	8.698	8.698	8.698
70	11.976	11.976	11.976
75	12.640	12.640	12.640
80	7.936	7.936	7.936
85	8.694	8.694	8.694
90	14.383	14.383	14.383
95	18.988	18.988	18.988
100	19.644	19.644	19.644
195	.129	.129	.129
200	.255	.255	.255
205	20.000	20.000	20.000
210	.631	.631	.631
215	.539	.539	.539

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*** LUMPED MASS TABLE ***

POINT NO.	X-COORDINATE LBS	Y-COORDINATE LBS	Z-COORDINATE LBS
220	.171	.171	.171
225	.088	.088	.088

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*** LUMPED MASS TABLE ***

POINT NO.	X-COORDINATE LBS	Y-COORDINATE LBS	Z-COORDINATE LBS
220	.171	.171	.171
225	.088	.088	.088
105	8.743	8.743	8.743
230	.764	.764	.764
235	.949	.949	.949
240	10.000	10.000	10.000
110	2.943	2.943	2.943
115	3.957	3.957	3.957
120	3.619	3.619	3.619
125	133.000	133.000	133.000
130	50.000	50.000	50.000
135	6.633	6.633	6.633
140	4.738	4.738	4.738
145	133.000	133.000	133.000
150	50.000	50.000	50.000
155	3.619	3.619	3.619
160	3.957	3.957	3.957
165	2.403	2.403	2.403
170	2.066	2.066	2.066
175	133.000	133.000	133.000
180	50.000	50.000	50.000
185	12.962	12.962	12.962
190	11.067	11.067	11.067
TOTAL SYSTEM	958.074	958.074	958.074

TOTAL DYNAMIC DEGREES OF FREEDOM = 144

LIR 136.5

APPENDIX B
COMPUTER PROGRAM DESCRIPTION

APPENDIX A
BASIC DATA, INPUT PARAMETERS

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.

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SUPPORT REACTIONS FOR LOAD CASE NO. 1

DEADWEIGHT

NODE	TYPE	REACTION (LBS. OR IN-LBS)	DIRECTION
1	FORCE	-0.	X COORD
1	FORCE	28.	Y COORD
1	FORCE	-2.	Z COORD
1	MOMENT	170.	X COORD
1	MOMENT	275.	Y COORD
1	MOMENT	317.	Z COORD
15	FORCE	85.	Y COORD
70	FORCE	178.	Y COORD
95	FORCE	4.	X COORD
95	FORCE	-0.	Z COORD
240	FORCE	-101.	X COORD
240	FORCE	6.	Y COORD
240	FORCE	11.	Z COORD
140	FORCE	594.	Y COORD
140	FORCE	-23.	Z COORD
185	FORCE	57.	X COORD
185	FORCE	14.	Z COORD

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EXTERNAL FORCES FOR LOAD CASE NO. 1

DEADWEIGHT

NODE	TYPE	FORCES (LBS OR IN-LBS)	AXIS
------	------	------------------------	------

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EXTERNAL FORCES FOR LOAD CASE NO. 1

DEADWEIGHT

NODE	TYPE	FORCES (LBS OR IN-LBS)	AXIS
------	------	------------------------	------

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INTERNAL FORCES AND DEFLECTIONS FOR LOAD 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

---	---	---	---	---	---	---	0.00	-0.000	-0.000	-0.0000	-0.0000	-0.0000
-----	-----	-----	-----	-----	-----	-----	------	--------	--------	---------	---------	---------

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INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 1

DEADWEIGHT

MEMBER	END	FX	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
			FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ	
FGRUN	1	-0.	28.	-2.	170.	275.	317.	.000	-.000	.000	-.0000	-.0000	-.0000	
	5	0.	-5.	2.	-91.	-202.	279.	.000	-.001	.002	-.0001	-.0001	-.0000	
FGRUN	5	-0.	5.	-2.	91.	202.	-279.	.000	-.001	.002	-.0001	-.0001	-.0000	
	10	0.	18.	2.	-121.	-129.	49.	.001	-.000	.007	-.0001	-.0002	-.0001	
FGRUN	10	-0.	-18.	-2.	121.	129.	-49.	.001	-.000	.007	-.0001	-.0002	-.0001	
	15	0.	41.	2.	-262.	-57.	-1007.	.002	-.001	.014	-.0002	-.0002	-.0001	
FGRUN	15	-0.	44.	-2.	262.	57.	1007.	.002	-.001	.014	-.0002	-.0002	-.0001	
	20	0.	-26.	2.	-128.	2.	8.	.003	-.009	.021	-.0003	-.0002	-.0003	
ELBOW	20	-0.	26.	-2.	128.	-2.	-8.	.003	-.009	.021	-.0003	-.0002	-.0003	
	25	0.	-22.	2.	-22.	11.	101.	.004	-.012	.021	-.0003	-.0002	-.0003	
FGRUN	25	-0.	22.	-2.	22.	-11.	-101.	.004	-.012	.021	-.0003	-.0002	-.0003	
	30	0.	1.	2.	357.	25.	101.	.011	-.023	.021	-.0003	-.0002	-.0002	
ELBOW	30	-0.	-1.	-2.	-357.	-25.	-101.	.011	-.023	.022	-.0001	-.0002	-.0002	
	35	0.	5.	2.	353.	26.	99.	.011	-.024	.022	-.0001	-.0002	-.0002	
FGRUN	35	-0.	5.	-2.	-353.	-26.	-99.	.011	-.024	.022	-.0001	-.0002	-.0002	
	40	0.	24.	2.	411.	26.	88.	.005	-.024	.024	-.0000	-.0002	-.0002	
FGRUN	40	-0.	-24.	-2.	-411.	-26.	-88.	.005	-.024	.024	-.0000	-.0002	-.0002	
	45	0.	45.	2.	-477.	-26.	76.	-.001	-.024	.020	.0002	-.0002	-.0002	
FGRUN	45	-0.	-45.	-2.	477.	26.	-76.	-.001	-.024	.020	.0002	-.0002	-.0002	
	50	0.	66.	2.	543.	26.	63.	-.006	-.024	.011	.0004	-.0002	-.0001	
FGRUN	50	-0.	-66.	-2.	-543.	-26.	-63.	-.006	-.024	.011	.0004	-.0002	-.0001	
	55	0.	85.	2.	601.	26.	52.	-.009	-.024	-.004	.0006	-.0002	-.0001	
ELBOW	55	-0.	-85.	-2.	-601.	-26.	-52.	-.009	-.024	-.004	.0006	-.0002	-.0001	
	60	0.	89.	2.	219.	28.	50.	-.009	-.020	-.007	.0008	-.0002	-.0001	
FGRUN	60	-0.	-89.	-2.	-219.	-28.	-50.	-.009	-.020	-.007	.0008	-.0002	-.0001	
	65	0.	96.	2.	-854.	32.	50.	-.007	-.011	-.007	.0007	-.0002	-.0001	
FGRUN	65	-0.	-96.	-2.	854.	-32.	-50.	-.007	-.011	-.007	.0007	-.0002	-.0001	
	70	0.	106.	2.	-2473.	38.	50.	-.005	-.002	-.007	.0004	-.0002	-.0001	

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MEMBER	END	FX	FORCES (LBS)		MX	MOMENTS (IN-LBS)		MZ	DEFLECTIONS (IN)			ROTATIONS (RAD)		
			FY	FZ		MY	MZ		DX	DY	DZ	RX	RY	RZ
FGRUN	70	-0.	72.	-2.	2473.	-38.	-50.	-.005	-.002	-.007	-.0004	-.0002	-.0001	
	75	0.	-58.	2.	-1051.	47.	50.	-.001	-.001	-.007	-.0000	-.0001	-.0001	
FGRUN	75	-0.	58.	-2.	1051.	-47.	-50.	-.001	-.001	-.007	-.0000	-.0001	-.0001	
	80	0.	-46.	2.	-110.	54.	50.	-.001	-.001	-.007	-.0002	-.0001	-.0001	

