MASTER

LOFT TECHNICAL REPORT LTR 1122-1

RE & C REPORT NUMBER RE-A-78-094

AUGUST 16, 1978

NOTICE

MN ONLY

PORTIONS OF THIS REPORT ARE ILLEGIBLE. It
has been reproduced from the best available
copy to permit the broadest possible avail-
ability.

LOFT WASTE GAS PROCESSING SYSTEM ANALYSIS
LINE 1-1/2"-BSV-10-VD OUTSIDE PENETRATION S-5C

A. T. Pierce

EG&G Idaho, Inc.

IDAHO NATIONAL ENGINEERING LABORATORY

DEPARTMENT OF ENERGY

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

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

LOFT TECHNICAL REPORT LTR 1122-1

RE&C Report # RE-A-78-094

DATE AUGUST 16, 1978 *Sh*

WORK REQUEST NO. 52261-100-352

RESEARCH, ENGINEERING AND CONSTRUCTION REPORT ENGINEERING ANALYSIS DIVISION

APPLIED MECHANICS BRANCH

NOTICE
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

LOFT WASTE GAS PROCESSING SYSTEM ANALYSIS
LINE 1-1/2"-BSV-10-VD OUTSIDE PENETRATION S-5C

A. T. Pierce / *A. T. Pierce*
AUTHOR

CHECKED BY: J. W. Muffett / *JW Muffett*

APPROVED BY: C. A. Moore / *CA Moore*

~~THIS DOCUMENT HAS NOT RECEIVED PATENT CLEARANCE AND IS NOT TO BE TRANSMITTED TO THE PUBLIC DOMAIN.~~

cc: J. G. Arendts
S. M. Gardner (3)
M. M. Laughlin (5)
C. A. Moore
J. W. Muffett
A. T. Pierce
D. E. Wilkins

g.b
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

IDAHO NATIONAL ENGINEERING LABORATORY
LOFT TECHNICAL REPORT
LOFT PROGRAM

TITLE LOFT WASTE GAS PROCESSING SYSTEM ANALYSIS LINE 1½"-BSV-10-VD OUTSIDE PENETRATION S-5C		REPORT NO. LTR 1122-1
		RE-A-78-094
AUTHOR A. T. Pierce		GWA NO. 52261-100-352
PERFORMING ORGANIZATION Applied Mechanics <i>LA Moore 6-28-78</i>		DATE AUGUST 16, 1978
LOFT APPROVAL <i>D. B. Zidan 7/17/78</i> <i>PSB Mgr.</i> <i>RSB Mgr.</i>		
<i>OR Meyer 8-15-78</i> P&CSB Mgr.		
<i>PSB Mgr.</i>		

ABSTRACT

Lines 1"-BSV-10-VD and 1½"-BSV-10-VD were analyzed to ASME Section III, Subsection NC (Class 2) criteria. The lines are part of the Waste Gas Processing System. The model considered the portion of the lines outside the containment. The analysis showed that Class 2 requirements will be met with the pipe supports specified in this report.

CONTENTS

ABSTRACT -----	ii
I. SCOPE -----	1
II. INTRODUCTION -----	2
III. PIPING SYSTEM DESCRIPTION -----	3
1. STRUCTURAL DESCRIPTION -----	3
2. MATERIAL AND GEOMETRIC DATA-----	3
IV. DESIGN AND SERVICE CONDITIONS -----	6
1. DESIGN CONDITIONS -----	6
2. LEVEL A SERVICE CONDITIONS -----	6
3. LEVEL B SERVICE CONDITIONS -----	6
4. LEVEL C SERVICE CONDITIONS -----	6
5. LEVEL D SERVICE CONDITIONS -----	7
6. TEST CONDITIONS -----	7
V. PIPING SYSTEM STRUCTURAL ANALYSIS -----	8
1. WEIGHT ANALYSIS -----	8
2. THERMAL EXPANSION ANALYSIS -----	8
3. SEISMIC ANALYSES -----	8
VI. ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, STRESS ANALYSIS -----	11
1. MINIMUM THICKNESS CHECK -----	11
2. DESIGN, LEVEL A, AND LEVEL B SERVICE CONDITIONS STRESS ANALYSIS -----	12
3. LEVEL C SERVICE CONDITIONS STRESS ANALYSIS -----	12
4. LEVEL D SERVICE CONDITIONS STRESS ANALYSIS -----	12
VII. COMPONENT SUPPORT ANALYSIS -----	13
VIII. SPECIAL CONSIDERATIONS -----	15
IX. CONCLUSIONS -----	16
X. REFERENCES -----	17

CONTENTS (continued)

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

TABLES

I. Piping System Valve Design Weights and Centers of Gravity -----	10
II. Minimum Thickness Parameters -----	11
III. Loads on Piping Supports -----	14

FIGURES

1. Piping System Computer Model Plot -----	5
2. SSE-Seismic Response Spectra Envelope -----	9

I. SCOPE

This document constitutes the stress report required by Subarticle NCA-3350 of the ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components", 1977 through Winter 1977 Addenda*. The piping system analyzed, to be installed as part of the "Loss-of-Fluid-Test" (LOFT) Reactor, was the Waste Gas Processing System, line numbers 1"-BSV-10-VD and 1 1/2"-BSV-10-VD.

*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 system transmits waste gases from the containment to the filter vaults. From Penetration S-5C the line enters an isolation valve. Beyond the valve the line has been relocated to follow the curve of the containment annulus. The line penetrates the containment shield wall, is surrounded by lead shielding for 16 feet, then passes through three filter vaults to connect with the Hot Skid. The line has heat tape and insulation.

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:

	1"-BSV-10-VD	1 1/2"-BSV-10-VD
O.D. (inches)	1.315	1.9
Thickness (inches)	0.133	0.145
Weight (lbs/inch)	2.34	3.54
Material	SA-376 Gr. TP 316	SA-376 Gr. TP 316
E_{cold} (10^6 psi)	28.3	28.3
S (260°F) (psi)	18,560	18,560
S_y (psi)	30,000	30,000
α (10^{-6} in./in. °F)	9.412	9.412

The expansion coefficients and thermal conductivities of SA-376, Gr. TP 316 steel are defined in Tables I-4.0 and I-5.0 of the Code.

MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSI
NUPIPE MATHEMATICAL MODEL

••LEGEND••

- / - NODE LOCATION
- - MASSPOINT LOCATION
- ⚡ - SPRING HANGER
- ⌊ - SNUBBER
- ↑ - RIGID SUPPORT
- ⌋ - ANCHOR
- * - ELASTO JOINT
- ⌋ - FLEXIBLE ANCHOR
- ⌋ - VALVE

ROTATION ABOUT Y-AXIS = -44.8 DEG.
X-Z PLANE TILT = 45.4 DEG.

See Reference 4.

IV. DESIGN AND SERVICE CONDITIONS

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

1. DESIGN CONDITIONS

An internal pressure of 150 psig and a uniform temperature of 260°F were used in the model.

2. LEVEL A SERVICE CONDITIONS

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

Entire model: 260°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

K&E 10 X 10 TO 1/4 INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

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

<u>Valve</u>	<u>Flooded Weight</u>	(Distance from <u>C.G. axis of Pipe</u>)
1" Isolation Valve CV-P138-54	150 lb (est.)	2' - 0" up

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	1.315	18,560	0.085	0.133
150	1.9	18,560	0.088	0.145

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

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

The loading conditions, defined as Design, Level A, and Level B in Section IV.1, 2, and 3, were used in performing a stress analysis of the piping system per the rules given in Subsection NC-3650 of the Code. The computer program NUPIPE-II was used for this analysis. The results of Equations (8), (9), (10), and (11) are detailed in Appendix F. Test conditions are encompassed by this stress analysis.

3. LEVEL C SERVICE CONDITIONS STRESS ANALYSIS

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

4. LEVEL D SERVICE CONDITIONS STRESS ANALYSIS

Not applicable.

VII. COMPONENT SUPPORT ANALYSIS

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 is 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 IIILOADS ON PIPING SUPPORTSTotal Load (SRSS)

<u>Support Type</u>	<u>Node No.</u>	<u>Deadweight</u>	<u>Thermal</u>	<u>OBE</u>	<u>SSE</u>	<u>Rated Load</u>
Clamp on valve	410	116	225	289	577	*
Clamp on valve	414	52	643	395	788	*
U-bolt	428	15	500	163	325	2260
Pinned rod	436	1	106	9	18	610
Pinned rod	438	5	29	7	14	800
Guide	444	59	7	12	24	Vendor-designed
Guide	450	28	17	15	30	Vendor-designed
Guide	460	49	4	25	50	Vendor-designed
Guide	470	47	11	41	80	Vendor-designed
Guide	480	42	18	28	55	Vendor-designed
Guide	527	18	192	4	6	Vendor-designed
Guide	535	38	1	1	2	Vendor-designed

* Acceptable by analysis in Appendix I.

VIII. SPECIAL CONSIDERATIONS

Effective Pipe Restraints

The wall penetrations are to be filled around the pipe with either concrete grout or foam, which will act as restraints on the piping. It was assumed that the grout would be 100 times stiffer than the foam, and that both would be 100 times stiffer in the direction perpendicular to the pipe than in the axial direction.

Slope of Piping

The slope of the piping was neglected in this analysis.

Nozzle Loading

The nozzle loading on the Hot Skid due to thermal, deadweight, and SSE will be:

Axial Force = 60 lbs

Combined Shear = 87 lbs

Torsional Moment = 255 in lbs

Combined Bending = 3075 in lbs

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 Dave Wilkins, A-E Branch, February, 1978.
3. American Institute of Steel Construction, Manual of Steel Construction, Seventh Edition, pp 5-6 to 5-24, 1973.
4. Piping model based upon Drawing Number 157871, issued by A-E Branch.

APPENDIX A
BASIC DATA, INPUT PARAMETERS

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 3

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
XSECTN	0	1	.132E+01	.133E+00	.234E+01	.283E+02	.150E+03	0.
XSECTN	0	2	.190E+01	.145E+00	.354E+01	.283E+02	.150E+03	0.
OPVAL	1	1	.282E+02	.215E-01	0.	0.	.700E+02	0.
CHECK MAGNITUDE OF ENTRIES ON ABOVE OPVAL CARD ****								
ANCHOR	0	280	0.	0.	0.	0.	0.	0.
RUN	280	405	.204E+01	0.	-.433E+00	.100E+01	.100E+01	0.
RUN	405	406	.228E+01	0.	-.485E+00	.100E+01	.100E+01	0.
RUN	406	410	.228E+01	0.	-.485E+00	.100E+01	.100E+01	0.
RES	0	410	0.	.100E+06	0.	0.	0.	0.
RSKEW	0	410	.100E+01	.200E+01	.208E+00	0.	.978E+00	.100E+06
VALVE	410	411	.245E+00	0.	-.520E-01	.100E+01	.100E+01	0.
VALVE	411	413	0.	.200E+01	0.	.100E+01	.100E+01	0.
CWE	0	413	0.	.150E+03	0.	0.	0.	0.
VALVE	411	414	.245E+00	0.	-.520E-01	.100E+01	.100E+01	0.
RES	0	414	0.	.100E+06	0.	0.	0.	0.
RSKEW	0	414	.100E+01	.200E+01	.208E+00	0.	.978E+00	.100E+06
RUN	414	418	.326E+00	0.	-.690E-01	.100E+01	.100E+01	0.
RED	418	420	.204E+00	0.	-.430E-01	.200E+01	.100E+01	0.
RUN	420	422	.184E+00	0.	-.400E-01	.200E+01	.100E+01	0.
ELBOW	422	423	0.	0.	0.	.200E+01	.100E+01	0.
RUN	423	426	0.	0.	-.100E+01	.200E+01	.100E+01	0.
ELBOW	426	427	0.	0.	0.	.200E+01	.100E+01	0.
RUN	427	428	-.500E+00	0.	0.	.200E+01	.100E+01	0.
RES	0	428	0.	.100E+06	0.	0.	0.	0.
RES	0	428	0.	0.	.100E+06	0.	0.	0.
RUN	428	430	-.225E+01	0.	0.	.200E+01	.100E+01	0.