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MEMBER	END	FX	FORCES (LBS) FY	FZ	MX	MOMENTS (IN-LBS) MY	MZ	DEFLECTIONS (IN) DX	DY	DZ	ROTATIONS (RAD) RX	RY	RZ
FGRUN	70	-0.	72.	-2.	2473.	-38.	-50.	-.005	-.002	-.007	-.0004	-.0002	-.0001
	75	0.	-58.	2.	-1051.	47.	50.	-.001	-.001	-.007	-.0000	-.0001	-.0001
FGRUN	75	-0.	58.	-2.	1051.	-47.	-50.	-.001	-.001	-.007	-.0000	-.0001	-.0001
	80	0.	-46.	2.	-110.	54.	50.	.001	-.001	-.007	-.0002	-.0001	-.0001
ELBOW	80	-0.	46.	-2.	110.	-54.	-50.	.001	-.001	-.007	-.0002	-.0001	-.0001
	85	0.	-42.	2.	97.	55.	48.	.001	-.002	-.006	-.0002	-.0001	-.0000
FGRUN	85	-0.	42.	-2.	-97.	-55.	-48.	.001	-.002	-.006	-.0002	-.0001	-.0000
	90	0.	-29.	2.	138.	55.	40.	.001	-.002	-.003	-.0001	-.0001	-.0000
FGRUN	90	-0.	29.	-2.	-138.	-55.	-40.	.001	-.002	-.003	-.0001	-.0001	-.0000
	95	0.	-13.	2.	187.	55.	31.	-.000	-.002	.000	-.0001	-.0001	-.0000
FGRUN	95	-4.	13.	-2.	-187.	-55.	-31.	-.000	-.002	.000	-.0001	-.0001	-.0000
	100	4.	9.	2.	258.	55.	168.	-.000	-.002	.002	-.0001	-.0001	-.0000
BRANCH	100	0.	22.	0.	-0.	-0.	-155.	-.000	-.002	.002	.0000	-.0001	-.0000
	195	-0.	-22.	0.	0.	0.	132.	-.000	-.002	.001	.0000	-.0001	-.0005
FGRUN	195	0.	22.	-0.	-0.	-0.	-132.	-.000	-.002	.001	.0000	-.0001	-.0005
	200	-0.	-22.	0.	0.	0.	94.	-.000	-.001	.001	.0000	-.0001	-.0003
VALVE	200	0.	22.	-0.	-0.	-0.	-94.	-.000	-.001	.001	.0000	-.0001	-.0003
	205	-0.	-22.	0.	0.	0.	13.	-.000	-.000	.001	.0000	-.0001	-.0002
VALVE	205	0.	2.	-0.	-0.	-0.	-13.	-.000	-.000	.001	.0000	-.0001	-.0002
	210	-0.	-1.	0.	0.	0.	8.	-.000	-.001	.001	.0000	-.0001	-.0002
FGRUN	210	0.	1.	-0.	-0.	-0.	-8.	-.000	.001	.001	.0000	-.0001	-.0002
	215	-0.	-0.	0.	0.	0.	0.	-.000	.002	.000	.0000	-.0001	-.0002
ELBOW	215	-0.	0.	-0.	-0.	-0.	-0.	-.000	.002	.000	.0000	-.0001	-.0002
	220	0.	-0.	0.	0.	0.	0.	-.000	.003	.000	.0000	-.0001	-.0002
FGRUN	220	0.	0.	-0.	-0.	-0.	-0.	-.000	.003	.000	.0000	-.0001	-.0002
	225	-0.	0.	0.	0.	0.	0.	-.000	.003	.000	.0000	-.0001	-.0002
FGRUN	100	4.	-31.	-2.	-258.	-55.	-13.	-.000	-.002	.002	.0000	-.0001	.0000
	105	-4.	48.	2.	312.	55.	119.	.000	-.002	.000	.0001	-.0000	.0000
BRANCH	105	4.	-48.	-2.	-312.	-55.	-119.	.000	-.002	.000	.0001	-.0000	.0000
	230	-4.	49.	2.	220.	48.	119.	.000	-.001	.000	.0002	-.0000	.0001
FGRUN	230	4.	-49.	-2.	-220.	-48.	-119.	.000	-.001	.000	.0002	-.0000	.0001
	235	-4.	50.	2.	18.	29.	119.	.001	-.000	.000	.0002	.0000	.0002

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MEMBER	END	FX	FORCES (LBS) FY	FZ	MX	MOMENTS (IN-LBS) MY	MZ	DEFLECTIONS (IN) DX	DY	DZ	ROTATIONS (RAD) RX	RY	RZ
ELBOW	235	4.	-50.	-2.	18.	-29.	-119.	.001	-.000	-.000	.0002	-.0000	.0002
	240	-4.	51.	2.	-127.	20.	127.	.001	-.000	-.000	.0001	-.0000	.0003
FGRUN	240	-97.	-55.	9.	127.	-20.	-127.	.001	-.000	-.000	.0001	-.0000	.0003
	10	97.	56.	-9.	-147.	20.	-91.	.002	-.000	-.000	.0001	-.0000	.0003

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
ELBOW	235	4.	-50.	-2.	18.	-29.	-119.	.001	-.000	-.000	.0002	-.0000	.0002
	240	-4.	51.	2.	-127.	20.	127.	.001	-.000	-.000	.0001	-.0000	.0003
FGRUN	240	-97.	-55.	9.	127.	-20.	-127.	.001	-.000	-.000	.0001	-.0000	.0003
	110	97.	56.	-9.	-147.	20.	-91.	.002	-.000	-.000	.0001	-.0000	.0003
ELBOW	110	-97.	-56.	9.	147.	-20.	91.	.002	-.000	-.000	.0001	-.0000	.0003
	115	97.	61.	-9.	-188.	61.	-265.	.003	-.001	-.000	.0000	-.0000	.0002
FGRUN	115	-97.	-61.	9.	188.	-61.	265.	.003	-.001	-.000	.0000	-.0000	.0002
	120	97.	64.	-9.	-188.	110.	77.	.003	-.002	-.000	.0000	-.0000	.0002
VALVE	120	-97.	-64.	9.	188.	-110.	-77.	.003	-.002	-.000	.0000	-.0000	.0002
	125	97.	68.	-9.	-188.	164.	474.	.003	-.003	-.000	.0000	-.0000	.0002
RUN	125	-0.	-56.	0.	0.	-0.	0.	.003	-.003	-.000	.0000	-.0000	.0002
	130	0.	50.	-0.	0.	0.	-0.	.001	-.003	-.000	.0000	-.0000	.0002
VALVE	125	-49.	-129.	5.	94.	-82.	-237.	.003	-.003	-.000	.0000	-.0000	.0002
	135	49.	133.	-5.	-94.	109.	1021.	.003	-.004	-.000	.0000	-.0000	.0002
VALVE	125	-49.	-129.	5.	94.	-82.	-237.	.003	-.003	-.000	.0000	-.0000	.0002
	135	49.	133.	-5.	-94.	109.	1021.	.003	-.004	-.000	.0000	-.0000	.0002
FGRUN	135	-97.	-265.	9.	188.	-219.	-2041.	.003	-.004	-.000	.0000	-.0000	.0002
	140	97.	271.	-9.	-188.	300.	4452.	.003	-.007	-.000	.0000	-.0000	.0005
VALVE	140	-97.	-423.	-14.	188.	-300.	-4452.	.003	-.007	-.000	.0000	-.0000	.0005
	145	97.	419.	14.	-188.	218.	1926.	.003	-.011	-.001	.0000	-.0000	.0006
RUN	145	-0.	-56.	0.	0.	-0.	0.	.003	-.011	-.001	.0000	-.0000	.0006
	150	0.	50.	-0.	0.	0.	-0.	-.003	-.011	-.000	.0000	-.0000	.0006
VALVE	145	-97.	-230.	-14.	188.	-218.	-1926.	.003	-.011	-.001	.0000	-.0000	.0006
	155	97.	226.	14.	-188.	136.	558.	.003	-.015	-.001	.0000	-.0000	.0006
FGRUN	155	-97.	-226.	-14.	188.	-136.	-558.	.003	-.015	-.001	.0000	-.0000	.0006
	160	97.	223.	14.	-188.	61.	666.	.003	-.018	-.001	.0000	-.0000	.0006
ELBOW	160	-97.	-223.	-14.	188.	-61.	666.	.003	-.018	-.001	.0000	-.0000	.0006
	165	97.	218.	14.	-249.	0.	-1220.	.001	-.021	-.001	.0000	-.0000	.0002
FGRUN	165	-97.	-218.	-14.	249.	-0.	1220.	.001	-.021	-.001	.0000	-.0000	.0002
	170	97.	218.	14.	-257.	0.	-1168.	.001	-.021	-.001	.0000	-.0000	.0002
VALVE	170	-97.	-218.	-14.	257.	-0.	1168.	.001	-.021	-.001	.0000	-.0000	.0002
	175	97.	214.	14.	-339.	0.	-584.	.000	-.021	-.001	.0000	-.0000	.0002

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	175	-0.	-55.	-0.	420.	-0.	-0.	-.000	-.021	.001	-.0001	.0001	.0002
	180	0.	50.	0.	-0.	0.	-0.	-.000	-.022	.001	-.0001	.0001	.0002
VALVE	175	-97.	-26.	-14.	-82.	-0.	584.	-.000	-.021	-.001	-.0001	.0001	.0002
	185	97.	22.	14.	-0.	0.	-0.	-.001	-.021	-.000	-.0001	.0001	.0002

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MEMBER	END	FX	FORCES (LBS)		FZ	MX	MOMENTS (IN-LBS)		MZ	DEFLECTIONS (IN)			ROTATIONS (RAD)		
			FY				MY			DX	DY	DZ	RX	RY	RZ
RUN	175 180	-0: 0:	55: -50:	-0: 0:	420: -0:	-0: 0:	-0: 0:	-0: 0:	-0: 0:	-.000 -.000	-.021 -.022	.001 .001	-.0001 -.0001	.0001 .0001	.0002 .0002
VALVE	175 185	-97: 97:	26: -22:	-14: 14:	-82: -0:	-0: 0:	584: 0:	-0: 0:	584: 0:	-.000 -.001	-.021 -.021	.001 -.000	-.0001 -.0001	.0001 .0001	.0002 .0002
FGRUN	185 190	-0: -0:	22: -0:	0: 0:	0: 0:	-0: 0:	-0: 0:	-0: 0:	-0: 0:	-.001 -.007	-.021 -.021	-.000 -.004	-.0001 -.0001	.0001 .0001	.0002 .0002

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APPENDIX D
THERMAL EXPANSION ANALYSIS RESULTS

APPENDIX C
WEIGHT ANALYSIS RESULTS

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SUPPORT REACTIONS FOR LOAD CASE NO. 2
THERMAL EXPANSION PLUS ANCHOR MOVEMENTS

NODE	TYPE	REACTION (LBS OR IN-LBS)	DIRECTION
1	FORCE	2.	X COORD
1	FORCE	2.	Y COORD
1	FORCE	-7.	Z COORD
1	MOMENT	-120.	X COORD
1	MOMENT	729.	Y COORD
1	MOMENT	98.	Z COORD
15	FORCE	-23.	Y COORD
70	FORCE	-9.	Y COORD
95	FORCE	-5.	X COORD
95	FORCE	0.	Z COORD
240	FORCE	-53.	X COORD
240	FORCE	39.	Y COORD
240	FORCE	7.	Z COORD
140	FORCE	-19.	Y COORD
140	FORCE	1.	Z COORD
185	FORCE	56.	X COORD
185	FORCE	-1.	Z COORD

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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
FGRUN	1	2.	2.	-7.	-120.	729.	98.	-0.000	-0.000	0.000	0.0000	-0.0000	-0.0000

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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
FGRUN	1	-2.	-2.	-7.	-120.	729.	98.	-.000	-.000	.000	.0020	-.0000	-.0000
	5	-2.	-2.	-7.	-131.	-481.	-15.	-.009	-.000	.004	.0001	-.0003	-.0000
FGRUN	5	-2.	-2.	-7.	-131.	481.	15.	.009	-.000	.004	.0001	-.0003	-.0000
	10	-2.	-2.	-7.	-142.	-232.	67.	.019	-.001	.015	.0001	-.0004	-.0000
FGRUN	10	-2.	-2.	-7.	-142.	232.	-67.	.019	-.001	.015	.0001	-.0004	-.0000
	15	-2.	-2.	-7.	-153.	17.	150.	.029	.000	.030	.0002	-.0005	.0000
FGRUN	15	-2.	-11.	-7.	-153.	-17.	-150.	.029	.000	.030	.0002	-.0005	.0000
	20	-2.	11.	-7.	-111.	216.	-172.	.037	.002	.042	.0003	-.0004	.0000
ELBOW	20	-2.	-11.	-7.	-111.	-216.	172.	.037	.002	.042	.0003	-.0004	.0000
	25	-2.	11.	-7.	-61.	234.	-215.	.040	.003	.043	.0003	-.0003	-.0000
FGRUN	25	-2.	-11.	-7.	-61.	-234.	215.	.040	.003	.043	.0003	-.0003	-.0000
	30	-2.	11.	-7.	-336.	151.	-215.	.050	.013	.035	.0002	-.0003	-.0001
ELBOW	30	-2.	-11.	-7.	-336.	-151.	215.	.050	.013	.035	.0002	-.0003	-.0001
	35	-2.	11.	-7.	-354.	140.	-205.	.050	.013	.033	.0001	-.0002	-.0002
FGRUN	35	-2.	-11.	-7.	-354.	-140.	205.	.050	.013	.033	.0001	-.0002	-.0002
	40	-2.	11.	-7.	-143.	140.	-136.	.044	.006	.032	.0000	-.0001	-.0003
FGRUN	40	-2.	-11.	-7.	-143.	-140.	136.	.044	-.006	.032	.0000	-.0001	-.0003
	45	-2.	11.	-7.	-101.	140.	-58.	.034	-.001	.032	.0000	-.0001	-.0003
FGRUN	45	-2.	-11.	-7.	-101.	-140.	58.	.034	-.001	.032	.0000	-.0001	-.0003
	50	-2.	11.	-7.	-344.	140.	-21.	.024	-.009	.031	.0001	.0000	-.0003
FGRUN	50	-2.	-11.	-7.	-344.	-140.	21.	.024	-.009	.031	.0001	.0000	-.0003
	55	-2.	11.	-7.	-555.	130.	-90.	.016	-.015	.026	.0002	.0001	-.0003
ELBOW	55	-2.	-11.	-7.	-555.	-130.	90.	.016	-.015	.026	.0002	.0001	-.0003
	60	-2.	11.	-7.	-537.	102.	-100.	.014	-.009	.024	.0005	.0001	-.0003
FGRUN	60	-2.	-11.	-7.	-537.	-102.	100.	.014	-.009	.024	.0005	.0001	-.0003
	65	-2.	11.	-7.	-408.	102.	-100.	.013	-.009	.021	.0005	.0001	-.0003
FGRUN	65	-2.	-11.	-7.	-408.	-102.	100.	.013	-.009	.021	.0005	.0001	-.0003
	70	-2.	11.	-7.	-230.	65.	100.	.011	.000	.018	.0006	.0001	-.0002

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	70	-2.	-20.	-7.	-230.	-65.	-100.	.011	.000	.018	.0006	.0001	-.0002
	75	-2.	20.	-7.	-207.	14.	100.	.008	.013	.013	.0006	.0001	-.0002
FGRU	75	-2.	-20.	-7.	-207.	-14.	-100.	.008	.013	.013	.0006	.0001	-.0002
	80	-2.	20.	-7.	-366.	-29.	100.	.006	.023	.009	.0005	.0001	-.0002

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	70	-2.	-20.	-7.	-230.	-65.	-100.	.011	.000	.018	.0006	.0001	-.0002
	75	-2.	20.	7.	-207.	14.	100.	.008	.013	.013	.0006	.0001	-.0002
FGRUN	75	-2.	-20.	-7.	-207.	-14.	-100.	.008	.013	.013	.0006	.0001	-.0002
	80	-2.	20.	7.	-566.	-29.	190.	.008	.023	.009	.0005	.0001	-.0002
ELBOW	80	-2.	-20.	-7.	566.	29.	-100.	.006	.023	.009	.0005	.0001	-.0002
	85	-2.	20.	7.	-623.	-39.	111.	.004	.024	.006	.0003	.0001	-.0001
FGRUN	85	-2.	-20.	-7.	623.	39.	-111.	.004	.024	.006	.0003	.0001	-.0001
	90	-2.	20.	7.	-475.	-39.	159.	.002	.020	.002	.0001	.0001	-.0001
FGRUN	90	-2.	-20.	-7.	475.	39.	-159.	.002	.020	.002	.0001	.0001	-.0001
	95	-2.	20.	7.	-294.	-39.	218.	.000	.014	-.000	.0000	.0001	-.0000
FGRUN	95	-3.	-20.	-7.	294.	39.	-218.	.000	.014	-.000	.0000	.0001	-.0000
	100	3.	20.	7.	-45.	-39.	108.	-.000	.006	.001	-.0000	.0001	-.0000
BRANCH	100	0.	0.	0.	0.	0.	0.	-.000	.006	.001	-.0000	.0001	.0000
	195	-0.	0.	0.	0.	0.	0.	-.000	.006	.001	-.0000	.0001	.0000
FGRUN	195	0.	0.	0.	0.	0.	0.	-.000	.006	.001	-.0000	.0001	.0000
	200	-0.	0.	0.	0.	0.	0.	-.001	.006	.001	-.0000	.0001	.0000
VALVE	200	0.	0.	0.	0.	0.	0.	-.001	.006	.001	-.0000	.0001	.0000
	205	-0.	0.	0.	0.	0.	0.	-.002	.006	.001	-.0000	.0001	.0000
VALVE	205	0.	0.	0.	0.	0.	0.	-.002	.006	.001	-.0000	.0001	.0000
	210	-0.	0.	0.	0.	0.	0.	-.003	.006	.001	-.0000	.0001	.0000
FGRUN	210	0.	0.	0.	0.	0.	0.	-.003	.006	.001	-.0000	.0001	.0000
	215	-0.	0.	0.	0.	0.	0.	-.005	.006	.002	-.0000	.0001	.0000
ELBOW	215	0.	0.	0.	0.	0.	0.	-.005	.006	.002	-.0000	.0001	.0000
	220	-0.	0.	0.	0.	0.	0.	-.005	.006	.002	-.0000	.0001	.0000
FGRUN	220	0.	0.	0.	0.	0.	0.	-.005	.006	.002	-.0000	.0001	.0000
	225	-0.	0.	0.	0.	0.	0.	-.005	.006	.002	-.0000	.0001	.0000
FGRUN	100	-3.	-20.	-7.	45.	39.	-108.	-.000	.006	.001	-.0000	.0001	.0000
	105	3.	20.	7.	-146.	-39.	23.	.001	-.000	.002	-.0000	.0001	.0000
BRANCH	105	-3.	-20.	-7.	146.	39.	-23.	.001	-.000	.002	-.0000	.0001	.0000
	230	3.	20.	7.	-108.	-33.	23.	.001	-.000	.002	-.0000	.0001	.0000
FGRUN	230	-3.	-20.	-7.	108.	33.	-23.	.001	-.000	.002	-.0000	.0001	.0000
	235	3.	20.	7.	-12.	-18.	23.	.000	.000	.000	.0000	.0000	.0001