LTR 1122-1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 4

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
RUN	430	434	-.225E+01	0.	0.	.200E+01	.100E+01	0.
ELBOW	434	435	0.	0.	0.	.200E+01	.100E+01	0.
RUN	435	436	0.	-.250E+00	0.	.200E+01	.100E+01	0.
RSKEW	0	436	.100E+01	.200E+01	.985E-00	0.	-.174E+00	.100E+06
RUN	436	438	0.	-.667E+00	0.	.200E+01	.100E+01	0.
RES	0	438	0.	0.	.100E+06	0.	0.	0.
RUN	438	439	0.	-.308E+01	0.	.200E+01	.100E+01	0.
RUN	439	440	0.	-.308E+01	0.	.200E+01	.100E+01	0.
RUN	440	442	0.	-.308E+01	0.	.200E+01	.100E+01	0.
ELBOW	442	443	0.	0.	0.	.200E+01	.100E+01	0.
RUN	443	444	.403E+00	0.	.190E+01	.200E+01	.100E+01	0.
RES	0	444	0.	.100E+06	0.	0.	0.	0.
RSKEW	0	444	.100E+01	.200E+01	.978E+00	0.	-.208E+00	.100E+06
RUN	444	446	.605E+00	0.	.285E+01	.200E+01	.100E+01	0.
ELBOW	446	447	.750E+01	0.	0.	.200E+01	.100E+01	0.
RUN	447	450	.152E+00	0.	.291E+01	.200E+01	.100E+01	0.
RES	0	450	0.	.100E+06	0.	0.	0.	0.
RSKEW	0	450	.100E+01	.200E+01	.999E+00	0.	-.520E-01	.100E+06
RUN	450	452	.171E+00	0.	.326E+01	.200E+01	.100E+01	0.
RUN	452	454	.171E+00	0.	.326E+01	.200E+01	.100E+01	0.
ELBOW	454	455	.750E+01	0.	0.	.200E+01	.100E+01	0.
RUN	455	456	-.954E+00	0.	.312E+01	.200E+01	.100E+01	0.
RUN	456	460	-.954E+00	0.	.312E+01	.200E+01	.100E+01	0.
RES	0	460	0.	.100E+06	0.	0.	0.	0.
RSKEW	0	460	.100E+01	.200E+01	.956E+00	0.	.292E+00	.100E+06

11R1122

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 5

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
RUN	460	462	-.954E+00	0.	.312E+01	.200E+01	.100E+01	0.
RUN	462	464	-.954E+00	0.	.312E+01	.200E+01	.100E+01	0.
ELBOW	464	465	.750E+01	0.	0.	.200E+01	.100E+01	0.
RUN	465	466	-.196E+01	0.	.261E+01	.200E+01	.100E+01	0.
RUN	466	470	-.196E+01	0.	.261E+01	.200E+01	.100E+01	0.
RES	0	470	0.	.100E+06	0.	0.	0.	0.
RSKEW	0	470	.100E+01	.200E+01	.799E+00	0.	.602E+00	.100E+06
RUN	470	472	-.196E+01	0.	.261E+01	.200E+01	.100E+01	0.
RUN	472	474	-.196E+01	0.	.261E+01	.200E+01	.100E+01	0.
ELBOW	474	475	.750E+01	0.	0.	.200E+01	.100E+01	0.
RUN	475	476	-.274E+01	0.	.178E+01	.200E+01	.100E+01	0.
RUN	476	480	-.274E+01	0.	.178E+01	.200E+01	.100E+01	0.
RES	0	480	0.	.100E+06	0.	0.	0.	0.
RSKEW	0	480	.100E+01	.200E+01	.545E+00	0.	.839E+00	.100E+06
RUN	480	482	-.244E+01	0.	.159E+01	.200E+01	.100E+01	0.
ELBOW	482	483	.750E+01	0.	0.	.200E+01	.100E+01	0.
RUN	483	484	-.266E+01	0.	.118E+01	.200E+01	.100E+01	0.
ELBOW	484	485	0.	0.	0.	.200E+01	.100E+01	0.
RUN	485	486	0.	0.	.667E+00	.200E+01	.100E+01	0.
RES	0	486	.100E+06	0.	0.	0.	0.	0.
RES	0	486	0.	.100E+06	0.	0.	0.	0.
RES	0	486	0.	0.	.100E+04	0.	0.	0.
RUN	486	500	0.	0.	.200E+01	.200E+01	.100E+01	0.
RES	0	500	.100E+06	0.	0.	0.	0.	0.
RES	0	500	0.	.100E+06	0.	0.	0.	0.

 ITR
 11221

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VC OUTSIDE - PIERCE

PAGE 6

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
RES	0	500	0.	0.	.100E+04	0.	0.	0.
RUN	500	510	0.	0.	.166E+02	.200E+01	.100E+01	0.
RESTRAINT	0	510	.100E+06	0.	0.	0.	0.	0.
RES	0	510	0.	.100E+06	0.	0.	0.	0.
RES	0	510	0.	0.	.100E+04	0.	0.	0.
RUN	510	515	0.	0.	.200E+01	.200E+01	.100E+01	0.
RESTRAINT	0	515	.100E+06	0.	0.	0.	0.	0.
RES	0	515	0.	.100E+06	0.	0.	0.	0.
RES	0	515	0.	0.	.100E+04	0.	0.	0.
RUN	515	516	0.	0.	.667E+00	.200E+01	.100E+01	0.
ELBOW	516	517	0.	0.	0.	.200E+01	.100E+01	0.
RUN	517	518	.200E+01	0.	0.	.200E+01	.100E+01	0.
ELBOW	518	519	.750E+01	0.	0.	.200E+01	.100E+01	0.
RUN	519	520	0.	0.	.150E+01	.200E+01	.100E+01	0.
ELBOW	520	521	.750E+01	0.	0.	.200E+01	.100E+01	0.
RUN	521	522	-.267E+01	0.	0.	.200E+01	.100E+01	0.
RUN	522	524	-.267E+01	0.	0.	.200E+01	.100E+01	0.
ELBOW	524	525	0.	0.	0.	.200E+01	.100E+01	0.
RUN	525	527	0.	0.	.225E+01	.200E+01	.100E+01	0.
RES	0	527	.100E+06	0.	0.	0.	0.	0.
RES	0	527	0.	.100E+06	0.	0.	0.	0.
RUN	527	528	0.	0.	.229E+01	.200E+01	.100E+01	0.
RUN	528	529	0.	0.	.229E+01	.200E+01	.100E+01	0.
RES	0	529	.100E+04	0.	0.	0.	0.	0.
RES	0	529	0.	.100E+04	0.	0.	0.	0.

LTR 1122

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1:5-BSV-10-VD OUTSIDE - PIERCE

PAGE 7

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
RES	0	529	0.	0.	.100E+02	0.	0.	0.
RUN	529	530	0.	0.	.100E+01	.200E+01	.100E+01	0.
RES	0	530	.100E+04	0.	0.	0.	0.	0.
RES	0	530	0.	.100E+04	0.	0.	0.	0.
RES	0	530	0.	0.	.100E+02	0.	0.	0.
RUN	530	532	0.	0.	.300E+01	.200E+01	.100E+01	0.
RUN	532	534	0.	0.	.300E+01	.200E+01	.100E+01	0.
RUN	534	535	0.	0.	.300E+01	.200E+01	.100E+01	0.
RES	0	535	.100E+06	0.	0.	0.	0.	0.
RES	0	535	0.	.100E+06	0.	0.	0.	0.
RUN	535	536	0.	0.	.333E+01	.200E+01	.100E+01	0.
RUN	536	538	0.	0.	.333E+01	.200E+01	.100E+01	0.
RUN	538	540	0.	0.	.333E+01	.200E+01	.100E+01	0.
RES	0	540	.100E+06	0.	0.	0.	0.	0.
RES	0	540	0.	.100E+06	0.	0.	0.	0.
RES	0	540	0.	0.	.100E+04	0.	0.	0.
RUN	540	545	0.	0.	.300E+01	.200E+01	.100E+01	0.
RES	0	545	.100E+06	0.	0.	0.	0.	0.
RES	0	545	0.	.100E+06	0.	0.	0.	0.
RES	0	545	0.	0.	.100E+04	0.	0.	0.
RUN	545	548	0.	0.	.300E+01	.200E+01	.100E+01	0.
RUN	548	550	0.	0.	.300E+01	.200E+01	.100E+01	0.
ELBOW	550	551	0.	0.	0.	.200E+01	.100E+01	0.
RUN	551	555	.583E+00	0.	0.	.200E+01	.100E+01	0.
ELBOW	555	556	0.	0.	0.	.200E+01	.100E+01	0.

 LTR
 122
 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
MOISTURE SEPARATOR - 1.5-BSV-1C-YD OUTSIDE - PIERCE

PAGE 8

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
RUN	556	558	0.	-.225E+01	0.	.200E+01	.100E+01	0.
RUN	558	560	0.	-.225E+01	0.	.200E+01	.100E+01	0.
ANCHOR	0	560	0.	0.	0.	0.	0.	0.
MASSPT	0	405	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	406	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	411	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	413	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	422	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	426	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	430	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	434	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	438	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	439	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	440	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	442	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	446	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	452	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	454	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	456	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	462	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	464	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	466	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	472	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	474	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	476	.100E+01	.100E+01	.100E+01	0.	0.	0.

LFR 1122

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VO OUTSIDE - PIERCE

PAGE 9

*** INPUT DATA ***

CARDTYPE	I1	I2	DELTA(1)	DELTA(2)	DELTA(3)	DELTA(4)	DELTA(5)	DELTA(6)
MASSPT	0	482	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	484	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	510	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	516	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	518	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	520	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	522	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	524	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	528	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	532	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	534	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	535	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	536	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	538	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	548	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	550	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	555	.100E+01	.100E+01	.100E+01	0.	0.	0.
MASSPT	0	558	.100E+01	.100E+01	.100E+01	0.	0.	0.
STRESS7	0	0	0.	0.	0.	0.	0.	0.
9CASES	2	0	0	0	0	0	0	0
10CASES	1	0	0	0	0	0	0	0
CKNODES	0	0	0	0	0	0	0	0
ALLDONE	0	0	0	0	0	0	0	0

CTR 11221

A-7
SPEEDREAD WITH REVERSE TRACK PATENT PENDING

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

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 32

SUPPORT REACTIONS FOR LOAD CASE NO. 2
DEADWEIGHT

NODE	TYPE	REACTION (LBS OR IN-LBS)	DIRECTION
280	FORCE	-1.	X COORD
280	FORCE	8.	Y COORD
280	FORCE	0.	Z COORD
280	MOMENT	21.	X COORD
280	MOMENT	1.	Y COORD
280	MOMENT	101.	Z COORD
410	FORCE	116.	Y COORD
410	FORCE	-3.	INCLINED
414	FORCE	52.	Y COORD
414	FORCE	5.	INCLINED
428	FORCE	15.	Y COORD
428	FORCE	-2.	Z COORD
436	FORCE	1.	INCLINED
438	FORCE	5.	Z COORD
444	FORCE	59.	Y COORD
444	FORCE	0.	INCLINED
450	FORCE	28.	Y COORD
450	FORCE	-1.	INCLINED
460	FORCE	49.	Y COORD
460	FORCE	-1.	INCLINED
470	FORCE	47.	Y COORD
470	FORCE	-1.	INCLINED
480	FORCE	42.	Y COORD
480	FORCE	-1.	INCLINED
486	FORCE	5.	X COORD
486	FORCE	-3.	Y COORD
486	FORCE	-0.	Z COORD
500	FORCE	-1.	X COORD
500	FORCE	42.	Y COORD
500	FORCE	-0.	Z COORD
510	FORCE	-0.	X COORD
510	FORCE	14.	Y COORD
510	FORCE	-0.	Z COORD
515	FORCE	-0.	X COORD
515	FORCE	50.	Y COORD
515	FORCE	-0.	Z COORD
527	FORCE	0.	X COORD
527	FORCE	18.	Y COORD
529	FORCE	-0.	X COORD
529	FORCE	11.	Y COORD
529	FORCE	-0.	Z COORD
530	FORCE	-0.	X COORD
530	FORCE	15.	Y COORD

LFR 1122

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 33

NODE	TYPE	REACTION (LBS OR IN-LBS)	DIRECTION
530	FORCE	0.	Z COORD
535	FORCE	0.	X COORD
535	FORCE	38.	Y COORD
540	FORCE	-1.	X COORD
540	FORCE	26.	Y COORD
540	FORCE	1.	Z COORD
545	FORCE	1.	X COORD
545	FORCE	11.	Y COORD
545	FORCE	1.	Z COORD
560	FORCE	-0.	X COORD
560	FORCE	28.	Y COORD
560	FORCE	-1.	Z COORD
560	MOMENT	-24.	X COORD
560	MOMENT	3.	Y COORD
560	MOMENT	-21.	Z COORD

C-2

LTR 1122 1

04/10/78

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

PAGE 35

MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 2

DEADWEIGHT

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
C-3 RUN	280	-1.	8.	0.	21.	1.	101.	.000	-.000	-.000	-.0000	-.0000	-.0000
	405	1.	-3.	-0.	8.	-0.	39.	.000	-.007	-.000	-.0001	-.0000	-.0003
RUN	405	-1.	3.	0.	-8.	0.	-39.	.000	-.007	.000	-.0001	-.0000	-.0003
	406	1.	-2.	-0.	12.	1.	55.	.000	-.009	.000	.0000	-.0000	.0002
RUN	406	-1.	-2.	0.	-12.	-1.	-55.	.000	-.009	.000	.0000	-.0000	.0002
	410	1.	8.	-0.	-17.	1.	-79.	.000	-.001	.000	.0000	.0000	.0001
VALVE	410	-1.	108.	-3.	17.	-1.	79.	.000	-.001	.000	.0000	.0000	.0001
	411	1.	-108.	3.	51.	11.	238.	.000	-.001	-.000	.0000	.0000	.0001
VALVE	411	-0.	155.	0.	-0.	0.	0.	.000	-.001	-.000	.0000	.0000	.0001
	413	0.	-150.	-0.	0.	0.	0.	-.003	-.001	.001	.0000	.0000	.0001
VALVE	411	-1.	-47.	-3.	-51.	-11.	-238.	.000	-.001	-.000	.0000	.0000	.0001
	414	1.	48.	3.	21.	20.	99.	-.000	-.001	-.000	.0000	.0000	.0002
RUN	414	-0.	5.	-2.	-21.	-20.	-99.	-.000	-.001	-.000	.0000	.0000	.0002
	418	0.	-4.	2.	25.	13.	116.	-.000	.001	-.000	.0001	.0000	.0003
REDUCE	418	-0.	4.	-2.	-25.	-13.	-116.	-.000	.001	-.000	.0001	.0000	.0003
	420	0.	-3.	2.	27.	8.	125.	-.000	.001	-.000	.0001	.0000	.0004
RUN	420	-0.	3.	-2.	-27.	-8.	-125.	-.000	.001	-.000	.0001	.0000	.0004
	422	0.	-3.	2.	27.	7.	127.	-.000	.002	-.000	.0001	.0000	.0004
ELBOW	422	-0.	3.	-2.	-27.	-7.	-127.	-.000	.002	-.000	.0001	.0000	.0004
	423	0.	-2.	2.	33.	4.	132.	-.000	.003	-.000	.0002	.0001	.0005
RUN	423	-0.	2.	-2.	-33.	-4.	-132.	-.000	.003	-.000	.0002	.0001	.0005
	426	0.	-0.	2.	42.	7.	132.	-.001	.004	-.000	.0002	.0001	.0007
ELBOW	426	-0.	0.	-2.	-42.	-7.	-132.	-.001	.004	-.000	.0002	.0001	.0007
	427	0.	-1.	2.	41.	12.	133.	-.001	.003	-.000	.0002	.0001	.0008
RUN	427	-0.	1.	-2.	-41.	-12.	-133.	-.001	.003	-.000	.0002	.0001	.0008
	428	0.	-2.	2.	41.	19.	139.	-.001	-.000	.000	.0002	.0001	.0008
RUN	428	-0.	12.	-0.	-41.	-19.	-139.	-.001	-.000	.000	.0002	.0001	.0008
	430	0.	-4.	0.	41.	8.	-87.	-.001	-.026	.003	.0004	.0001	.0009