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
ELBOW	235	-3.	-20.	-7.	-12.	18.	-23.	.000	.000	.000	.0000	.0000	.0001
	240	3.	20.	7.	-17.	-11.	16.	.001	-.000	-.000	.0000	.0000	.0001
FGRUN	240	-56.	19.	0.	17.	11.	-16.	.001	-.000	-.000	.0000	.0000	.0001
	110	56.	-19.	0.	-16.	-11.	111.	.001	-.001	-.000	.0000	.0000	.0001

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
ELBOW	235	-3.	-20.	-7.	-12.	-18.	-23.	.000	-.000	-.000	.0000	.0000	.0001
	240	3.	20.	7.	-17.	-11.	16.	.001	-.000	-.000	.0000	.0000	.0001
FGRUN	240	-56.	19.	-0.	17.	11.	-16.	.001	-.000	-.000	.0000	.0000	.0001
	110	56.	-19.	0.	-18.	-11.	-111.	.001	-.001	-.000	.0000	.0000	.0001
ELBOW	110	-56.	19.	-0.	16.	11.	111.	.001	-.001	-.000	.0000	.0000	.0001
	115	56.	-19.	0.	-15.	-12.	-450.	.000	-.002	-.000	.0000	.0000	-.0000
FGRUN	115	-56.	19.	-0.	15.	12.	450.	.000	-.002	-.000	.0000	.0000	-.0000
	120	56.	-19.	0.	-15.	-14.	-555.	-.001	-.002	-.000	.0000	.0000	-.0001
VALVE	120	-56.	19.	-0.	15.	14.	555.	-.001	-.002	-.000	.0000	.0000	-.0001
	125	56.	-19.	0.	-15.	-15.	-670.	-.003	-.001	-.000	.0000	.0000	-.0001
RUN	125	0.	0.	0.	0.	0.	-0.	-.003	-.001	-.000	.0000	.0000	-.0001
	130	-0.	-0.	-0.	0.	0.	0.	-.002	.001	.000	.0000	.0000	-.0001
VALVE	125	-28.	10.	-0.	8.	8.	335.	-.003	-.001	-.000	.0000	.0000	-.0001
	135	28.	-10.	0.	-8.	-8.	-393.	-.004	-.001	-.000	.0000	.0000	-.0001
VALVE	125	-28.	10.	-0.	8.	8.	335.	-.003	-.001	-.000	.0000	.0000	-.0001
	135	28.	-10.	0.	-8.	-8.	-393.	-.004	-.001	-.000	.0000	.0000	-.0001
FGRUN	135	-56.	19.	-0.	15.	17.	785.	-.004	-.001	-.000	.0000	.0000	-.0001
	140	56.	-19.	0.	-15.	-19.	-958.	-.006	.000	-.000	.0000	.0000	-.0002
VALVE	140	-56.	0.	1.	15.	19.	958.	-.006	.000	-.000	.0000	.0000	-.0002
	145	56.	0.	-1.	-15.	-14.	-958.	-.007	.001	-.000	.0000	.0000	-.0002
RUN	145	0.	0.	0.	0.	0.	-0.	-.007	.001	-.000	.0000	.0000	-.0002
	150	-0.	-0.	-0.	0.	0.	0.	-.005	.004	.000	.0000	.0000	-.0002
VALVE	145	-56.	0.	1.	15.	14.	958.	-.007	.001	-.000	.0000	.0000	-.0002
	155	56.	0.	-1.	-15.	-9.	-958.	-.009	.003	.000	.0000	.0000	-.0002
FGRUN	155	-56.	0.	1.	15.	9.	958.	-.009	.003	.000	.0000	.0000	-.0002
	160	56.	0.	-1.	-15.	-4.	-958.	-.010	.004	.000	.0000	.0000	-.0003
ELBOW	160	-56.	0.	1.	15.	4.	958.	-.010	.004	.000	.0000	.0000	-.0003
	165	56.	0.	-1.	-11.	-0.	-705.	-.009	.007	.000	-.0000	-.0000	-.0006
FGRUN	165	-56.	0.	1.	11.	0.	705.	-.009	.007	.000	-.0000	-.0000	-.0006
	170	56.	0.	-1.	-11.	-0.	-675.	-.008	.007	.000	-.0000	-.0000	-.0006
VALVE	170	-56.	0.	1.	11.	0.	675.	-.008	.007	.000	-.0000	-.0000	-.0006
	175	56.	0.	-1.	-5.	-0.	-337.	-.004	.008	.000	-.0000	-.0000	-.0006

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	175	0.	0.	-0.	-0.	-0.	0.	-.004	.008	-.000	-.0000	-.0000	-.0006
	180	-0.	-0.	0.	0.	0.	0.	-.004	.008	-.002	-.0000	-.0000	-.0006
VALVE	175	-56.	0.	1.	5.	0.	337.	-.004	.008	.000	-.0000	-.0000	-.0006
	185	56.	0.	-1.	0.	-0.	-0.	-.001	.010	.000	-.0000	-.0000	-.0006

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	175	0.	0.	0.	0.	0.	0.	-.004	.008	-.002	-.0000	-.0000	-.0006
	180	-0.	-0.	0.	0.	-0.	0.	-.004	.008	-.002	-.0000	-.0000	-.0006
VALVE	175	-56.	-0.	-1.	5.	0.	337.	-.004	.008	.000	-.0000	-.0000	-.0006
	185	-56.	-0.	-1.	0.	-0.	-0.	-.001	.010	.000	-.0000	-.0000	-.0006
FGRUN	185	-0.	0.	0.	0.	-0.	0.	-.001	.010	-.000	-.0000	-.0000	-.0006
	190	-0.	0.	0.	0.	-0.	0.	-.022	.018	-.000	-.0000	-.0000	-.0006

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APPENDIX E
SEISMIC ANALYSES RESULTS

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SUPPORT REACTIONS FOR LOAD CASE NO. 3

SSE 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
1	FORCE	65.	X CCORD
1	FORCE	56.	Y CCORD
1	FORCE	81.	Z CCORD
1	MOMENT	678.	X CCORD
1	MOMENT	8571.	Y CCORD
1	MOMENT	1922.	Z CCORD
15	FORCE	146.	Y CCORD
70	FORCE	72.	Y CCORD
95	FORCE	58.	X CCORD
95	FORCE	153.	Z CCORD
240	FORCE	177.	X CCORD
240	FORCE	118.	Y CCORD
240	FORCE	78.	Z CCORD
140	FORCE	169.	Y CCORD
140	FORCE	143.	Z CCORD
185	FORCE	77.	X CCORD
185	FORCE	49.	Z CCORD

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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

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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	1	65.	56.	81.	678.	8571.	1922.	.000	.000	.000	.0000	.0000	.0000
	5	65.	56.	81.	458.	5644.	126.	.008	.010	.059	.0003	.0031	.0004
FGRUN	5	65.	54.	75.	458.	5644.	126.	.008	.010	.059	.0003	.0031	.0004
	10	65.	54.	75.	324.	3028.	2043.	.028	.020	.206	.0005	.0049	.0001
FGRUN	10	65.	53.	61.	324.	3028.	2043.	.028	.020	.206	.0005	.0049	.0001
	15	65.	53.	61.	366.	1254.	3940.	.053	.001	.400	.0007	.0057	.0014
FGRUN	15	64.	98.	39.	366.	1254.	3940.	.053	.001	.400	.0007	.0057	.0014
	20	64.	98.	39.	192.	1243.	2159.	.075	.055	.567	.0008	.0058	.0023
ELBOW	20	63.	96.	24.	192.	1243.	2159.	.075	.055	.567	.0008	.0058	.0023
	25	63.	96.	24.	517.	1202.	2107.	.101	.063	.589	.0006	.0057	.0027
FGRUN	25	62.	95.	15.	517.	1202.	2107.	.101	.063	.589	.0006	.0057	.0027
	30	62.	95.	15.	3850.	2171.	2107.	.297	.041	.589	.0012	.0053	.0036
ELBOW	30	54.	93.	26.	3850.	2171.	2107.	.297	.041	.589	.0012	.0053	.0036
	35	54.	93.	26.	4166.	2381.	1916.	.309	.034	.580	.0027	.0050	.0040
FGRUN	35	50.	92.	42.	4166.	2381.	1916.	.309	.034	.580	.0027	.0050	.0040
	40	50.	92.	42.	3031.	2381.	912.	.253	.034	.485	.0039	.0045	.0045
FGRUN	40	41.	92.	64.	3031.	2381.	912.	.253	.034	.485	.0039	.0045	.0045
	45	41.	92.	64.	1021.	2381.	1082.	.259	.034	.340	.0046	.0043	.0045
FGRUN	45	30.	91.	82.	1021.	2381.	1082.	.259	.034	.340	.0046	.0043	.0045
	50	30.	91.	82.	1970.	2381.	1709.	.331	.034	.185	.0044	.0045	.0041
FGRUN	50	22.	92.	92.	1970.	2381.	1709.	.331	.034	.185	.0044	.0045	.0041
	55	22.	92.	92.	4589.	2381.	1845.	.409	.034	.074	.0033	.0049	.0036
ELBOW	55	26.	92.	95.	4589.	2381.	1845.	.409	.034	.074	.0033	.0049	.0036
	60	26.	92.	95.	4621.	2265.	1813.	.398	.025	.063	.0015	.0053	.0032
FGRUN	60	32.	92.	96.	4621.	2265.	1813.	.398	.025	.063	.0015	.0053	.0032
	65	32.	92.	96.	3656.	1897.	1813.	.337	.011	.063	.0010	.0055	.0029
FGRUN	65	41.	93.	99.	3656.	1897.	1813.	.337	.011	.063	.0010	.0055	.0029
	70	41.	93.	99.	2478.	1275.	1813.	.251	.001	.063	.0004	.0056	.0025
FGRUN	70	52.	110.	102.	2478.	1275.	1813.	.251	.001	.063	.0004	.0056	.0025
	75	52.	110.	102.	619.	614.	1813.	.133	.003	.063	.0001	.0057	.0020

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	75	58.	110.	106.	619.	614.	1813.	.133	.003	.063	.0001	.0057	.0020
	80	58.	110.	106.	2099.	1231.	1813.	.059	.006	.063	.0003	.0055	.0017
ELBOW	80	59.	110.	109.	2099.	1231.	1813.	.059	.006	.063	.0003	.0055	.0017
	85	59.	110.	109.	2087.	1466.	1651.	.049	.008	.059	.0012	.0053	.0014

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	75	58.	110.	106.	619.	614.	1913.	.133	.003	.063	.0001	.0057	.0020
	80	58.	110.	106.	2099.	1231.	1813.	.059	.006	.063	.0003	.0055	.0017
ELBOW	80	59.	110.	109.	2099.	1231.	1813.	.059	.006	.063	.0003	.0055	.0017
	85	59.	110.	109.	2087.	1466.	1651.	.049	.006	.059	.0012	.0053	.0014
FGRUN	85	60.	110.	112.	2087.	1466.	1651.	.049	.008	.059	.0012	.0053	.0014
	90	60.	110.	112.	209.	1466.	1435.	.023	.008	.032	.0014	.0049	.0011
FGRUN	90	61.	111.	114.	209.	1466.	1435.	.023	.008	.032	.0014	.0049	.0011
	95	61.	111.	114.	3066.	1466.	2348.	.001	.008	.002	.0009	.0043	.0006
FGRUN	95	40.	113.	39.	3066.	1466.	2348.	.001	.008	.002	.0009	.0043	.0006
	100	40.	113.	39.	1773.	1466.	992.	.012	.008	.011	.0001	.0035	.0003
BRANCH	100	5.	9.	4.	0.	24.	58.	.012	.008	.011	.0001	.0035	.0003
	195	5.	9.	4.	0.	20.	49.	.012	.008	.012	.0001	.0034	.0004
FGRUN	195	5.	9.	4.	0.	14.	34.	.012	.008	.016	.0001	.0034	.0003
	200	5.	9.	4.	0.	14.	34.	.012	.008	.016	.0001	.0034	.0003
VALVE	200	5.	9.	4.	0.	14.	34.	.012	.008	.016	.0001	.0034	.0003
	205	5.	9.	4.	0.	14.	2.	.012	.008	.026	.0001	.0034	.0003
VALVE	205	0.	0.	0.	0.	4.	2.	.012	.008	.038	.0001	.0034	.0003
	210	0.	0.	0.	0.	3.	1.	.012	.008	.038	.0001	.0034	.0003
FGRUN	210	0.	0.	0.	0.	3.	1.	.012	.008	.038	.0001	.0034	.0003
	215	0.	0.	0.	0.	0.	0.	.012	.010	.070	.0001	.0034	.0003
ELBOW	215	0.	0.	0.	0.	0.	0.	.012	.010	.074	.0001	.0034	.0003
	220	0.	0.	0.	0.	0.	0.	.012	.010	.074	.0001	.0034	.0003
FGRUN	220	0.	0.	0.	0.	0.	0.	.012	.010	.074	.0001	.0034	.0003
	225	0.	0.	0.	0.	0.	0.	.011	.010	.074	.0001	.0034	.0003
FGRUN	100	40.	120.	40.	1773.	1481.	995.	.012	.008	.011	.0001	.0035	.0003
	105	40.	120.	40.	795.	1481.	316.	.018	.008	.002	.0005	.0029	.0004
BRANCH	105	41.	122.	40.	795.	1481.	316.	.018	.008	.032	.0005	.0029	.0004
	230	41.	122.	40.	564.	1445.	316.	.013	.007	.002	.0006	.0026	.0003
FGRUN	230	41.	122.	40.	564.	1445.	316.	.013	.007	.002	.0006	.0026	.0003
	235	41.	122.	40.	83.	1370.	316.	.003	.003	.002	.0008	.0018	.0003
ELBOW	235	41.	123.	40.	83.	1370.	316.	.003	.003	.002	.0008	.0018	.0003
	240	41.	123.	40.	401.	1343.	366.	.002	.001	.001	.0004	.0005	.0004

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	240	167.	56.	62.	401.	1343.	366.	.002	.001	.001	.0004	.0005	.0004
	110	167.	56.	62.	431.	1343.	415.	.002	.001	.001	.0004	.0004	.0003
ELBOW	110	166.	56.	62.	431.	1343.	415.	.002	.001	.001	.0004	.0004	.0003
	115	166.	56.	62.	588.	1231.	920.	.004	.001	.002	.0004	.0001	.0001

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	240	167.	56.	62.	401.	1343.	366.	.002	.001	.001	.0004	.0005	.0004
	110	167.	56.	62.	431.	1343.	415.	.002	.001	.001	.0004	.0004	.0003
ELBOW	110	166.	56.	62.	431.	1343.	415.	.002	.001	.001	.0004	.0004	.0003
	115	166.	56.	62.	588.	1231.	920.	.004	.001	.002	.0004	.0001	.0001
FGRUN	115	164.	56.	62.	588.	1231.	920.	.004	.001	.002	.0004	.0001	.0001
	120	164.	56.	62.	588.	1169.	850.	.004	.001	.001	.0004	.0001	.0001
VALVE	120	163.	56.	62.	588.	1169.	850.	.004	.001	.001	.0004	.0001	.0001
	125	163.	56.	62.	588.	1212.	893.	.004	.001	.001	.0004	.0001	.0001
RUN	125	21.	6.	25.	250.	0.	299.	.004	.001	.001	.0004	.0001	.0001
	130	21.	6.	25.	0.	0.	0.	.004	.001	.004	.0004	.0001	.0001
VALVE	125	47.	31.	29.	262.	606.	376.	.004	.001	.001	.0004	.0001	.0001
	135	47.	31.	29.	262.	640.	467.	.004	.001	.001	.0004	.0001	.0001
VALVE	125	47.	31.	29.	262.	606.	376.	.004	.001	.001	.0004	.0001	.0001
	135	47.	31.	29.	262.	640.	467.	.004	.001	.001	.0004	.0001	.0001
FGRUN	135	91.	63.	58.	525.	1280.	934.	.004	.001	.001	.0004	.0001	.0001
	140	91.	63.	58.	525.	1526.	1403.	.004	.002	.001	.0004	.0002	.0002
VALVE	140	90.	114.	96.	525.	1526.	1403.	.004	.002	.001	.0004	.0002	.0002
	145	90.	114.	96.	525.	1033.	731.	.004	.003	.003	.0004	.0002	.0002
RUN	145	23.	9.	25.	251.	0.	230.	.004	.003	.003	.0004	.0002	.0002
	150	23.	9.	25.	0.	0.	0.	.004	.003	.003	.0004	.0002	.0002
VALVE	145	40.	81.	61.	606.	1033.	752.	.004	.003	.003	.0004	.0002	.0002
	155	40.	81.	61.	606.	674.	469.	.004	.004	.004	.0004	.0002	.0002
FGRUN	155	40.	80.	59.	606.	674.	469.	.004	.004	.004	.0004	.0002	.0002
	160	40.	80.	59.	606.	360.	553.	.004	.006	.005	.0004	.0003	.0002
ELBOW	160	40.	79.	58.	606.	360.	553.	.004	.006	.005	.0004	.0003	.0002
	165	40.	79.	58.	649.	159.	727.	.003	.006	.005	.0004	.0003	.0002
FGRUN	165	40.	78.	57.	649.	159.	727.	.003	.006	.005	.0004	.0003	.0002
	170	40.	78.	57.	661.	159.	719.	.003	.006	.005	.0004	.0003	.0002
VALVE	170	40.	77.	56.	661.	159.	719.	.003	.006	.005	.0004	.0003	.0002
	175	40.	77.	56.	844.	159.	677.	.002	.006	.002	.0004	.0003	.0002
RUN	175	20.	21.	12.	168.	159.	0.	.002	.006	.002	.0004	.0003	.0002
	180	20.	21.	12.	0.	0.	0.	.003	.007	.002	.0004	.0003	.0002