LTR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VC OUTSIDE - PIERCE

PAGE 36

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	430	-0.	4.	-0.	-41.	-8.	87.	-.001	-.026	.003	.0004	.0001	.0009
	434	0.	3.	0.	41.	-2.	-105.	-.001	-.045	.006	.0005	.0001	.0007
ELBOW	434	-0.	-3.	-0.	-41.	2.	105.	-.001	-.045	.006	.0005	.0001	.0007
	435	0.	4.	0.	42.	-3.	-98.	.000	-.047	.005	.0006	.0001	.0005
RUN	435	-0.	-4.	-0.	-42.	3.	98.	.000	-.047	.005	.0006	.0001	.0005
	436	0.	4.	0.	42.	-3.	-98.	.001	-.047	.005	.0006	.0001	.0005
RUN	436	1.	-4.	-1.	-42.	3.	98.	.001	-.047	.005	.0006	.0001	.0005
	438	-1.	7.	1.	47.	-3.	-93.	.004	-.047	-.000	.0006	.0001	.0004
RUN	438	1.	-7.	-4.	-47.	3.	93.	.004	-.047	-.000	.0006	.0001	.0004
	439	-1.	17.	-4.	-103.	-3.	-69.	.013	-.047	-.023	.0005	.0001	.0001
RUN	439	1.	-17.	4.	103.	3.	69.	.013	-.047	-.023	.0005	.0001	.0001
	440	-1.	29.	-4.	-252.	-3.	-46.	.010	-.047	-.029	-.0003	.0001	-.0002
RUN	440	1.	-28.	4.	252.	3.	46.	.010	-.047	-.029	-.0003	.0001	-.0002
	442	-1.	39.	-4.	-393.	-3.	-24.	.001	-.047	.000	-.0015	.0001	-.0003
ELBOW	442	1.	-39.	4.	393.	3.	24.	.001	-.047	.000	-.0015	.0001	-.0003
	443	-1.	40.	-4.	-316.	-4.	-41.	.001	-.043	.004	-.0021	.0000	-.0003
RUN	443	1.	-40.	4.	316.	4.	41.	.001	-.043	.004	-.0021	.0000	-.0003
	444	-1.	46.	-4.	554.	-8.	-227.	.001	-.001	.004	-.0018	.0000	-.0007
RUN	444	1.	13.	-4.	-564.	8.	227.	.001	-.001	.004	-.0018	.0000	-.0007
	446	-1.	-3.	4.	296.	-4.	-170.	.001	.021	.004	-.0002	-.0000	-.0016
ELBOW	446	1.	3.	-4.	-296.	4.	170.	.001	.021	.004	-.0002	-.0000	-.0016
	447	-1.	-3.	4.	293.	-3.	-170.	.001	.021	.004	-.0001	-.0000	-.0016
RUN	447	1.	3.	-4.	-293.	3.	170.	.001	.021	.004	-.0001	-.0000	-.0016
	450	-1.	8.	-4.	380.	23.	-175.	.000	-.000	.004	-.0012	.0000	-.0025
RUN	450	-0.	21.	4.	-320.	-23.	175.	.000	-.000	.004	.0012	.0000	-.0025
	452	0.	-9.	-4.	-206.	-3.	-144.	.002	-.069	.004	.0016	.0001	-.0034
RUN	452	-0.	9.	-4.	206.	3.	144.	.002	-.069	.004	.0016	.0001	-.0034
	454	0.	2.	4.	-343.	-29.	-137.	.004	-.115	.004	.0004	-.0000	-.0042
ELBOW	454	-0.	-2.	4.	343.	29.	137.	.004	-.115	.004	.0004	-.0000	-.0042
	455	0.	3.	-4.	-337.	-29.	-136.	.004	-.115	.004	.0003	-.0000	-.0043
RUN	455	-0.	-3.	4.	337.	29.	136.	.004	-.115	.004	.0003	-.0000	-.0043
	456	0.	14.	-4.	-37.	-0.	-44.	.001	-.056	.003	-.0005	-.0001	-.0047

LFR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 37

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	456	-0.	-14.	4.	37.	0.	44.	-.001	-.056	.003	-.0005	-.0001	-.0047
	460	0.	25.	-4.	699.	29.	181.	-.001	-.000	.003	-.0010	-.0000	-.0044
RUN	460	-2.	23.	4.	-699.	-29.	-181.	-.001	-.000	.003	.0010	-.0000	-.0044
	462	2.	-12.	-4.	40.	1.	-21.	.000	-.029	.003	.0026	.0001	-.0041
RUN	462	-2.	12.	4.	-40.	-1.	21.	.000	-.029	.003	.0026	-.0001	-.0041
	464	2.	-1.	-4.	-187.	-25.	-90.	.001	-.074	.003	.0023	-.0000	-.0044
ELBOW	464	-2.	1.	4.	187.	25.	90.	.001	-.074	.003	.0023	-.0000	-.0044
	465	2.	0.	-4.	-188.	-25.	-90.	.001	-.074	.003	.0022	-.0000	-.0044
RUN	465	-2.	-0.	4.	188.	25.	90.	.001	-.074	.003	.0022	-.0000	-.0044
	466	2.	11.	-4.	-17.	2.	38.	.000	-.031	.002	.0018	-.0001	-.0045
RUN	466	-2.	-11.	4.	17.	-2.	-38.	.000	-.031	.002	.0018	-.0001	-.0045
	470	2.	23.	-4.	515.	29.	439.	-.001	-.000	.002	.0029	.0000	-.0034
RUN	470	-3.	24.	3.	-515.	-29.	-439.	-.001	-.000	.002	.0029	.0000	-.0034
	472	3.	-13.	-3.	-66.	-0.	2.	.001	-.048	.003	.0038	.0001	-.0024
RUN	472	-3.	13.	3.	66.	0.	-2.	.001	-.048	.003	.0038	.0001	-.0024
	474	3.	-2.	-3.	-284.	-29.	-163.	.002	-.098	.004	.0030	.0000	-.0027
ELBOW	474	-3.	2.	3.	284.	29.	163.	.002	-.098	.004	.0030	.0000	-.0027
	475	3.	-1.	-3.	-286.	-29.	-165.	.002	-.099	.004	.0029	-.0000	-.0027
RUN	475	-3.	1.	3.	286.	29.	165.	.002	-.099	.004	.0029	-.0000	-.0027
	476	3.	-10.	-3.	-189.	-5.	-16.	.001	-.054	.002	.0017	-.0001	-.0030
RUN	476	-3.	10.	3.	189.	5.	16.	.001	-.054	.002	.0017	-.0001	-.0030
	480	3.	-22.	-3.	153.	21.	511.	-.000	-.000	.000	.0015	-.0000	-.0018
RUN	480	-4.	20.	2.	-153.	-21.	-511.	-.000	-.000	.000	.0015	-.0000	-.0018
	482	4.	-10.	-2.	-134.	3.	69.	-.001	.000	-.000	.0014	.0000	-.0006
ELBOW	482	-4.	10.	2.	134.	-3.	-69.	-.001	.000	-.000	.0014	.0000	-.0006
	483	4.	-10.	-2.	-140.	3.	59.	-.000	.000	-.000	.0014	.0000	-.0005
RUN	483	-4.	10.	2.	140.	-3.	-59.	-.000	.000	-.000	.0014	.0000	-.0005
	484	4.	-0.	-2.	-207.	7.	-94.	-.000	.002	.000	.0006	.0000	-.0005
ELBOW	484	-4.	0.	2.	207.	-7.	94.	-.000	.002	.000	.0006	.0000	-.0005
	485	4.	1.	-2.	-207.	1.	-93.	-.000	.002	.000	.0003	.0000	-.0007
RUN	485	-4.	-1.	2.	207.	-1.	93.	-.000	.002	.000	.0003	.0000	-.0007
	486	4.	2.	-2.	-197.	-22.	-93.	-.000	.000	.000	.0002	.0000	-.0007

LFR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 38

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	486	1.	-6.	1.	197.	22.	-93.	-.000	-.000	.000	-.0002	-.0000	-.0007
	500	-1.	13.	-1.	21.	1.	-93.	-.000	-.000	.000	-.0000	-.0000	-.0011
RUN	500	-0.	30.	1.	-21.	-1.	-93.	-.000	-.000	.000	-.0000	-.0000	-.0011
	510	0.	29.	-1.	-29.	-1.	-93.	-.000	-.000	.000	-.0001	-.0000	-.0038
RUN	510	0.	-15.	1.	29.	1.	-93.	-.000	-.000	.000	-.0001	-.0000	-.0038
	515	-0.	22.	-1.	411.	3.	-93.	-.000	-.001	.000	.0004	.0000	-.0042
RUN	515	-0.	28.	0.	-411.	-3.	-93.	.000	-.001	.000	.0004	.0000	-.0042
	516	0.	-27.	-0.	252.	2.	-93.	.000	-.003	.000	.0006	.0000	-.0042
ELBOW	516	-0.	27.	0.	-252.	-2.	-93.	.000	-.003	.000	.0006	.0000	-.0042
	517	0.	-26.	-0.	193.	1.	-34.	.000	-.015	.000	.0009	.0000	-.0044
RUN	517	-0.	26.	0.	-193.	-1.	34.	.000	-.015	.000	.0009	.0000	-.0044
	518	0.	-22.	-0.	193.	-2.	302.	.000	-.076	.000	.0013	.0000	-.0042
ELBOW	518	-0.	22.	0.	-193.	2.	-302.	.000	-.076	.000	.0013	.0000	-.0042
	519	0.	-18.	-0.	45.	-4.	-451.	.000	-.117	.000	.0015	.0000	-.0035
RUN	519	-0.	18.	0.	-45.	4.	-451.	.000	-.117	.000	.0015	.0000	-.0035
	520	0.	-17.	-0.	-8.	-5.	451.	.000	-.122	.000	.0015	-.0000	-.0033
ELBOW	520	-0.	17.	0.	8.	5.	-451.	.000	-.122	.000	.0015	-.0000	-.0033
	521	0.	-14.	-0.	-124.	-5.	335.	.000	-.112	.000	.0014	-.0000	-.0026
RUN	521	-0.	14.	0.	124.	5.	-335.	.000	-.112	.000	.0014	-.0000	-.0026
	522	0.	-6.	-0.	-124.	-1.	88.	.000	-.056	-.000	.0009	-.0000	-.0020
RUN	522	-0.	6.	0.	124.	1.	-88.	.000	-.056	-.000	.0009	-.0000	-.0020
	524	0.	2.	-0.	-124.	4.	27.	.000	.000	-.001	.0004	-.0000	-.0018
ELBOW	524	-0.	-2.	0.	124.	-4.	-27.	.000	.000	-.001	.0004	-.0000	-.0018
	525	0.	3.	-0.	-117.	4.	33.	.000	.004	-.001	.0003	-.0000	-.0018
RUN	525	-0.	-3.	0.	117.	-4.	-33.	-.000	-.004	-.001	.0003	-.0000	-.0018
	527	0.	11.	-0.	56.	-0.	33.	-.000	-.000	-.001	.0002	-.0000	-.0017
RUN	527	-0.	8.	0.	-56.	0.	-33.	-.000	-.000	-.001	.0002	-.0000	-.0017
	528	0.	0.	-0.	-42.	-0.	33.	.000	-.006	-.001	.0002	.0000	-.0016
RUN	528	-0.	-0.	0.	42.	0.	-33.	.000	-.006	-.001	.0002	.0000	-.0016
	529	0.	9.	-0.	83.	0.	33.	.000	-.011	-.001	.0003	.0000	-.0014
RUN	529	-0.	2.	0.	-83.	-0.	-33.	.000	-.011	-.001	.0003	.0000	-.0014
	530	0.	1.	-0.	78.	0.	33.	.000	-.015	-.001	.0004	.0000	-.0014