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
VALVE	175	68.	9.	40.	761.	0.	670.	.002	.006	.002	.0004	.0003	.0002
	185	68.	9.	40.	756.	0.	690.	.001	.006	.000	.0004	.0003	.0002
FGRUN	185	19.	4.	22.	758.	0.	650.	.001	.006	.000	.0004	.0003	.0002
	90	19.	4.	22.	0.	0.	0.	.012	.006	.019	.0004	.0003	.0002

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
VALVE	175	68.	9.	40.	761.	0.	670.	.002	.006	.002	.0004	.0003	.0002
	185	68.	9.	40.	758.	0.	650.	.001	.006	.000	.0004	.0003	.0002
FGRUN	185	19.	4.	22.	758.	0.	650.	.001	.006	.000	.0004	.0003	.0002
	190	19.	4.	22.	0.	0.	0.	.012	.006	.019	.0006	.0003	.0004

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SYSTEM ACCELERATION FOR LOAD CASE NO. 3

SSE RESPONSE SPECTRUM - 1% DAMPING
 COMBINED RESULT FOR MODE 1 THRU 15 BY RMS SUMMATION

SPECTRA SET = 1

POINT
NO.X-DIRECTION
(G)Y-DIRECTION
(G)Z-DIRECTION
(G)

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SYSTEM ACCELERATION FOR LOAD CASE NO. 3

SSE RESPONSE SPECTRUM - 1% DAMPING
 COMBINED RESULT FOR MODE 1 THRU 15 BY RPS SUMMATION

SPECTRA SET = 1

POINT NO.	X-DIRECTION (G)	Y-DIRECTION (G)	Z-DIRECTION (G)
1	.000	.000	.000
5	.037	.206	.277
10	.093	.284	.699
15	.147	.017	1.105
20	.197	.346	1.487
25	.268	.369	1.542
30	1.123	.352	1.542
35	1.193	.361	1.515
40	1.180	.361	1.291
45	1.162	.360	1.028
50	1.233	.360	.717
55	1.575	.359	.605
60	1.541	.314	.604
65	1.393	.178	.604
70	.554	.065	.604
75	.536	.310	.604
80	.397	.552	.604
85	.373	.585	.571
90	.176	.585	.310
95	.022	.584	.053
100	.257	.580	.310
105	.238	.558	.294
110	.238	.499	.250
115	.238	.413	.177
120	.238	.331	.164
125	.238	.145	.372
130	.237	.142	.407
135	.234	.142	.410
140	.231	.576	.123
145	.268	.515	.123
150	.194	.266	.123
155	.182	.149	.075
160	.261	.144	.121
165	.383	.146	.240
170	.384	.136	.221
175	.384	.114	.194
180	.384	.114	.502
185	.384	.089	.163
190	.384	.107	.191

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POINT NO.	X-DIRECTION (G)	Y-DIRECTION (G)	Z-DIRECTION (G)
145	.388	.184	.295
150	.461	.184	.504
155	.388	.270	.414
160	.388	.348	.537
165	.331	.390	.501

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POINT NO.	X-DIRECTION (G)	Y-DIRECTION (G)	Z-DIRECTION (G)
145	.388	.184	.295
150	.461	.184	.504
155	.388	.270	.414
160	.388	.348	.537
165	.331	.390	.501
170	.320	.390	.480
175	.210	.391	.246
180	.397	.420	.246
185	.179	.391	.083
190	1.677	.391	1.954

E7

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SUPPORT REACTIONS FOR LOAD COMBINATION CASE NO. 4
DBE RESPONSE SPECTRUM - ONE-HALF SSE

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

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SUPPORT REACTIONS FOR LOAD COMBINATION CASE NO. 4

DBE RESPONSE SPECTRUM - ONE-HALF SSE

NODE	TYPE	REACTIONS (LBS OR IN-LBS)	DIRECTION
1	FORCE	33.	X COORD
1	FORCE	28.	Y COORD
1	FORCE	41.	Z COORD
1	MOMENT	339.	X COORD
1	MOMENT	4286.	Y COORD
1	MOMENT	961.	Z COORD
15	FORCE	73.	Y COORD
70	FORCE	36.	Y COORD
95	FORCE	49.	X COORD
240	FORCE	76.	Z COORD
240	FORCE	86.	X COORD
240	FORCE	69.	Y COORD
240	FORCE	39.	Z COORD
140	FORCE	84.	Y COORD
140	FORCE	71.	Z COORD
185	FORCE	38.	X COORD
185	FORCE	25.	Z COORD

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INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 4

DBE RESPONSE SPECTRUM - ONE-HALF SSE

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
						4286.	961.	.000	.000	.002	.0000	.0000	.0000

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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	DX	DY	DZ	RX	RY	RZ
FGRUN	1	33.	28.	41.	339.	4286.	961.	.000	.000	.007	.0300	.0000	.0000
	5	33.	28.	41.	229.	2822.	63.	.004	.005	.030	.0002	.0015	.0002
FGRUN	5	33.	27.	37.	229.	2822.	63.	.004	.005	.030	.0002	.0015	.0002
	10	33.	27.	37.	162.	1514.	1022.	.014	.010	.103	.0003	.0025	.0000
FGRUN	10	32.	27.	30.	162.	1514.	1022.	.014	.010	.103	.0003	.0025	.0000
	15	32.	27.	30.	183.	627.	1970.	.027	.001	.200	.0003	.0029	.0007
FGRUN	15	32.	49.	20.	183.	627.	1970.	.027	.001	.200	.0003	.0029	.0007
	20	32.	49.	20.	96.	621.	1080.	.038	.028	.283	.0004	.0029	.0012
ELBOW	20	32.	48.	12.	96.	621.	1080.	.038	.028	.283	.0004	.0029	.0012
	25	32.	48.	12.	259.	601.	1053.	.050	.032	.295	.0003	.0028	.0013
FGRUN	25	31.	47.	7.	259.	601.	1053.	.050	.032	.295	.0003	.0028	.0013
	30	31.	47.	7.	1925.	1086.	1053.	.148	.021	.295	.0006	.0027	.0018
ELBOW	30	27.	47.	13.	1925.	1086.	1053.	.148	.021	.295	.0006	.0027	.0018
	35	27.	47.	13.	2083.	1190.	958.	.154	.017	.290	.0013	.0025	.0020
FGRUN	35	25.	46.	21.	2083.	1190.	958.	.154	.017	.290	.0013	.0025	.0020
	40	25.	46.	21.	1515.	1190.	456.	.126	.017	.242	.0019	.0023	.0022
FGRUN	40	21.	46.	32.	1515.	1190.	456.	.126	.017	.242	.0019	.0023	.0022
	45	21.	46.	32.	510.	1190.	541.	.129	.017	.170	.0023	.0022	.0023
FGRUN	45	15.	46.	41.	510.	1190.	541.	.129	.017	.170	.0023	.0022	.0023
	50	15.	46.	41.	985.	1190.	855.	.165	.017	.093	.0022	.0022	.0021
FGRUN	50	11.	46.	46.	985.	1190.	855.	.165	.017	.093	.0022	.0022	.0021
	55	11.	46.	46.	2295.	1190.	922.	.204	.017	.037	.0016	.0024	.0018
ELBOW	55	13.	46.	47.	2295.	1190.	922.	.204	.017	.037	.0016	.0024	.0018
	60	13.	46.	47.	1133.	1133.	906.	.199	.012	.032	.0008	.0027	.0016
FGRUN	60	16.	46.	48.	1133.	1133.	906.	.199	.012	.032	.0008	.0027	.0016
	65	16.	46.	48.	2310.	1133.	906.	.199	.012	.032	.0008	.0027	.0016
FGRUN	65	16.	46.	48.	1828.	948.	906.	.168	.005	.032	.0005	.0027	.0014
	70	21.	46.	49.	1828.	948.	906.	.168	.005	.032	.0005	.0027	.0014
FGRUN	70	21.	46.	49.	1239.	638.	906.	.125	.000	.032	.0002	.0028	.0013
	75	26.	55.	51.	1239.	638.	906.	.125	.000	.032	.0002	.0028	.0013
FGRUN	75	26.	55.	51.	310.	307.	906.	.066	.002	.032	.0000	.0028	.0010

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	75	29.	55.	53.	310.	307.	906.	.066	.002	.032	.0000	.0028	.0010
	80	29.	55.	53.	1050.	616.	906.	.029	.003	.032	.0002	.0028	.0008
ELBOW	80	30.	55.	54.	1050.	616.	906.	.029	.003	.032	.0002	.0028	.0008
	85	30.	55.	54.	1044.	733.	825.	.025	.004	.030	.0006	.0027	.0007