LFR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 39

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	530	-0.	13.	-0.	-78.	-0.	-33.	.000	-.015	-.001	.0004	.0000	-.0014
	532	0.	-3.	-0.	-207.	-0.	33.	.000	-.026	-.001	.0001	.0000	-.0012
RUN	532	-0.	3.	-0.	207.	0.	-33.	.000	-.026	-.001	.0001	.0000	-.0012
	534	0.	8.	-0.	-110.	-0.	33.	.000	-.017	-.001	-.0006	-.0000	-.0010
RUN	534	-0.	-8.	0.	110.	0.	-33.	.000	-.017	-.001	-.0006	-.0000	-.0010
	535	0.	19.	-0.	369.	-1.	33.	-.000	-.000	-.001	-.0000	-.0000	-.0000
RUN	535	-0.	19.	-0.	-369.	1.	-33.	-.000	-.000	-.001	-.0000	-.0000	-.0000
	536	0.	-7.	-0.	-154.	0.	33.	-.000	-.017	-.001	.0005	-.0000	-.0007
RUN	536	-0.	7.	0.	154.	-0.	-33.	-.000	-.017	-.001	-.0005	-.0000	-.0007
	538	0.	-5.	-0.	-206.	-2.	33.	-.000	-.020	-.001	-.0004	.0000	-.0005
RUN	538	-0.	5.	0.	206.	2.	-33.	-.000	-.020	-.001	-.0004	.0000	-.0005
	540	0.	16.	-0.	214.	3.	33.	-.000	-.000	-.001	-.0003	.0000	-.0003
RUN	540	-1.	10.	1.	-214.	-3.	-33.	.000	-.000	-.001	-.0003	.0000	-.0003
	545	1.	-1.	-1.	50.	-21.	33.	-.000	-.000	-.001	.0002	-.0000	-.0001
RUN	545	-0.	11.	1.	-50.	21.	-33.	-.000	-.000	-.001	.0002	-.0000	-.0001
	548	0.	0.	-1.	-140.	-4.	33.	-.002	-.007	-.001	.0000	-.0001	.0001
RUN	548	-0.	-0.	1.	140.	4.	-33.	-.002	-.007	-.001	-.0000	-.0001	.0001
	550	0.	10.	-1.	29.	12.	33.	-.005	-.002	-.001	-.0002	-.0001	.0002
ELBOW	550	-0.	-10.	1.	-29.	-12.	-33.	-.005	-.002	-.001	-.0002	-.0001	.0002
	551	0.	11.	-1.	53.	10.	33.	-.005	-.001	-.001	-.0002	-.0000	.0003
RUN	551	-0.	-11.	1.	-53.	-10.	-33.	-.005	-.001	-.001	-.0002	-.0000	.0003
	555	0.	12.	-1.	53.	6.	19.	-.005	-.001	-.000	-.0001	-.0000	.0003
ELBOW	555	-0.	-12.	1.	-53.	-6.	-19.	-.005	-.001	-.000	-.0001	-.0000	.0003
	556	0.	13.	-1.	50.	3.	-46.	-.004	-.000	-.000	-.0001	-.0000	.0002
RUN	556	-0.	-13.	1.	-50.	-3.	46.	-.004	-.000	-.000	-.0001	-.0000	.0002
	558	0.	20.	-1.	14.	3.	-34.	-.001	-.000	.000	.0000	-.0000	.0001
RUN	558	-0.	-20.	1.	-14.	-3.	34.	-.001	-.000	.000	.0000	-.0000	.0001
	560	0.	28.	-1.	-24.	3.	-21.	.000	-.000	.000	.0000	-.0000	.0000

LFR 1122 1

APPENDIX D
THERMAL EXPANSION ANALYSIS RESULTS

04/10/78

WUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 25

SUPPORT REACTIONS FOR LOAD CASE NO. 1
 THERMAL EXPANSION PLUS ANCHOR MOVEMENTS

NODE	TYPE	REACTION (LBS OR IN-LBS)	DIRECTION
280	FORCE	192.	X COORD
280	FORCE	-1.	Y COORD
280	FORCE	-38.	Z COORD
280	MOMENT	-16.	X COORD
280	MOMENT	-72.	Y COORD
280	MOMENT	-35.	Z COORD
410	FORCE	-157.	Y COORD
410	FORCE	161.	INCLINED
414	FORCE	244.	Y COORD
414	FORCE	-595.	INCLINED
428	FORCE	-104.	Y COORD
428	FORCE	480.	Z COORD
436	FORCE	-106.	INCLINED
438	FORCE	-29.	Z COORD
444	FORCE	3.	Y COORD
444	FORCE	6.	INCLINED
450	FORCE	16.	Y COORD
450	FORCE	-6.	INCLINED
460	FORCE	-2.	Y COORD
460	FORCE	-4.	INCLINED
470	FORCE	0.	Y COORD
470	FORCE	-11.	INCLINED
480	FORCE	-0.	Y COORD
480	FORCE	18.	INCLINED
486	FORCE	-22.	X COORD
486	FORCE	0.	Y COORD
486	FORCE	250.	Z COORD
500	FORCE	26.	X COORD
500	FORCE	-0.	Y COORD
500	FORCE	207.	Z COORD
510	FORCE	120.	X COORD
510	FORCE	0.	Y COORD
510	FORCE	-145.	Z COORD
515	FORCE	-296.	X COORD
515	FORCE	-1.	Y COORD
515	FORCE	-187.	Z COORD
527	FORCE	192.	X COORD
527	FORCE	0.	Y COORD
529	FORCE	-11.	X COORD
529	FORCE	-0.	Y COORD
529	FORCE	4.	Z COORD
530	FORCE	-5.	X COORD
530	FORCE	0.	Y COORD

LTR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-1C-VC OUTSIDE - PIERCE

PAGE 26

D-2

NGDE	TYPE	REACTION (LBS OR IN-LBS)	DIRECTION
530	FORCE	4.	Z COORD
535	FORCE	1.	X COORD
535	FORCE	-1.	Y COORD
540	FORCE	-5.	X COORD
540	FORCE	-24.	Y COORD
540	FORCE	-12.	Z COORD
545	FORCE	10.	X COORD
545	FORCE	-52.	Y COORD
545	FORCE	-76.	Z COORD
560	FORCE	-6.	X COORD
560	FORCE	28.	Y COORD
560	FORCE	-69.	Z COORD
560	MOMENT	-2423.	X COORD
560	MOMENT	-163.	Y COORD
560	MOMENT	-149.	Z COORD

LTR
1122

04/10/78

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

PAGE 27

MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 1

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
RUN	280	192.	-1.	-38.	-16.	-72.	-35.	-.000	.000	-.000	.0000	.0000	.0000
	405	-192.	1.	38.	9.	7.	2.	.042	.003	-.015	.0002	.0004	.0002
RUN	405	192.	-1.	-38.	-9.	-7.	-2.	.042	.003	-.015	.0002	.0004	.0002
	406	-192.	1.	38.	1.	-67.	-35.	.089	.008	-.034	.0002	.0001	-.0000
D-3 RUN	406	192.	-1.	-38.	-1.	67.	35.	.089	.008	-.034	.0002	.0001	-.0000
	410	-192.	1.	38.	7.	-141.	-73.	.140	.002	-.031	.0002	-.0011	-.0006
VALVE	410	225.	-158.	120.	7.	141.	73.	.140	.002	-.031	.0002	-.0011	-.0006
	411	-225.	158.	-120.	-105.	-634.	-537.	.146	-.000	-.029	.0002	-.0013	-.0008
VALVE	411	0.	0.	0.	0.	0.	0.	.146	-.000	-.029	.0002	-.0013	-.0008
	413	-0.	-0.	0.	0.	-0.	-0.	.164	.043	-.024	.0002	-.0013	-.0008
VALVE	411	225.	-158.	120.	105.	634.	537.	.146	-.000	-.029	.0002	-.0013	-.0008
	414	-225.	158.	-120.	-204.	-1126.	-1002.	.152	-.002	-.026	.0002	-.0016	-.0011
RUN	414	102.	86.	-462.	204.	1126.	1002.	.152	-.002	-.026	.0002	-.0016	-.0011
	418	-102.	-86.	462.	-133.	598.	-665.	.161	-.010	-.019	-.0001	-.0021	-.0024
REDUCE	418	102.	86.	-462.	133.	-598.	665.	.161	-.010	-.019	-.0001	-.0021	-.0024
	420	-102.	-86.	462.	-88.	1677.	-455.	.166	-.016	-.015	-.0001	-.0017	-.0026
RUN	420	102.	86.	-462.	88.	-1677.	455.	.166	-.016	-.015	-.0001	-.0017	-.0026
	422	-102.	-86.	462.	-80.	1869.	-417.	.167	-.017	-.014	-.0002	-.0017	-.0026
ELBOW	422	102.	86.	-462.	80.	-1869.	417.	.167	-.017	-.014	-.0002	-.0017	-.0026
	423	-102.	-86.	462.	109.	2464.	-265.	.170	-.022	-.017	-.0002	-.0015	-.0029
RUN	423	102.	86.	-462.	-109.	-2464.	265.	.170	-.022	-.017	-.0002	.0015	-.0029
	426	-102.	-86.	462.	792.	1657.	-265.	.151	-.023	-.031	.0002	.0033	-.0032
ELBOW	426	102.	86.	-462.	-792.	-1657.	265.	.151	-.023	-.031	.0002	.0033	-.0032
	427	-102.	-86.	462.	985.	389.	-459.	.137	-.014	-.024	.0012	.0051	-.0039
RUN	427	102.	86.	-462.	-985.	-389.	459.	.137	-.014	-.024	.0012	.0051	-.0039
	428	-102.	-86.	462.	985.	-1344.	-781.	.130	.001	-.005	.0018	.0049	-.0041
RUN	428	102.	-18.	-27.	-985.	1344.	781.	.130	.001	-.005	.0018	.0049	-.0041
	430	-102.	18.	27.	985.	-624.	-293.	.082	.139	.082	.0057	.0019	-.0058

LTR 1122 1

04/10/78

NUPIPE-IIP - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-1C-VD OUTSIDE - PIERCE

PAGE 28

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	430	-102.	-18.	-27.	-985.	624.	293.	.082	.139	.082	.0057	.0019	-.0058
	434	-102.	18.	-27.	985.	36.	155.	.038	.287	.114	.0093	.0011	-.0060
ELBOW	434	102.	-18.	27.	-985.	-36.	-155.	.038	.287	.114	.0093	.0011	-.0060
	435	-102.	18.	-27.	925.	97.	425.	.020	.296	.094	.0103	.0008	-.0056
RUN	435	102.	-18.	27.	-925.	-97.	-425.	.020	.296	.094	.0103	.0008	-.0056
	436	-102.	18.	-27.	905.	97.	501.	.016	.295	.086	.0104	.0008	-.0055
RUN	436	-2.	-18.	45.	-905.	-97.	-501.	.016	.295	.086	.0104	.0008	-.0055
	438	2.	18.	-45.	544.	97.	482.	-.026	.281	.000	.0110	.0009	-.0051
RUN	438	-2.	-18.	16.	-544.	-97.	-482.	-.026	.281	.000	.0110	.0009	-.0051
	439	2.	18.	-16.	64.	97.	395.	-.179	.214	-.435	.0120	.0015	-.0032
RUN	439	-2.	-18.	16.	-64.	-97.	-395.	-.179	.214	-.435	.0120	.0015	-.0032
	440	2.	18.	-16.	673.	97.	307.	-.270	.148	-.860	.0105	.0020	-.0018
RUN	440	-2.	-18.	16.	-673.	-97.	-307.	-.270	.148	-.860	.0105	.0020	-.0018
	442	2.	18.	-16.	1245.	97.	225.	-.311	.086	-1.165	.0067	.0025	-.0007
ELBOW	442	-2.	-18.	16.	-1245.	-97.	-225.	.311	.086	-1.165	.0067	.0025	-.0007
	443	2.	18.	-16.	1242.	84.	211.	-.306	.070	-1.175	.0047	.0026	-.0003
RUN	443	-2.	-18.	16.	-1242.	-84.	-211.	.306	.070	-1.175	.0047	.0026	-.0003
	444	2.	18.	-16.	870.	-37.	132.	-.245	-.070	-1.150	.0022	.0026	-.0001
RUN	444	-3.	-15.	15.	-870.	37.	-132.	.245	.070	-1.150	.0022	.0026	-.0001
	446	3.	15.	-15.	379.	-30.	28.	-.146	-.025	-1.108	-.0003	.0025	.0003
ELBOW	446	-3.	-15.	15.	-379.	30.	-28.	.146	.025	-1.108	-.0003	.0025	.0003
	447	3.	15.	-15.	361.	-29.	26.	-.143	-.025	-1.106	-.0003	.0025	.0003
RUN	447	-3.	-15.	15.	-361.	29.	-26.	.143	.025	-1.106	-.0003	.0025	.0003
	450	3.	15.	-15.	140.	61.	-0.	-.055	-.000	-1.050	-.0008	.0025	.0004
RUN	450	-2.	1.	16.	-140.	-61.	0.	.055	.000	-1.050	-.0008	.0025	.0004
	452	2.	-1.	-16.	94.	-52.	2.	.051	.019	-.985	-.0002	.0026	.0004
RUN	452	-2.	1.	16.	-94.	52.	-2.	.051	.019	-.985	-.0002	.0026	.0004
	454	2.	-1.	-16.	49.	-161.	4.	.144	.022	-.922	.0001	.0021	.0004
ELBOW	454	-2.	1.	16.	-49.	161.	-4.	.144	.022	-.922	.0001	.0021	.0004
	455	2.	-1.	-16.	46.	-161.	4.	.149	.022	-.917	.0001	.0021	.0004
RUN	455	-2.	1.	16.	-46.	161.	-4.	.149	.022	-.917	.0001	.0021	.0004
	456	2.	-1.	-16.	3.	-65.	-9.	.193	.011	-.833	.0002	.0016	.0004

LIR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 29

MEMBER	END	FX	FORCES (LBS) FY	FZ	MX	MOMENTS (IN-LBS) MY	MZ	DEFLECTIONS (IN) DX	DY	DZ	ROTATIONS (RAD) RX	RY	RZ
RUN	456	-2.	-1.	-16.	-3.	65.	9.	.193	.011	-.833	.0002	.0016	.0004
	460	-2.	-1.	-16.	-41.	35.	-23.	.229	.000	-.749	.0001	.0015	.0003
RUN	460	-6.	-0.	-14.	-41.	-35.	23.	.229	-.000	-.749	.0001	.0015	.0003
	462	-6.	-0.	-14.	-27.	-21.	-18.	.266	-.005	-.664	-.0000	.0015	.0002
RUN	462	-6.	-0.	-14.	-27.	21.	-18.	.266	-.005	-.664	-.0000	.0015	.0002
	464	-6.	-0.	-14.	-14.	-75.	-14.	.298	-.004	-.584	-.0001	.0013	.0001
ELBOW	464	-6.	-0.	-14.	-14.	75.	-14.	.298	-.004	-.584	-.0001	.0013	.0001
	465	-6.	-0.	-14.	-13.	-72.	-14.	.299	-.004	-.578	-.0001	.0013	.0001
RUN	465	-6.	-0.	-14.	-13.	72.	14.	.299	-.004	-.578	-.0001	.0013	.0001
	468	-6.	-0.	-14.	-2.	77.	-6.	.296	-.003	-.496	-.0001	.0013	.0001
RUN	465	-6.	-0.	-14.	2.	-77.	6.	.296	-.003	-.496	-.0001	.0013	.0001
	470	-6.	-0.	-14.	9.	231.	3.	.303	-.000	-.402	-.0001	.0020	.0001
RUN	470	-15.	-0.	-7.	-9.	-231.	-3.	.303	-.000	-.402	-.0001	.0020	.0001
	472	-15.	-0.	-7.	6.	-64.	1.	.333	.001	-.293	-.0001	.0024	.0001
RUN	472	-15.	-0.	-7.	-6.	64.	-1.	.333	.001	-.293	-.0001	.0024	.0001
	474	-15.	-0.	-7.	4.	-349.	-1.	.353	.002	-.193	-.0001	.0015	.0001
ELBOW	474	-15.	-0.	-7.	-4.	349.	-1.	.353	.002	-.193	-.0001	.0015	.0001
	475	-15.	-0.	-7.	4.	-361.	-1.	.352	.002	-.187	-.0001	.0013	.0001
RUN	475	-15.	-0.	-7.	-4.	361.	1.	.352	.002	-.187	-.0001	.0013	.0001
	476	-15.	-0.	-7.	-2.	-435.	-4.	.306	.001	-.134	-.0000	-.0004	.0001
RUN	476	-15.	-0.	-7.	-2.	435.	4.	.306	.001	-.134	-.0000	-.0004	.0001
	480	-15.	-0.	-7.	0.	-511.	-7.	.217	.000	-.141	-.0000	-.0025	.0000
RUN	480	-5.	-0.	-23.	-0.	511.	7.	.217	-.000	-.141	-.0000	-.0025	.0000
	482	-5.	-0.	-23.	2.	48.	-3.	.107	-.000	-.198	-.0000	-.0034	.0000
ELBOW	482	-5.	-0.	-23.	-2.	-48.	-3.	.107	-.000	-.198	-.0000	-.0034	.0000
	483	-5.	-0.	-23.	-3.	-69.	-3.	.104	-.000	-.200	-.0000	-.0034	.0000
RUN	483	-5.	-0.	-23.	-3.	69.	3.	.104	-.000	-.200	-.0000	-.0034	.0000
	484	-5.	-0.	-23.	-4.	-684.	1.	.012	-.000	-.263	-.0000	-.0020	.0000
ELBOW	484	-5.	-0.	-23.	-4.	684.	-1.	.012	-.000	-.263	-.0000	-.0020	.0000
	485	-5.	-0.	-23.	5.	704.	1.	.006	-.000	-.261	-.0000	-.0012	.0000
RUN	485	-5.	-0.	-23.	-5.	-704.	-1.	.006	-.000	-.261	-.0000	-.0012	.0000
	486	-5.	-0.	-23.	5.	671.	1.	.000	-.000	-.250	-.0000	-.0006	.0000

11R 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 30

MEMBER	END	FX	FORCES (LBS)		MX	MOMENTS (IN-LBS)		MZ	DEFLECTIONS (IN)			ROTATIONS (RAD)		
			FY	FZ		MY	MZ		DX	DY	DZ	RX	RY	RZ
RUN	486	-27.	0.	272.	-5.	-671.	-1.	-.000	-.000	-.250	-.0000	-.0006	.0000	
	500	27.	-0.	-272.	-0.	26.	1.	-.000	-.000	-.207	-.0000	-.0003	.0000	
RUN	500	-1.	0.	480.	0.	-26.	-1.	-.000	.000	-.207	.0000	-.0003	.0000	
	510	1.	0.	-480.	1.	-133.	1.	-.001	-.000	.145	.0000	-.0009	.0000	
RUN	510	119.	0.	335.	-1.	133.	-1.	-.001	-.000	.145	.0000	-.0009	.0000	
	515	-119.	-0.	-335.	-7.	2716.	1.	-.003	-.000	.187	-.0000	.0026	.0001	
RUN	515	-177.	-0.	148.	7.	-2716.	-1.	.003	.000	.187	-.0000	.0026	.0001	
	516	177.	0.	-148.	-5.	1695.	1.	.023	.000	.197	-.0000	.0041	.0001	
ELBOW	516	-177.	-0.	148.	5.	-1695.	-1.	.023	.000	.197	-.0000	.0041	.0001	
	517	177.	0.	-148.	-5.	963.	1.	.038	.000	.189	-.0000	.0061	.0001	
RUN	517	-177.	-0.	148.	5.	-963.	-1.	.038	.000	.189	-.0000	.0061	.0001	
	518	177.	0.	-148.	-5.	-1145.	-3.	.064	.001	.098	-.0000	.0060	.0001	
ELBOW	518	-177.	-0.	148.	5.	1145.	3.	.064	.001	.098	-.0000	.0060	.0001	
	519	177.	0.	-148.	-5.	-3584.	-5.	.107	.002	.074	-.0000	.0023	.0000	
RUN	519	-177.	-0.	148.	3.	3584.	5.	.107	.002	.074	-.0000	.0023	.0000	
	520	177.	0.	-148.	-2.	-4116.	-5.	.113	.002	.079	-.0000	.0010	.0000	
ELBOW	520	-177.	-0.	148.	2.	4116.	5.	.113	.002	.079	-.0000	.0010	.0000	
	521	177.	0.	-148.	-0.	-4336.	-3.	.088	.002	.066	-.0000	-.0061	.0000	
RUN	521	-177.	-0.	148.	0.	4336.	3.	.088	.002	.066	-.0000	-.0061	.0000	
	522	177.	0.	-148.	-0.	-712.	3.	.044	.001	-.193	-.0000	-.0132	.0000	
RUN	522	-177.	-0.	148.	0.	712.	-3.	.044	.001	-.193	-.0000	-.0132	.0000	
	524	177.	0.	-148.	-0.	3690.	11.	-.009	-.001	-.548	-.0000	-.0081	.0001	
ELBOW	524	-177.	-0.	148.	0.	-3690.	-11.	-.009	-.001	-.548	-.0000	-.0081	.0001	
	525	177.	0.	-148.	1.	3624.	11.	-.023	-.001	-.558	-.0000	-.0023	.0001	
RUN	525	-177.	-0.	148.	-1.	-3624.	-11.	-.023	-.001	-.558	-.0000	-.0023	.0001	
	527	177.	0.	-148.	7.	-765.	11.	-.002	-.000	-.514	-.0000	.0018	.0001	
RUN	527	15.	0.	143.	-7.	765.	-11.	-.002	-.000	-.514	-.0000	.0018	.0001	
	528	-15.	-0.	-143.	6.	-361.	11.	.020	.000	-.465	-.0000	.0000	.0002	
RUN	528	15.	0.	143.	-6.	361.	-11.	.020	.000	-.465	-.0000	.0000	.0002	
	529	-15.	-0.	-143.	6.	43.	11.	.011	.000	-.416	-.0000	-.0005	.0002	
RUN	529	4.	0.	152.	-6.	-43.	-11.	.011	.000	-.416	-.0000	-.0005	.0002	
	530	-4.	-0.	-152.	5.	93.	11.	.005	-.000	-.394	-.0000	-.0004	.0002	

LTR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VO OUTSIDE - PIERCE

PAGE 31

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	530	-1.	0.	156.	-5.	-93.	-11.	-.005	-.000	-.394	.0000	-.0004	.0022
	532	1.	-0.	-156.	-5.	55.	11.	-.003	-.001	-.330	.0000	-.0001	.0003
RUN	532	-1.	0.	156.	5.	-55.	-11.	-.003	-.001	-.330	.0000	-.0001	.0003
	534	1.	-0.	-156.	-15.	16.	11.	-.003	-.002	-.266	.0000	-.0001	.0003
RUN	534	-1.	0.	156.	15.	-16.	-11.	-.003	-.002	-.266	.0000	.0001	.0003
	535	1.	-0.	-156.	-25.	-22.	11.	-.000	.000	-.202	-.0001	.0001	.0004
RUN	535	0.	-1.	156.	25.	22.	-11.	-.000	.000	-.202	-.0001	-.0001	.0004
	536	-0.	1.	-156.	14.	-7.	11.	.000	.005	-.131	-.0001	-.0000	.0005
RUN	536	0.	-1.	156.	-14.	7.	-11.	-.000	.005	-.131	-.0001	-.0000	.0005
	538	-0.	1.	-156.	53.	8.	11.	-.000	.007	-.060	.0000	-.0000	.0005
RUN	538	0.	-1.	156.	-53.	-8.	-11.	-.000	.007	-.060	.0000	-.0000	.0005
	540	-0.	1.	-156.	91.	23.	11.	-.000	-.000	.012	.0004	-.0001	.0006
RUN	540	-4.	23.	144.	-91.	-23.	-11.	.000	.000	.012	-.0004	.0001	.0006
	545	4.	-23.	-144.	-752.	-130.	11.	-.000	.001	.076	-.0010	-.0002	.0007
RUN	545	6.	-28.	69.	752.	130.	-11.	-.000	.001	.076	-.0010	-.0002	.0007
	548	-6.	28.	-69.	262.	93.	11.	-.010	.067	.140	-.0020	-.0002	.0007
RUN	548	6.	-28.	69.	-262.	-93.	-11.	-.010	.067	.140	-.0020	-.0002	.0007
	550	-6.	28.	-69.	1213.	302.	11.	-.008	.097	.200	.0008	.0005	.0008
ELBOW	550	6.	-28.	69.	-1213.	-302.	-11.	-.008	.097	.200	.0008	.0005	.0008
	551	-6.	28.	-69.	1276.	162.	-52.	-.002	.095	.203	.0021	.0009	.0003
RUN	551	6.	-28.	69.	-1276.	-162.	52.	-.002	.095	.203	.0021	.0009	.0003
	555	-6.	28.	-69.	1276.	-9.	-122.	.002	.096	.200	.0026	.0009	.0003
ELBOW	555	6.	-28.	69.	-1276.	9.	122.	.002	.096	.200	.0026	.0009	.0003
	556	-6.	28.	-69.	1122.	-163.	-172.	.006	.092	.190	.0038	.0013	.0001
RUN	556	6.	-28.	69.	-1122.	163.	172.	.006	.092	.190	.0038	.0013	.0001
	558	-6.	28.	-69.	-574.	-163.	-19.	.004	.048	.076	.0046	.0007	-.0002
RUN	558	6.	-28.	69.	574.	163.	19.	.004	.048	.076	.0046	.0007	-.0002
	560	-6.	28.	-69.	-2423.	-163.	149.	.000	-.000	.000	.0000	.0000	-.0000

 1122
 1

APPENDIX E
SEISMIC ANALYSES RESULTS

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-8SV-10-VO OUTSIDE - PIERCE

PAGE 71

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

NCDE TYPE REACTIONS DIRECTION
 (LBS OR IN-LBS)

280	FORC	151.	X	COORD
280	FORC	6.	Y	COORD
280	FORC	32.	Z	COORD
280	MOMENT	507.	X	COORD
280	MOMENT	1.	Y	COORD
280	MOMENT	121.	Z	COORD
410	FORC	568.	Y	COORD
410	FORC	104.	INCLINED	
414	FORC	783.	Y	COORD
414	FORC	92.	INCLINED	
428	FORC	325.	Y	COORD
436	FORC	16.	Z	COORD
436	FORC	18.	INCLINED	
436	FORC	14.	Z	COORD
444	FORC	21.	Y	COORD
444	FORC	12.	INCLINED	
450	FORC	18.	Y	COORD
450	FORC	24.	INCLINED	
450	FORC	21.	Y	COORD
470	FORC	45.	INCLINED	
470	FORC	23.	Y	COORD
470	FORC	77.	INCLINED	
480	FORC	19.	Y	COORD
480	FORC	52.	INCLINED	
486	FORC	137.	X	COORD
486	FORC	14.	Y	COORD
486	FORC	13.	Z	COORD
500	FORC	32.	X	COORD
500	FORC	7.	Y	COORD
510	FORC	13.	Z	COORD
510	FORC	6.	X	COORD
510	FORC	8.	Y	COORD
510	FORC	13.	Z	COORD
515	FORC	12.	X	COORD
515	FORC	19.	Y	COORD
515	FORC	13.	Z	COORD
527	FORC	5.	X	COORD
527	FORC	4.	Y	COORD
529	FORC	1.	X	COORD
529	FORC	2.	Y	COORD
530	FORC	0.	Z	COORD
530	FORC	3.	X	COORD
530	FORC	2.	Y	COORD
530	FORC	0.	Z	COORD
535	FORC	2.	X	COORD