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LOFT CIS ANALYSIS - S-5B PENETRATION DUCT (3 IA-296-AB) WXB-04

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	75	29.	55.	53.	310.	307.	906.	.066	.002	.032	.0000	.0028	.0010
	80	29.	55.	53.	1050.	616.	906.	.029	.003	.032	.0002	.0028	.0008
ELBDW	80	30.	55.	54.	1050.	616.	906.	.029	.003	.032	.0002	.0028	.0008
	85	30.	55.	54.	1044.	733.	825.	.025	.004	.030	.0006	.0027	.0007
FGRUN	85	30.	55.	56.	1044.	733.	825.	.025	.004	.030	.0006	.0027	.0007
	90	30.	55.	56.	104.	733.	718.	.012	.004	.016	.0007	.0024	.0006
FGRUN	90	30.	56.	57.	104.	733.	718.	.012	.004	.015	.0007	.0024	.0006
	95	30.	56.	57.	1533.	733.	1174.	.000	.004	.001	.0004	.0021	.0003
FGRUN	95	20.	57.	20.	1533.	733.	1174.	.000	.004	.001	.0004	.0021	.0003
	100	20.	57.	20.	886.	733.	496.	.006	.004	.005	.0001	.0016	.0002
BRANCH	100	3.	4.	2.	0.	12.	29.	.006	.004	.005	.0001	.0018	.0002
	195	3.	4.	2.	0.	10.	24.	.006	.004	.006	.0001	.0017	.0002
FGRUN	195	3.	4.	2.	0.	10.	24.	.006	.004	.006	.0001	.0017	.0002
	200	3.	4.	2.	0.	7.	17.	.006	.004	.008	.0001	.0017	.0002
VALVE	200	3.	4.	2.	0.	7.	17.	.006	.004	.008	.0001	.0017	.0002
	205	3.	4.	2.	0.	2.	1.	.006	.004	.013	.0001	.0017	.0002
VALVE	205	0.	0.	0.	0.	2.	1.	.006	.004	.013	.0001	.0017	.0002
	210	0.	0.	0.	0.	2.	1.	.006	.004	.019	.0001	.0017	.0002
FGRUN	210	0.	0.	0.	0.	2.	1.	.006	.004	.019	.0001	.0017	.0002
	215	0.	0.	0.	0.	0.	0.	.006	.005	.035	.0001	.0017	.0002
ELBOW	215	0.	0.	0.	0.	0.	0.	.006	.005	.035	.0001	.0017	.0002
	220	0.	0.	0.	0.	0.	0.	.006	.005	.037	.0001	.0017	.0002
FGRUN	220	0.	0.	0.	0.	0.	0.	.006	.005	.037	.0001	.0017	.0002
	225	0.	0.	0.	0.	0.	0.	.006	.005	.037	.0001	.0017	.0002
FGRUN	100	20.	60.	20.	886.	741.	497.	.006	.004	.005	.0001	.0018	.0002
	105	20.	60.	20.	397.	741.	158.	.009	.004	.001	.0003	.0015	.0002
BRANCH	105	20.	61.	20.	397.	741.	158.	.009	.004	.001	.0003	.0015	.0002
	230	20.	61.	20.	282.	723.	158.	.006	.003	.001	.0003	.0013	.0002
FGRUN	230	20.	61.	20.	282.	723.	158.	.006	.003	.001	.0003	.0013	.0002
	235	20.	61.	20.	41.	685.	158.	.001	.001	.001	.0004	.0009	.0001
ELBOW	235	20.	61.	20.	41.	685.	158.	.001	.001	.001	.0004	.0009	.0001
	240	20.	61.	20.	200.	671.	183.	.001	.001	.000	.0002	.0002	.0002

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	240	83.	28.	31.	200.	671.	183.	.001	.001	.000	.0002	.0002	.0002
	110	83.	28.	31.	215.	671.	208.	.001	.001	.000	.0002	.0002	.0002
ELBOW	110	83.	28.	31.	215.	671.	208.	.001	.001	.000	.0002	.0002	.0002
	115	83.	28.	31.	294.	615.	460.	.002	.001	.001	.0002	.0001	.0000

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
FGRUN	240	83.	28.	31.	200.	671.	183.	.001	.001	.000	.0002	.0002	.0002
	110	83.	28.	31.	215.	671.	208.	.001	.001	.000	.0002	.0002	.0002
ELBOW	110	83.	28.	31.	215.	671.	208.	.001	.001	.000	.0002	.0002	.0002
	115	83.	28.	31.	294.	615.	460.	.002	.001	.001	.0002	.0001	.0000
FGRUN	115	82.	28.	31.	294.	615.	460.	.002	.001	.001	.0002	.0001	.0000
	120	82.	28.	31.	294.	584.	425.	.002	.001	.001	.0002	.0000	.0000
VALVE	120	82.	28.	31.	294.	584.	425.	.002	.001	.001	.0002	.0000	.0000
	125	82.	28.	31.	294.	606.	447.	.002	.000	.001	.0002	.0000	.0000
RUN	125	11.	3.	13.	125.	0.	105.	.002	.000	.001	.0002	.0000	.0000
	130	11.	3.	13.	0.	0.	0.	.002	.000	.002	.0002	.0000	.0000
VALVE	125	23.	16.	14.	131.	303.	188.	.002	.000	.001	.0002	.0000	.0000
	135	23.	16.	14.	131.	320.	233.	.002	.000	.000	.0002	.0000	.0000
VALVE	125	23.	16.	14.	131.	303.	188.	.002	.000	.001	.0002	.0000	.0000
	135	23.	16.	14.	131.	320.	233.	.002	.000	.000	.0002	.0000	.0000
FGRUN	135	46.	32.	29.	262.	640.	467.	.002	.000	.000	.0002	.0000	.0000
	140	46.	32.	29.	262.	763.	702.	.002	.001	.001	.0002	.0001	.0001
VALVE	140	45.	57.	48.	262.	763.	702.	.002	.001	.001	.0002	.0001	.0001
	145	45.	57.	48.	262.	516.	366.	.002	.001	.001	.0002	.0001	.0001
RUN	145	12.	5.	13.	125.	0.	115.	.002	.001	.001	.0002	.0001	.0001
	150	12.	5.	13.	0.	0.	0.	.002	.001	.001	.0002	.0001	.0001
VALVE	145	20.	40.	30.	303.	516.	375.	.002	.001	.001	.0002	.0001	.0001
	155	20.	40.	30.	303.	337.	234.	.002	.002	.002	.0002	.0001	.0001
FGRUN	155	20.	40.	30.	303.	337.	234.	.002	.002	.002	.0002	.0001	.0001
	160	20.	40.	30.	303.	180.	276.	.002	.003	.003	.0002	.0001	.0001
ELBOW	160	20.	39.	29.	303.	180.	276.	.002	.003	.003	.0002	.0001	.0001
	165	20.	39.	29.	325.	79.	364.	.002	.003	.002	.0002	.0001	.0001
FGRUN	165	20.	39.	28.	325.	79.	364.	.002	.003	.002	.0002	.0001	.0001
	170	20.	39.	28.	330.	79.	360.	.001	.003	.002	.0002	.0001	.0001
VALVE	170	20.	38.	28.	330.	79.	360.	.001	.003	.002	.0002	.0001	.0001
	175	20.	38.	28.	422.	79.	335.	.001	.003	.001	.0002	.0001	.0001
RUN	175	10.	11.	6.	84.	79.	0.	.001	.003	.001	.0002	.0001	.0001
	180	10.	11.	6.	0.	0.	0.	.001	.004	.001	.0002	.0001	.0001

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MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
VALVE	175	34.	5.	20.	380.	0.	335.	.001	.003	.001	.0002	.0001	.0001
	185	34.	5.	20.	379.	0.	325.	.000	.003	.000	.0002	.0001	.0001
FGRUN	185	9.	2.	11.	379.	0.	325.	.000	.003	.000	.0002	.0001	.0001
	190	9.	2.	11.	0.	0.	0.	.006	.003	.009	.0003	.0001	.0002

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MEMBER*	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
VALVE	175	34.	5.	20.	380.	0.	335.	.001	.003	.001	.0002	.0001	.0001
	185	34.	5.	20.	379.	0.	325.	.000	.003	.000	.0002	.0001	.0001
FGRUN	185	9.	2.	11.	379.	0.	325.	.000	.003	.000	.0002	.0001	.0001
	190	9.	2.	11.	0.	0.	0.	.006	.003	.009	.0003	.0001	.0002

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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)
FGRUN	1	1.000	1017.	3425.	407.	1424.
	5	1.000	965.	2512.	272.	1237.
FGRUN	5	1.000	965.	2512.	272.	1237.
	10	1.000	870.	1873.	153.	1023.
FGRUN	10	1.000	870.	1873.	153.	1023.
	15	1.000	1339.	2473.	117.	1457.
FGRUN	15	1.000	1339.	2473.	117.	1457.
	20	1.000	840.	1523.	163.	1003.
ELBOW	20	1.777	863.	1774.	289.	1152.
	25	1.777	845.	1749.	315.	1160.
FGRUN	25	1.000	827.	1504.	177.	1004.
	30	1.000	973.	2311.	233.	1206.
ELBOW	30	1.777	1041.	2824.	414.	1455.
	35	1.777	1038.	2920.	420.	1457.
FGRUN	35	1.000	971.	2383.	236.	1207.
	40	1.000	1000.	2082.	132.	1132.
FGRUN	40	1.000	1000.	2082.	132.	1132.
	45	1.000	1034.	1801.	99.	1133.
FGRUN	45	1.000	1034.	1801.	99.	1133.
	50	1.000	1069.	2034.	203.	1272.
FGRUN	50	1.000	1069.	2034.	203.	1272.
	55	1.000	1100.	2600.	317.	1416.
ELBOW	55	1.777	1210.	3209.	563.	1773.
	60	1.777	935.	2922.	546.	1481.
FGRUN	60	1.000	894.	2385.	307.	1201.
	65	1.000	1238.	2468.	237.	1474.
FGRUN	65	1.000	1238.	2468.	237.	1474.
	70	1.000	2122.	3030.	142.	2264.

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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)
FGRUN	70	1.000	2122.	3030.	142.	2264.

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ASME SECTION III CLASS 2 OR ANSI B31.1.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	70	1.000	2122.	3030.	142.	2264.
	75	1.000	1345.	1895.	126.	1471.
FGRUN	75	1.000	1345.	1895.	126.	1471.
	80	1.000	842.	1671.	315.	1157.
ELBDW	80	1.777	866.	1972.	559.	1425.
	85	1.777	858.	1965.	616.	1474.
FGRUN	85	1.000	836.	1667.	346.	1183.
	90	1.000	854.	1417.	275.	1128.
FGRUN	90	1.000	854.	1417.	275.	1128.
	95	1.000	878.	2006.	201.	1079.
FGRUN	95	1.000	878.	2006.	201.	1079.
	100	1.447	955.	1698.	97.	1053.
BRANCH	100	1.447	1934.	2235.	0.	1934.
	195	1.000	2133.	2471.	0.	2133.
FGRUN	195	1.000	2133.	2471.	0.	2133.
	200	1.000	1652.	1889.	0.	1652.
FGRUN	210	1.000	544.	565.	0.	544.
	215	1.000	445.	447.	0.	445.
ELBOW	215	1.296	445.	447.	0.	445.
	220	1.296	441.	442.	0.	441.
FGRUN	220	1.000	441.	442.	0.	441.
	225	1.000	441.	441.	0.	441.
FGRUN	100	1.447	926.	1672.	97.	1024.
	105	2.631	1135.	2057.	220.	1355.
BRANCH	105	2.631	1901.	5130.	771.	2672.
	230	1.000	1349.	3606.	330.	1678.
FGRUN	230	1.000	1349.	3606.	330.	1678.
	235	1.000	975.	2982.	90.	1064.

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ASME SECTION III CLASS 2 OR ANSI B31.1.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)
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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)
ELBOW	235	1.596	1044.	3446.	143.	1187.
	240	1.596	1240.	3711.	116.	1356.
FGRUN	240	1.000	869.	1264.	14.	883.
	110	1.000	865.	1267.	61.	926.
ELBOW	110	1.777	897.	1432.	109.	1006.
	115	1.777	1011.	1610.	438.	1448.
FGRUN	115	1.000	950.	1400.	246.	1197.
	120	1.000	896.	1322.	304.	1199.
RUN	125	1.000	770.	859.	0.	770.
	130	1.000	770.	770.	0.	770.
FGRUN	135	1.000	1896.	2352.	429.	2326.
	140	1.000	3211.	3795.	524.	3734.
RUN	145	1.000	770.	863.	0.	770.
	150	1.000	770.	770.	0.	770.
FGRUN	155	1.000	1100.	1379.	524.	1624.
	160	1.000	1150.	1394.	524.	1673.
ELBOW	160	1.777	1276.	1602.	931.	2207.
	165	1.777	1677.	2037.	685.	2362.
FGRUN	165	1.000	1450.	1720.	385.	1836.
	170	1.000	1423.	1694.	369.	1792.
RUN	175	1.000	999.	1063.	0.	999.
	180	1.000	770.	770.	0.	770.
FGRUN	185	1.000	770.	1043.	0.	770.
	190	1.000	770.	770.	0.	770.

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

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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)
FGRUN	1	1.000	1017.	5832.	0.	1017.
	5	1.000	965.	4060.	0.	965.
FGRUN	5	1.000	965.	4060.	0.	965.
	10	1.000	870.	2875.	0.	870.
FGRUN	10	1.000	870.	2875.	0.	870.
	15	1.000	1339.	3608.	0.	1339.
FGRUN	15	1.000	1339.	3608.	0.	1339.
	20	1.000	840.	2206.	0.	840.
ELBOW	20	1.777	863.	2684.	0.	863.
	25	1.777	845.	2652.	0.	845.
FGRUN	25	1.000	827.	2182.	0.	827.
	30	1.000	973.	3649.	0.	973.
ELBOW	30	1.777	1041.	4608.	0.	1041.
	35	1.777	1038.	4802.	0.	1038.
FGRUN	35	1.000	971.	3795.	0.	971.
	40	1.000	1000.	3164.	0.	1000.
FGRUN	40	1.000	1000.	3164.	0.	1000.
	45	1.000	1034.	2568.	0.	1034.
FGRUN	45	1.000	1034.	2568.	0.	1034.
	50	1.000	1069.	2999.	0.	1069.
FGRUN	50	1.000	1069.	2999.	0.	1069.
	55	1.000	1100.	4100.	0.	1100.
ELBOW	55	1.777	1210.	5209.	0.	1210.
	60	1.777	935.	4910.	0.	935.
FGRUN	60	1.000	894.	3876.	0.	894.
	65	1.000	1238.	3697.	0.	1238.
FGRUN	65	1.000	1238.	3697.	0.	1238.
	70	1.000	2122.	3939.	0.	2122.

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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)
FGRUN	70	1.000	2122.	3939.	0.	2122.
	75	1.000	1345.	2445.	0.	1345.

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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)
FGRUN	70	1.000	2122.	3939.	0.	2122.
	75	1.000	1345.	2445.	0.	1345.
FGRUN	75	1.000	1345.	2445.	0.	1345.
	80	1.000	842.	2501.	0.	842.
ELBOW	80	1.777	866.	3077.	0.	866.
	85	1.777	858.	3072.	0.	858.
FGRUN	85	1.000	836.	2497.	0.	836.
	90	1.000	854.	1981.	0.	854.
FGRUN	90	1.000	854.	1981.	0.	854.
	95	1.000	878.	3135.	0.	878.
FGRUN	95	1.000	878.	3135.	0.	878.
	100	1.447	955.	2441.	0.	955.
BRANCH	100	1.447	1934.	2536.	0.	1934.
	195	1.000	2133.	2808.	0.	2133.
FGRUN	195	1.000	2133.	2608.	0.	2133.
	200	1.000	1652.	2125.	0.	1652.
FGRUN	210	1.000	544.	586.	0.	544.
	215	1.000	445.	448.	0.	445.
ELBOW	215	1.296	445.	448.	0.	445.
	220	1.296	441.	442.	0.	441.
FGRUN	220	1.000	441.	442.	0.	441.
	225	1.000	441.	441.	0.	441.
FGRUN	100	1.447	926.	2418.	0.	926.
	105	2.631	1135.	2979.	0.	1135.
BRANCH	105	2.631	1901.	8359.	0.	1901.
	230	1.000	1349.	5862.	0.	1349.
FGRUN	230	1.000	1349.	5862.	0.	1349.
	235	1.000	975.	4969.	0.	975.

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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)
ELBOW	235	1.596	1044.	5848.	0.	1044.

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APPENDIX G
LEVEL C SERVICE CONDITIONS
STRESS ANALYSIS RESULTS

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ASME SECTION III CLASS 2 OR ANSI B31.1-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)
ELBOW	235	1.596	1044.	5848.	0.	1044.
	240	1.596	1240.	6182.	0.	1240.
FGRUN	240	1.000	869.	1660.	0.	869.
	110	1.000	865.	1669.	0.	865.
ELBOW	110	1.777	897.	1968.	0.	897.
	115	1.777	1011.	2209.	0.	1011.
FGRUN	115	1.000	950.	1850.	0.	950.
	120	1.000	896.	1748.	0.	896.
RUN	125	1.000	770.	948.	0.	770.
	130	1.000	770.	770.	0.	770.
FGRUN	135	1.000	1896.	2808.	0.	1896.
	140	1.000	3211.	4379.	0.	3211.
RUN	145	1.000	770.	956.	0.	770.
	150	1.000	770.	770.	0.	770.
FGRUN	155	1.000	1100.	1658.	0.	1100.
	160	1.000	1150.	1639.	0.	1150.
ELBOW	160	1.777	1276.	1929.	0.	1276.
	165	1.777	1677.	2397.	0.	1677.
FGRUN	165	1.000	1450.	1990.	0.	1450.
	170	1.000	1423.	1964.	0.	1423.
RUN	175	1.000	999.	1126.	0.	999.
	180	1.000	770.	770.	0.	770.
FGRUN	185	1.000	770.	1315.	0.	770.
	190	1.000	770.	770.	0.	770.

APPENDIX H
LEVEL D SERVICE CONDITIONS
STRESS ANALYSIS RESULTS

Level D service conditions do not apply to this line.

APPENDIX I
COMPONENT SUPPORT ANALYSIS RESULTS

Support/restraint loads and locations are listed in the body of the report. Support designs were not available at the time of the analysis.