LTR 1122 1

04/10/78

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

PAGE 72

MOISTURE SEPARATOR - 1.5-BSV-1G-VG OUTSIDE - PIERCE

NODE	TYPE	REACTIONS (LBS OR IN-LBS)	DIRECTION
535	FORC	1.	Y COORD
540	FORC	6.	X COORD
540	FORC	5.	Y COORD
540	FORC	42.	Z COORD
545	FORC	21.	X COORD
545	FORC	10.	Y COORD
545	FORC	42.	Z COORD
560	FORC	14.	X COORD
560	FORC	4.	Y COORD
560	FORC	15.	Z COORD
560	MOMENT	527.	X COORD
560	MOMENT	95.	Y COORD
560	MOMENT	652.	Z COORD

E-2

LTR 1122 1

04/10/78

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

PAGE 73

MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

INTERNAL FORCES AND DEFLECTIONS FOR LOAD CASE NO. 3

SSE RESPONSE SPECTRUM - 1% DAMPING

COMBINED RESULT FOR MODE 1 THRU 15 BY RMS SUMMATION SPECTRA SET = 1

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	283	151.	6.	32.	507.	1.	121.	.000	.000	.000	.0000	.0000	.0000
	405	151.	6.	32.	488.	1.	96.	.000	.013	.000	.0065	.0000	.0011
RUN	405	151.	5.	32.	488.	1.	96.	.000	.013	.000	.0065	.0000	.0011
	406	151.	5.	32.	469.	2.	214.	.001	.031	.000	.0136	.0000	.0028
RUN	406	151.	4.	32.	469.	2.	214.	.001	.031	.000	.0136	.0000	.0028
	410	151.	4.	32.	453.	3.	332.	.001	.006	.001	.0204	.0000	.0050
VALVE	410	154.	573.	105.	453.	3.	332.	.001	.006	.001	.0204	.0000	.0060
	411	154.	573.	105.	433.	310.	1994.	.001	.001	.001	.0206	.0000	.0064
VALVE	411	149.	0.	159.	4764.	0.	3585.	.001	.001	.001	.0206	.0000	.0064
	413	149.	0.	159.	0.	0.	0.	.226	.001	.620	.0283	.0000	.0110
VALVE	411	22.	573.	98.	4448.	310.	1711.	.001	.001	.001	.0206	.0000	.0064
	414	22.	573.	98.	4605.	41.	759.	.001	.008	.001	.0183	.0001	.0062
RUN	414	15.	328.	13.	4605.	41.	759.	.001	.008	.001	.0183	.0001	.0062
	418	15.	328.	13.	4334.	64.	609.	.001	.022	.001	.0090	.0001	.0058
REDUCE	418	15.	328.	13.	4334.	64.	609.	.001	.022	.001	.0090	.0001	.0058
	420	15.	328.	13.	4166.	86.	1383.	.001	.031	.001	.0075	.0001	.0055
RUN	420	15.	328.	13.	4166.	86.	1383.	.001	.031	.001	.0075	.0001	.0055
	422	15.	328.	13.	4135.	90.	1524.	.001	.033	.001	.0072	.0001	.0054
ELBOW	422	15.	328.	13.	4135.	90.	1524.	.001	.033	.001	.0072	.0001	.0054
	423	15.	328.	13.	3416.	81.	2098.	.001	.031	.001	.0042	.0002	.0051
RUN	423	15.	328.	13.	3416.	81.	2098.	.001	.031	.001	.0042	.0002	.0051
	426	15.	328.	13.	825.	52.	2098.	.002	.008	.001	.0024	.0002	.0027
ELBOW	426	15.	327.	13.	825.	52.	2098.	.002	.008	.001	.0024	.0002	.0027
	427	15.	327.	13.	188.	107.	1370.	.003	.004	.001	.0015	.0001	.0010
RUN	427	15.	327.	13.	188.	107.	1370.	.003	.004	.001	.0015	.0001	.0010
	428	15.	327.	13.	188.	152.	268.	.003	.003	.000	.0014	.0001	.0008
RUN	428	15.	6.	3.	188.	152.	268.	.003	.003	.000	.0014	.0001	.0008
	430	15.	6.	3.	188.	72.	145.	.003	.016	.006	.0013	.0003	.0005
RUN	430	15.	6.	3.	188.	72.	145.	.003	.016	.006	.0013	.0003	.0005
	434	15.	6.	3.	188.	48.	130.	.003	.024	.014	.0014	.0004	.0005

LTR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 74

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
ELBOW	434	15.	6.	3.	188.	48.	130.	.003	.024	.014	.0014	.0004	.0005
	435	15.	6.	3.	191.	49.	145.	.002	.025	.012	.0014	.0004	.0007
RUN	435	15.	6.	3.	191.	49.	145.	.002	.025	.012	.0014	.0004	.0007
	436	15.	6.	3.	193.	49.	150.	.002	.025	.011	.0014	.0004	.0007
RUN	436	7.	6.	5.	193.	49.	150.	.002	.025	.011	.0014	.0004	.0007
	438	7.	6.	5.	227.	49.	104.	.006	.025	.000	.0014	.0004	.0007
RUN	438	6.	8.	9.	227.	49.	104.	.006	.025	.000	.0014	.0004	.0007
	439	6.	8.	9.	169.	49.	149.	.033	.025	.060	.0016	.0005	.0006
E-4 RUN	439	2.	10.	4.	169.	49.	149.	.033	.025	.060	.0016	.0005	.0006
	440	2.	10.	4.	291.	49.	189.	.044	.025	.106	.0009	.0008	.0004
RUN	440	5.	13.	5.	291.	49.	189.	.044	.025	.106	.0009	.0008	.0004
	442	5.	13.	5.	168.	49.	64.	.039	.025	.122	.0010	.0010	.0007
ELBOW	442	9.	17.	15.	168.	49.	64.	.039	.025	.122	.0010	.0010	.0007
	443	9.	17.	15.	120.	35.	59.	.037	.023	.122	.0011	.0010	.0007
RUN	443	9.	17.	15.	120.	35.	59.	.037	.023	.122	.0011	.0010	.0007
	444	9.	17.	15.	279.	158.	81.	.026	.000	.123	.0010	.0009	.0008
RUN	444	8.	7.	15.	279.	158.	81.	.026	.000	.123	.0010	.0009	.0008
	446	8.	7.	15.	253.	316.	96.	.027	.016	.125	.0002	.0003	.0011
ELBOW	446	7.	8.	31.	253.	316.	96.	.027	.016	.125	.0002	.0003	.0011
	447	7.	8.	31.	253.	320.	96.	.027	.016	.125	.0002	.0003	.0011
RUN	447	7.	8.	31.	253.	320.	96.	.027	.016	.125	.0002	.0003	.0011
	450	7.	8.	31.	361.	493.	101.	.007	.000	.126	.0010	.0015	.0015
RUN	450	18.	12.	31.	361.	493.	101.	.007	.000	.126	.0010	.0015	.0015
	452	18.	12.	31.	137.	221.	80.	.079	.056	.126	.0015	.0021	.0020
RUN	452	9.	6.	44.	137.	221.	80.	.079	.056	.126	.0015	.0021	.0020
	454	9.	6.	44.	341.	553.	75.	.135	.098	.127	.0005	.0010	.0024
ELBOW	454	5.	6.	54.	341.	553.	75.	.135	.098	.127	.0005	.0010	.0024
	455	5.	6.	54.	337.	545.	73.	.136	.099	.127	.0004	.0010	.0025
RUN	455	5.	6.	54.	337.	545.	73.	.136	.099	.127	.0004	.0010	.0025
	456	5.	6.	54.	345.	595.	27.	.122	.070	.118	.0011	.0019	.0027
RUN	456	17.	11.	67.	345.	595.	27.	.122	.070	.118	.0011	.0019	.0027
	460	17.	11.	67.	428.	844.	104.	.040	.000	.131	.0024	.0036	.0025

LTR 1122

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 75

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	460	52.	16.	55.	428.	844.	104.	.040	.000	.131	.0024	.0036	.0025
	462	52.	16.	55.	260.	636.	167.	.117	.089	.172	.0027	.0036	.0024
RUN	462	42.	6.	73.	260.	636.	167.	.117	.089	.172	.0027	.0036	.0024
	464	42.	6.	73.	426.	1280.	218.	.181	.140	.190	.0015	.0008	.0030
ELBOW	464	31.	5.	87.	426.	1280.	218.	.181	.140	.190	.0015	.0008	.0030
	465	31.	5.	87.	414.	1248.	211.	.180	.140	.189	.0014	.0012	.0030
RUN	465	31.	6.	87.	414.	1248.	211.	.180	.140	.189	.0014	.0012	.0030
	466	31.	6.	87.	282.	401.	119.	.106	.088	.122	.0013	.0042	.0033
E-5 RUN	466	28.	16.	100.	282.	401.	119.	.106	.088	.122	.0013	.0042	.0033
	470	28.	16.	100.	346.	1496.	324.	.045	.000	.061	.0022	.0026	.0027
RUN	470	87.	12.	54.	346.	1496.	324.	.045	.000	.061	.0022	.0026	.0027
	472	87.	12.	54.	217.	410.	263.	.045	.072	.121	.0025	.0032	.0015
RUN	472	85.	6.	64.	217.	410.	263.	.045	.072	.121	.0025	.0032	.0015
	474	85.	6.	64.	269.	1148.	265.	.098	.103	.168	.0018	.0008	.0016
ELBOW	474	79.	6.	75.	269.	1148.	265.	.098	.103	.168	.0018	.0008	.0016
	475	79.	6.	75.	260.	1142.	254.	.099	.103	.168	.0018	.0006	.0016
RUN	475	79.	6.	75.	260.	1142.	254.	.099	.103	.168	.0018	.0006	.0016
	476	79.	6.	75.	158.	377.	67.	.059	.059	.107	.0011	.0032	.0021
RUN	476	75.	13.	85.	158.	377.	67.	.059	.059	.107	.0011	.0032	.0021
	480	75.	13.	85.	148.	917.	371.	.009	.000	.007	.0008	.0020	.0014
RUN	480	101.	6.	44.	148.	917.	371.	.009	.000	.007	.0008	.0020	.0014
	482	101.	6.	44.	69.	275.	220.	.019	.014	.015	.0006	.0003	.0003
ELBOW	482	103.	7.	43.	69.	275.	220.	.019	.014	.015	.0006	.0003	.0003
	483	103.	7.	43.	68.	259.	214.	.019	.014	.015	.0006	.0004	.0003
RUN	483	103.	7.	43.	68.	259.	214.	.019	.014	.015	.0006	.0004	.0003
	484	103.	7.	43.	90.	142.	50.	.010	.002	.012	.0003	.0010	.0005
ELBOW	484	105.	8.	47.	90.	142.	50.	.010	.002	.012	.0003	.0010	.0005
	485	105.	8.	47.	104.	101.	48.	.008	.001	.013	.0002	.0010	.0005
RUN	485	105.	8.	47.	104.	101.	48.	.008	.001	.013	.0002	.0010	.0005
	486	105.	8.	47.	150.	731.	48.	.001	.000	.013	.0001	.0007	.0005
RUN	486	32.	7.	34.	150.	731.	48.	.001	.000	.013	.0001	.0007	.0005
	500	32.	7.	34.	10.	38.	48.	.000	.000	.013	.0000	.0002	.0007

LIR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 76

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	500	0.	0.	22.	10.	38.	48.	.000	.000	.013	.0000	.0002	.0007
	510	0.	0.	22.	11.	19.	48.	.000	.000	.013	.0001	.0000	.0020
RUN	510	6.	8.	14.	11.	19.	48.	.000	.000	.013	.0001	.0000	.0020
	515	6.	8.	14.	182.	140.	48.	.000	.000	.013	.0002	.0001	.0022
RUN	515	6.	11.	12.	182.	140.	48.	.000	.030	.013	.0002	.0001	.0022
	516	6.	11.	12.	119.	106.	48.	.001	.002	.013	.0003	.0002	.0022
ELBOW	516	6.	11.	11.	119.	106.	48.	.001	.002	.013	.0003	.0002	.0022
	517	6.	11.	11.	94.	68.	24.	.002	.007	.013	.0004	.0004	.0023
RUN	517	6.	11.	11.	94.	68.	24.	.002	.007	.013	.0004	.0004	.0023
	518	6.	11.	11.	94.	90.	131.	.002	.039	.016	.0006	.0003	.0022
ELBOW	518	6.	9.	10.	94.	90.	131.	.002	.039	.016	.0006	.0003	.0022
	519	6.	9.	10.	28.	208.	198.	.003	.060	.018	.0007	.0001	.0019
RUN	519	6.	9.	10.	28.	208.	198.	.003	.060	.018	.0007	.0001	.0019
	520	6.	9.	10.	6.	226.	198.	.003	.062	.018	.0007	.0000	.0018
ELBOW	520	6.	4.	9.	6.	226.	198.	.003	.062	.018	.0007	.0000	.0018
	521	6.	4.	9.	29.	202.	168.	.003	.056	.018	.0007	.0004	.0015
RUN	521	6.	4.	9.	29.	202.	168.	.003	.056	.018	.0007	.0004	.0015
	522	6.	4.	9.	29.	16.	71.	.003	.024	.028	.0006	.0006	.0012
RUN	522	5.	2.	4.	29.	16.	71.	.003	.024	.028	.0006	.0006	.0012
	524	5.	2.	4.	29.	137.	35.	.003	.008	.042	.0005	.0004	.0010
ELBOW	524	5.	3.	6.	29.	137.	35.	.003	.008	.042	.0005	.0004	.0010
	525	5.	3.	6.	35.	118.	32.	.002	.009	.043	.0004	.0002	.0010
RUN	525	5.	3.	6.	35.	118.	32.	.002	.009	.043	.0004	.0002	.0010
	527	5.	3.	6.	99.	16.	32.	.000	.000	.043	.0002	.0000	.0009
RUN	527	1.	2.	6.	99.	16.	32.	.000	.000	.043	.0002	.0000	.0009
	528	1.	2.	6.	59.	23.	32.	.001	.003	.043	.0000	.0000	.0009
RUN	528	1.	2.	20.	59.	23.	32.	.001	.003	.043	.0000	.0000	.0009
	529	1.	2.	20.	36.	44.	32.	.001	.002	.043	.0001	.0001	.0009
RUN	529	0.	1.	19.	36.	44.	32.	.001	.002	.043	.0001	.0001	.0009
	530	0.	1.	19.	36.	43.	32.	.003	.002	.043	.0002	.0002	.0009
RUN	530	3.	2.	19.	36.	43.	32.	.003	.002	.043	.0002	.0002	.0009
	532	3.	2.	19.	54.	59.	32.	.009	.008	.043	.0001	.0001	.0009

LTR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 77

MEMBER	END	FORCES (LBS)			MOMENTS (IN-LBS)			DEFLECTIONS (IN)			ROTATIONS (RAD)		
		FX	FY	FZ	MX	MY	MZ	DX	DY	DZ	RX	RY	RZ
RUN	532	0.	0.	31.	54.	59.	32.	.009	.008	.043	.0001	.0001	.0009
	534	0.	0.	31.	57.	71.	32.	.009	.007	.043	.0001	.0001	.0010
RUN	534	1.	1.	39.	57.	71.	32.	.009	.007	.043	.0001	.0001	.0010
	535	1.	1.	39.	13.	30.	32.	.000	.000	.043	.0003	.0003	.0010
RUN	535	3.	2.	47.	13.	30.	32.	.000	.000	.043	.0003	.0003	.0010
	536	3.	2.	47.	65.	85.	32.	.013	.009	.043	.0001	.0002	.0012
RUN	536	1.	0.	56.	65.	85.	32.	.013	.009	.043	.0001	.0002	.0012
	538	1.	0.	56.	66.	103.	32.	.013	.008	.043	.0002	.0002	.0013
RUN	538	4.	3.	72.	66.	103.	32.	.013	.008	.043	.0002	.0002	.0013
	540	4.	3.	72.	70.	69.	32.	.000	.000	.042	.0002	.0003	.0014
RUN	540	9.	3.	30.	70.	69.	32.	.000	.000	.042	.0002	.0003	.0014
	545	9.	3.	30.	135.	364.	32.	.000	.000	.042	.0002	.0005	.0016
RUN	545	13.	7.	13.	135.	364.	32.	.000	.000	.042	.0002	.0005	.0016
	548	13.	7.	13.	106.	89.	32.	.035	.012	.042	.0003	.0011	.0017
RUN	548	1.	3.	3.	106.	89.	32.	.035	.012	.042	.0003	.0011	.0017
	550	1.	3.	3.	192.	121.	32.	.066	.013	.042	.0006	.0008	.0019
ELBOW	550	6.	3.	7.	192.	121.	32.	.066	.013	.042	.0006	.0008	.0019
	551	6.	3.	7.	195.	94.	31.	.068	.009	.043	.0007	.0008	.0018
RUN	551	6.	3.	7.	195.	94.	31.	.068	.009	.043	.0007	.0008	.0018
	555	6.	3.	7.	195.	76.	35.	.068	.004	.044	.0008	.0008	.0018
ELBOW	555	11.	4.	11.	195.	76.	35.	.068	.004	.044	.0008	.0008	.0018
	556	11.	4.	11.	171.	95.	22.	.064	.000	.043	.0010	.0007	.0018
RUN	556	11.	4.	11.	171.	95.	22.	.064	.000	.043	.0010	.0007	.0018
	558	11.	4.	11.	132.	95.	270.	.022	.000	.017	.0010	.0004	.0014
RUN	558	14.	4.	15.	132.	95.	270.	.022	.000	.017	.0010	.0004	.0014
	560	14.	4.	15.	527.	95.	652.	.000	.000	.000	.0000	.0000	.0000

LIR 1122 1

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

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 89

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	280	1.000	1079.	2864.	562.	1642.
	405	1.000	643.	2348.	78.	721.
RUN	405	1.000	643.	2348.	78.	721.
	406	1.000	753.	2520.	522.	1274.
Π RUN	406	1.000	753.	2520.	522.	1274.
	410	1.000	924.	2847.	1090.	2014.
1 RUN	414	1.000	1078.	17069.	10421.	11498.
	418	1.000	1191.	16188.	6197.	7388.
REDUCE	418	2.000	1003.	10363.	5157.	6160.
	420	2.000	1041.	10428.	9919.	10960.
RUN	420	1.000	858.	7116.	4959.	5817.
	422	1.000	862.	7144.	5463.	6325.
ELBOW	422	1.596	935.	8454.	8718.	9653.
	423	1.596	955.	7798.	11286.	12241.
RUN	423	1.000	879.	6594.	7072.	7950.
	426	1.000	886.	4100.	5290.	6176.
ELBOW	426	1.596	964.	4810.	8442.	9405.
	427	1.596	968.	3333.	5250.	6218.
RUN	427	1.000	889.	2866.	3290.	4179.
	428	1.000	908.	1422.	5247.	6156.
RUN	428	1.000	908.	1422.	5247.	6156.
	430	1.000	765.	1119.	3427.	4192.
RUN	430	1.000	765.	1119.	3427.	4192.
	434	1.000	812.	1144.	2845.	3657.
ELBOW	434	1.596	875.	1272.	4540.	5415.
	435	1.596	854.	1272.	4652.	5506.
RUN	435	1.000	794.	1144.	2915.	3709.
	436	1.000	795.	1151.	2962.	3757.

LTR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-B5V-10-VD OUTSIDE - PIERCE

PAGE 90

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	436	1.000	795.	1151.	2962.	3757.
	438	1.000	788.	1150.	2091.	2879.
RUN	438	1.000	788.	1150.	2091.	2879.
	439	1.000	845.	1174.	1173.	2018.
RUN	439	1.000	845.	1174.	1173.	2018.
	440	1.000	1222.	1722.	2127.	3350.
RUN	440	1.000	1222.	1722.	2127.	3350.
	442	1.000	1613.	1878.	3617.	5229.
ELBOW	442	1.596	1834.	2151.	5772.	7605.
	443	1.596	1577.	1812.	5744.	7321.
RUN	443	1.000	1399.	1595.	3599.	4998.
	444	1.000	2224.	2695.	2510.	4734.
RUN	444	1.000	2224.	2695.	2510.	4734.
	446	1.000	1466.	2058.	1086.	2551.
ELBOW	446	1.000	1466.	2058.	1086.	2551.
	447	1.000	1457.	2055.	1036.	2494.
RUN	447	1.000	1457.	2055.	1036.	2494.
	450	1.000	1684.	2567.	436.	2120.
RUN	450	1.000	1684.	2567.	436.	2120.
	452	1.000	1208.	1596.	306.	1513.
RUN	452	1.000	1208.	1596.	306.	1513.
	454	1.000	1547.	2479.	480.	2027.
ELBOW	454	1.000	1547.	2479.	480.	2027.
	455	1.000	1531.	2450.	479.	2009.
RUN	455	1.000	1531.	2450.	479.	2009.
	456	1.000	655.	1636.	187.	842.
RUN	456	1.000	655.	1636.	187.	842.
	460	1.000	2552.	3909.	166.	2718.

LTR 1122 1

04/10/78

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

PAGE 91

MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

ASME SECTION III CLASS 2 OR ANSI 831.1.8 STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIFY FACTOR	SUSTAINED STRESS EQ. 6 (PSI)	OCCASIONAL STRESS EQ. 9 (PSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
RUN	460	1.000	2552.	3909.	166.	2718.
	462	1.000	619.	1627.	112.	731.
RUN	462	1.000	619.	1627.	112.	731.
	464	1.000	1088.	3036.	223.	1310.
ELBOW	464	1.000	1088.	3036.	223.	1310.
	465	1.000	1090.	2988.	213.	1303.
RUN	465	1.000	1090.	2988.	213.	1303.
	466	1.000	611.	1331.	220.	831.
RUN	466	1.000	611.	1331.	220.	831.
	470	1.000	2423.	4660.	659.	3081.
RUN	470	1.000	2423.	4660.	659.	3081.
	472	1.000	679.	1439.	183.	862.
RUN	472	1.000	679.	1439.	183.	862.
	474	1.000	1429.	3152.	995.	2423.
ELBOW	474	1.000	1429.	3152.	995.	2423.
	475	1.000	1438.	3145.	1030.	2468.
RUN	475	1.000	1438.	3145.	1030.	2468.
	476	1.000	1034.	1624.	1240.	2274.
RUN	476	1.000	1034.	1624.	1240.	2274.
	480	1.000	2012.	3438.	1458.	3470.
RUN	480	1.000	2012.	3438.	1458.	3470.
	482	1.000	2012.	3438.	1458.	3470.
ELBOW	482	1.000	921.	1433.	139.	1060.
	483	1.000	923.	1412.	198.	1121.
RUN	483	1.000	923.	1412.	198.	1121.
	484	1.000	1140.	1390.	1951.	3091.
ELBOW	484	1.596	1268.	1567.	3114.	4382.
	485	1.596	1266.	1527.	3204.	4471.

LFR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 92

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)
RUN	485	1.000	1139.	1355.	2008.	3147.
	496	1.000	1117.	2182.	1913.	3029.
RUN	486	1.000	1117.	2182.	1913.	3029.
	500	1.000	764.	853.	74.	838.
RUN	500	1.000	764.	853.	74.	838.
	510	1.000	770.	846.	381.	1151.
RUN	510	1.000	770.	846.	381.	1151.
	515	1.000	1693.	2027.	7742.	9435.
RUN	515	1.000	1693.	2027.	7742.	9435.
	516	1.000	1298.	1494.	4633.	6031.
ELBOW	516	1.596	1409.	1692.	7713.	9121.
	517	1.596	1160.	1363.	4383.	5544.
RUN	517	1.000	1050.	1220.	2747.	3797.
	518	1.000	1514.	1778.	3263.	4777.
ELBOW	518	1.000	1514.	1778.	3263.	4777.
	519	1.000	1783.	2194.	10217.	12000.
RUN	519	1.000	1783.	2194.	10217.	12000.
	520	1.000	1776.	2205.	11734.	13510.
ELBOW	520	1.000	1776.	2205.	11734.	13510.
	521	1.000	1510.	1867.	12363.	13672.
RUN	521	1.000	1510.	1867.	12363.	13672.
	522	1.000	925.	1037.	2028.	2953.
RUN	522	1.000	925.	1037.	2028.	2953.
	524	1.000	853.	1058.	10520.	11372.
ELBOW	524	1.596	924.	1169.	16788.	17712.
	525	1.596	908.	1125.	16487.	17395.
RUN	525	1.000	839.	1021.	10331.	11170.
	527	1.000	677.	827.	2181.	2658.

LTR 1122 1

04/10/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 93.

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	527	1.000	677.	827.	2181.	2858.
	528	1.000	643.	745.	1029.	1673.
RUN	528	1.000	643.	745.	1029.	1673.
	529	1.000	747.	840.	128.	875.
RUN	529	1.000	747.	840.	128.	875.
	530	1.000	732.	824.	268.	1000.
F-5 RUN	530	1.000	732.	824.	268.	1000.
	532	1.000	1090.	1213.	160.	1250.
RUN	532	1.000	1090.	1213.	160.	1250.
	534	1.000	819.	957.	70.	889.
RUN	534	1.000	819.	957.	70.	889.
	535	1.000	1549.	1615.	100.	1649.
RUN	535	1.000	1549.	1615.	100.	1649.
	536	1.000	940.	1100.	55.	996.
RUN	536	1.000	940.	1100.	55.	996.
	538	1.000	1085.	1265.	155.	1241.
RUN	538	1.000	1085.	1265.	155.	1241.
	540	1.000	1110.	1257.	271.	1380.
RUN	540	1.000	1110.	1257.	271.	1380.
	545	1.000	673.	1228.	2177.	2850.
RUN	545	1.000	673.	1228.	2177.	2850.
	548	1.000	901.	1104.	793.	1694.
RUN	548	1.000	901.	1104.	793.	1694.
	550	1.000	622.	949.	3563.	4185.
ELBOW	550	1.596	647.	1039.	5686.	6334.
	551	1.596	678.	1051.	5857.	6535.
RUN	551	1.000	647.	959.	3670.	4317.
	555	1.000	653.	955.	3655.	4308.

777
 777
 777

04/10/78

NUPIRE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-1C-V) OUTSIDE - PIERCE

PAGE 94

ASME SECTION III CLASS 2 OR ANSI B31.1-8 STRESS SUMMARY

MEMBER	NOQE	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	555	1.596	684.	1046.	5833.	6517.
	556	1.596	722.	1058.	5217.	5939.
RUN	556	1.000	684.	964.	3269.	3953.
	558	1.000	597.	1046.	1701.	2298.
RUN	558	1.000	597.	1046.	1701.	2298.
	560	1.000	582.	1785.	6938.	7520.

LFR 1122 1

APPENDIX G
LEVEL C SERVICE CONDITIONS
STRESS ANALYSIS RESULTS

04/11/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 89

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	280	1.000	1079.	4648.	0.	1079.
	405	1.000	643.	4052.	0.	643.
RUN	405	1.000	643.	4052.	0.	643.
	406	1.000	753.	4288.	0.	753.
RUN	406	1.000	753.	4288.	0.	753.
	410	1.000	924.	4770.	0.	924.
RUN	414	1.000	1078.	33059.	0.	1078.
	418	1.000	1191.	31186.	0.	1191.
REDUCE	418	2.000	1003.	19723.	0.	1003.
	420	2.000	1041.	19815.	0.	1041.
RUN	420	1.000	858.	13373.	0.	858.
	422	1.000	862.	13427.	0.	862.
ELBOW	422	1.596	935.	15974.	0.	935.
	423	1.596	955.	14637.	0.	955.
RUN	423	1.000	879.	12310.	0.	879.
	425	1.000	886.	7314.	0.	886.
ELBOW	426	1.596	964.	8657.	0.	964.
	427	1.596	968.	5699.	0.	968.
RUN	427	1.000	889.	4842.	0.	889.
	428	1.000	908.	1936.	0.	908.
RUN	428	1.000	908.	1936.	0.	908.
	430	1.000	765.	1473.	0.	765.
RUN	430	1.000	765.	1473.	0.	765.
	434	1.000	812.	1476.	0.	812.
ELBOW	434	1.596	875.	1670.	0.	875.
	435	1.596	854.	1691.	0.	854.
RUN	435	1.000	794.	1494.	0.	794.
	436	1.000	795.	1506.	0.	795.

LTR 1122 1

04/11/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-V3 OUTSIDE - PIERCE

PAGE 90

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

MEMBER	NODE	STRESS INTENSITY FACTOR	SUSTAINED STRESS EQ. 8 (PSI)	OCCASIONAL STRESS EQ. 9 (PSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
RUN	436	1.000	795.	1506.	0.	795.
	438	1.000	798.	1513.	0.	798.
RUN	438	1.000	788.	1513.	0.	788.
	439	1.000	845.	1504.	0.	845.
RUN	439	1.000	845.	1504.	0.	845.
	440	1.000	1222.	2221.	0.	1222.
RUN	440	1.000	1222.	2221.	0.	1222.
	442	1.000	1613.	2143.	0.	1613.
ELBOW	442	1.596	1834.	2468.	0.	1834.
	443	1.596	1577.	2047.	0.	1577.
RUN	443	1.000	1399.	1791.	0.	1399.
	444	1.000	2224.	3166.	0.	2224.
RUN	444	1.000	2224.	3166.	0.	2224.
	446	1.000	1466.	2650.	0.	1466.
ELBOW	446	1.000	1466.	2650.	0.	1466.
	447	1.000	1457.	2652.	0.	1457.
RUN	447	1.000	1457.	2652.	0.	1457.
	450	1.000	1684.	3450.	0.	1684.
RUN	450	1.000	1684.	3450.	0.	1684.
	452	1.000	1208.	1984.	0.	1208.
RUN	452	1.000	1208.	1984.	0.	1208.
	454	1.000	1547.	3412.	0.	1547.
ELBOW	454	1.000	1547.	3412.	0.	1547.
	455	1.000	1531.	3369.	0.	1531.
RUN	455	1.000	1531.	3369.	0.	1531.
	456	1.000	655.	2617.	0.	655.
RUN	456	1.000	655.	2617.	0.	655.
	460	1.000	2552.	5266.	0.	2552.

LTR 1122 1

04/11/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VO OUTSIDE - PIERCE

PAGE 91

ASME SECTION III CLASS 2 OR ANSI 331.1.8 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	460	1.000	2552.	5266.	0.	2552.
	462	1.000	619.	2636.	0.	619.
RUN	462	1.000	619.	2636.	0.	619.
	464	1.000	1088.	4984.	0.	1088.
ELBOW	464	1.000	1088.	4984.	0.	1088.
	465	1.000	1090.	4887.	0.	1090.
RUN	465	1.000	1090.	4887.	0.	1090.
	466	1.000	611.	2050.	0.	611.
RUN	466	1.000	611.	2050.	0.	611.
	470	1.000	2423.	6896.	0.	2423.
RUN	470	1.000	2423.	6896.	0.	2423.
	472	1.000	679.	2200.	0.	679.
RUN	472	1.000	679.	2200.	0.	679.
	474	1.000	1429.	4875.	0.	1429.
ELBOW	474	1.000	1429.	4875.	0.	1429.
	475	1.000	1438.	4853.	0.	1438.
RUN	475	1.000	1438.	4853.	0.	1438.
	476	1.000	1034.	2215.	0.	1034.
RUN	476	1.000	1034.	2215.	0.	1034.
	480	1.000	2012.	4864.	0.	2012.
RUN	480	1.000	2012.	4864.	0.	2012.
	482	1.000	921.	1945.	0.	921.
ELBOW	482	1.000	921.	1945.	0.	921.
	483	1.000	923.	1900.	0.	923.
RUN	483	1.000	923.	1900.	0.	923.
	484	1.000	1140.	1641.	0.	1140.
ELBOW	484	1.596	1268.	1867.	0.	1268.
	485	1.596	1266.	1787.	0.	1266.

LTR 1122 1

04/11/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-B5V-10-VD OUTSIDE - PIERCE

PAGE 92

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

MEMBER	NODE	STRESS INTENSIFY FACTOR	SUSTAINED STRESS EQ. 8 (PSI)	OCCASIONAL STRESS EQ. 9 (PSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
RUN	485	1.000	1139.	1574.	0.	1139.
	486	1.000	1117.	3248.	0.	1117.
RUN	486	1.000	1117.	3248.	0.	1117.
	500	1.000	764.	941.	0.	764.
RUN	500	1.000	764.	941.	0.	764.
	510	1.000	770.	921.	0.	770.
RUN	510	1.000	770.	921.	0.	770.
	515	1.000	1693.	2261.	0.	1693.
RUN	515	1.000	1693.	2261.	0.	1693.
	516	1.000	1258.	1731.	0.	1258.
ELBOW	516	1.596	1409.	1975.	0.	1409.
	517	1.596	1160.	1566.	0.	1160.
RUN	517	1.000	1050.	1389.	0.	1050.
	518	1.000	1514.	2042.	0.	1514.
ELBOW	518	1.000	1514.	2042.	0.	1514.
	519	1.000	1783.	2606.	0.	1783.
RUN	519	1.000	1783.	2606.	0.	1783.
	520	1.000	1776.	2633.	0.	1776.
ELBOW	520	1.000	1776.	2633.	0.	1776.
	521	1.000	1510.	2265.	0.	1510.
RUN	521	1.000	1510.	2265.	0.	1510.
	522	1.000	925.	1150.	0.	925.
RUN	522	1.000	925.	1150.	0.	925.
	524	1.000	853.	1263.	0.	853.
ELBOW	524	1.596	924.	1315.	0.	924.
	525	1.596	908.	1342.	0.	908.
RUN	525	1.000	839.	1202.	0.	839.
	527	1.000	677.	978.	0.	677.

LIR 1122 1

04/11/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
 MOISTURE SEPARATOR - 1.5-BSV-10-VO OUTSIDE - PIERCE

PAGE 93

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

MEMBER	NODE	STRESS INTENSIF FACTOR	SUSTAINED STRESS EQ. 9 (PSI)	OCCASIONAL STRESS EQ. 9 (PSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
RUN	527	1.000	677.	978.	0.	677.
	528	1.000	643.	847.	0.	643.
RUN	528	1.000	643.	847.	0.	643.
	529	1.000	747.	934.	0.	747.
RUN	529	1.000	747.	934.	0.	747.
	530	1.000	732.	916.	0.	732.
RUN	530	1.000	732.	916.	0.	732.
	532	1.000	1090.	1336.	0.	1090.
RUN	532	1.000	1090.	1336.	0.	1090.
	534	1.000	819.	1095.	0.	819.
RUN	534	1.000	819.	1095.	0.	819.
	535	1.000	1549.	1681.	0.	1549.
RUN	535	1.000	1549.	1681.	0.	1549.
	536	1.000	940.	1260.	0.	940.
RUN	536	1.000	940.	1260.	0.	940.
	538	1.000	1085.	1445.	0.	1085.
RUN	538	1.000	1085.	1445.	0.	1085.
	540	1.000	1110.	1404.	0.	1110.
RUN	540	1.000	1110.	1404.	0.	1110.
	545	1.000	673.	1783.	0.	673.
RUN	545	1.000	673.	1783.	0.	673.
	548	1.000	901.	1307.	0.	901.
RUN	548	1.000	901.	1307.	0.	901.
	550	1.000	622.	1276.	0.	622.
ELBOW	550	1.596	647.	1430.	0.	647.
	551	1.596	678.	1424.	0.	678.
RUN	551	1.000	647.	1271.	0.	647.
	555	1.000	653.	1257.	0.	653.

LTR 1122 1

04/11/78

NUPIPE-IIM - NUCLEAR SERVICES CORPORATION PIPING ANALYSIS PROGRAM - VERSION 1.1
MOISTURE SEPARATOR - 1.5-BSV-10-VD OUTSIDE - PIERCE

PAGE 94

ASME SECTION III CLASS 2 OF ANSI B31.1.9 STRESS SUMMARY

MEMBER	NODE	STRESS INTENSIF FACTOR	SUSTAINED STRESS EQ. 6 (PSI)	OCCASIONAL STRESS EQ. 9 (PSI)	EXPANSION STRESS EQ. 10 (PSI)	SUSTAINED PLUS EXPANSION STRESS EQ. 11 (PSI)
ELBOW	555	1.596	684.	1408.	0.	684.
	556	1.596	722.	1393.	0.	722.
6- 9- RUN	556	1.000	684.	1245.	0.	684.
	558	1.000	597.	1495.	0.	597.
RUN	558	1.000	597.	1495.	0.	597.
	560	1.000	582.	2987.	0.	582.

LTR 1122 1

APPENDIX H
LEVEL D SERVICE CONDITIONS
STRESS ANALYSIS RESULTS

LTR 1122 1

THERE ARE NO LEVEL D SERVICE
CONDITIONS FOR THIS SYSTEM

APPENDIX I
COMPONENT SUPPORT ANALYSIS RESULTS

CALCULATION WORK SHEET

Page 1 of 2 Pages

Subject LOFT Waste Gas Processing System Line 1 1/2" - BSV-10-VD Date May 31, 1978

Prepared By A. Pierce

Checked _____

Work Request _____

Support Analysis - Valve

Supports for Isolation Valve CV - P138 - 54:

Node 410 (Loads on Support)

	F_y	Horizontal Force	Bending Moment (= Hor. Force $\times$ L)
T	+157	-161	
DW	-116	+ 3	
SSE	± 568	± 104	
T, DW, SSE	+609	-262	1048

Node 414 (Loads on Support)

	F_y	Horizontal Force	Bending Moment (= Hor. Force $\times$ L)
T	-244	+595	
DW	-52	- 5	
SSE	± 783	± 92	
T, DW, SSE (worst case)	-1079	+682	2728

I-1

CALCULATION WORK SHEET

Page 2 of 2 Pages

Subject W. G. P. S. 1 1/2" - BSV - 10 - V D

Date 5-31-78

Prepared By A. Pierce

Checked _____

Work Request _____

Valve support (cont.)

Normal Stress Due to Bending Moments:

$$\sigma_a = \frac{M}{Z} = \frac{4M}{\pi t D^2}$$

$$t = b \cos 45^\circ$$

$$\sigma_a = \frac{5.657M}{\pi b D^2} = 8733 \text{ psi}$$

Normal Stress Due to Axial Force:

$$\text{Assume } A = t \pi \left(D + \frac{b}{2}\right) = \pi (b \cos 45^\circ) \left(D + \frac{b}{2}\right) = 0.902$$

$$\sigma_b = \frac{1029}{0.902} = 1196 \text{ psi}$$

Shear Stress Due to Shear (Horizontal) Force:

$$\tau = \frac{F}{A} = \frac{682}{0.902} = 756 \text{ psi}$$

Worst Case: All stress add.

$$\text{Normal} = 8733 + 1196 = 9928 \text{ psi}$$

$$\text{Shear} = 756 \text{ psi}$$

Max. Shearing Stress Theory gives:

$$\tau_{\max} = \left[\tau^2 + \left(\frac{\sigma}{2}\right)^2 \right]^{1/2} = 5021 \text{ psi}$$

$$\text{Allowable for weld material} = 0.30(60,000) = 18,000 \text{ psi}$$

OK